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# Hamilton LRT Project

## Public Information Centre 2



Building on previous work and consultation, the City of Hamilton and Metrolinx have embarked on an update to the previously approved 2011 Environmental Project Report.

**This update follows the Transit Project Assessment Process (TPAP) and addresses the changes that have been proposed in terms of:**

- Design modifications to the 2011 EPR LRT (the B-Line) alignment;
- Adding the A-Line along James Street North connecting the new West Harbour GO Station and potentially down to the City's redeveloping Waterfront area;
- Potentially reconfiguring the MacNab Street bus terminal;
- Creating a new terminus with bus facility at the Queenston Traffic Circle;
- Adding a High-Order Pedestrian Connection on Hughson Street connecting the Hamilton GO Centre with LRT; and,
- Locating an Operations Maintenance and Storage Facility (OMSF) where light rail vehicles

would be maintained and stored, along with its run-in track in mixed traffic on Frid Street and Longwood Road to Main Street West, across the Longwood Road bridge and via the Frid Street extension.

**The purpose of this Public Information Centre is to:**

- Present new and updated information on the study topics developed since PIC #1 in September 2016.
- Provide information on the Transit Project Assessment Process (TPAP).
- Obtain your input and views on key elements of the project to assist us in finalizing the design concept.
- Staff are available from the City of Hamilton, Metrolinx and the consultant team to explain the materials and answer your questions.



↑ Scott Park Visualization (poles for overhead wires not shown)



# What Has Changed?

Based on input received at PIC #1, several important changes have been made to details of the project, and new details are being presented.

**Several elements of the project have been changed based on your input:**

- Selection of a preferred option for the McMaster terminus with side running LRT west of Dalewood to maintain existing traffic circulation patterns in the area
- Selection of a preferred option for the Longwood Road / Paradise Road area which retains the left turn at Paradise Road and eliminates the U-turn at Longwood
- Added a new stop – Gage Park, near the Delta
- Added new pedestrian crossing signals

**New and additional detailed information is also presented for environmental studies covering:**

- Natural heritage
- Contamination
- Hydrogeology
- Noise and Vibration
- Air Quality
- Traffic impacts
- Transit route changes





## Hamilton has established a vision to guide the development of Rapid Transit across the city:

Rapid Transit is more than just moving people from place to place. It is about providing a catalyst for the development of high quality, safe, sustainable and affordable transportation options for our citizens, connecting key destination points, stimulating economic development and revitalizing Hamilton. Rapid Transit planning strives to improve the quality of life for our community and the surrounding environment, as we move Hamilton forward.



↑ James Visualization (poles for overhead wires not shown)

## What is the Hamilton LRT project?

The Hamilton LRT project is a Light Rail Transit (LRT) project that will provide frequent and limited stop service along Main West, King Street and Main East; connecting McMaster University to Queenston. It also includes a short connection from King Street, via James Street, to West Harbour GO Station and the Waterfront, as well as a High-Order Pedestrian Connection to the Hamilton GO Centre.

In 2015, the Province of Ontario announced \$1 billion in funding for the Hamilton LRT project.



Sustainable environment

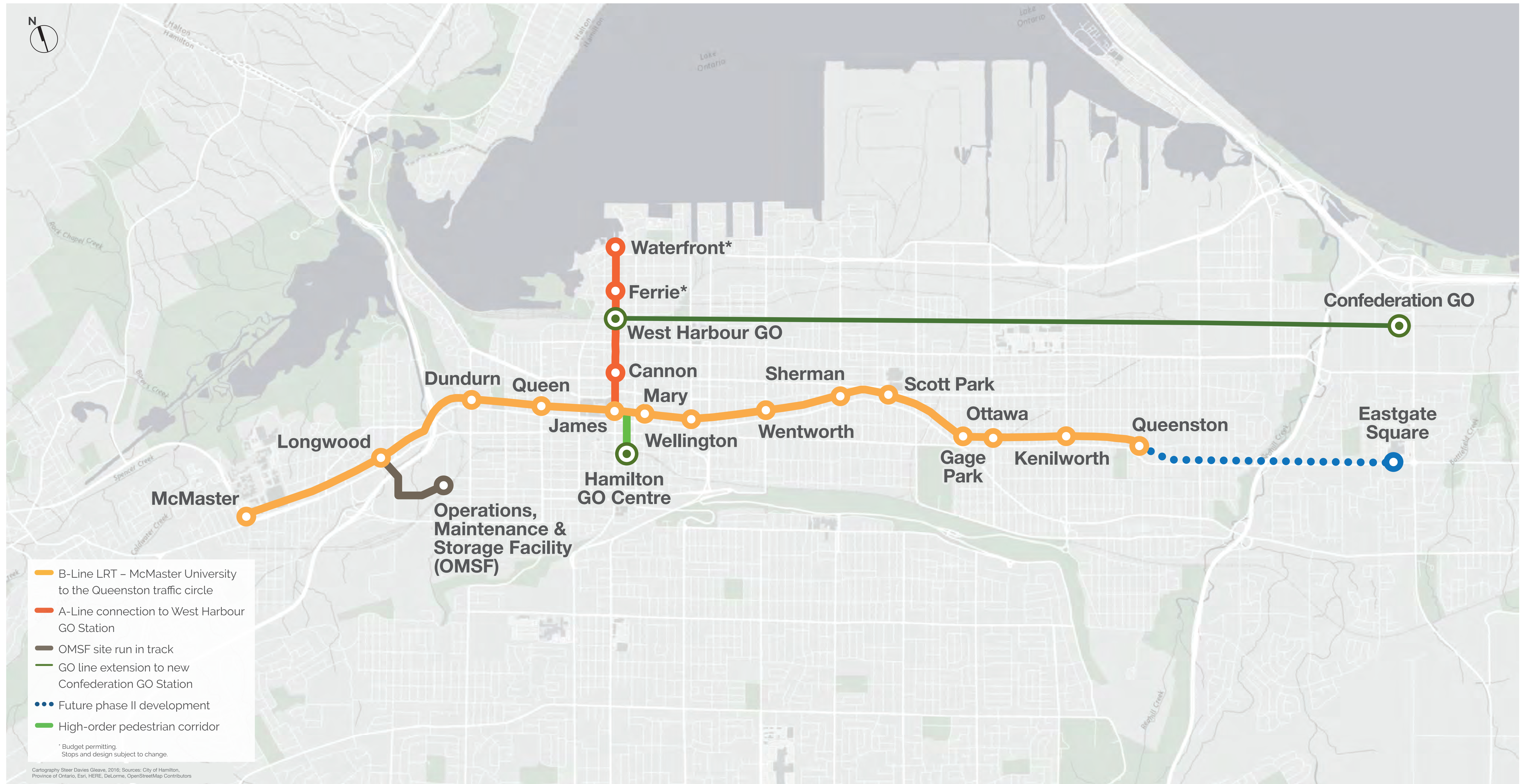


High quality of life



A competitive economy

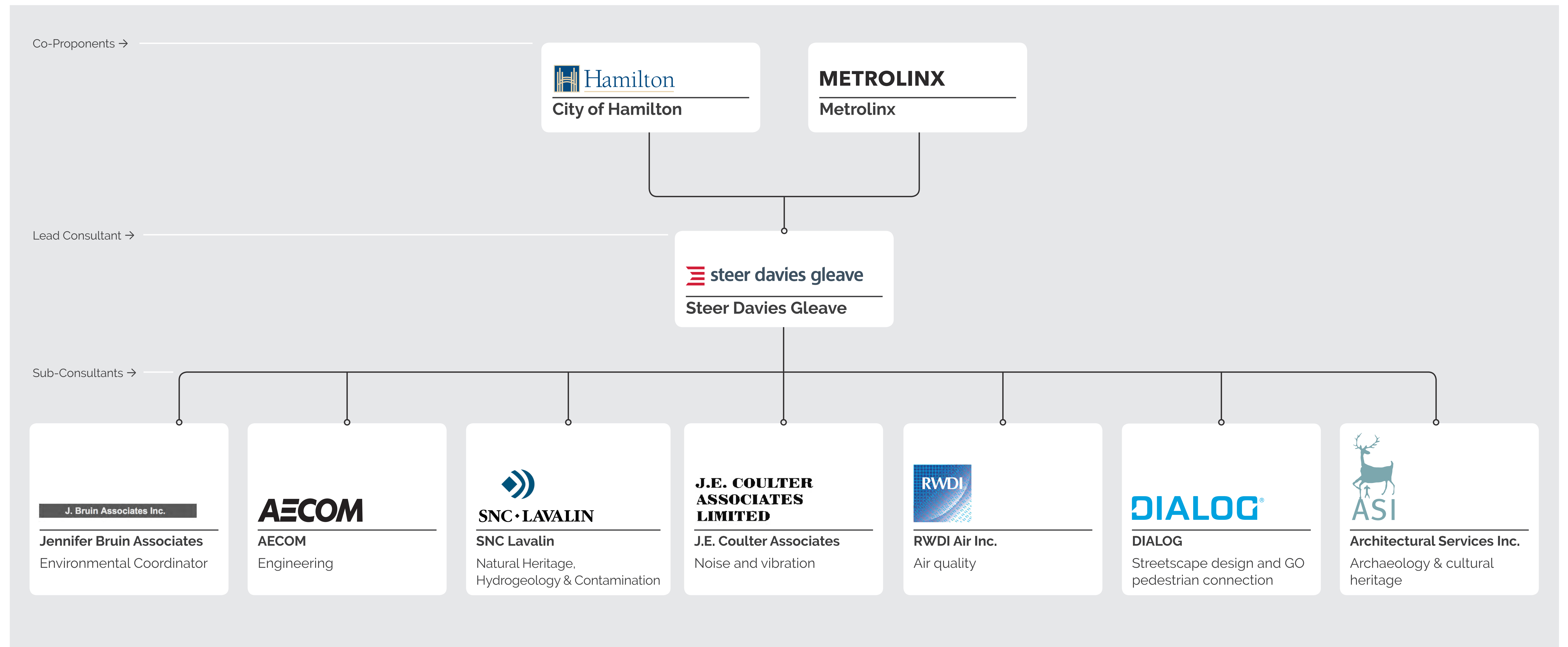




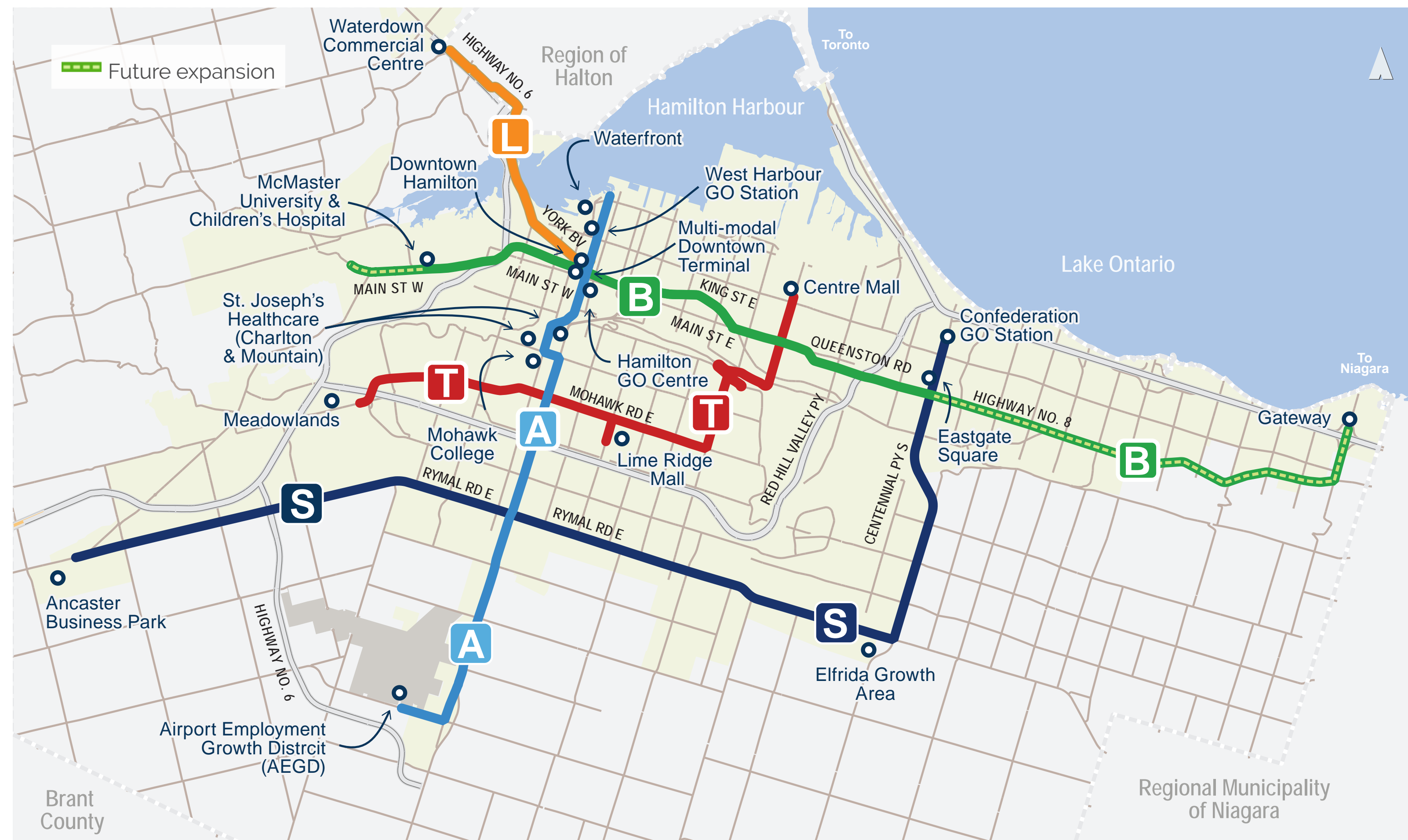


# Hamilton LRT Project Team

The following agencies and companies are responsible for completing various components of the Environmental Project Report update:







↑ Hamilton long term rapid transit system "B.L.A.S.T"

Hamilton's 2007 Transportation Master Plan developed the concept of the BLAST network – a system of five interconnected rapid transit lines (comprising Light Rail Transit and Bus Rapid Transit), supported by the conventional bus network.

The proposed LRT fulfils a substantial portion of the B-Line proposal and establishes the beginning of the A-Line with the connection to West Harbour GO Station and the Waterfront.

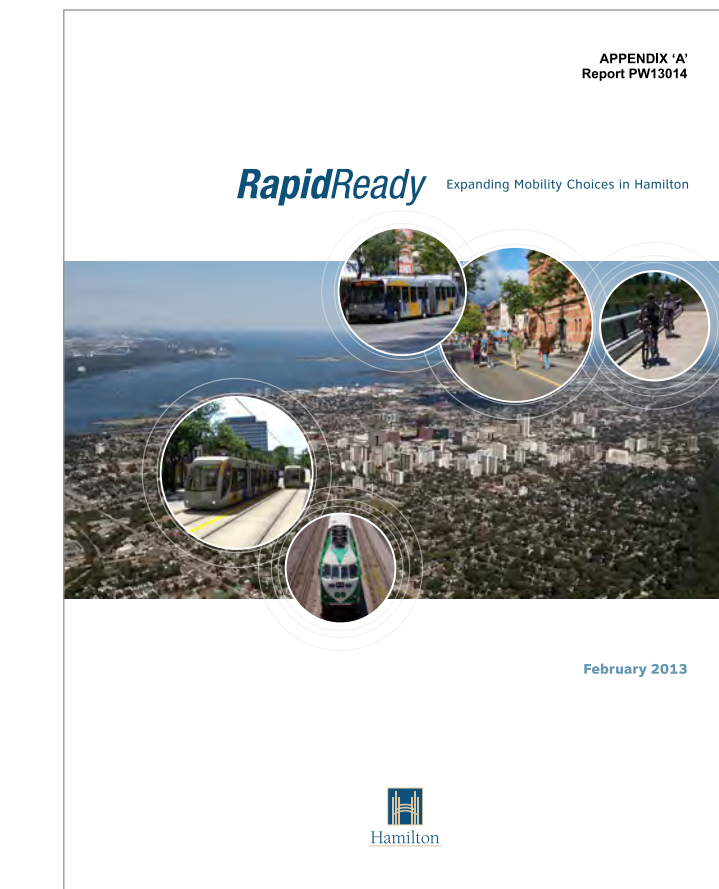


### Provincially / regionally

Places to Grow was created by the Province of Ontario to guide the growth of the GGH (Greater Golden Horseshoe) region through to 2031.

To accompany Places to Grow, Metrolinx developed The Big Move Regional Transportation Plan in November 2008. This sets out many goals to improve the state of transportation across the Greater Toronto and Hamilton Area, including construction of a "comprehensive regional rapid transit network".

In 2010, the Metrolinx Benefits Case Analysis identified LRT as the preferred technology for the B-Line corridor.



### Other relevant studies

The City has completed a wide variety of studies and established supporting policies that inform and support the development of the rapid transit network.

- City of Hamilton Official Plan
- Downtown Secondary Plan
- Rapid-Ready
- Growth-Related Integrated Development Strategy (GRIDS)
- Transportation Master Plan Update
- City-wide Planning Principles and Design Guidelines



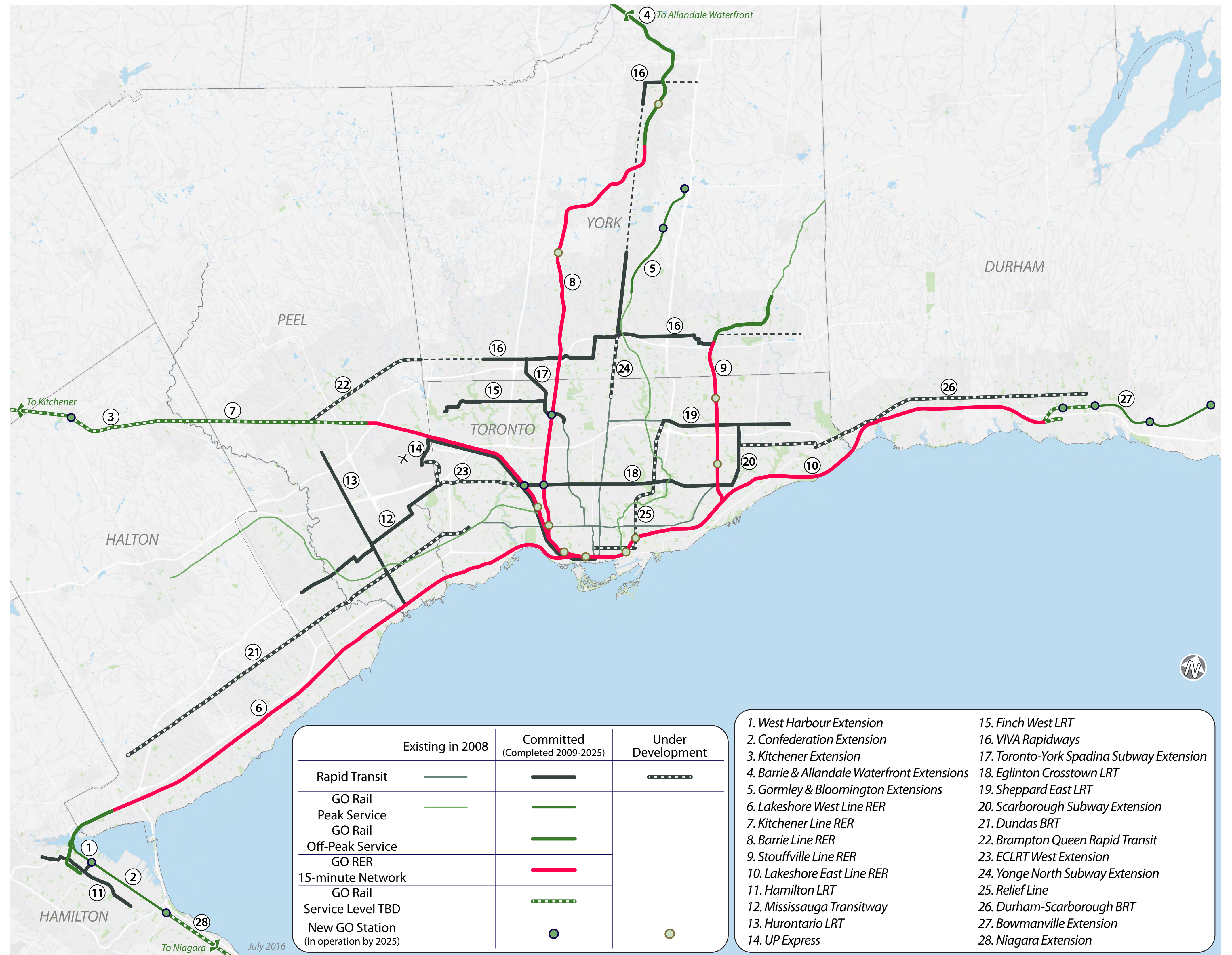
The Regional Transportation Plan is centred on developing an integrated transportation system that enhances our prosperity, environment and quality of life across the Greater Toronto & Hamilton Area (GTHA).

It is more than a transit plan: it articulates a vision for all modes of transportation in the region, supporting both people and goods movement.

Effective transit and transportation solutions can bolster our global competitiveness, protect our environment, and improve our quality of life. Expanding transportation can also help create thousands of new green and well-paid jobs, and save billions of dollars in time, energy and other efficiencies.

The Plan is unfolding through projects such as the transformation of the GO rail network to bring all-day, two-way frequent train service to the region, with connections to new light rail and bus rapid transit in Hamilton, Mississauga and Toronto, all enabled by PRESTO.

We are also delivering on initiatives to help incorporate active and sustainable transportation into the daily commute, including carpooling, walking and cycling, through our SmartCommute program.



↑ In-progress Rapid Transit Network. Subject to change. This diagram is not to scale.



# Benefits of Light Rail Transit



## Safe for passengers

- Surveillance cameras, emergency communications located at stops.
- Passenger assistance alarms and emergency voice communication provided on all LRVs.



## Fast and reliable

- Segregated LRT operation avoids traffic congestion and improved service reliability.
- Frequent service: typically every 6 minutes during peak times and 10–15 minutes and less frequent during the day.



## Accessible

- Level boarding with no steps and meeting accessibility standards.
- Wayfinding systems guide people with visual impairments.



## Superior passenger experience

- Smooth, quiet, comfortable ride quality.
- Large windows, natural daylight.
- No local emissions.

There are many benefits of Light Rail Transit that will help enhance the user's experience by making their trip smoother and more integrated.



## Integrated fares

- Fare payment will be integrated with GTHA wide Presto Card system ensuring seamless access between all transit modes.
- Proof of payment system will facilitate quick boarding at all doors.
- Flexible payment methods.



## Flexible travel times

- Service up to 20 hours per day.
- Estimated travel time from McMaster to Queenston is approximately 24 minutes.
- Additional service can be provided for special events.



## Clear routes

- Transit network maps provided at stops and on board trains.
- Next-stop announcements on trains.
- Next train displays.



## Incorporates cycling

- Bikes will be permitted on LRVs during most of the day.
- Bikes may be excluded during peak hours.
- Cycle lane connections and facilities in select corridor segments provides easy access for cyclists.



# LRT System at a Glance



- 1 Overhead wires (poles not shown pending design)
- 2 Driver controlled
- 3 Transit shelter
- 4 Step-Free access and level boarding
- 5 Segregated LRT with curb
- 6 Landscaping
- 7 Pleasant walking areas

↑ Scott Park Visualization (OCS poles not shown)





## Modern vehicles

- A single vehicle is 30m long and carries about 130 passengers comfortably. Equivalent to 2,5 buses.
- Low floor with easy access for mobility aids, strollers and bicycles.
- Join units for more capacity. In the long-term twinned vehicles, 60m long, will carry 260 passengers.



