

# WATERFRONT EAST LRT

## PRELIMINARY DESIGN BUSINESS CASE

MAY 2023

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# Business Case Summary

## Scope:

The Waterfront East Light Rail Transit (WELRT) Preliminary Design Business Case summarizes the strategic, economic, financial, and deliverability evaluation for the WELRT, focused on the costs and benefits of the project. This project supports the continued revitalization of the waterfront and the development of areas including the East Bayfront, Keating Channel, Villiers Island, Lower Don Lands, and West Don Lands precincts, as well as improved benefits to the Central Waterfront that is currently served by LRT.

## Options:

The business case evaluates two alternative options to be delivered as WELRT by 2032:

- ***Union to Villiers Loop (option 1)***: includes reconstruction of Union Station streetcar loop, and new surface transit infrastructure along Queens Quay East, Cherry Street, and Commissioners Street to a loop on Commissioners Street near New Muniton Street. The surface transit project includes construction of the light rail transitway, road, pedestrian, cycling, and the improved public realm environment.
- ***Union and Distillery to Villiers Loop (option 2)***: includes reconstruction of Union Station streetcar loop, and new surface transit infrastructure along Queens Quay East, Cherry Street, and Commissioners Street to a loop on Commissioners Street near New Muniton Street. The surface transit project includes construction of the light rail transitway, road, pedestrian, cycling, and improved public realm environment. This option also includes a light rail connection on Cherry Street between Queens Quay and the Distillery Loop with a new Cherry Street portal under the Union Station Rail Corridor, enabling the extension of streetcar route 504A to the loop on Commissioners Street near New Muniton Street.

Both options are measured against a 2032 Base Case that assumes a frequent bus service operating between Union Station and East Harbour via Queens Quay and Commissioners operating in mixed traffic.

Each of these options were assessed through the City of Toronto's Rapid Transit Evaluation Framework.

### Key Findings:

The Waterfront East LRT (WELRT) has long been established and officially approved as an essential component of Toronto's eastern waterfront. This project will facilitate a transformation of existing and future development areas into a destination that welcomes all, connecting residents, workers and visitors to countless landmark places throughout Toronto's waterfront. The project will expand and enhance access and safety for all road users, including pedestrians, cyclists, transit riders, and motorists.

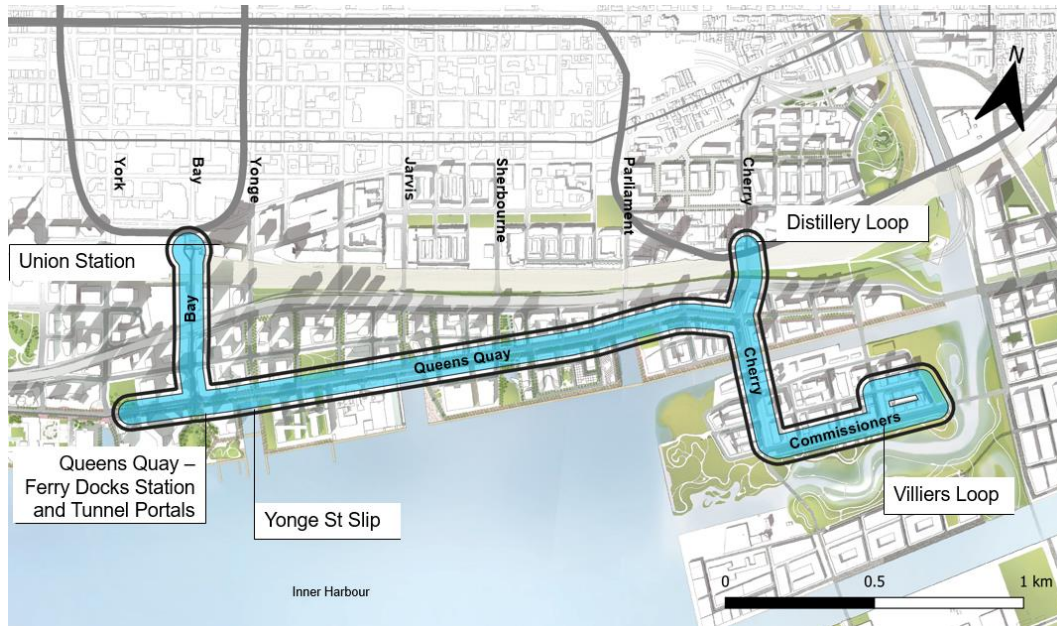
Toronto's aspiration for a truly great waterfront begins with the transformation of Queens Quay. By transforming Queens Quay East into an improved multi-modal corridor and public realm space, this project will fulfil and balance the needs of residents, businesses, recreational users and visitors.

As ambitious plans to build dense housing and commercial spaces in the eastern waterfront advance, the transportation network must be built to support this new development. If the Waterfront East LRT project is not constructed to provide critical transportation infrastructure to the area, this will place ever increasing pressure on transit operating in mixed traffic. To bring these incredible places within reach of Toronto's residents, workers and visitors in an efficient and equitable manner, it is critical that they be connected with convenient, high-capacity transit service and served by a contiguous and inviting public realm. Per direction from City Council, further density increases are contemplated for the Port Lands and other developments on City-owned land, and these potential changes are not reflected in this business case as the work is still ongoing. These changes are expected to further strengthen the case for higher-order transit in this area.

The project will have an immense benefit to the local, provincial, and federal economies, as estimated through separate work undertaken by Waterfront Toronto using the Statistics Canada Input-Output multipliers. Although this broader economic impact analysis work is not part of the economic analysis under the business case framework, the unique context of the eastern waterfront provides an unusual opportunity for investment, which is reflected in this work. Preliminary estimates have found that investment in the project will generate nearly \$2.5 billion of value added to the economy, will create more than 20,000 full-time, full-year jobs by direct, indirect and induced expenditures, and will generate almost \$800 million in government revenues.

This document evaluates the strategic, economic, financial and deliverability cases for the Waterfront East LRT. The project is identified as a critically important investment through evaluation under the City of Toronto's Rapid Transit Evaluation Framework, and the economic case performs well, particularly in consideration of some of the broader project benefits resulting from its unique context of providing transit service to vacant public lands planned for future development. In consideration of the relatively ambitious assumptions for the base operating case, it is safe to assume that the project benefit cost ratio conservatively underestimates the full benefits that the Waterfront East LRT will deliver.

**Figure 1: Preferred Network of the Waterfront East LRT**



### *Strategic Case*

**The Waterfront East LRT aligns with the priorities and objectives outlined in the City of Toronto’s Rapid Transit Evaluation Framework. This project:**

- **Serves people** by reducing overall travel time and provides **higher-order transit connectivity to the eastern waterfront**, thereby increasing access for residents, workers, and visitors. The use of a dedicated lane and direct connection to the underground Union Station gives priority over vehicular traffic, improving reliability and saving time for users;
- **Strengthens places** by using higher-order transit to **catalyze the revitalization of the eastern waterfront** and by **encouraging the reduction of vehicle travel** (improving safety and reducing carbon emissions); and
- **Supports prosperity** by providing transit access to an area of planned job growth and economic development activity.

The Strategic Case identified an alignment from Union Station and the Distillery Loop to Villiers Island as the preferred WELRT network alignment, as it **provides the greatest strategic value** of the options. This network:

- improves access to residents and jobs within 45 minutes;
- reduces travel time by transit and by car;
- encourages the reduction of vehicle travel;
- provides greater access to natural areas, and
- Includes an additional connection to the Distillery Loop, which increases the resilience and connectivity of the streetcar network in the eastern waterfront.

WELRT unlocks potential development across the Port Lands precinct, which is undergoing flood protection through to 2024. The Precinct Planning work in the area is predicated on the provision of higher-order transit to support high residential and commercial densities. **Dedicated transit to the Port Lands in coordination with significant development buildout would help expedite the revitalization of the eastern waterfront into a complete community, and future extensions of the network would realize even greater benefits at marginal cost.**

### Economic Case

Through the Economic Case, the benefits and costs of the project were assessed and compared. The benefit-cost ratio (BCR) for WELRT ranges between 0.19 and 0.74 depending on benefits incorporated which include conventional benefits, context-sensitivity & wider benefits. The project is also expected to create between 800 and 940 direct annual construction jobs.

The conventional benefit-cost ratio (BCR) for WELRT ranges between 0.19 and 0.29 based on the combination of user impacts, incremental fares, and external benefits typically attributed to the improvement of the transit network. However, it is important to note that these benefits are calculated in comparison to an ambitious base case which may exceed the baseline service improvements that are typically assumed for transit business cases in Toronto. These benefits reflect the project's incremental benefits over the best-case operating scenario with mixed traffic bus operations, rather than a business-as-usual approach which would preserve the current surface transit network with limited additions. The project team felt that this approach was necessary given the project context, as significant service improvements must be contemplated as the eastern waterfront undergoes dense planned residential and commercial development in the coming years.

Further to the above point, it is important to consider the unique nature of this project site, which includes a significant area of currently vacant publicly-owned lands that are planned for dense future development. As a result, there are significant context-specific benefits that reflect how the project will support new communities to be built primarily on publicly-owned lands within eastern waterfront (e.g., East Bayfront, Keating Channel, Villiers Island, Lower Don Lands, and West Don Lands). Key benefits include the incremental revenue from the sale of public lands attributed to the higher land values in proximity to transit. With WELRT, it is anticipated that the sale of public lands could yield an additional \$265 – 312 million (in 2023 prices) following the implementation of WELRT, plus additional benefits associated with tourism. Including the context-sensitive benefits improves the benefit-cost ratio to a range between 0.48 and 0.52.

The WELRT performs better when the area is able to achieve higher reductions in auto travel in the area, and when the project accounts for reduction in user parking costs. A sensitivity analysis was conducted to assess a scenario where a 25% auto mode share is achieved on Villiers Island, as envisioned through the Climate Positive Framework of the Villiers Island Precinct Plan<sup>1</sup>. In this case, the BCR range is estimated to expand to 0.71 – 0.74.

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<sup>1</sup> Source: [https://portlandsto.ca/wp-content/uploads/2017.10.04\\_Villiers+Island+Precinct+Plan+AODA+Attachment+2.pdf](https://portlandsto.ca/wp-content/uploads/2017.10.04_Villiers+Island+Precinct+Plan+AODA+Attachment+2.pdf)



The WELRT is an investment in new transit infrastructure and improvement to the existing transit network. The existing western waterfront routes 509 and 510 also benefit from the expanded Union Station streetcar loop and reconstruction of the west portal. The Economic Case considers within the benefit-cost ratio (BCR) of the project both the benefits and costs of Waterfront East LRT as a standalone line, and the broader benefit to service on the western waterfront.

### *Financial Case*

As is expected for public infrastructure and transportation projects, the financial case finds that project capital and operating costs exceed expected incremental revenues over a 60-year period. However, the many benefits of the project as described qualitatively and partially quantified through this document support the case that the WELRT is a sound investment which provides innumerable benefits to Toronto's residents, workers, and visitors as the future backbone of Toronto's eastern waterfront. The financial case anticipates that the total project cost less revenue (NPV) will be between \$1.41 billion and \$1.76 billion (in 2023 prices), totaling over a 60-year horizon.

In addition to the above costs, the project is expected to support higher property tax and land transfer tax revenue resulting from the land value uplift for properties located in the line catchment area, which is subject to substantial residential and commercial development in the coming decades.

### *Deliverability and Operations Case*

The Deliverability and Operations Case provides an assessment of the approach and strategy to deliver the WELRT project. It highlights the key components of the project, the critical issues that impact delivery, and the risks of the project that should be considered during procurement, construction, and future operations. This section also includes assessment of the operations and maintenance implications of the project.

### **Conclusion:**

This report presents Union and Distillery to Villiers Loop (Option 2) as the preferred WELRT network compared to Union to Villiers Loop (Option 1). The network (Option 1 and 2) will address transit needs for Toronto's waterfront by providing sustainable, reliable, higher-order transit service along Queens Quay, Cherry Street and Commissioners Street. The network will also expand the capacity of critical streetcar infrastructure at Union Station, which will provide benefits for existing streetcar service along Queens Quay West in addition to the WELRT.

WELRT implementation will support a range of broader goals as well. The WELRT extends the Central Waterfront Master Plan's goal of developing the waterfront into a vibrant and inviting destination eastward while supporting the city's objective to strengthen and support the prosperity of the eastern waterfront. It will support the redevelopment of the waterfront and will be a key enabler of residential densification and, in particular the development of affordable housing. The WELRT also serves a catalyst for economic development on the Waterfront East area and supports increased land values.

# 1. Introduction

## 1.1 Project Context

The City of Toronto, TTC and Waterfront Toronto are working together to advance the Waterfront East Transit Network Plan. Ultimately, this network will provide connections between Union Station, the planned East Harbour Station, the Polson Loop, and Leslie Barns via Queens Quay East, Cherry Street, Commissioners Street, and Broadview Avenue.

The current scope of the Waterfront East LRT (WELRT) project is considered for delivery by 2032. The current scope of the WELRT includes upgrades to the Union Station loop, Queens Quay Station entrance improvements, portal construction, and new surface rail transit along Queens Quay East (between the east portal and the realigned Cherry Street), Cherry Street (between the existing Distillery Loop and Commissioners Street), and Commissioners Street (between Cherry Street and the Villiers Loop).

At the direction of City Council, the City of Toronto, Waterfront Toronto, and the TTC are advancing the design and environmental assessment for the current scope of the Waterfront East LRT project. Environmental approvals for project areas where existing approvals have lapsed are being advanced through the Transit Project Assessment Process (TPAP).

This Preliminary Design Business Case (PDBC) provides a consolidation of the benefits and costs for the Waterfront East LRT and identifies the recommended portion of the Waterfront East LRT to be delivered in the current scope of the project. This document provides the evidence and data to support City Council in its funding decision on the recommended scope for the Waterfront East network.

## 1.2 Business Case Objectives

A Business Case explains the rationale of a project through a comprehensive analysis of its costs and benefits. Business Cases provide transparent evaluations of infrastructure, policy, and program investments in support of evidence-based decision-making. The core objectives of a Business Case include defining an investment; identifying its alignment with business and public policy initiatives; determining its economic, environmental, and social value; calculating its financial impacts; and assessing its feasibility.

Business Cases typically include four components:

- **Strategic Case:** considers how an investment aligns with strategic goals and objectives.
- **Economic Case:** determines what benefits an investment will generate.
- **Financial Case:** establishes the cost of an investment, focusing on capital, operating, and revenue impacts, which fall within the City standards and policies.
- **Deliverability and Operations Case:** identifies the risks and requirements of delivering and operating an investment.

Each project or investment is usually supported by a series of increasingly detailed business cases:

- **Initial Business Case:** compares investment scenarios and identifies a recommended alternative for further design
- **Preliminary Design Business Case:** refines and optimizes the recommended alternative from the Initial Business Case and is used to secure funding
- **Full Business Case:** confirms the recommended alternative for procurement
- **Post In-Service Business Case:** assesses the actual costs and benefits of an investment after implementation

### 1.3 Business Case Structure

The WELRT PDBC includes six components:

- **Case for Change** (Section 2) Defines the Project Need and Opportunity Statements for the WELRT in the context of the policy and objectives outlined in the Waterfront Transit Reset Study and directions from City Council.
- **Investment Scenarios** (Section 3): Identifies the baseline and preferred scenarios under comparison within the PDBC.
- **Strategic Case** (Section 4): Assesses the project using the City of Toronto's Rapid Transit Evaluation Framework, which includes seven strategic criteria that align with the policy goals and objectives of the City.
- **Economic Case** (Section 5): Includes a cost-benefit assessment focused on the transport, environmental, social, and wider economic benefits of the WELRT project. A further discussion is included on other benefits not monetized in the cost-benefit assessment, including rehabilitation of existing Union Station streetcar loop, enhanced public realm, improved access to new tourist destinations, and extension of active travel facilities.
- **Financial Case** (Section 6): Presents a capital plan based on Class 3 cost estimates developed as part of the 30% design, in conjunction with preliminary implementation concepts for the construction of WELRT.
- **Deliverability and Operations Case** (Section 7): Describes the constructability and implementation plan and summarizes the preferred procurement approach and operating model for the project.

## 2. The Case for Change

The WELRT is a network of proposed rapid transit lines that will run along Queens Quay East, Cherry Street, Commissioners Street, and Broadview Avenue between Union Station, the planned East Harbour Station, the Polson Loop, and Leslie Barns. The network addresses transit priorities for Toronto's waterfront by providing sustainable transportation modes and supports ongoing and future redevelopment of the waterfront.

The WELRT is one component of the overarching vision for Toronto's central waterfront and is a critical part of the Waterfront Transit Network Vision identified through the City of Toronto's Waterfront Transit Reset study. The WELRT extends the vision of the Central Waterfront Master Plan eastwards to transform the waterfront into a vibrant and attractive destination. The Central Waterfront Master Plan includes three major components:

- A continuous water's edge promenade;
- The transformation of Queens Quay into an iconic boulevard; and
- In-water elements such as finger piers and aquatic habitat.

Central to this vision is a new waterfront boulevard with two lanes of east-west traffic on the north side of the street, dedicated LRT guideways on the south side of the street, and a wide pedestrian promenade adjacent to the enhanced Martin Goodman Trail.

### 2.1 Key Decision History

This section summarizes the previous decisions and directions provided for the WELRT.

- The **2010 East Bayfront Transit Class Environmental Assessment** approved an LRT line from Union Station along Queens Quay East to an interim loop at Parliament Street.
- The **2014 Lower Don Lands Environmental Assessment Master Plan Addendum** approved an extension of the LRT line to Cherry Street and into the Port Lands.
- In **November 2015**, City Council directed City staff in consultation with the TTC and Waterfront Toronto to undertake a comprehensive review of waterfront transit initiatives and options (Waterfront Transit Reset).
- In **July 2016**, City Council directed City staff to initiate the second phase of the Waterfront Transit Reset to further develop and cost alignment concepts, priority segments, business case, and implementation strategy for a coordinated waterfront transit solution.
- In **January 2018**, City Council endorsed the overall Waterfront Transit Network Plan, and directed staff to complete a focused feasibility study of light rail and automated funicular technology options for the below grade section between Union Station and Queens Quay.

- In **April 2019**, City Council approved the streetcar option as the preferred technology for the Union Station to Queens Quay Link, and directed staff to undertake the preliminary design and engineering phase of the extension of streetcar service.
- In **February 2020**, as part of the TTC’s 2020-2029 Capital Budget, City Council approved the advancement of the Preliminary Design and Engineering for the Segment 1 of the WELRT project including expansion of Union Station and Queens Quay Station, improvements to the Queens Quay West portal, and a new portal at Queens Quay East.
- In **December 2020**, City Council directed staff to report back on the recommended schedule and funding requirements for the Union Station to Queens Quay Link and the WELRT, including phasing options and an updated business case as part of an update on Waterfront Transit Network priorities prior to the 2022 Budget process.
- In **May 2022**, City Council directed the Transit Expansion division to undertake a constructability review of the Waterfront East LRT in consultation with other City departments, the TTC, and Waterfront Toronto. City Council also directed staff to report back in Q2 2023 with the recommended alignment and scope of the project; an updated cost estimate; and a funding, financing, and implementation strategy, including a phasing plan.

## **2.2 Opportunity Statement and Key Benefits**

Investment in the Waterfront East LRT is central to the success of the overall Waterfront Transit Network and the sustainable development of Toronto’s eastern waterfront. The Waterfront East LRT project is an opportunity to realize the following benefits:

### **WELRT expands the capacity of critical streetcar infrastructure at Union Station**

The Union Station – Queens Quay Link is a fundamental connection within the overall Waterfront Transit Network, serving both existing Waterfront West streetcars and the planned Waterfront East LRT. The existing streetcar loop at Union Station currently has limited capacity for waiting passengers and for streetcars—there is space for a maximum of two streetcars along one long platform with no room for lay-bys or streetcar passing. Expansion of the Union Station streetcar loop to a four-platform station with double tracks to permit maneuvering around vehicles loading at platforms improves the customer experience by increasing capacity and operational flexibility, which benefits users across the entire Waterfront Transit Network. A four-platform solution provides sufficient capacity to support the projected demand of the Waterfront Transit Network and provides futureproofing for capacity throughout the life of the project.

### **WELRT transforms Queens Quay East into an attractive boulevard with sustainable transport options for residents and visitors to the Waterfront**

With the WELRT investment, Queens Quay East becomes a complete street with a transitway, a wide pedestrian promenade, and an improved Martin Goodman Trail. The

street becomes a place that attracts active travel and sustainable mobility for all users of the Waterfront.

### **WELRT provides a reliable higher-order transit option to East Bayfront and the Port Lands**

To date, transit along Queens Quay East, Cherry Street, and Commissioners Street is provided by buses operating in mixed traffic. The construction of the WELRT transitway enables both buses and streetcars to operate in their own right-of-way, improving reliability of transit to the eastern waterfront.

### **WELRT supports a Transit-First approach to the revitalization of Villiers Island in the Port Lands, unlocking significant public land value capture**

The Villiers Island Precinct Plan has identified a vision for a new eastern waterfront that is sustainable and inclusive, and unlocks new economic development within the City. The Villiers Island Precinct Plan is predicated on the provision of higher-order transit to support higher densities. Early implementation of the WELRT would enable between \$265 million to \$315 million in incremental land value to be captured through the sale of the public lands in the Port Lands for development. Additional land value could be captured resulting from the sale of public lands in proximity to future planned phases of the WELRT network.

