



Canadian Consulting Engineering Awards 2016

## Queens Quay West Revitalization

Category B: Transportation

April 2016

# ARUP





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# Entry Consent Form



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# Project Information

<b>Project Name</b>	Queens Quay West Revitalization
<b>Project Location</b>	Queens Quay between Bathurst and Parliament Streets, Toronto, Ontario
<b>Project Size</b>	3.5km of roadway, 1.5km of the Martin Goodman Trail, 9 complex intersections, and 1.5km of utility relocations
<b>Year Completed</b>	June 2015
<b>Entering Firm</b>	Arup
<b>Role</b>	Engineer providing services for civil, structural, electrical, geotechnical, architecture, landscape, environmental design, traction power design, foundations design, traffic signals, public realm, and construction management.
<b>Project Partners</b>	Waterfront Toronto (Owner), West 8 + DTAH in Joint Venture (Landscape Architecture), Eastern Construction (Contractor)
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The Martin Goodman Trail ©Arup





Dedicated LRT space within the boulevard ©Arup



## Project Summary

Waterfront Toronto's vision was to transform the congested stretch of Queens Quay into a vibrant public destination in the city. Arup provided planning and multidisciplinary engineering services to transform the 3.5km stretch of busy four lane road into a two-lane, tree-lined, pedestrian and cyclist-friendly waterfront boulevard. It includes 1.5km of light rail; 3.5km of the Martin Goodman Trail; 9 complex intersections; 1.5km of utility relocations - all successfully carried out in a complex stakeholder environment.



The Martin Goodman Trail ©Arup





## Innovation

Queens Quay Boulevard West is the centerpiece of Toronto's Central Waterfront. The corridor was reconfigured to connect the Martin Goodman Trail within the city's waterfront, and leverage much-needed rehabilitation of the streetcar tracks. It is now an iconic boulevard and public space to be enjoyed by Torontonians and visitors alike.

Working closely with West 8 + DTAH and Waterfront Toronto, Arup reconfigured the transportation plan, redesigned the street and prepared an operational concept to address requirements of the community, businesses, and tourism and transit by incorporating extensive landscape features within existing built environment and within strict site boundaries.

During the Environmental Assessment process, the team undertook feasibility studies, conceptual and schematic design and selection of preferred design solutions to address challenging constructability constraint with limited space within the Queens Quay right-of-way. Constructability and feasibility reviews continued during the construction phase in some site specific locations to address unforeseen conditions related to utility conflicts, high water-table levels and conflicting utility relocation schedule constraints.

Part of the stakeholder consultation process included using cutting edge simulations in VISSIM to show anticipated traffic and transit flows and to demonstrate how the planned narrowing of Queens Quay would not negatively affect area traffic. Local officials

thus gained a comfort level for a plan that promotes sustainability by reducing vehicle traffic and improving public transit. In order to ensure that emergency vehicles can utilize the LRT right-of-way, Arup designed a rolled curb that accommodates emergency vehicle access.

Since streetcar platform locations require loading of passengers in the middle of the intersection which required the careful placement of traffic signals and pedestrian push-buttons. The unique configuration of the roadway required careful and detailed planning and design to make sure that traffic, transit, cyclists and pedestrians on the promenade could safely use the intersection together,