## LRT stops

- Stops to be integrated into the streetscape.
- Low platforms for level step-free access.
- Passenger information at stops.
- Proof-Of-Payment fare system with no fare barriers.



## Track

- Light Rail Vehicles (LRV) run on steel track.
- Steel track level with the road surface.
- Track separated from other traffic to provide quick and reliable journeys.
- Modern vehicle design reduces noise and vibration.



## Electrically powered

- Powered from overhead wires.
- Poles support the wires and road lighting, traffic signals and signs.
- Poles can be located in the centre between the tracks or at the side of the roadway.
- LRVs emit no pollution at their point of use.

Light Rail Transit will be integrated with the streetscape, creating a seamless link between public transport and the urban realm.



## An integrated network

- LRT services are integrated with bus transit services, and with GO regional bus and GO rail services.
- Integrated pedestrian and cycling network.



## Operations, Maintenance and Storage Facility (OMSF)

- Includes overnight storage for vehicles, cleaning, maintenance and repair facilities, LRT control room, management offices and staff facilities.
- Proposed site is near Longwood Road and Aberdeen Avenue.



## Electrical substations

- Convert electricity from the main grid to 750 VDC for the LRT line.
- Located approximately every 1.5 kms along the route and at terminals.
- Screening designed to fit into the local streetscape and may be integrated with public art.



## Integrated in the streetscape

- Light Rail is integrated into a vibrant urban streetscape.
- Opportunities to create more livable streets through an enhanced urban realm.
- Opportunities for placemaking.
- Opportunities for public art.



These images show typical cross-sections for the LRT in various locations along the corridor.

## Typical centre stop platform



LRT	Platform	LRT
2.95m	4.5m	2.95m
Curb		Curb
0.35m		0.35m

## Side-running cross-section

King Street East International Village



Sidewalk	LRT	LRT	Travel	Sidewalk
3.7m	3.1m	3.1m	3.7m	2.5m
Curb	Buffer	Curb	Curb	
0.2m	0.2m	0.35m	0.5m	

## Centre-running cross-section

King Street East, Main Street East with 1 lane in each direction



Sidewalk	Travel	LRT	LRT	Travel	Sidewalk
2.5m	3.7m	3.1m	3.1m	3.7m	2.5m
Curb	Curb	Buffer	Curb	Curb	Curb
0.5m	0.35m	0.2m	0.35m	0.5m	0.5m

## Side-running cross-section

Main Street West with 3 east bound traffic lanes and 2 west bound traffic lanes near McMaster stop



Grass	Sidewalk	Grass	LRT	LRT	Boulevard	Travel	Travel	Landscape median	Travel	Travel	Travel	Sidewalk	Grass
1.9m	3.5m	2.0m	3.1m	3.1m	2.9m	3.5m	3.5m	4.3m	3.3m	3.3m	3.3m	3.0m	1.5m
		Curb	Buffer	Curb	Curb			Curb	Curb		Curb		
		0.2m	0.9m	0.2m	0.5m			0.5m	0.5m		0.5m		

## Centre-running cross-section

Main Street West with 3 east bound traffic lanes and 2 west bound traffic lanes at Dalewood Avenue to Paradise Rd



Sidewalk	Travel	Travel	LRT	LRT	Travel	Travel	Travel	Sidewalk
2.5m	3.5m	3.5m	3.1m	3.1m	3.3m	3.3m	3.3m	2.5m
Curb			Curb	Buffer	Curb			Curb
0.5m			0.35m	0.9m	0.35m			0.5m



The project will require an Operations, Maintenance and Storage Facility (OMSF), which serves several key purposes.

Based on a review of multiple potential sites along the LRT corridor, a preferred OMSF site on lands south of Chatham Street, near Frid Street was identified.

The project team has developed a concept plan for the facility to confirm its size and functional layout, taking into account opening day service levels and long-term expansion requirements.

**Functions:**

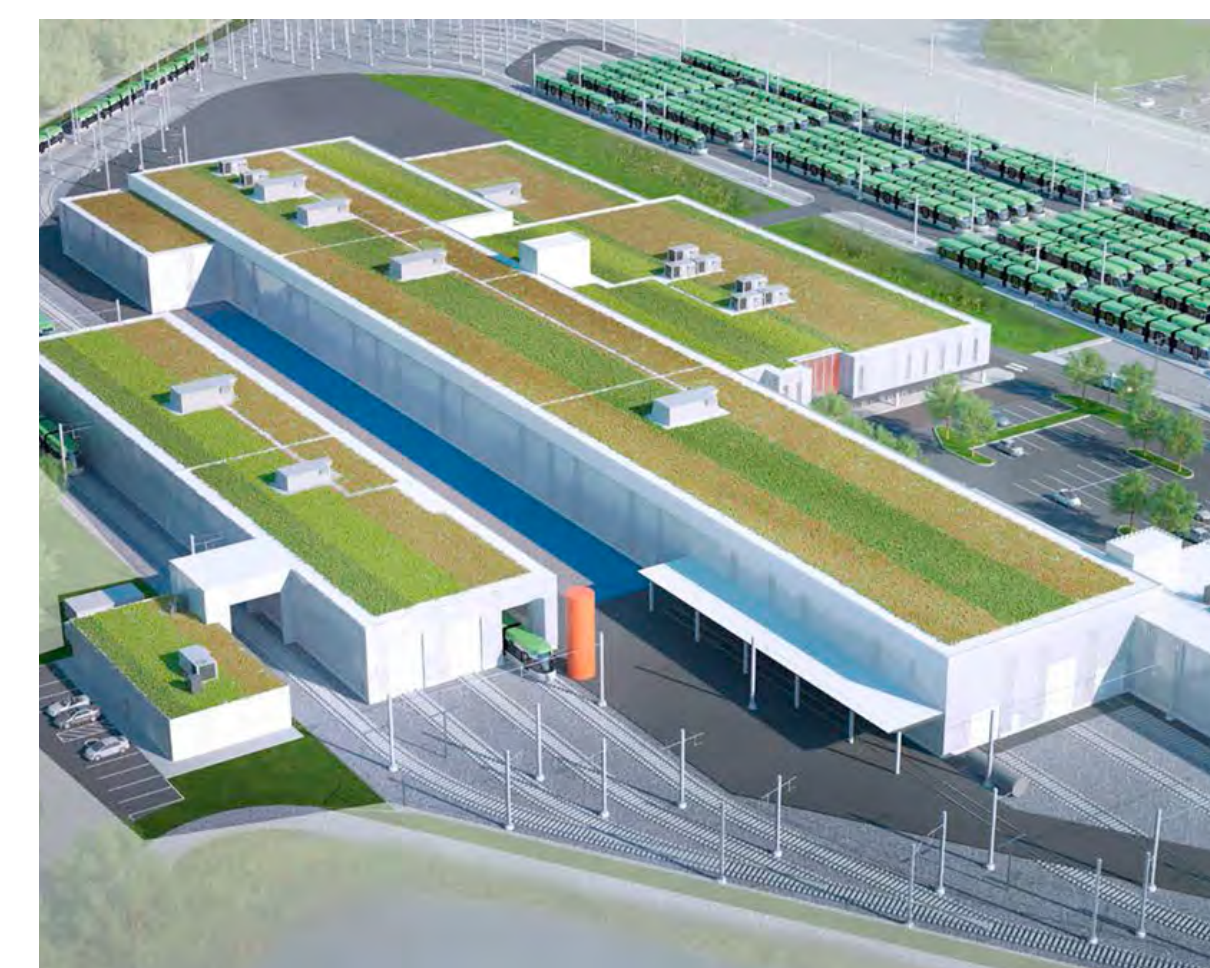
- Control and maintenance base for operations
- System administration centre
- Operations control centre
- Vehicle servicing and repair
- Daily vehicle cleaning
- Overnight storage yard



↑ Location area for the OMSF site



↑ Rendering of interior of Eglinton Crosstown OMSF facility



↑ Rendering of exterior of Eglinton Crosstown OMSF facility



# Operations, Maintenance and Storage Facility

Site Detail

The Operations, Maintenance and Storage Facility (OMSF) will include the completion of Frid Street from Chatham Street to the McMaster Innovation Park.

## THE OMSF facility will include:

- 1 Service and repair shop with administration offices
- 2 An outdoor storage area for LRVs
- 3 Stormwater management facility
- 4 Parking
- 5 Service buildings
- 6 Visual and sound screening

LRVs will travel to an from the B-Line via service tracks on Frid Street and Longwood Road.

The Environmental Assessment for the Frid Street extension was completed in 2011, and will be included as part of this EPR Addendum, since the alignment is changed somewhat from the original approved plan.



↑ Possible configuration of Operations, Maintenance and Storage Facility



# Overhead Contact System (OCS)

Light rail vehicles are electrically-powered, and the electricity is delivered from power substations located along the corridor (about 7 or 8 along the B-Line) to an overhead wire running above the tracks. Wiring systems for urban LRT are typically simple single wire systems, though some use a two-wire “catenary” system.

## Suspension Systems

Overhead wires are suspended through different methods, depending on the characteristics of the corridor.

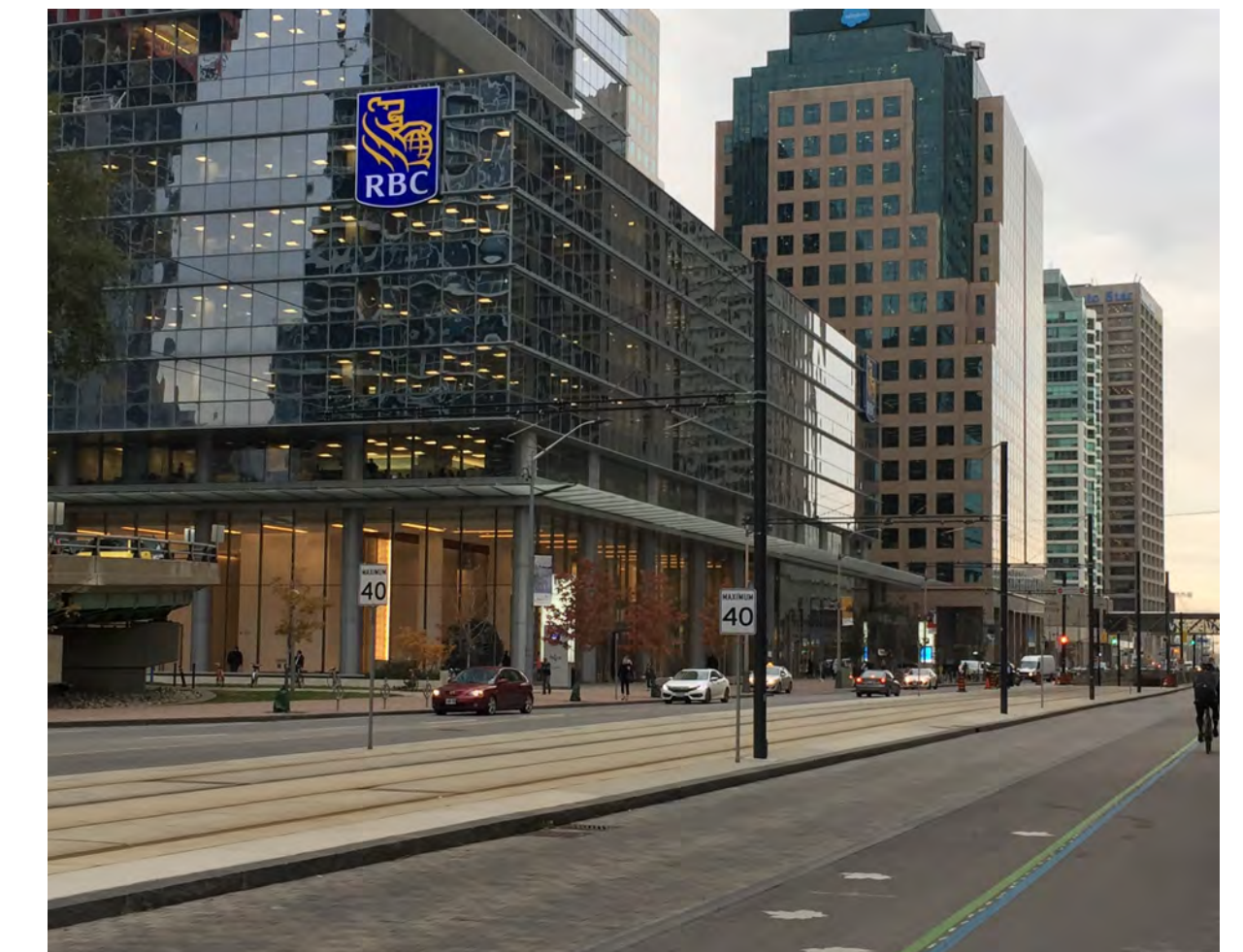
- Centre poles are located between the tracks with the wire suspended on either side.
- Side poles are located at the side of the road or sidewalk, with arms or support wires extending across the roadway and LRT tracks.
- Building mounts can be used in narrow corridors where appropriate mounting locations are available.
- For side poles, poles can be combined with light standards to minimize intrusion.



↑ OCS poles on Queen's Quay in Toronto



↑ Centre-pole catenary system in Minneapolis (centre-running with one traffic lanes on each side)



↑ OCS poles on Queen's Quay in Toronto



↑ Side-pole system at off-street stop in Dublin with platform lighting combined on OCS poles



↑ Building mounted supports in Nottingham



# Integrated Transit Network

Route Overview

The LRT will connect with local and regional transit services, GO bus and GO rail services. This will provide an integrated transit network, enabling passengers to move as easily as possible, in and around the city and the region.

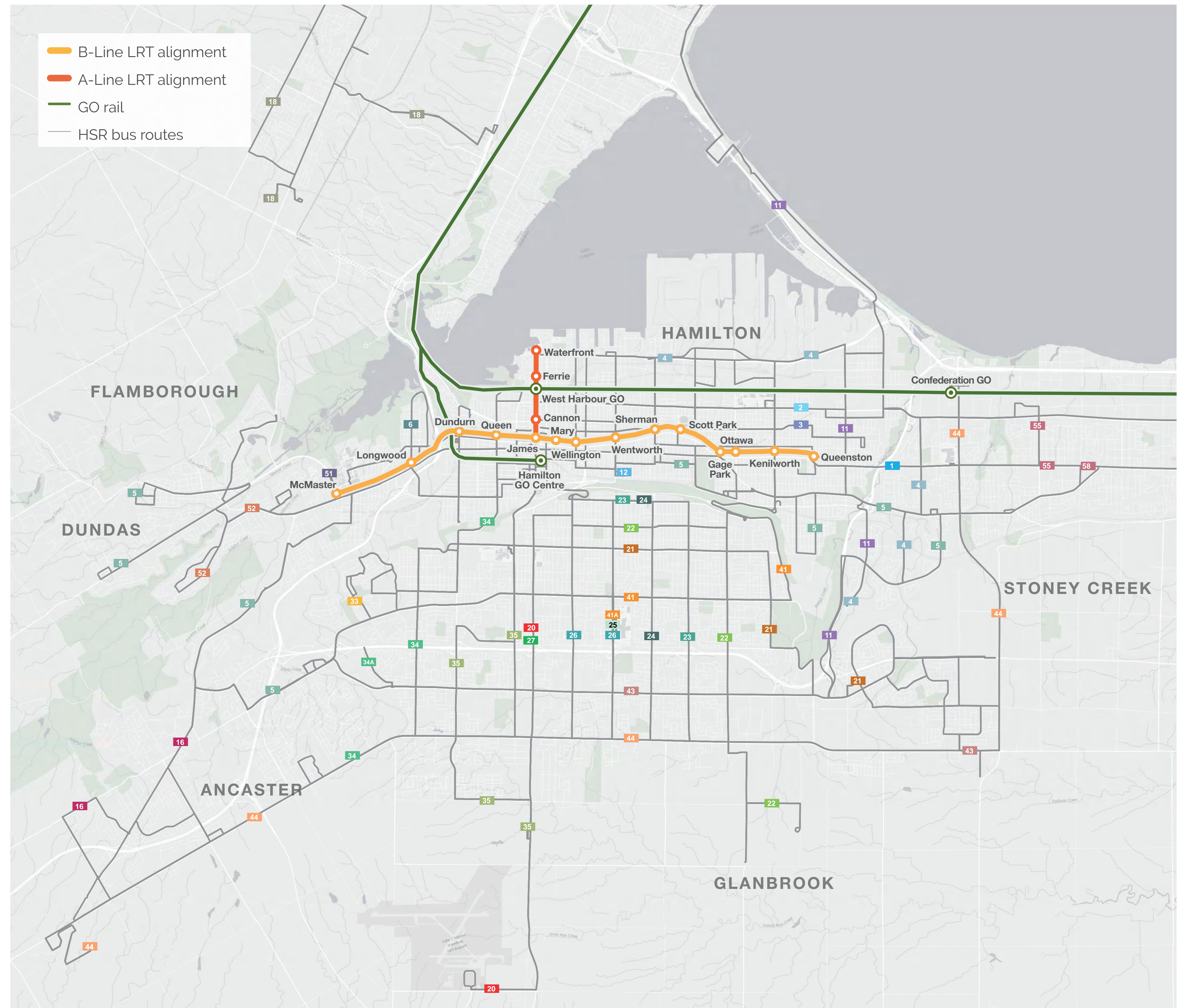
## Locally

The LRT will form the core of the east-west transit network in the lower city, and both support and be supported by the network of transit services throughout the city.

## Regionally

The LRT will form a key part of the regional network, and connect with regional rail and bus services, providing a choice of transfer locations.

This connectivity, together with the planned improvements to the regional services, will make travel to Hamilton easier from all over the region.



↑ Integrated transit network

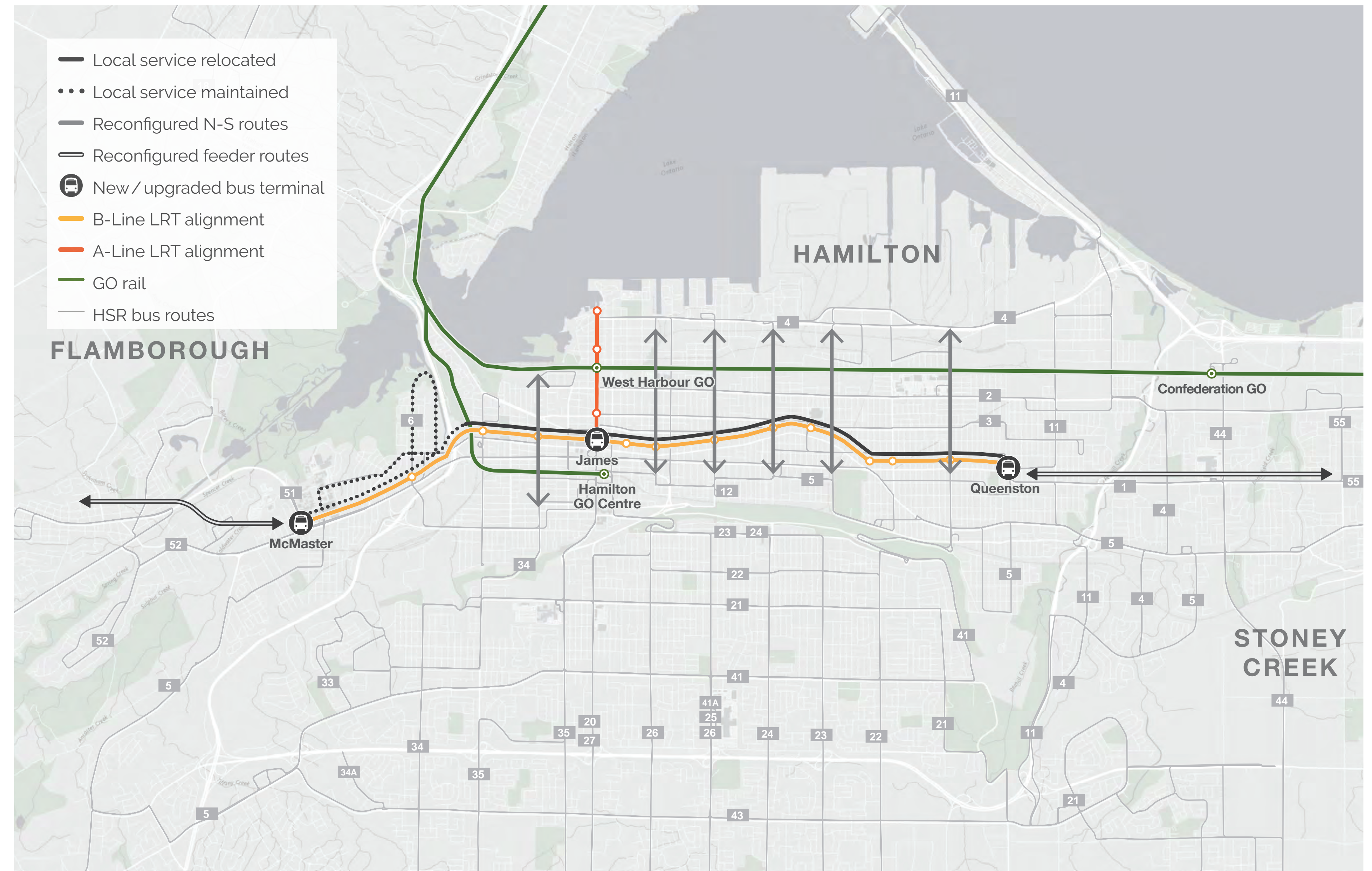


Local transit service in the corridor will be re-organized to support the LRT, and ensure good travel options throughout the region.

Consistent with the 10-year Transit strategy and the Rapid Ready network recommendations, local service will be re-organized to provide:

- Feeder services to and from Stoney Creek and Dundas;
- Reconfigured north-south routes to feed LRT stops;
- Effective service on Main Street West where there are few parallel alternatives;
- Continued 1-King service in Westdale;
- Relocated service from the LRT corridor to appropriate parallel streets: B-Line replaced by LRT and 1-King westbound to east-west corridor north of King (to be determined); and,
- New and upgraded terminals at McMaster, MacNab and Queenston.

Objective is to integrate LRT fares with the HSR fare structure in place at the time.



↑ Transit concept



“Complete streets create a balance between the movement of pedestrians, cyclists, transit, and vehicles.”

Metrolinx Mobility Hub Guidelines



Planning for a pedestrian-oriented corridor means providing space and amenities to encourage walking, cycling, and transit. The goal is to create a safe, attractive and comfortable environment for walking which connects to transit facilities and other key destinations. The design aims to support the needs of busy urban areas, quiet residential neighbourhoods, and other unique places along the corridor.

