ATTACHMENT 2

Updated Initial Business Case

Eglinton East Light Rail Transit (EELRT)

OCTOBER 2023

TORONTO

Contents

Tables

Figures

Executive Summary

Introduction

The purpose of this Initial Business Case (IBC) is to provide an updated assessment on higher-order transit for a study area located in eastern Scarborough as compared to a Base Case or Business-as-Usual (BAU) scenario to determine a preferred option for further design and analysis.

A business case for transit investment is prepared to gather and present evidence to support decision making and to answer the following fundamental questions:

- **Strategic Case:** If a project is supported by a robust case for change that fits with wider public policy objectives.
- **Economic Case:** If the project can be demonstrated to show good value for money.
- **Financial Case:** If the project is financially affordable.
- **Deliverability & Operations Case:** If the project is achievable.

As a result of the introduction of the RapidTO curbside bus lanes in late 2020, this updated IBC compares the proposed LRT investment against an improved transit environment from what was considered in 2016.

The options evaluated are as follows:

- **Base Case – 2041 Business-as-Usual (BAU):** The Base Case is the BAU scenario set in the horizon year of 2041. This scenario assumes the existing higher order transit network including everything that is currently under construction, the proposed Line 4 extension, and the Durham-Scarborough BRT (DSBRT). GO Expansion with all-day, two-way service is assumed at 15-minute headways for the Lakeshore East line at Eglinton GO and Guildwood GO; and at 7.5-minute headways for the Stouffville line at Kennedy GO. This scenario consists of bus service using the RapidTO curbside bus lanes along Eglinton Avenue East, Kingston Road, and Morningside Avenue to Ellesmere Road. North of the University of Toronto Scarborough (UTSC) in the rest of the study area, transit service is provided by local and express buses running in mixed traffic. This includes services along Sheppard Avenue East, Morningside Avenue, and Neilson Road.
- **Option 1 – Eglinton East LRT (EELRT):** Option 1 is the EELRT project as a distinct service separate from Line 5. This scenario also

assumes the existing higher order transit network including everything that is currently under construction, the proposed Line 4 extension, and the DSBRT. GO Expansion with all-day, two-way service is assumed at 15-minute headways for the Lakeshore East line at Eglinton GO and Guildwood GO; and at 7.5-minute headways for the Stouffville line at Kennedy GO. The EELRT alignment extends from Kennedy Station to Sheppard Avenue East and McCowan Road (Sheppard East Station) along Eglinton Avenue East, Kingston Road, Morningside Road, and Sheppard Avenue East via UTSC and Malvern Town Centre. The light rail vehicles (LRVs) are planned to be stored and maintained at a maintenance and storage facility located north of Sheppard Avenue East at Conlins Road (Conlins site).

Figure ES-1 and **Figure ES-2** illustrate the options evaluated.

Figure ES-1 **Base Case – Business-as-Usual (BAU)**

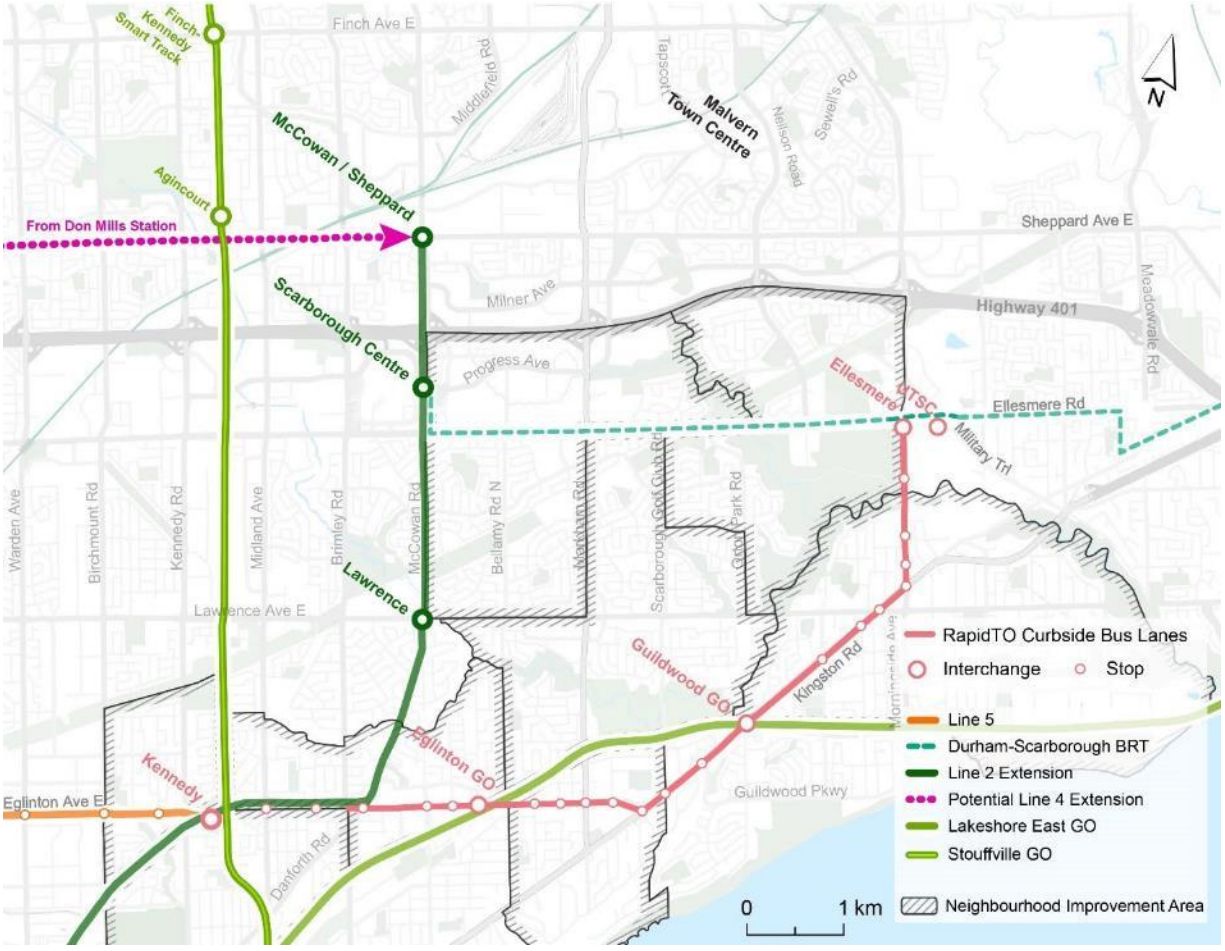
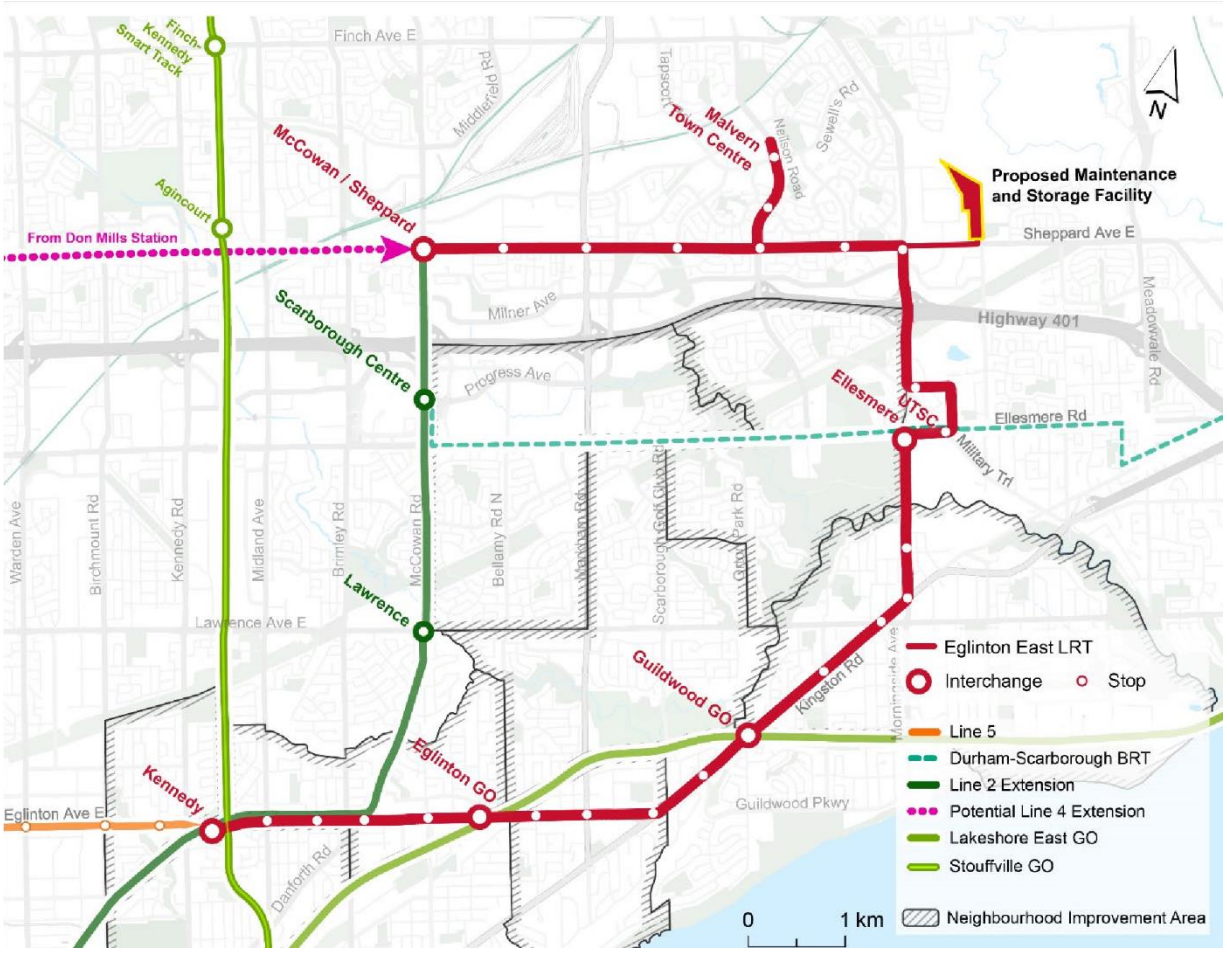


Figure ES-2: Option 1 – Eglinton East LRT (EELRT)



Summary of Updated Initial Business Case Key Findings

Strategic Case

- Option 1: EELRT is preferred over the Base Case as the projected demand in 2041 along the study corridor far exceeds the capacity that can be practically provided by the Base Case. Option 1 would better address the Rapid Transit Evaluation Framework (RTEF) criteria used to determine if a project achieves wider policy objectives. Option 1 provides new and additional higher-order transit in reach of seven of the City's Neighbourhood Improvement Areas (NIAs), supporting sustainable mobility in historically underserved communities.
- Option 1 is designed to support further improvements in the surrounding transit network by accommodating increased ridership and changing travel patterns.

- A peak point ridership of over 3,700 passengers per hour would require buses every one minute or less. While it is theoretically possible to serve this ridership with buses, large expansions to the Kennedy Station bus terminal and bus maintenance and storage facilities would be required. Operating costs would increase proportionally and would make the Base Case impractical. Operations of this terminal and the buses along the corridor would be a challenge, and reliability and comfort would be low. Higher-order transit is required to serve the study area reliably, comfortably, and sustainably. Option 1 offers improved experiences due to greater reliability, smoother rides, and reduced crowding for transit riders.

Economic Case

- Option 1: EELRT is expected to deliver almost $1.4 billion in discounted benefits with an expected Net Present Value (NPV) of -$4.4 billion and a Benefit-Cost Ratio (BCR) of 0.2 at a 3.5% discount rate.

Financial Case

- Option 1: EELRT is estimated to cost $4.4 billion at a 5.5% discount rate inclusive of capital costs, incremental rehabilitation costs, incremental fleet replacement costs, operations and maintenance costs, and incremental fare revenue.

Deliverability & Operations Case

- Option 1: EELRT introduces deliverability challenges as it involves the construction of a new transit line. However, the significant operational challenges of the Base Case outweigh the deliverability challenges of Option 1. As a result, Option 1 is preferred over the Base Case for the Deliverability and Operations Case.

In conclusion, this analysis found that higher-order transit investment is required to serve this corridor. Despite performing poorly in the Economic and Financial Cases, Option 1 – EELRT is the preferred option over the Base Case due to operational concerns. There is evidence that implementation of LRT can provide an uplift in property values, investment, and associated economic activity, particularly if it is coordinated with other policy initiatives. Consequently, development of an appropriate funding and financing strategy including exploration of ways to reduce cost and optimize benefits should be considered for future phases of project development.

1. Introduction

Updated Initial Business Case Scope and Objectives

The purpose of this Initial Business Case (IBC) is to provide an updated assessment on higher-order transit for a study area located in eastern Scarborough as compared to a Base Case or Business-as-Usual (BAU) scenario to determine a preferred option for further design and analysis.

The structure of this document is as follows:

- **Executive Summary**
- **Introduction** provides purpose and background.
- **Problem Statement** outlines the problem statement and project objectives.
- **Investment Options** describes the options being considered.
- **Strategic Case** evaluates each option against broader city-building objectives.
- **Economic Case** quantifies and compares the benefits and disbenefits of each option.
- **Financial Case** compares the capital and operating costs associated with each option.
- **Deliverability & Operations Case** evaluates the key challenges to implementing a project from the technical or engineering, operational, and governance perspectives.
- **Conclusion** summarizes the results of the analysis.

A business case for transit investment is prepared to gather and present evidence to support decision making and to answer the following fundamental questions:

- **Strategic Case:** If a project is supported by a robust case for change that fits with wider public policy objectives.
- **Economic Case:** If the project can be demonstrated to show good value for money.
- **Financial Case:** If the project is financially affordable.
- **Deliverability & Operations Case:** If the project is achievable.

Background

Scarborough is a historically auto dependent community in Toronto and is underserved by transit. More low-income residents reside in Scarborough (21.4%) compared to the citywide average (20.2%)[1]. Additionally, there are substantially more first-generation immigrants in Scarborough than in other parts of the City. Scarborough lacks both intracommunity and intracity transportation connections, perpetuating a cycle of inequity. As the population of the region increases, traffic congestion is expected to worsen due to the lack of alternatives. This will make travel times longer and more unpredictable. As such, studies were commenced to evaluate transit infrastructure improvements for Scarborough.

Higher-order transit has been studied in the past for Scarborough. Most recently, a light rail option known as the Eglinton East LRT (EELRT) has been studied.

In 2016, a Preliminary Options Analysis for the EELRT project was prepared. That analysis considered two LRT project options – one extending from the planned Line 5 Eglinton eastern terminus at Kennedy Station to Sheppard Avenue East and Morningside Avenue, and the other option terminating at the University of Toronto Scarborough (UTSC). The analysis recommended that an LRT to UTSC be carried forward for further technical and planning analysis.

Further analysis and design work proceeded over the following years and, in December 2020, City Council approved an EELRT alignment as an extension of Line 5 Eglinton from Kennedy through UTSC to Malvern Town Centre and directed staff to update the IBC. In February 2022, City Council directed staff to resolve alignment issues at Kennedy Station with respect to conflicts with the Province's Scarborough Subway Extension (SSE), evaluate the potential to host the Maintenance and Storage Facility (MSF) for the EELRT on Provincial lands at 8300 Sheppard Avenue East (Conlins Yard), and ensure that the new Sheppard East Station (terminus for the SSE at Sheppard Avenue East and McCowan Road) does not prohibit the development of future higher order transit connections along Sheppard Avenue East.

In late 2020, as part of the RapidTO program, curbside bus lanes were painted on a portion of the approved LRT alignment. The RapidTO curbside bus lanes run along Eglinton Avenue East, Kingston Road, and Morningside Avenue from Brimley Road, through to Ellesmere Road.

[1] Scarborough, City of Toronto Community Council Area Profiles, 2016 Census

This transit service improvement has resulted in a change to existing conditions from what was considered in the 2016 Preliminary Options Analysis, summarized below:

- The High Occupancy Vehicle (HOV) lanes on Eglinton Avenue East were converted to RapidTO curbside bus lanes.
- Curbside general-purpose lanes on Kingston Road and Morningside Avenue were converted to RapidTO curbside bus lanes.
- RapidTO curbside bus lanes are reserved for TTC buses, Wheel-Trans vehicles, and bicycles 24 hours a day, seven days a week, and identified using red surface treatment and signage.
- The total project cost approximately $4 million.

The investment in the RapidTO curbside bus lanes has improved transit service in this corridor, including improved reliability and transit travel times. These improvements can also be viewed as a pre-cursor to investment in higher-order transit, such as an LRT.

As a result of the introduction of the RapidTO bus lanes, this updated IBC compares the proposed investment option against a different environment from what was considered in 2016. It is important to take this into account when considering the findings that follow.

2. Problem Statement

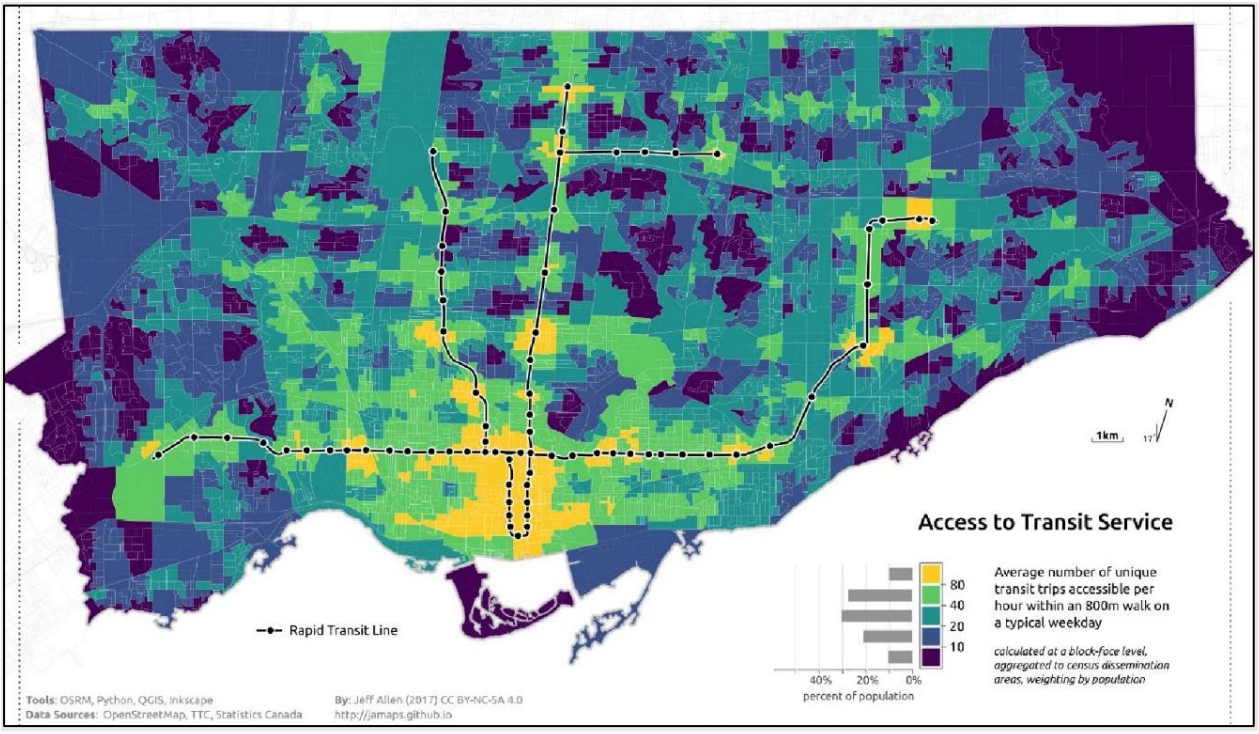
Introduction

This chapter defines the Case for Change, which is used to guide the evaluation of investment options considered within this IBC.

Case for Change: Problem and Opportunity Statement

Scarborough residents have poor access to reliable, frequent, and fast transit; access to higher-order transit options is even lower, relative to the rest of Toronto (see **Figure 2-1**). Unreliable and slow transit, combined with auto-centric land use patterns have a disproportionate impact on communities experiencing inequity. Nearly all neighbourhoods along the Eglinton Avenue East and Kingston Road corridor between Kennedy Station and Morningside Avenue have been identified by the Toronto Strong Neighbourhoods Strategy 2020 (TSNS 2020) as "Neighbourhood Improvement Areas" (NIAs).[2]

Figure 2-1: Access to Transit Service Map



Source: Jeff Allen, PhD

[2] The Toronto Strong Neighbourhoods Strategy (TSNS) 2020 is the City of Toronto's action plan for ensuring that each neighbourhood within Toronto can succeed and thrive, including the City's NIAs

Increasing traffic congestion over time will continue to degrade the existing transit service, thereby increasing the cost of living and degrading quality of life, perpetuating a cycle of further inequity.

Transit is a proven catalyst to improving quality of life by decreasing the cost of living, improving access to key destinations, reducing pollution, and alleviating traffic congestion. Investment in higher-order transit can contribute to the creation of complete communities that meet people's needs for daily living, provide more transportation choice, and reduce auto dependence.

Although there is extensive bus service in a portion of the corridor via the RapidTO curbside bus lanes, higher-order transit service is currently limited to the southern part of Scarborough at three GO rail stations (Kennedy, Eglinton, and Guildwood). The currently under construction SSE, an extension of Line 2 to Sheppard East Station (Sheppard Avenue East and McCowan Road) will bring higher-order transit north of Highway 401 to the western part of Scarborough.

The projected demand in 2041 along the study corridor far exceeds the capacity that can be provided by buses. With a peak point ridership of over 3,700 passengers per hour, this would require approximately 50 (18 metre) to 75 (12 metre) buses per hour (or buses every 1 minute or less). Additionally, reliability of the service will be hard to maintain due to short headways and overcrowding. Aside from reliability concerns and decreased passenger experiences, there are physical constraints along the road and at terminal stops that cannot handle this number of vehicles. There is also the challenge of finding a location to store a bus fleet of over 100 (18 metre) to 160 (12 metre) buses (including 20% spare ratio) and the operating cost of over 80 (18 metre) to 130 (12 metre) in-service buses. 80 (18 metre) buses are approximately 1.5 kilometre (km) long, accounting for nearly one-third of the length of the study area along Eglinton Avenue East from the terminus at Kennedy Station to Kingston Road. This contributes to a lower quality of life in the surrounding area due to increased traffic congestion, noise, and air pollution. In order to meet the projected 2041 ridership demand, higher-capacity transit is required.