### **The Waterfront East area is planned to support an estimated 50,000 jobs and 100,000 residents<sup>2</sup> with a significant number of affordable housing units**

WELRT will improve connectivity to both residents and jobs across the eastern waterfront. The WELRT connection into Union Station (and its future connection to East Harbour) provides a critical link for commuters accessing current and future jobs across downtown Toronto. The neighbourhoods served by WELRT are planned as diverse, mixed-use, and inclusive communities that include affordable housing.

### **WELRT will provide access to 34 acres of parkland in the Port Lands**

The WELRT will provide access to approximately 34 acres of parkland in the East Bayfront, Keating Channel, Lower Don Lands, and West Don Lands precincts. Planned WELRT stops at Cherry Street / Commissioners Street and the Villiers Loop provide direct access to new parks within the Port Lands.

### **WELRT will provide higher-order transit service for large-scale events of national significance in the Villiers Island**

Villiers Island will be a special world-class cultural destination that will act as a catalyst, attracting people and interests from across the city and beyond. WELRT, an efficient and

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<sup>2</sup> Source : Waterfront Toronto

reliable mode of transport, will provide direct access to these cultural events, optimizing the use of the system during off-peak hours.

The overall benefits of the project are assessed through the following sections of the Preliminary Design Business Case.

## 3. Investment Scenarios

### 3.1 Base Case

This PDBC evaluates the benefits and costs of WELRT investment options against a 'Base Case' scenario. In the Base Case scenario, the project area is served by TTC buses between Union Station and East Harbour Station. The service would operate in mixed traffic using Bay Street, Queens Quay East, Cherry Street, Commissioners Street, and Broadview Avenue. Representative headway assumptions for the service are three minutes in AM and PM peak periods, and up to 10 minutes in off-peak periods.

As this PDBC is focused on assessing the performance of the WELRT project, the western section of the Waterfront Transit Network through to Long Branch is assumed to be included within the Base Case scenario. The Base Case scenario also includes investments within the broader transit network that are expected for completion by the 2031 horizon, including:

- **Ontario Line**, which is in proximity to the Waterfront Transit Network at Exhibition, Corktown, and East Harbour; and
- **GO Expansion**, which would connect to the Waterfront Transit Network at Exhibition, Union Station (in the current project scope) and East Harbour (ultimate build-out of WELRT).

The base transportation network also includes adjustments to local bus routes in the vicinity of the Waterfront East LRT which are planned to connect with the Waterfront Transit Network and the Ontario Line.

### 3.2 Investment Scenarios

This PDBC assesses the performance of the WELRT project under different phasing scenarios in order to identify the preferred network. Two options are assessed in this business case. The options include:

- ***Union to Villiers Loop (option 1)***: includes upgrades to the existing underground streetcar tunnel between Union Station and Queens Quay, and a new surface transit boulevard on Queens Quay East, Cherry Street, and Commissioners Street to a loop on Commissioners Street near New Munition Street. The surface transit project includes construction of the light rail transitway, road, and improved public realm.
- ***Union and Distillery to Villiers Loop (option 2)***: includes upgrades to the existing underground streetcar tunnel between Union Station and Queens Quay, and a new surface transit boulevard along Queens Quay East, Cherry Street, and Commissioners Street to a loop on Commissioners Street near New Munition Street. The surface



transit project includes construction of the light rail transitway, road, and improved public realm. This option also includes a light rail connection on Cherry Street between Queens Quay and the Distillery Loop with a new Cherry Street portal under the Union Station Rail Corridor, enabling the extension of the existing King streetcar route 504A to the loop on Commissioners Street near New Munition Street.

Table 1 displays maps of the different options under consideration for WELRT. In both Options 1 and 2, an incremental bus service between Villiers Loop and East Harbour is assumed in the PDBC in addition to the baseline TTC bus network.

**Table 1: WELRT Options**

Alternative	Map
Option 1 – Union to Villiers Loop	
Option 2 – Union and Distillery to Villiers Loop	



### 3.3 Travel Demand Modelling Assumptions

Ridership and economic benefit results for the Waterfront East LRT Preliminary Design Business Case are derived from the City of Toronto’s travel demand model (GTAModel V4), which was used to test the change in travel demand and behaviour with the planned infrastructure. The following key assumptions are included within the travel demand model:

- **Future Land Use:** GTAModel land use for 2031, with adjustments to the traffic analysis zones representing the Port Lands to align with planned residential and employment by Waterfront Toronto;
- **Ontario Line:** The Ontario Line is included in the network (based on its Initial Business Case);
- **Waterfront West:** The Waterfront West LRT service is assumed to operate between Union Station and Long Branch via Exhibition, in line with the broader Waterfront Transit Reset plan.
- **Supporting Waterfront Bus Network:** Changes to local bus services are based on a proposed network to support the Waterfront East LRT and the Ontario Line. Key changes include aligning the Bay, Parliament and Pape bus routes to feed the WELRT and a new route between Corktown Station and Cherry Beach;
- **Waterfront East:** The current scope of work of WELRT is assumed to be operational starting in 2032. Future phases of the Waterfront East LRT have not been assessed in this analysis. The key travel demand model assumptions for each option are summarized below.

**Table 2: Waterfront East LRT Options and Service Assumptions**

Option	WELRT Service Assumptions <sup>3</sup>
Base Case	<ul style="list-style-type: none"> <li>• <b>Bus:</b> Union to East Harbour (3 min peak, 10 min off-peak)</li> </ul>
Option 1: Union to Villiers Loop	<ul style="list-style-type: none"> <li>• <b>WELRT:</b> Union to Villiers Island (6 min AM, 4.5 min PM, 10 min off-peak)</li> <li>• <b>Bus:</b> Villiers Island to East Harbour (6 min AM, 4.5 min PM, 10 min off-peak)</li> </ul>
Option 2: Union and Distillery to Villiers Loop	<ul style="list-style-type: none"> <li>• <b>WELRT:</b> Union to Villiers Island (6 min AM, 4.5 min PM, 10 min off-peak)</li> <li>• <b>Bus:</b> Villiers Island to East Harbour (6 min AM, 4.5 min PM, 10 min off-peak)</li> <li>• <b>Cherry Streetcar:</b> Extend from Distillery to Villiers Island (based on existing headways)</li> </ul>

<sup>3</sup> The modelling of WELRT assumed that the Villiers Island terminus is at Polson Loop. Since the completion of the modelling, the project has refined the location of this terminus to Villiers Loop. It is not anticipated that the location of the terminus will have a significant impact on the results.

## 4. Strategic Case

The Waterfront East Light Rail Transit (WELRT) project will provide essential support to ongoing and future development through the provision of sustainable transportation modes, increased right-of-way transportation capacity, high-quality open spaces adjacent to Lake Ontario, and new connections with the rest of the city.

While the introduction of the Ontario Line is expected to absorb a portion of the demand originally estimated for the WELRT, future developments in Lower Yonge, East Bayfront, and the Lower Don Lands still require streetcar service to meet demand. Moreover, the 2020 Transit Phasing Study concluded that the streetcar service proposed by the WELRT project increases the resiliency and capacity of the broader transit network, providing more choices to connect the Port Lands and downtown Toronto.

The WELRT project is aligned with current plans and policies at the municipal level, advancing key objectives for Toronto. It will support efforts to:

- remove barriers and connect new development sites along Lake Ontario with the City;
- create dynamic mixed-use communities that attract new business and provide affordable housing; and
- promote a clean and green environment by developing sustainable transportation infrastructure that promotes transit, cycling and walking.

The WELRT is a priority transit project for the City of Toronto. The 2019 Toronto Official Plan establishes strategic elements to accommodate sustainable growth in jobs and housing while protecting natural and historical features, as well as building resiliency to climate change. The Central Waterfront Secondary Plan identifies the Waterfront Rapid Light Rail Line as a key component of the plan offering an excellent connection into the city and to support housing and employment densification. The WELRT project aligns with this policy, increasing connectivity to the Lower Yonge, East Bayfront, Keating Channel and Lower Don Lands areas.

The Strategic Case evaluates the performance of the two options of WELRT project scopes against the City of Toronto's Rapid Transit evaluation framework, summarized in Table 3.

**Table 3: The City of Toronto's Rapid Transit Evaluation Framework**

Principles	Criteria		
<b>Serve people</b>	<b>Experience:</b> to ease overcrowding / congestion; reduce travel times; make travel more reliable, safe and enjoyable.	<b>Choice:</b> develop an integrated network that connects different modes to provide more travel options	<b>Social Equity:</b> allow everyone good access to work, school and other activities
<b>Strengthen Places</b>	<b>Shaping the city:</b> use the transportation network as a tool to shape the residential development of the city	<b>Healthy Neighbourhoods:</b> Changes in the transportation network should strengthen and enhance existing neighbourhoods; promote safe walking and cycling within and between neighbourhoods.	<b>Public Health and Environment:</b> support and enhance natural areas; encourage people to reduce how far they drive.
<b>Support Prosperity</b>	<b>Supports Growth:</b> investment in public transportation should support economic development; allow workers to get to jobs more easily; allow goods to get to markets.	<b>Affordability:</b> improvements to the transportation system should be affordable to build, maintain and operate.	

The WELRT project is also aligned with the five Critical Paths introduced as part of TTC's 2018-2022 Corporate Plan, which lay out avenues through which the TTC can serve Toronto going forward. The five paths include:

1. **Transform for financial sustainability** as measured by the alignment of funding with cash flow priorities;
2. **Enable our employees to succeed** as measured by employee engagement;
3. **Move more customers more reliably** as measured by ridership and the reliability of transit service;
4. **Make taking public transit seamless** as measured by customer satisfaction; and
5. **Innovate for the long-term.**

The Strategic Case details how the WELRT project represents a crucial step forward in achieving the key objectives set out by both the City of Toronto and the TTC with efficient, accessible, and sustainable transportation to one of the city's most rapidly developing areas.

## 4.1 Serve People

Compared to a Base Case situation where buses operate in mixed traffic, light rail transit (LRT) improves passenger experience with sustainable higher-order transit in its own dedicated lane, thereby reducing travel times and improving reliability. The WELRT will provide a more integrated intermodal transit network that efficiently links different modes together. The WELRT also advances social equity goals by enabling better access to work, school, services, and other activities, particularly in light of high affordable housing targets for future waterfront development.

### 4.1.1 Experience

A frequent and well-connected transit service that improves travel times and enables people to access key destinations more easily provides a better experience for riders. The impact of the different WELRT options on the *experience* criteria is assessed through the following indicators:

- **Ridership:** quantitative assessment based on the GTAModel to assess how transit ridership varies depending on options. An option will have darker shade of green relative to other options as the transit ridership of the option increases relative to others.
- **Road congestion:** quantitative assessment based on the GTAModel to assess how auto travel time varies depending on options. An option will have darker shade of green relative to other options as the auto travel time savings of the option increases relative to others.
- **Total travel time:** quantitative assessment based on the GTAModel to assess how total travel time (transit and auto) varies depending on options. An option will have darker shade of green relative to other options as the total travel time savings of the option increases relative to others.
- **Reliability:** qualitative assessment based on the amount of Waterfront area served by LRT, which is a more reliable service as it runs on dedicated right-of-way. An option will have darker shade of green relative to other options if a greater area along the Waterfront is served by LRT.

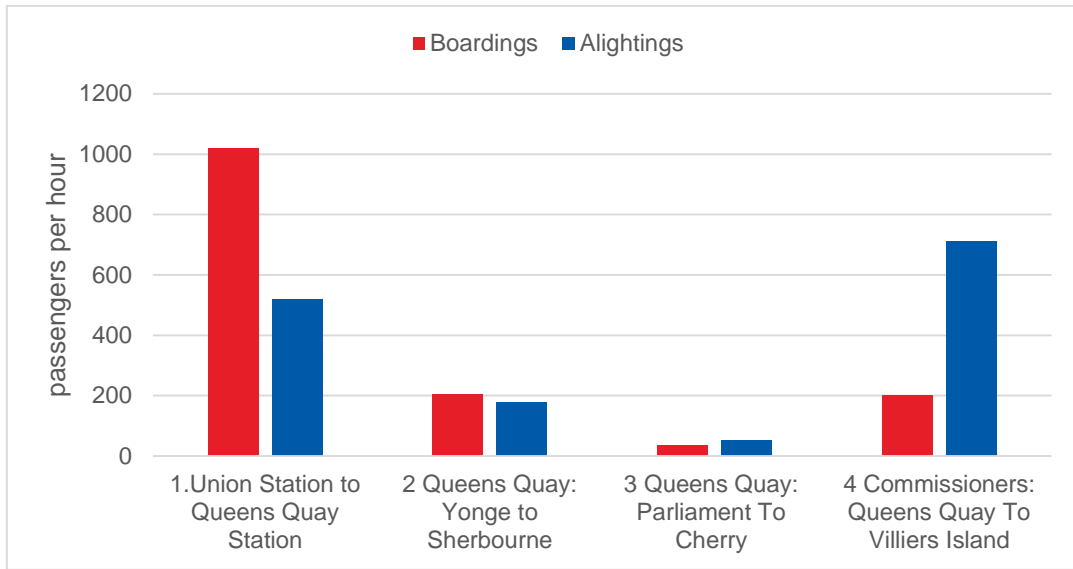
**Table 4: Strategic assessment of the WELRT options - Experience criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Ridership</b> (more information on ridership below)	Total boardings on WELRT line only is 3,000 during the AM peak period, and 4,800 in the PM peak period.	Total boardings on WELRT line only is 2,100 during the AM peak period, and 4,600 in the PM peak period.  It is anticipated that 950 riders in the AM Peak and 300 riders in the PM peak would travel on Cherry Street using the King streetcar instead of WELRT.
<b>Road congestion</b>	Auto time saving of 70 hours daily in 2032.	Auto time saving of 260 hours daily in 2032.
<b>Total travel time</b>	560 hours of daily time savings (transit and auto) in 2032.	1,100 hours of daily time savings (transit and auto) in 2032.
<b>Reliability</b>	Improves service reliability within the Lower Yonge, East Bayfront, Keating Channel, and Lower Don Lands precincts.	Improves service reliability within the Lower Yonge, East Bayfront, Keating Channel, Lower Don Lands and West Don Lands precincts, as well as the Distillery District.

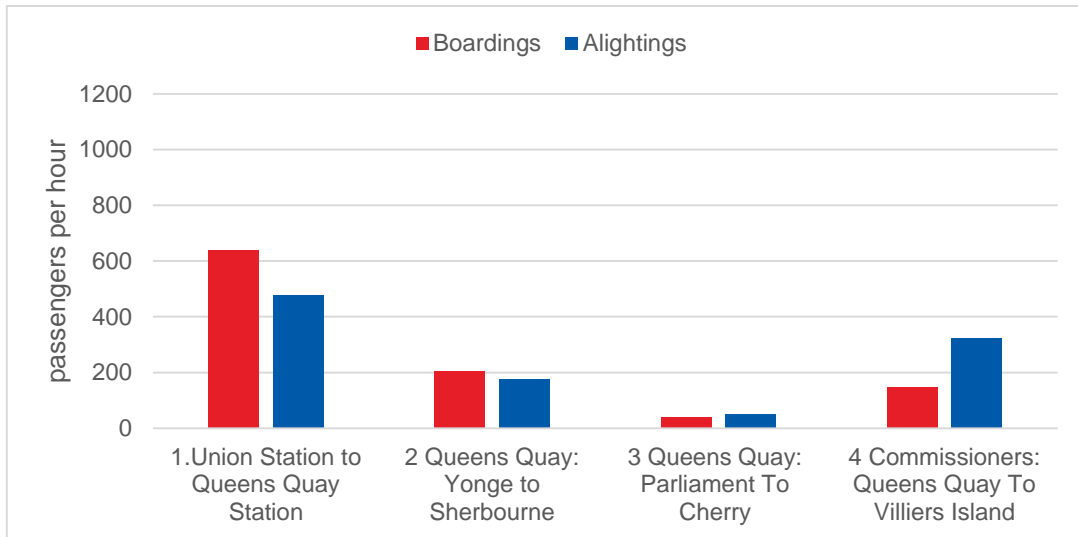
The Waterfront East LRT is expected to support a growth in transit ridership along the Waterfront. Figures 2 and 3 illustrate the 2031 AM peak hour boarding and alighting in 2031 for Options 1 and 2, and indicate the sections where people get on and off the WELRT. In the morning, the peak direction is from Union Station towards Villiers Island, as there are relatively higher boardings near Union Station and relatively higher alightings near Villiers Island. The opposite is true in the afternoon.

It is important to note that the figures below present data for the WELRT only, and exclude boarding and alightings on the 504A on Cherry Street. With the introduction of the connection to Distillery in Option 2, the modelling results suggest a lower ridership on the Waterfront East service given greater resilience within the Waterfront transit network. Transit users have alternate routes to access the Port Lands (via the King Streetcar or the Waterfront East service). In Option 2, it is anticipated that some riders (950 riders in the AM peak, and 300 riders in the PM peak) may access the Waterfront via the Cherry/King Streetcar. This lowers peak ridership on the WELRT but provides further capacity and resilience to the Waterfront Transit Network.

**Figure 2: WELRT Option 1 2031 AM Peak Hour Ridership (both directions combined)**



**Figure 3: WELRT Option 2 AM Peak Hour Ridership (both directions combined)**



\*Note: Figures represent boarding and alightings on WELRT only, and excludes riders on 504A on Cherry Street in Option 2. It is anticipated that some riders may access the Waterfront via the Cherry/King Streetcar. This lowers peak ridership on the WELRT but provides further capacity and resilience to the Waterfront Transit Network.

#### 4.1.2 Choice

Better connectivity and more integrated systems offer people greater access to destinations and encourage people to choose sustainable travelling modes. The impact of the different WELRT options on the *choice* criteria is assessed by the following connectivity indicators:

- **Local connectivity:** qualitative assessment based on the Waterfront area served by new transit. An option will have darker shade of green relative to other options if it enables transit to serve a greater area along the Waterfront.
- **Regional connectivity:** qualitative assessment based on the number of regional transit connections. An option will have darker shade of green relative to other options if it connects to other transit lines and routes of higher-order transit.

**Table 5: Strategic assessment of the WELRT options - Choice criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Local connectivity</b>	Improved local connectivity as it provides access to: <ul style="list-style-type: none"> <li>- Lower Yonge;</li> <li>- East Bayfront;</li> <li>- Keating Channel;</li> <li>- Lower Don Lands</li> </ul>	Significantly improved local connectivity as it provides access to: <ul style="list-style-type: none"> <li>- Lower Yonge;</li> <li>- East Bayfront;</li> <li>- Keating Channel;</li> <li>- Lower Don Lands;</li> <li>- West Don Lands</li> <li>- Distillery District</li> </ul>
<b>Regional Connectivity</b>	Improved regional connection at Union Station.	Improved regional connectivity. Connection at Union Station and connection with the 504A streetcar. Direct connection with Ontario Line at Corktown Station (King / Berkeley)

#### 4.1.3 Social Equity

A service that improves accessibility for those who live, work and visit the Waterfront East areas and that improves the overall accessibility to jobs in the region and Toronto’s dense employment centre promotes social equity. In addition, an LRT service that serves people living in affordable housing improves social equity. The impact of the different WELRT options on *social equity* criteria is assessed through following indicators:

- **Change in residents served:** qualitative assessment based on the transit accessibility of residents. An option will have darker shade of green relative to other options if it has greater accessibility.
- **Change in jobs served:** qualitative assessment based on the accessibility of jobs. An option will have darker shade of green relative to other options if it has a greater accessibility.

- **Accessibility:** qualitative assessment based on the accessibility of different options compared to the bus network within Waterfront East area. An option will have darker shade of green relative to other options if the improvements in accessibility are greater than other options. See ‘Access to Transit’ maps for the relative change in transit accessibility from the WELRT.
- **Access to affordable housing:** qualitative assessment based on the number of units served by new transit. An option will have darker shade of green relative to other options if it enables transit to serve a greater amount of affordable housing.

**Table 6: Strategic assessment of WELRT options - Social equity criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Change in residents served</b>	Provision of WELRT service improves transit access for residents along the eastern waterfront, increasing the number of residents that have access to transit.	Provision of both WELRT and 504A streetcar extension services improves transit access for residents along the eastern waterfront and the Distillery District, increasing the number of residents that have access to transit.
<b>Change in jobs served</b>	WELRT service increases transit connectivity to jobs located in the Port Lands and within the central downtown near Union Station.	WELRT and 504A streetcar extension services increases transit connectivity to jobs located in the Port Lands and within the central downtown near Union Station, and along King Street.
<b>Accessibility</b>	This option provides higher improvements in transit service density (Transit Score) to the western Port Lands, and brings local improvements to the Villiers Island.	This option provides still higher improvements in transit score to the western Port Lands due to the 504A streetcar extension, along with similar improvements to East Bayfront.
<b>Access to affordable housing</b>	Access to a higher-order transit service would be provided for a significant number of affordable housing units as the Port Lands are developed. The affordable housing strategy is a priority for the City of Toronto as outlined in the City of Toronto's February 10, 2023 Villiers Island – Affordable Housing Update ( <a href="https://www.toronto.ca/legdocs/mmis/2023/ph/bgrd/backgroundfile-234511.pdf">https://www.toronto.ca/legdocs/mmis/2023/ph/bgrd/backgroundfile-234511.pdf</a> ). It recommends providing a minimum of 20% and targeting 30% affordable rental housing on public lands, secured as long-term or permanent affordable housing and aligned with the City's new income-based definition of affordability.	