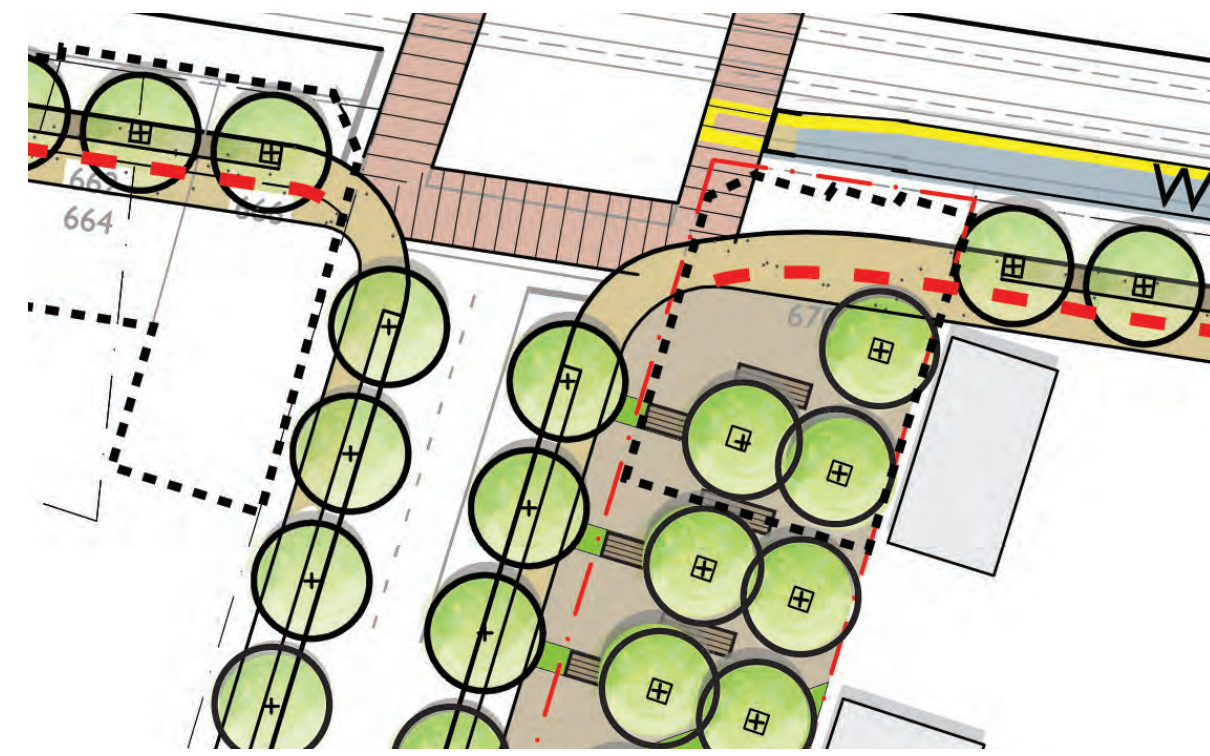
Some of the emerging work illustrated on this and subsequent panels may come forward as part of this project, while others may come forward through change and development on lands adjacent to the corridor, undertaken by individual property owners and stakeholders.

[Here are some early design opportunities for consideration →](#)



### Pedestrian through zone

Where feasible, provide a 2.0 metre wide Pedestrian Through Zone, located on both sides of the street, and continuous along the entire length of the corridor.



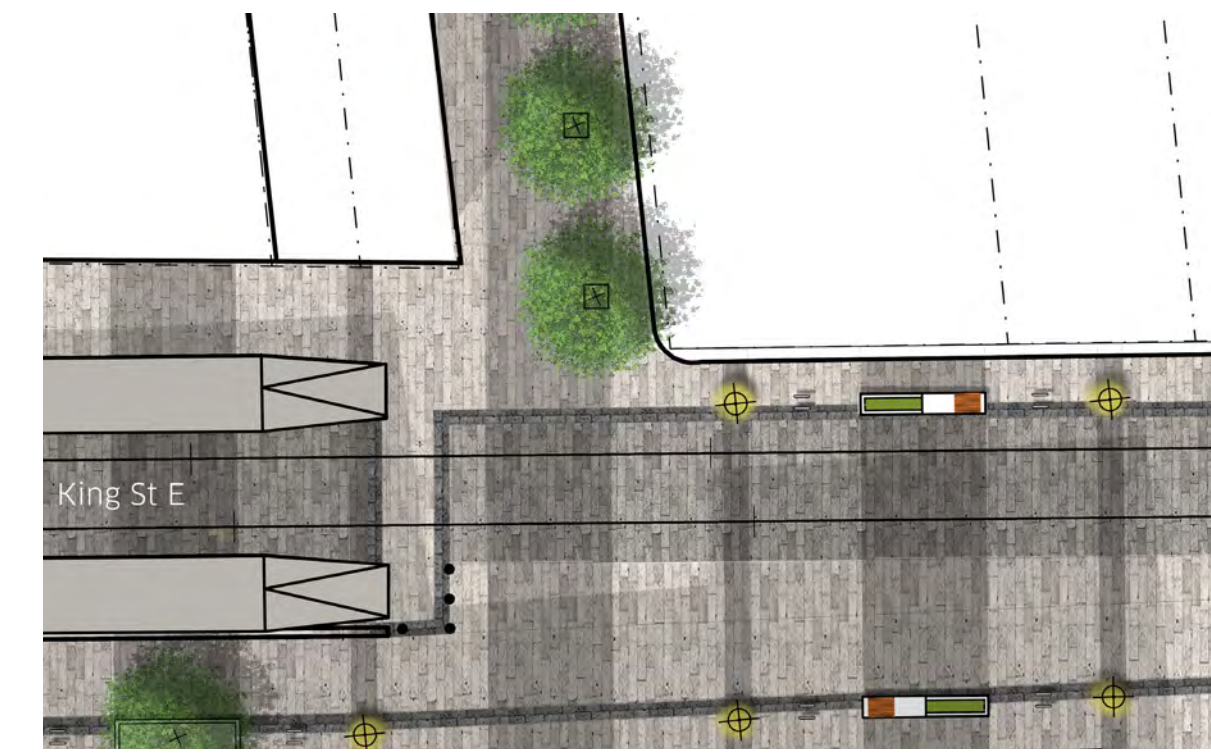
### Interim design of vacant properties

The design strategy proposes to install plantings, and pedestrian amenities on acquired sites, where demolition has created a vacant parcel on the streetscape, and where that parcel is deemed unlikely to be redeveloped in the first 5+ years following opening day.



### Healthy plantings & street trees

Cluster plantings and street trees to leverage a shared soil trench to support long term health and growth potential. Provide 8–10 metre spacing between trees. This approach also supports an organized visual rhythm to plantings, furnishings, lighting, and other elements.



### Side streets: Green lobbies to the corridor

Side streets are often the first impression for pedestrians entering the corridor. The design strategy proposes to implement street trees and related enhancements, 25 metres back from the edge of crosswalk, or corridor building face.



### Pedestrian-oriented intersections & crossings

Pedestrian safety and comfort is prioritized by demarcating crosswalks with distinctive paving treatments, colours and materials, in combination with urban braille. Where possible, curb radii are tightened, to reduce the crossing distance for pedestrians.

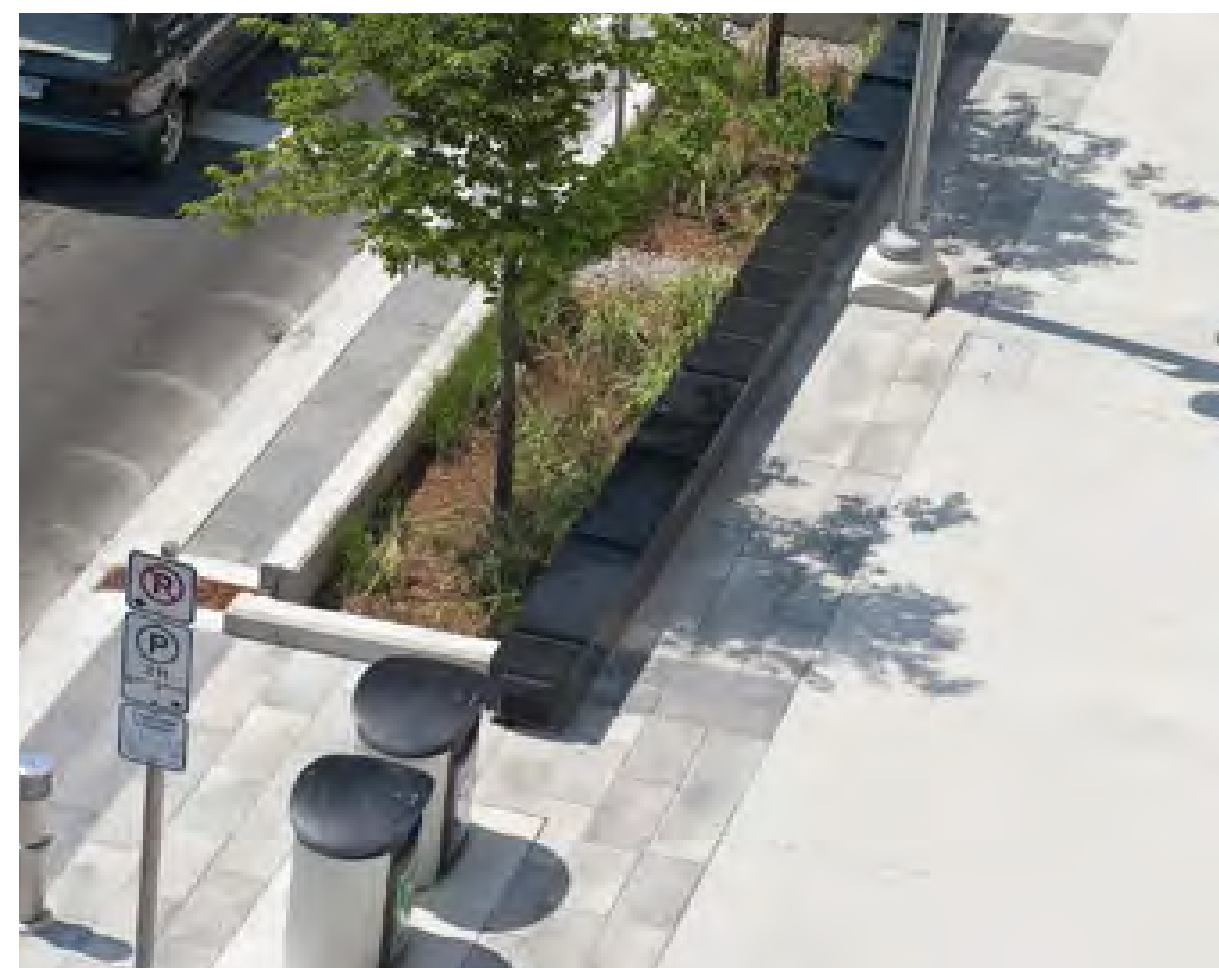


### Context sensitive design

The design strategy aims to celebrate and support the future vision of character areas and key destinations. The strategy applies a tailored approach to the deployment of streetscape elements and infrastructure, particularly at areas of constraint such as International Village.



This panel outlines streetscape types to support the future vision for existing and emerging urban areas, as well as areas of less urban intensity along the corridor. The types respond to the intended character of the area, as well as the level of targeted investment.



↑ Typical

## Urban streetscape zones

The urban streetscape types will support pedestrian-oriented retail and mixed use urban areas, through the provision of a spacious pedestrian through zone, buffered from the roadway by a hardscaped planting and furnishing zone, where accommodation is provided for tree plantings, lighting, furnishings, and utilities.



↑ Typical



↑ Tree in single pit, with grate



↑ Tree in continuous, uncovered pit

## Greenscape zones

The greenscape types support the creation of idyllic, naturalized pedestrian-oriented areas, through the provision of a spacious pedestrian through zone, buffered from the roadway by street trees, vegetation, and related soft palette of materials that support the surrounding context.

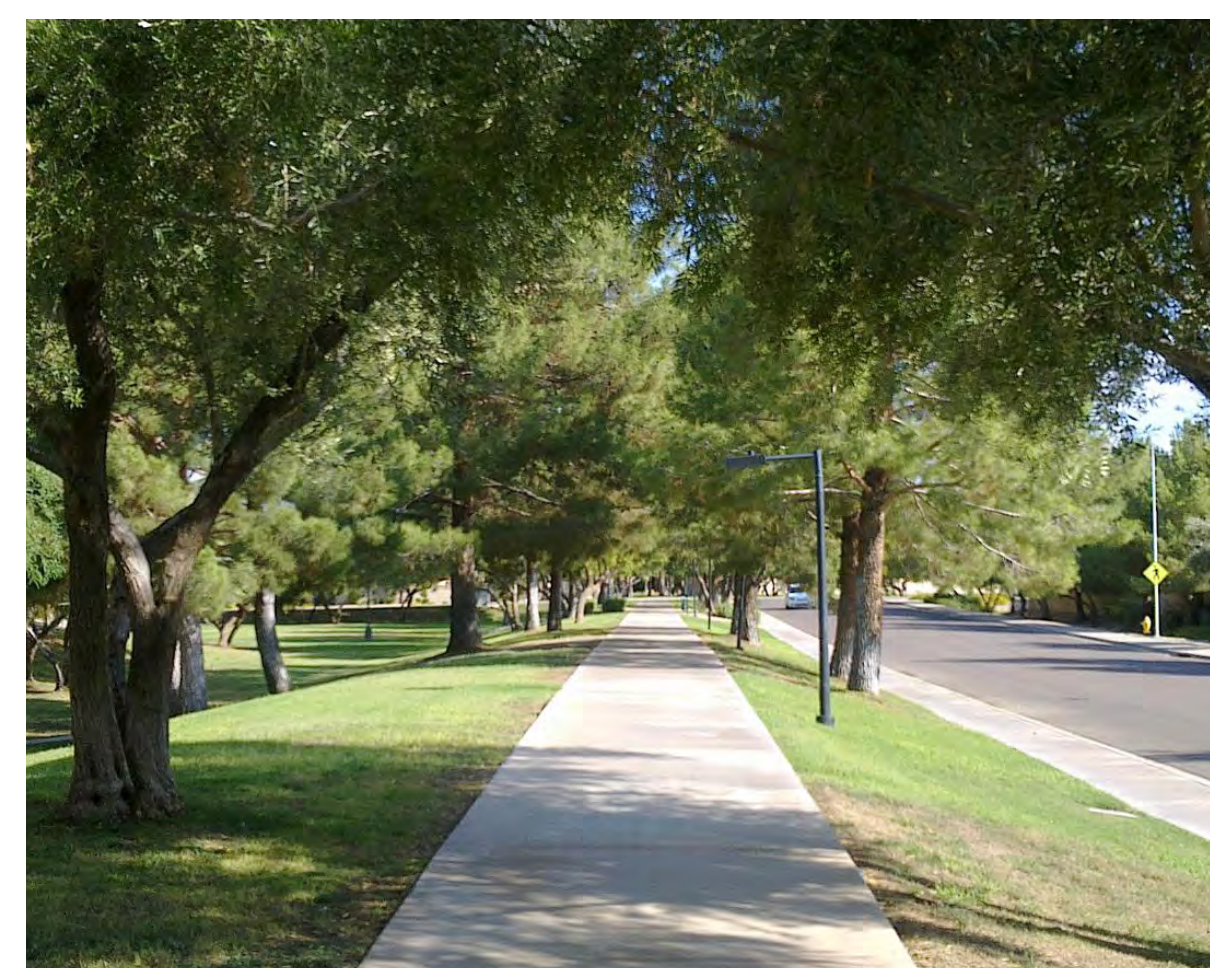
## Streetscape plantings and paving

The LRT corridor should be designed to support robust and beautiful streetscape plantings, and a range of durable and beautiful paving materials. For instance, to support:

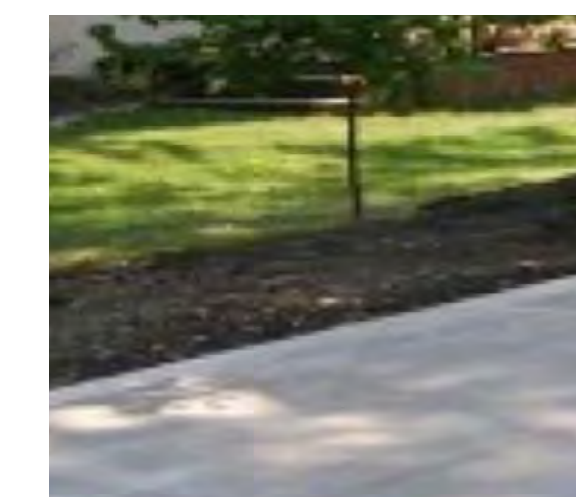
- Low shrub, perennial and grasses at select locations within the central roadway median, and adjacent to LRT stops;
- Trees along the streetscape, where feasible, to improve the quality of the experience for pedestrians and transit users, particularly in close proximity to LRT stops; and,
- Specific areas within the streetscape environment, such as sidewalks and crosswalks.



↑ Enhanced



↑ Enhanced



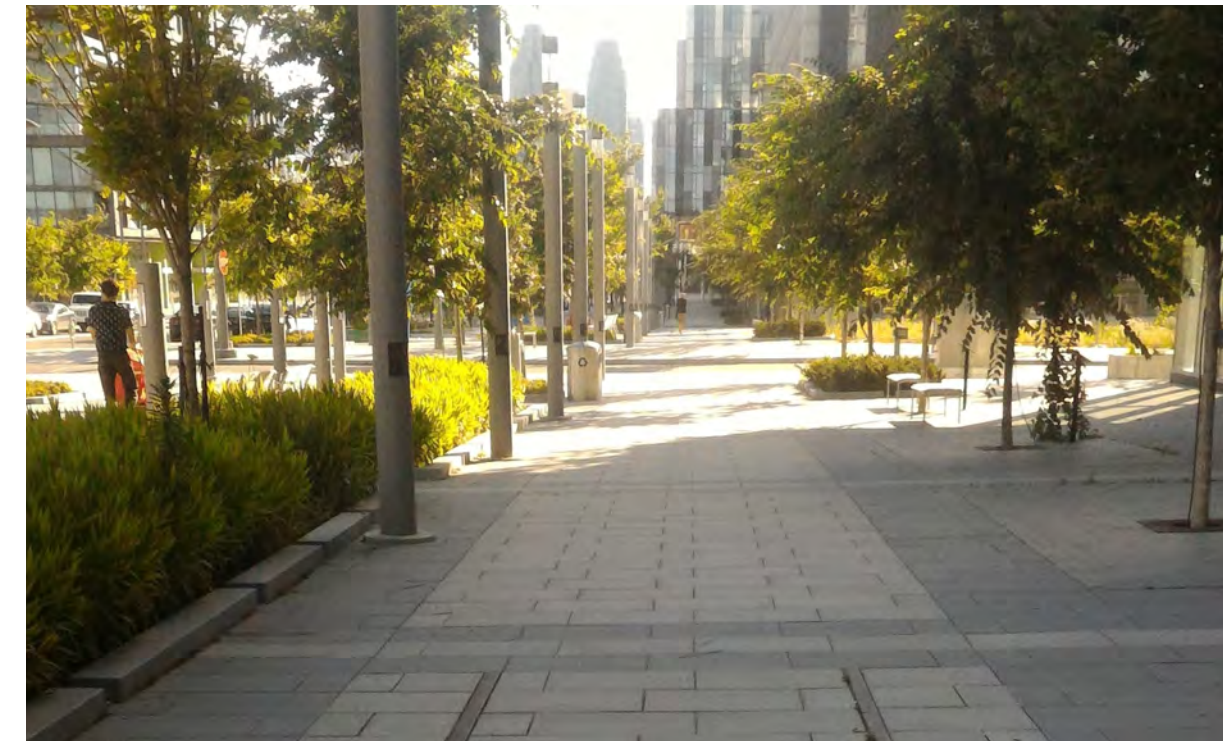
↑ Concrete sidewalk



↑ Concrete unit paving



The following objectives are intended to inform and guide the design of the GO High-Order Pedestrian Connection.



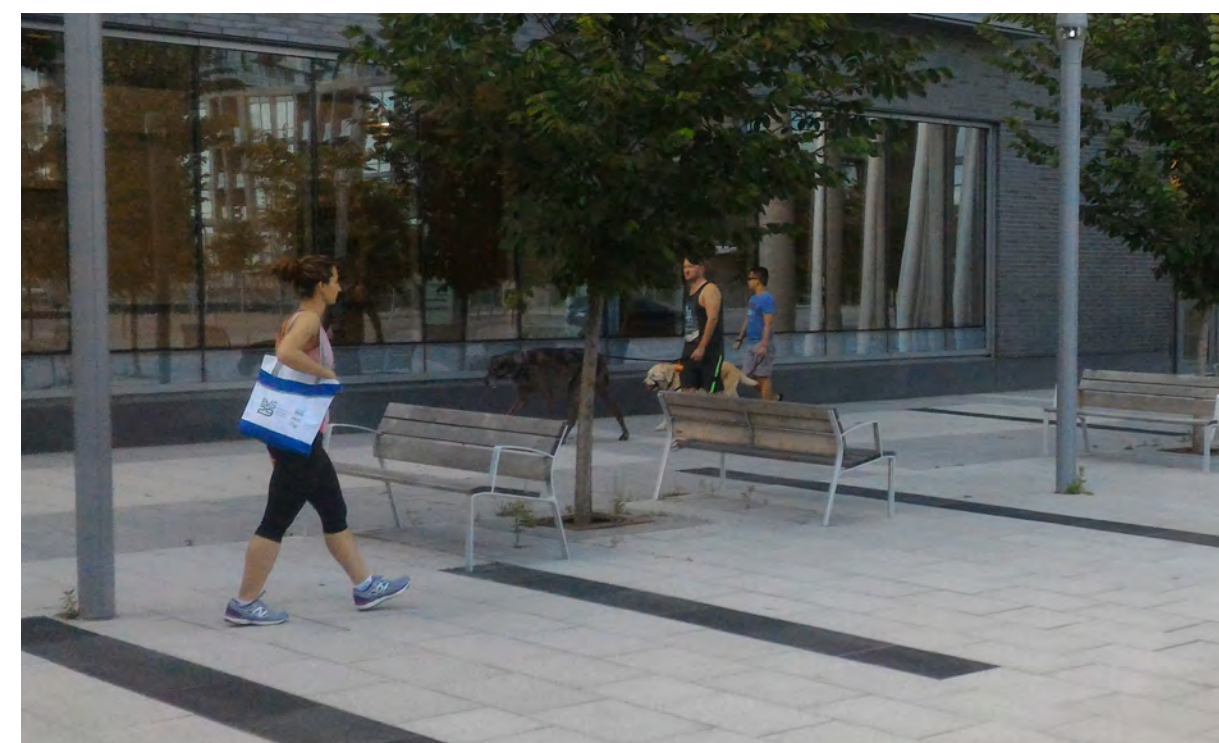
### Design excellence

Shape an attractive, functional design for the streetscape connection that is grounded in best practices. A design that inspires greater pedestrian use and enjoyment.



### Convenient

Plan for seamless and efficient pedestrian connections between the Hunter Street GO Station and LRT, as well as other destinations in the Downtown Core.



### Comfortable

Provide amenities such as lighting, weather protection, plantings and seating, to improve the pedestrian experience.



### Safety and security

Support clearly defined, well-lit, safe pedestrian routes, crossings, and related components of the public realm.



### Intuitive

Support intuitive wayfinding between transit destinations.