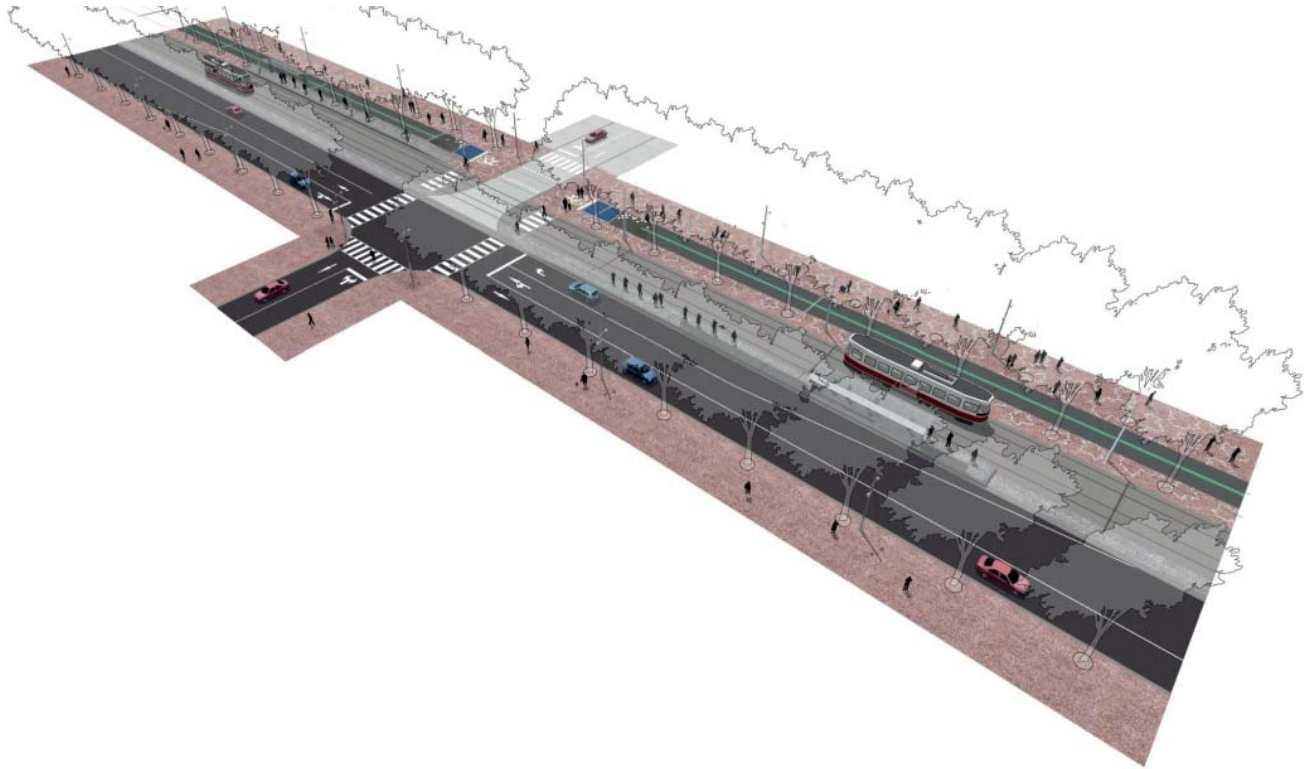
The design, including the LRT platforms, accommodate boarding access for current LRT vehicles, but can also accommodate future low-floor vehicles.

Because plans called for the boulevard to be tree-lined, a detailed analysis of the major and minor flow systems across the corridor was used to identify opportunities for improvements that would promote tree growth. These included introduction of passive irrigation systems to maintain tree health over the long term. Using the space beneath the multi-use trail to increase available soil volume and therefore growing space, and using innovative technology in the form of silva cells resulted in an optimized growing environment.