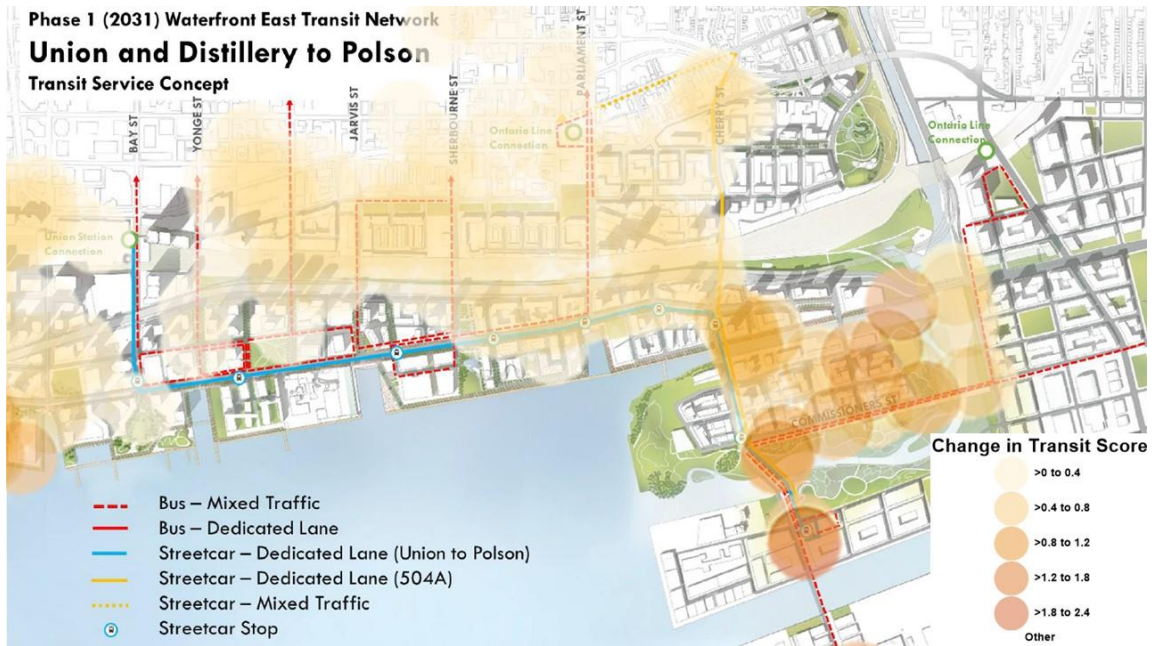
**Access to Transit Score:**

Access to Transit from a location can be measured based on the walking distance to a transit stop, and the level of transit service provided at the stop. This is represented using an Accessibility Index (AI)<sup>4</sup>, which is a score of 0-10, where a higher score for a location indicates better access to frequent transit service relative to other locations within the Toronto region. With the WELRT, there are increase of +0.5 to +2.0 in the Accessibility Index, indicating an improvement in transit catchment and frequency, to locations along Queens Quay East and Villiers Island.

<sup>4</sup> The Access to Transit calculation estimates the ‘Accessibility Index’ (AI) of transit services stopping near each node in the input network. This is a level of service that takes walking distance and transit frequencies into account (using a formula that is defined as:  $30 / (\text{headway} / 2 + \text{walk time})$ ). The score is converted to 0-10 score on a logarithmic scale.



**Figure 4: Change in Access to Transit Score**



## 4.2 Strengthen Places

The WELRT project shapes the city by boosting residential and non-residential development. It promotes healthier neighbourhoods complete with active transportation networks that support walking and cycling within and between neighborhoods. In addition, the project enhances natural spaces and encourages reduced reliance on cars, which has a positive impact on public health and on environment.

### 4.2.1 Shaping the City

A frequent and reliable transit service can play a significant role in the revitalization and development of Toronto’s waterfront area. Open spaces, vegetation, trees, and the naturalization of the Don River will create positive impacts for the region, all of which will be accessible via by a higher-order transit service. The impacts of the different WELRT options on the *shaping the city* criteria are assessed by the following indicators:

- **Projected population growth:** qualitative assessment based on the number of people served by LRT in Waterfront East area. An option will have darker shade of green relative to other options if the higher number of people are served by LRT that other options. Note that council direction has been received to explore increased development densities on Villiers Island.
- **Projected land use:** qualitative assessment based on the land use projections of the areas served by different options. Land use of the Port Lands is intended to be mixed use, and therefore it will provide services and other amenities within walking distance for the people who will live and work there. It supports the 15-minute neighbourhood

strategy. Even if LRT will enhance this development, it depends more on land use planning and the development of the active mode network.

**Table 7: Strategic assessment of the WELRT options - Shaping the City criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Projected population growth of the area<sup>5</sup></b>	The LRT would serve <b>approximately 37,000 new residents in 2032, and up to 100,000 new residents at full build-out.</b>	The LRT would serve <b>approximately 46,000 new residents in 2032, and up to 100,000 new residents at full build-out.</b>
<b>Projected land use</b>	Development of mixed-use neighbourhoods, including amenities, retail opportunities, community facilities, mixed-income housing, and jobs. Floor space would be 80% residential and 20% non-residential development.	

#### 4.2.2 Healthy Neighbourhoods

The transit service provides access to existing and future healthy neighborhoods, including those being delivered as part of the Port Lands Flood Protection project. The impacts of the different WELRT options on *healthy neighbourhoods* criteria are assessed by the following indicators:

- **Pedestrian accessibility:** qualitative assessment based on access to improved walking conditions. Each of the options increases access to an improved pedestrian environment.
- **Bike accessibility:** qualitative assessment based on access to improved bicycle conditions. Each of the options increases access to improved bicycle conditions.

**Table 8: Strategic assessment of the WELRT options - Healthy Neighbourhoods criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Pedestrian accessibility</b>	Lower Jarvis Street, Lower Sherbourne Street and Parliament Street are carried through the project area and terminate at the water's edge. The street and open space networks in East Bayfront and Lower Yonge are designed to be pedestrian friendly, with five-meter sidewalks planned along both sides of Queens Quay East. In Villiers Island, the WELRT provides access to a high-quality pedestrian environment. The stretch of Centre Street between New and Old Cherry Streets will be pedestrian only. Footbridges and New Munition Street will provide new pedestrian access to Villiers Island.	
<b>Bike accessibility</b>	The Martin Goodman Trail, an east-west commuter bicycle route along Queens Quay East, will be enhanced. The project will provide access to bike lanes on Villiers Island, including on New Cherry Street, New Munition Street, and footbridges.	

<sup>5</sup> Source: GTAModel

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
	The bike network in the project area is part of a much larger commuter and recreational network extending from the Central Waterfront into the Port Lands, east to the Beaches, and up the Don Valley.	

The Queens Quay corridor includes the Martin Goodman Trail and will connect to up to 34 acres of new greenspace within the Port Lands. This supports increased cycling and walking activity in the community in addition to the walking incurred by new transit users. Higher levels of active travel improves health (e.g., reduction in obesity, osteoporosis, depression, cardiovascular disease, respiratory disease, and stroke), reduces work absenteeism, and further reduce vehicle travel.<sup>6</sup> In a 2012 analysis by Toronto Public Health value of reductions in mortality from present levels of walking and cycling in the Toronto population is estimated to be between \$130 million to \$478 million each year in excluding reduced medical expenditures. Increasing Toronto's walking mode share to 12% and cycling mode share to 6% would result in the avoidance of around 100 more deaths, with a benefit of \$109 million to \$400 million.<sup>7</sup> According to the 2016 Census, 2.7 percent of people in Toronto bike to work. The use of WELRT can support into further increasing the number of people using active travel to get to work which will result avoidance of more deaths and the reduction in the correlated death costs.

#### 4.2.3 Public Health and Environment

The implementation of new higher-order transit service should reduce reliance on private cars. It should also provide access to high-quality natural areas for the people living, working, and visiting the area. The impacts of the different WELRT options on *public health and environment* criteria are assessed through following indicators:

- **Access to natural areas:** qualitative assessment based on access to parks by LRT. An option will have darker shade of green relative to other options if it enables access to a larger area of parks than other options.
- **Impact on stormwater runoff:** qualitative assessment of the impacts to the environment in terms of water balance within the ground, water quality of stormwater runoff, and the amount of stormwater discharged to the municipal systems.
- **Landscape:** qualitative assessment of the WELRT on the landscape value.
- **Private motor vehicle kilometers travelled (VKT):** quantitative assessment based on the improvements in public health and to the environment thanks to changes in private motor vehicle kilometers travelled. An option will have darker shade of green relative to other options if it has decreased VKT more than other options.

<sup>6</sup> Three Toronto BIAs Recognize the Benefits of Cycling. The Centre for Active Transportation. (2021). Retrieved 14 October 2021, from <https://www.tcat.ca/three-toronto-bias-recognize-the-benefits-of-cycling/>.

<sup>7</sup> Three Toronto BIAs Recognize the Benefits of Cycling. The Centre for Active Transportation. (2021). Retrieved 16 October 2021, from <https://www.tcat.ca/three-toronto-bias-recognize-the-benefits-of-cycling/>.

**Table 9: Strategic assessment of the WELRT options - Public health and environment criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Access to natural areas<sup>8</sup></b>	Provides access to <b>25.2 acres of parks</b> in the East Bayfront and Keating Channel Precincts and in Villiers Island such as Sherbourne Park, Bikeway Park and River Park.	Provides access to <b>34 acres of parks</b> in East Bayfront, Keating Channel, Villiers Island, and West Don Lands such as Sherbourne Park, Bikeway Park and River Park.
<b>Impact on stormwater runoff</b>	<b>Reduced impacts from stormwater runoff:</b> The Waterfront East LRT project is a Green Street Infrastructure project that incorporates natural and human-made elements to improve various hydrological processes such as water balance, water quality, and water quantity. The infrastructure provides benefits to the environment in terms of water balance within the ground, water quality of stormwater runoff, and the amount of stormwater discharged to the municipal systems. These environmental benefits have not been monetized as part of the economic case but provide wider value to the waterfront.	
<b>Landscape</b>	Although there is no monetary assessment of the landscape value, the benefits can be assessed based on the best practice research TAG qualitative assessment. The use of WELRT generates an iconic high-quality feature and/or succession of features, it considerably enhances the landscape's character including quality and value.	
<b>Private motor vehicle kilometers travelled (VKT)</b>	Improves environment and public health due to <b>annual reduction of 1.5 million VKT</b> . This is equivalent to 270,000 trips per year.	Improves environment and public health due to <b>annual reduction of 3.7 million VKT</b> . This is equivalent to 651,000 trips per year.

### 4.3 Support Prosperity

The Waterfront East Light Rail Transit options will support economic growth through investment in fast, reliable, and attractive public transportation. It will enable workers to get to their jobs more easily. The Waterfront East Light Rail Transit options should be affordable to build, maintain and operate compared to the benefits it will generate.

#### 4.3.1 Supports Growth

An investment in transit service should support economic development and serve major employment areas to support economic growth of the area and the region. The impacts of the different WELRT options on the *supporting growth* criteria is assessed through the following indicators:

- **Projected employment growth:** LRT will support employment development plans (including office and retail). This is a qualitative assessment based on the number of jobs served by LRT in Waterfront East area. An option will have darker shade of

<sup>8</sup> Sources: East Bayfront Precinct Plan, November 2005; Keating Channel Precinct Plan, May 2010; Villiers Island Precinct Plan, September 2017; West Don Lands Precinct Plan, May 2005.

green relative to other options if the higher number of jobs is served by LRT than other options.

- Projected economic development:** qualitative assessment based on the economic development initiatives and commercial land-use areas served by LRT in the Waterfront East area. LRT will support the development of commercial activities as well as economic development initiatives. An option will have a darker shade of green relative to other options if more economic development initiatives and a greater area of planned commercial services are served by LRT than other options.

**Table 10: Strategic assessment of the WELRT options - Supports growth criteria**

Indicator	Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<b>Projected employment growth<sup>9</sup></b>	LRT will serve the Lower Yonge, East Bayfront, Keating Channel, and Lower Don Lands Precincts.  <b>(up to 30,000 jobs by 2032 and 50,000 jobs by full buildout).</b>	LRT will serve the Lower Yonge, East Bayfront, Keating Channel, Lower Don Lands, and West Don Lands Precincts.  <b>(up to 32,000 jobs by 2032 and 50,000 jobs by full buildout).</b>
<b>Projected economic development</b>	LRT will enhance ongoing and future mixed land-use development of the Lower Yonge, East Bayfront, Keating Channel, and Lower Don Lands Precincts.  It will especially support the development of commerce on the ground floor of the buildings along Queens Quay and New Cherry Street.  In addition, it will support the creation of Living Lab, Learning Hub for Climate and development of incubators.	LRT will enhance ongoing and future mixed land-use development of the Lower Yonge, East Bayfront, Keating Channel, Lower Don Lands and West Don Lands precincts.  It will especially support the development of commerce on the ground floor of the buildings along Queens Quay and New Cherry Street.  In addition, it will support the creation of Living Lab, Learning Hub for Climate and development of incubators.

**WELRT will be fundamental to the development of the Villiers Island.** It is expected to catalyze the envisaged economic development in the planned mixed-use residential district on the Island. The 2017 Villiers Island Precinct Plan features the development of a ring of public spaces, community facilities, and parks encircling a business and residential district, encompassing a mix of residential, office, retail and service, recreational, and cultural activities. The City of Toronto is also currently studying a

<sup>9</sup> Source: GTAModel

preferred approach for increasing densities to support more affordable housing achievable on Villiers Island, consistent with the broader, city-wide goals outlined within its 2023 Housing Action Plan<sup>10</sup>. The additional density on Villiers Island proposed beyond the Precinct Plan is expected to generate additional revenue to support affordable housing initiatives on the Island, which would in turn increase the demand for infrastructure and community services, and accelerate the need for higher-order transit on the Island.

By enabling swift connectivity to the 33.5-hectare development, WELRT serves as a new gateway to the high-density development on the Villiers Island, while offering a greater capacity than cars accessing the Island via the New Cherry Street bridge under construction. This also aligns with the goal of the Precinct Plan to create eco-friendly communities on the Island with reduced carbon emissions from cars.

#### 4.3.2 Affordability

Improvements in transit service should be affordable to build, maintain and operate. It should also generate benefits for society. The impact of the different WELRT options on affordability criteria is assessed through the benefit-cost ratio indicator, which compares the costs and benefits of different options, including monetized externalities. These are detailed within the Economic Case.

## 4.4 Strategic Case Summary and Key Metrics

**The Waterfront East LRT aligns with the City of Toronto’s priorities and objectives outlined within the Rapid Transit Evaluation Framework.** A summary of the Strategic Case assessment is provided in the following table.

The project:

- **Serves people** by **reducing overall travel time**, and **provides higher-order transit connectivity to the eastern waterfront**, increasing access to residents and jobs. The use of a dedicated lane and direct connection to the underground Union Station gives priority over vehicular traffic, improving reliability and saving time for users;
- **Strengthens places** by using the Waterfront East LRT as a way to **catalyze the revitalization of the eastern waterfront**, and **encourages the reduction of vehicle travel** (improving safety and reducing carbon emissions); and
- **Supports prosperity** by providing transit access to an area of future planned job growth and economic development activity.

The Waterfront East service **increases the resiliency and capacity of the broader network**. Extending the Waterfront East service eastwards **leads to higher line ridership** across the entire Waterfront East service as the line supports a larger catchment area.

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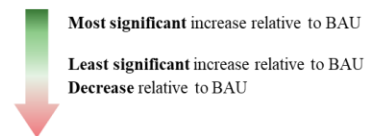
<sup>10</sup> City of Toronto Planning and Housing Committee - Item 2023.PH2.9: <https://secure.toronto.ca/council/agenda-item.do?item=2023.PH2.9>



The table below provides a summary of the strategic assessment of Option 1 and 2 by principle.

**Table 11: Summary of strategic assessment by principle**

Criteria	Indicator	WELRT Phase 1	
		Option 1: Union to Villiers Loop	Option 2: Union and Distillery to Villiers Loop
<i>4.1. Serve People</i>			
<b>1. Experience</b>	Ridership		
	Road congestion		
	Total travel time		
	Reliability		
<b>2. Choice</b>	Local Connectivity		
	Regional Connectivity		
<b>3. Social Equity</b>	Change in residents served		
	Change in jobs served		
	Accessibility		
	Access to affordable housing		
<i>4.2. Strengthen Places</i>			
<b>1. Shaping the City</b>	Projected population growth of the area		
	Projected land use		
<b>2. Healthy Neighbourhoods</b>	Pedestrian accessibility		
	Bike accessibility		
<b>3. Public Health and Environment</b>	Access to natural areas		
	Impact on stormwater runoff		
	Landscape		
	Private motor vehicle kilometers travelled (VKT)		
<i>4.3 Support Prosperity</i>			
<b>1. Supports Growth</b>	Projected employment growth		
	Projected economic development		
<b>2. Affordability</b>	Benefit-cost ratio (BCR)	Detailed in 5. Economics Case	



**Waterfront East service between Union Station and Villiers Loop (Option 1) provides a strategic connection between Waterfront East and downtown Toronto.** The customer experience, connectivity and accessibility improves compared to the Base Case.

**Waterfront East service between Union Station, Distillery, and Villiers Loop (Option 2) provides the greatest strategic value of both options** as it provides the greatest improvement in connectivity for residents, jobs, and natural areas. Option 2 builds upon the strategic value of the Waterfront East LRT with an additional connection to the Distillery Loop, which further increases the resilience and connectivity of the streetcar network in the eastern waterfront. Option 2 contributes to a greater increase in transportation network benefits including greater travel time savings, and lower car trips.

Both Options 1 and 2 unlocks potential development across the Port Lands precinct, which is undergoing flood protection through to 2024. **Dedicated transit to the Port Lands could help expedite the revitalization of the eastern waterfront into a complete community.** The key benefits of the option 1 and 2 Waterfront East LRT over a 60-year lifecycle are summarized in Table 12.

**Table 12: Change in metrics with Option 1 & Option 2 WELRT compared to Base Case.**

Change in metrics	Annual in 2032		Total over 60 year lifecycle	
	Option 1	Option 2	Option 1	Option 2
<b>Transit Travel Time Saved</b>	150,000 hours	260,400 hours	11,310,000 hours	19,389,000 hours
<b>Auto Travel Time Saved</b>	21,400 hours	80,600 hours	1,616,000 hours	6,001,000 hours
<b>Reduction in Vehicle Kilometres Travelled</b>	1,500,000 km	3,700,000 km	112,180,000 km	277,910,000 km
<b>Reduction of Car Trips.<sup>11</sup></b>	202,000 trips	501,000 trips	15,262,000 trips	37,811,000 trips

<sup>11</sup> Assumes an average car trip length of 7.3km based on data from the Transportation Tomorrow Survey



## 5. Economic Case

The Economic Case quantifies the overall impact of the proposed project to society. In this business case, the Economic Case measures benefits of providing new rapid transit service along Queens Quay East and into the Port Lands, and compares against the overall cost for the project, including capital, operating, and maintenance costs across a 60-year lifecycle.

The following sections outline the approach, assumptions, and results of the economic analysis. There is also potential additional value of societal benefits related to the improved transit corridor across the eastern waterfront that are not typically captured within the results of the travel demand model – this section provides an overall narrative on these wider benefits.

### 5.1 Evaluation Approach and Assumptions

This economic case focuses on the incremental benefit associated with the Waterfront East LRT project. It assesses the benefits realized through the implementation of the Waterfront East LRT via Option 1 or Option 2. Option 1 is between Union Station and Villiers Loop; and Option 2 is between Union Station, the Distillery, and Villiers Loop. Across the Economic Case, the results presented are the incremental costs and benefits between a scenario with the Waterfront East LRT and the Base Case option. Incremental costs and benefits associated with the Waterfront West transit network are excluded from this economic analysis.

The economic analysis uses an approach that aligns with the [Metrolinx Business Case Guidance \(August 2021\)](#). Key evaluation parameters consistent with the Metrolinx Business Case Guidance are outlined in Table 13. Throughout the Economic Case, the values are presented in 2023 prices.