As such, transit infrastructure investment has been identified as the preferred solution for improving livability by providing more sustainable and reliable transportation options in eastern Scarborough.

Strategic Outcomes

The proposed investment to be recommended through this updated IBC should support the realization of the three primary strategic outcomes as defined by the City’s framework:

- Improve **access to opportunities by transit.**
- Improve **transit equity** by supporting the Toronto Strong Neighbourhoods Strategy 2020 and improve transit access to NIAs and equity-deserving residents.
- Support the city's **economic vitality** and development of **complete communities.**

These objectives will be evaluated in the **Strategic Case** using the City's Rapid Transit Evaluation Framework (RTEF), a framework developed through extensive consultation used to guide the evaluation of options in major transit expansion projects undertaken by the City and TTC. These objectives are discussed further below.

Strategic Objectives

Access to Opportunities by Transit

An objective of Toronto's Official Plan is to reduce auto dependence for residents by improving transit access to opportunities, such as jobs, education, and services. Toronto's Official Plan identifies Eglinton Avenue East and Kingston Road as *Avenues* and targets them for smaller-scale, mixed-use growth, and economic development.[3] Additionally, the transit mode share for trips within Scarborough (16%)[4] is far outpaced by internal trip transit mode share for the Toronto and East York area (32%)[5].

As outlined in Maps 4 and 5 of Toronto's Official Plan (see **Figure 2-2** and **Figure 2-3**), higher-order transit within the study area forms part of the transit network envisioned for Scarborough, which includes a range of transit improvements and projects.

The University of Toronto Scarborough (UTSC) has ambitious plans for expansion which are linked to improved transit service. The Official Plan supports universities and colleges by "improving transit services to existing

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[3] According to Toronto's Official Plan, Avenues are important corridors along major streets where reurbanization is anticipated and encouraged to create new housing and job opportunities while improving the pedestrian environment, the look of the street, shopping opportunities, and transit service for community residents.

[4] Transit mode share for the commute to work is higher than average among residents of NIAs in Scarborough compared with NIA residents across the City. Taking account of all trips, not just the commute to work, and taking account of all residents of Scarborough, the transit mode share is lower than the City of Toronto average.

[5] Transportation Tomorrow Survey, 2016

universities… not currently served by rapid transit" (OP Policy 3.5.1(10)(h)), and "Where an existing university… is not directly served by rapid transit, the provision of excellent surface transit of these institutions will be pursued" (OP Policy 4.8(3)). Transit service to UTSC currently consists of local bus services, Durham Region Transit's PULSE service connecting downtown Oshawa to downtown Pickering and UTSC, and GO bus service to Durham Region, Rouge Hill GO Station, and Scarborough Town Centre. While it is estimated that 56% of students travel to campus by local transit, many experience long travel times.[6]

There are also important emerging higher-order transit improvements within Scarborough with potential connections to the study area: the Durham Scarborough Bus Rapid Transit (DSBRT), the Scarborough Subway Extension (SSE), and GO Expansion.

The planned DSBRT would provide approximately 36 km of dedicated transit infrastructure that would connect Durham Region and the City of Toronto, enhancing intraregional mobility and connecting residents and employment areas. Within Scarborough, the DSBRT would primarily run along Ellesmere Road with a planned connection at UTSC. The City of Toronto and TTC are working with Metrolinx, Durham Region, and Durham Region Transit on the planning and design of the DSBRT. The Transit Project Assessment Process (TPAP) for the DSBRT was completed in January 2022.

The SSE, which has begun construction, is an extension of TTC Line 2 from Kennedy Station to Sheppard East Station (Sheppard Avenue East and McCowan Road), replacing Line 3 Scarborough. It will help reduce travel times and improve access to jobs, schools, and other key destinations throughout Scarborough. The SSE is being delivered by Metrolinx and Infrastructure Ontario with an anticipated completion date of 2030. The advanced tunneling contract was awarded in May 2021 and a development partner for the Stations, Rail, and Systems (SRS) package was selected in November 2022.

GO Expansion is a large project that is currently underway that will improve GO rail service across the Greater Toronto Hamilton Area (GTHA). It involves substantial infrastructure improvements to support all-day, two-way service every 15 minutes or better on the core network, which includes station renovations, track expansion, and electrification. Within Scarborough, the Lakeshore East and Stouffville lines are designated as part of the core GO rail network that will receive improved service. Improvements to the service will be phased in over time.

[6] StudentMoveTO, 2019

Figure 2-2: OPA 456 – Map 4 – Higher-Order Transit Corridors

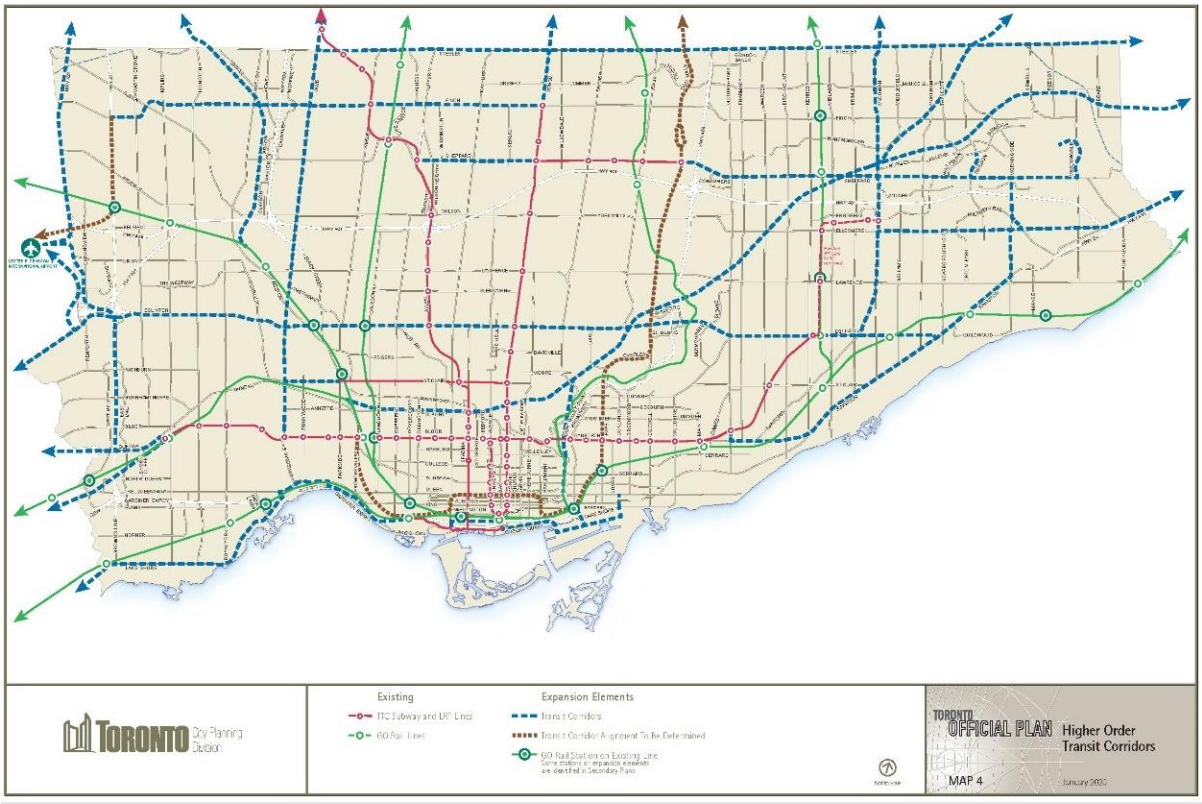
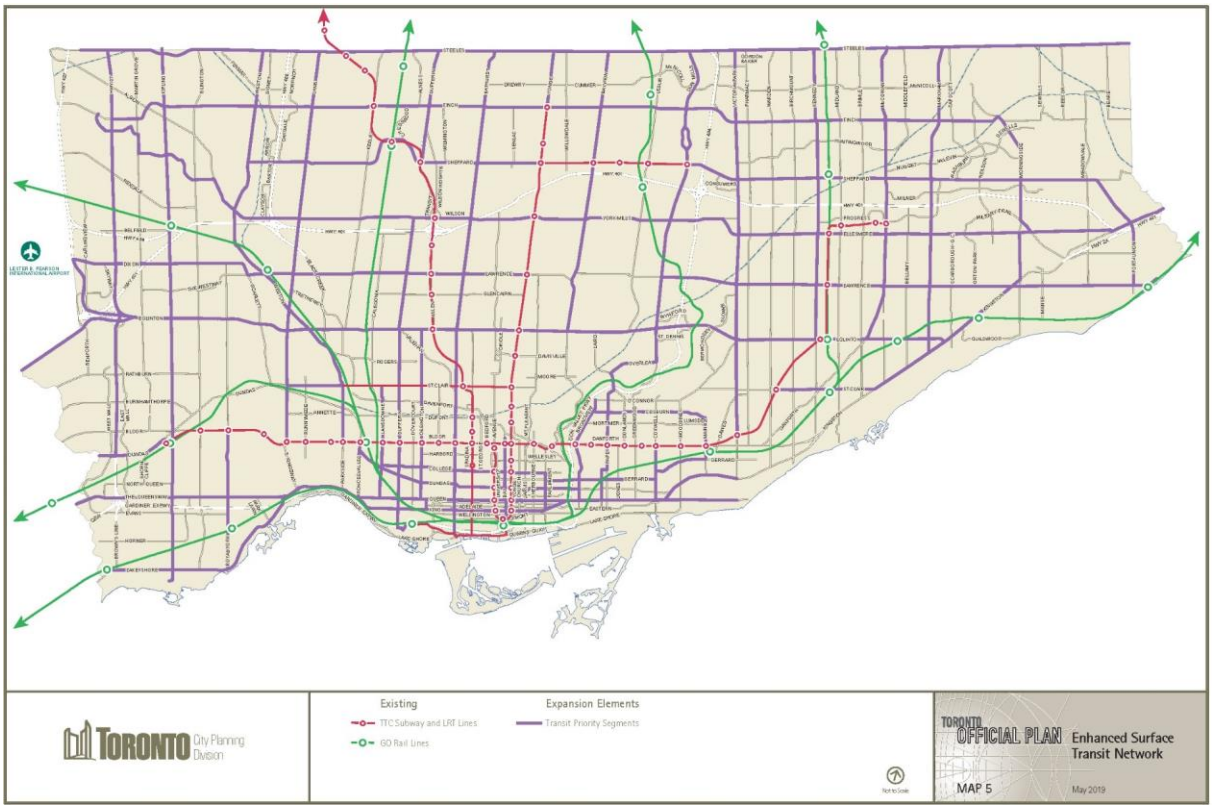


Figure 2-3: OPA 456 – Map 5 – Enhanced Surface Transit Network



Transit Equity

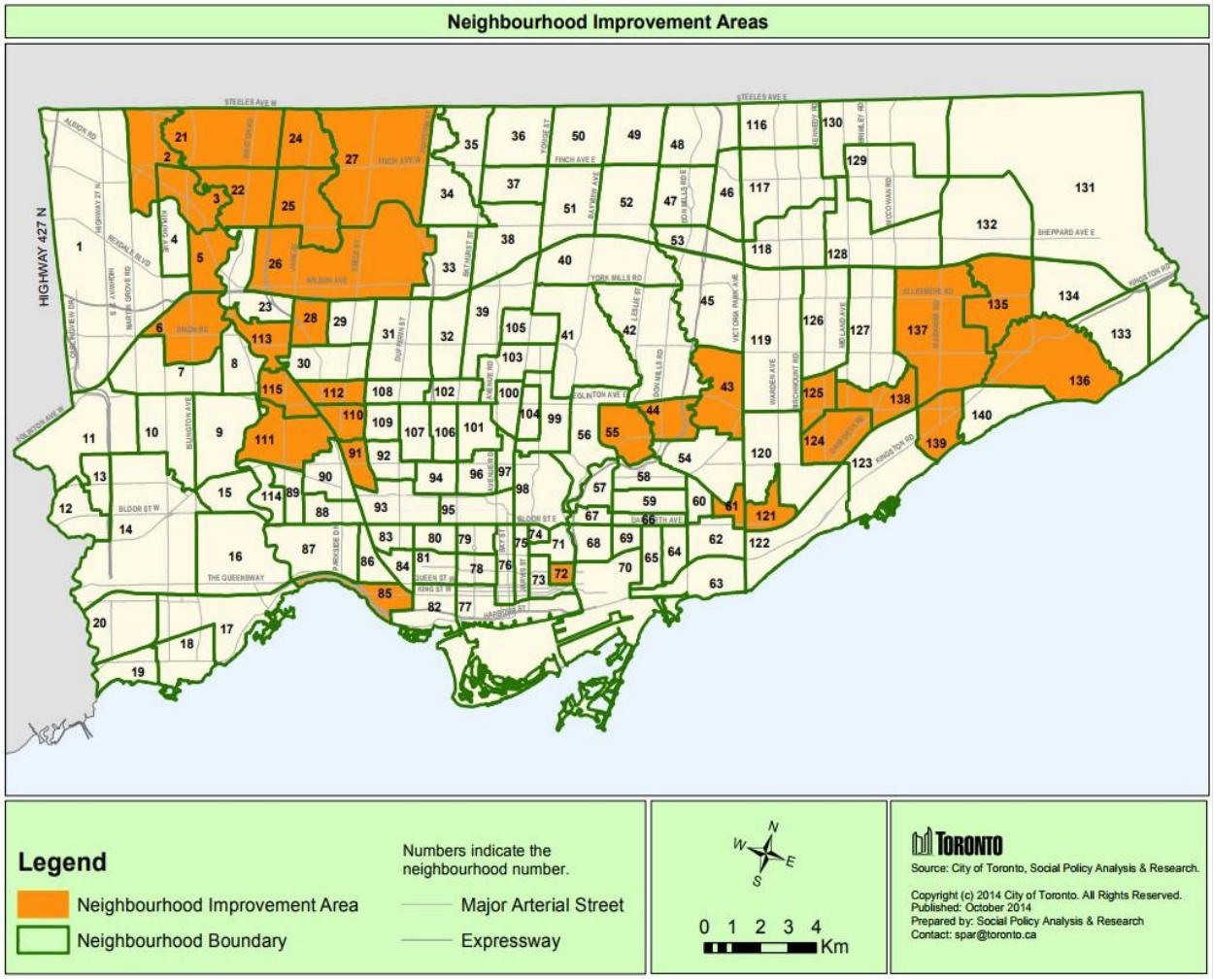
Scarborough is home to approximately 632,000 Torontonians, making up 23% of Toronto's population.[7] Scarborough is also now home to nine Neighbourhood Improvement Areas (NIAs) as defined by Toronto's Strong Neighbourhoods Strategy (TSNS) (**Figure 2-4**). **Figure 2-5** shows the changes in neighbourhood boundaries in April 2022, which resulted in the addition of one NIA in Scarborough, through the splitting of Golfdale-Cedarbrae-Woburn and Woburn North. Additionally, Scarborough also encompasses six of the City's ten Emerging Neighbourhoods defined by the TSNS. Emerging Neighbourhoods are neighbourhoods which were previously designated Priority Neighbourhoods but were not recommended as Neighbourhood Improvement Areas.

Access to transit service in Scarborough, particularly higher-order transit, is lower than in other parts of the city. The average Scarborough resident can access only half the number of jobs that the average Toronto resident can access using transit. Transit use is higher than average for residents living within NIAs in Scarborough; in some NIAs, up to 50% of residents use transit to commute to work, compared to a city-wide average of 37%.[8] Transit access in Scarborough to key destinations, such as community services, jobs, and educational opportunities, falls below Toronto's benchmark, as defined by TSNS 2020. The introduction of higher-order transit improvements would better serve equity-deserving residents of these NIAs and Emerging Neighbourhoods, allowing for improved transit reliability within Scarborough and to other parts of the City.

Equity-deserving groups are communities that face significant collective challenges in participating in society. This marginalization could be created by attitudinal, historic, social, and environmental barriers based on age, ethnicity, disability, economic status, gender, nationality, race, and sexual orientation etc. Equity-deserving groups are those that experience barriers to equal access, opportunities, and resources due to disadvantage and discrimination and actively seek social justice and reparation.[9] This includes equal access to transit.

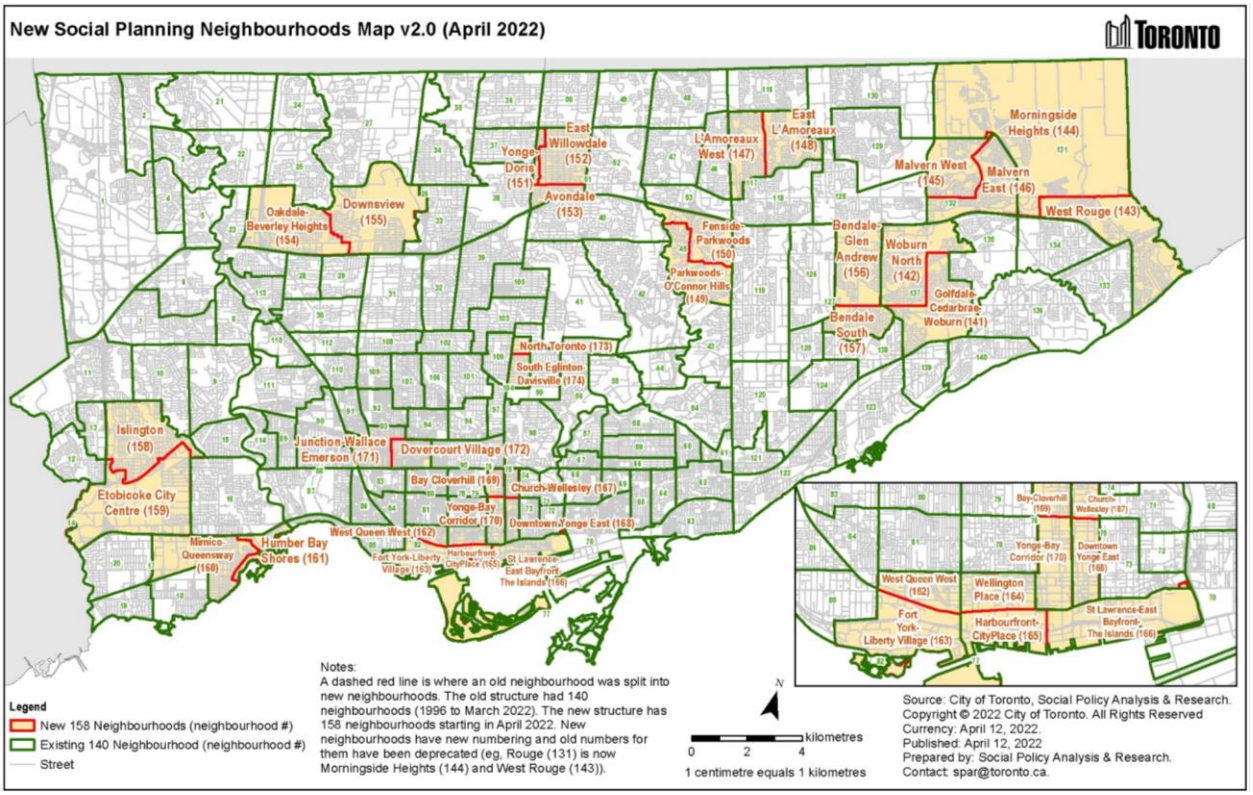
[7] Statistics Canada, 2016 Census
[8] Statistics Canada, 2016 Census
[9] Canada Council for the Arts

Figure 2-4: Designated NIAs in the City of Toronto



Note: Map does not include recent changes to neighbourhood boundaries, specifically the splitting of Woburn into Woburn North 142 and Golfdale-Woburn.

Figure 2-5: Changes to Neighbourhood Boundaries (April 2022)



Economic Vitality and Complete Communities

The Official Plan focuses on successful city-building to support a strong economy and complete communities. City-building involves balancing social, economic, and environmental needs and priorities for all. To remain economically competitive in the global economy, it is important to understand the connections that make up people's daily lives, and provide a fast, convenient, and high-quality transit system linking areas of housing and employment, while also providing access to goods and services, healthcare, education, and recreation.

Within the study area, areas planned for growth are focused along Eglinton Avenue and Kingston Road, which are defined as Avenues in the Official Plan. Potential development nodes are located at Eglinton Avenue East/ Kingston Road, Kingston Road/Lawrence Avenue East/Morningside Avenue, the Morningside Campuses (Centennial College and UTSC), Malvern Town Centre, and Sheppard Avenue/McCowan Road.

Development activity within the study area is illustrated in Figure 2-6 and Figure 2-7, with approximately 6,000 residential units and 131,000 square metres of non-residential Gross Floor Area (GFA) anticipated. Over the past five years, the study area has seen an increase of 160% in proposed residential developments (approximately 3,500 units) and 311% in non-residential GFA (approximately 99,000 square metres).