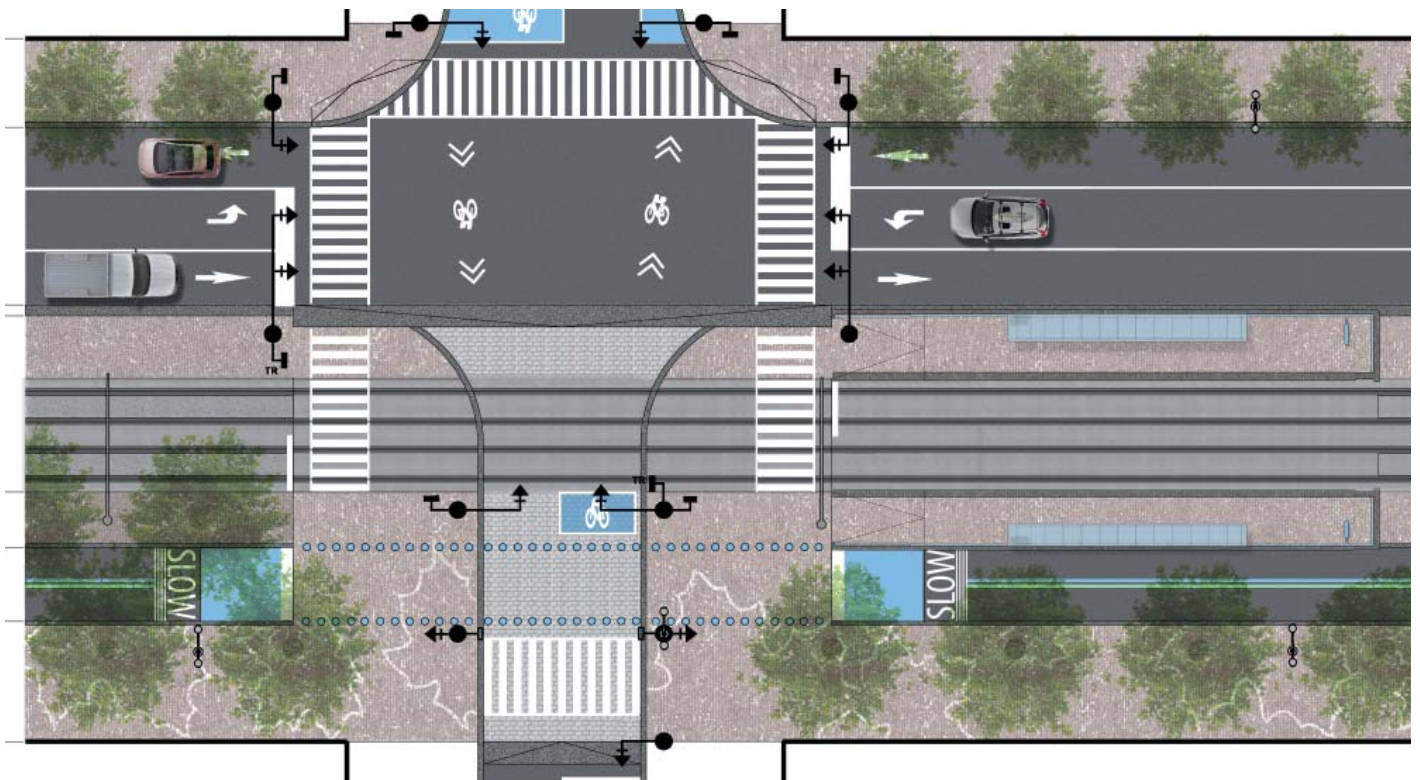


The Martin Goodman Trail ©Arup





Overview layout of Queens Quay West - the overall concept kept the streetcar in the same place in the roadway, but completed the Martin Goodman multiuse trail and a generous promenade south of the tracks. Two way traffic was placed north of the tracks. ©Waterfront Toronto/West 8 + DTAH



Intersection layout - the unique configuration of Queens Quay required careful and detailed planning to make sure that traffic, transit, cyclists and pedestrians on the promenade could safely use the intersection together. ©Waterfront Toronto/West 8 + DTAH



# Complexity

The revitalization of Queens Quay Boulevard provided a multitude of complex challenges that needed to be addressed by Waterfront Toronto and the design team. The 3.5km stretch of road that was redeveloped sits at the heart of downtown Toronto and is used as a key thoroughfare for east-west traffic along the city's waterfront.

It is lined by a large number of commercial, residential, and industrial users, and includes elements that are under the jurisdiction of the City of Toronto, the TTC, and utility companies. In addition, soil conditions are challenging due to infill and a high water table.

Part of the stakeholder consultation process included using cutting edge simulations in VISSIM to show anticipated traffic and transit flows and to demonstrate how the planned narrowing of Queens Quay would not negatively affect area traffic. Local officials and other project stakeholders thus gained a comfort level for a

plan that promotes sustainability by reducing vehicle traffic and improving public transit.