**Table 13: Economic case parameters and assumptions**

Parameter	Value	Units	Source
<b>General</b>			
Base Year of Evaluation	2023	year	Assumption
Evaluation Period	60	years	Metrolinx Guidance
Economic Discount Rate	3.5%	%	Metrolinx Guidance
WELRT Service Opening Year	2032	year	Assumed for all options
<b>User Benefits</b>			
Ridership/Benefits Projection Year	2041	year	GTAModel

Ridership/Benefits Growth Cap Year	2053	year	Metrolinx Guidance
Value of Time (2023\$ / hour)	\$21.09	\$ / hour	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
Travel Time Savings / Ridership Annualization Factor	306	factor	TTC
Annual Time Savings Benefits/ Ridership Growth Rate from 2031 to Ridership/Benefits Cap Year	5%	% / year	Waterfront Toronto residential and employment projection (2031 – 2041)
Transit Amenity Benefit	\$0.196	\$ per trip	Perceived benefit of improved journey quality (based on values from Transport for London, 2013, escalated to 2023 values)
Weighted Average Transit User Fare	\$2.92	\$ per trip	Based on TTC 2021 Annual Report (escalated to 2023 values)
Real Fare Growth %	1%	% / year	Assumption
Auto Operating Cost Parameter	\$0.11	\$ / km	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
<b>Externalities User Benefits</b>			
Road Safety Parameter	\$0.10	\$ / km	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
Road Safety Parameter Growth Rate	-5.3%	% per year	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
GHG Emissions Impacts	\$0.01	\$ / veh-km	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
Air Quality Impacts	\$0.002	\$ / veh-km	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
Average Walking Distance to access an LRT stop	800	metres	Assumption
Walking Health Benefit	\$4.58	\$ / km	Based on Metrolinx Guidance, inflated to 2023 prices based on CPI
<b>Wider Economic Benefits</b>			
Journey Purpose - Business %	1.65%	% of total trips	GTAModel

Imperfect Competition Factor (%)	10%	% of time savings	Best practice research
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## 5.2 Costs

### 5.2.1 Capital costs

Capital costs for the Waterfront East LRT have been developed by the TTC and Waterfront Toronto for the different segments of the project. These costs were reviewed by City staff, including through the project Constructability Assessment, and were accepted as reasonable. Key inputs into the capital costs include:

- 30% design estimates for Segment 1 by the TTC;
- 30% design estimates for Segment 2 by Waterfront Toronto;
- 30% design estimates for Segment 3 by Waterfront Toronto.

**Capital costs provided as input into this business case are Class 3 Cost Estimates** (as defined by the AACE). **They are subject to change as design progresses.** The capital cost estimates included within this economic case include all markups, tax, and allowances for escalation, contingency, engineering and management. The input values are reported in the table below as nominal dollars and in present values (discounted to 2023 prices).

Infrastructure improvements planned in Segment 1 (i.e. Union Station, Queens Quay Station, and the east and west portals) are anticipated to benefit both the WELRT service and the Waterfront West routes (i.e., existing 509 and 510 streetcar services). An analysis by the TTC on the Waterfront routes that would benefit from the Segment 1 improvements led to a suggested **Segment 1 cost allocation of 26% to the Waterfront West routes and 74% to the WELRT.** The Economic Case includes both an overall project benefit-cost ratio (BCR) (inclusive of both benefit and cost to Waterfront West routes) and a WELRT-specific BCR based on the capital costs presented in Table 14. This analysis is undertaken for the Economic Case only. The assessment of affordability (in the Financial Case) and deliverability (in the Deliverability and Operations Case) is based on the project as a whole and does not evaluate the project separately in this manner.

**Table 14: Capital costs by segment (Present Value in 2023 prices, 60-year total discounted)**

Sections	Nominal Dollars		Present Value	
	Option 1	Option 2	Option 1	Option 2
<b>Segment 1</b>	\$1,044,600,000	\$1,044,600,000	\$783,200,000	\$783,200,000
<b>Segment 2</b>	\$672,700,000	\$672,700,000	\$483,300,000	\$483,300,000
<b>Segment 3</b>	\$186,400,000	\$516,400,000	\$127,400,000	\$329,000,000
<b>Project Capital Costs</b>	\$2,003,700,000	\$2,333,700,000	\$1,393,900,000	\$1,595,500,000
<i>26% of Segment 1 costs provide</i>	\$297,600,000	\$297,600,000	\$203,700,000	\$203,700,000

<i>benefit to Waterfront West</i>				
<b>WELRT Capital Costs</b>	\$1,706,100,000	\$2,036,100,000	\$1,190,200,000	\$1,391,800,000

For the purposes of assessing a WELRT-specific capital cost, approximately \$297 million in nominal dollars of the Segment 1 (Union Station, Queens Quay Station, and Portals) capital cost is attributed to benefit the existing Waterfront West routes. Given this, the WELRT-specific capital costs to deliver Option 1 is \$1.7 billion and Option 2 is \$2.0 billion in nominal dollars. Capital costs are allocated to a particular year based on the proposed Implementation Plan, and assuming a linear distribution of costs for each project component. These values are discounted to a present value, which results in a total discounted WELRT capital cost of \$1.1 billion for Option 1 and over \$1.3 billion for Option 2. The difference in the capital costs Option 2 is associated with the additional connection on Cherry Street to the Distillery Loop.

The total project capital cost to deliver Option 1 is over \$2.0 billion and Option 2 is over \$2.3 billion in nominal dollars. The resultant total discounted project capital cost is \$1.3 billion for Option 1 and \$1.5 billion for Option 2.

### 5.2.2 Operating costs

Operating costs for the WELRT are based on unit rates provided by the TTC<sup>12</sup>, and estimates for the vehicle-kilometres and vehicle-hours required to provide the level of service identified in each option. Operating costs are presented by phase in 2023 prices in Table 15. Consistent with Metrolinx Business Case Guidance, operating costs are escalated in real terms by 1% per year until 2052, after which operating costs are assumed to remain constant in real terms.

**Table 15: Operating costs (Present Value in 2023 prices, 60-year total discounted)**

Option	Nominal Dollars	Present Value
<b>Option 1</b>	-\$328,900,000	-\$100,500,000
<b>Option 2</b>	\$128,500,000	\$39,300,000

The operating costs that are included in the economic analysis are relative to the transit service provided in the Base Case scenario, which is assumed to be a frequent bus service between Union Station, Villiers Loop, and East Harbour. The operating costs WELRT Option 1 includes the WELRT between Union Station and Villiers Loop, plus a connecting bus service between Villiers Loop and East Harbour. This is incrementally lower than the assumed Base Case service. The operating cost for WELRT Option 2 also includes the additional 504A service on Cherry Street. Compared to a Base Case scenario, this service has a higher incremental operating cost.

<sup>12</sup> Operating costs have been calculated based on the provided cost rates from the TTC (converted to 2023 prices using CPI), using the same rates for buses and LRT under the assumption that the difference in operating costs unit rates between buses and LRT is negligible.



### 5.2.3 Cost Summary

Table 16 below presents the nominal dollars and present value total costs for the project. The present value is totaled over a 60-year evaluation period and discounted to 2023 present values.

**Table 16: Cost Summary (Present Value in 2023 prices, 60-year total discounted)**

Cost	Nominal Dollars		Present Value	
	Option 1	Option 2	Option 1	Option 2
<b>Capital costs</b>	\$2,003,700,000	\$2,333,700,000	\$1,393,900,000	\$1,595,500,000
<b>Operating costs</b>	-\$328,900,000	\$128,500,000	-\$100,500,000	\$39,300,000
<b>Total costs</b>	\$1,674,800,000	\$2,462,200,000	\$1,293,400,000	\$1,634,800,000
<i>26% of Segment 1 costs provide benefit to Waterfront West</i>	\$297,600,000	\$297,600,000	\$203,700,000	\$203,700,000
<b>WELRT Costs</b>	\$1,377,200,000	\$2,164,600,000	\$1,089,700,000	\$1,431,100,000

The present value cost for the WELRT is largely driven by the capital costs. Operating costs represent the incremental cost of operating LRT services compared to bus services to Waterfront East.

### 5.3 User Impacts

User impacts are the monetized changes in travel time and out-of-pocket costs resulting from changes to the transport network. These benefits include:

- **Transit travel time savings:** The WELRT is expected to provide an improved transit service with lower travel times compared to a bus operating in mixed traffic. Time savings are monetized based on the value of time.
- **Transit travel time savings (Waterfront West):** Investment in additional capacity at Union Station enables additional frequencies to accommodate demand on Waterfront West routes. An off-model analysis was undertaken to estimate the implied travel time savings for new users who can use the Waterfront West routes (e.g., 509 / 510) with increased frequencies, who would otherwise walk towards Union Station. This analysis was based on the TTC's Recommended Forecast for Union Station (prepared in 2021). This benefit is applied only for the total project analysis.
- **Auto travel time savings:** As the WELRT attracts current automobile users to transit, there is an improvement in travel times across the network reflective of decongestion. Time savings are monetized based on the value of time.
- **Auto operating cost savings:** Users who switch modes from auto to transit derive cost savings related to vehicle ownership and maintenance that are not typically factored into day-to-day trip making decisions. From research and consistent with

Metrolinx Business Case Guidance, this benefit was assessed to be \$0.18 per km (and is inclusive of fuel, maintenance, and depreciation).<sup>13</sup> Users who switch from driving to transit can also experience reduced costs associated with parking. A sensitivity analysis was completed and can be found as part of the Context-Sensitive Benefits section.

- **Transit Amenity:** Transit amenity benefits users by lowering the perceived impact/cost of travelling through locations. For the WELRT, we expect improvements to the stations, stops, shelters, as well as the ride quality for customers. From research, the improvements to the quality of the transit experience for riders have been quantified and assigned a monetary value of \$0.196 per trip.<sup>14</sup> This is assigned only to the riders of the WELRT and the economic benefit calculated based on the rule-of-a-half.

A summary of the user impacts totalled over a 60-year evaluation period is presented in Table 17.

**Table 17: Summary of user impacts (2023 prices, 60-year total discounted to PV)**

Benefit	Option 1	Option 2
<b>Transit time savings</b>	\$129,200,000	\$223,300,000
<b>Transit time savings (Waterfront West)</b>	\$35,100,000	\$35,100,000
<b>Transit amenity</b>	\$18,300,000	\$13,600,000
<b>Auto time savings</b>	\$19,200,000	\$68,600,000
<b>Auto cost savings</b>	\$11,200,000	\$27,700,000
<b>Total Benefits</b>	<b>\$213,000,000</b>	<b>\$368,300,000</b>
<b>Total WELRT Benefits</b>	<b>\$177,800,000</b>	<b>\$333,200,000</b>

## 5.4 External Impacts

External impacts relate to broader changes in society resulting from more users travelling by transit. These are typically monetized as the reduction of cost borne by society related to health or environmental impacts from vehicle use. A lower distance travelled on the road resulting from the use of the WELRT will lead to these external impacts:

- **Improved health from increased walking activity:** With increased transit use, there are health benefits associated with increased walking activity related to accessing transit from the origin or destination. The benefit is based on an assumed walking distance to/from transit.
- **Improved road safety:** As the WELRT attracts current automobile users to transit, there is a lower cost to society resulting from the reduction in vehicle collisions that

<sup>13</sup> Metrolinx Business Case Guidance (2021), converted to 2023 prices using CPI.

<sup>14</sup> Transport for London (2013). Business Case Development Manual, converted to 2023 prices using CPI.

result in property damage, injury, or death. The benefit is based on lower vehicle-kilometres travelled in the network.

- **Lower automobile greenhouse gas emissions:** With the reduction in car travel, there are lower greenhouse gas emissions, and lowers the impact and costs of climate change on society. The benefit is based on lower vehicle-kilometres travelled in the network.
- **Lower transit greenhouse gas emissions:** With the implementation of the WELRT, fewer greenhouse gas emissions are released when compared to the all-bus base case. This benefit is based on the tonnes of carbon dioxide saved when using an electrically powered LRT compared to diesel buses. As the TTC has stated that they aim to have an all-electric fleet by 2040, it is assumed that electric buses make up half the fleet from 2030-2040, and all buses are fully electric from 2041 onwards.
- **Improved local air quality:** Similar to greenhouse gas emissions, lower car travel also reduces the number of pollutants, such as nitrogen oxides, sulphur dioxides, and particulate matter, that impact local air quality and are harmful to health. The benefit is based on lower vehicle-kilometres travelled in the network.

A summary of the external impacts totalled over a 60-year evaluation period is presented in Table 18.

**Table 18: Summary of external benefits (2023 prices, 60-year total discounted to PV)**

Benefit	Option 1	Option 2
Health / Walking	\$13,100,000	\$34,000,000
Road Safety	\$1,700,000	\$4,100,000
Automobile GHG Emissions	\$700,000	\$1,700,000
Transit GHG Emissions	\$700,000	\$100,000
Local Air Quality	\$100,000	\$300,000
<b>Total</b>	<b>\$16,300,000</b>	<b>\$40,300,000</b>

## 5.5 Development and Land Value

### Transit as a catalyst for urban development

Higher-order transit can act as a catalyst for the revitalization of the East Bayfront and Port Lands areas. The WELRT can stimulate the redevelopment of the eastern waterfront, from its currently industrial state to a vibrant and growing community.

The Region of Waterloo’s ION LRT service demonstrates the ability of transit to catalyze urban development. In the five years after implementation plans to build their ION LRT service, the Region saw a 50% increase in new residential development occurring in built-up areas. Additionally, 25% of all new housing units were being built within walking distance of an ION station and 25% of new industrial, commercial, and institutional buildings were developed near ION stations.<sup>15</sup> The Region of Waterloo also

<sup>15</sup> Region of Waterloo (2016). The ION Story



found wider benefits from the introduction of the LRT to their communities. The percentage of building permits for single-detached homes dropped from 67% in 2005 to 31% in 2019,<sup>16</sup> reducing both urban sprawl and the region’s additional costs that come with servicing residents outside of the existing developed area.

### Transit and land value uplift

Land value typically increases with proximity to higher-order transit. This is commonly known as a “transit premium” or “transit influenced appreciation.” Research conducted in Toronto, as well as many other North American cities – including San Diego, Dallas, Montreal, Portland, and Philadelphia – have found that there is 3% to 15% price premium for residences within walking distance of higher order transit. In a growing city like Toronto, the Waterfront East LRT would provide the frequent, reliable, and affordable transit service necessary to support the development of an attractive and revitalized neighborhood in the Port Lands area.

For this business case, NBLC conducted a land value analysis in 2021 for the Waterfront East LRT service area comparing the incremental uplift between a base scenario with mixed-traffic bus service, and a scenario with Waterfront East LRT. The land value uplift is based on the Residual Land Value, or “RLV” model. This model determines what a developer would be willing to pay for a site, after accounting for all revenues and costs associated with a project, as well as the developer’s required profit margin. The difference between a project’s revenues and costs (including profit margin), is a site’s residual land value.

NBLC’s analysis found that compared to the base case, LRT service is expected to provide a 7% pricing premium for residential units in the studied area. Additionally, LRT service in the studied area is expected to have several other effects on residential projects and its land value. The introduction of LRT service is expected to reduce the number of parking spaces required per unit from 0.55 to 0.30. This is comparable to buildings launched in similar market areas of Toronto. Furthermore, due to the fewer number of parking spaces available, the price of an underground parking space is expected to increase 15% to an average of \$80,000. Finally, the absorption rate, or the rate at which units are sold, is expected to increase by approximately 20%. **These effects reduce the build and financing costs for developers, resulting in a 28% to 33% increase in residual land value for the proposed projects.** In monetary terms, for the prototypical developments the NBLC assessed, the value uplift ranged from \$46 to \$50 (in 2021 dollars) per square foot of residential floor area.

### Land Value Uplift Estimate

The catchment area of the Waterfront East LRT is unique as it serves the Port Lands, which is largely under public ownership (e.g., CreateTO, provincial, or federal lands). Advancing the delivery of Waterfront East LRT will enable the public sector to derive additional value from transit prior to the sale of these lands for development and revitalization.

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<sup>16</sup> Lewington, Jennifer (2019). Public transit investment spurs renewal in downtown core. *The Globe and Mail*

The impact of higher-order transit on the value of public lands is estimated from the NBLC residual land value analysis based on a prototypical development applied to the land use plans provided by Waterfront Toronto. Key findings of this analysis include:

- The implementation of the WELRT serves planned residential developments in the Keating Channel Precinct, Villiers Island, Polson Quay and South River. The latest plans indicate that this area is expected to contain approximately 4.34 million square feet of floor area for residential use on public land. Based on the uplifts from the NBLC report, an uplift of \$47-49 per square foot of gross floor area was used to represent the land value uplift from transit. Therefore, the WELRT is expected to increase the land value of public lands by approximately \$204 - 248 million if the lands were sold today.
- The implementation of the WELRT also serves public land to be re-developed for non-residential purposes within the Keating Channel Precinct, Villiers Island, Polson Quay and South River. This area contains approximately 1.3 million square feet of public land. Based on a \$47-49 uplift per square foot of land area<sup>17</sup>, the WELRT is expected to increase the publicly owned land value planned for non-residential use by approximately \$61-64 million if the lands were sold today.

A summary of the estimated land value uplift of public land is presented in the table below, with the assumption of a terminus located in Villiers Island. The low end of the range represents land value uplift representative of densities identified in the Villiers Island Precinct Plan, and the high end of this range representative of additional densities currently considered for Villiers Island<sup>18</sup>.

**Implementation of plans for the WELRT to Villiers prior to the sale of public lands enables the public sector to capture the value estimated in an analysis completed in 2021. Land prices will fluctuate due to a range of market forces and the land value captured will vary from the estimates identified in the table.**

**Table 19: Land value captured from the sale of public land with WELRT (2023 present values)**

Type	Incremental Revenue
<b>Residential</b>	\$204,500,000 - \$248,400,000
<b>Non-Residential<sup>19</sup></b>	\$61,000,000 - \$64,100,000
<b>Total</b>	\$265,500,000 - \$312,500,000

With the full-build out of the WELRT (towards East Harbour, Polson Loop, and Leslie Barns), it is anticipated that there is significant additional incremental land value that can be captured from the sale of public lands for future development.

<sup>17</sup> A \$47-49 uplift per square foot of land area is assumed as a proxy for this analysis, the uplift will be influenced by the density of the non-residential land use. Further work is required to validate the land value uplift associated with non-residential land use.

<sup>18</sup> Refer to <https://secure.toronto.ca/council/agenda-item.do?item=2023.PH2.9>.

<sup>19</sup> Due to rounding, numbers presented may not add up precisely to the totals provided

## 5.6 Context-Sensitive and Wider Impacts

There are context-sensitive and wider impacts resulting from the WELRT, particularly as the investment provides a complete street corridor with light rail transit, cycling infrastructure, and an improved streetscape. This corridor is central to the development of the eastern waterfront and there are impacts realized by the broader city and region based on additional value generated by the land use and activities within East Bayfront and the Port Lands.

Some of these benefits have not been captured within the Metrolinx Business Case Guidance framework. In these cases, the impacts have been described qualitatively and acknowledged in the following sections below. The improved corridor brings wider benefits with regards to lower embodied carbon emissions, reduced impacts from stormwater runoff, tourism, and greater active travel:

- **Reduction of embodied carbon emissions:** The design of the surface section of the WELRT on Queens Quay includes more sustainable materials for curbs and paving, furniture, fixtures, transit elements, and planting elements to reduce the amount of embodied carbon within the project. An analysis of the embodied carbon emissions<sup>20</sup> suggests that the proposed design for Queens Quay East has 600 tonnes CO<sub>2</sub>e less of total embodied emissions compared to a baseline design over the 60-year lifecycle. Based on a social cost of carbon of \$68.36 per tonne of CO<sub>2</sub>e in 2030<sup>21</sup>, the expected benefit of the reduced embodied carbon is \$41,000.
- **Auto Operating Costs associated with Parking:** The Metrolinx business case framework does not include the cost of parking in the figure provided for unperceived auto operating costs. However, it is anticipated that parking in the redeveloped Port Lands would require payment. As most vehicle owners would need parking when visiting the Port Lands, the parking costs could be included in the auto operating cost figure to better reflect the actual costs of using a car. A sensitivity analysis was conducted, looking at the cost of parking per vehicle kilometer travelled. Parking rates were based on the 3-Hour, Daytime, and 24-Hour parking rates for the area south of King St E, east of Yonge St., and west of Leslie St. Additionally, the parking rates were converted to a per-kilometre basis using data on vehicle trips, distance, and trip purpose from the 2016 Transportation Tomorrow Survey for Wards 28 and 30 in the City of Toronto. Based on this analysis, the additional cost of parking per km driven was calculated to be \$0.22 per km for a typical 3-hour stay<sup>22</sup>. An additional cost of \$0.22 per vehicle kilometre driven was applied as a sensitivity test to factor in the user's savings related to parking fees. This resulted in an additional auto operating cost savings of \$12.7 million for Option 1, and \$31.4 million for Option 2.
- **Imperfect Competition** – Higher prices for specific goods can be higher due to low network connectivity. Transit investments can improve competition by connecting

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<sup>20</sup> WSP (2021). Waterfront Toronto - Queen's Quay East – Phase 2A – Lifecycle Assessment – Embodied Carbon

<sup>21</sup> Source: Environment Canada – The social cost of carbon emissions in 2030 is \$59.60 per tonne (2019 prices), which is \$68.36 in 2023 prices based on CPI.

<sup>22</sup> The trip distances were based on the following trip purposes - for residents of the area: Home-based discretionary, Non-home-based; For trips to the area: Work, Other

new markets or reducing the cost of travel within existing markets. This benefit is captured as a percentage of the travel time savings associated with work trips.

- **Tourism benefits – extending the entire destination of the Waterfront:** Based on the success of revitalised waterfronts in other major North American cities, such as Baltimore and San Francisco, Toronto's waterfront extension is anticipated to attract even more tourists as new improvements proceed.

Research has found that tourists are motivated to travel to an area with public transport for the following reasons: wanting to get in touch with the local people, wanting to enjoy the surroundings on the way to their destination, avoiding automobile traffic, avoiding the stress of finding parking, as well as no access to an automobile while travelling. Additionally, a major factor of tourists choosing to use public transit is the convenience and ease of use.<sup>23</sup>

When built, the WELRT will allow tourists to easily access the East Bayfront and Port Lands communities, making transit a more convenient travel option during their time in the city. As tourists who use public transit are generally younger, independent travellers, the introduction of higher order transit will make the eastern waterfront open to all, rather than only to those who have access to alternate transportation. Additionally, research has found that LRT service is “physically and psychologically easier” for tourists to use over buses.<sup>24</sup> By reducing some of the stresses typically associated with a bus service, older travellers would be more likely to use transit to access the Waterfront East area as well.