Figure 2-6: Residential Units Proposed within the Study Area

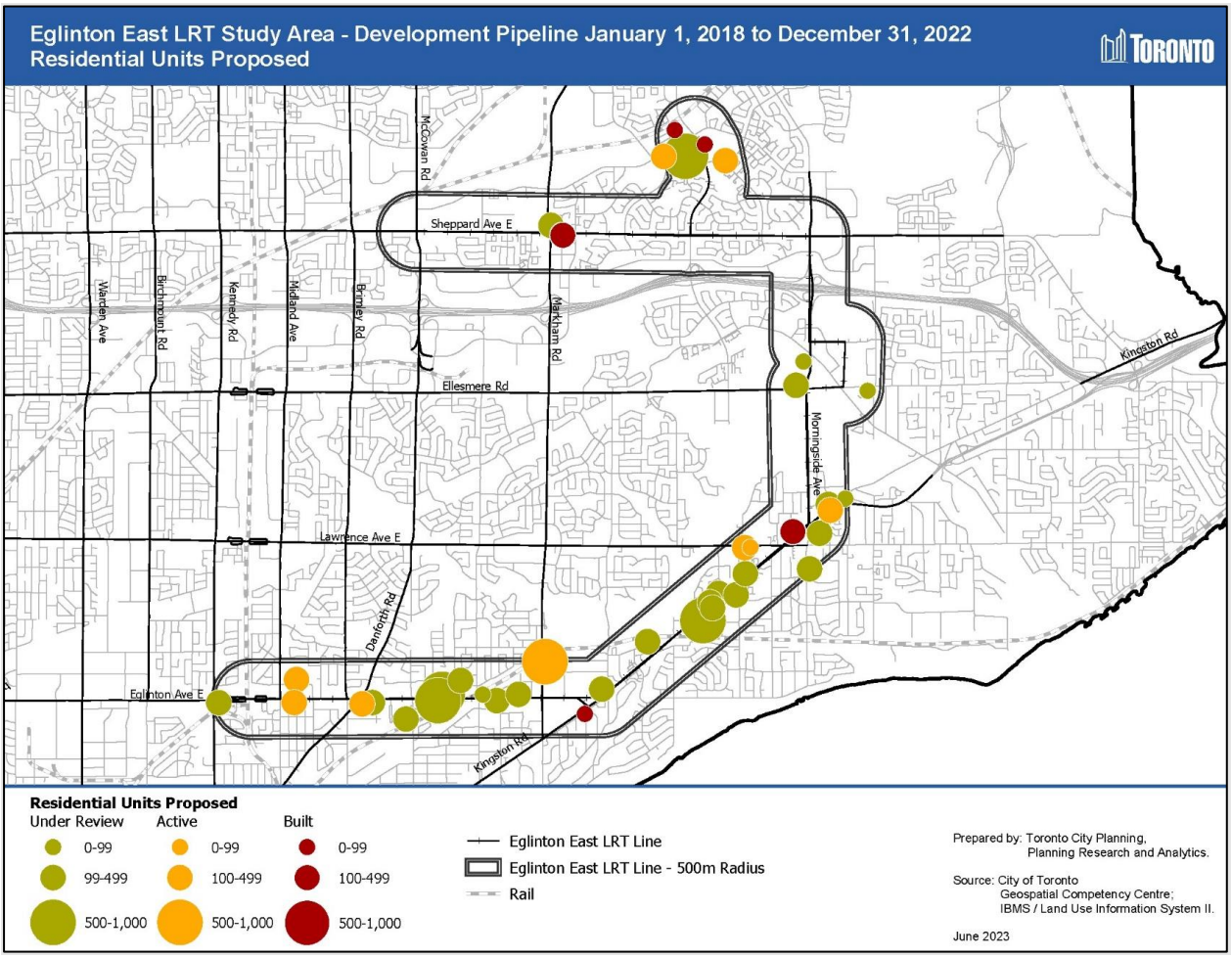
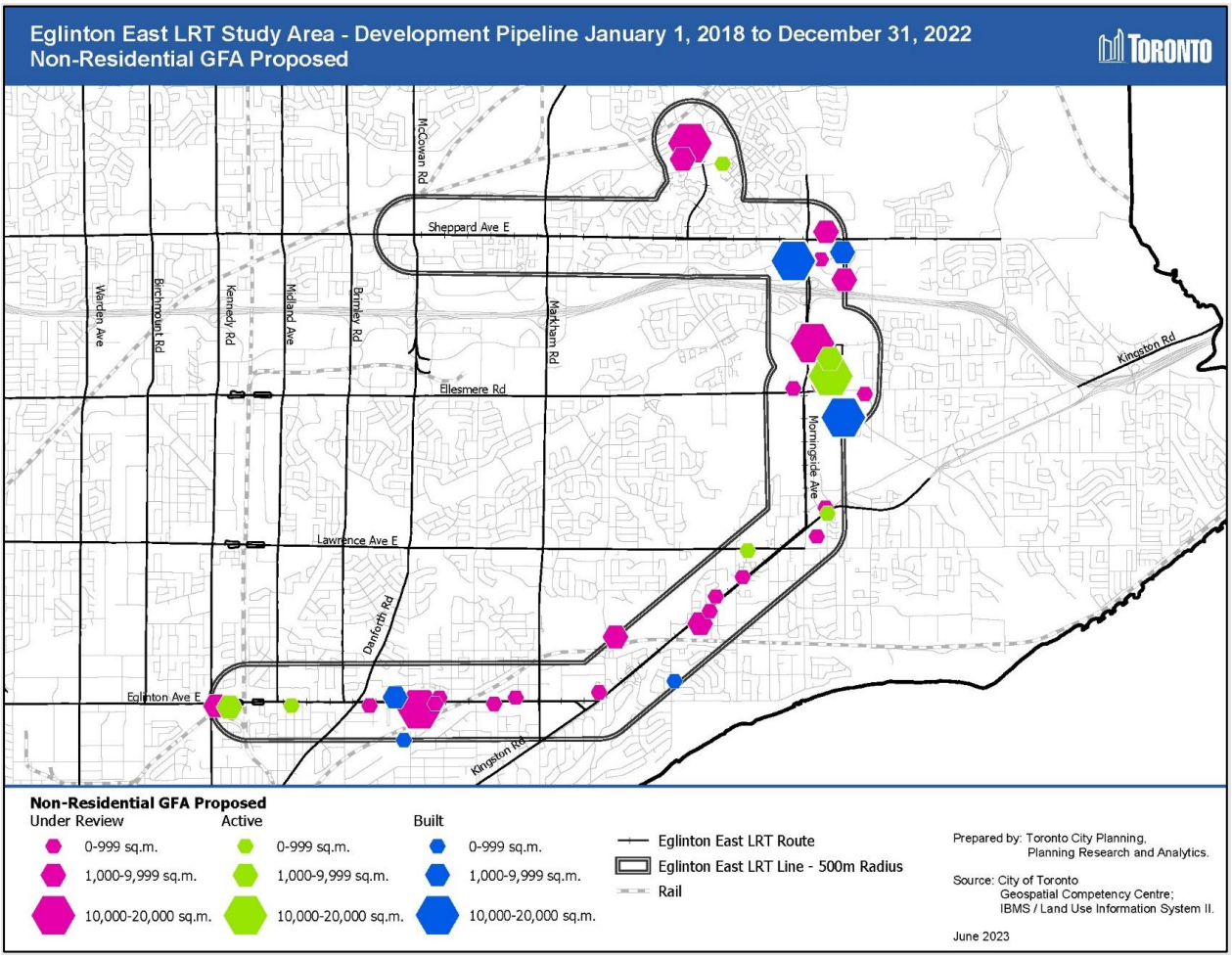


Figure 2-7: Non-Residential GFA Proposed within the Study Area



3. Investment Options

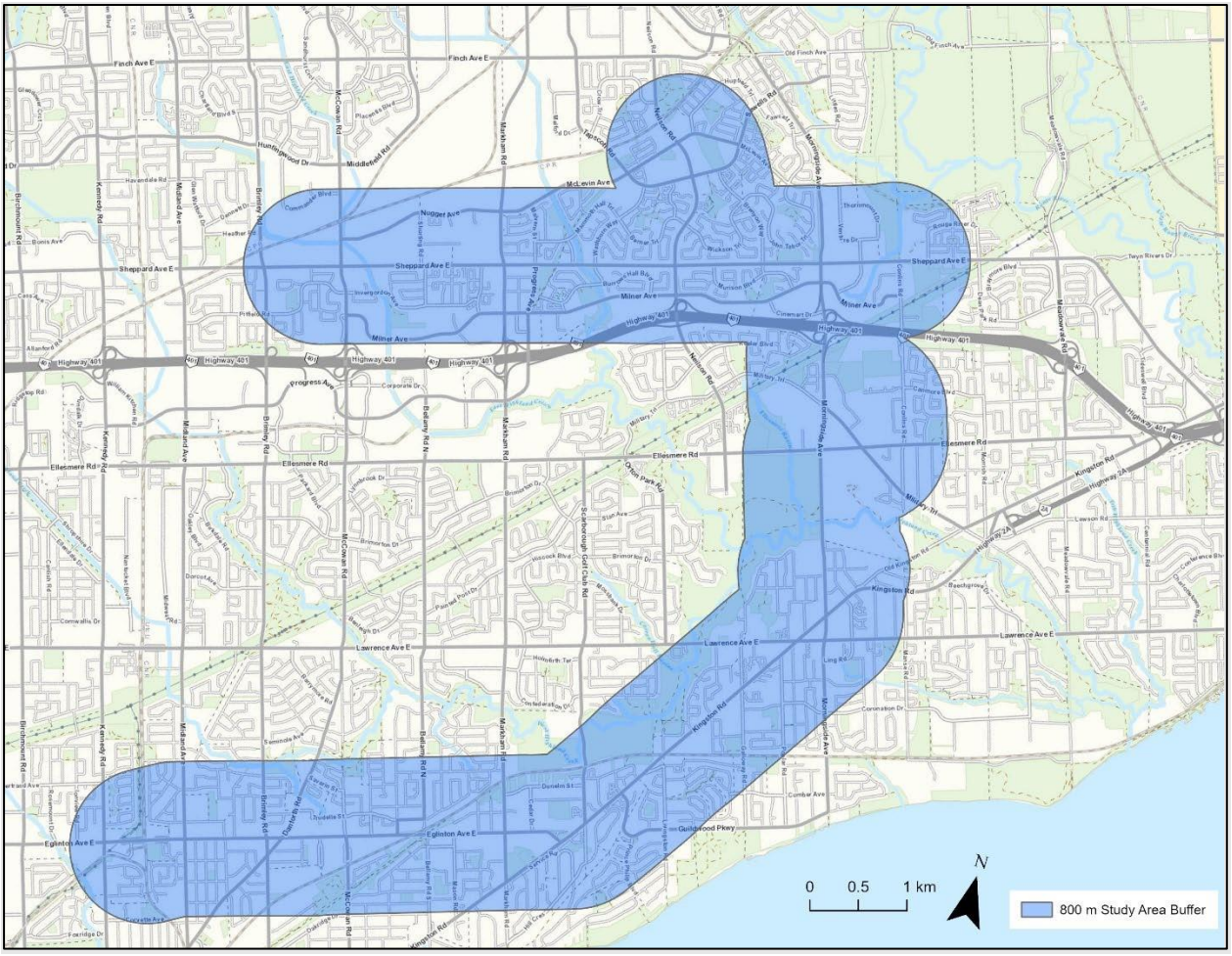
Introduction

This chapter introduces the options to be evaluated and compared through the four cases that constitute the updated IBC. Two options within the same study area in Scarborough, including the Base Case, are considered in this document.

Options Development

Figure 3-1 highlights the study area that will be evaluated.

Figure 3-1: Study Area Map



Base Case – 2041 Business-as-Usual (BAU)

The Business-as-Usual (BAU) scenario is set in the horizon year 2041. This scenario includes the Line 2 extension (SSE) from Kennedy Station to Sheppard East Station and the proposed Line 4 extension to Sheppard East Station. Additionally, the BAU assumes a realigned bus network proposed in the post completion state of the Line 2 extension. The BAU also assumes the completion of the Durham-Scarborough Bus Rapid Transit (DSBRT) currently under development along Ellesmere Road. GO Expansion with all-day, two-way service is assumed at 15-minute headways for the Lakeshore East line at Eglinton GO and Guildwood GO; and at 7.5-minute headways for the Stouffville line at Kennedy GO.

RapidTO curbside bus lanes painted in late 2020 along a portion of the study area will remain as part of the BAU. The RapidTO curbside bus lanes run along Eglinton Avenue East, Kingston Road, and Morningside Avenue from Brimley Road, through to Ellesmere Road.

Option 1 – Eglinton East LRT (EELRT)

Option 1 is the EELRT. This scenario includes the Line 2 extension (SSE) from Kennedy Station to Sheppard East Station and the proposed Line 4 extension to Sheppard East Station. Additionally, Option 1 assumes a preliminary realigned bus network designed to feed into the LRT. This scenario also assumes the completion of the DSBRT. GO Expansion with all-day, two-way service is assumed at 15-minute headways for the Lakeshore East line at Eglinton GO and Guildwood GO; and at 7.5-minute headways for the Stouffville line at Kennedy GO. RapidTO curbside bus lanes in the southern portion of the study area will be removed and replaced by the LRT service in this scenario.

The EELRT was initially developed as an extension of Line 5. As a result of the constructability challenges that would complicate the deliverability and increased cost of an extension of Line 5 (Eglinton) to Malvern Town Centre as reported in EX33.2, an alternative option was developed consisting of a distinct service option, decoupled from the Eglinton Crosstown LRT at Kennedy Station.

While the initial analysis of the distinct service showed increased transfer time at Kennedy Station by an average 80 seconds, numerous potential advantages also arose from the analysis which include:

- A $2.1 billion reduction in up front property, construction, and vehicle costs.
- Opening 3-4 years earlier with a 6-8 year reduction in continuous construction period at Kennedy-Falmouth.

- Reduced property impact along the north side of Eglinton between Midland Avenue and Bimbrok Road, improving transit-oriented development (TOD) potential.
- Minimized risks with the SSE interface and not requiring major contract negotiations with Metrolinx and Crosslinx (consortium responsible for constructing and maintaining Line 5) to secure commercial agreements.
- The ability to remain at-grade with lower costs and impacts on Kingston Road between Lawrence Avenue and Morningside Avenue.
- A 15-fold reduction in emissions due to reduced grade separations, representing 12% of Toronto's City-wide 2035 greenhouse gas emissions budget.
- The ability to procure shorter, nimbler light rail vehicles that:
    - Can provide service more tailored towards the demand along the corridor.
    - Reduce cost and impact with smaller infrastructure requirements, which include:
        - Shorter platforms (50 metre compared to 100 metre).
        - Shorter storage tracks.
        - Improved turning radius.
        - The ability to traverse across the existing Morningside Avenue bridge across Highland Creek, lowering environmental impacts on the Highland Creek valley.

Options Overview

Base Case – Business-as-Usual (BAU)

The Base Case, or Business-as-Usual (BAU) scenario, consists of local and express bus services. The southern portion of the study area that contains dedicated RapidTO curbside bus lanes is shown in **Figure 3-2**. Where available, these services (local and express buses) travel along the RapidTO curbside bus lanes (see **Figure 3-3**). Otherwise, they travel in mixed traffic, such as along Morningside Avenue north of the University of Toronto Scarborough (UTSC), along Sheppard Avenue East, and along Neilson Road.

Bus routes using these dedicated bus lanes primarily include the following:

- 86 Scarborough
- 986 Scarborough Express
- 116 Morningside
- 905 Eglinton East Express

Figure 3-2: Map of the Base Case – RapidTO Lanes

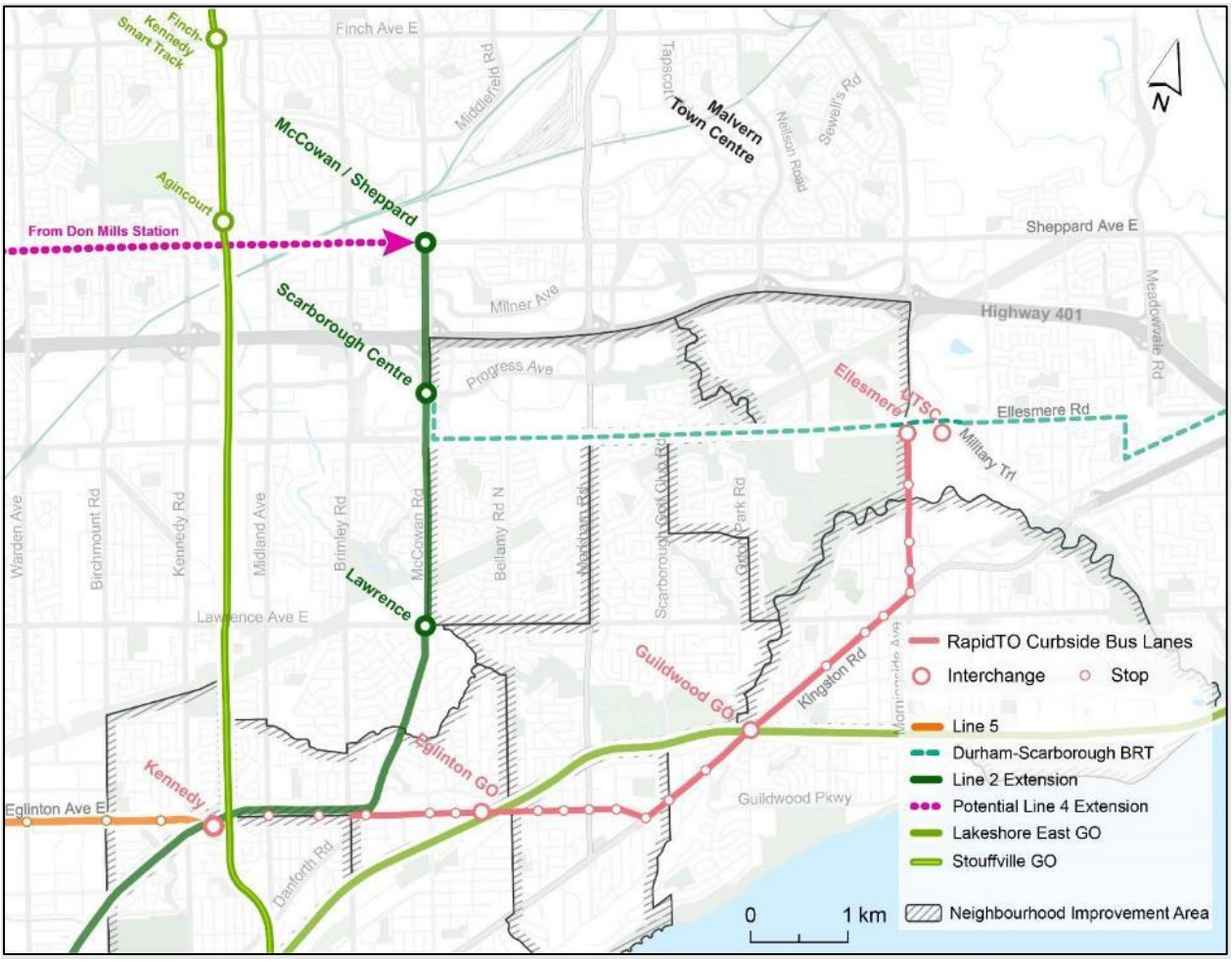
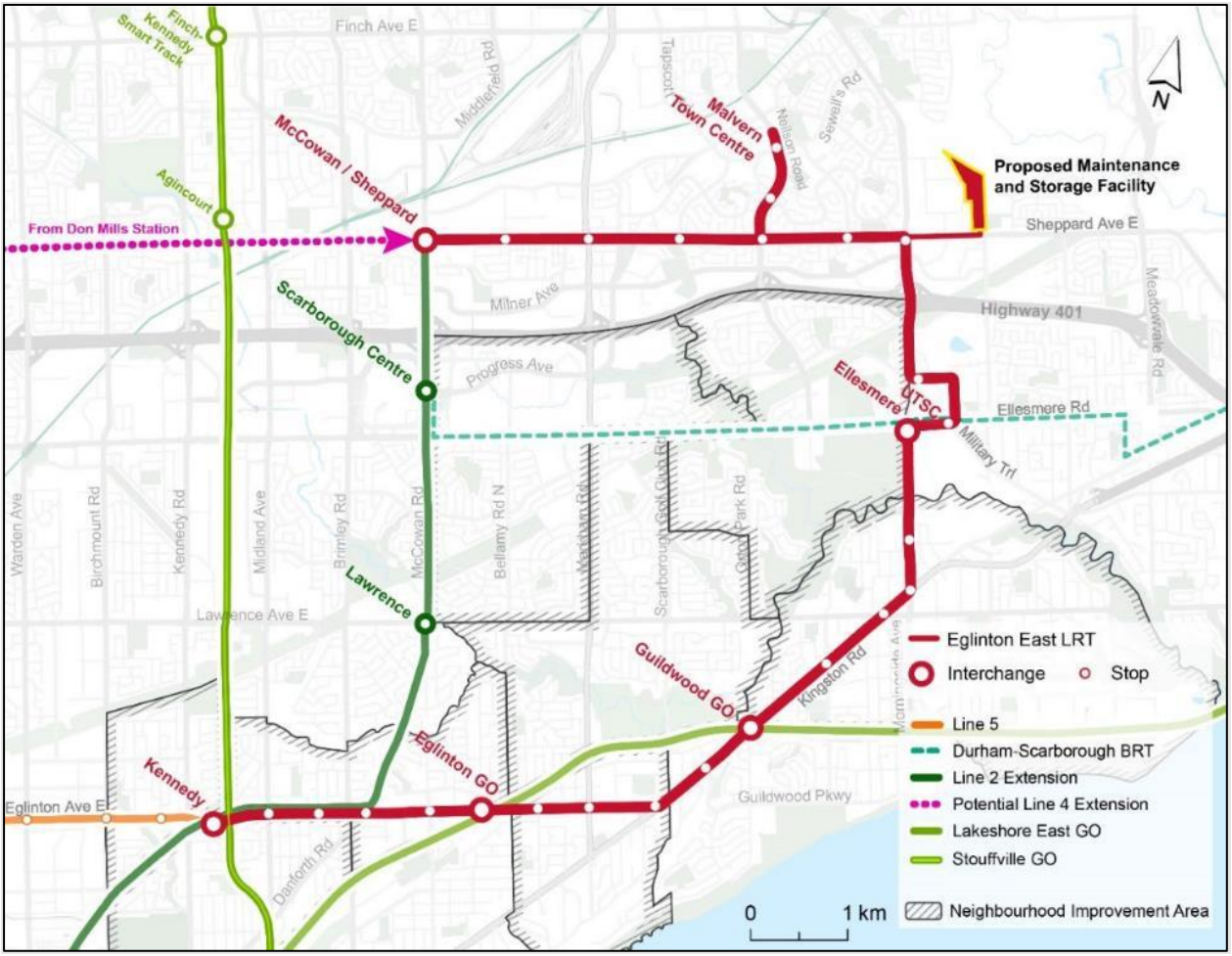


Figure 3-3: RapidTO Bus Lanes along Eglinton Avenue East

Option 1 – Eglinton East LRT (EELRT)

The EELRT is an 18.6 km, 27 stop LRT alignment that is entirely located within Scarborough (see **Figure 3-4**). The alignment follows Eglinton Avenue East, Kingston Road, Morningside Avenue (south of Ellesmere Road), Ellesmere Road, New Military Trail, Morningside Avenue (north of New Military Trail), Sheppard Avenue East to McCowan Road, and a branch along Neilson Road to Tapscott Drive. The LRT will provide higher-order transit connections to the UTSC and Malvern Town Centre. This EELRT alignment is Option 1 in this business case analysis.