### Corridor selection criteria

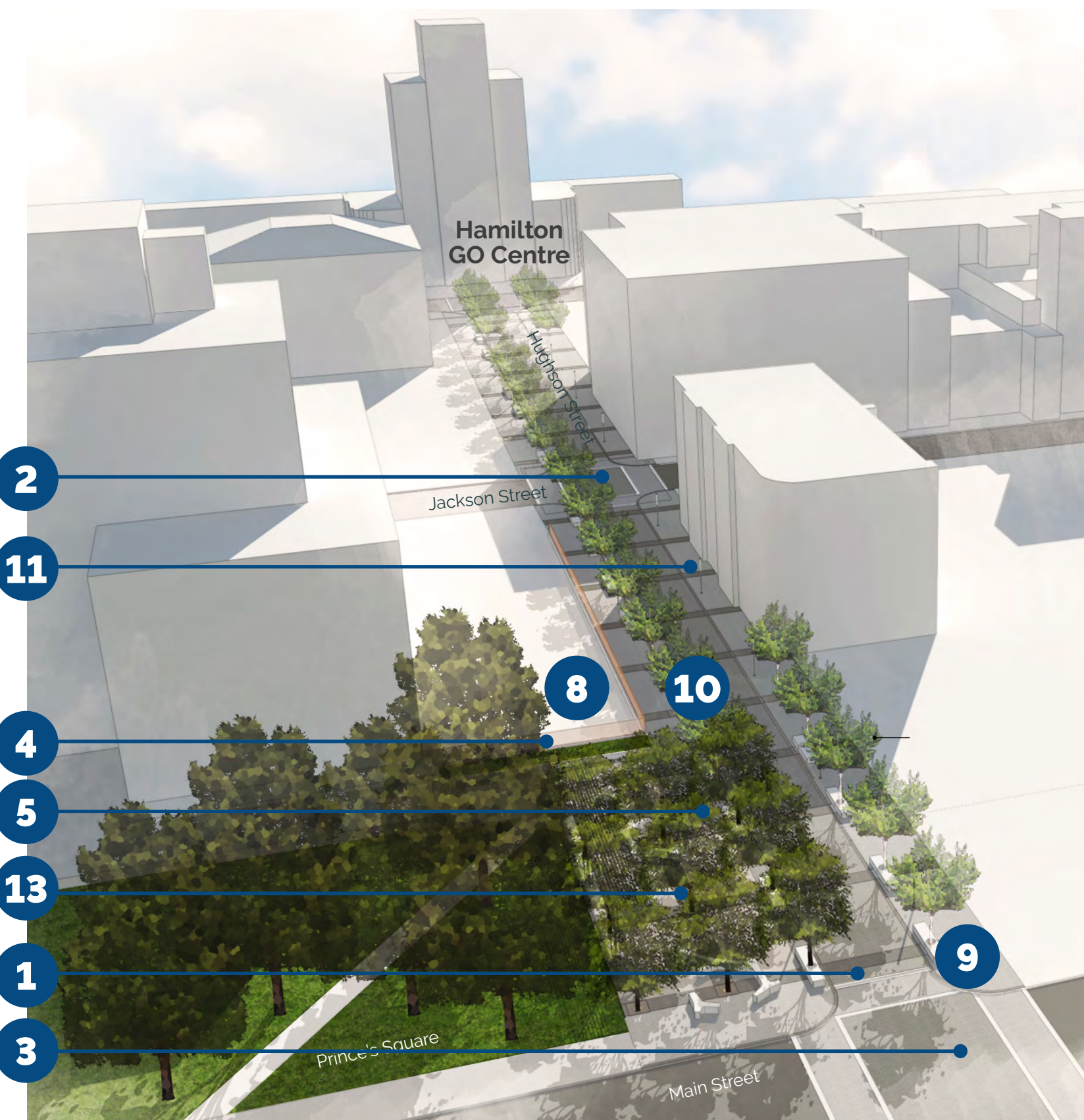
Hughson Street was selected as the preferred corridor to make the pedestrian connection between the B-Line LRT and the Hamilton GO Rail Station. The other candidate routes included James Street, and MacNab Street. The evaluation was guided by the following criteria:

- **Short walking distance from the LRT to the GO Centre:** As measured from the westbound LRT platform, to the Station building entrance at Hughson and Hunter Streets.
- **Wide pedestrian walking zone:** Average width of clear sidewalk as measured along the journey between the LRT platform and GO rail station entrance.
- **Weather protection opportunity:** Hughson Street provides opportunities to plan for awnings or canopies affixed to existing buildings, along the pedestrian journey.
- **Safe pedestrian crossings:** Hughson Street provides a safe walking environment, with relatively few crossings of busy roads, relative to other parallel streets in the area.

- **Few unsignalized crossings:** Most intersections along Hughson Street are signalized, which supports greater pedestrian safety, relative to unsignalized crossings.
- **Development / frontage potential:** Measured as the linear length of vacant blocks along the route, where future development may occur.
- **Plantings and furnishings zone:** Areas where there are existing trees and / or furnishings, and where it is reasonable to accommodate them in future, without unduly impacting the available walking area.
- **Intuitive wayfinding:** Without the aid of signage, this route provides clear view corridors that allow pedestrians to see the transit destination, at either end of the route.
- **Minimizing traffic impacts:** Relative to other route options, Hughson Street minimizes potential impacts to vehicle oriented traffic operations.



The streetscape concept illustrated on this panel has been designed to establish a high-quality civic corridor, prioritizing pedestrians and supporting safe, convenient and comfortable connections between the Hamilton GO Centre and the LRT Corridor.



↑ Conceptual View: Looking North to the Hamilton GO Centre



↑ GO High-Order Pedestrian Connection: Conceptual Plan

- 1 Enhanced hardscape paving
- 2 Two-way vehicular traffic
- 3 Distinctive hardscape paving at intersection with raised profile
- 4 Decorative screening opportunity
- 5 Pedestrian plaza / bosque
- 6 Existing drive to parkade & surface parking to remain
- 7 Restricted vehicular access from King Street E to Hughson Street
- 8 Loading area
- 9 Tree in integrated bench / planter, comes with soil cell (typical)
- 10 Tree in grate, comes with soil cell (typical)
- 11 Proposed pedestrian light pole (typical)
- 12 Existing pedestrian light pole to remain (typical in front of Hamilton GO Centre)
- 13 Plaza canopy structure (above)



↑ Conceptual view: Looking south to the Hamilton GO Centre



↑ 'A - A' conceptual Hughson Street cross section: looking north



The design includes a range of components, deployed to support a safe, convenient, comfortable, and attractive pedestrian connection between the Hamilton GO Centre and the LRT Corridor.



↑ Key plan of Hughson Street between Jackson Street and Main Street



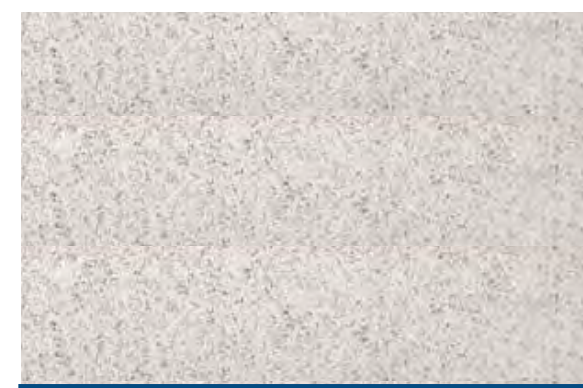
1 Paving bands



2 Sidewalk



3 Roadway



4 Crosswalk edge



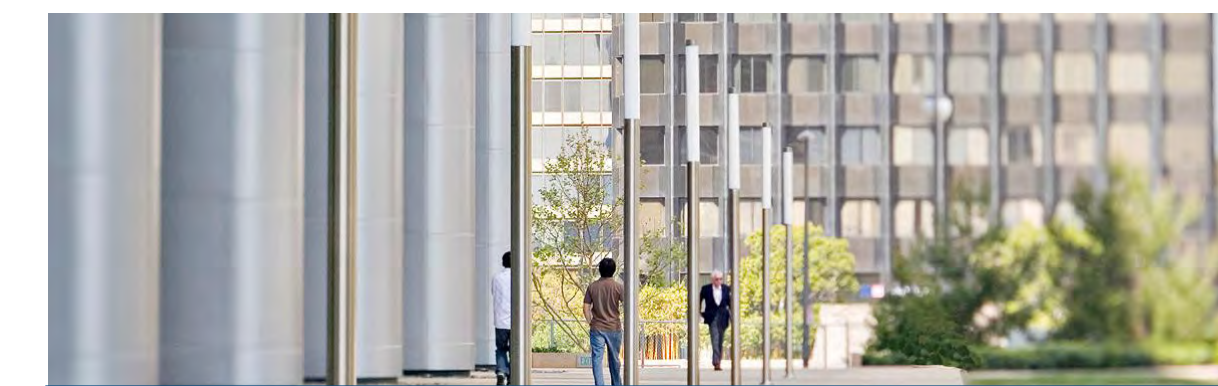
5 Tree in integrated bench / planter



6 Tree in grate



7 Paved intersection / crossing



8 Pedestrian light pole



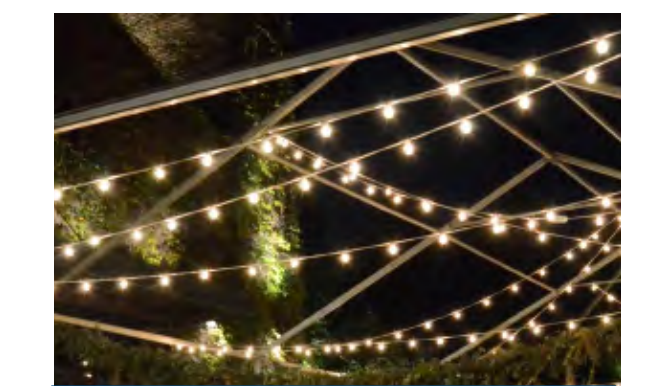
9 Lit bollard



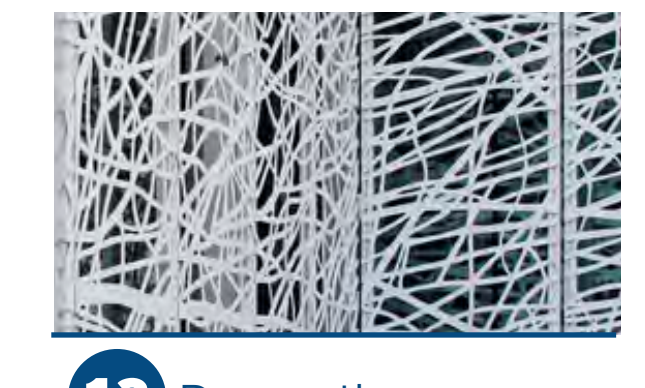
10 Plaza seating



11 Bicycle rack



12 Plaza canopy



13 Decorative screening opportunity

## Hardscapes

The design approach deploys a palette of hardscapes that is durable, high quality, and composed of complementary colours, patterns and textures. A key objective is to integrate the look and feel of sidewalks and crosswalks with the street, to feel like one integrated, pedestrian-oriented space.

## Plantings and street trees

Plantings and street trees help 'soften' and enhance the urban landscape, while creating an attractive streetscape that supports walking, provides shade, and frames key view corridors.

## Intersections and crossings

Distinctive hardscape colours and patterns are used as visual cues to drivers, people with low vision, and other users of the roadway to support the safety and comfort of pedestrians.

## Lighting

Lighting provides several benefits: visual continuity along the corridor; highlighting the character of the streetscape; contributing to a safe environment; and providing a distinctive design feature to enhance the pedestrian experience.

## Pedestrian amenities

Amenities include seating, bike parking, public art, waste and recycling receptacles, and other components that support the experience of pedestrians along the corridor.



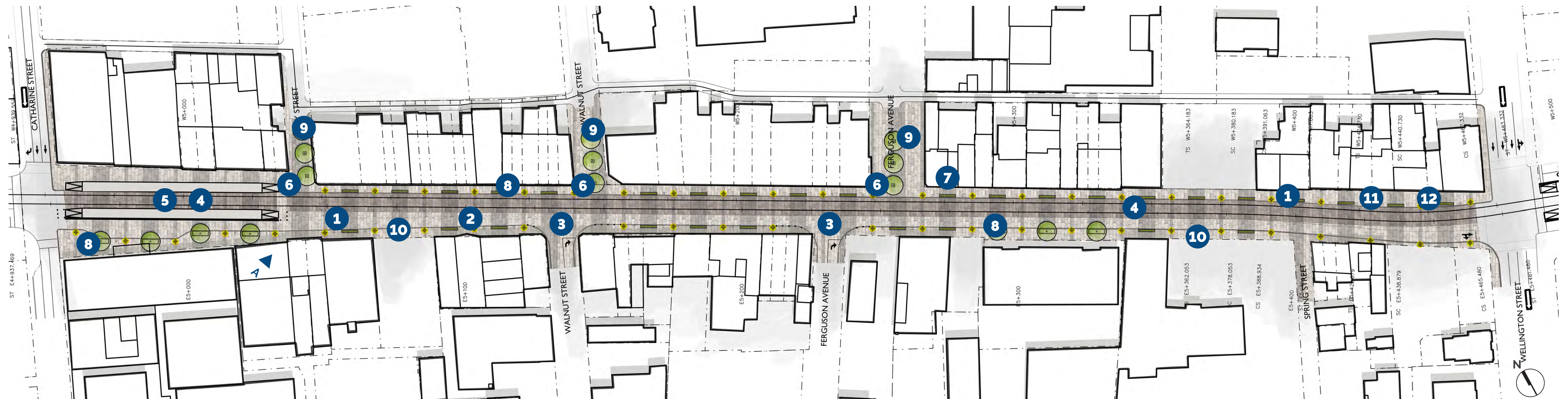
# Street Design Approach: International Village

The streetscape concept illustrated on this panel has been designed to establish a high-quality civic corridor, prioritizing pedestrians and supporting safe, convenient and comfortable connections within International Village, between Mary and Wellington stops, and along the LRT Corridor.

- 1 Enhanced hardscape paving
- 2 One-way vehicular traffic
- 3 Distinctive hardscape paving at intersection
- 4 LRT trackbed
- 5 LRT stop platform
- 6 Restricted vehicular access
- 7 Shrubs in planter / seating (typical)
- 8 Tree in planter, come with soil cells (typical)
- 9 Tree in grate, comes with soil cell (typical)
- 10 Existing drive to parkade and surface parking to remain
- 11 Proposed pedestrian light pole (typical)
- 12 Proposed bicycle rack (typical)



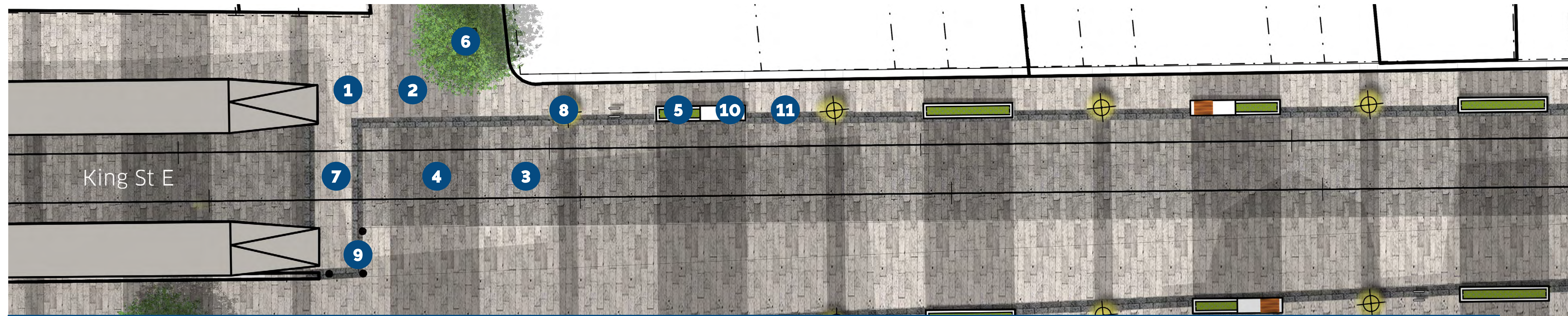
↑ Axonometric view 'A': Side street intersection at International Village



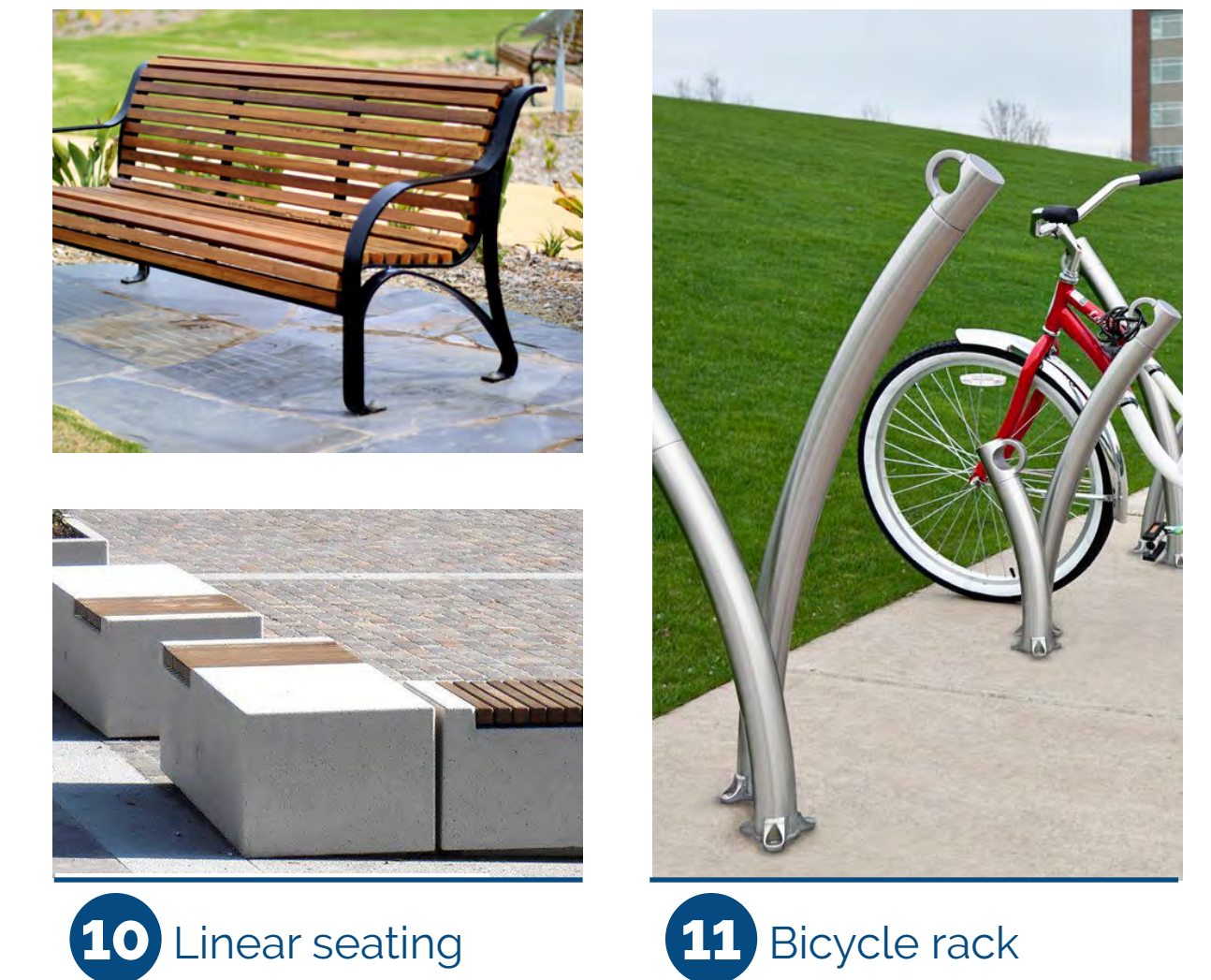
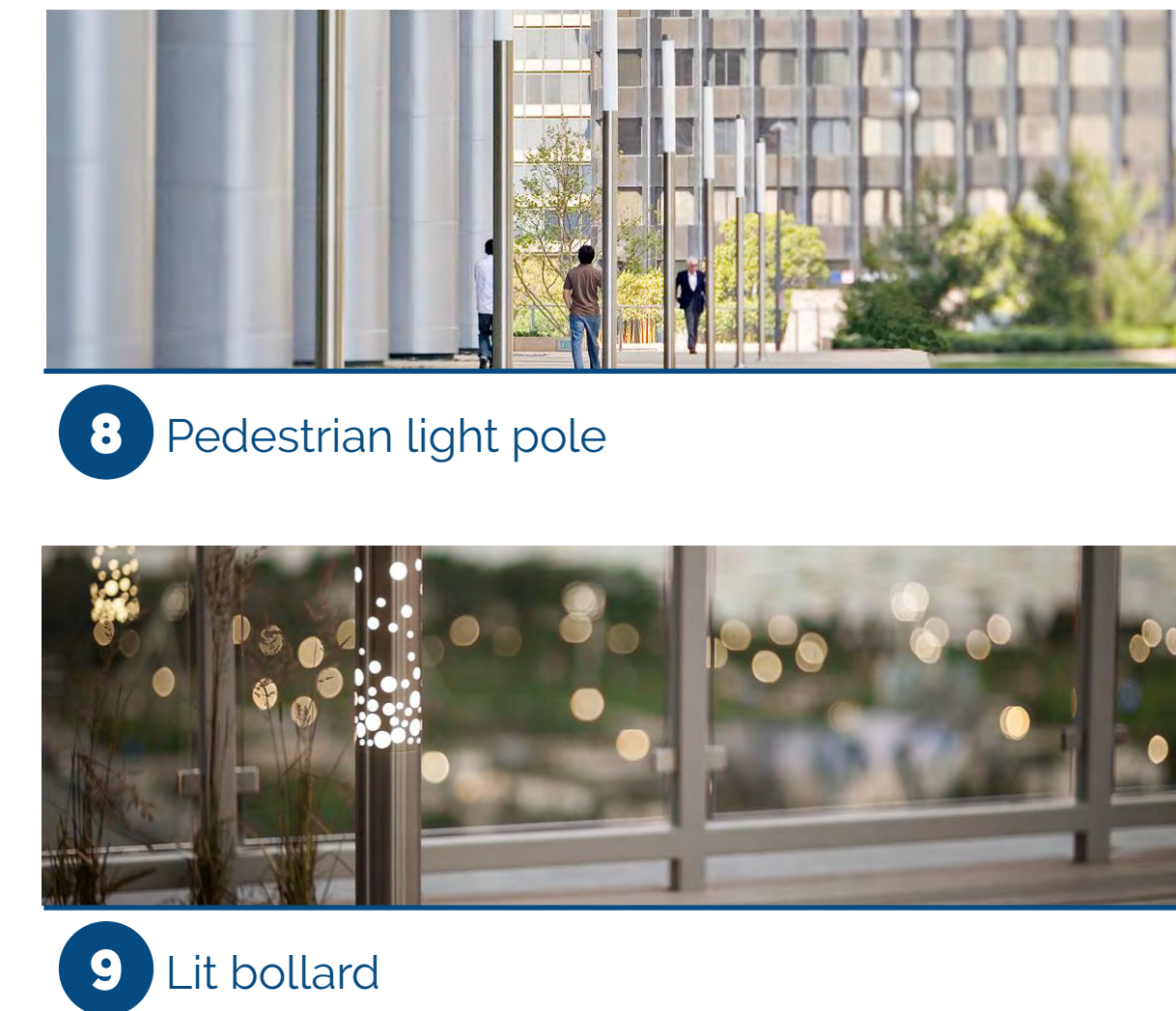
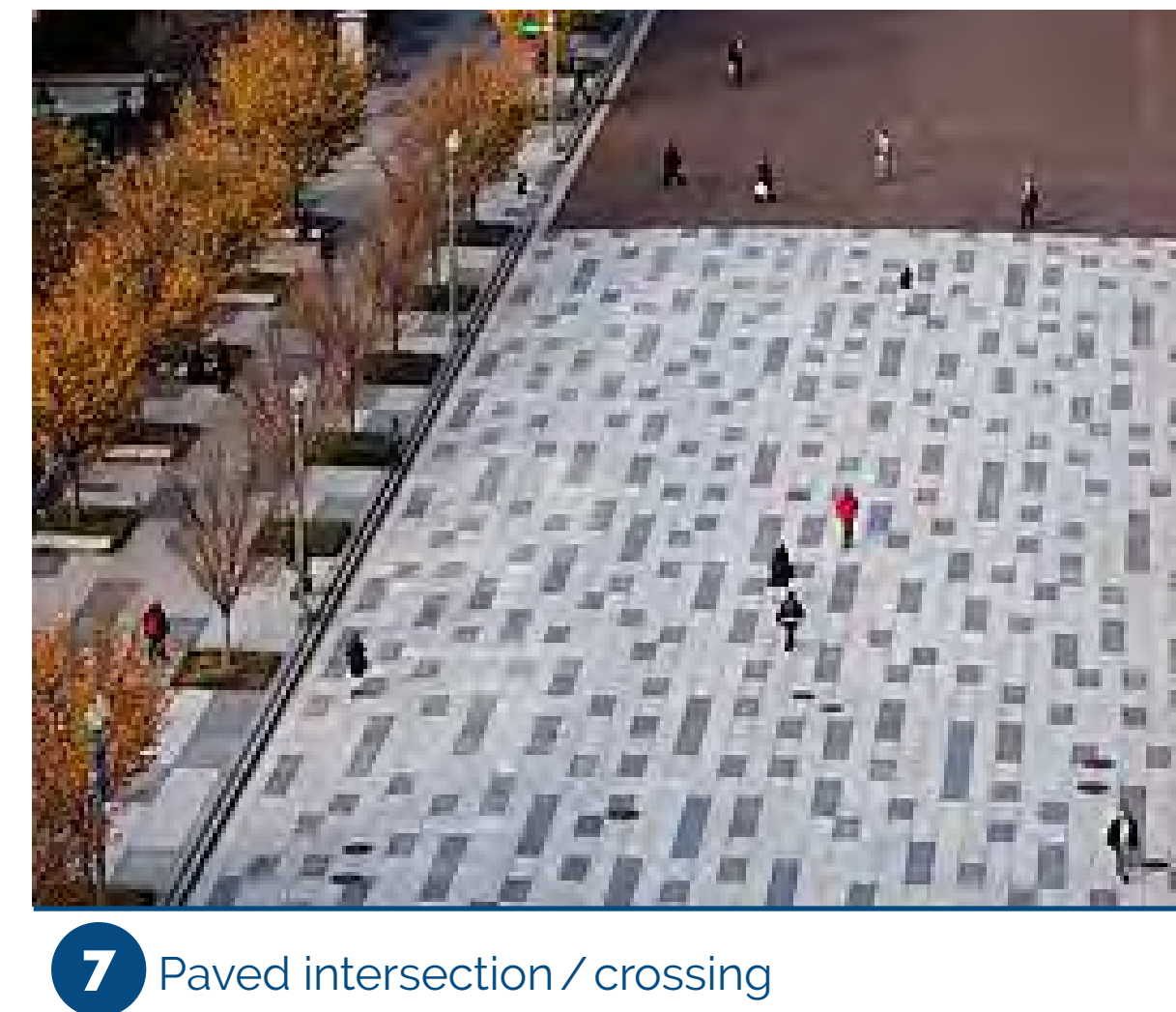
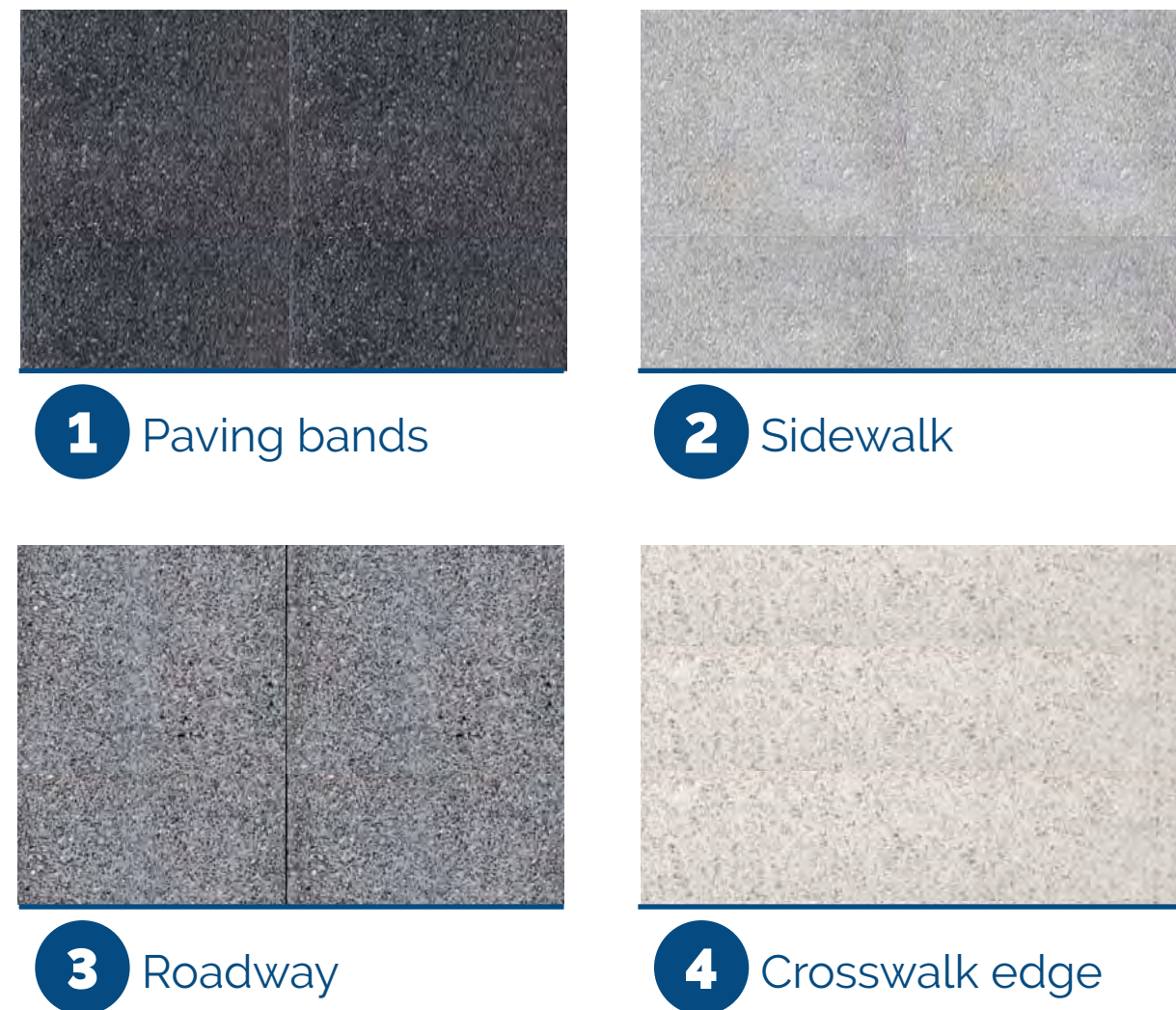
↑ International Village Streetscape Design: Conceptual Plan (1:500)