The ease of access that the WELRT provides supports an increase in the total number of tourists who visit the area, increasing the tourism-based revenue generated for businesses in the area. Quantification of the tourism revenue is based on the daily boardings on WELRT towards the eastern waterfront, the percentage of leisure trips to the eastern waterfront based on travel surveys<sup>25</sup>, and the incremental spending surveyed by visitors to the waterfront. To quantify the benefit, tourism activities that visitors of the waterfront spent more on than average Torontonians from 2019 to 2022 were identified, including certain dining and entertainment activities. A comparison between the four-year average spends on each item of Waterfront visitors and Torontonians revealed that Waterfront visitors spent \$0.52 more on the tourism-related activities per day. Multiplying it by the estimated annual tourism-related ridership of WELRT<sup>26</sup>, it is estimated that the total tourism benefit over a 60-year period will amount to approximately \$10.6 million.

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<sup>23</sup> Le-Klähn, Diem-Trinh & Gerike, Regine & Hall, Colin. (2014). Visitor users vs. non-users of public transport: The case of Munich, Germany. *Journal of Destination Marketing & Management*.

<sup>24</sup> Hsuan Hsuan Chang & Tsung-Yu Lai (2009). The Taipei MRT (Mass Rapid Transit) Tourism Attraction Analysis from the Inbound Tourists' Perspectives. *Journal of Travel & Tourism Marketing*

<sup>25</sup> The 2016 Transportation Tomorrow Survey states that 34% of trips to the eastern waterfront is associated with 'Other' trips (i.e., not related to commute, school, or work trips).

<sup>26</sup> Tourism related ridership is assumed to be based on the total boardings towards Villiers Island multiplied by the percentage of discretionary trips, which was 34% for Villiers Island based on the 2016 Transportation Tomorrow Survey.

**Construction Jobs:** Based on the estimate capital cost and duration of the project, the WELRT is expected to generate new jobs in the delivery of infrastructure. The average number of jobs associated with construction each year is approximately 800 for Option 1 and 940 for Option 2. This is a high-level analysis based on input-output multipliers provided by Statistics Canada for the year 2019, and the total capital cost for the project. This number may change based on Statistics Canada multiplier updates, total capital cost, and scheduled duration of construction.

## 5.7 Sensitivity Analysis – 25% Auto Mode Share

A key proposal for Villiers Island is the potential implementation of a special policy area that restricts the number of parking spaces in the study area to reduce automobile usage. This designation would allow changes from the standard zoning and parking policies in Toronto to one that increases the user’s costs of owning a car (e.g., the reduction of the number of required parking spaces in buildings, higher on-street and off-street parking rates, shared street designs which reduce vehicle speed, etc.).

These policies would be aimed at encouraging people to consider transport alternatives to driving, with a target of 25% auto mode share of all trips taken to/from/within the study area, down from an average of 35% auto mode share estimated from the GTAModel. A sensitivity test that explores the impact of the reduction in auto mode share was investigated, and it was determined that the WELRT-conventional benefits of the project would increase to approximately \$441 million for Option 1 and \$631.8 million for Option 2.

This increase can be attributed to an increase in the following present value benefits:

- **Transit Time Savings:** With the increase in passengers who benefit from WELRT’s faster journey times when compared to the bus-only base case, this benefit increases to \$148.6 million for Option 1 and \$256.8 million for Option 2.
- **Transit Amenity:** The increase in passenger volume increases this benefit, although the net increase is minimal due to the “rule of a half” principle.
- **Auto Operating Cost Savings:** The decrease in vehicle kilometers travelled due to people switching from driving to alternative modes of transportation is expected to be ~\$24.9 million for Option 1, and \$41.4 million for Option 2.
- **Health/Walking Benefit:** As stated in Section 5.4, the health benefit is associated with increased walking activity related to accessing transit from the origin or destination. As people switch modes from driving to taking transit in this sensitivity test, those who switch will walk to/from their nearest transit stop, resulting in the total societal health benefit increasing to approximately \$123.0 million for Option 1 and \$143.9 million for Option 2.
- **Road Safety:** As there is a reduction of Automobile Vehicle Kilometers Travelled (VKTs), there is an increased societal benefit in road safety from the diminished risk of vehicle collisions to \$5.5 million for Option 1 and \$7.9 million for Option 2.
- **Auto GHG Emissions & Local Air Quality:** With the reduction in Auto VKTs in this sensitivity test, the amount of gas emissions produced by automobiles is reduced, reducing GHG emissions and improving the local air quality. The benefit in this

sensitivity test from the reduction in Auto GHG Emissions is \$1.5 million for Option 1, and \$2.6 million for Option 2. For improved local air quality, the benefit increases to approximately \$300,000 - \$500,000.

- **Incremental Fares:** In this sensitivity test, as people switch from driving to alternative modes of transport, transit ridership is expected to increase. This increase in ridership is expected to generate \$129.1 million for Option 1 and \$150.6 million for Option in incremental fare revenue.

This sensitivity analysis is expected to have no impact on the following benefit:

- **Auto Travel Time Savings:** In this sensitivity test, the benefit resulting from automobile travel time savings is not expected to change. This is because less traffic is expected due to fewer cars on the road resulting in additional travel time savings per person, but the number of people who benefit from this time savings decreases. Therefore, the total automobile travel time savings is not expected to change.

Additionally, operating and maintenance costs were increased by 15% for this sensitivity test due to the additional service needed to support the increased passenger demand associated with a 25% automobile mode share. A summary of the incremental benefits/costs can be found in the table in the following section.

## 5.8 Economic Case Summary

This Economic Case has quantified the user and external impacts associated with the Waterfront East LRT, plus the wider impacts to the broader society resulting from the improved transport corridor within the East Bayfront and the Port Lands.

In this analysis, Option 2 (Union and Distillery to Villiers Loop) performs better than Option 1 (Union to Villiers Loop). The benefit-cost ratio (BCR) for WELRT ranges between 0.19 and 0.74 depending on benefits incorporated which include conventional benefits, context-sensitivity & wider benefits, and assumed benefit from auto share sensitivity. The conventional benefit-cost ratio (BCR) of WELRT is 0.19 for Option 1 and ranges between 0.27 – 0.29 for Option 2, depending on the treatment of the benefits and costs of the project related to the western waterfront LRT lines.

Additionally, there are context-specific benefits that reflect the unique nature of the project as it supports new communities within Villiers Island and the Port Lands. Key benefits include the incremental revenue from the sale of public lands attributed to the higher land values in proximity to transit, and tourism benefits. With WELRT, it is anticipated that these wider economic benefits could yield an additional \$312 million to \$331 million (in 2023 prices). Including the context-sensitive benefits improves the benefit-cost ratio to 0.48 for Option 1 and 0.52 for Option 2. By factoring in the 25% auto share sensitivity, which assumes a higher percentage of automobile users switching to public transit improves the benefit-cost ratio to 0.74 for Option 1 and 0.71 for Option 2.

**Table 20: Option 1 Economic case Summary – (2023 prices, 60-year total discounted to PV)**

	Option 1	25% Auto Mode Share Sensitivity
<b>Capital Costs – including 100% of Segment 1 costs (A)</b>	\$1,393,900,000	\$1,393,900,000
<b>O&amp;M Costs (B)</b>	-\$100,500,000	-\$128,100,000
<b>Total Costs – including 100% of Segment 1 costs (C = A + B)</b>	<b>\$1,293,400,000</b>	<b>\$1,265,800,000</b>
<i>26% of Segment 1 costs provide benefit to Waterfront West (D)</i>	\$203,700,000	\$203,700,000
<b>WELRT-specific Costs (E = C – D)</b>	<b>\$1,089,700,000</b>	<b>\$1,062,100,000</b>
<i>Conventional Benefits</i>		
<b>User Impacts (Waterfront East only) (F)</b>	\$177,800,000	\$211,000,000
<b>User Impacts (Waterfront West) (F')</b>	\$35,100,000	\$35,100,000
<b>Incremental Fares (G)</b>	\$13,500,000	\$129,100,000
<b>External Benefit (H)</b>	\$16,300,000	\$131,000,000
<b>Conventional Benefits (I = F + F' + G + H)</b>	\$242,700,000	\$506,200,000
<b>Conventional Project NPV (I - C)</b>	-\$1,050,700,000	-\$759,600,000
<b>Conventional WELRT NPV (I – F' – E)</b>	-\$882,100,000	-\$591,000,000
<b>Conventional Project BCR (I / C)</b>	<b>0.19</b>	<b>0.40</b>
<b>Conventional WELRT BCR (I – F' / E)</b>	<b>0.19</b>	<b>0.44</b>
<i>Context-Sensitive &amp; Wider Benefits</i>		
<b>Parking Cost</b>	\$12,700,000	\$12,700,000
<b>Reduction of embodied carbon emissions</b>	\$41,000	\$41,000
<b>Imperfect Competition</b>	\$200,000	\$200,000
<b>Incremental revenue from sale of public lands<sup>27</sup></b>	\$289,000,000	\$289,000,000
<b>Tourism Benefits</b>	\$10,900,000	\$10,900,000
<b>Total Context-Sensitive Benefits (J)</b>	\$312,800,000	\$312,800,000
<b>Context-Sensitive WELRT NPV ((J+I-F') – E)</b>	-\$569,300,000	-\$278,200,000
<b>Context-Sensitive WELRT BCR ((J+I-F') / E)</b>	<b>0.48</b>	<b>0.74</b>
<i>Other Economic Metrics</i>		
<b>Construction jobs (average annual)</b>	800 direct jobs	800 direct jobs

<sup>27</sup> The value reported in the summary table is an average of the low-high range of public land value uplift (\$265.5M - \$313.5M) discussed in Section 5.5.



**Table 21: Option 2 Economic Case Summary - (2023 prices, 60-year total discounted to PV)**

	<b>Option 2</b>	<b>25% Auto Mode Share Sensitivity</b>
<b>Capital Costs – including 100% of Segment 1 costs (A)</b>	\$1,595,500,000	\$1,595,500,000
<b>O&amp;M Costs (B)</b>	\$39,300,000	\$50,100,000
<b>Total Costs – including 100% of Segment 1 costs (C = A + B)</b>	<b>\$1,634,800,000</b>	<b>\$1,645,600,000</b>
<i>26% of Segment 1 costs provide benefit to Waterfront West (D)</i>	\$203,700,000	\$203,700,000
<b>WELRT-specific Costs (E = C – D)</b>	<b>\$1,431,100,000</b>	<b>\$1,441,900,000</b>
<i>Conventional Benefits</i>		
<b>User Impacts (Waterfront East only) (F)</b>	\$333,200,000	\$380,400,000
<b>User Impacts (Waterfront West) (F')</b>	\$35,100,000	\$35,100,000
<b>Incremental Fares (G)</b>	\$35,000,000	\$150,600,000
<b>External Benefit (H)</b>	\$40,300,000	\$155,000,000
<b>Conventional Benefits (I = F + F' + G + H)</b>	\$443,600,000	\$721,100,000
<b>Conventional Project NPV (I - C)</b>	-\$1,191,300,000	-\$924,500,000
<b>Conventional WELRT NPV (I – F' – E)</b>	-\$1,022,700,000	-\$755,900,000
<b>Conventional Project BCR (I / C)</b>	<b>0.27</b>	<b>0.44</b>
<b>Conventional WELRT BCR (I – F' / E)</b>	<b>0.29</b>	<b>0.48</b>
<i>Context-Sensitive &amp; Wider Benefits</i>		
<b>Parking Cost</b>	\$31,400,000	\$31,400,000
<b>Reduction of embodied carbon emissions</b>	\$41,000	\$41,000
<b>Imperfect Competition</b>	\$400,000	\$400,000
<b>Incremental revenue from sale of public lands<sup>28</sup></b>	\$289,000,000	\$289,000,000
<b>Tourism Benefits</b>	\$10,900,000	\$10,900,000
<b>Total Context-Sensitive Benefits (J)</b>	\$331,700,000	\$371,700,000
<b>Context-Sensitive WELRT NPV ((J+I-F') – E)</b>	-\$691,000,000	-\$424,200,000
<b>Context-Sensitive WELRT BCR ((J+I-F') / E)</b>	<b>0.52</b>	<b>0.71</b>
<i>Other Economic Metrics</i>		
<b>Construction jobs (average annual)</b>	940 direct jobs	940 direct jobs

<sup>28</sup> The value reported in the summary table is an average of the low-high range of public land value uplift (\$265.5M - \$313.5M) discussed in Section 5.5.

Additional sensitivity analyses were completed to test the impact of specific parameters on the overall BCR. These include:

- **Higher growth in operating and maintenance costs** (e.g., +2% per year in real growth): This would have a low impact to the BCR given that operating and maintenance costs represent a small portion of overall costs. **The conventional BCRs would be 0.19-0.20 for Option 1, and 0.27-0.28 for Option 2.**
- **Annual growth in value of time** (+0.75% per year): This would have a marginal increase in the BCR to reflect the additional benefit over time. **The conventional BCRs would be 0.22-0.23 for Option 1, and 0.33-0.35 for Option 2.**

## 6. Financial Case

The Financial Case assesses the overall financial impact of WELRT investment. This assessment compares the incremental revenue against the incremental capital and operating and maintenance expenditure required for WELRT. The section includes a summary of capital plan, plus the overall costs for Option 1 and Option 2 of the Waterfront East LRT.

### 6.1 Incremental Cost

#### Capital Costs

The capital cost estimation is based on 30% design work that has been undertaken for the different elements of the project. **Capital costs provided as input into this business case are Class 3 Cost Estimates** (as defined by the AACE). **They are subject to change as design progresses.** These costs include cost of labour and materials to construct light rail infrastructure (civils, track, systems), which also covers elements such as road, public realm, transitway, and others. These costs also include allowances for contingency, procurement, engineering, construction management, and escalation. The input costs are previously described in Section 5.2.1.

#### Operating and Maintenance Costs

The operating cost estimates are calculated using TTC rates for operating and maintenance based on vehicle kilometres, vehicle hours, and the number of peak vehicles. The operating costs is incremental: it includes the cost of operating the WELRT service including both the LRT and the connecting bus between the LRT terminus and East Harbour, net of the operating cost of bus service that is assumed in the Base Case scenario. Annual operating and maintenance costs of Option 1 and Option 2 are in Table 22 below. Based on this analysis, Option 1 is showing an incremental operational cost saving for operating the LRT service instead of the Base Case bus service. The additional cost of LRT service on Cherry Street means that there is an additional operating cost for Option 2.

**Table 22: Annual operating costs by phase (2023 prices)**

1.	2.	Base Case	3.	WELRT	4.	Delta
5. <b>Option 1</b>	0	6. \$25,000,000	7.	\$23,900,000	8.	-\$4,200,000
9. <b>Option 2</b>	0	10. \$25,000,000	11.	\$30,600,000	12.	\$1,600,000

#### Incremental Cost Summary

Table 23 provides a summary of the total capital and operating and maintenance costs presented as nominal dollar values (inclusive of escalation), and in discounted present values. The present values are totalled over the 60-year evaluation period and is discounted to present value using a financial case discount rate of 5.5% in line with

Metrolinx Business Case Guidance. These values will differ from the Economic Case, as values includes inflation and a different discount rate.

**Table 23: Incremental cost summary (totalled over 60-years)**

13. Options	Opti	14. Nominal Dollars				15. Present Value			
		16. Option 1	Option	17. Option 2	Option	18. Option 1	Option	19. Option 2	Option
20. Capital Costs	Capit	21. \$2,003,800,000	Option	22. \$2,333,800,000	Option	23. \$1,524,000,000	Option	24. \$1,749,600,000	Option
25. O&M Costs	O&M	26. - \$758,000,000	Option	27. \$296,200,000	Option	28. - \$101,900,000	Option	29. \$39,800,000	Option
30. Total Costs	Total	31. \$1,245,800,000	Option	32. \$2,630,000,000	Option	33. \$1,422,100,000	Option	34. \$1,789,400,000	Option

## 6.2 Incremental Revenue

Additional revenue would be generated from the new ridership across the TTC network over the 60-year evaluation period associated with the WELRT project. As a high-level estimate, the incremental revenue is estimated from the number of new riders (from GTAModel) and an average TTC fare of \$2.92.<sup>29</sup> Within the Financial Case, the average fare is assumed to grow at an average inflation (2%) + 1%.

Table 24 provides a summary of the incremental revenue.

**Table 24: Incremental revenue (totalled over 60-years)**

35. Options	Opt	36. Nominal Dollars				37. Present Value			
		38. Option 1	Option	39. Option 2	Option	40. Option 1	Option	41. Option 2	Option
42. Revenue	Rev	43. \$92,700,000	Option	44. \$240,400,000	Option	45. \$10,700,000	Option	46. \$27,700,000	Option

In addition to incremental fare revenue, the annual tax revenue associated with total residential land value uplift is estimated as \$1,612,000 per year for both Options 1 and 2. The annual tax revenue associated with total non-residential uplift is estimated as \$1,630,000 per year. This is a high-level analysis based on 2022 property tax rates provided by the City of Toronto, and the total (public and private) land value uplift from the analysis in Section 5.5. Residential tax rates are based on 'Residential' and 'New Multi-Residential' total tax rates. Non-residential tax rates are based on 'Commercial' total tax rates. Annual tax revenue estimations may change based on updated property tax rates and/or changes to the total land value uplift.

<sup>29</sup> Average fare based on data within the 2021 TTC Annual Report, inflated to 2023 prices based on CPI.

### 6.3 Financial Case Summary

Table 25 summarizes the change in financial impact to the City associated with the WELRT. Note that these costs will be different to the Economic Case due to the use of inflation and a different discount rate. The net present value is negative meaning that the total costs are higher than the total revenue: these are driven by the capital costs.

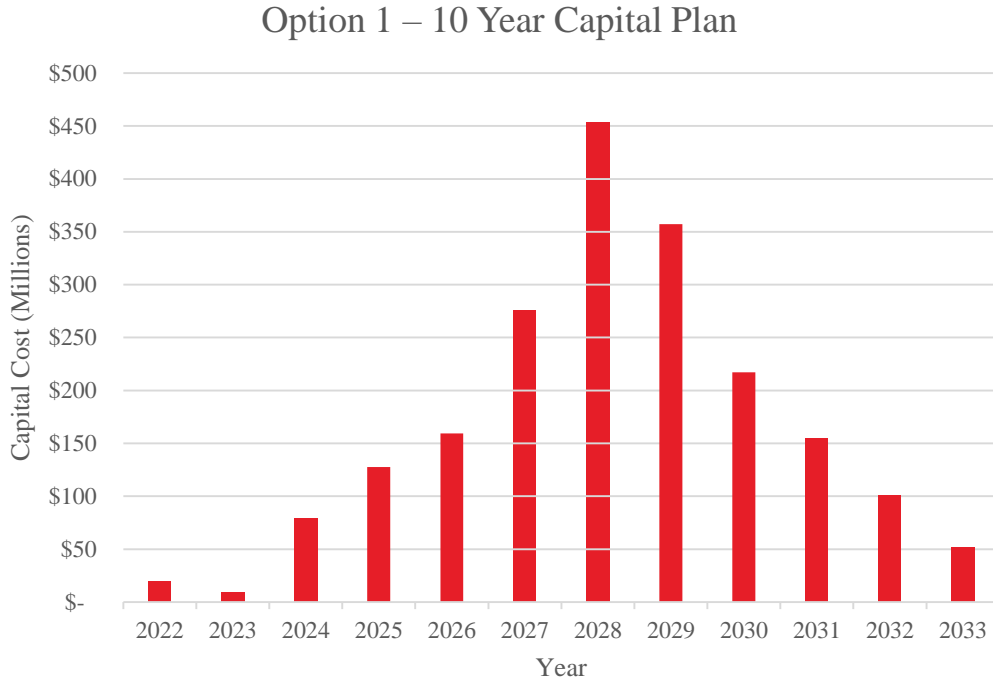
**Table 25: Financial case summary (\$2023 prices, discounted to PV)**

Cost	Nominal Dollars		Present Value	
	Option 1	Option 2	Option 1	Option 2
<b>Capital Costs</b>	\$2,003,800,000	\$2,333,800,000	\$1,524,000,000	\$1,749,600,000
<b>O&amp;M Costs</b>	-\$758,000,000	\$296,200,000	-\$101,900,000	\$39,800,000
<b>Total Cost (PV)</b>	<b>\$1,245,800,000</b>	<b>\$2,630,000,000</b>	<b>\$1,422,100,000</b>	<b>\$1,789,400,000</b>
<b>Incremental Revenue</b>	\$92,700,000	\$240,400,000	\$10,700,000	\$27,700,000
<b>Total Cost less revenue (NPV)</b>	<b>-\$1,153,100,000</b>	<b>-\$2,389,600,000</b>	<b>-\$1,411,400,000</b>	<b>-\$1,761,700,000</b>

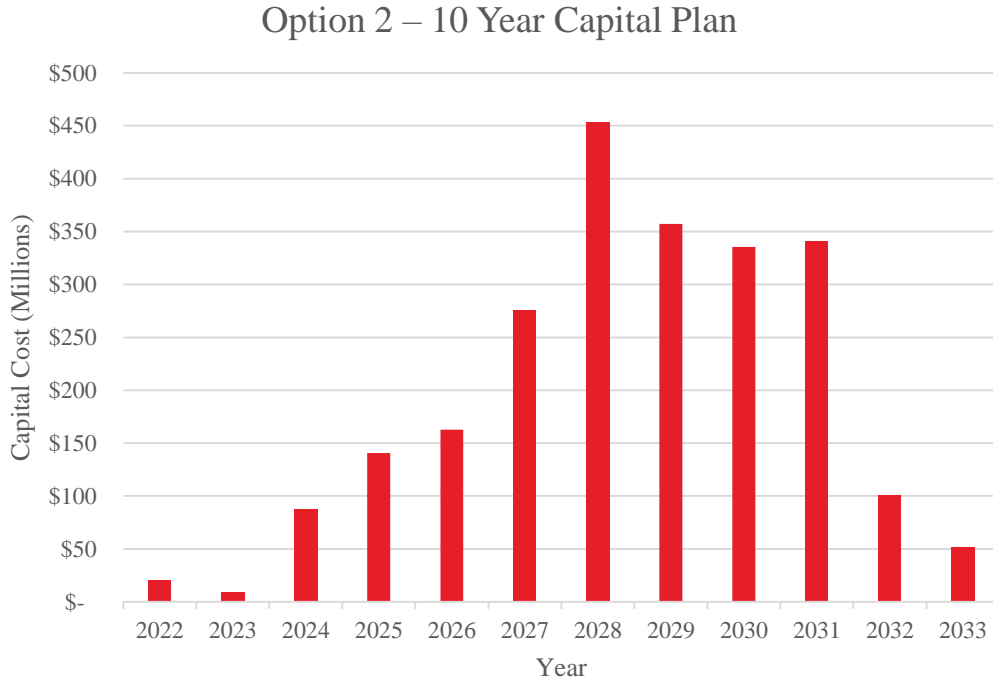
### 6.4 10-Year Capital Plan

Overall capital expenditure for Option 1 and Option 2 have been allocated to a particular year to reflect the proposed construction timings within the draft WELRT Implementation Plan (discussed in Section 7.1.4). A summary of the capital cash flows in each year between 2022-2032 is summarized in the following figures. The capital cash flows are similar between Options 1 and 2 up to 2030, with higher capital expected for Option 2 post-2030 to reflect the timing of the additional connection to Distillery Loop and the Cherry Street portal works.