Figure 3-4: Map of Option 1: Eglinton East LRT (EELRT)



The EELRT will connect to Line 2 and 5 at Kennedy Station; and Line 2 and potential Line 4 at Sheppard East Station. GO Transit connections will be provided at Kennedy GO, Eglinton GO, and Guildwood GO. Additionally, the EELRT will intersect with the DSBRT at Ellesmere Road between Morningside Avenue and Military Trail. Passenger transfers with local bus services are assumed at the following locations:

- Kennedy Station
- Eglinton Avenue East/Kingston Road (EK)
- Kingston Road/Lawrence Avenue East/Morningside Avenue (KLM)
- Morningside Avenue/Ellesmere Road
- University of Toronto Scarborough (UTSC)
- Malvern Town Centre
- Sheppard East Station

The EELRT will travel in a dedicated right-of-way (ROW) in the median of the road with level boarding and barrier-free access at all stops. The Maintenance and Storage Facility (MSF) is anticipated to be located north of Sheppard Avenue East at Conlins Road (Conlins Yard).

The EELRT creates an opportunity to transform the way that people move around Scarborough by providing convenient and reliable higher-order transit, supporting a shift to more sustainable travel modes, and building complete streets that support a variety of road users (OP Policy 3.1.1(6)). Combined with the bus network and improved points of transfer, there would be an opportunity to enhance access to key destinations beyond and along the corridor while complimentary investments in pedestrian and cycling infrastructure can help to support first and last mile access to transit and amenities in the area.

4. Strategic Case

Introduction

The purpose of the Strategic Case is to evaluate how the investment option addresses the project objectives and broader City of Toronto goals. The options have been evaluated using the City's Rapid Transit Evaluation Framework (RTEF) (**Table 4-1**). The RTEF outlines the outcomes, criteria, and objectives that fulfil the City's **Strategic Objectives**: Access to Opportunities by Transit, Transit Equity; and Economic Vitality and Complete Communities.

The findings from the RTEF assessment are provided below, except for the assessment of affordability, which is included as part of the Economic Case.

Table 4-1: Overview of the Rapid Transit Evaluation Framework

Outcomes	Criteria	Objectives
Serving People	Choice	Develop an integrated network that connects different modes to provide for more travel options
	Experience	Capacity to ease crowding / congestion; reduce travel times; make travel more reliable, safe, and enjoyable
	Social Equity	Allow everyone good access to work, school, and other activities
Strengthening Places	Shaping the City	Use the transportation network as a tool to shape the residential development of the City
	Healthy Neighbourhoods	Changes in the transportation network should strengthen and enhance existing neighbourhoods; promote safe walking and cycling within and between neighbourhoods
	Public Health and Environment	Support and enhance natural areas; encourage people to reduce how far they drive; mitigate negative impacts
Supporting Prosperity	Affordability	Improvements to the transportation system should be affordable to build, maintain, and operate

Outcomes	Criteria	Objectives
	Supports Growth	Investment in public transportation should support economic development: allow workers to get to jobs more easily; allow goods to get to markets

Strategic Evaluation by Outcome Area

The evaluation of the Rapid Transit Evaluation Framework (RTEF) criteria is presented in this section.

Outcome 1: Serving People

New transit infrastructure should improve the connections between people and places. The service will improve access to jobs and other services by transit. Improving the quality of, and access to, transit services is essential to support the City's continued economic development.

This section will evaluate the ability of the investment option to deliver three benefits to support the realization of Outcome 1: Serving People.

Criteria 1: Choice

From the Choice perspective, Option 1: EELRT is preferred over the Base Case. **Table 4-2** summarizes the Choice measures relative to the Base Case.

Key findings show that Option 1 improves choice compared to the Base Case:

- New higher-order transit service in the proximity of 71,000 residents.
- Increase in higher-order transit connections to three GO Stations, Line 2, Line 5, the proposed Line 4 extension, and the DSBRT.
- Better transportation options for Malvern residents who are currently only served by local bus services, including new higher-order transit connections to UTSC, Line 2, and the proposed Line 4 extension.
- Protected cycling facilities along the corridor and improved connections to existing cycling infrastructure, implemented concurrently with LRT construction.

Table 4-2: Summary of Choice Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Population within walking distance (500 m) of higher-order transit stops	Existing (2021): 71,000 people Projected growth (2021 to 2041): +10,000 people Projected future (2041): 81,000 people
Change in number of transfer stations* / Change in number of connections available	Increased transfer opportunities with DSBRT, Line 2, potential Line 4 extension, and 3 GO stations
Change in connections to existing cycling infrastructure	Concurrent introduction of protected cycling facilities along the corridor consisting of raised cycle tracks, Multi-Use Paths (MUPs), cross rides, and protected intersections
Change in transit access to major destinations	Improved transit access to UTSC, Malvern Town Centre, Guildwood GO, Eglinton GO, and Kennedy GO.

* Higher-order transit stations only. Further work is needed to identify the bus network that complements and supports the EELRT.

Regarding access to key destinations in the Greater Toronto Area, Option 1 offers the following impacts compared to the Base Case:

- **University of Toronto Scarborough (UTSC):** Generally decreased travel times for areas to the west of UTSC. Particularly decreased travel times for central Markham, North York, and the area south of Kennedy Station.
- **Malvern Town Centre:** Overall decreased travel time for all areas accessing Malvern.
- **Scarborough Town Centre:** Decreases in travel times for Malvern residents and increases in travel times outside of the study corridor in the vicinity surrounding Sheppard Avenue East and Meadowvale Road.
- **Pearson Airport and Downtown Toronto:** Decreases in travel time from Malvern and UTSC and increases in travel times south of Kingston Road.

An integrated transit network that connects different routes and modes to provide for more travel options leads to increased choice for Toronto residents. Choice can be measured by access to higher-order transit and connections via transfer opportunities, access to active transportation connections, and access to major destinations.

The Province's GO Expansion Program will make GO stations increasingly important connection points for riders destined for downtown Toronto and elsewhere in the city. Option 1 connects higher-order transit to the GO rail network at three stations – Guildwood, Eglinton, and Kennedy. As the details of GO Expansion Program are still under-development, further improvements to GO service are possible. Option 1 is designed to support further improvements in the surrounding transit network by absorbing increased ridership and changing travel patterns.

Direct connections to the higher-order transit network would be provided at Sheppard East Station to Lines 2 and proposed Line 4; and at Kennedy Station to Lines 2 and 5. These provide connections to North York, midtown Toronto, and connections to Line 1 and the GO network beyond Scarborough.

Option 1 will provide a convenient transfer with the DSBRT at UTSC, providing improved transit connections from UTSC to Scarborough Centre and Durham Region.

The stop at the Toronto Pan Am Sports Centre also provides opportunities for active transportation connections to the proposed Meadoway multi-use trail along the Gatineau Hydro Corridor.

Criteria 2: Experience

From an Experience perspective, Option 1: EELRT is preferred over the Base Case. **Table 4-3** summarizes the Experience measures.

Table 4-3: Summary of Experience Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Average transit travel times*	Average transit travel times are comparable for both options: AM: 62 minutes Mid-day: 46 minutes PM: 61 minutes Evening: 57 minutes
Average daily transfers per person across TTC system (2041)	1.8 transfers (No change)
Reliability	LRT operates in a dedicated median ROW with reduced conflicts with turning vehicles, cyclists, pedestrians, and automobiles.
Customer satisfaction, cleanliness, and comfort (Perceived, due to crowding)	LRVs operate with smoother movements than traditional buses, resulting in a more comfortable ride. LRVs have greater passenger capacity, reducing discomfort related to crowding.
Transit ridership change (Daily riders attracted to transit system in 2041)	- 5,000 (Compared to Base Case)

* Average travel times are for an average trip in the GTA

Key findings show that Option 1: EELRT provides a better experience compared to the Base Case:

- Both options may expect similar average network-wide transit travel times on an average weekday.
- Transit travel time along the study corridor is expected to decrease due to the higher speed and reliability provided by the LRT compared to mixed traffic buses.
- The average daily number of transfers across the TTC system (i.e., the convenience of trips) is approximately the same for both options
- Reliability of service is expected to be higher for the LRT due to a dedicated right-of-way (ROW) and reduced conflict points with other road users.

- The LRT provides a more comfortable ride for passengers.

A transit project's ability to improve travellers' experience impacts projected transit ridership, given that people are more likely to choose to take transit if it offers a better experience than a different mode of travel. Experience can be understood in terms of ability to mitigate crowding on transit, change in travel time between origins and destinations, reliability, and the perceived safety, cleanliness, and comfort of the transit trip.

The projected demand in 2041 along the study corridor far exceeds the capacity that can be provided by the Base Case (buses). With a peak point ridership of over 3,700 passengers per hour, this would require buses every one minute or less. As a result, the reliability of service will be hard to maintain due to short headways and increased dwell times at stops leading to lesser reliable travel times for transit riders. Aside from reliability concerns and decreased passenger experiences, there are physical constraints for bus storage, at terminal stops, and road space. A new bus maintenance and storage facility will likely be needed, in addition to substantial renovations to increase bus capacity at Kennedy Station. Operating costs will increase proportionally. Buses every one minute or less along Eglinton Avenue East will cause increased traffic congestion, noise, and air pollution; substantially degrading passenger and all road users' experiences. Option 1 would better support the projected 2041 ridership.

Transit ridership forecasts for Option 1 were developed with a preliminary realigned bus network to feed into the LRT. Results showed an overall reduction in network-wide transit riders. However, it is anticipated that at a minimum, 35,000 people would use the LRT in 2041 over the course of a typical weekday. Further development of a complementary and supportive bus network for Option 1 will continue as the project design advances.

Criteria 3: Social Equity

From a Social Equity perspective, Option 1: EELRT provides better access to jobs and destinations; and enables more opportunities to stimulate vibrant communities and economic growth. **Table 4-4** summarizes the Social Equity measures relative to the Base Case.

Table 4-4: Summary of Social Equity Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Alignment with Toronto Strong Neighbourhoods Strategy 2020	Creates more opportunities to improve physical surroundings, economic opportunities, and healthy lives for the equity-deserving residents in Scarborough
Change in NIAs served by higher-order transit stops	7 NIAs
Estimated number of equity-deserving residents served by higher-order transit* (500 metre radius of stations) (2021)	48,000 residents
Access to destinations for NIA residents (2041)** (Number of people accessible within a 45-minute travel time for an average resident of a NIA in Scarborough)	603,000 people (No change compared to the Base Case)
Average number of jobs within a 45-minute travel time for an average resident of a NIA in Scarborough (2041)	271,000 (+3,000 compared to the Base Case)

* Population weighted by Neighbourhood Equity Index is used as a proxy for estimated number of equity-deserving residents.
** Number of people accessible by transit is used as a proxy for access to all destinations.

Key findings show that Option 1 has the following advantages over the Base Case:

- Creates opportunities to better align with Toronto's Strong Neighbourhoods Strategy (TSNS) 2020 objectives of improving physical surroundings, economic opportunities, and healthy lives for the equity-deserving residents in Scarborough.
- Within a 500-metre walking distance from higher-order transit stations, Option 1 would directly serve an estimated 48,000 equity-deserving residents, including approximately 3,000 equity-deserving Malvern residents.
- North of UTSC (beyond the corridor served by the RapidTO curbside bus lanes), EELRT provides opportunities to stimulate economic growth at Malvern Town Centre, improve access to jobs, support existing community groups and programs, and enhance transit service to local amenities and services.

- Provides the average NIA resident in Scarborough with access to 3,000 more jobs.

Social equity is an important city building objective when considering major transit investments, due to the potential to help uplift vulnerable communities and empower equity-deserving individuals. Social equity objectives include providing convenient, affordable, and reliable transit options to those who need it, increasing access to jobs, and increasing the size and diversity of the labour-force available to existing or potential employers. TSNS 2020 aims to ensure each of Toronto's neighbourhoods can succeed and thrive, including targeting inequalities neighbourhoods are facing and removing differences between neighbourhoods that are unjust, unnecessary, and unfair.

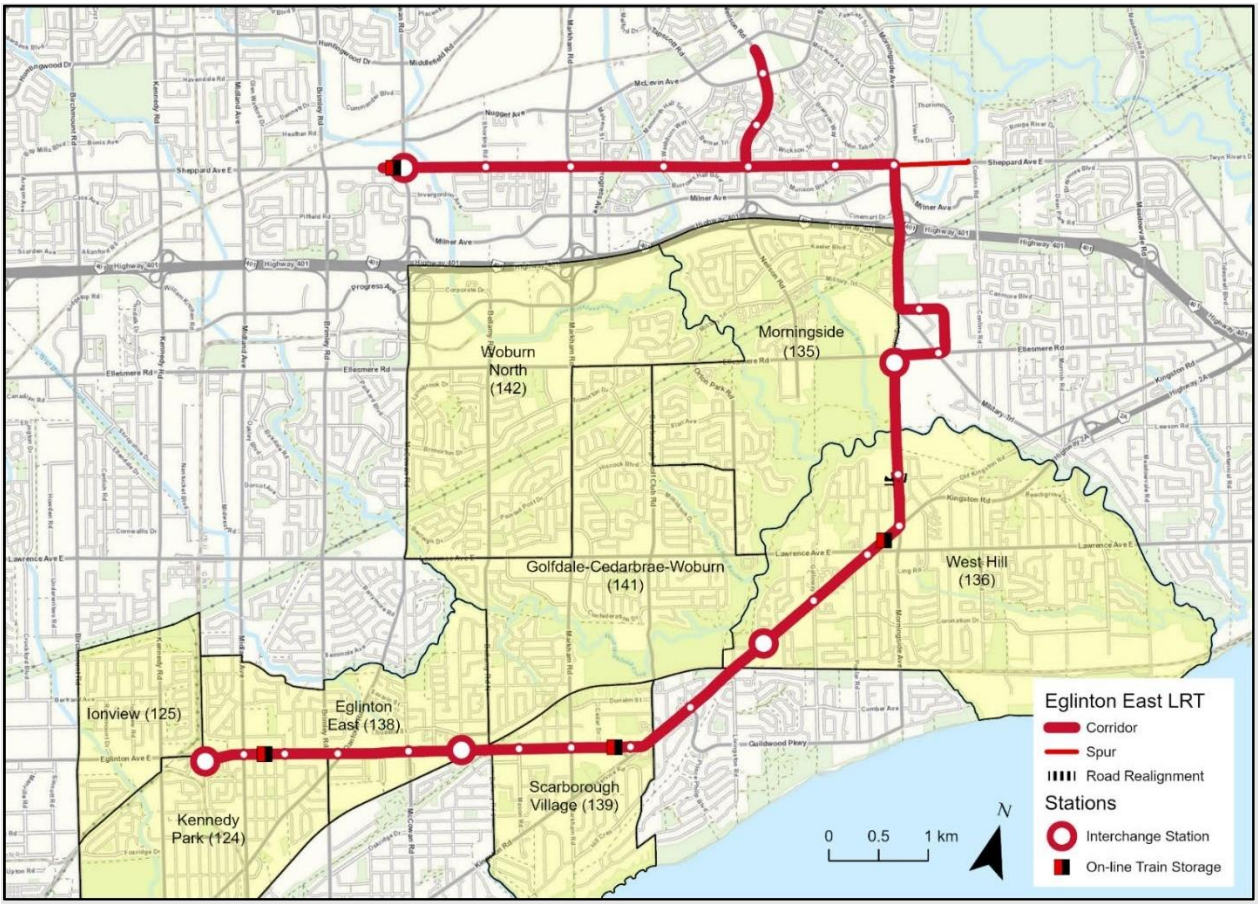
TSNS 2020 also aims for the long-term transformation of Neighbourhood Improvement Areas (NIAs); along the study corridor, equity-deserving residents within seven NIAs would benefit from access to higher-order transit (**Figure 4-1**). These NIAs include Ionview, Kennedy Park, Eglinton East, Scarborough Village, Golfdale-Cedarbrae-Woburn, West Hill, and Morningside. Woburn North can also be expected to benefit from higher-order transit in its vicinity. Malvern East and Malvern West are categorized as Emerging Neighbourhoods with an estimated 3,000 equity-deserving individuals that would have direct access to higher-order transit through the EELRT.

The EELRT aligns well with TSNS 2020 through the following benefits to equity-deserving residents in Scarborough:

- Stimulates a vibrant local community by promoting transit development where it helps to shape new economic opportunities, jobs, and affordable housing.
- Creates a cleaner and healthier environment by improving air quality through the creation of more walkable communities.
- Promotes active living through investing in active transportation infrastructure and facilities and improving the public realm.
- Connects residents to the amenities and services they need, such as healthcare, healthy food, school, and community services.
- Improves transit access in neighbourhoods, supports the local community, enables the creation of vibrant communities near transit hubs, integrates the TTC and GO for a GTA-wide system, and creates local jobs as part of transit expansion.

Improving access to jobs for NIAs is important for improving economic opportunities in Scarborough. Option 1 increases access to 3,000 more jobs within a 45-minute travel time for residents living in NIAs.

Figure 4-1: Neighbourhood Improvement Areas (NIA) along the Study Area



Outcome 2: Strengthening Places

Criteria 1: Shaping the City

From a Shaping the City perspective, Option 1: EELRT is preferred over the Base Case. **Table 4-5** summarizes the Shaping the City measures relative to the Base Case.

Key findings show that Option 1 is preferred over the Base Case in terms of the following:

- Potential to stimulate more growth and development along Eglinton Avenue East and Kingston Road, and in Malvern.
- Provides higher-order transit stops within walking distance of approximately 71,000 residents, including identified growth areas and potential transit-oriented development.

Table 4-5: Summary of Shaping the City Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Higher-order transit service to residential growth areas	13 stops planned within mixed-use Avenues along Eglinton Avenue East and Kingston Road and opportunities to serve future residential development to the north towards Malvern
Area and proportion of land within walking distance (500 metre) of higher-order transit stops designated for population growth	Mixed-Use: 1.5 km^2 10%
Population within walking distance (500 metre) of higher-order transit stops	Existing (2021): 71,000 people Projected growth (2021 to 2041): 10,000 people Projected future (2041): 81,000 people
Population density within walking distance (500 metre) of higher-order transit stops	Existing (2021): 4,800 people/km^2 Projected growth (2021 to 2041): 700 people/km^2 Projected future (2041): 5,500 people/km^2

Transit investment can play a significant role in the residential development of the city. Higher-order transit may be constructed to better serve existing areas of high residential and/or employment density or areas planned for higher density in order to increase access to transit and incentivize compact mixed-use development near stops and stations. [10]

The evaluation of a project's impact on supporting residential growth relates to how a project would serve residential growth areas. Studies have consistently demonstrated that LRT can provide an uplift in property values and increase residential development.[11] There are opportunities for growth and development within the mixed-use avenues along Eglinton Avenue East and Kingston Road, and beyond in Malvern.

[10] Existing population density can be used as a proxy for what future population density would be, and models can be used to project future population density. Projections are based on observed trends and do not capture any incentive that higher-order transit infrastructure would provide to developers in the future.

[11] 'The North American Light Rail Experience: Insights for Hamilton' (2012), Higgins, C., Ferguson, M. McMaster Institute for Transportation and Logistics, McMaster University, Hamilton, ON. April 2012. This paper provides a review of the academic literature examining the impacts of LRT on property values. Up to 23% uplift in value for commercial properties, and up to 10% uplift in property values for homes, depending on place.

Criteria 2: Healthy Neighbourhoods

Option 1: EELRT is preferred over the Base Case from the perspective of Healthy Neighbourhoods due to improvements to Neighbourhoods. Table 4-6 summarizes the Healthy Neighbourhood measures relative to the Base Case.

Table 4-6: Summary of Healthy Neighbourhoods Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Area and proportion of land within walking distance (500 metre) of higher-order transit stops designated as Neighbourhoods	5.8 km^2 39% (71,000 residents in 2021)
Amenity and public realm improvements (Improvements to streetscapes, facilities, stations, stops, or vehicles related to a transport trip)	Improvements to the streetscape and public realm
Road safety benefits (Reduction in auto vehicle kilometres travelled (VKT) as proxy for reduced accidents resulting in death or injury)	Potential reduction in accidents due to fewer conflict points with vehicles and cyclists, but minor increase in accidents due to higher auto VKT compared to the base case (refer to **Table 4-7** and "Public Health & Environment" subsection)
Access to community amenities	Increased access to community amenities due to provision of higher-order transit

Key findings show that Option 1 has the following advantages over the Base Case:

- Provides higher-order transit within walking distance (500 metre) of 5.8 km^2 of lands designated as Neighbourhoods and 71,000 residents.
- Provides substantial improvements to the streetscape and public realm through project implementation.
- Improved safety for vulnerable road users due to new separated pedestrian and cycling infrastructure and consolidation of driveways which reduces points of conflict.

Option 1 offers increased access to community amenities, such as libraries, parks, and schools due to the extended reach of higher-order transit.

Transit investments can strengthen and enhance existing Neighbourhoods through enhancing amenities and the public realm, improving road safety for

all users, and improving access to community benefits.[12] Option 1 will concurrently introduce improved pedestrian infrastructure, dedicated and protected cycling infrastructure, and street trees to beautify the street, reduce speeding, and provide shade.

The majority of the study corridor is recognized as *Avenues*, designated for mixed use growth in the City's Official Plan. Some of the land use within proposed EELRT station areas (although set back from the roadway) is identified as *Neighbourhoods*. This land amounts to around 40% of the area within walking distance (500 metre) of station areas and may see some development pressure in the long term. Along Morningside Avenue, much of the corridor is designated as Open Space. The EELRT would cross the Highland Creek ravine on the existing Morningside Avenue bridge and no stations would be built within the Open Space area.