Another key challenge was utility relocations. The existing right-of-way was developed in an ad-hoc fashion, with each utility company laying infrastructure in any available space (water, sanitary and storm mains, power ducts, telecommunications cables, and gas mains.) The design team developed complicated staging plans to allow utilities to be consolidated within a single trench, and, where possible, to be stacked.

The engineering efforts and extensive stakeholder consultations resulted in a successful project that has transformed the community.



The new Queens Quay Boulevard ©Arup



## Social and/or Economic Benefits

“The revitalization of Toronto’s waterfront is proving to be an economic driver.” ~ Finance Minister, Joe Oliver

The newly transformed Queens Quay has the potential to substantially contribute to the economic and social quality of life for the citizens of Toronto. The central waterfront area is now a destination for locals and visitors alike, providing a variety of experiences and amenities.

Traffic flow was improved in many respects. Transit and traffic now move together through intersections improving efficiency, whereas before they moved separately. Dedicated parking lay-bys were provided for the many businesses on the north side of the street.

With the city to the north, having traffic north of the tracks improves flow for turning movements. People

can experience the waterfront in a variety of ways - by foot along the granite walkway, by bike, by transit and still by car to the various major parking facilities for which access had to be maintained.

Businesses and condominiums on the north side of the street now front onto widened sidewalks with granite sidewalks and a row of mature trees, and provide opportunities for shopping, dining, and a large array of recreational activities. It provides the kind of atmosphere conducive to economic vitality, ground floor retail activity and urban vibrancy.

With the high number of tourists who visit the waterfront for events at Harbourfront Centre, cruises and other recreation, the revitalization also included a comprehensive bus management strategy for large groups arriving via coach and bus.

Queens Quay West has become an iconic street that is as beautiful as it is functional.



Birds Eye View of Queens Quay Boulevard looking east ©Waterfront Toronto/West 8 + DTAH



# Environmental Benefits

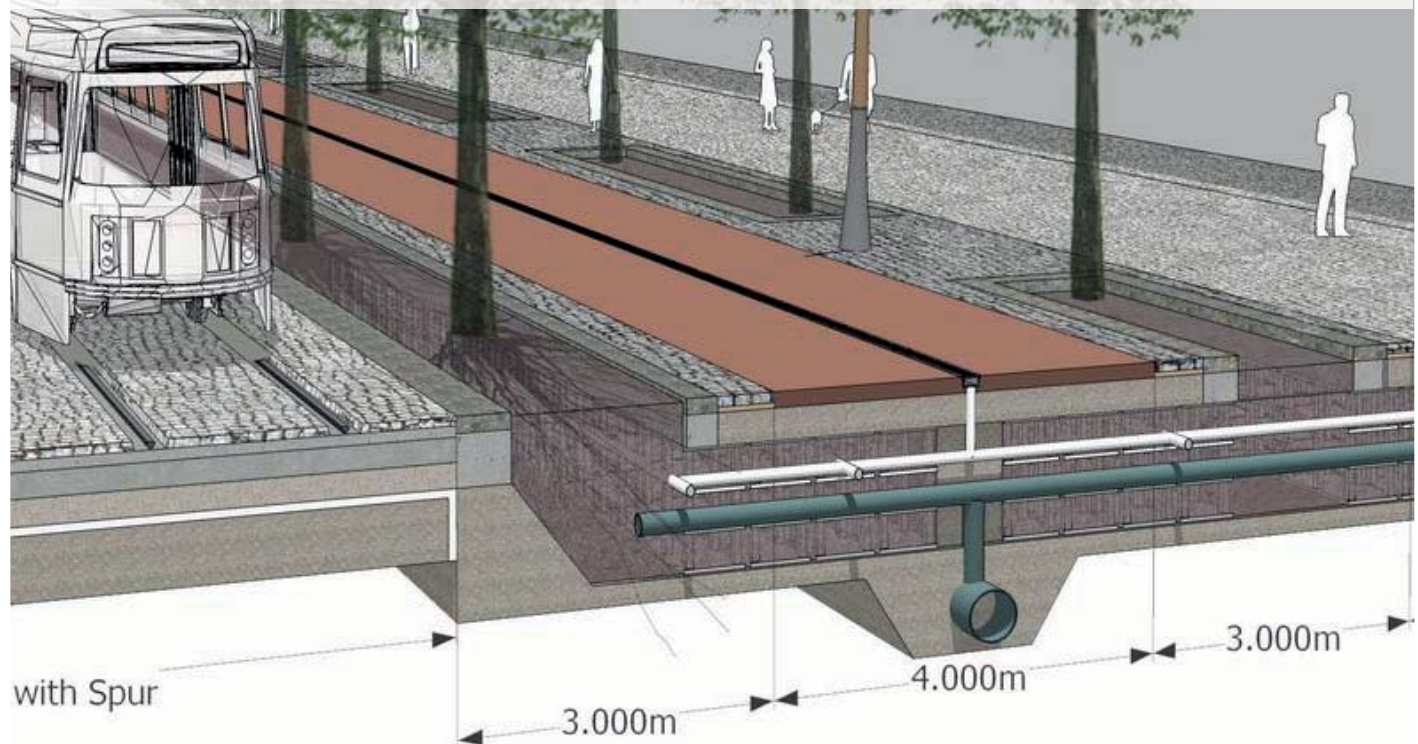
The quality of environmental design is evident in the boulevard's trees which are each given adequate growing space using innovative technology in the form of silva cells and providing significant environmental benefits, on-site stormwater management, improved soil and water quality and reduced erosion.