**Figure 5: Option 1 – 10 Year Capital Plan (Nominal Dollars)**



**Figure 6: Option 2 – 10 Year Capital Plan (Nominal Dollars)**



## 7. Deliverability and Operations Case

The Deliverability and Operations Case provides an assessment of the approach and strategy to deliver the WELRT project. It highlights the key components of the project, the critical issues that impact delivery, and the risks of the project that should be considered during procurement, construction, and future operations.

### 7.1 Project Delivery

#### 7.1.1 Governance and Stakeholders

The City of Toronto, Waterfront Toronto, and Toronto Transit Commission (TTC) are working together to deliver the WELRT project and the Waterfront Transit Network. Table 26 summarizes their role and responsibilities on the project.

**Table 26: Stakeholders and their responsibilities on the project**

47. Stakeholders	48. Role and Responsibility
49. City of Toronto	50. The City of Toronto is responsible for the overall planning coordination for the Waterfront Transit Network, and the Waterfront East LRT project. The City is leading public and stakeholder consultations and will be responsible for providing the approvals to proceed with the project.
51. Waterfront Toronto	52. Waterfront Toronto is a tri-government corporation with the overall mandate to transform the Toronto waterfront by creating new places to live, work, learn, and play. Waterfront Toronto has lead responsibility for the design of the surface sections of the project, including Queens Quay East, Cherry Street, and Commissioners Street (Segments 2 & 3).
53. Toronto Transit Commission	54. The Toronto Transit Commission (TTC) is the operator of the local transit network including the existing streetcar routes into Union Station. The TTC has lead responsibility for the design for the underground section between Union Station and Queens Quay (Segment 1). The TTC will operate the new services planned for the Waterfront East Transit Network.

#### 7.1.2 Major Project Components

Major project components for WELRT are summarized in this section, including the alignment, stations, systems, signalling and equipment. The works are split into three main segments and described below.

**Segment 1** includes new civil infrastructure, track, underground stations, and rail systems to enable the LRT service underground between Union and Queens Quay. The works include the reconstruction and expansion of the Union Station streetcar loop, upgrades to Queens Quay Station entrances, construction and reconstruction of the east and west portals on Queens Quay, respectively, and various enabling works in the Bay Street Corridor.

**Segment 2** includes the Queens Quay transitway from Yonge Street to Cherry Street. It includes partial fill of the Yonge Street slip and provision of public realm in this section.

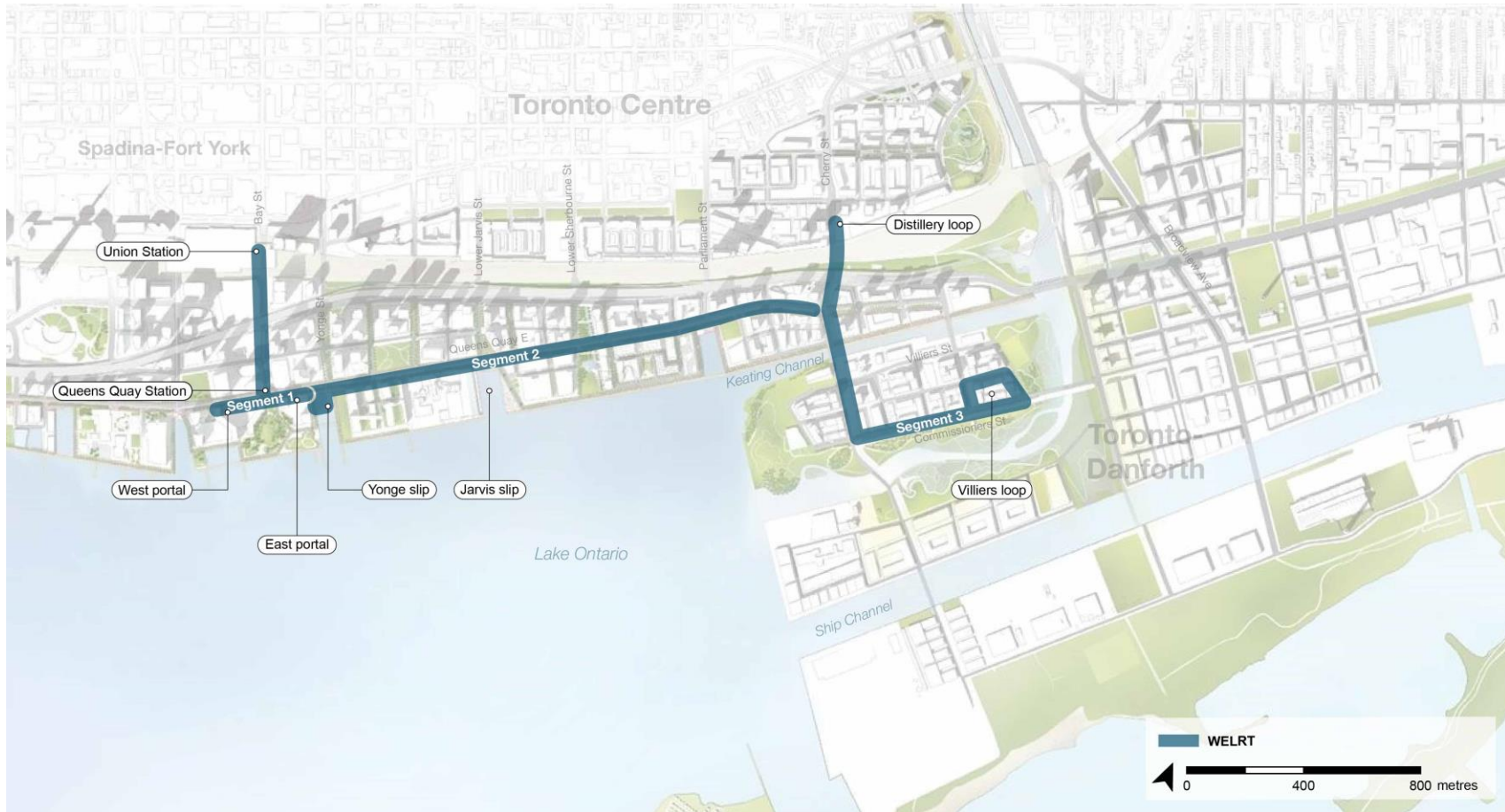


A Traction Power Substation (TPSS) has been identified within Quayside. Segment 2 also includes the extension of Queens Quay East from Silo Street to New Cherry Street.

**Segment 3** includes Cherry Street between Mill Street (Distillery Loop) and Commissioners Street (including the portal underneath the Union Station Rail Corridor), Commissioners Street between Cherry Street and the Villiers Loop, as well as a TPSS on Villiers Island in the vicinity of the future terminal loop.

These three segments for the project are illustrated in Figure 7.

Figure 7: WELRT project segments



### 7.1.3 Constructability challenges and impacts

Through the preliminary design of the different segments of the WELRT, key constructability challenges have been identified as areas of deliverability risk with potential impacts to project cost or schedule. The key challenges on the project are identified below, with mitigations to be developed as part of further design development and stakeholder coordination. Table 27 illustrates the main constructability challenges that may be encountered for each location. Each challenge has a different level of impact, risk on cost, or schedule.

**Table 27: Constructability challenges**

55. Location	56. Constructability challenges
57. Union Station	<ul style="list-style-type: none"> <li>Closure of the existing Union Station – Queens Quay streetcar loop and stations to enable rehabilitation and expansion of Union Station</li> <li>Complex underground construction of Union Station streetcar loop under existing rail corridor</li> </ul>
58. Queens Quay East Portal	<ul style="list-style-type: none"> <li>WELRT alignment located near existing hydro duct bank. Design requires coordination and approval with Hydro One (HONI) to minimize impact to existing duct bank and risk to schedule</li> <li>Construction will potentially cause service disruption for traffic and public transit</li> </ul>
59. Yonge Slip Fill	<ul style="list-style-type: none"> <li>Planned design requires stakeholder input on the acceptability of proposed operations and access to adjacent building</li> <li>Construction sequencing of the WELRT needs to consider maintaining the existing combined sewer outflow at this location</li> <li>Operational model of Yonge slip requires confirmation prior to construction</li> </ul>
60. Yonge/Queens Quay Intersection	<ul style="list-style-type: none"> <li>Existing parking lot east of Yonge slip is a preferred location for construction laydown; would require closure during construction</li> </ul>
61. 10 Yonge / Queens Quay	<ul style="list-style-type: none"> <li>Maintaining access to existing parking lot at 10 Yonge/Queens Quay during WELRT construction</li> </ul>
62. Adjacent Properties	<ul style="list-style-type: none"> <li>Corridor on Queens Quay is constrained in a limited number of locations where there is limited right-of-way. In these locations, the project assumes constrained conditions (i.e., without land acquisition)</li> <li>An easement may be required to accommodate the infrastructure adjacent to property on the northwest corner of Yonge /Queens Quay</li> </ul>
63. Quayside	<ul style="list-style-type: none"> <li>Portions of the road network and public realm constructed through the Quayside Infrastructure and Public Realm project will interface with the future WELRT construction. Construction activities will need to be coordinated accordingly.</li> </ul>

	<ul style="list-style-type: none"> <li>• A Traction Power Substation is planned for Quayside. The location and design to be coordinated with the Quayside proponent</li> </ul>
<b>64. Queens Quay East Extension</b>	<ul style="list-style-type: none"> <li>• Right-of-way located across a brownfield site with poor soils and risk of settlement. Design will require ground improvements to mitigate current conditions</li> <li>• Current stormwater management system design may require additional capacity and requires coordination with Toronto Water to identify an acceptable interim solution</li> </ul>
<b>65. Cherry Street (Queens Quay to Distillery)</b>	<ul style="list-style-type: none"> <li>• Alignment requires crossing of Lakeshore and Queens Quay, and new portal underneath existing Union Station Rail Corridor</li> <li>• Connection to Distillery Loop may impact the Cherry Street signal box</li> </ul>
<b>66. Cherry Street (Queens Quay to Commissioners)</b>	<ul style="list-style-type: none"> <li>• Right-of-way located on new, realigned Cherry Street being constructed as part of the Port Lands Flood Protection Project</li> </ul>
<b>67. All</b>	<ul style="list-style-type: none"> <li>• Coordination with Inner Harbour Tunnel project: Potential schedule and implementation impacts as it has a construction timeline that overlaps with this project</li> <li>• Coordination with various Metrolinx projects within the area</li> <li>• Gardiner Expressway re-construction (and re-routed traffic) could impact WELRT construction sequencing</li> <li>• Corridor located in area with potential water and soil contamination – mitigations are being explored through the TPAP</li> <li>• Delays in water permitting/approvals, including approval of any traffic impacts caused by the project construction</li> <li>• Coordination of utility impacts and any required relocations, including potential impacts on the project cost and schedule. This will include both coordination with interfacing projects and agreements required with utility providers</li> </ul>

During construction of the WELRT, there may be the need for temporary road closures and traffic diversions impacting Bay Street, Queens Quay, Cherry Street, and Commissioners Street. Details of the traffic diversions and other project impacts are discussed within the Environmental Project Report (EPR).

#### 7.1.4 Implementation plan

A draft implementation plan has been developed for the project as part of the preliminary design. Under the three segments, the implementation plan considers the following works:

### **Segment 1: TTC Underground Works**

- 1A: Union Station Upgrades
- 1B: Queens Quay West Portal Reconstruction
- 1C: Queens Quay East Portal Construction

### **Segment 2: Queens Quay Surface Works**

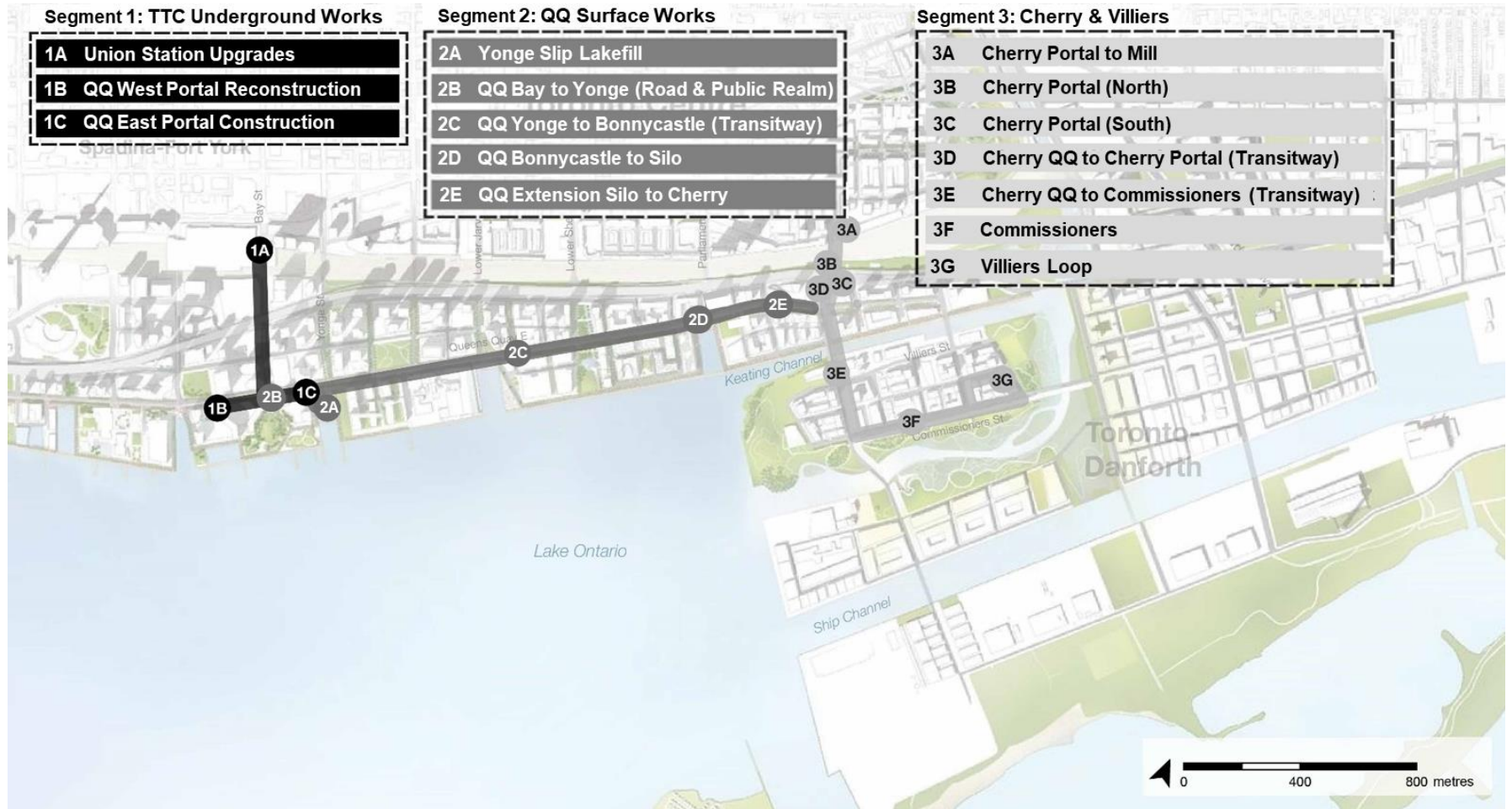
- 2A: Yonge Slip Lakefill
- 2B: Queens Quay, Bay Street to Yonge Street (Road & Public Realm)
- 2C: Queens Quay, Yonge Street to Bonnycastle Street
- 2D: Queens Quay, Bonnycastle Street to Silo Street (Transitway)
- 2E: Queens Quay Extension, Silo Street to Cherry Street

### **Segment 3: Cherry Street & Villiers Island**

- 3A: Cherry Street Portal to Mill Street
- 3B: Cherry Street Portal (North)
- 3C: Cherry Street Portal (South)
- 3D: Cherry Street, Queens Quay to Cherry Street Portal (Transitway)
- 3E: Cherry Street, Queens Quay to Commissioners Street (Transitway)
- 3F: Commissioners Street
- 3G: Villiers Loop (Transitway)

Figure 8 illustrates the locations of these construction works in each segment.

**Figure 8: Locations of WELRT construction works by segment**



Some of the works in Segments 1, 2, and 3 will be carried out in coordination with 14 projects outside of the WELRT project scope. These separate projects (SP) and their corresponding work coordination with WELRT are listed on Table 28. Figure 9 then further shows the interconnections between these separate projects and the timeline of WELRT construction works.