The design aims to create a civic space that enhances the experience of pedestrians and transit users within International Village, and particularly between Mary and Wellington Streets. The concept deploys a range of streetscape components to support a safe, convenient, comfortable, and attractive experience.



↑ Key plan of LRT corridor within International Village



## Hardscapes

The design approach deploys a palette of hardscapes that is durable, high quality, and composed of complementary colours, patterns and textures. A key objective is to integrate the look and feel of sidewalks and crosswalks with the street, to feel like one integrated, pedestrian-oriented space.

## Plantings and street trees

Plantings and street trees help 'soften' and enhance the urban landscape, while creating an attractive streetscape that supports walking, provides shade, and frames key view corridors.

## Intersections and crossings

Distinctive hardscape colours and patterns are used as visual cues to drivers, people with low vision, and other users of the roadway to support the safety and comfort of pedestrians.

## Lighting

Lighting provides several benefits: visual continuity along the corridor; highlighting the character of the streetscape; contributing to a safe environment; and providing a distinctive design feature to enhance the pedestrian experience.

## Pedestrian amenities

Amenities include seating, bike parking, public art, waste and recycling receptacles, and other components that support the experience of pedestrians along the corridor.



The Metrolinx commitment to design excellence is grounded in a belief that all aspects of its systems can deliver design quality and functionality at the highest level.

For the Hamilton LRT, such an expansive civic contribution to the public realm carries with it a responsibility to current and future generations, to maximize the transformative power of public transit in order to both catalyse a shift toward high quality, safe, sustainable and affordable transportation options for our citizens, connecting key destination points, stimulating economic development and revitalizing Hamilton.

## Step 1: Listen and learn

- Leverage the Finch West and Eglinton LRT process to understand opportunities for the Hamilton LRT.
- Gather and learn from precedent designs from other LRT systems.
- Consult with Stakeholders.
- Establish a clear design vision and principles for the Hamilton LRT.

## Step 2: Build on the vision

- Produce the Design Excellence Principles and Requirements document including the principles, evaluation criteria and demonstration designs.
- The demonstration designs allow ideas to be tested for stops and other infrastructure such as the termini, interchange stop, the OMSF, the Traction Power Substations (TPSS), and other elements of the line – providing pragmatic direction.

## Step 3: Engage with bid teams

- The Design Excellence team is involved in proponent pre-qualification and selection to ensure design capability on bid teams.
- During the bidding period, the design excellence team engages with the bid teams – providing feedback – to ensure every team achieves a design that would meet the criteria outlined in the Design Excellence Principles and Requirements document.

## Step 4: Select a winning bid team

- Once the Bidding Period concludes and the Bid Teams have submitted their schemes for evaluation, the Design Excellence team forms a key part of the evaluation scoring team involved in the selection of the winning Bid Team.

## Step 5: Ensure compliance

- The Design Excellence team reviews design submissions from the winning bid team (Project Co) through implementation to ensure compliance with the DX Principles and Requirements document.



↑ Design excellence workshop



↑ Precedent example of architectural form as a stop enhancement, University of British Columbia



↑ Precedent of lighting as a stop enhancement, Paris, France



# Principles of Design Excellence

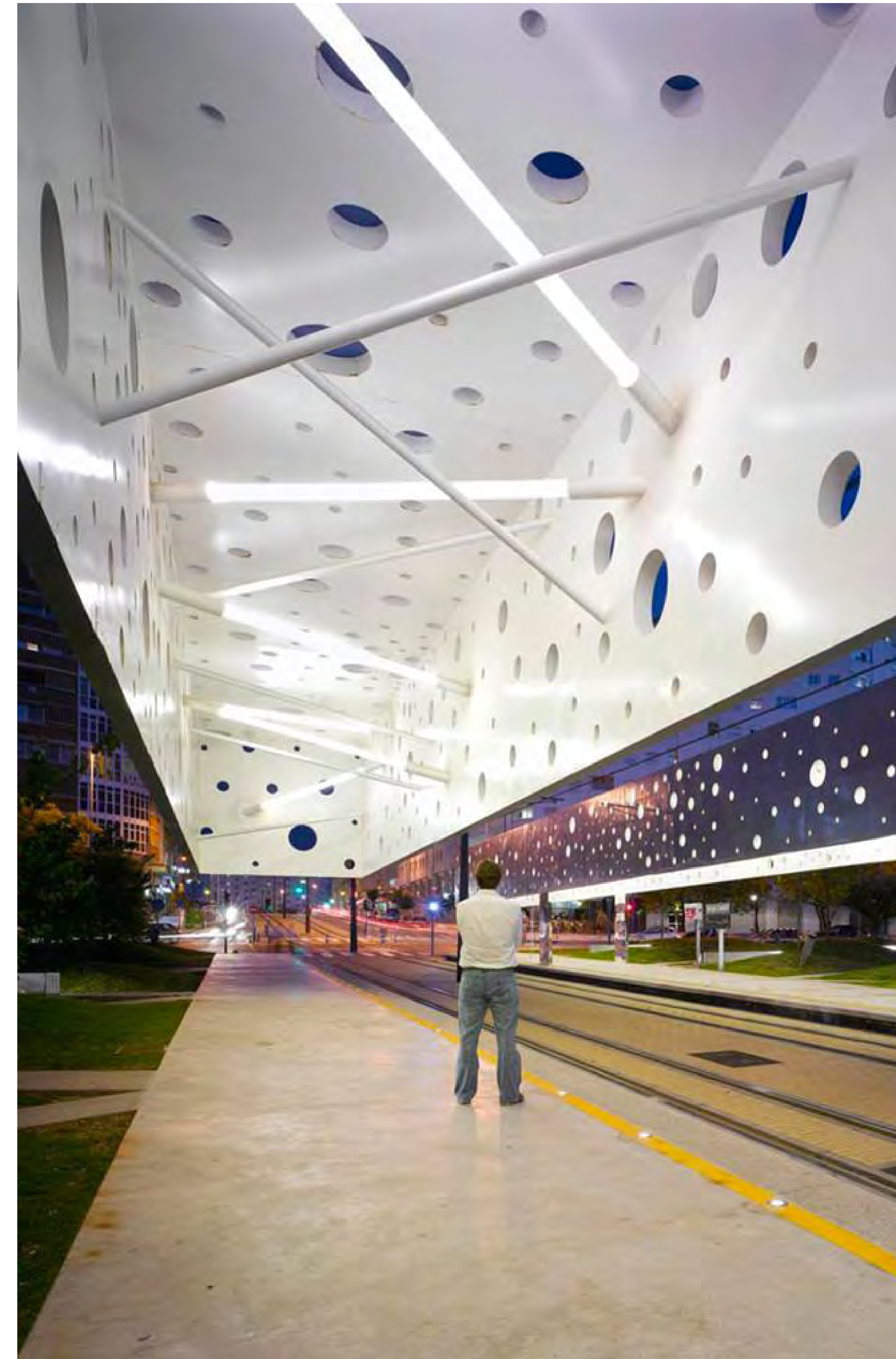
The Principles and Requirements of the Design Excellence document contains three distinct elements of guidance: principles and requirements, precedents, and demonstration designs.

The purpose of this document is to clearly articulate the Design Excellence principles, requirements and key evaluative criteria that proponent bid teams competing on the Hamilton LRT project must incorporate into their design.



Listed below are Metrolinx's standard *Principles of Design Excellence*, which will act as the basis of the Hamilton LRT Principles:

- 1 A strong conceptual design narrative across the system.
- 2 Design that elevates the quality of the passenger experience.
- 3 Civic character, exhibited through scale, materiality and quality.
- 4 Clarity and simplicity of architectural expression through integrated design of all systems and elements.
- 5 Responsiveness to contextual, local and future conditions.



↑ Precedent example of architectural form as a Stop enhancement, Alicante, Spain



↑ Precedent example of well designed Stops, Raleigh, North Carolina



↑ Precedent example of well designed Stops, Zürich, Switzerland



↑ Precedent example of well designed Stops, Hamilton

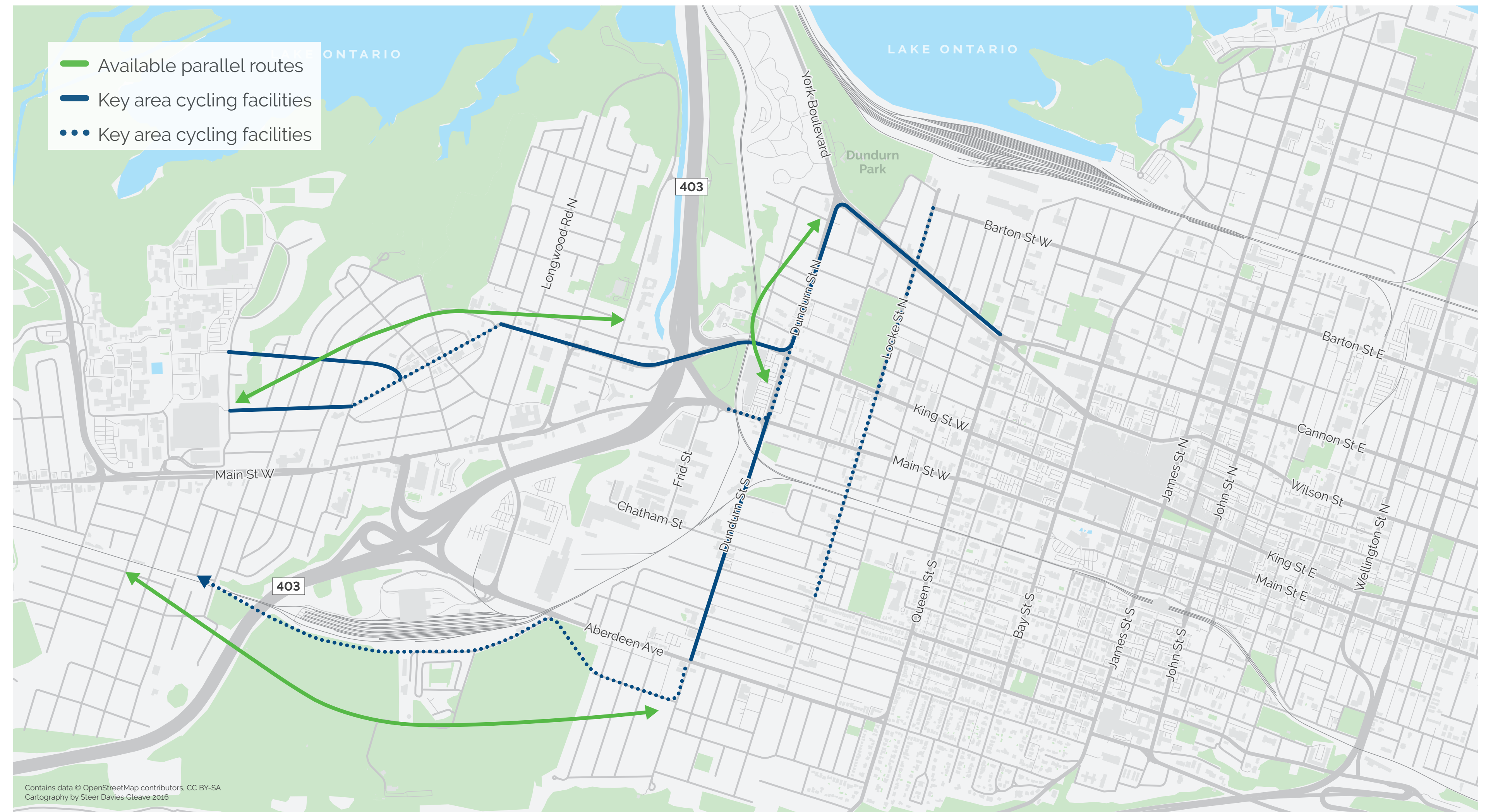


Metrolinx and the City of Hamilton are committed to replacing bike lanes impacted by the LRT project during construction and developing longer term solutions in close consultation with affected neighbourhoods and the cycling community.

The LRT project team is seeking input from the cycling community and affected neighbourhood associations to identify alternative routes and innovative solutions. A community consultation session will be scheduled for February or March 2017.

- Dundurn Street North existing bike lanes
- York Boulevard (Queen to Dundurn) existing bike lanes
- Main Street West proposed bike lanes from Macklin to Cootes

Based on the traffic modeling information, we have identified areas along the west end of the route that will require more traffic capacity during LRT construction and when it is in service. This may have an impact on existing and proposed cycling infrastructure, including:



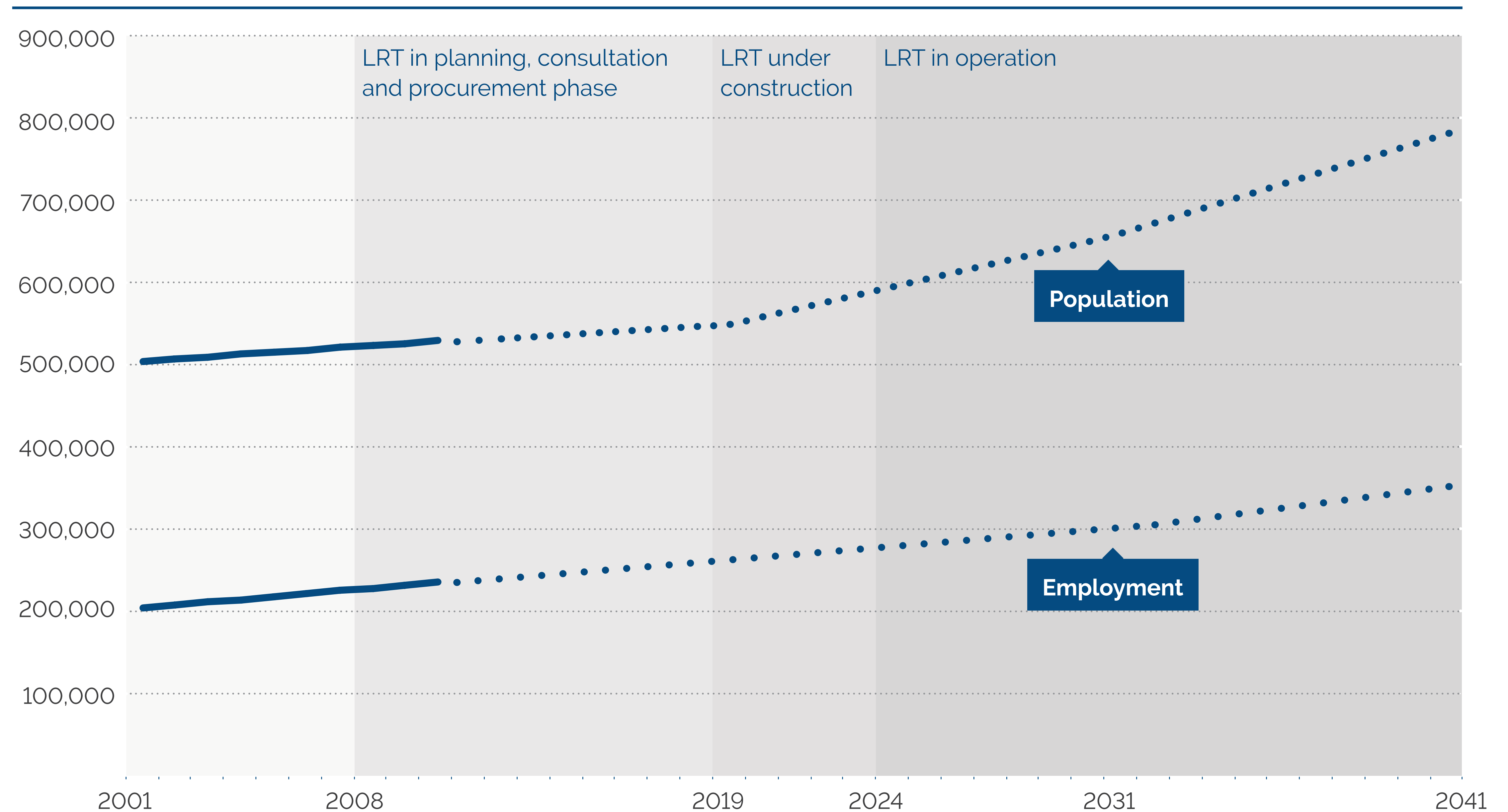
↑ Cycling plans



The Growth Plan for the Greater Golden Horseshoe (2013) forecasts that the City of Hamilton will have a population of 660,000 by 2031 and 780,000 by 2041, while the number of jobs will increase up to 300,000 by 2031 and 350,000 by 2041.

This is equivalent to a growth of about 25 percent by 2031 and almost 50 percent by 2041. This increase in people and jobs also means increased activity throughout the city, and thus, more people making more trips.

The LRT project, as part of the City's on-going transportation planning and development, will help the City of Hamilton accommodate the added traffic expected from this growth.