The provision of higher-order transit stops near Neighbourhoods will bring improved walking and cycling infrastructure for accessing transit stops and other physical surroundings such as parks, green spaces, and public meeting spaces.

Criteria 3: Public Health and Environment

Option 1: EELRT performs slightly worse or similar to the Base Case from a Public Health and Environment perspective. **Table 4-7** summarizes the Public Health and Environment measures relative to the Base Case.

Key findings include the following:

- The Base Case results in more new transit passengers by 2041.
- Option 1 provides improved walking and cycling infrastructure, which may increase the use of active modes for short trips.
- Option 1 experiences minimal auto mode share change, although auto VKT increases slightly compared to the Base Case.
- Light rail vehicles (LRVs) produce substantially fewer greenhouse gas emissions and adverse local air quality impacts than diesel and hybrid buses.[13]

[12] According to the Official Plan, Neighbourhoods are considered physically stable areas made up of residential uses in lower scale buildings such as detached houses, semi-detached houses, duplexes, triplexes, and townhouses, as well as interspersed walk-up apartments that are no higher than four storeys. Parks, low scale local institutions, home occupations, cultural and recreational facilities and small-scale retail, service and office uses are also provided for in Neighbourhoods.
[13] The TTC is transitioning to a 100% e-bus fleet by 2040.

Table 4-7: Summary of Public Health and Environment Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Total daily GTA system-wide transit passengers (2041)	3,198,000 passengers (<1% compared to the Base Case)
Active lives (Health improvements due to shift to active modes)	Includes improved pedestrian infrastructure and protected cycling infrastructure to encourage active modes for accessing transit and local trips
Change in auto mode share (2041)*	No change
Change in daily vehicle-kilometres travelled (VKT) (2041)*	+34,000 VKT
Change in greenhouse gas emissions per passenger (2041)	-0.0157 kg to -0.0315 CO_{2e}/passenger/km (Compared to hybrid and diesel 12 metre bus)**
Major environmental challenges	None

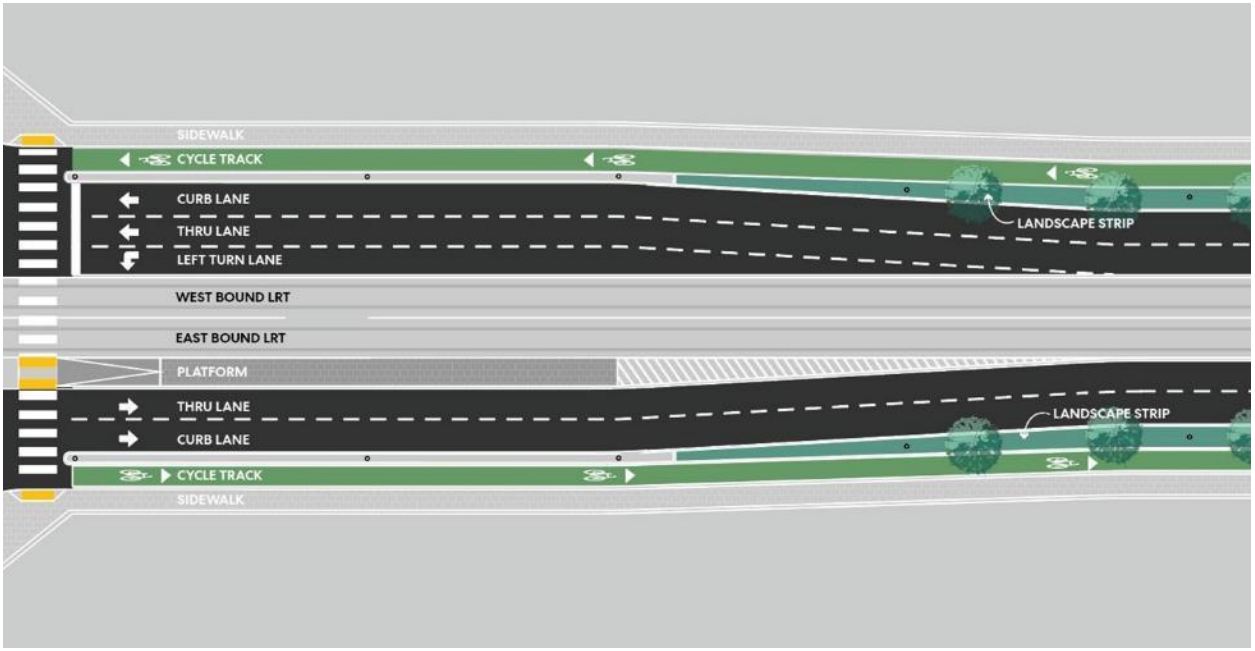
* The change in auto mode share and change in vehicle-kilometres-travelled (VKT) assumes that a portion of buses would be rerouted from the Eglinton-Kingston corridor once the EELRT is operational. Further work is required to identify the local bus transit routes and service that would complement and support the EELRT.
** LRV: 0.0010 kg CO2e/passenger/km; 12 m diesel and hybrid bus: 0.0167 kg to 0.0325 kg CO2e/passenger/km

Transit has the opportunity to reduce adverse impacts to health and encourage healthy habits. Providing attractive and efficient transit options close to people and jobs encourages an increase in both transit usage and the use of active modes to access transit (e.g., walking and cycling). Active transportation modes are largely dependent on convenience, density, built form, and supportive infrastructure.

Option 1 will provide significantly improved active transportation infrastructure within the study corridor. These include wider sidewalks on both sides of the road, protected cycle tracks along the corridor, an increased buffer between vulnerable road users and general traffic, and improved landscaping that provides shade to cyclists and pedestrians. These improvements to the pedestrian and cycling network in the corridor will create a safer and more comfortable experience for sustainable transportation modes. **Figure 4-2**

illustrates a typical plan view proposed for Option 1 depicting protected cycle tracks and the landscaping strip.

Figure 4-2: Typical Plan View for Option 1



Transit can reduce impacts of transportation on the environment. There are benefits to shifting auto trips to transit to relieve traffic congestion, use energy more efficiently, and reduce greenhouse gas emissions. Major infrastructure projects such as higher-order transit may also have adverse impacts to natural features, which must be avoided or mitigated. The proposed EELRT will have minimal impacts to natural features.

The projected demand in 2041 along the study corridor far exceeds the capacity that can be provided by buses (Base Case). The peak point ridership will require buses every 1 minute or less. This will substantially increase traffic congestion along the corridor, impacting not only traffic flow, but also the natural environment through increased air and noise pollution. These impacts can have wide-ranging effects on surrounding communities, degrading liveability, and quality of life. In equity-deserving neighbourhoods, such as Neighbourhood Improvement Areas (NIAs), this exacerbates a cycle of further inequities.

Option 1 supports the 2041 projected ridership demand sustainably and more equitably with reduced traffic congestion, less noise and air pollution, and an enhanced urban environment. As a result, Option 1 improves overall liveability and quality of life. Higher ridership would also suggest lower VKT

and greenhouse gas emissions.[14] Although Option 1 would result in a daily average of 34,000 VKT more than the Base Case, LRVs utilize electric rail technologies, which reduces the amount of energy spent per trip and per passenger compared to the private automobiles and buses.

The EELRT would cross the Highland Creek ravine, a significant natural feature in Scarborough, along Morningside Avenue between Kingston Road and Ellesmere Road. It will share the existing road bridge. Detailed mitigation strategies will be updated for the EELRT through the Transit Project Assessment Process (TPAP).

Outcome 3: Supporting Prosperity

Criteria 1: Affordability

Affordability is evaluated in the **Economic Case**.

Criteria 2: Supports Growth

From a Supports Growth perspective, Option 1: EELRT is preferred over the Base Case. **Table 4-8** summarizes the Supports Growth measures relative to the Base Case.

Key findings include the following:

- Option 1 better supports the employment growth and development of Mixed-Use Areas, General Employment Areas, and Core Employment Areas along the alignment compared to the Base Case, due to the coverage of higher-order transit and the value LRT generates.
- The EELRT would provide higher-order transit stops within walking distance of 17,800 jobs.
    - Transit investments can play a significant role in the employment development in the City. Higher-order transit may be constructed to better serve existing areas of high employment density or areas planned for higher density to increase transportation accessibility, and therefore incentivize businesses to be located near stops and stations.[15]

[14] Vehicle Kilometres Travelled (VKT) measures the total distance travelled by cars (volume and length of trips). A decrease in VKT in Toronto indicates a reduction in overall congestion and greenhouse gas emissions.

[15] Existing employment density can be used as a proxy for projected future employment density in an area. Projections are based on observed trends and may not be able to predict some employment growth as they do not capture the positive incentives that higher-order transit infrastructure would provide to businesses in the future.

Table 4-8: Summary of Supports Growth Measures – Relative to Base Case

Measure	Option 1: Eglinton East LRT
Higher-order transit service to employment growth areas	13 stops planned within mixed-use Avenues along Eglinton Avenue East and Kingston Road, 6 stops within or near Core/General Employment Areas, and 2 stops in Malvern
Area and proportion of land within walking distance (500 metre) of higher-order transit stations designated for employment growth	Mixed-Use: 1.5 km^2 Employment lands: 1.1 km^2 Total: 18%
Jobs within walking distance (500 metre) of higher-order transit stations	Existing (2021): 17,800 jobs Projected growth (2021 to 2041): +3,000 jobs Projected future (2041): 20,800 jobs
Employment density within walking distance (500 metre) of higher-order transit stations	Existing (2021): 1,200 jobs/km^2 Projected growth (2021 to 2041): +300 jobs/km^2 Projected future (2041): 1,500 jobs/km^2
Access to jobs (number of jobs accessible to the average person in Scarborough within 45-minute transit travel) (2041)	255,000 jobs (-1,000 jobs compared to the Base Case)

The evaluation of a project's impact on supporting employment growth relates to how the project would serve employment growth areas. Studies have consistently demonstrated the value that LRT brings to city-building and growth. There is evidence that implementation of LRT can provide an uplift in property values, investment, and associated economic activity, particularly if it is coordinated with other planning initiatives.[16]

The EELRT would enhance transit connections to existing employment and generate opportunities for employment growth in Mixed-Use Areas, General Employment Areas, and Core Employment Areas along the alignment. Such

[16] 'The North American Light Rail Experience: Insights for Hamilton' (2012), Higgins, C., Ferguson, M. McMaster Institute for Transportation and Logistics, McMaster University, Hamilton, ON. April 2012. This paper provides a review of the academic literature examining the impacts of LRT on property values. Up to 23% uplift in value for commercial properties, and up to 10% uplift in property values for homes, depending on place.

connections would include existing employment along the Eglinton Avenue East and Kingston Road corridor, as well as various retail clusters (Eglinton-Markham, Kingston-Lawrence-Morningside, Morningside-Sheppard, and Sheppard-McCowan), and Malvern Town Centre.

The EELRT provides higher-order transit service to UTSC students and staff and supports campus expansion. This strategic link between UTSC and the rest of the City supports UTSC's ambition of becoming an anchor institution.

Strategic Evaluation Summary

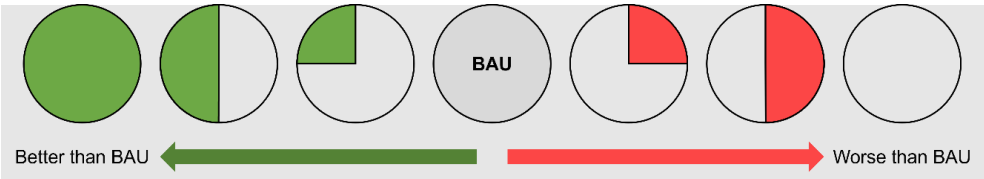
Based on evaluation of seven of the Rapid Transit Evaluation Framework (RTEF) criteria, as well as the overall project objectives, Option 1: EELRT is preferred over the Base Case from a Strategic Case perspective. See **Table 4-9** for the Strategic Evaluation Summary.

Option 1 provides a new higher-order transit option for residents in Scarborough. This includes connections to three GO stations, Line 2, Line 5, the proposed Line 4 extension, and the DSBRT.

Option 1 is proposed to serve UTSC which would provide additional higher-order transit service for students and staff and support planned campus expansion. Option 1, in combination with the DSBRT provides a strategic link between UTSC, the rest of the City, and Durham Region. It also supports UTSC's ambition to become an anchor institution. There is an opportunity for UTSC to plan its campus expansion to be more easily served by future higher-order transit.

The average number of transfers and average travel times across the network in Option 1 are similar to the Base Case. Current ridership modelling suggests that the Base Case attracts a higher forecasted system-wide ridership than Option 1 by 5,000 passengers per day in 2041. However, further work developing a complementary bus network is expected to improve ridership. The projected demand in 2041 along the study corridor far exceeds the capacity that can be practically provided by the Base Case. A peak point ridership of over 3,700 passengers per hour would require buses every 1 minute or less. While it is theoretically possible to provide enough buses to serve this ridership in the future, this would require large expansions to the Kennedy Station bus terminal and bus maintenance and storage facilities.

Table 4-9: Strategic Evaluation Summary



Outcomes	Criteria	Option 1: Eglinton East LRT
Serving People	Choice	
	Experience	
	Social Equity	
Strengthening Places	Shaping the City	
	Healthy Neighbourhoods	
	Public Health and Environment	
Supporting Prosperity	Affordability	*See **Economic Case***
	Supports Growth	

Operating costs would increase proportionally and would make the Base Case impractical. Operations of this terminal and the buses along the corridor would be a challenge, and reliability and comfort would be low. The Base Case would contribute to a lower quality of life in the surrounding area due to increased traffic congestion, noise, and air pollution. In equity-deserving neighbourhoods, this exacerbates a cycle of further inequities. Higher-order transit is required to serve the study area reliably, comfortably, and sustainably. Option 1 offers improved experiences due to greater reliability, smoother rides, reduced crowding, and new amenities for transit riders.

Option 1 better aligns with the Toronto Strong Neighbourhoods Strategy (TSNS) through the benefits of constructing new higher-order transit, such as

supporting residential and employment growth, improving the public realm; and stimulating the local economy for seven Neighbourhood Improvement Areas (NIAs) and two Emerging Neighbourhoods.

Option 1 creates an opportunity for wider community-building benefits as a result of the investment in the project, including new community-gathering spaces and civic spaces at key locations and improving the streetscape and public realm along the alignment. New community gathering spaces would support wider social equity and community development goals. The EELRT connects to Mixed-Use Avenues, retail clusters in Employment Areas and Malvern, community services and facilities, two post-secondary institutions, and the Toronto Pan Am Sports Centre, stimulating growth and vibrancy in these areas and encouraging economic opportunities along the alignment. Option 1 would also support the development of complete communities and transit-oriented development along Eglinton Avenue East and Kingston Road and at Malvern Town Centre.

Option 1 offers improvements to the Public Health and Environment through the reduction of bus traffic and provision of dedicated pedestrian and cycling facilities that expand the accessibility of active transportation options in the area. New environmental challenges are not expected for the Base Case.

It should be noted that approximately half of the area that would be served by the EELRT is currently being served by local and express buses on the RapidTO curbside bus lanes in the Base Case. The current RapidTO curbside bus lanes end at UTSC and do not serve residents in northern Scarborough and Malvern. The EELRT offers the additional strategic benefit of providing a higher-order transit connection to Malvern and additional rapid transit connections to Line 2 and the proposed Line 4.

5. Economic Case

Introduction & Assumptions

The Economic Case is another case in the business case framework examining the rationale for pursuing an investment. While the Strategic Case evaluates the options based on a project specific policy/plan-oriented evaluation framework, the Economic Case determines if the expected benefits of this investment exceed the costs required to deliver it and articulates the overall benefit to society of pursuing the investment.

The Economic Case provides estimates of the economic benefits that are expected to be generated by the proposed project over a 60-year period of operations (plus the construction period) and compares them to the anticipated costs. A 60-year operating period was selected for this updated IBC given the long life of the underlying LRT infrastructure.

Project costs include both the resources required to develop Option 1: EELRT and the costs of maintaining the new infrastructure asset over time. Estimated benefits are based on the projected impacts of the project on both users and non-users of the facility, valued in monetary terms to the extent possible, as compared to a base case. The assumed Base Case is the scenario of continued bus operations in the study area, or the Business-as-Usual (BAU) scenario described in the Investment Options section of this report. The analysis considers the magnitude of costs and benefits as well as overall performance indicators, in particular:

- Net Present Value (NPV): project benefits minus project costs, which is used to indicate the overall net value of the project to society (magnitude of net benefits).
- Benefit-Cost Ratio (BCR): an indicator showing the value of benefits for each $1 of project costs (value of benefits in relation to project costs).
- Internal Rate of Return (IRR): discount factor needed for the annual costs and benefits of the project to have a NPV of $0 in a discounted cash flow analysis.

Table 5-1 provides the key framing assumptions for the analysis and estimation of benefits and costs of the project over the analysis period. All assumptions were based on Metrolinx Business Case Guidance August 2021 edition.[17]

[17] Metrolinx. Business Case Manual Volume 2: Guidance. August 2021. Metrolinx Business Case Manual Volume 2: Guidance

Table 5-1: Economic Case Key Analysis and Parameter Value Assumptions

Input	Unit	Value	Source and Comments
Base Year	year	2023	Current Year
First Year of Study Period	year	2023	Current Year
Evaluation Period	years of operations	60	Metrolinx Business Case Guidance. August 2021
Growth Cap	years after Base Year	30	Metrolinx Business Case Guidance. August 2021. Applies to all growth rates.
Final Year of Study	year	2093	Calculated from inputs.
Construction Start	year	2027	City of Toronto
Construction End	year	2033	City of Toronto
Project Opening Year	year	2034	Calculated
Discount Rate	percent	3.5%	Metrolinx Business Case Guidance. August 2021

Costs

Capital Construction Costs

Table 5-2 provides a summary of the capital construction cost of Option 1: EELRT.[18] Costs shown in the table represent up to Class 3 estimates (or a 10% design) of the expected magnitude of construction costs and include direct costs for construction of structures, site preparation and civil work, as well as indirect costs such as general requirements and mobilization, design professional fees, a contingency allowance of 15%, and an escalation factor of 47% to account for possible cost fluctuations and increase in real costs by the time construction start.

[18] Construction costs were estimated by Altus Expert Services quantity surveyors in September 2023 and presented in 2023 dollars. Table 5-2 does not include Metrolinx-related contingencies and allowances (Program Development in the amount of 17% and Program Contingency of 10%) which were included in the cost estimates provided by Altus. In the Economic Case, these contingencies were replaced by the Optimism Bias.

Per the Metrolinx guidance, an adjustment for Optimism Bias (OB) must be applied to costs in the Economic Case to account for the tendency to underestimate costs of medium to large infrastructure projects. For 10% design costs, the OB factor is 64%. This factor was applied to the estimated base capital construction costs but without the escalation factor. Total Capital Construction Cost Adjusted for OB was then the sum of base capital costs, OB amount, and the escalation factor. Table 5-2 provides a summary of capital construction cost estimates. Base capital construction costs amount to $2.97 billion (without escalation). Total capital construction costs adjusted for OB are then $4.87 billion and costs adjusted for escalation are $5.88 billion.

Table 5-2: Capital Construction Costs, Millions of 2023 Dollars

	Amount
Total Base Capital Costs (Not Escalated)	**$2,969.9**
Optimism Bias	$1,900.7
Total Capital Costs Adjusted for Optimism Bias	**$4,870.6**
Escalation	$1,014.2
Total Capital Costs Adjusted for Optimism Bias (Escalated)	**$5,884.7**

Vehicle Fleet, Rehabilitation, and Renewal Costs

Vehicle fleet costs represent the initial costs of light rail vehicles (LRVs) and their replacement at the end of their life cycle which is anticipated after 30 years of operations. It is estimated that about 31 LRVs would be required for the planned service level.

Cost estimates of the LRVs were not available at the time of this analysis.

Based on past news releases of contracts awarded by Metrolinx to a major manufacturer of LRVs for Ontario LRT projects, this cost is estimated at about $10.3 million per vehicle (in 2023 dollars).[19]

The schedule of rehabilitation and renewal costs was not determined at the time of this analysis. For this updated IBC, based on previous similar analyses, the total rehabilitation and renewal costs were assumed at 50% of the initial capital construction costs. These costs were distributed in equal average annual amounts over the operating period years 16 to 60.

Recognizing that LRT operations will eliminate the need for bus services and the corresponding capital costs, the cost of the bus fleet that would be needed for the Base Case operations in the Eglinton East corridor was deducted from the LRT costs.

It is estimated that about 83 to 98 buses will be required in the Base Case. Anticipating a transition to electric buses.[20] The cost per bus was assumed based on a recent announcement by the City of Toronto and the federal government regarding the purchase of zero emission buses for the City of Toronto.[21] Based on that announcement, the cost per bus is estimated at about $2.1 million, including the charging infrastructure that would be needed.

It is also recognized that the Base Case scenario would also require certain capital renewal costs such as those related to roadway maintenance. Specific cost information for the Base Case was not available. Therefore, this cost was approximated based on construction cost of the Durham-Scarborough BRT (as published in the Initial Business Case Report and total costs converted to cost/km) extrapolated to the Base Case based on the length of the bus lanes. The average annual rehabilitation and renewal cost was then calculated in the same way as for Option 1, assuming total cost of

[19] Refer to: Alstom receives order for 61 Citadis Spirit light rail vehicles for Greater Toronto and Hamilton area | Alstom (accessed September 2023).
[20] The TTC is transiting to a 100% e-bus fleet by 2040.
[21] Refer to: Toronto is buying over 300 new electric buses with help from the federal government | CBC News (accessed September 2023).

50% of construction costs distributed over the years 16-60 and adjusted for OB.

In the Economic Case modeling, the number of vehicles for both Option 1 and the Base Case was increased by the spare ratio of 20%. In addition, consistently with Metrolinx requirements, the OB factor of 64% and the annual cost escalation factor of 1% were applied to all vehicle costs. The Option 1 renewal and rehabilitation costs were escalated by the annual rate of 1% counting from the first year of operations.

Table 5-3 provides an overview of assumptions.