**Table 28: List of Separate Projects in coordination**

Separate Project (SP)	Project Timeline	Implications for WELRT	WELRT Components in Coordination	Risk to Project Delivery
<b>SP1. Quayside Project</b>	2023 – 2030 (TBD)	<p><u>Project scope:</u> Construction of infrastructure and public realm components to support development of several new blocks along Queens Quay between Bonnycastle St and Silo St.</p> <ul style="list-style-type: none"> <li>Includes the <b>Parliament Slip lakefill (SP1a)</b>, <b>realignment of Parliament Street (SP1b)</b>, and <b>extension of QQ from Bonnycastle Street east to Silo Street (Road and Public Realm of) (SP1c)</b>.</li> <li>If WELRT funding is available, construction of the transitway of QQ Bonnycastle to Silo (2C) may take place in conjunction with <b>QQ Bonnycastle to Silo (Road and Public Realm) (SP1c)</b> to minimize construction impacts.</li> <li>Parliament Slip Lakefill must be completed to advance WELRT in the area, however this is identified as an early work for the Quayside project.</li> </ul>	<ul style="list-style-type: none"> <li><b>2D:</b> Queens Quay, Bonnycastle Street to Silo Street (Transitway)</li> </ul>	<b>Low</b>
<b>SP2. Metrolinx USRC Signaling Project</b>	2023 – 2026	<p><u>Project scope:</u> Upgrades on signaling infrastructure throughout USRC (Union Station Rail Corridor). The Cherry Street Signal Tower must remain operational until Metrolinx transitions to new system by mid-2025, when the Tower is tentatively planned to be decommissioned.</p> <ul style="list-style-type: none"> <li><b>Cherry Portal North (3B)</b> construction may not commence until this project is completed.</li> <li>Transition to new signal system does not necessarily permit the relocation of Cherry Signal Tower to occur. Additional coordination and approval is required from Metrolinx.</li> </ul>	<ul style="list-style-type: none"> <li><b>3B:</b> Cherry Street Portal (North)</li> </ul>	<b>Medium</b>



<p><b>SP3. Metrolinx HONI Relocation</b></p>	<p>2023-2025</p>	<p><u>Project scope:</u> Relocation of HONI (Hydro One Networks Inc) overhead wires along the Union Station Rail Corridor (USRC) underground, along with HONI utility bridges across intersection (e.g., Cherry Street).</p> <ul style="list-style-type: none"> <li>The 90% project and 60% structural design drawings conflict with the WELRT Cherry Portal (3B, 3C) configuration, causing a delay in the <b>Cherry South portal (3C) construction</b> until after the <b>Gardiner-LSB project (SP4)</b> wraps up in 2029. This could set back the overall delivery of the 504A extension by around 2 years. The conflict is under further evaluation but additional work, expenses, and approvals might be required for retrofitting the HONI utility bridge.</li> </ul>	<ul style="list-style-type: none"> <li><b>3B:</b> Cherry Street Portal (North)</li> <li><b>3C:</b> Cherry Street Portal (South)</li> </ul>	<p><b>High</b></p> <p>(504A extension delayed by ~2 years – assumption of this risk is considered in schedule)</p>
<p><b>SP4. Gardiner-Lakeshore East Realignment</b></p>	<p>2026 – 2029</p>	<p><u>Project scope:</u> Reconstruction of Gardiner Expressway and Lakeshore Boulevard East of Cherry Street in a new alignment.</p> <ul style="list-style-type: none"> <li>This project intends to use most of <b>Segment 2</b> (QQ Bay to Parliament) as an interim detour/overflow route. The potential for lane reductions on QQ during this period is uncertain and must be further coordinated.</li> <li>This project will use a temporary bypass road for Lakeshore Boulevard across Cherry Street until its completion, after which <b>Cherry Street from QQ to Lakeshore (3D, 3E)</b> could start construction.</li> <li><b>Cherry Street between Lakeshore and Mill Street</b> (including 3A, 3B, 3C, 3D, 3E) will be closed throughout this project to minimize public disruption during this window.</li> </ul>	<ul style="list-style-type: none"> <li><b>2A:</b> Yonge Slip Lakefill</li> <li><b>2B:</b> Queens Quay, Bay Street to Yonge Street (Road &amp; Public Realm)</li> <li><b>2C:</b> Queens Quay, Yonge Street to Bonnycastle Street</li> <li><b>2D:</b> Queens Quay, Bonnycastle Street to Silo Street (Transitway)</li> <li><b>3C:</b> Cherry Street Portal (South)</li> <li><b>3D:</b> Cherry Street, Queens Quay to Cherry Street Portal (Transitway)</li> <li><b>3E:</b> Cherry Street, Queens Quay to Commissioners Street (Transitway)</li> </ul>	<p><b>High</b></p> <p>(Construction method for 3C potentially adapted in response to risk presented by future Gardiner bent conflict, and windows for South portal construction require additional coordination)</p>

<p><b>SP5. Villiers Island Enabling Infrastructure</b></p>	<p>2025 – 2039 (TBD)</p>	<p><u>Project scope:</u> Construction of enabling infrastructure for development on Villiers Island, including roads (except for Cherry Street and Commissioners Street) and public realm.</p> <ul style="list-style-type: none"> <li>• Villiers Loop (3G) is planned to be constructed on roads delivered through this project (including <b>New Munition Street, Centre Street, and Villiers Park Street</b>), of which delivery is planned for 2028-2030.</li> <li>• If WELRT proceeds ahead of Villiers Island, all or part of these three streets or supporting infrastructure (e.g., stormwater systems, grading) may need to be transferred to the WELRT project scope.</li> </ul> <p>If the Villiers Island project proceeds ahead of WELRT, these three streets may be delivered in an interim state, protecting space for the future Villiers Loop transitway.</p>	<ul style="list-style-type: none"> <li>• <b>3G: Villiers Loop (Transitway)</b></li> </ul>	<p><b>Medium</b></p> <p>(Potential additional cost borne by WELRT if Villiers Island Enabling Infrastructure does not proceed in time to deliver Villiers Loop transitway in tandem or following)</p>
<p><b>SP6. Inner Harbour West Tunnel</b></p>	<p>2029 – 2033</p>	<p><u>Project scope:</u> Construction of a tunnel through the bedrock along the alignment of Queens Quay, along with associated diversion chambers and drop shafts connecting to several existing CSOs throughout the WELRT Alignment, including Yonge Street, Jarvis Street, and Small Street.</p> <ul style="list-style-type: none"> <li>• Proposed Yonge Street infrastructure is north of Queens Quay and not in conflict with the planned WELRT construction, however an alternative is being discussed for locating the infrastructure within the Yonge Slip lakefill (2A) area, which would require coordination.</li> <li>• Proposed Jarvis Street infrastructure is identified to conflict with the planned WELRT construction. Comments have been submitted and coordination efforts will continue to resolve the conflict.</li> <li>• Proposed Small Street infrastructure north of Queens Quay is not in conflict with the planned WELRT construction.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>2A: Yonge Slip Lakefill</b></li> </ul>	<p><b>Medium</b></p> <p>(Jarvis Street additional design coordination)</p>

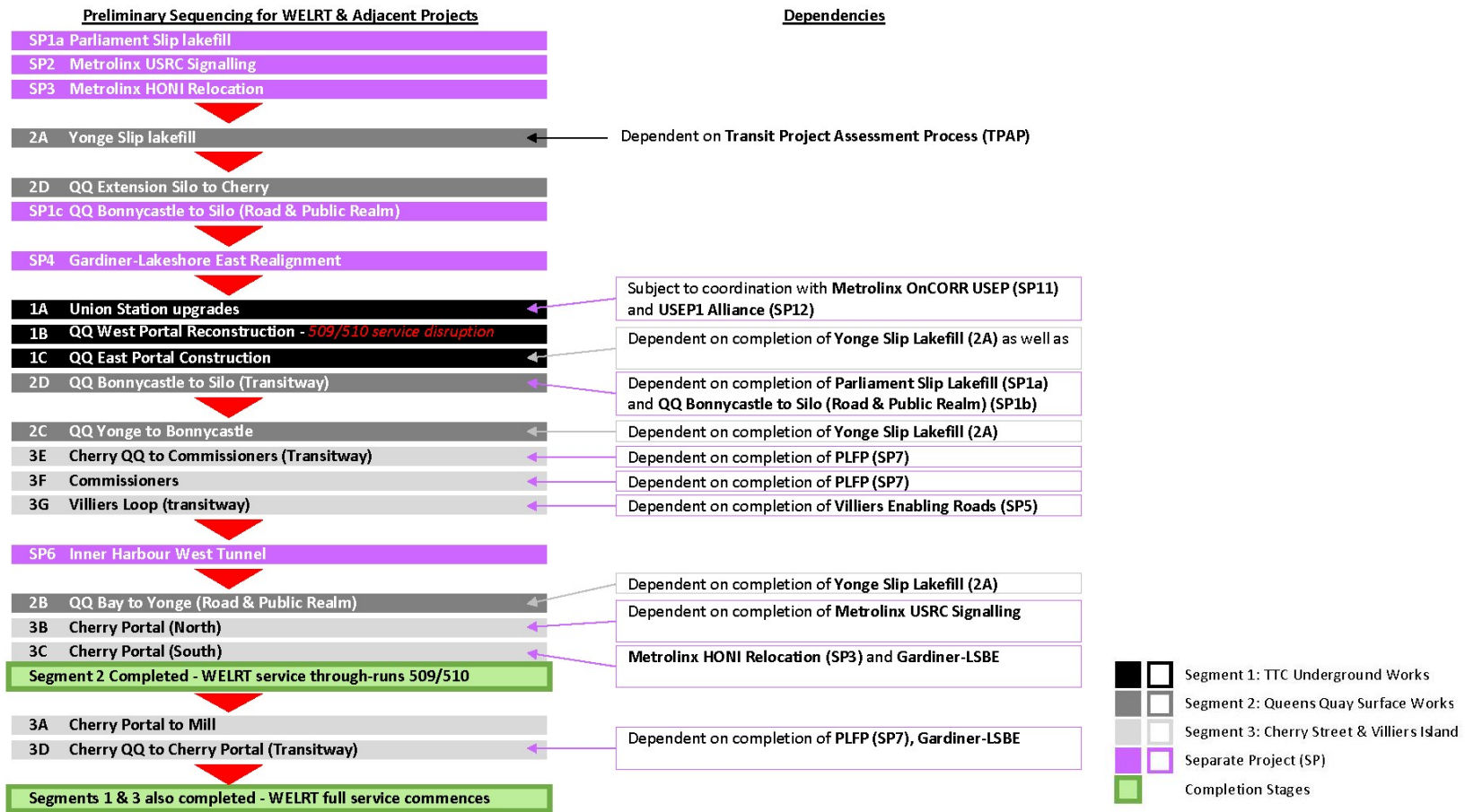
<b>SP7. Port Lands Flood Protection (PLFP)</b>	2017 – 2025	<p><u>Project scope:</u> Flood protection and construction of the future Villiers Island.</p> <ul style="list-style-type: none"> <li>• Portions on <b>Segment 3</b>, particularly along <b>Cherry Street and Commissioners Street</b> (3D, 3E, 3F) are all dependent on the completion of PLFP.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>3D:</b> Cherry Street, Queens Quay to Cherry Street Portal (Transitway)</li> <li>• <b>3E:</b> Cherry Street, Queens Quay to Commissioners Street (Transitway)</li> <li>• <b>3F:</b> Commissioners Street</li> </ul>	<b>Low</b>
<b>SP8. Cherry Street Combined Sewer Overflow (CSO) Protection</b>	TBD	<p><u>Project scope:</u> The current Cherry Street CSO runs along the old Cherry Street alignment, which is being shifted westward through PLFP project (SP1). Upon completion of PLFP, the CSO will run through a land parcel and will likely need to be rerouted to avoid this conflict. Current relocation routes identified by the Inner Harbour West Tunnel (SP7) team plan to maintain the current CSO route through the WELRT tracks, and reroute the CSO <b>east</b> of the tracks.</p> <ul style="list-style-type: none"> <li>• Since the CSO is in close proximity to the current Cherry Street track alignment, and realigning the tracks would pose a significant issue, it is decided that the most appropriate measure is to protect the CSO in its <b>current alignment</b> (through discussions with TTC, Toronto Water, and the Gardiner-Lakeshore East Realignment team).</li> <li>• A protective concrete <b>bridge</b> structure has been designed and costed in the current 30% design and will be advanced as design proceeds.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>3D:</b> Cherry Street, Queens Quay to Cherry Street Portal (Transitway)</li> <li>• <b>3E:</b> Cherry Street, Queens Quay to Commissioners Street (Transitway)</li> </ul>	<b>Medium</b>  (CSO protection design requires coordination and approval with Toronto Water)
<b>SP9. Lower Yonge Project</b>	TBD	<p><u>Project scope:</u> Planned reconstruction of Yonge and Harbour Street.</p> <p>The planned <b>Segment 1</b> construction timeline presents potential conflicts with this project. Further construction staging analysis will be required to ensure coordination of both projects. Coordination is required to align the timing of both the Lower Yonge precinct plan and the Harbour Street extension construction with the works in <b>1B and 1C</b> (e.g., availability of the designated bus stop or layover on Freeland Street as part of a replacement bus route proposed to connect QQ and Union).</p>	<ul style="list-style-type: none"> <li>• <b>1A:</b> Union Station Upgrades</li> <li>• <b>1B:</b> Queens Quay West Portal Reconstruction</li> <li>• <b>1C:</b> Queens Quay East Portal Construction</li> </ul>	<b>Low</b>

<b>SP10. 3C Waterfront Development</b>	Uncertain	<p><u>Project scope:</u> Development of the 3C Waterfront site will require access via the extension of <b>Queens Quay from Silo east to Cherry Street (2D)</b>. Developer has the option to proceed with the construction of municipal infrastructure within the Queens Quay East extension <b>required to service 3C development</b> if 2D works have not started by <b>June 2025</b> (as per an Ontario Land Tribunal decision). <b>Cherry Street transitway construction (3D, 3E)</b> is also in close proximity to the embankment at the 3C Waterfront development site.</p> <ul style="list-style-type: none"> <li>• Construction of the <b>Queens Quay extension (2D)</b> is planned to proceed by June 2025. Property access / easement may be required for <b>Cherry transitway construction (3D, 3E)</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>2D:</b> Queens Quay, Bonnycastle Street to Silo Street (Transitway)</li> <li>• <b>3D:</b> Cherry Street, Queens Quay to Cherry Street Portal (Transitway)</li> <li>• <b>3E:</b> Cherry Street, Queens Quay to Commissioners Street (Transitway)</li> </ul>	<p><b>Medium</b></p> <p>(Risk from coordination and cost from option to construct municipal infrastructure)</p>
<b>SP11. Metrolinx: GO Expansion - On-Corridor (OnCORR) Works project</b>	2024 – 2032	<p><u>Project scope:</u> OnCORR is the largest project in Metrolinx’s GO Rail Expansion program and aims to transform the regional rail network with electrification, more frequent service, shorter journey times and a more modernized system for the Greater Toronto and Hamilton Region. It involves the reconstruction of Union Station track and platforms.</p> <ul style="list-style-type: none"> <li>• <b>Union Station updates (1A)</b> will require coordination with this project and further coordination with Metrolinx and its Project Company (ONxpress) to adjust the staging and construction schedule for Union Station in order to account for overlapping staging area.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>1A:</b> Union Station Upgrades</li> </ul>	<p><b>Low</b></p>
<b>SP12. Metrolinx: GO Expansion - Union Station Enhancement Project (USEP) and (USEP1) / Alliance</b>	Present – 2025	<p><u>Project scope:</u> USEP serves to deliver substantial enabling works necessary to build capacity prior to the completion of OnCORR. This will involve the construction of new platforms with canopies and vertical access elements, two new tracks, a new concourse area, and installation of storm water management system and other building systems.</p>	<ul style="list-style-type: none"> <li>• <b>1A:</b> Union Station Upgrades</li> </ul>	<p><b>Low</b></p>

<b>SP13. Ontario Line</b>	Present - 2031	<p><u>Project scope:</u> The Ontario Line new rail service will connect the Exhibition/Ontario Place, downtown Toronto, Corktown, East Harbour, Pape Station and the Eglinton Crosstown LRT. It is expected to absorb some of the streetcar demand.</p> <ul style="list-style-type: none"> <li>• Current staging area will not conflict with Cherry Portal construction (3B, 3C).</li> <li>• Emergency Exit Building (EEB) staging area has been coordinated and its updated planned location does not conflict with WELRT.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>3B:</b> Cherry Street Portal (North)</li> <li>• <b>3C:</b> Cherry Street Portal (South)</li> </ul>	<b>Low</b>
<b>SP14. Planned OnTrack Alliance Track Closures</b>	Present – 2026	<p><u>Project scope:</u> OnTrack Alliance closure requirements on the south side of the USRC (i.e., Tracks E5, E6, Harbour Lead and Don Lead) are proposed for long term closures until summer of 2026.</p> <ul style="list-style-type: none"> <li>• There is a possible opportunity for to amend the <b>Cherry South Portal construction (3C)</b> method for greater encroachment into the Metrolinx property and more flexible track closure time.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>3C:</b> Cherry Street Portal (South)</li> </ul>	<b>Low</b>

Figure 9 presents an overview of the sequencing of WELRT work commencements and their associated dependencies, a majority of which are separate projects listed on Table 28.

**Figure 9: Work commencements of sub-areas of each segment and associated dependencies**



*\*Note: this preliminary sequencing estimate is provided at the time of this business case development and is subject to further refinement as project design and coordination advance.*

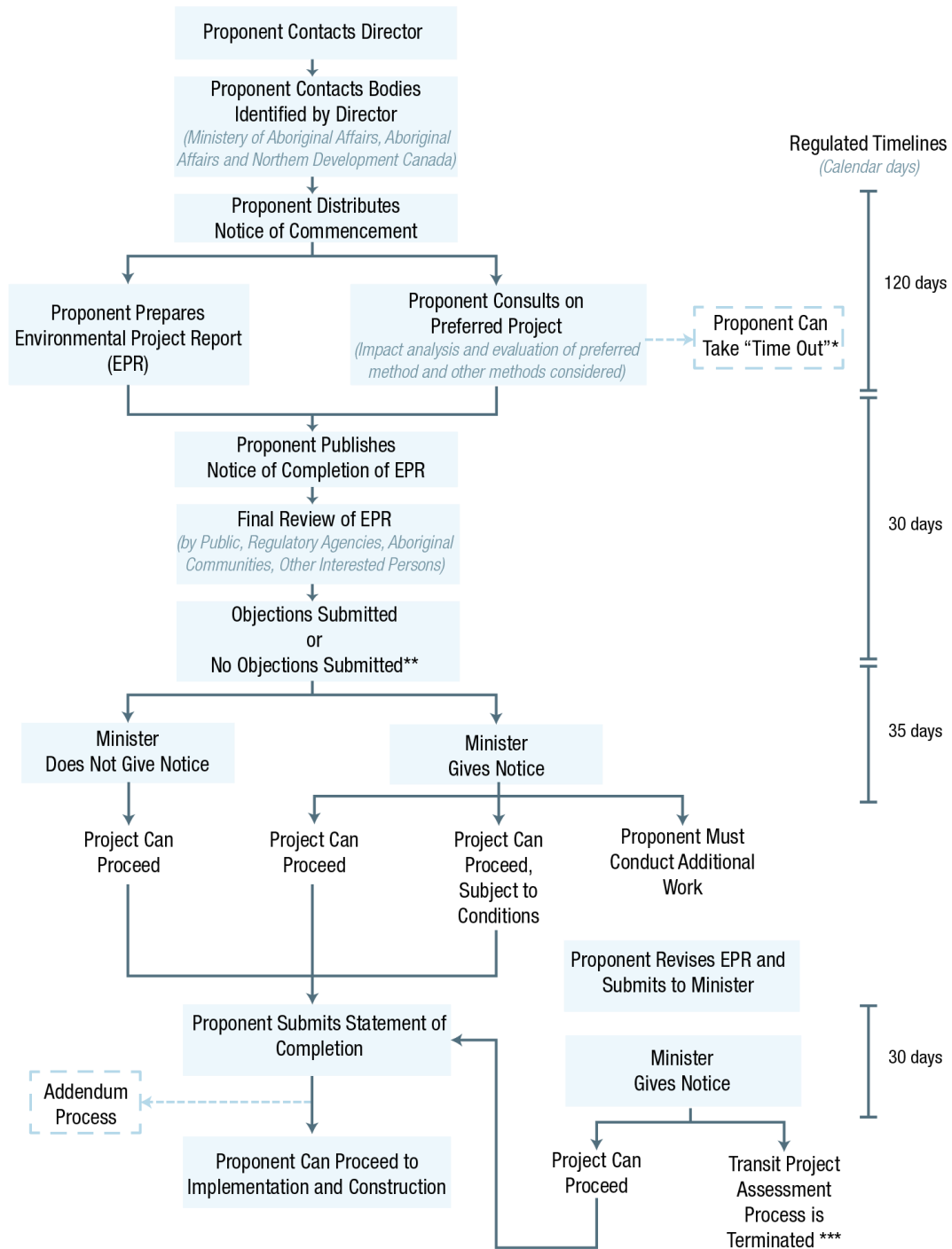
### 7.1.5 Environmental assessment requirements

Environmental approvals for WELRT were originally obtained through two different approvals processes: approvals for the portion of the project between Union Station and a loop located east of Parliament Street were obtained as part of the 2010 East Bayfront Transit Class Environmental Assessment (2010 EBF Transit Class EA) while approvals for the portion of the project between Parliament Street, the Distillery Loop, and the Polson Loop (the project's previously planned terminus) were obtained through the 2010 Lower Don Lands Infrastructure Master Plan and Keating Channel Precinct Environmental Study Report (2010 LDL IMP). In 2014, the 2010 LDL IMP was amended by the Lower Don Lands Environmental Assessment Master Plan (2014 LDL EAMP).

As environmental approvals remain valid for 10 years, the approvals for the portion of the project covered by the 2010 EBF Transit Class EA expired in 2020, while the approvals for the portion of the project covered by the 2014 LDL EAMP remain valid until 2024 (10 years from the date of approval). As construction on the Lower Don Lands has commenced, the 10-year limit is not an issue. However, it is good practice to perform updates when major changes occur. For this reason, the project proponents are pursuing updated environmental approvals through the transit project assessment process (TPAP) for the portion of the project previously covered by the 2010 EBF Transit Class EA. Figure 10 summarizes the overall process that will be undertaken to satisfy the TPAP. **A draft of the Environmental Project Report is expected to be published in 2023.**



**Figure 10: TPAP timelines**



## 7.2 Operations and Maintenance Plan

### 7.2.1 Changes in Service Provision

This section provides an overview of the changes in service routes under the phasing plan, as well as new services and operational considerations after the completion of WELRT in 2032.

#### 7.2.1.1 Interim Conditions

During construction, an interim transit service plan will be in operation to mitigate the disruption on the existing streetcar service during construction. Several interim streetcar and bus services are proposed during the following WELRT construction works:

- 1A: Union Station upgrades (2027 – 2032)
  - **Temporary streetcar through-service** between Villiers Loop and Exhibition Loop, by-passing Bay Street
  - **Replacement bus** to connect Queens Quay and Union, with a proposed route of Freeland Street – Front Street or Wellington Street – Simcoe Street
  - Proposed **passenger transfers**:
    - Freeland - QQ East (for streetcar service from the east)
    - Existing 509 Street streetcar stop near the Harbourfront Centre (for streetcar service from west)
- 1B & 1C: Queens Quay Portal Construction (2027 – 2029)
  - **510 route** is planned to extend west towards Exhibition during the temporary suspension of the 509 route
  - **Replacement buses** providing coverage from Spadina east toward downtown. Special trips during peak periods may be provided depending on demand in the downtown area
- 3B: Cherry Street Portal North (2030 – 2031)
  - **Replacement bus** for 504A will be required from 2028 – 2029 for TTC’s planned State of Good Repairs program during the Distillery Loop closure
  - Potential use of a portion of the Distillery Loop area to enable buses to **turn around within the streetcar right-of-way** during the construction of the Portal

In addition, there also several broader network impacts to note during WELRT construction:

- Potential service disruptions for traffic and public transit during the construction of the QQE Portal
- Ongoing closures of Queen and Yonge Streets (Metrolinx)
- TTC State of Good Repairs program:

This program involves a portion of the TTC’s expenditure allocated towards maintaining the safety and dependability of its system and infrastructure. Related works in the following areas may have a significant impact on the feasibility of running replacement buses as part of the WELRT:

- King-Parliament in 2028
- Queen-Church in 2028
- Along Spadina in 2028

- King East from Queen West to Parliament in 2029

TTC will look to combine routes and replacement buses as much as possible to minimize disruption. Adjustments will be required through coordination with the Infrastructure and Coordination Unit within the City of Toronto.