## Where will car traffic go?

The modelling process projects various changes in traffic patterns with the LRT in place, including:

- Significant reduction on King Street westbound.
- New traffic on King Street eastbound where the new lane is introduced.
- Decreases on some perpendicular routes because of restrictions on crossing the LRT alignment.
- Increases on some perpendicular routes as traffic consolidates at crossing points.
- Increases on parallel routes as traffic is diverted.
- Challenges are at intersections.



## Traffic modelling

Projections of future traffic movements, with and without LRT, were forecasted using a three-tiered modelling approach that looked at regional, area and corridor projections and impacts.

This process showed:

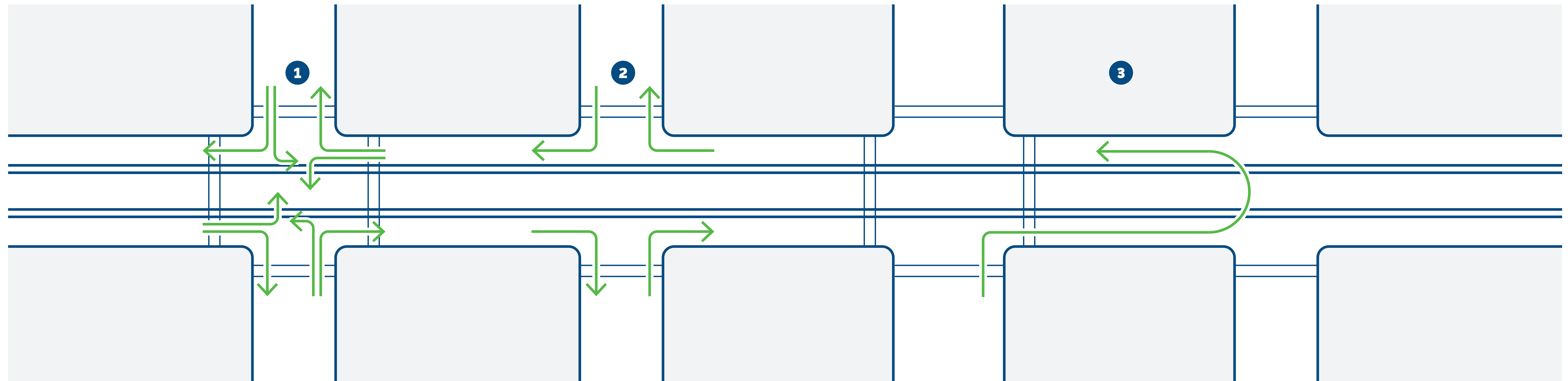
- Traffic will increase in relationship to the projected population and employment growth, with or without LRT.
- LRT will change traffic patterns, the flow of traffic, and the level of service at intersections. The results of those impacts will require mitigation strategies.
- With proper management strategies, traffic will continue to flow when LRT is in service.
- The change in alignment of the LRT from primarily "side running" (2011) to primarily "centre running" (2016) produces similar impacts.

## What kinds of strategies will be used?

For each intersection where there are important increases in delay, network solutions will be examined including:

- Signal timing and phasing optimization
- Lane configuration alterations
- Turn restrictions
- LRT signal priority adjustments





**With segregated centre-running LRT on the B-Line, traffic will only be permitted to cross the tracks at select locations, typically major streets with signalized intersections.**

At minor side streets, traffic will not be permitted to cross the tracks, either turning left or going straight through.

To maintain access to all locations, U-turns will be permitted at strategic locations.

On the A-Line, the LRVs will operate in mixed traffic, so all current turning movements are maintained.

- 1** Typical signalized intersection entrance and exit: Crossing of tracks permitted.
- 2** Typical side-street entrance and exit: No crossing of tracks permitted.
- 3** Drivers wishing to turn in the opposite directions where crossing the tracks is not permitted, will need to make the allowed right turn and travel to the next U-turn location, and make a permitted U-turn. U-turns at these locations will be combined with left turns, and controlled by their own separate signal phase to ensure safety.



Projections of future traffic movements, with and without LRT, were forecasted using a three-tiered modelling approach that looked at regional, area and corridor projections and impacts.

**The modelling process projects various changes in traffic patterns with the LRT in place including:**

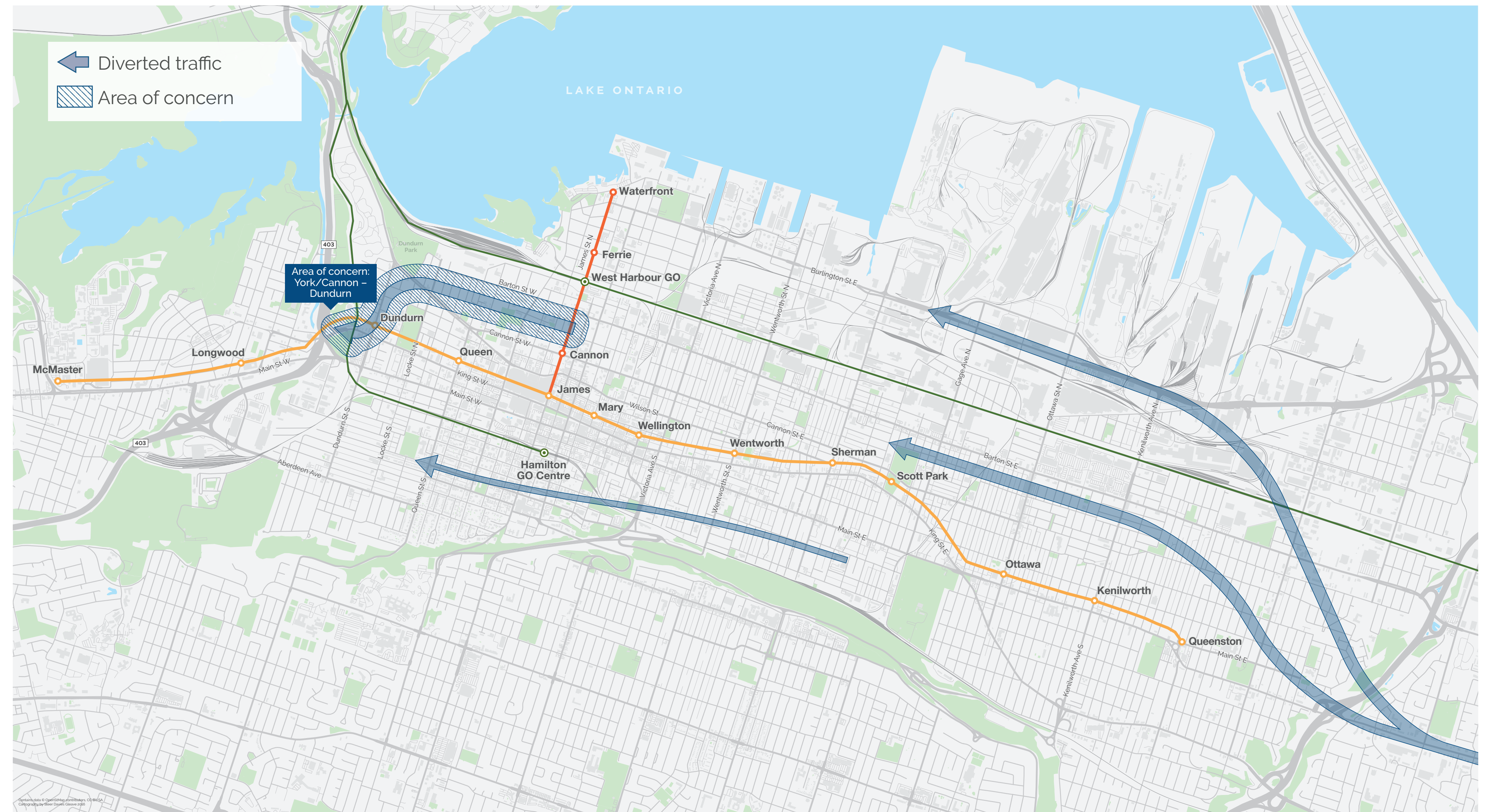
- Significant reduction on King Street westbound.
- New traffic on King Street eastbound where the new lane is introduced.
- Decreases on some perpendicular routes because of restrictions on crossing the LRT alignment.
- Increases on some perpendicular routes as traffic consolidates at crossing points.
- Increases on parallel routes as traffic is diverted.

**This process shows:**

- Traffic will increase in relationship to the project population and employment growth, with or without LRT.
- LRT will change traffic patterns, the flow of traffic, and the level of service at intersections. The results of those impacts will require mitigation strategies.
- With proper management strategies, traffic will continue to flow when LRT is in service.

**Areas of concern:**

- The York / Cannon / Dundurn corridor from Queen to King / Dundurn will require further study.
- Mountain accesses will continue to operate adequately after the introduction of LRT.



↑ Diverted traffic



The diversion of traffic resulting from the LRT operation created congestion in several area intersections, and one significant area of concern, where diverted traffic needs to return to the King / 403 corridor.

## Mitigation Measures

The initial round of modelling pointed to several areas throughout the network with congestion problems at the intersections.

Initially, improvements were tested that did not require physical modifications to the roadway. These included:

- Traffic signal operations
- Timing allocation
- Staging changes
- Dedicated turn phases
- Signal cycle times
- Turning lane reallocation
- Turn movement bans

These changes resulted in reasonable traffic conditions throughout the network, with the

exception of the corridor on York Street from Cannon / Queen to Dundurn and Dundurn to King Street – a result of traffic needing to return to King Street for access to Hwy 403, King West and Dundas.

To address congestion in the York / Dundurn corridor, a number of physical changes are necessary, including:

- Cannon at Queen / York – three lanes on eastbound approach;
- Dundurn at York: added lane on all three approaches to accommodate turns;
- Locke at York: westbound left turn ban, added lanes on all approaches (100 metres);
- York from Dundurn to Queen: three lanes in both directions;

- Dundurn from York to King – added southbound lane; and,
- King at Dundurn: added southbound right-turn slip lane; added westbound approach lanes.

These changes along York and Dundurn will require further assessment to identify cycling impacts and options (see [Committed to Cycling](#) board)





# Where will Cars Park and Trucks Unload?

Implementing LRT in the King / Main corridor will have an impact on on-street parking and loading areas. Specific plans will be developed to ensure that this impact to residences and businesses will be minimized.

## Parking and Loading Impacts

Implementation of the LRT will eliminate current metered parking spaces and formal loading areas on the street from Dundurn to Queenston.

Approximately 400 metered parking spaces will be eliminated.

Both formal and informal loading areas will no longer be available on-street, on King Street and Main Street East.

Current use of parking and loading spaces varies in relation to the distance from the downtown. In and around downtown, both parking and loading spaces are highly utilized – more than 80 percent in peak times.

Outside of the downtown, utilization is lower – down to 60 percent in some areas.

This means that not all parking spaces may need to be replaced – detailed studies will be conducted to determine the specific replacement rate by area, and how these spaces are to be replaced.

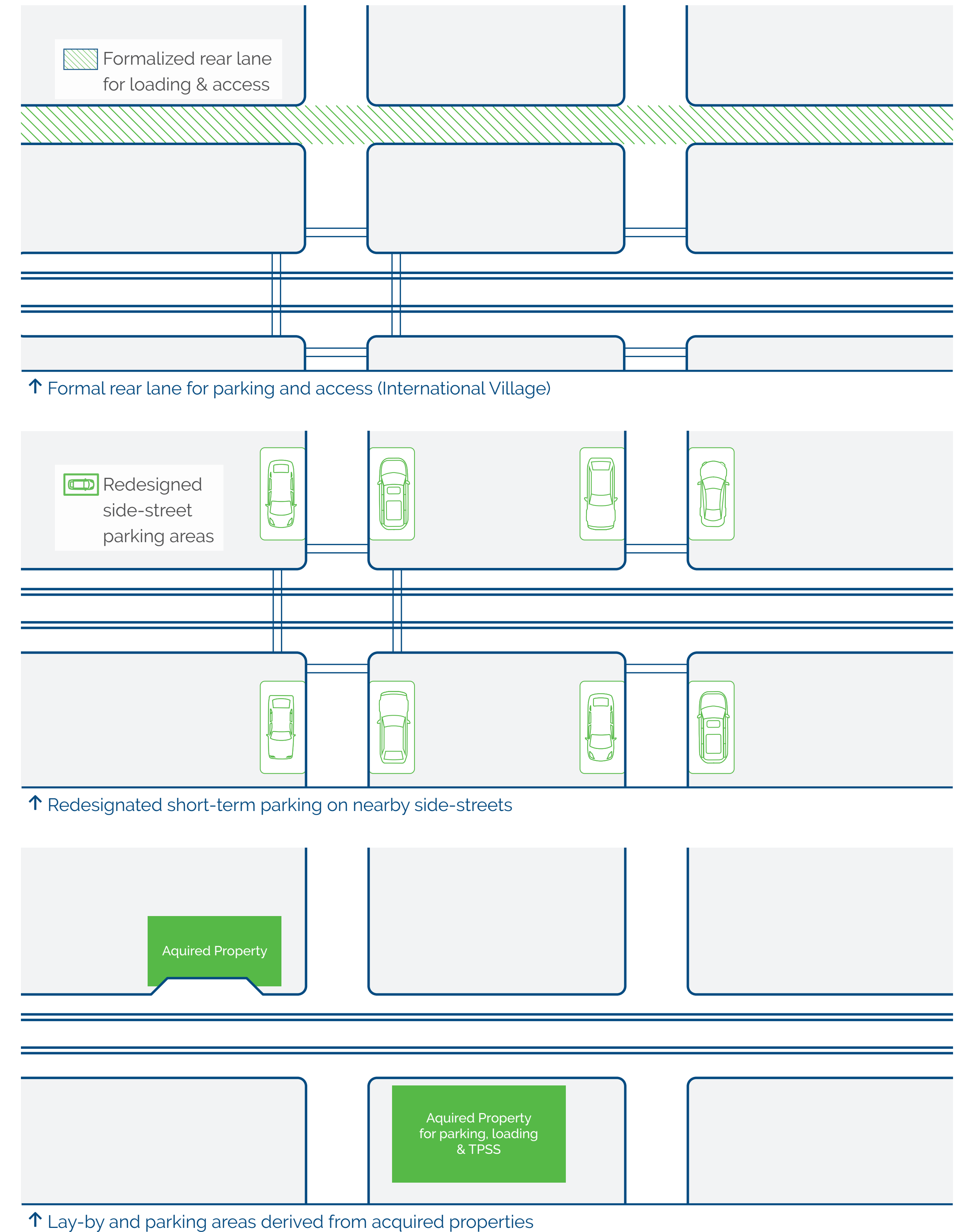
## Developing Solutions

Parking spaces will be replaced in a number of prioritized methods. Specific studies for each area will be conducted to determine the measures that include:

- Re-designating permit and unlimited parking areas on side streets close to the corridor;
- Identify and designate short-term parking spots and loading areas in nearby parking lots ;
- Use portions of acquired properties to establish short-term parking spots and loading areas;

- Develop formal rear lanes ( for example, north of King Street in the International Village) for loading areas and access;
- Integrate parking and loading laybys with the power substation locations; and,
- Integrate parking and loading layby design with the streetscape design plans.

Hamilton and Metrolinx will work closely with the community to develop effective solutions both for the short-term construction period as well as the long-term.





**Traffic volumes will increase considerably to 2031, with or without the LRT. Implementing the LRT will change traffic patterns in and around the corridor.**

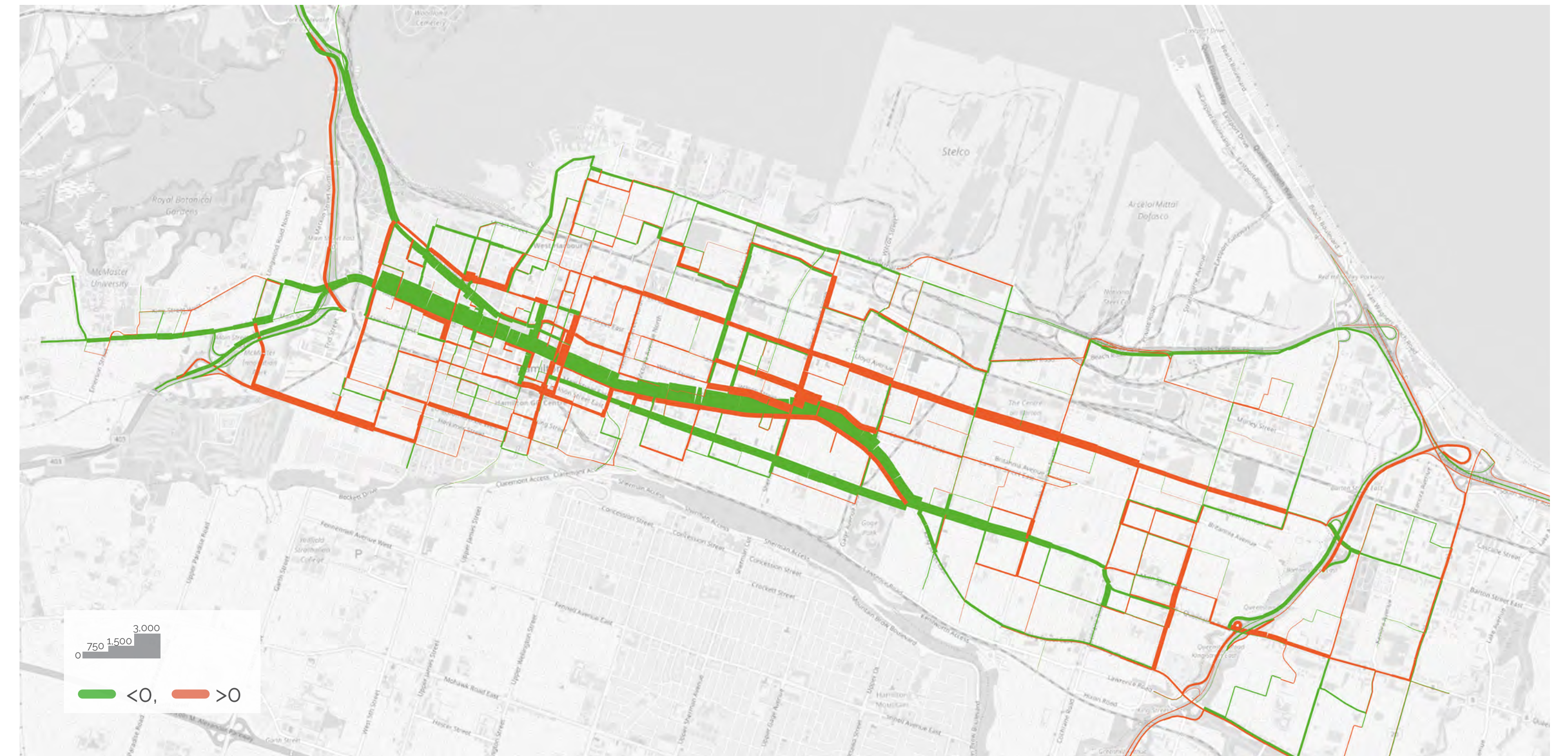
These figures show the forecast PM peak traffic volumes, based on the 2031 targets for population (660,000 people) and employment (300,000 jobs).

The *2031 Difference* figure shows the projected PM peak difference between the "Business-as-Usual" scenario, without LRT, and the LRT scenario. The difference figure illustrates the changes in traffic as a result:

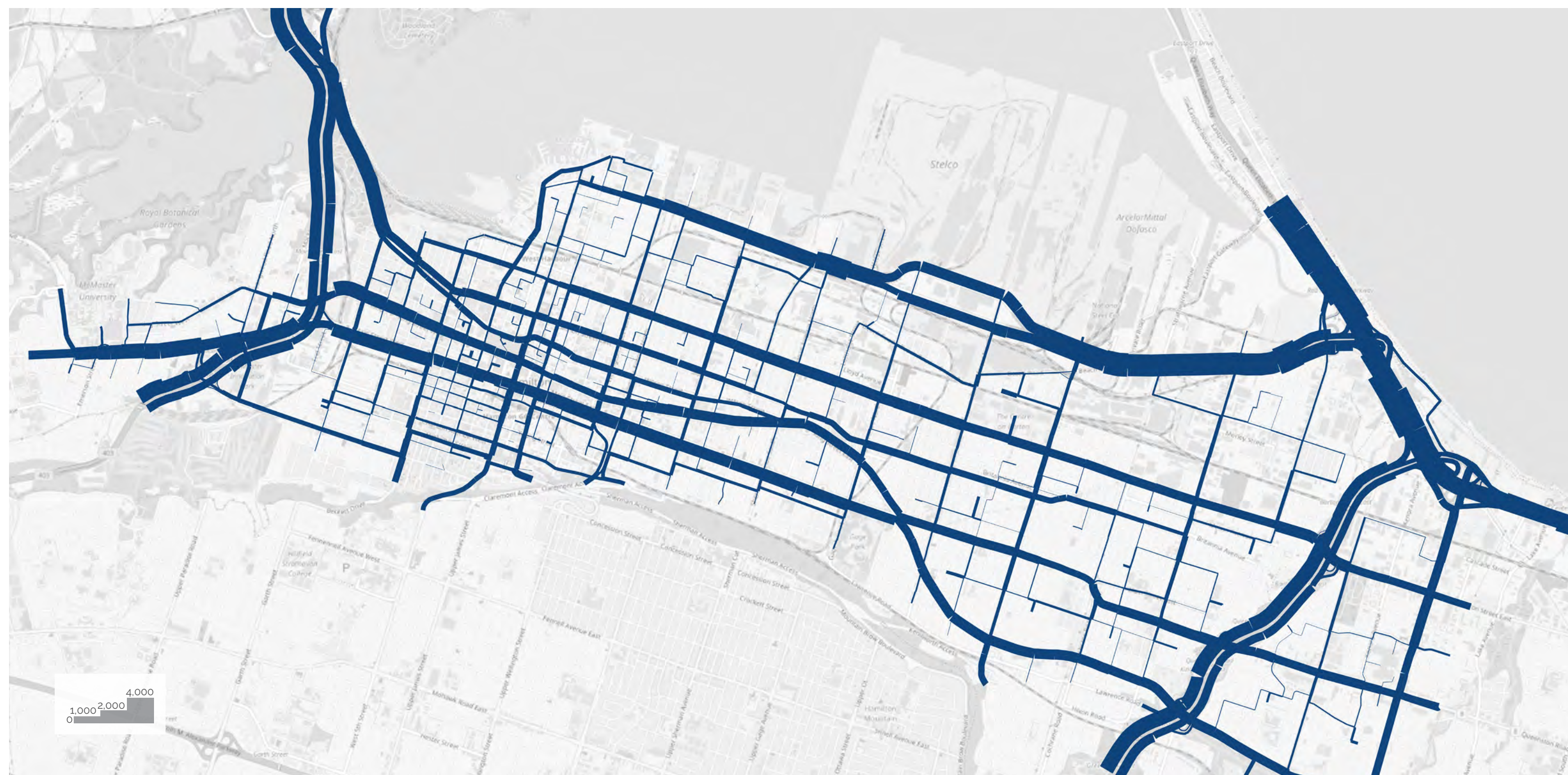
- Reductions (green) in traffic westbound on King Street, with new eastbound traffic;
- Increases in westbound traffic on York Street, from Bay Street to York/Dundurn and south to King Street;
- Reduction in inbound traffic on York Boulevard, with an increase on 403 traffic to Main Street; and,
- Increases on Barton, Cannon, Hunter, Aberdeen and north-south connections.

This represents the overall pattern of traffic diverting around the LRT corridor. These traffic patterns created the need for improvement strategies.