Table 5-3: Vehicle Fleet, Renewal and Rehabilitation Costs Assumptions

Cost Element	Unit	Amount	Source and Comments
Number of LRT Vehicles Required, by Year of Purchase/ Replacement			
2034	Number	31	Operating assumptions
2064		33	
Number of Buses Required in Base Case, by Year of Purchase/ Replacement			
2034	Number	83	Operating assumptions.
2046		92	
2058		98	
2070		98	
2082		98	
Vehicle Spare Ratio	Percent	20%	Industry Standard Assumption. Applies to both LRT vehicles and buses.
LRV Unit Cost	$ millions/ vehicle	$10.3	Calculated based on: https://www.alstom.com/press-releasesnews/2017/5/alstom-receives-order-for61-citadis-spirit-light-rail-vehicles-forgreater-toronto-and-hamilton-area, converted to 2023$.
Bus Unit Cost (Including Charging Infrastructure)	$ millions/ vehicle	$2.1	Calculated based on: https://www.cbc.ca/news/canada/toronto/ont-toronto-electric-buses-1.6820707

Cost Element	Unit	Amount	Source and Comments
Optimism Bias for Vehicle Costs	Percent	64%	Metrolinx Business Case Guidance. August 2021. Applied on both LRV costs and bus costs.
Vehicle Cost Escalation Factor	Percent	1%	Metrolinx Business Case Guidance. August 2021. Applied on both LRV costs and bus costs.
Rehabilitation and Renewal Costs	Percent of construction costs	50%	Assumption. Applies to both LRVs and buses.
Proxy for Bus Capital Rehabilitation and Renewal	$ millions	$13.8	Value based on Durham-Scarborough Bus Rapid Transit Study IBC. 2018. Total cost converted to $/km and multiplied by 8.5. Values escalated to 2023.
Total Lifecycle Vehicle Replacement Cost (Buses)	$ millions	$2,920.7	Calculated based on above assumptions. Undiscounted.
Total Lifecycle Vehicle Replacement Cost (LRVs)	$ millions	$1,604.6	Calculated based on above assumptions. Undiscounted.

Property Costs

Construction of Option 1 is also expected to require acquisition of certain properties such as for a maintenance and storage facility (MSF). Although a baseline value of a candidate site was available at the time of writing this report, a comparable assessment for the Base Case property requirements and costs was not completed. Including a property cost for Option 1 without corresponding savings on property costs that would have to be incurred in the Base Case would overstate the net cost of Option 1. Therefore, this updated IBC did not include property costs.

Operations and Maintenance Costs

Operating and maintenance (O&M) costs are ongoing costs required to operate the service and provide day-to-day maintenance of the project. Lifecycle maintenance and renewal are included under the vehicle fleet,

rehabilitation, and renewal cost category. Therefore, the O&M costs include the labour costs related to drivers/vehicle operators and routine maintenance.

O&M costs specific for Option 1 operations were not available at the time of this analysis. Therefore, the costs for this Economic Case were based on Finch West LRT. These costs are estimated at $58.8 million annually (in 2023 dollars). Bus O&M costs, estimated at $24.4 million annually were netted off the LRT cost resulting in the net annual O&M cost of $34.4 million as of 2023. In the Economic Case model, these annual costs were escalated at the rate of 1% annually. Bus O&M costs were escalated by an additional rate of 1% annually to account for the impact of anticipated increasing road congestion. Increasing road congestion will reduce bus operating speeds, increase travel times, and thus driver hours. This can be expected to increase labour costs of the Base Case. **Table 5-4** provides a summary of assumptions.

Table 5-4: Operations and Maintenance Costs Assumptions

Cost Element	Unit	Amount	Source and Comments
Annual LRT Operating Cost, 2023	$ millions	$58.8	Based on Finch West LRT operations, provided by TTC.
Annual Bus Operating Cost, 2023	$ millions	$24.4	Provided by TTC.
Net Annual Option 1 Operating Cost, 2023	$ millions	$34.3	Difference between full LRT costs and bus costs.
Cost Escalation Factor	Percent Annually	1%	Metrolinx Business Case Guidance. August 2021. Applied to both O&M in Base Case and Option 1.
Congestion Cost Escalation Factor	Percent Annually	1%	Assumption. Applied to Base Case O&M to account for increasing costs due to congestion.

User Impacts

Transportation User Impacts reflect the benefits to travellers that are realized when the investment changes the generalized cost of travel. The generalized cost of travel can include a multitude of factors, including travel time, wait time, reliability, amenity, user costs, and crowding that reflected the users perceived journey time. These impacts capture the overall change in welfare of transport network users. This analysis includes the following user impacts:

- **Transit User Travel Time:** The overall change in transit travel time including in-vehicle, access, and waiting time across the transit network.
- **Transit User Journey Perception (Mode Perception):** Value reflecting the perceived benefit of traveling on the LRT mode compared to the same trip on a bus (preference of a rail mode compared to bus modes).
- **Reduction in Transit User Crowding:** Value reflecting perceived quality of service related to the utilization and capacity of the line and transit vehicles.
- **Improved Transit Service Reliability:** Measure of excess wait time that results when users cannot receive service when they show up at a stop (get on the bus or LRV) due to demand exceeding capacity. In this situation, users are stranded at a stop and forced to wait for another vehicle.
- **Unperceived Auto Cost Savings:** Changes in marginal costs related to owning and operating a vehicle experienced by users switching between auto and transit. User impacts are driven by the magnitude of transit ridership in Option 1: EELRT and the Base Case.

EELRT ridership – in the form of peak-hours ridership by link – was estimated by City Planning using the GTAv4 transportation model for model year 2041. For this Economic Case, ridership was assumed to grow at an average annual rate of growth of 0.85% (based on population projections by the Ontario Ministry of Finance). After 2052, ridership volumes were held constant, consistent with a 30-year growth cap recommended by Metrolinx. For years prior to 2041, ridership was decreased at the same rate of growth. Peak-hours ridership was extrapolated to annual ridership based on a factor of 1607 allocated between 3-hour AM ridership and 4-hour PM ridership based on previous business case analyses of light rail transit investment in the area.[22]

All user benefits estimates were converted to factor costs by dividing the initial estimates by 1.13 as per Metrolinx guidance. The adjustment is needed to evaluate project impacts and project costs on a comparable scale: while

[22] Metrolinx, “Eglinton Crosstown Rapid Transit Benefits Case Update”, June 2012. The extrapolation factor was derived based on report Table 3.1 and Table 3.2 which showed 3-hour AM peak and annual ridership, respectively. It was assumed that the Eglinton Crosstown LRT provides a reasonable approximation of the daily distribution of travel that would be experienced on EELRT. Factor of 1607 was divided by annualization factor of 306, then distributed evenly between AM / PM peaks periods.

user impacts accrue in the market price unit of account, i.e., inclusive of taxation, project costs accrue in the factor cost unit of account, i.e., net of any taxes. In this conversion, a project's estimated direct user benefits are subject to a downward tax adjustment, or a division by a factor equivalent to Ontario's harmonized sales tax (HST), a factor equal to (1+0.13).

The key input data assumptions used in the estimation of annual benefits and impacts and parameters used for valuation of the impacts are as shown are summarized in **Table 5-5**. To the extent possible, the methodology of estimation of the various benefits and impacts was based on Metrolinx guidance and its recommended valuation parameters (which were adjusted to 2023 dollars using the consumer price index from Statistics Canada). Where Metrolinx guidance was lacking, approaches/methodologies and valuation parameters from international leading agencies were adopted. The specific benefits and their methodology are discussed in subsequent sections following the table.

Table 5-5: Assumptions in Estimation of User Impacts

Input	Unit	Value	Source and Comments
Transit Ridership in Scarborough – Base Case	passengers/day	479,000	City of Toronto, outputs from GTAv4 transportation model.
Transit Ridership in Scarborough – Option 1	passengers/day	474,000	
Model Year	year	2041	
Impacts to Auto Travel Times – Option 1	minutes per day	-43,000	
Total Daily Auto VKT – Base Case	daily VKT	174,917,000	
Total Daily Auto VKT – Option 1	daily VKT	174,951,000	
AM Peak Period Ridership (6AM9AM) – Option 1	passengers/peak period	18,100	City of Toronto, outputs from GTAv4 transportation model.
PM Peak Period Ridership (3PM7PM) – Option 1	passengers/peak period	22,800	

Input	Unit	Value	Source and Comments
Annualization Factor (For Travel Time Savings)	days/year	306	Based on TTC 2019 annual passengers divided by average daily passenger revenue
Conversion Factor from Peak Hours to Daily Ridership Flow Impacts (AM / PM)	Number	2.62	Calculated based on peak period factor of 1607 (previous analysis) and the annualization factor. Applied to AM & PM peak ridership.
Annualization Factor (For Crowding)	days/year	250	Typical number of workdays per year
Daily Ridership (2041) – Option 1	passengers/day	107,200	Calculated using above factors.
Ridership Growth Rate	%	0.85%	Based on population projections by Ontario Ministry of Finance. Ridership is assumed to grow at same rate as population.
Average LRT Speed	km/h	22.0	Previous LRT analyses and TTC.
Average Bus Speed	km/h	18.0	
Reduction in Bus Speed due to Corridor Congestion	percent annually	1%	Applied after 2041 and capped after 2052.
Value of Time	2023$/year	$20.62	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Road Safety Benefits	2023$/vkt	$0.10	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$

Input	Unit	Value	Source and Comments
Annual Reduction in Road Safety Benefits	%	-$0.05	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Greenhouse Gas Emission Cost	2023$/vkt	$0.011	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Criteria Air Contaminants Cost	2023$/vkt	$0.002	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Auto Maintenance Cost	2023$/vkt	$0.005	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Auto Fuel Cost	2023$/vkt	$0.38	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Unperceived Auto Operating Costs	2023$/vkt	$0.11	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$
Indirect Fuel Taxation	2023$/vkt	$0.04	Metrolinx Business Case Guidance. August 2021. Inflated to 2023$

Input	Unit	Value	Source and Comments
Step-Free Access to Vehicle Benefit	2023$/rider	$0.12	Calculated following US DOT BCA Guidance. 2023 Update. Converted to $2023 CAD. Retrieved from: https://www.transportation.gov/sites/dot.gov/files/202001/benefit-cost-analysis-
Value of Expanded Sidewalk	2023$/ personmile	$0.02	guidance- 2020_0.pdf#:~:text=This%20document%20is%20intended%20to%20provide%20applicants%20to,benefits%20and%20costs%20of%20a%20potential%20infrastructure%20project.
CPI Adjustment 2021 to 2023	number	1.10	Statistics Canada. Table 18-100005-01 Consumer Price Index, annual average, not seasonally adjusted
USD/CAD	factor	1.34	Bank of Canada. Monthly Exchange Rates, 2023 average. https://www.bankofcanada.ca/rates/exchange/monthly exchange-rates/

Input	Unit	Value	Source and Comments
Value of Journey Quality Improvements – Per 25 min Trip	minutes/trip	4.7	Australian Transport Assessment Planning Guidelines, M1-Public Transport, May 2018, Table 25. https://www.atap.gov.au/sites/default/files/M1_Public_transport.pdf

Travel Time Savings to Transit Users

Average operating speeds of LRT are expected to be higher than for buses running in RapidTO curbside bus lanes along Eglinton East and in mixed traffic elsewhere in the study corridor. Based on previous analyses of LRT and TTC operating experience along this corridor, the average LRT speed was assumed at 22 km/hour and average bus speed was assumed at 18 km/hour.[23] Given that this is the average bus speed in the RapidTO curbside bus lanes, this is a conservative estimate of the greater travel time savings for bus routes in mixed traffic in the rest of the study corridor.

These average speeds were used to calculate average travel times by LRT and by bus on each link in the LRT corridor (i.e., from stop to stop). Transportation modeling provided peak period LRT ridership for each link in both directions of travel. Multiplying these link volumes by the LRT travel time and summing across links generated the total LRT travel time for all users. Repeating the same calculation with the average bus travel time generated the total bus travel time for all users. The difference between the bus travel time and the LRT travel time is the travel time saving of the LRT mode. These calculations implied the average travel time savings per trip of about 5 minutes.

The LRT and bus travel time calculations described above were conducted for the AM and PM peak periods for the model year 2041. They were then extrapolated for years prior and after 2041 assuming the ridership rate of growth of 0.85%. The LRT travel time was assumed constant over the analysis period given LRT operations in dedicated median lanes. Bus operating speeds were assumed to deteriorate in the long-run given the

[23] The average operating speeds account for deceleration time, dwell time at bus stops, and acceleration time to full operating speed.

overall trends of increasing road congestion. To account for this effect, bus travel times were assumed to increase after 2041 by an average annual rate of 1%.

Travel time savings calculated in this way cover the peak periods only and thus may be considered a conservative estimate of travel time savings benefit of Option 1: EELRT. Similar magnitudes of travel time savings can also be expected during off-peak time. To account for this effect, the peak-hour estimates were multiplied by a peak-to daily extrapolation factor of 2.62 in both peak periods to convert them to daily benefits.[24]

Annualized daily travel time savings were multiplied by the value of time to obtain the monetary value of travel time savings. It is also noted that these estimates account for changes in in-vehicle time only. Walk time to stops and stations can be assumed essentially the same between the base case and Option 1. The difference in excess wait time due to the constraints in service capacity is accounted for separately under the benefit of reduction in unserved demand.

Transit User Journey Perceptions

There has been growing recognition that travelers may prefer one mode over another for reasons that go beyond travel time and the amount of fare. These may include quality and amenity aspects of stops/stations and vehicles, overall convenience and comfort, and other “softer” factors which may impact on the perceptions of travel and choice of mode.

The emerging practice accounts for these benefits in the form of multipliers to the travel time of the relevant segment of the journey, or alternatively as a constant change to the generalized travel time (in minutes per journey). This evaluation uses the latter approach and adopts “mode specific constants” (or MSC) based on Australian business case guidance for public transport projects. The benefits captured by MSCs are expressed in terms of a “bonus” travel time saved when travelling on the LRT as opposed to bus. This benefit varies by trip length. For example, for a 15-minute bus trip that would be replaced by LRT, they amount to 1.8 minutes per trip, and for a 20-minute and 25-minute bus trip that would be replaced by LRT, they amount to 3.0 and 4.7 minutes per trip, respectively.

It is estimated that in the Base Case the end-to-end bus travel time in the study corridor would take about 50 minutes. For this analysis, the average trip length was assumed at half of the entire travel time given the nature of the service in the corridor (service to/from a major subway station such as

[24] The peak-hours-to daily extrapolation factor is an implied value based on the assumed peak-to annual extrapolation factor of 1607 referred to earlier and a general daily-to annual annualization factor of 306 stated in Table 5-5.

the Kennedy Station and a major destination such as UTSC). This implies the average bus travel time of 25 minutes.

Replacing this trip with LRT results in a benefit of 4.7 minutes per passenger based on the Australian guidance. This benefit was applied to all LRT ridership.

Reduction in Transit User Crowding

Crowding represents the discomfort to transit users of travelling in crowded conditions or being required to stand. Crowding impacts are typically quantified by multiplying the travel time spent travelling under crowded conditions (for both seated and standing passengers) with a multiplier to represent the discomfort associated with doing so.[25]

The crowding factor was calculated for the peak hours of service, separately for the bus service and the LRT, using a formula from Metrolinx business case guidance.[26] The formula features weights and parameters (with specific values recommended by Metrolinx), and considers transit demand, capacity, and transit vehicle configuration (number of seated passengers and number of standing passengers). The calculation showed that the crowding factor for buses is larger than for LRT due to lower capacity of the bus service (1.64 versus 1.38 for buses and LRT, respectively). Travel time in crowded conditions was then calculated separately for the Base Case and Option 1 by multiplying the peak ridership by the average travel time and the crowding factor. Overall, Option 1 shows a reduction in crowding impacts.

Reduction in Unserved Demand

It is expected that by 2041, transit demand during peak hours will exceed or be just equal to the scheduled service capacity. Passengers stranded at a stop, or “unserved”, will be forced to wait until next vehicle with available capacity.[27]

The number of unserved passengers in the study corridor was estimated for the morning peak (6 AM to 9 AM) based on the hourly distribution of demand

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[25] TTC strives to ensure comparable travel comfort/crowding across all its services and modes and adjusts service frequencies accordingly. In operation, the service levels assumed in this analysis would be adjusted to maintain the crowding standard and reduce this benefit to 0. The transit user crowding benefits should be seen as a proxy for the changes in other user benefits and operating cost that would result from the iterative process to establish the ultimate service frequencies.

[26] Metrolinx. Business Case Manual Volume 2: Guidance. August 2021. Metrolinx Business Case Manual Volume 2: Guidance, Equation 5.7.

[27] Similarly to transit user crowding impacts, unserved demand/stranded passenger impacts can be seen as a proxy for other user benefits and operating costs that would result from the iterative process to establish the ultimate service frequencies. TTC strives to minimize the number of stranded passengers.

and scheduled capacity, both for the Base Case and Option 1. Passengers unserved in the first peak hour are forced to the next hour increasing demand in that hour. The calculation was repeated over the three peak hours, and the number of unserved passengers from each hour was summed across. The average additional wait time for stranded passengers was assumed equal to the headway in the next hour. This additional wait time was multiplied by the number of unserved passengers, value of time, and the wait time inconvenience factor of 2.5.

The additional wait time is expected to be smaller in Option 1 as the LRT offers a higher capacity than the bus service. The difference in the additional wait time between the Base Case and Option 1 is a benefit of the LRT project.

Unperceived Auto Cost Impacts

Unperceived auto costs refer to the “sunk” costs associated with each user trip by automobile, such as vehicle depreciation. Unperceived auto costs are quantified when an individual switches mode from automobile to transit for their commute over an extended period of time, as it generates a change in annual kilometres travelled which can affect the unperceived costs. In this case, because the EELRT transit modelling projects an overall decrease in transit ridership and an increase in auto vehicle kilometres, the result is an increase in unperceived auto costs.

To calculate this impact, the unit value of unperceived vehicle costs recommended by Metrolinx in its business case guidance is multiplied by the incremental change in annual vehicle kilometres traveled between the Base Case and Option 1. The assumptions used in the estimation of unperceived auto cost benefits are listed in **Table 5-5.**

Improved Accessibility

Light rail vehicles (LRVs) are generally boarded from a platform that offers platform level boarding without any steps. In comparison, boarding a bus usually requires stepping up.

Step-free boarding is particularly valued by wheelchair users as it allows them independent boarding (no need rely on a ramp being deployed). However, step-free access benefits all users by providing easier more comfortable access.

Recent cost-benefit analysis guidance from the United States Department of Transportation recommends a value of $0.08 per user trip (in 2021 dollars) to

monetize this benefit for LRVs.[28] This value was converted to Canadian dollars, adjusted to 2023 dollars, and multiplied by LRT ridership to derive total monetary value of improved accessibility.

Benefits to Pedestrians and Cyclists

Option 1: EELRT includes overall improvements to the streetscape in the LRT corridor. Specifically, this includes improved wider sidewalks of a general width of 2.1 metres, and new dedicated and separated bicycle lanes. Currently, some segments have sidewalks only on one side of the road, and most of the existing sidewalks are up to 1.8 metres wide. Also, currently the corridor does not have any bicycle lanes; cyclists have to use the general driving lanes in mixed traffic with autos or the RapidTO curbside bus lanes where available.

Sidewalk quality with attributes such as ample width directly impacts the comfort, convenience, and safety of a facility for pedestrian use. This is because of increased allowance for distances between pedestrians and moving vehicles and among pedestrians themselves, leading to improved safety, decreased noise and exhaust exposure, fewer pathing conflicts, and increased comfort.

Dedicated cycling facilities improves journey quality and comfort for cyclists as well as improve their travel times. In addition, research indicates that dedicated bicycle lanes reduce crashes on a roadway. This effect is due to the separation of cyclists and motorized traffic which can prevent or mitigate interactions and conflicts between them. Research conducted by United States Federal Highway Administration (FHWA) concludes that bicycle lane additions can reduce total crashes up to 49% on urban four-lane undivided collectors and 30% on urban two-lane undivided collectors and local roads.[29]

This updated IBC quantified benefits of improved sidewalks using recommendations from US Department of Transportation benefit-cost analysis guidance and the recommended benefit of $0.11 per person-mile per foot of added sidewalk width (in 2021 dollars).[30]

Data on pedestrian traffic in the LRT corridor was not available at the time of conducting this analysis. However, it can be assumed that all LRT users are pedestrians as well and have to walk a certain distance to/from the stop. For

[28] U.S. Department of Transportation, “Benefit-Cost Analysis Guidance for Discretionary Grant Programs”, January 2023, Table A10.
[29] Bicycle Lanes - Safety | Federal Highway Administration (dot.gov) (accessed September 2023).
[30] U.S. Department of Transportation, “Benefit-Cost Analysis Guidance for Discretionary Grant Programs”, January 2023, Table A8.

this analysis, it was assumed that the walk distance is 100 metres to and from a stop (for a combined distance of 200 metres) per LRT user, and that the sidewalk width increases from 1.8 to 2.1 metres across the corridor (i.e., by about one foot). This resulted in a benefit of $0.014 per passenger trip. This value was converted to Canadian dollars, adjusted to 2023 dollars, and multiplied by total LRT ridership.

Cycling benefits were not quantified in this updated IBC as cycling trip volumes and road collision statistics were not available. These benefits are highlighted here qualitatively as significant benefits.

Summary of User Benefits and Impacts Estimates

Table 5-6 presents estimates of user benefits discussed above. Total user benefits are estimated at nearly $5.7 billion undiscounted and $1.6 billion discounted at 3.5%. The largest benefit is travel time savings followed by the journey perception benefit, reduction in crowding, and accessibility benefits.

Table 5-6: User Benefits over Analysis Period, Millions of 2023 Dollars

Benefit or Impact Category	Undiscounted	Discounted at 3.5%
Travel Time Savings	$2,888.4	$767.6
Journey Perception Benefits	$1,691.1	$487.6
Pedestrian Benefits	$21.2	$6.1
Accessibility Benefits	$123.6	$35.6
Reduction in Unserved Demand (Reliability)	$123.2	$35.5
Crowding Reduction Benefits	$879.1	$253.5
Auto Operating Cost Impacts	-$54.0	-$15.6
Total User Benefits	**$5,672.4**	**$1,570.2**

Non-User and External Impacts

External impacts refer to broader socio-economic costs of transportation borne by the broader society which are not necessarily fully paid for by the transportation users. These include costs of road accidents (or road safety), environmental emissions (tailpipe greenhouse gases and criteria air contaminants), impacts on overall congestion and travel times experienced by other road users, and impacts on users' health due to the extent to which

transportation choices affects their engagement in physical activity. Mode shifts from auto to transit will lead to a reduction in these costs as transit has lower social/external costs per trip profile.