As the proposed work progresses through detailed design, mitigation measures including alternatives stops and detour routes will need to be developed to provide continued service during construction. The Traffic Management Plan, which will be developed during detailed design, will identify detours / lane closures / restrictions that will also apply to buses. In particular, the WELRT project schedule should be coordinated with the Gardiner Expressway project schedule so that there is sufficient network capacity in the area during construction.

#### *7.2.1.2 Full Build-out Conditions*

68. This section discusses operational considerations for the WELRT. Based on demand estimated for the route, the route is estimated to operate with up to 3-minute headways. The high frequency of this service may present potential reliability challenges for transit and traffic during operation given the number of multi-modal movements and signalized intersections along the corridor. In particular, current analysis suggests potential impacts on Cherry Street for both future transit and traffic operations, as described below.

Travel demand to and from the Lower Don Lands and Keating Channel Precinct is expected to grow significantly over the next 20 years to 2041. Several studies, including approved EAs and subsequent addenda, were undertaken in the area and recommended the transportation network currently planned. Specifically, the EAs recommended vehicular connections across the Keating Channel at Cherry Street and New Munition Street, with the LRT connection only at Cherry Street.

#### **Bus service**

Changes to the local bus route network are also required once WELRT is in service. Routes currently under consideration with TTC Service Planning include:

- Route 19, which would run on Bay Street to connect Union Station to Bay Station (Line 2).
- Route 97B, which would run on Yonge Street, connects to the WELRT at Queens Quay and Freeland Street.
- Unnamed bus route, which would be implemented following the construction of the connection between Church Street and Cooper Street.
- Route 75, which would run on Sherbourne Street to connect to Sherbourne Station (Line 2).
- Route 65, which would run on Parliament Street to connect to Castle Frank Station (Line 2).
- Route 172, which would run on Cherry Street to connect Cherry Beach to Corktown Station.
- Route 72, which would run on Commissioners Street to connect Villiers Loop to Pape Station (Line 2).

- Route 519A, which would temporarily run on Don Roadway to connect Villiers Loop to East Harbour
- Route 519B, which would temporarily run on Commissioners Street to connect Villiers Loop to the Leslie Barns

### Changes in Maintenance Plan

Train maintenance, guideway maintenance, equipment, and system maintenance, as well as ancillary maintenance operations, are expected to be covered by the TTC. No shortfalls in operations and maintenance facilities and equipment are assumed at this stage. The new train maintenance and storage facilities, the Leslie Barns, and the currently updated Russell Carhouse, offer potential maintenance and storage capacity for WELRT’s rolling stock.

## 7.3 Procurement Plan

Two separate Procurement Options Assessments have been conducted to determine the optimal models for the successful delivery of WELRT. For Segment 1 (TTC Underground Works), the TTC engaged CIMA Canada Inc. (CIMA+) and PricewaterhouseCoopers LLP (PwC) to carry out a Procurement Options Analysis for the underground works. Similarly, procurement options were evaluated by the Waterfront Toronto for the above-ground segments, including Segment 2 (Queens Quay Surface Works) and Segment 3 (Cherry Street & Villiers Island).

### 7.3.1 Segment 1

#### 7.3.1.1 Assessment Methodology

A series of qualitative and quantitative assessments have been performed by PwC and CIMA+ in collaborations with TTC to derive the final recommended procurement options for the delivery of Segment 1 of WELRT. The methodologies through which the recommendations were concluded are detailed below.

#### a) Multi-criteria Analysis

A series of collaborative workshops have been completed with the TTC to evaluate a list of six project procurement options in an initial Multi-criteria Analysis (MCA) workshop, which were later narrowed down to four in a supplementary MCA workshop. The models compared included Design-Bid-Build (DBB), Progressive Design-Build (PDC), Construction Management with a Fee at Risk (CMAR), and Collaborative Contracting Alliance Contracting / Integrated Project Delivery (AC/IPD). The criteria evaluated included:

- Flexibility
- Interfacing project integration
- Schedule
- Efficient risk allocation
- Stakeholder support

- Market appetite - designers, constructors, and financiers
- Budget

From the four models, those among the highest scored were selected to move forward to a quantitative assessment. A summary of the key findings from the MCA is outlined in Section 7.3.1.2.

### b) Market Sounding

To assess the market appetite for the WELRT project and its potential procurement options, a market sounding exercise was completed to solicit feedback from Canadian and international engineering and construction firms experienced in the delivery of comparable projects. The main goal was to understand various aspects related to the project, such as its technical nature, procurement and contractual factors, the capacity of the contractors, financial views, as well as the general interest and willingness to bid on the project. Table 29 highlights the key findings.

**Table 29: Key findings from market sounding for Segment 1 construction**

Assessment	Participants Response
<b>Market Interest</b>	<ul style="list-style-type: none"> <li>• Participants expressed <b>high interest</b> and have experience undertaking projects of similar size and scope. Their interest is contingent upon proper sharing of risks and rewards between the TTC and partner.</li> </ul>
<b>Market Capacity</b>	<ul style="list-style-type: none"> <li>• Participants indicated <b>sufficient capacity</b> for the project. However, the market is expected to face capacity constraints for contractors and trades in the coming years due to a large number of transit projects planned for Toronto and Ontario.</li> </ul>
<b>Market Preferences</b>	<ul style="list-style-type: none"> <li>• <b>Background studies including geotechnical investigations, contamination studies and utility location drawings</b> have been identified as crucial information required for bidding on the WELRT Project. Other required background studies include decontamination reports, studies from recent projects in the vicinity, and approvals or permits from key stakeholders (e.g., City of Toronto).</li> </ul>
<b>Challenges / Risks</b>	<ul style="list-style-type: none"> <li>• <b>Sourcing and procuring materials is a potential challenge</b> considering the instability in pricing for materials mostly due to the COVID-19 pandemic.</li> <li>• <b>Utilities, geotechnical reporting, contamination, stakeholder management, property requirements/land acquisition, and traffic management</b> have been identified as major risks by participants.</li> <li>• <b>Project interface risk between the TTC/Waterfront projects</b> has been unanimously identified as a challenge due to time-consuming interface agreements. Concerns were also raised about potential differences in procurement models between the two projects while the market may prefer a single point of contact in decision making. However, participants expressed interest in the interface scope and their experience with transit integration.</li> </ul>

### c) Risk Analysis

A quantified risk analysis was used to evaluate project risks retained by the public sector across the two procurement options shortlisted from the qualitative assessment stage. This was achieved by identifying, quantifying, and analyzing the risks of WELRT and the expected retained risk under each procurement

model. This exercise involved evaluating the probability of each risk occurring as a percentage, as well as the estimation of the cost impact from each risk occurring as a percentage of the WELRT's base costs or as a monthly delay cost. The risks were then allocated to the public or private party best suited to manage them in order to minimize the cost of each risk.

The quantified transferred risks were included in the Value for Money (VFM) Analysis.

#### **d) Value for Money Analysis**

Subsequently, a VFM analysis was conducted for the two shortlisted options. The purpose was to evaluate and compare the two options on a risk-adjusted net present value (NPV) basis, with the goal of identifying the model that would provide the highest VFM for the TTC throughout the WELRT lifecycle. In the analysis, a Public Sector Comparator (PSC), which provides a risk-adjusted cost estimate of project delivery under a traditional procurement model, was compared against the two shortlisted procurement options with different risk and responsibility allocations than the PSC.

The results from the VFM analysis are detailed in Section 7.3.1.2 to account for the final recommendation.

#### **7.3.1.2 Procurement Options**

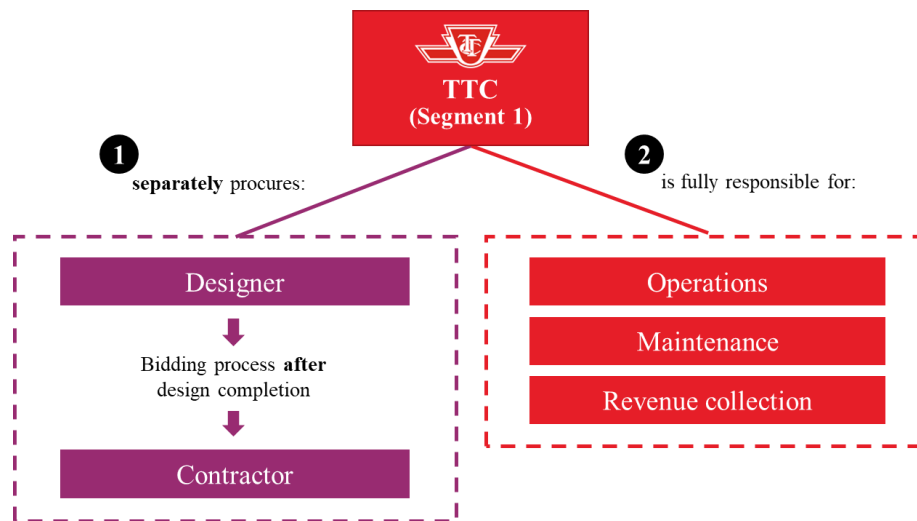
Combining the results from the qualitative and quantitative assessments, the Procurement Options Analysis (POA) identified either Design-Bid-Build (DBB) or Progressive-Design-Build (PDB) as viable procurement models to deliver the project. Considering the results the POA, the Team recommended adopting a PDB procurement model for WELRT Segment 1.

#### **Design-Bid-Build (DBB):**

As the conventional project delivery approach for the TTC, DBB is where the design is procured and completed before the bidding process for a construction contractor begins. Once a contractor is procured based on their qualifications, experience, and price, the construction phase of Segment 1 commences in 2027.

In the design and construction phases, the TTC enters separate contracts with different private sector contractors, and retains the responsibility for the operations, maintenance, and revenue collection, as well as the overall effective integration of the design and construction of the WELRT. It will also retain most of the risks in the project. Figure 11 illustrates the responsibility division among the parties under a DBB model.

**Figure 11: Typical division of responsibilities under a Design-Bid-Build (DBB) model**



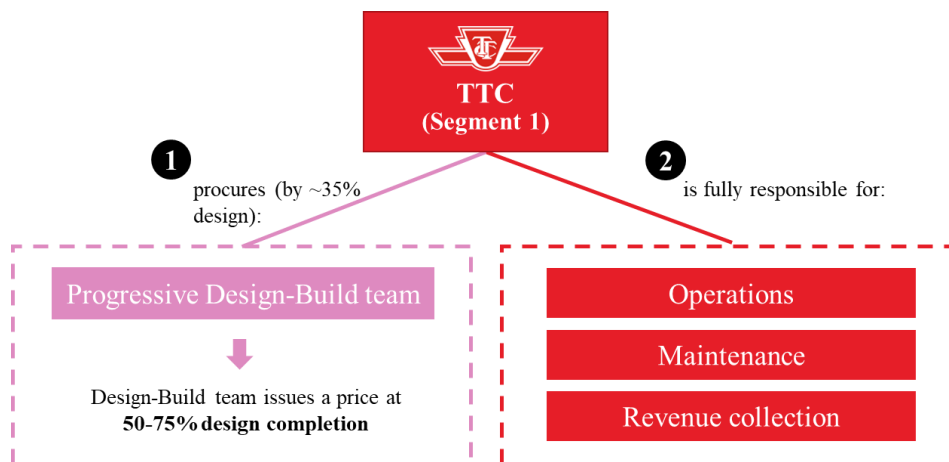
**Progressive Design-Build (PDB):**

Rather than procuring a designer and contractor separately at ~35% design or more, under a PDB model, the TTC would gather a single design-build team typically even earlier in the design phase. The team will be selected almost entirely based on qualifications.

As the design reaches ~50-75% of completion, the team will issue a price for the project in the form of either Guaranteed Maximum Price (GMP), Target Price (TP), or Lump Sum (LS), depending on the market conditions and practices.

Under this model, the PDB team has the opportunity to participate in the early stages of the development of Segment 1, which allows them to play an integral part of the TTC’s project team in the designing the underground works. This model fosters collaboration between the three key parties in a construction contract – the TTC, designer, and contractor. Figure 12 illustrates the responsibility division among the parties under this model.

**Figure 12: Typical division of responsibilities under a Progressive Design-Build (PDB) model**



Alliance Contracting/Integrated Project Delivery and PDB are two of the top scorers in the final MCA and the most feasible options for the TTC to implement for Segment 1. However, given the lack of market

maturity and experience, the AC/IPD model was not considered further for analysis. The analysis proceeded with the comparison of the traditional DBB delivery method as a baseline model with PDB as the preferred procurement delivery model. Though minimal, the evaluated differences between the two suggest that the PDB model would be preferable to the DBB model overall. PDB was assigned a slightly higher MCA score than DBB, and the VFM analysis also suggests that PDB provides positive VFM (approximately 4%) when compared to the DBB, a difference deemed significant enough to suggest that PDB may be a more cost-effective choice for the design and construction of Segment 1. In all, PDB option has an advantage over DBB model both qualitatively and quantitatively.

While it is understood that the TTC has historically adopted the DBB model for its facilities capital programs, the model has not been used for a heavy civil infrastructure project like the WELRT. Adopting a PDB model for the WELRT presents an opportunity for the TTC to expand its design-build capabilities into the heavy civil infrastructure arena.

### 7.3.2 Segments 2 & 3

#### 7.3.2.1 Assessment Methodology

##### a) Multi-criteria Analysis

A Multi-criteria Analysis (MCA) was conducted by Waterfront Toronto to identify a procurement model best suited for the delivery of Segments 2 & 3 of WELRT.

Waterfront Toronto has evaluated a list of six procurement options in an MCA exercise. The models compared included Design-Bid-Build (DBB), Design-Build (DB) Construction Manager at Risk (CMAR), Design-Build-Finance (DBF), Build-Finance (BF), and Alliancing/Integrated Project Delivery (IPD).

A list of eight Project Specific Procurement Principles were developed, against which each component of work was assessed to allow for application of appropriate procurement criteria. That includes the ability of the model to meet the following principles:

- Conduct open, fair, transparent and competitive procurement
- Manage occupational health and safety compliance risk
- Manage risk appropriately
- Pre-construction planning and procurement readiness
- Encourage innovation
- Manage integration and changed conditions risk
- Achieve design excellence
- Manage market uncertainty to contain cost
- Secure early contractor involvement

The final recommendation in the section below illustrates the definitions of these principles through the rationale employed.

##### b) Risk Identification



The selection of a suitable procurement model also took into account the scopes of various high-impact project risks expected in Segments 2 & 3. The identified risks range from potential interface risks associated with coordination with the separate projects (Table 28), approvals and dependencies, and risks arising from construction complexity. An ideal procurement model is expected to allocate risks to the parties that can optimally leverage their respective capabilities to manage them.

### *7.3.2.2 Procurement Option*

Comparing the six models among all eight principles, the **Construction Manager at Risk (CMAR)** model has scored the highest in the MCA. Of note, the criteria in which CMAR has scored the highest include the ability to achieve design excellence under the approved budget, as well as work packaging and staging strategy development the model can support before the construction phase, both of which are assigned the highest weighting in the MCA.

#### **Construction Manager at Risk (CMAR):**

At ~30% design completion of Segments 2 and 3, a **construction manager (CM)** is selected early on based on services, qualifications, and fee proposal. During the design phase, the CM would provide **pre-construction services** to facilitate the constructability and financial feasibility of WELRT, the scope of which is shown in Table 30. The CM would then procure sub-trade tenders at different stages of design completion to accommodate the recommended schedule. This would be an open book process where the costs of the sub-contractors are transparent for Waterfront's inspection. Cost certainty is achieved when the final sub-trade tender is awarded by the CM.

At ~60-90% design completion, Waterfront Toronto and the CM could negotiate either a Guaranteed Maximum Price (GMP) or a Lump Sum (LS) price for the construction of Segments 2 and 3 based on the defined scope and schedule. In the construction phase, the GC would provide **construction services** and **post-construction services** for Segments 2 and 3, the scopes of which are also outlined in Table 30.

The figure below shows the typical division of responsibilities under this model.

Figure 13: Typical division of responsibilities under a CM at risk model

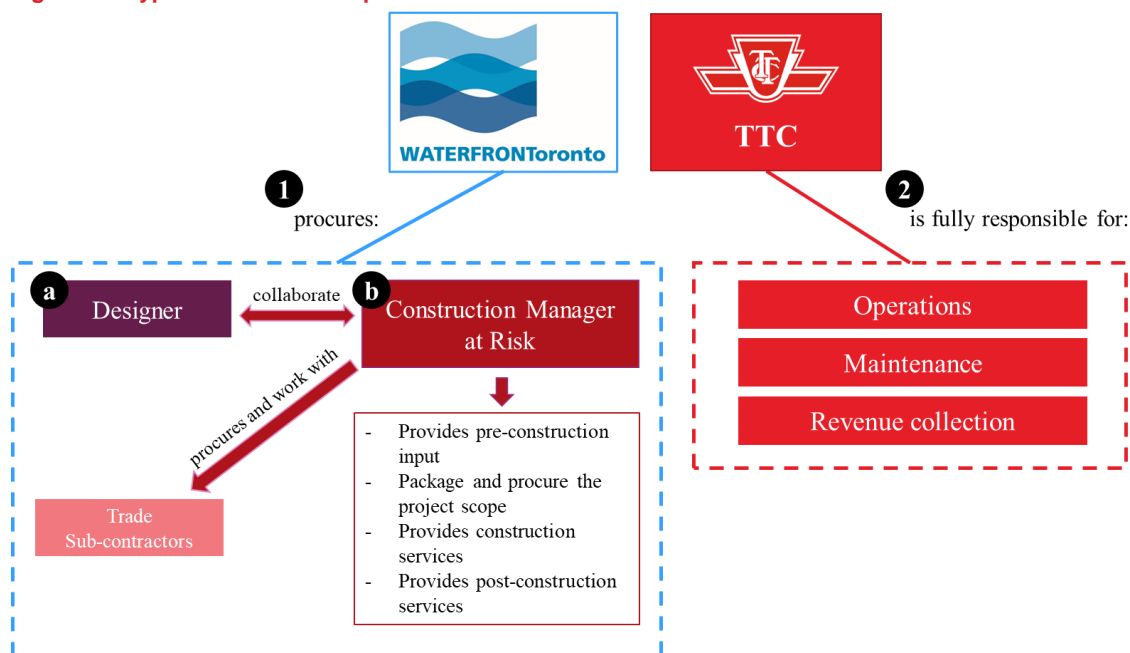


Table 30: Input from CM at risk throughout design and construction phases

Input from CM at risk:	1. Pre construction services	2. Construction Services	3. Post Construction Services
<b>Scope of Work:</b>	<ul style="list-style-type: none"> <li>• Cost estimating</li> <li>• Scheduling</li> <li>• Constructability reviews</li> <li>• Procurement (i.e., tender packages, pre-qualification, long lead materials and equipment orders, labour, sub-contractor)</li> <li>• Value engineering</li> </ul>	<ul style="list-style-type: none"> <li>• Health and Safety</li> <li>• Site Logistics</li> <li>• Construction scheduling</li> <li>• Sub-Contract Management</li> <li>• Quality control</li> <li>• Reporting</li> <li>• Change management</li> <li>• Construction means and method</li> </ul>	<ul style="list-style-type: none"> <li>• Operations (i.e., facilitate takeover of WELRT, and coordinate trade subcontractors' major claim requests)</li> <li>• Warranties (i.e., administer warranties of the trade sub-contractors)</li> <li>• Handover (i.e., assist in completing handover of WELRT to the City)</li> </ul>

As can be seen from the model structure, CMAR accommodates separate construction consultants and design teams for different components, which can allow for an increased competition in consultant procurement. With that, not only is the CMAR model expected to result in the greatest risk transfer related to the construction process (e.g., site logistics, timing and sequencing of tender packages, construction issues), but it also offers easier coordination between different aspects of the project with the CM as a single point of contact and accountability as advised, rather than a separate CM and GC.

Moreover, this model offers sufficient flexibility to accommodate changes in Waterfront's project scope, particularly when necessitated by adjacent project coordination.

Instead of procuring contractors and/or sub-contractors for each component directly itself, Waterfront Toronto would procure through the CM in accordance with the agreed component packaging, though the agreement should also allow Waterfront to procure directly if deemed advantageous, specifically from a cost, schedule, and risk perspective. It is also worth noting that separate agreements should be issued for every sub-component project procured by the CM. In addition, while the CMAR model ultimately serves to optimize cost and schedule efficiencies, Waterfront Toronto would bear most of the project risks.