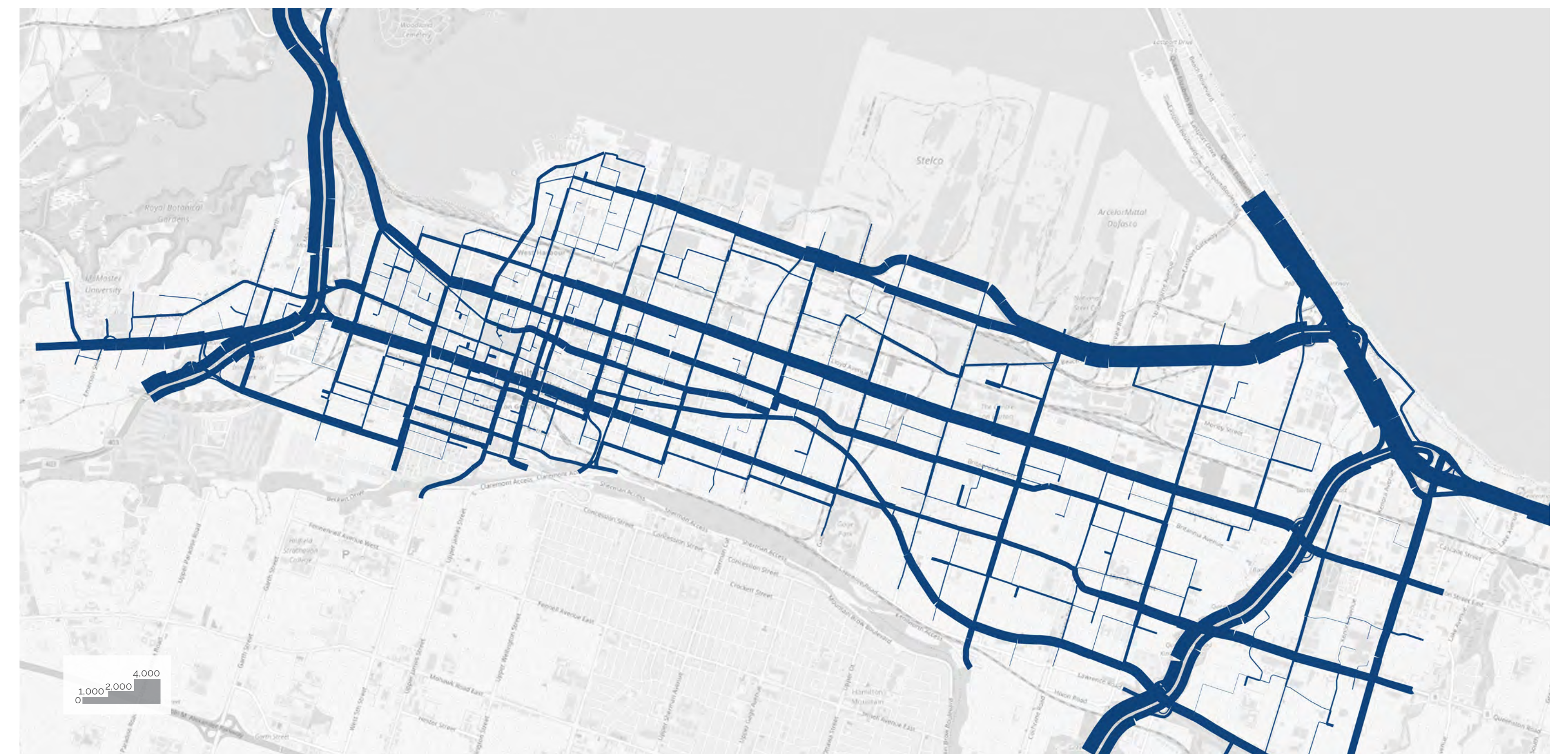
**2031 Difference**



**2031 Traffic Volumes without LRT**



**2031 Volumes With LRT**







Transit in the Main / King corridor is a crucial element in Hamilton's transportation network, serving the downtown, significant employment and residential areas, and major institutions.

Current bus services are often at capacity and crowding and congestion degrade reliability, affecting growth potential. The LRT on King Street – replacing the B-Line and complemented by other routes will provide direct reliable service throughout the corridor. Fed by complementary routes, the LRT will provide effective end-to-end travel serving key stops along the way.

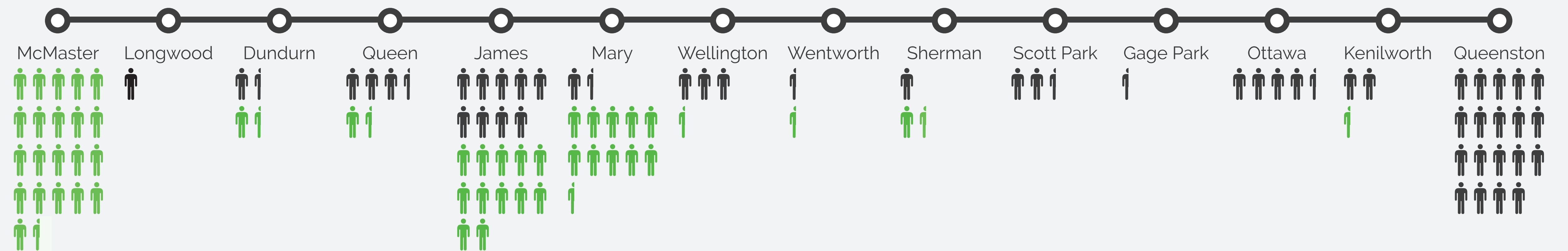
Key stops at the terminal and downtown locations will promote both ridership and economic development. The introduction of the LRT to the corridor will help achieve both the transportation and growth objectives for the City of Hamilton.

## B-Line stop activity 2041 – westbound AM peak hour

Each person represents about 75 riders:

 Boardings  Alightings

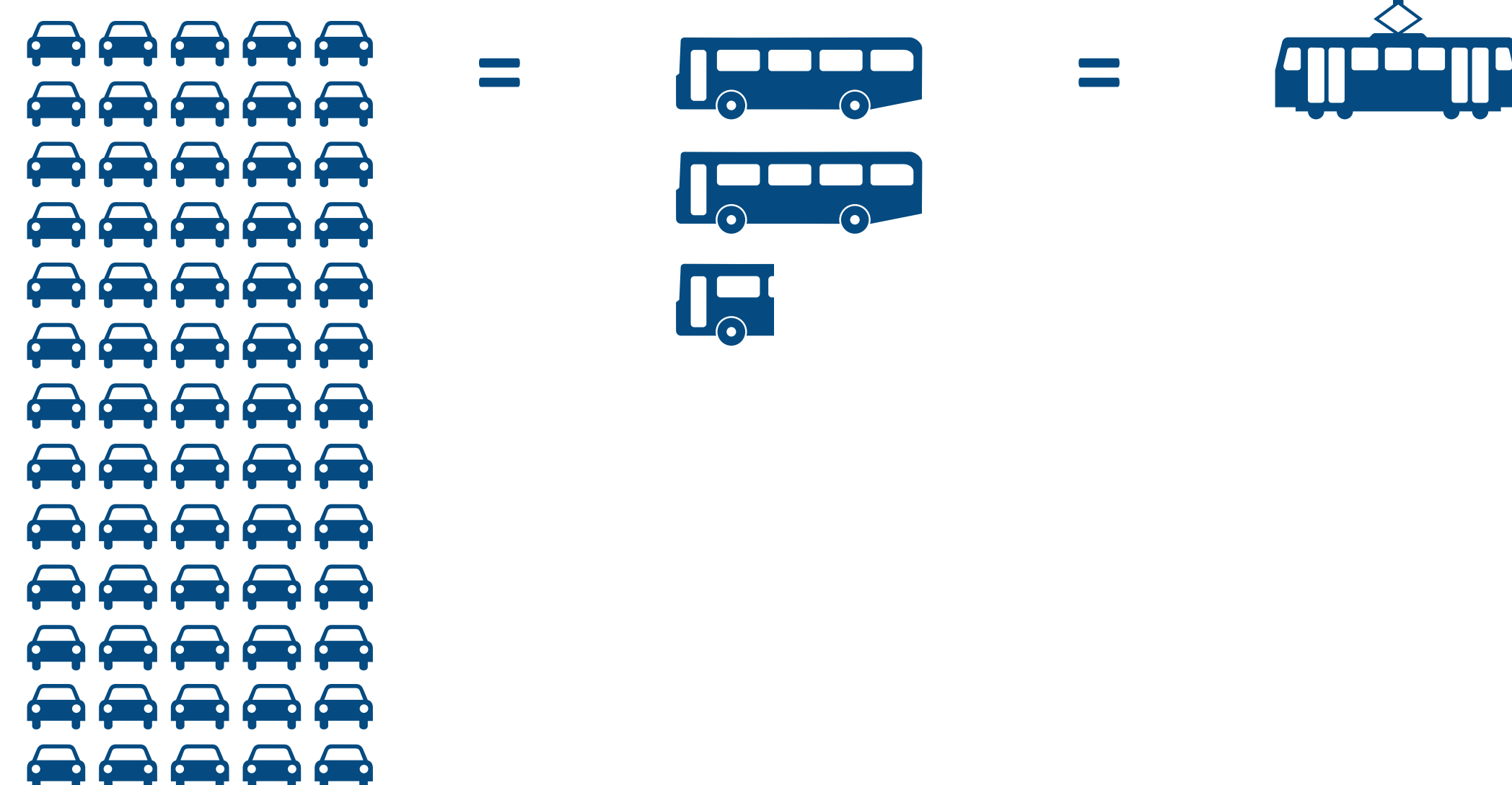
\*Ridership patterns shown here typically reverse in the afternoon peak



130 people in cars  
(1 car = 2 people)

130 people in buses  
(1 bus = 55 people)

130 people in LRV  
(1 LRV = 130 people)



## A-Line ridership

The A-Line ridership pattern is different from the B-Line. As a short spur, the A-Line is designed to connect to the West Harbour GO Station and the Waterfront, and provide local service along James Street. Ridership patterns will depend on the level of service at West Harbour GO, compared to the Hamilton GO Centre, and the amount of local service that remains on James Street. Since James Street is very walkable and the distance from end-to-end is short (about a 25 minute walk), people will choose

to use the A-Line more as a shuttle rather than a commuter connection, and thus peak usage will vary. Off-peak use on this line could also be important – on evenings and weekends – as riders take advantage of the James Street and Waterfront experience.



On December 22, 2011, the Ontario Minister of the Environment and Climate Change (MOECC) issued a Notice to Proceed with the Hamilton LRT project in accordance with the Environmental Project Report (2011) completed under the Transit Project Assessment Process (TPAP).

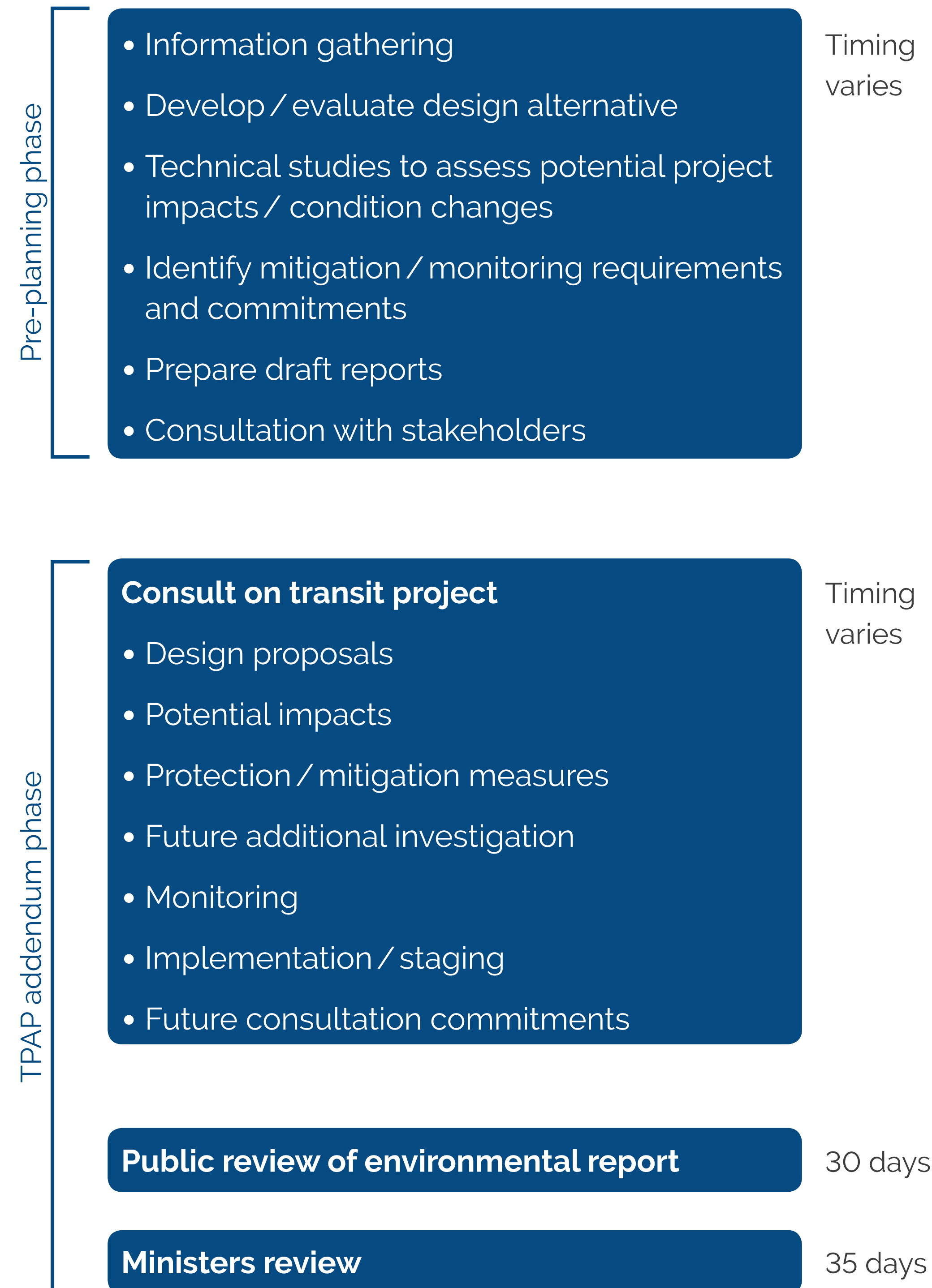
The TPAP process is a focused Environmental Assessment process specific to public transit projects that includes consultation, an assessment of potential positive and negative impacts, and assessment of measures to reduce negative impacts and documentation in an Environmental Project Report (EPR).

The TPAP documents the process that was followed and the conclusions that were reached including:

- An overview of the process used to select the transit project.
- Description of the transit project.
- Assessment of environmental impacts and how negative impacts will be mitigated.

- Record of consultation with the public, agencies, aboriginal communities and stakeholders.
- Commitments to monitoring environmental effects / mitigation, conducting further technical analysis, and consultation in other project phases.

The TPAP process includes an addendum process to make changes in a project after the EPR is completed. This allows for the possibility for changes or additions to the project that change the scope of the Environmental Project Report.



### Why is a TPAP addendum required?

The approved LRT project in the 2011 Environmental Project Report (EPR) included a side-running, street-level LRT alignment on Main Street West, King Street, and Main Street East, from McMaster University to Eastgate Square.

An addendum to the EPR is required to assess the impact of these changes.

With the Provincial announcement and further project development, changes to the project include:

- A new eastern terminus at Queenston Traffic Circle, with a new bus facility.
- A new spur line connecting from King Street via James Street North to West Harbour GO Station and potentially extended to the Waterfront.
- A High-Order Pedestrian Connection, connecting King Street at James to the Hamilton GO Centre.
- A shift to centre-running alignment to improve transit speed and reliability.
- The required Operations and Maintenance facility.



These environmental components include cultural heritage and archaeology, natural heritage (aquatic and terrestrial), contamination, hydrogeology, air quality, noise and vibration.

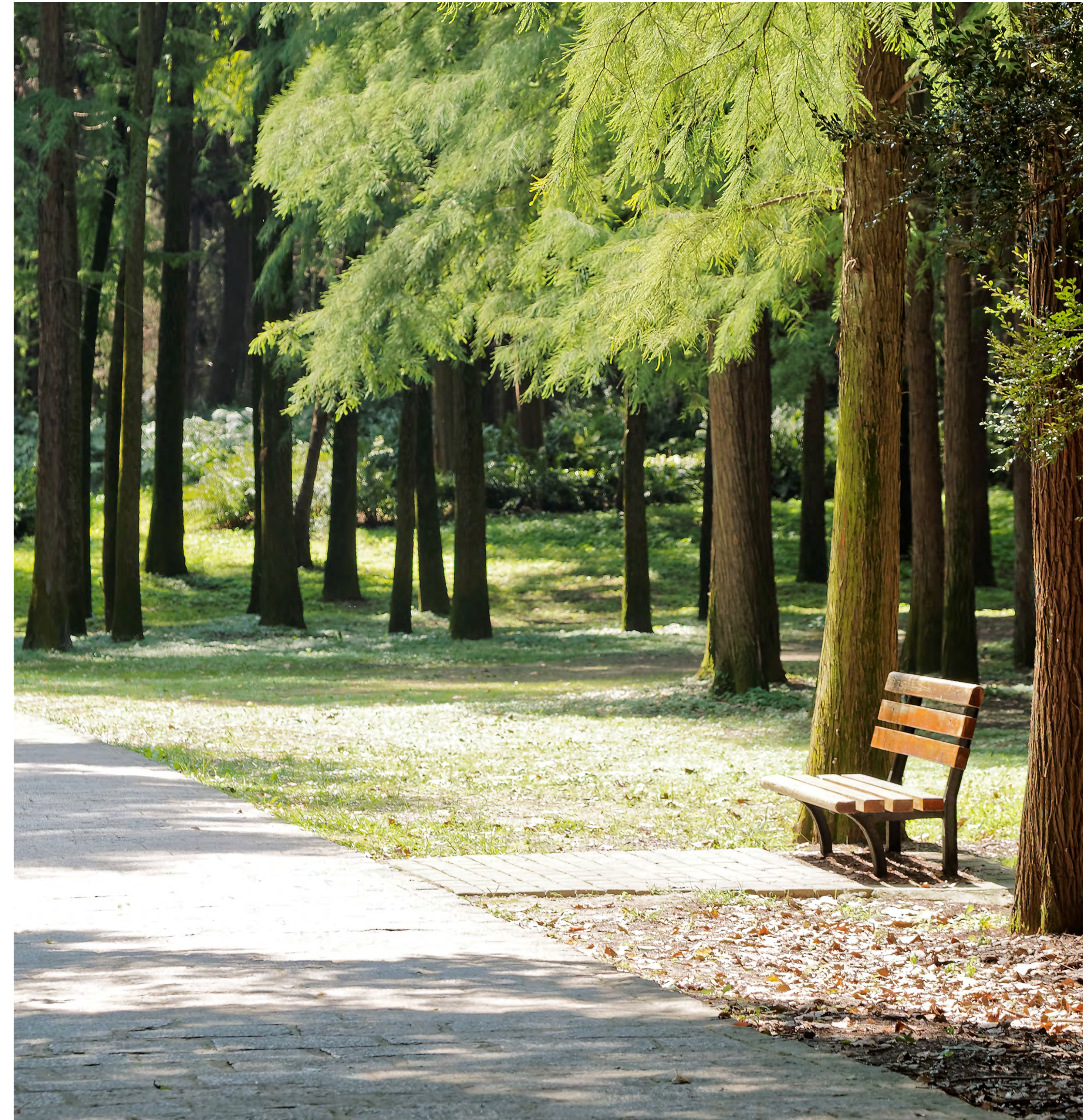
**The new scope includes:**

- Updating the 2011 existing conditions, impact assessment and mitigation.
- Inclusion of the A-Line spur line, running to the north from the B-Line along James Street North, that will connect to the new West Harbour GO Station and Waterfront. This spur link was previously part of the A-Line feasibility study.
- Development of an Operations, Maintenance and Servicing Facility (OMSF) on a site located near Frid Street and Chatham Street, which will run from the intersection of Longwood and Main Street, across the Longwood bridge over the 403 bridge and using the Frid Street extension to the site.

The following list of environmental inventories were conducted:

- Hydrogeological Report (SNC- Lavalin);

- Contamination Overview Study (SNC- Lavalin);
- Ecology Report (SNC- Lavalin);
- Arborist Memo, RE: Endangered Species (Bruce Tree);
- Air Quality Existing Conditions Report and Air Quality Study (RWDI Air Inc.);
- Stormwater Management Report (AECOM);
- A-Line and OMSF Geotechnical EA Report (AECOM);
- Review of B-Line Geotechnical Report (AECOM);
- Noise and Vibration Report (J.E. Coulter Associates);
- Stage 1 Archaeological Assessment (ASI); and,
- Cultural Heritage Screening Report (ASI).





No significant impacts to the groundwater regime are expected, as no significant groundwater recharge areas or wellhead (municipal well field) protection areas are present, and no private drinking water wells are expected within the project study area.

## Construction / Operation Impacts

Minor localized disturbance and impacts to groundwater may occur due to project related construction activities. These could include construction dewatering (for structure foundations) and utility relocation (especially in shallow groundwater level areas; i.e. near shoreline or creeks); accidental spills or releases of contaminants (i.e. fuel, lubricating oil and metals) during refuelling; operations and maintenance of the equipment; and potential contaminated soil and / or groundwater handling.

## Mitigation Measures and Net Effects

Mitigation measures will be outlined in contract specifications and operational constrains, and on the detailed-design drawings:

- Limit dewatering duration and volumes as minimal as possible;
- Groundwater sampling should be conducted prior to discharge to assess baseline groundwater qualities;
- Discharge water should be treated prior to discharge if contamination / exceedance is detected;
- If extracted water is to be directed to the natural environment (i.e. creeks, ditches), proper erosion and sediment control measures should

be implemented;

- Refuel equipment and vehicles on spill pads and / or in designated areas;
- Remove and dispose waste materials by licensed contractors;
- Utilize MOECC soil management best practices, including developing soils management plans for the project;
- Cover contaminated soil piles during rain events (to prevent contaminants / leaches from releasing into the ground); and,
- Dispose contaminated soil off-site (at a licenced waste facility) as soon as possible using licenced contractors.



## Monitoring / Future Work

An overall monitoring plan is not required. Temporary or localized plans can be prepared on an as needed basis (i.e., in proximity to Chedoke Creek and Red Hill Creek). Contingency plans will be developed to handle contaminated soil and / or groundwater (in case encountered) and accidental spills during the construction period to prevent or minimize potential groundwater contamination.



The potential for adverse environmental impacts along the corridor is considered medium to low. The subgrade material underlying the surface of the road may be fill material of unknown quality, which has been subjected to years to de-icing and may be considered potential impacted as a result. During the proposed earthwork activities for construction of the spur line, contaminated soil or groundwater may be encountered.



## Construction / Operations Impact

The potential for adverse environmental impacts directly within the OMSF site is considered high, due to historical and on-going industrial operations at the property. Potential off-site sources of impact to soil and groundwater exist in the vicinity of the site. If required, Phase I and Phase II Environmental Site Assessments will be undertaken during detail design.

Potential impacts associated with disturbance of contaminated properties include runoff of contaminated materials into watercourses, airborne transmission of particulate matter, and contaminant leaching into groundwater.

There are localized areas of potential environmental concern adjacent to the alignment, which may impact the soils or groundwater encountered during construction. The likelihood of encountering contaminated material will depend on the actual land takings for the project. During construction, impacts to activities can be mitigated by including special provisions in the contract documents if contaminated soil or groundwater is encountered.