Vehicle Emissions Impacts

Since auto vehicle kilometres traveled (VKTs) are projected to increase in Option 1: EELRT, vehicle emissions can also be expected to increase. These impacts were monetized by applying a value of $0.01 per additional VKT for greenhouse gases (GHG), and a value of $0.002 for criteria air contaminants based on Metrolinx guidance (both values adjusted from 2021 to 2023 dollars using a consumer price index). It is, however, noted that in the long run, as the uptake of electric vehicles increases, this impact will gradually decrease. Therefore, the impact reported in this updated IBC is likely over-estimated.

It is also noted that removal of buses from the Eglinton East travel corridor will have a corresponding reduction in vehicle emissions, at least in the short run (since LRT will be powered by electricity) and generate offsetting benefits. In the long-run, as diesel-powered buses are replaced by electric buses, this effect will decline. Given the uncertainties regarding future fleets composition, these benefits were not quantified in this updated IBC, but they are highlighted as a qualitative benefit.

Travel Time Impacts to Auto Users

Transportation modeling for the EELRT project indicates an increase in travel time to auto traffic which is an expected outcome given the projected increase in in auto VKT. The 2041 model result for daily impact was annualized and extrapolated to years after and before 2041 assuming a rate of growth of 0.85% (the same as for the transit ridership).

Road Accident Impacts

Increase in auto VKT can also be expected to increase the exposure to the risks of road collisions and thus the number of road accidents. This impact was quantified and monetized by applying an accident cost value of $0.09 (adjusted from 2021 to 2023 dollars using a consumer price index) for every additional auto VKT. This valuation parameter was reduced by 5.3 percent annually (as per Metrolinx Business Case Framework August 2021 guidance).

Other Impacts

Other impacts of Option 1 are considered likely small. A brief discussion of potential impacts is provided below.

Wider Economic Impacts

Wider economic impacts are benefits to society realized when cost of travel is reduced and leads to increased productivity, improved access to labour pools with better matching skills, or when it reduces other inefficiencies in the economy.

As discussed in the Strategic Case chapter, Option 1 is expected to improve connectivity to jobs and increase the number of jobs within 500 metres from the stations and stops and increase the number of jobs accessible to an average Scarborough resident within 45 minutes (**Table 4-8**). This may increase access to labour pools. A detailed TAZ-level analysis of trip patterns and travel costs between the Base Case and Option 1 would be required to quantify this effect.

Increased Economic Development in the Corridor

It is sometimes argued that LRT is more “visible” than buses and thus may attract more business and residential development leading to increased business activity and increased property values. This effect may also be aided by general streetscape improvements envisioned with this project that may attract more visitors and pedestrians to the area. This benefit is uncertain at this time and thus highlighted as a potential impact.

Summary of Non-User Benefits

Table 5-7 presents estimates of user impacts discussed above. Total impacts amount to a negative $269.9 million undiscounted and $78.9 million discounted at 3.5%. The largest impact is due to travel time impacts to autos which account for over 90% of total impacts.

Table 5-7: Non-User and External Impacts over Analysis Period, Millions of 2023 Dollars

Benefit or Impact Category	Undiscounted	Discounted at 3.5%
Greenhouse Gas Impacts	-$5.4	-$1.6
Criteria Air Contaminant Impacts	-$1.1	-$0.3
Travel Time Impacts to Auto Users	-$255.6	-$73.7
Road Safety Impacts	-$7.8	-$3.4
Total Non-User and External Impacts	**-$269.9**	**-$78.9**

Economic Analysis Summary

The Economic Case compares life-cycle costs and benefits of an investment to determine its overall economic performance.

The methodology of estimating benefits used in this study and the resulting benefit estimates reported in the previous sections require an additional adjustment for (1) incremental fare revenues impact due to change in ridership, and (2) a change in government indirect fuel tax revenue due to a change in auto VKT. The first component (i.e., the incremental fare revenue) is a reduction in fare revenue due to estimated ridership in Option 1 being lower than in the Base Case, while the second component is an increase in government tax revenues due to an increase in auto VKTs. The revenue impact was calculated based on the average TTC fare of $2.40. The taxation impact was calculated using an indirect fuel factor of $0.035/VKT (adjusted from 2011 to 2023 dollars) recommended by Metrolinx.

The summary of total benefits, total costs, and resulting NPV, BCR, and IRR of the project are presented in **Table 5-8** below. Total discounted benefits amount to about $1.44 billion while total discounted costs amount to $5.87 billion (net of savings to the bus system). The project discounted NPV is then -$4,437.9 million for a BCR of 0.2. In undiscounted dollar terms, NPV and BCR amount to -$5,433.1 million and 0.5, respectively. Project IRR amounts to -9.5%.

Table 5-8: Summary of Economic Case Results, Millions of 2023 Dollars*

Impact Type	Undiscounted	Discounted at 3.5%
Benefits and Impacts		
User Benefits and Impacts	$5,672.4	$1,570.2
Non-User and External Impacts	-$269.9	-$78.9
CBA Adjustments	-$190.0	-$54.8
Total Adjusted Benefits	$5,212.6	$1,436.5
Costs		
Capital Construction Costs	$5,884.7	$4,571.0

Impact Type	Undiscounted	Discounted at 3.5%
Incremental Rehabilitation and Renewal Costs	$3,725.9	$792.6
Incremental Fleet Replacement Cost	-$1,316.1	-$205.4
Operations and Maintenance Costs	$2,351.2	$716.2
Total Costs	$10,645.7	$5,874.5
Net Outcomes		
Net Present Value (NPV)	-$5,433.1	-$4,437.9
Benefit-Cost Ratio (BCR, Number)	0.5	0.2
Internal Rate of Return (IRR, Percent)		-9.5%

* Unless indicated otherwise

Economic Case Sensitivity Analysis

Variation in Key Inputs and Assumptions

The economic outcomes presented in the previous sections rely on a large number of assumptions and long-term projections; both of which are subject to considerable uncertainty. This sensitivity analysis follows the recommendations for sensitivity analysis in the Metrolinx August 2021 Business Case Manual Volume 2: Guidance.

The primary purpose of the sensitivity analysis is to help identify the variables and model parameters whose variations have the greatest impact on the economic case outcomes: the “critical variables.”

The sensitivity analysis can also be used to:

- Evaluate the impact of changes in individual critical variables – how much the final results would vary with reasonable departures from the “preferred” or most likely value for the variable; and
- Assess the robustness of the analysis and evaluate whether the conclusions reached under the “preferred” set of input values are significantly altered by reasonable departures from those values.

In total, five sensitivities were tested for the economic case, with the NPV varying between 11.5 percent and 72.8% percent. The scenarios are listed below:

- **Removal of Benefit Adjustment for Taxation:** Under the Metrolinx Business Case Guidance, user impacts are converted to the factor price unit of account through the application of a tax adjustment equivalent to Ontario's HST using an indirect tax adjustment of (1+0.13). The first sensitivity considers the removal of this downwards adjustment.
- **Removal of Optimism Bias:** In the economic case, capital construction costs and vehicle costs are adjusted using an optimism bias uplift of 64%. The second sensitivity test eliminates this uplift factor.
- **Removal Of Benefit Adjustment for Taxation and Optimism Bias:** This scenario is a combination of the above two scenarios.
- **2.5% Real Discount Rate:** In the original analysis, a 3.5% real discount rate is recommended by Metrolinx. The fourth sensitivity considers a lower real discount rate of 2.5%. This will increase the magnitude of total discounted costs as well as benefits which will be reduced at a smaller rate over the analysis period.
- **Variation in the Value of Time Growth Rate:** The final scenario applies a growth rate of 0.75% annually to the value of time monetization factor. This will increase the value of travel time savings and related benefits quantified in the Economic Case model. Similar to other growth rates used throughout the model, this growth is capped 30 after years of analysis (beginning at the base year of 2023).

The outcomes of the sensitivity analysis for Option 1 - EELRT are summarized in **Table 5-9**. The table provides the percentage changes to the NPV in each test scenario compared to the default scenario parameters, as indicated in the column headers.

The sensitivity analysis indicates that the Option 1 – EELRT is robust across the change, with the benefit-cost ratio varying most significantly under the scenario where the 13% benefit adjustment for taxation and 64% optimism bias adjustment for capital costs are eliminated. In this test scenario, NPV increases to -$2,693 million and BCR increases to 0.4. However, as the table shows, in all test scenarios considered the benefit cost ratio remains below the breakeven threshold of 1.0.

Table 5-9: Sensitivity Analysis Results - Option 1: EELRT

Original NPV, Millions of 2023 Dollars (Discounted at 3.5%)	Original BCR	Parameters Change/Test Scenario	New NPV, Millions of 2023 Dollars (Discounted at 3.5%) *	Change in NPV (Percent)	New BCR
-$4,438	0.2	**Removal of Benefit Adjustment for Taxation**	-$4,383	+1.2%	0.3
		Removal of Optimism Bias	-$2,693	+39.3%	0.3
		Removal Of Benefit Adjustment for Taxation and Optimism Bias	-$2,693	+39.3%	0.4
		2.5% Real Discount Rate	-$4,719	+6.3%	0.3
		0.75% per year VOT Growth Rate	-$4,294	+3.3%	0.3

6. Financial Case

Introduction

The Financial Case assesses the overall financial impact of a proposed investment. While the Strategic Case and Economic Case outline how an investment achieves organizational goals and social value, the Financial Case is one of two cases (the other being the Deliverability and Operations Case) that focuses on the requirements to successfully deliver an investment. This includes a review of expenditures (capital, operating and maintenance) and revenues expected over the lifecycle of the investment, incremental to the base case scenario. The Financial Case does not assume any borrowing (as these details are not yet available) and does not reflect the procurement and delivery methods. A key difference between the Economic Case and Financial Case is that the Financial Case is conducted in nominal terms, meaning all costs and revenue changes include the impact of inflation.

Table 6-1 provides a summary of the key assumptions used across all components of the Financial Case analysis. Similar to the Economic Case, all assumptions are in accordance with the Metrolinx Business Case Guidance August 2021 edition.

Table 6-1: Financial Case Key Analysis and Parameter Value Assumptions

Input	Unit	Value	Source and Comments
Base Year	year	2023	Current Year
First Year of Study Period	year	2023	Current Year
Evaluation Period	years of operations	60	Metrolinx Business Case Guidance. August 2021
Growth Cap	years after Base Year	30	Metrolinx Business Case Guidance. August 2021. Applies to all growth rates.
Final Year of Study	year	2093	Calculated from inputs.
Construction Start	year	2027	City of Toronto
Construction End	year	2033	City of Toronto
Project Opening Year	year	2034	Calculated
Discount Rate	percent	5.5%	Metrolinx Business Case Guidance. August 2021
Inflation Rate	percent	2.0%	Metrolinx Business Case Guidance. August 2021.

Capital Costs

Table 6-2 provides a summary of the capital construction cost of Option 1: EELRT. As in the Economic Case, the costs represent up to a Class 3 estimate (10% design) of the expected magnitude of construction costs and include direct costs for construction of structures, site preparation and civil work, as well as indirect costs. The same contingency allowances and escalation factors are applied in the Financial Case as in the Economic Case. In the Financial Case, the Optimism Bias is not included in the cost estimate. However, an additional 27% in Metrolinx related contingency allowance (17% for program development, and 10% program contingency) is included in the construction cost estimate, along with non-recoverable harmonized sales tax (HST). Including escalation and all allowances, total capital construction cost amounts to $4,645.4 billion.

Table 6-2: Capital Construction Costs, Millions of 2023$ (Financial Case)

	Amount
Total Base Capital Costs (Not Escalated)	**$3,631.3**
Escalation	$1,014.2
Total Capital Costs	**$4,645.4**

Vehicle Fleet, Rehabilitation, and Renewal Costs

Vehicle fleet replacement assumptions regarding the number of needed vehicles and operational life cycles for both the Option 1 and Base Case are the same as those presented in the Economic Case.

The key difference between the Economic and Financial modeling of vehicle fleet, rehabilitation, and renewal costs is the adjustment of costs over the period of analysis. The financial case does not include optimism bias, however, as previously stated, all costs are presented in nominal terms, and as such are adjusted for inflation on an annual basis.

Table 6-3 provides an overview of vehicle fleet, rehabilitation, and renewal costs. Assuming a 5.5 percent discount rate, over the period of analysis these costs are expected to amount to $443.6 million.

Table 6-3: Vehicle Fleet, Rehabilitation, and Renewal Costs, Millions of 2023 Dollars

Cost Element	Undiscounted	Discounted at 5.5%
Incremental Rehabilitation and Renewal Costs	$8,075.4	$661.3
Incremental Fleet Replacement Cost	-$2,612.0	-$195.5
Total Vehicle Fleet, Rehabilitation, and Renewal Costs	**$5,463.4**	**$465.7**

Operational and Maintenance Costs

Operating and maintenance (O&M) costs are ongoing costs required to operate the service and provide day-to-day maintenance of the project. Lifecycle maintenance and renewal are included in the previous section. Therefore, the O&M costs include the labour costs related to drivers/vehicle operators and routine maintenance. All assumptions for Operational and Maintenance Costs are the same as the Economic Case, except for the additional 2% per year adjustment for inflation that is applied in the Financial Case. **Table 6-4** presents the annual assumptions used in the derivation of Operational and Maintenance Costs for Option 1, and **Table 6-5** presents the full value of the costs over the period of analysis. Assuming a 5.5% discount rate in accordance with Metrolinx Business Case guidance, incremental Operational and Maintenance Costs are expected to be $709.9 million over the study period.

Table 6-4: Operational and Maintenance Cost Assumptions

Cost Element	Unit	Amount	Source and Comments
Annual LRT Operating Cost, 2023	$ millions	$58.8	Based on Finch West LRT operations, provided by TTC.
Annual Bus Operating Cost, 2023	$ millions	$24.4	Provided by TTC.
Net Annual Option 1: EELRT Operating Cost, 2023	$ millions	$34.3	Difference between full LRT costs and bus costs.
Cost Escalation Factor	Percent Annually	1%	Metrolinx Business Case Guidance. August 2021. Applied to both Base Case O&M and Option 1 O&M.
Congestion Cost Escalation Factor	Percent Annually	1%	Assumption. Applied to Base Case O&M to account for increasing costs due to congestion.
Inflation Factor	Percent Annually	2%	Metrolinx Business Case Guidance. August 2021. Applied to both Base Case O&M and Option 1 O&M.

Table 6-5: Operational and Maintenance Costs, Millions of 2023 Dollars

Cost Element	Undiscounted	Discounted at 5.5%
Operations and Maintenance Costs	$5,254.5	$709.9

Revenue Impacts

Fare revenue impacts are directly related to the change in ridership as a result of the project. Modeling shows that Option 1 will result in a slight decrease of 5,000 transit users per day by 2041. As such, fare revenues are expected to decrease. Transit ridership was extrapolated for all other years considered in the period of analysis using an annual rate of 0.85% based on population projections published by the Ontario Ministry of Finance.

Average transit fares per user are sourced from the TTC's 2021 Conventional Transit Statistics Operating Data. This value was increased in line with

growth in basic adult fare in Toronto between 2014 and 2023. All assumptions used in the derivation of fare revenue impacts are presented in **Table 6-6.**

Table 6-6 Fare Revenue Impact Assumptions

Input	Unit	Value	Source
Transit Ridership in Scarborough - Base Case	passengers/day	479,000	City of Toronto, outputs from GTAv4 transportation model.
Transit Ridership in Scarborough - Option 1: EELRT	passengers/year	474,000	
Average TTC Fare (2021)	$/user	$2.29	TTC. Conventional Transit Statistics Operating Data. 2021
Inflation Rate	percent annually	2.00%	Metrolinx Business Case Guidance. August 2021.

Assuming a 5.5% discount rate, the incremental change in fare revenue over the period of analysis is expected to be -$69.5 million. Estimates are presented in **Table 6-7**.

Table 6-7: Incremental Fare Revenues, Millions of 2023 Dollars

Cost Element	Undiscounted	Discounted at 5.5%
Incremental Fare Revenue	-$563.2	-$69.5

Financial Analysis Summary

The Financial Case assess the overall financial impact of the investment option. The capital, operating and maintenance, vehicle fleet, rehabilitation, and renewal costs as well as fare revenue are evaluated incrementally to the Base Case (excluding capital costs). **Table 6-8** summarizes the financial costs and fare revenues associated with Option 1 over the period of analysis. Assuming a 5.5% discount rate, total project capital costs and other associated incremental costs are $4.4 billion.

Table 6-8: Summary of Financial Case Results, Millions of 2023 Dollars

Cost Element	Undiscounted	Discounted at 5.5%
Capital Costs	$4,718.1	$3,191.1
Incremental Rehabilitation and Renewal Costs	$8,075.4	$661.3
Incremental Fleet Replacement Cost	-$2,612.0	-$195.5
Operations and Maintenance Costs	$5,254.5	$709.9
Incremental Fare Revenue	-$563.2	-$69.5
Total Costs	**$15,435.9**	**$4,366.7**

7. Deliverability and Operations Case

Introduction

The Deliverability and Operations Case considers key challenges to implementing a project. While the Strategic Case and Economic Case outline how an investment achieves organizational goals and social value, the Financial Case and the Deliverability and Operations Case focus on the requirements to successfully deliver an investment. Implementation challenges are highlighted from a technical or engineering, operational, and governance perspectives. Previously, the EELRT has had strong support from the public regardless of the options considered, with particularly strong public support for the extension to Malvern. All images in this section are from the emerging 10% design publicly shared in May and June 2023. Refer to other documentation for description of the 10% design and updates on coordination related to deliverability topics.

Project Delivery

This section provides more details on project delivery considerations and constructability challenges that are anticipated during the delivery of Option 1: EELRT. These details are subject to further refinement in advanced stages of design.

Kennedy Station

The EELRT project would provide a distinct service from Line 5 at Kennedy Station. This means that a separate terminus will need to be constructed that provides connections to other higher order transit at Kennedy Station with Line 2 and the Stouffville GO line.

The platform for the EELRT is expected to be located east of the existing GO rail line. A wedge-shaped surface platform with an underground connection to buses, Line 2, Line 5, and the Stouffville GO line is currently proposed. **Figure 7-1** and **Figure 7-2** illustrate the proposed layout of the EELRT infrastructure at Kennedy Station.

Coordination is needed to mitigate schedule and cost risks, through the clarification and formalization of respective City and Metrolinx roles and responsibilities in the design, construction, and maintenance of the project as it relates to the Kennedy Station.

Figure 7-1: Kennedy Station Layout

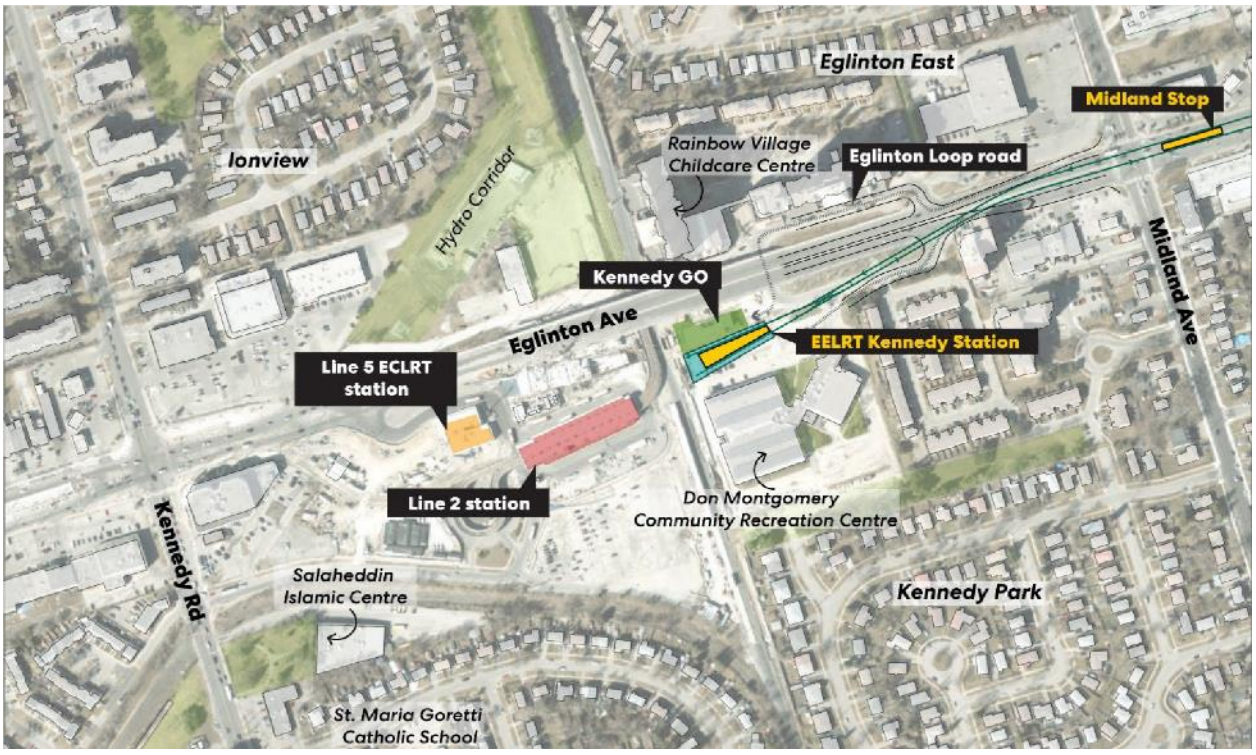
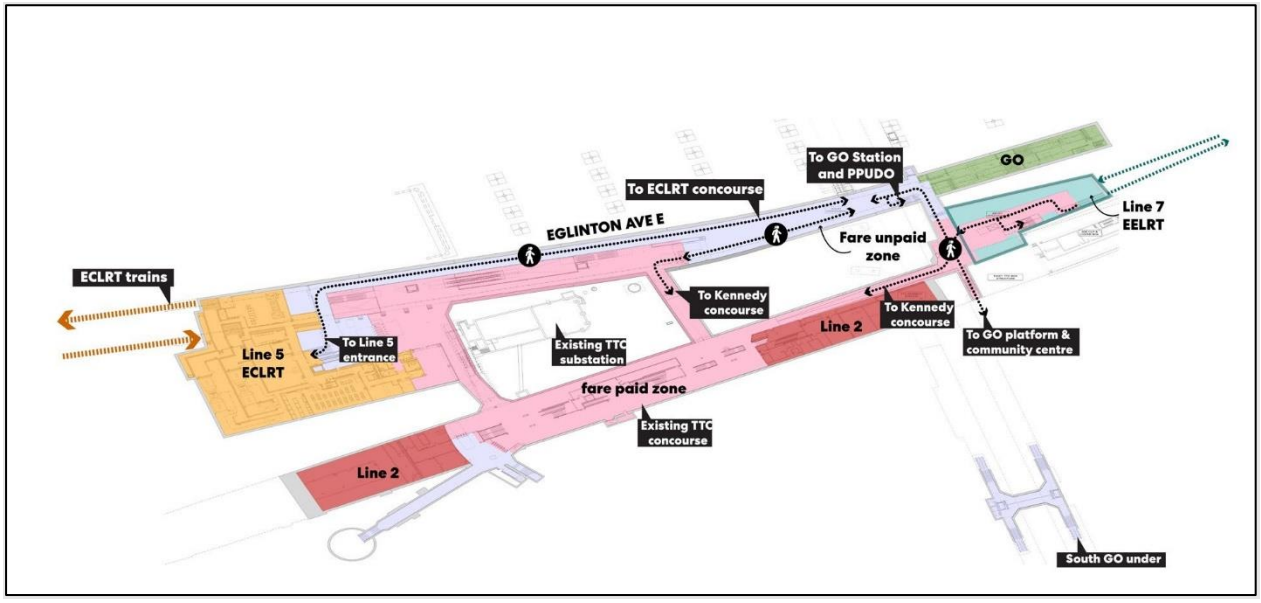


Figure 7-2: Proposed Circulation Map of Kennedy Station



Interface with Guildwood GO Station

A stop at the intersection of Kingston Road and Celeste Drive is planned. This stop would be located more than 200 metre from Guildwood GO Station. As a redevelopment of the Guildwood GO Station is being planned as part of GO Expansion, further discussion is required to explore opportunities for enhancing the connection between the EELRT and the Guildwood GO Station. Enhancements to the connection are to be considered in future stages of design. **Figure 7-3** shows a plan view at Guildwood GO Station.