Several cross sections were considered to find the optimum configuration and placement of various utilities and tree soil structures in the constrained right-of-way. To maintain healthy trees, several details were considered including irrigation and using space beneath the multi-use trail to increase available soil volume.

Arup also coordinated the permits and approvals associated with the Ministry of the Environment, City of Toronto, TTC and utilities.

To ensure the continued operations of the LRT system throughout winter, and potential heavy snowfalls, the design team carefully considered both the longitudinal profile and transverse section to ensure adequate positive drainage was provided to prevent flooding during thaws (when road and tracks are salted throughout the winter, and in the spring).

Inherent in the project is a mode shift on the street away from cars toward pedestrians, cyclists and transit users. By updating the transit signal priority and bike signals, the newly redesigned street makes alternative modes of transportation more comfortable, reducing the number of cars. Additionally, in the simulations, improved traffic flows resulted in less delay and therefore reduced vehicle emissions.



Tree planting and drainage options ©Arup



## Meeting Client's Needs

**“This has been an intensive nine-year project and Arup has been a creative partner in creating this new street typology.” ~ John Campbell (Former)**

**Waterfront Toronto President and CEO**

The key objective of the Queen's Quay West revitalization project was to transform the city's main waterfront thoroughfare into a modern, complete street and public promenade. Waterfront Toronto recognized the need to have Queens Quay act as the 'spine' of the central waterfront. The revitalized street now has an iconic design fit for Toronto's main waterfront street.

The project re-organized the layout of the entire street, separating cyclists and pedestrians from cars and thereby also improving safety.

With outstanding results, the team managed to create an destination that integrates the overall waterfront park and trail system – offering both active and passive users diverse experiences and memories.

The project offers an outdoor space for public gathering that can host compelling activities, community events, entertainment, and cultural activities to draw a range of audiences throughout the different seasons. It also provides a public 'backyard' for all Ontarians – one that enhances the natural setting – and one that provides year-round and barrier-free access to outdoor public space.

After three years of construction, Queens Quay West opened to the public in June 2015, on schedule and in time for both the Pan Am Games and the Redpath Waterfront Festival.



Quay to the City Pilot Project ©Waterfront Toronto/West 8 + DTAH





before

©Waterfront Toronto/West 8 + DTAH



after

©West 8 + DTAH





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