## Mitigation Measures and Net Effects

Where removal of potentially contaminated soil or groundwater is necessary, contractors will be required to test excavated soil and groundwater for suspected contaminants of concern identified in the area under construction. Testing of the soil and groundwater within the OMSF study area should be conducted prior to construction. The analytical results from the soil and groundwater sampling should be compared to the Ministry of the Environment (MOE) Soil, Ground Water and Sediment Standards (July 2011) in accordance with Ontario Regulation 153 / 04 (O. Reg. 153 / 04) (as amended) under Part XV.I of the Environmental Protection Act (EPA).

## Monitoring / Future Work

Regular and frequent monitoring will be performed in areas where contamination has been identified, following the City's contaminated Sites Management Program manual.



Impacts to both natural and culturally impacted vegetation communities (cultural and forest communities) are anticipated.



## Construction / Operations Impact

In addition to the direct impacts as a result of construction activities, the construction of the OMSF will have indirect impacts to vegetation communities, both during construction and operations phases. These indirect impacts may include:

- Release of construction-generated sediment to vegetation areas;
- Vegetation clearing / damage beyond the working area. This may include additional vegetation removals associated with grading encroachment into vegetated slopes;
- Damage to adjacent vegetation from tree felling and / or grubbing;
- Spills of contaminants, fuels, and other materials that may reach natural areas;
- Creation of opportunities for invasive species at the edges of the forest community associated with the Chedoke Creek valley; and,
- Changes in drainage patterns (groundwater and / or surface runoff flow) that can affect dependent vegetation areas adjacent to the development area.

## Mitigation Measures and Net Effects

Mitigation measures will be outlined in contract specifications and operational constraints, and on the detailed-design drawings.

In order to minimize the potential for negative impacts to vegetation communities adjacent to the development area for the proposed OMSF development, the following general mitigation measures are recommended:

- Temporary erosion and sediment control measures prior to construction, and to be maintained throughout construction;
- Any dewatering effluent (if dewatering is required) as result of the proposed works will be treated (i.e. filter bags, sediment traps) as needed, to ensure it does not transport excess sediment into vegetated areas; and,
- It is recommended that a complete inventory and assessment of all trees that are to be affected by the proposed work be completed, and appropriate tree management activities implemented.

## Monitoring / Future Work

Environmental site inspections will be required during key construction periods and at key locations. This will ensure environmental protection / re-vegetation measures are implemented and working, and any required remedial action is undertaken. If species at risk are identified within the influence zone of construction activities, the Ontario Ministry of Natural Resources (MNR) will be contacted to determine how specimens of such species should be treated.

Butternut trees have been identified in the OMSF impact area, and a focused Butternut / health assessment survey will be conducted as part of the tree inventory during detailed-design. If species at risk are identified within the influence zone of construction activities, the Ontario Ministry of Natural Resources (MNR) will be contacted to determine how specimens of such species should be treated.



Anticipated impacts to wildlife and wildlife habitat within the study area, as a result of the construction of the Hamilton LRT and construction work at the OMSF, are considered against the general wildlife habitat function of the project area, where mitigation takes into consideration local and resident wildlife communities often comprised of the most urban tolerant species.



## Construction / Operations Impact

Potential effects to wildlife or their habitat as a result of the proposed works include:

- Direct removal of available habitat for resident species;
- Construction disturbance to adjacent habitat and communities;
- Potential for incidental killing or harm to local and resident wildlife species;
- Change in animal behaviour due to lighting (i.e. nocturnal foraging, migration movements, light attraction or repulsion, social interactions); and,
- Animal / vehicle conflicts may occur where there are existing migratory corridors such as along linear landscape features (i.e. valleys), and anywhere with low topographic complexity.

## Mitigation Measures and Net Effects

To minimize impacts to wildlife and their habitat during construction, the following mitigation measures should be implemented:

- Minimize habitat removal through minimizing access, staging, storage, and grading footprints;

- Avoid harassment to wildlife species during all stages of construction;
- Construction zone should be walked at a slow pace to flush any animals out of the area prior to silt fence installation;
- Workers should be trained on the potential for mammal species to move through the project area, and should remain vigilant and alert to the presence of wildlife in the work area;
- Install temporary erosion and sediment control measures prior to construction, and maintain throughout construction;
- Routinely inspect sediment and erosion control measures, including after storm events, and repair as required;
- Stabilize and re-vegetate exposed surfaces as soon as possible. Construction activities must adhere to the Migratory Birds Convention Act, which states that no tree cutting can take place from April 1 to August 31 in any given year;
- If tree removal cannot occur outside of the migratory bird nesting window, then undertake a pre-clearing nesting bird survey by a competent avian biologist;

- Ensure the construction areas are delineated by fencing (i.e. silt fencing) to exclude wildlife from entering the work areas; and,
- All construction vehicle movement should be at a slow pace to avoid trampling.

## Monitoring / Future Work

Monitoring of the migratory bird prevention measures, if required, will occur during the critical breeding / nesting period (April 10 – July 15) to ensure that the measures are effective in restricting nesting on structures scheduled or removal or alteration; thus, eliminating the potential for incidental take.

A detailed Species at Risk Assessment will be undertaken for Chimney Swift and Bats.



Indirect impacts to fish and fish habitat are possible due to land and water based construction activities near Chedoke Creek (i.e. release of silt as a result of poor sediment controls, fuel spills), as well as construction access to roads. The aquatic habitat effects analysis focused on the evaluation of the fisheries and aquatic habitats with respect to the effects from construction activities and the operation of the facility.



## Construction / Operations Impact

Potential effects to fish and fish habitat include:

- Discharge of sediment to a watercourse from earth / spoil stockpiles, grading and excavation activities associated with highway reconstruction, and culvert works resulting in the impairment of water quality and / or physical damage to habitat;
- Changes to groundwater discharge to the creek;
- Release of fuel, oil, and / or grease contaminants from mobile equipment, resulting in unacceptable contaminant concentrations in receiving watercourse; and,
- Change to sensitive life stages / process (i.e. spawning) if in-water works are not timed appropriately.

## Mitigation Measures and Net Effects

To address the potential impact to fish and fish habitat, the following key design and construction mitigation measures, with respect to the works in the study area, will be incorporated in the construction contract through the detail design drawings and

contract documentation:

- Design and install native woody vegetation and groundcover to pre-construction conditions or better;
- Design and implement erosion and sediment controls to prevent erosion of exposed soils and migration of sediment to watercourse;
- Store, handle, and dispose of all excess materials in a manner that prevents their entry to a watercourse;
- Operate, maintain, and store (i.e. fuel, lubricates) all equipment and materials in a manner that prevents the entry of any deleterious substances to the watercourse;
- Maintain existing ground cover such as grasses or other low lying vegetation within the valley, particularly on the banks of Chedoke Creek and in close proximity to surface water features and other sensitive areas;
- Properly maintain erosion control measures, including following storms events, until all construction work has been completed and the site has been stabilized; and,
- Refuel and maintain vehicles and equipment at the staging areas

or other pre-designated locations which are a minimum of 30 metres removed from the surface water system.

## Monitoring / Future Work

If needed, an environmental monitoring plan to assess the mitigation measures for protection of aquatic and surface water resources will be prepared. Monitoring during operations is anticipated to be limited to sediment accumulation and functioning of stormwater management facilities, and stability of drainage systems and slopes near the watercourses in the study area.



The project was reviewed for the potential to create project related changes in traffic that impact air quality at nearby sensitive land uses. The impact to traffic change was considered negative if it increased the potential for an air pollutant to exceed its acceptable threshold, and positive if it decreased this potential. The potential for construction activities to cause temporary impacts at nearby sensitive land uses was also studied.



#### *Air Quality Impacts from Changes in Road Traffic*

Since the proposed Hamilton LRT is an electrified rail system, it does not produce any significant local air emissions. Rather, it displaces emissions that would otherwise be generated by alternative methods of carrying its passengers, either automobile or bus.

#### *Air Quality Impacts from the Operation, Maintenance and Servicing Facility (OMSF)*

One of the advantages of the proposed site is that rail access can be created without using one of the existing street corridors. The site will generate some employee traffic on the local roads, as evidenced by the 236 parking spaces that are included in the current OMSF site layout. This traffic will contribute a small increase in local levels of vehicle exhaust pollutants. Therefore, the proposed facility is not expected to cause impacts to local road traffic that would significantly affect the local air quality.

#### **Construction / Operations Impact**

An emissions management plan will be developed for construction, setting out the various practices to be undertaken to minimize dust and other air pollutants.

The operations at the OMSF facility will include activities and equipment that have the potential to generate air pollutant emissions, including sandblasting, spray painting, welding, wheel truing, sand handling system, compressed air blow-downs, steam cleaning, boilers, and emergency generators.

#### **Mitigation Measures and Net Effects**

In order to comply with provincial regulations (Ontario Environmental Protection Act and Regulation 419 / 05), the OMSF must be designed so that off-site concentrations of air contaminants emitted from it are below the provincial standards at all times. This has to be documented in an Emission Summary and Dispersion Modelling (ESDM) report, which is submitted to the Ontario Ministry of Environment

and Climate Change (MOECC), together with an application for Environmental Compliance Approval (ECA).

#### **Monitoring / Future Work**

Ontario Regulation 419 / 05, under the Environmental Protection Act, requires that every measure be taken to minimize emissions and prohibit visible emissions from escaping beyond the project limits of a construction site. During construction, observation of visible emissions will be treated as a case where immediate action must be taken. Dust generation will be visually monitored, to proactively achieve the goal of reducing impacts to local air quality.

The City of Hamilton will continue to assess area wide air quality under its current monitoring program (through Clean Air Hamilton), and it is expected that the Hamilton LRT operations will be captured by this initiative.



The majority of the Hamilton LRT alignment will have surface runoff collected and fed into the City of Hamilton's storm sewer system. The amount of impervious area will not increase substantially along the corridor and therefore the impacts on stormwater drainage are not significant.

#### **Construction / Operations Impact**

The OMSF site will require site plan approval, addressing stormwater quality and quantity controls. These controls are to be designed based on relevant criteria (Ontario Ministry of the Environment Stormwater Management Planning and Design Manual, 2003).

Where an increase in impervious surface area occurs, along with increased stormwater runoff, best management practices will be assessed. Consideration will also be given to enhancing runoff conditions in existing road segments, where practical.

An erosion and sediment control plan is required to satisfy the criteria of "Erosion and Sediments Control Guidelines for Urban Construction"

(Greater Golden Horseshoe Area Conservation Authorities, December 2006).

#### **Monitoring / Future Work**

A Storm Water Management (SWM) study will need to be undertaken to prepare the detailed stormwater management plan required for the OMSF site.





Subsurface and groundwater information was reviewed, and the investigation requirements for the detailed design stage have been identified with consideration of Infrastructure Ontario (IO) AFP-Geotechnical, Hydrogeology, Environmental Due Diligence Technical Requirements-Civil Infrastructure Projects (final draft dated on January, 2016).



An assessment of the potential for contaminated sites within the study area has been completed concurrently, and will have an impact on how groundwater is controlled during the construction stages.

### **Construction / Operations Impact**

Depending on the site-specific subsurface conditions and subgrade inspection findings during construction, proper frost mitigation measures should be implemented to minimize any frost related maintenance issues, should they be identified.

Where deep excavation in sands and silts is anticipated, a positive groundwater control system will be required. The impacts of groundwater in areas of deeper excavation shall be assessed through a detailed hydrogeological assessment.

### **Mitigation Measures and Net Effects**

In case of using short caisson foundations in a frost susceptible soil with a high groundwater table, adfreezing / frost heave uplift mitigation should also be considered.

Preferably, construction is to be carried out during the summer months when the groundwater is usually the lowest, in order to minimize the quantity of groundwater to be handled.

### **Monitoring / Future Work**

Consideration can be given to the use of Infrastructure Ontario (IO) AFP-Geotechnical, Hydrogeology, Environmental Due Diligence Technical Requirements (final draft dated on May, 2012).

The following hydrogeological testing of the geotechnical boreholes will be conducted during detail design:

- Monitoring wells for every third borehole;
- Well development prior to testing;
- Water quality sampling of every monitoring well;
- Slug testing of every second monitoring well; and,
- A short-term pumping test for each of the excavations for deep structures (if any).



Increased noise and vibration levels during construction due to construction activities and operations are anticipated. Noise sources evaluated include McMaster Bus Terminal, OMSF site, MacNab Bus Terminal and Queenston Bus Terminal. Both McMaster University and CanMET have been identified as receptors sensitive to vibration.

## Construction / Operations Impact

Noise level increases during construction are temporary and can be mitigated. Limits have been provided against which noise from the bus terminals and OMSF will be evaluated.

## Mitigation Measures and Net Effects

Provincial and municipal guidelines provide restrictions with regard to construction noise and vibration, including:

- Noise limits outlined in NPC-115 guidelines;
- Use of noise abatement equipment on machinery;
- City of Hamilton By-Law No.

03-020, which prescribes periods of construction activity between 7a.m and 7p.m.; and,

- Best practices.

Noise by-law exemptions will be obtained prior to construction in periods prohibited by the noise by-law, if required.

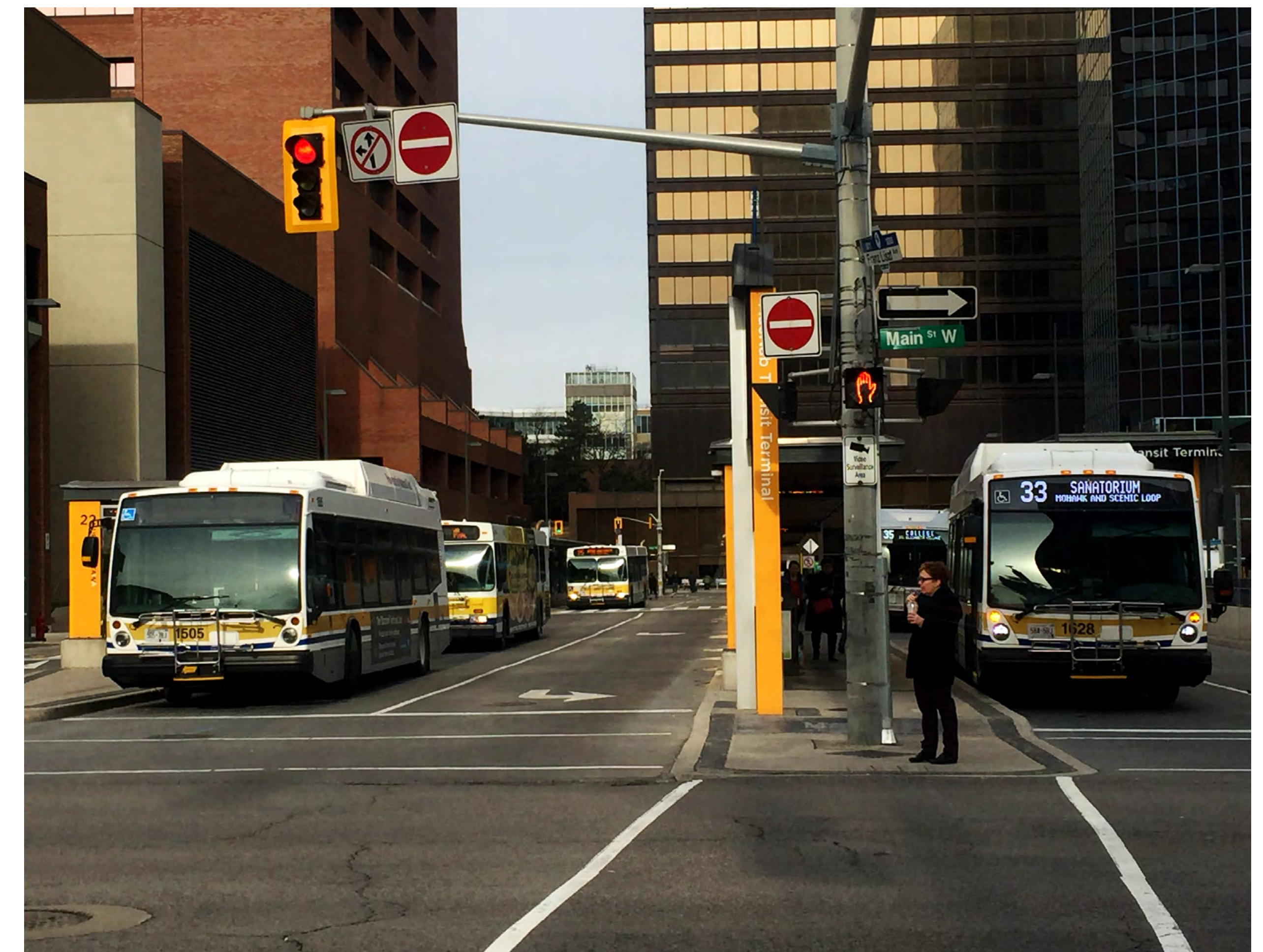
## Monitoring / Future Work

The OMSF will require a detailed noise and vibration study in support of an Environmental Compliance Approval for that site;

- A more detailed noise and vibration impact assessment of the final alignment, including the effects of special trackwork using the proposed vehicle's actual noise emissions (manufacturer's data);

- A noise barrier is recommended for the OMSF property;
- A more detailed noise assessment of the traction power substations and bus terminals;
- An assessment and mitigation strategy for construction related noise and vibration; and,

Noise and vibration monitoring during the construction period.





The Stage 1 Archaeology Report determined that four previously registered archaeological sites are located within one kilometre of the study area. However, the study area itself does not retain archaeological potential.



↑ Evacuation site



↑ Northeast view of the proposed OMSF site old rail line; area is disturbed with no archaeological potential.

The study area has a long and complex Indigenous history due to its proximity to Cootes Paradise and Lake Ontario. A review of the geography of the study area suggested a potential for the identification of Indigenous and Euro-Canadian archaeological resources, depending on soil conditions and the degree to which soils have been subject to deep disturbance. However, a property inspection determined that the study area has been subjected to deep and extensive soil disturbance events and does not possess archaeological potential.

### Construction / Operations Impact

The project was assessed against the potential for encountering and disturbing archaeological resources adjacent to the disturbed right of way that remain undisturbed and does not contain archaeological potential. Should the proposed work extend beyond the current study area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands. It should be noted that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict,

account for, or identify every form of isolated or deeply buried archaeological deposit.

### Mitigation Measures and Net Effects

In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the Ministry of Tourism Culture and Sport (MTCS) should be immediately notified.

Compliance with the following legislation is required:

- It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site, or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has: completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act.

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site, and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately, and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act.
- The Cemeteries Act, R.S.O. 1990 c. C.4 and the Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police, or coroner, and the Registrar of Cemeteries at the Ministry of Consumer Services.

### Monitoring / Future Work

During construction, a licensed archaeologist should be on site to monitor earthworks in areas exhibiting archaeological potential.



There are no affected properties within the project study area that have previously been identified as a Provincial Heritage Property (PHP) or Provincial Heritage Property of Provincial Significance (PHPPS).

A Cultural Heritage Screening Report (CHSR) was prepared to identify properties in the study area with built heritage or cultural heritage landscape resources that are over 40 years of age. These properties are further screened to identify known cultural heritage value or potential for cultural heritage value. Cultural Heritage Evaluation Reports are currently being prepared to evaluate properties in accordance with Standards and Guidelines for the Conservation of Provincial Heritage Properties.

## Construction / Operations Impact

The proposed undertaking, including construction and operations impacts, has the potential to impact identified cultural heritage resources. Where appropriate, further impact assessment studies and conservation plans are recommended to be undertaken during detail design. Should the proposed work extend beyond the current study area, further cultural heritage assessment should be conducted to determine the heritage potential of the surrounding properties.

## Mitigation Measures and Net Effects

Cultural Heritage Evaluation Reports (CHER) will be prepared for impacted properties of cultural heritage value. Where recommended, avoidance, minimization of encroachment, maintenance of vehicular access to identified cultural heritage resources, minimization of negative visual impacts through sensitive design of LRT stops and platforms in areas where cultural heritage resources have been identified, and documentation of resources in advance of alteration will be addressed during detail design.

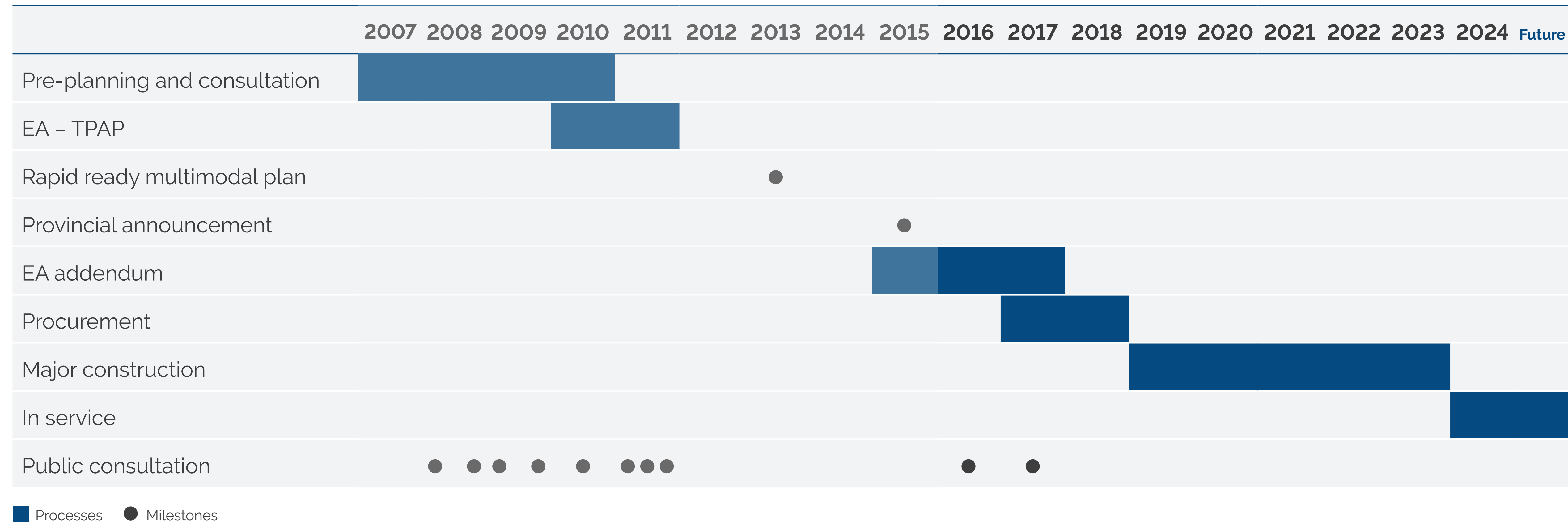
## Monitoring / Future Work

Based on the results of vibration studies, appropriate conservation plans should be developed, including but not limited to building and / or façade stabilization measures or development of appropriate setbacks.





Hamilton and Metrolinx have been working together on planning the LRT since 2007, with numerous consultation events like this one. This timeline shows the general outline of activities we have completed, and what is coming up.



### Next steps

Following Public Information Centre #2, the Environmental Project Report Addendum will be prepared and submitted.

Once the Addendum has been submitted and reviewed by members of the public, government agencies, aboriginal communities, and other interested parties, the proponents will respond to and address any matters arising from the review of the project.

To stay on track with us, visit the project website for the latest developments or email your questions to [lrt@hamilton.ca](mailto:lrt@hamilton.ca)

For more information go to:  
[hamilton.ca/LRT](http://hamilton.ca/LRT)  
[metrolinx.com/HamiltonLRT](http://metrolinx.com/HamiltonLRT)



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# Thank you for coming!

If you have any project related questions or would like to be added to our project mailing list, please contact:

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