Figure 7-3: Guildwood GO Station

Kingston Road/Lawrence Avenue East/Morningside Ave

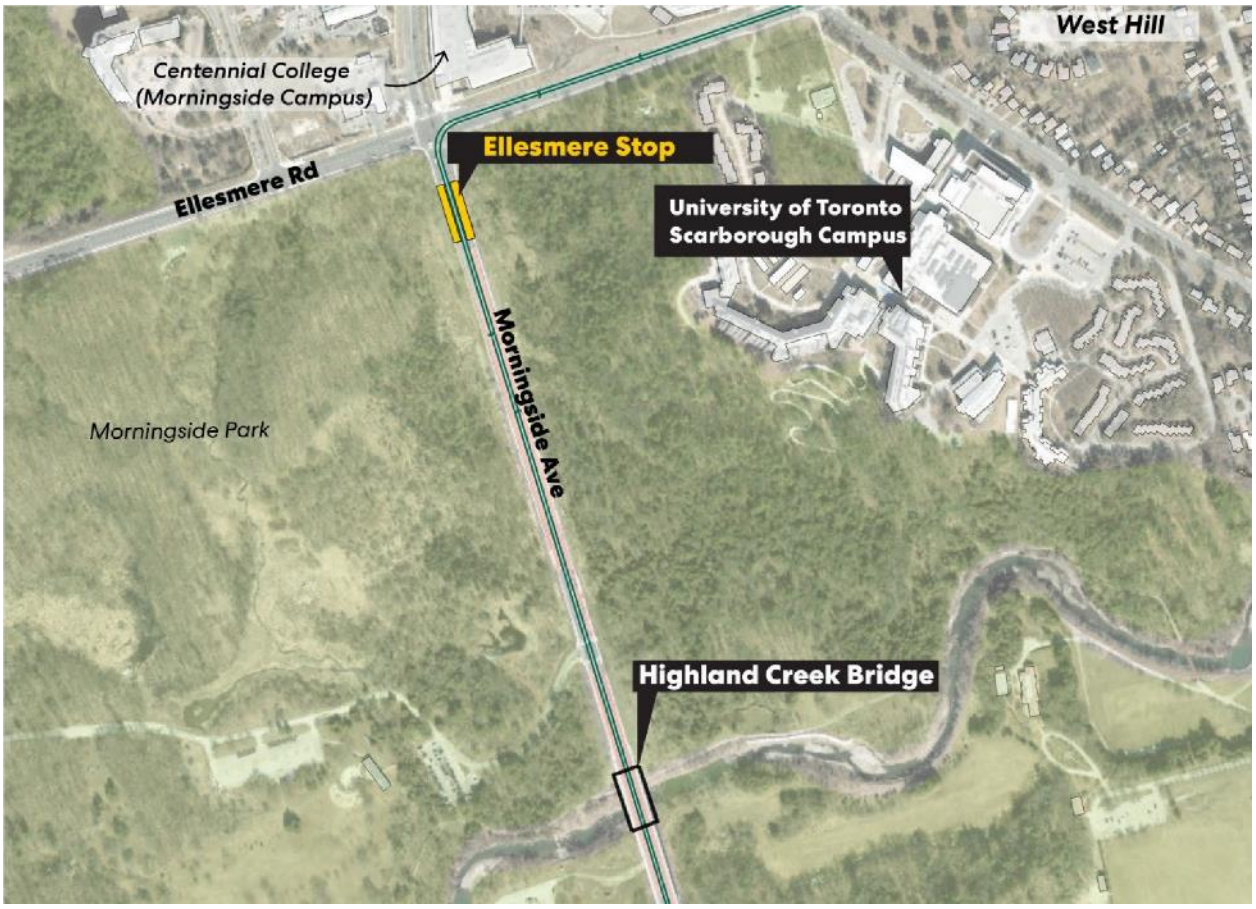
The surface alignment at the Kingston Road/Lawrence Avenue East/Morningside Avenue (KLM) section of the EELRT results in an increased property impact on Kingston Road due to the small setback of adjacent properties. However, the KLM triangle has plans for redevelopment and provides additional space for ROW widening. **Figure 7-4** shows a plan view of the KLM triangle.

Figure 7-4: KLM Triangle

Highland Creek Crossing

The Highland Creek area is an environmentally sensitive area. The distinct service with smaller, nimbler trains, and the conversion of existing curb lanes from RapidTO to LRT lanes on Morningside Avenue allows for the Highland Creek Crossing bridge structure to be unchanged. The impacts of this crossing and strategies to mitigate those impacts would be identified through an updated Transit Project Assessment Process for the project. **Figure 7-5** shows a plan view of the Morningside Avenue Highland Creek Bridge.

Figure 7-5: Morningside Avenue Highland Creek Bridge



Ellesmere Watermain and Durham-Scarborough BRT

Within the UTSC portion of the EELRT alignment, a 2100 mm transmission watermain exists on the south side of Ellesmere Road, within close proximity to the existing right of-way. Opportunities to shift either project's infrastructure is constrained by the valley south of Ellesmere Road. Relocating the watermain is not a preferred solution due to the significant costs associated with interrupting service for a transmission watermain.

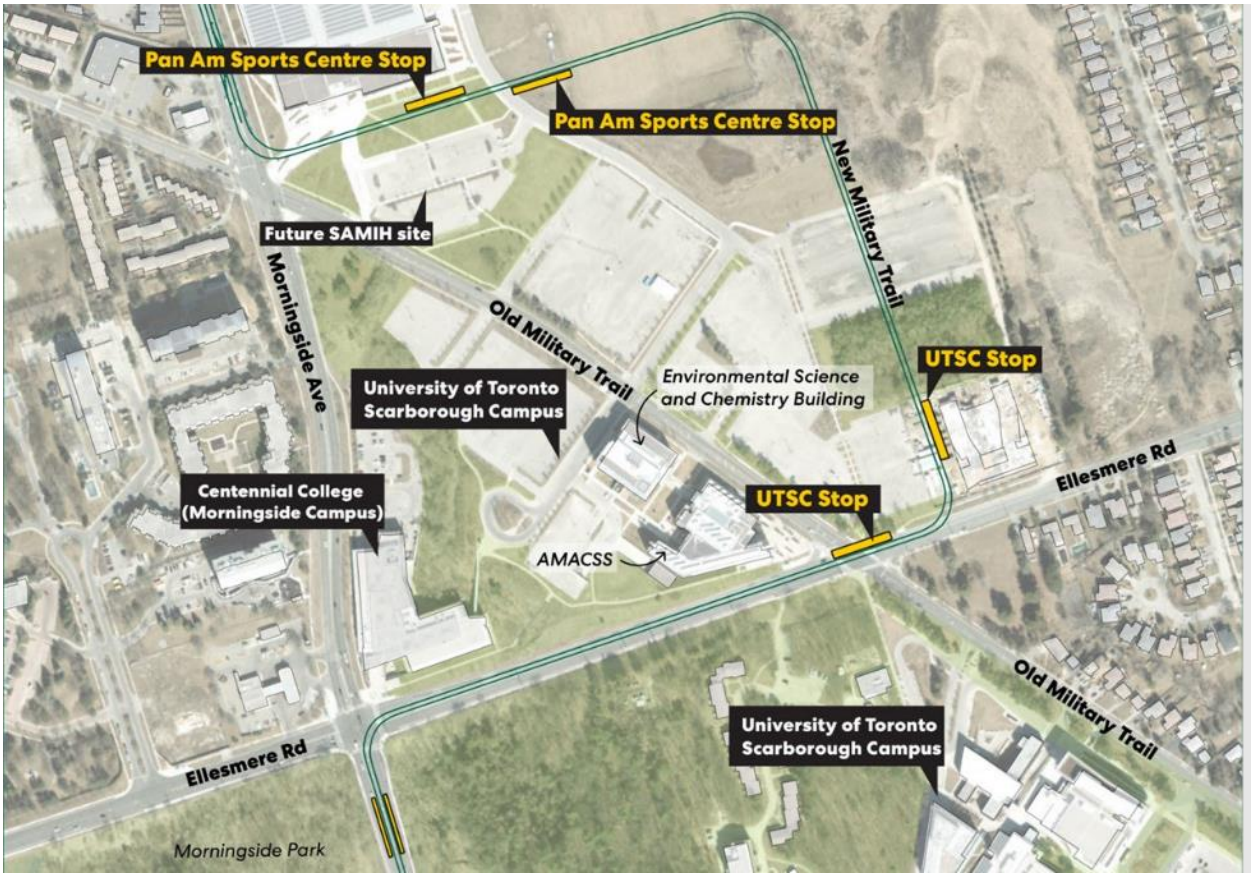
With refinements in the design during the 10% design phase, the EELRT avoids the watermain along Ellesmere Road. Instead of a south side running design that would directly interfere with the watermain, the EELRT guideway is located in the centre median. Buses would be proposed to run in the curb lanes in the segment between Morningside Avenue and New Military Trail.

Coordination with Toronto Water, UTSC, Metrolinx, Durham Region will be required to understand the amount of separation or mitigation measures required to minimize impacts to the watermain, New Military Trail, and proposed passenger and pedestrian connections at UTSC, and develop an appropriate public realm including measures to improve curbside bus operations.

Military Trail Re-alignment and UTSC Master Planning Study

The re-alignment of Military Trail as set out in the UTSC Master Plan (2011) was envisioned to ensure that LRT can support the development of UTSC. During conversations with UTSC, the smaller, nimbler trains of the distinct service support the campus' vision for a sustainable, transit accessible campus. **Figure 7-6** shows a plan view of the UTSC campus with EELRT infrastructure.

Figure 7-6: UTSC Plan with EELRT Infrastructure



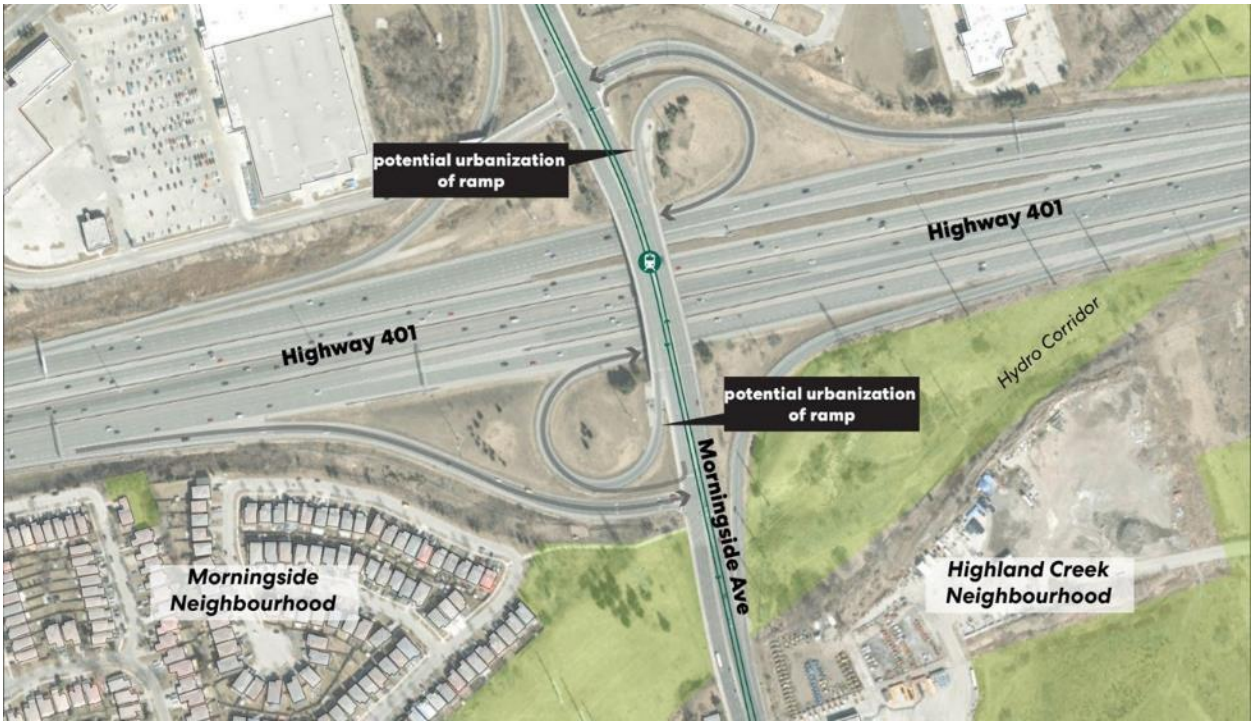
Note: Design refinements to the UTSC Stop depicted above have occurred and are described in the updated 10% design. Ongoing coordination with UTSC will occur to coordinate the design and construction of the EELRT with the University's objectives and expansion plans, including development applications currently underway.

Highway 401-Morningside Avenue Bridge

The Ministry of Transportation (MTO) will be refurbishing the Morningside overpass over Highway 401 in the second phase of Highway 401 upgrades, with an anticipated construction start date of 2025. City staff are coordinating with MTO to ensure the bridge can accommodate the EELRT.

There is a desire to provide upgraded active transportation facilities, which are anticipated to include multi-use paths across the 401, per the City's cycling plan. The addition of active transportation facilities could trigger a redesign of the interchange to be more suitable for vulnerable road users. Further coordination with MTO is required to ensure that EELRT is accommodated. **Figure 7-7** shows a plan view of the Highway 401-Morningside Avenue interchange with potential ramp urbanization.

Figure 7-7: Highway 401-Morningside Avenue Interchange



Malvern Segment (Neilson Road)

The EELRT will provide higher order transit service to Malvern Town Centre along Neilson Road. Lane reductions are proposed in this segment to support the City's Vision Zero policies and to protect private property by reducing ROW encroachment. **Figure 7-8** shows the Malvern segment of the EELRT.

Figure 7-8: Malvern Segment

Sheppard East Station

The EELRT will terminate at the currently under construction Sheppard East Station (Sheppard Avenue East and McCowan Road). This will also be the terminus for Line 2 and the proposed Line 4. Coordination with Metrolinx for the design of this station is essential. A northward shift of the headhouse (station entrance) for the Line 2 entrance is required to accommodate the EELRT. This shift allows for the greater buildout of the public realm and an EELRT platform with integrated vertical circulation elements (VCEs). This means that the EELRT platform will provide vertical access (e.g., elevators) to an underground concourse with direct connections to Line 2 and the potential future Line 4 making transfers seamless and convenient.

A large storm sewer along Sheppard Avenue East introduces additional constructability challenges because it cannot be relocated. As part of the 10% design, this challenge has been resolved because the LRT avoids it.

Maintenance and Storage Facility (MSF) Requirements

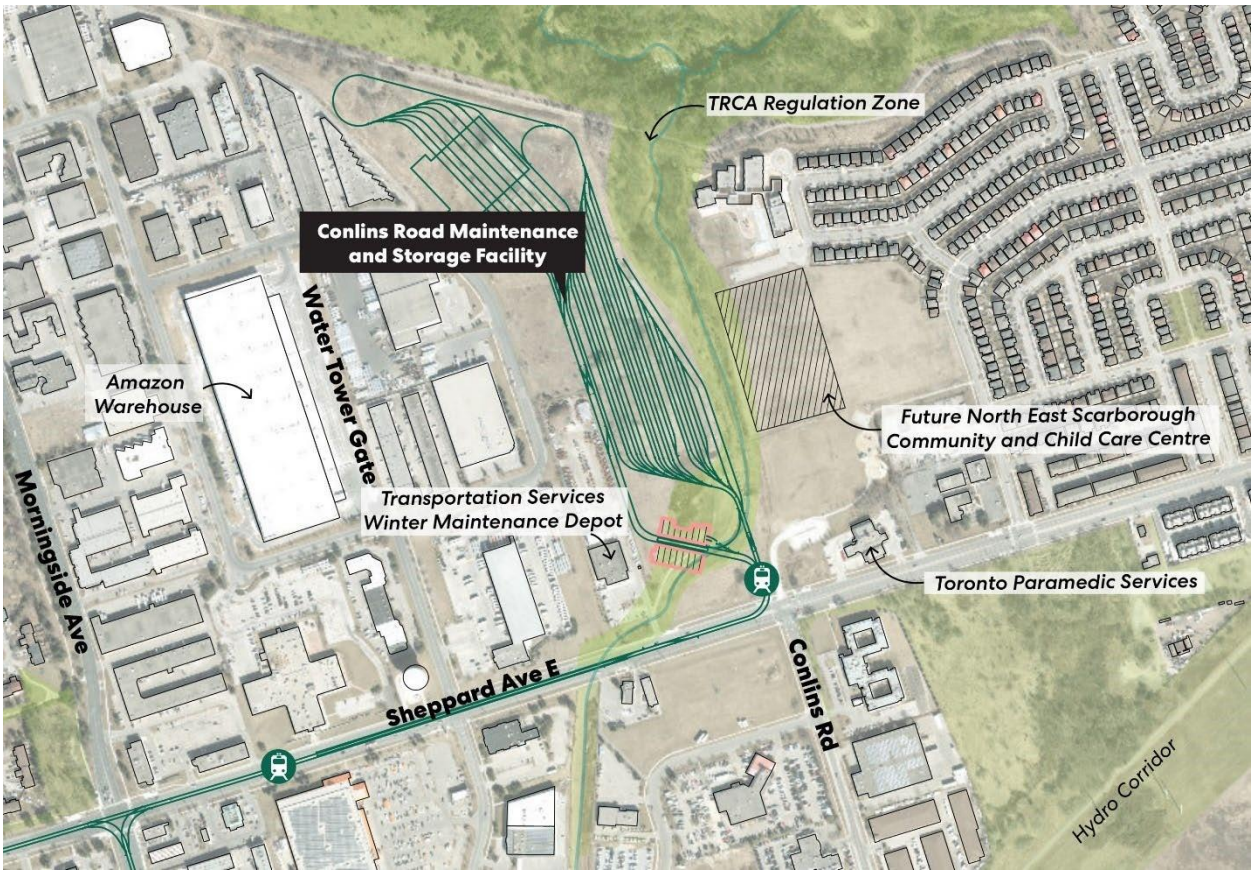
The Council-Preferred MSF is at the Conlins Yard, located on Provincial lands at 8300 Sheppard Avenue East. Some enabling works for the site have been completed.

Challenges for the Conlins MSF include:

- Required environmental protection and mitigation measures. The MSF is situated on top of a channelized stream, near the Rouge River Valley, and near the Toronto Zoo, which is particularly sensitive to noise and light pollution.
- Its proximity to a future planned, funded, and approved Northeast Scarborough Community Centre and Joyce Trimmer Park on the east side of the MSF site. Building an MSF in this location could erode the potential to cultivate a community hub in the area.

Assessment of requirements for the MSF is ongoing and will be confirmed through future design phases. **Figure 7-9** shows a conceptual plan view of the proposed MSF for the EELRT.

Figure 7-9: Maintenance and Storage Facility - Plan View



Operations and Maintenance Plan

The EELRT would require 50 metre platforms to meet the projected demand 30 years after opening. Space has been protected for platforms to be expandable to 60 metre in length to support future capacity expansion as required.

The Base Case faces deliverability challenges in terms of bus service continuing to serve existing routes using the RapidTO curbside bus lanes. In order for the Base Case to reasonably meet transit demand, a large number of additional buses would be required. The ability to meet the demand for transit service to Kennedy Station will be constrained by the physical size of Kennedy Station and its capacity to serve buses. As a result, the feasibility of serving the projected demand with buses is very low. Reliability and comfort of the service will also degrade due to increased traffic congestion caused by both automobiles and buses as well as overcrowding. Limited bus storage and road space further limit the Base Case's feasibility. The cost associated with expanding the bus terminal at Kennedy Station or other required facilities has not been explored in this business case.

Traffic Conditions

Traffic impacts are anticipated at intersections along the EELRT alignment. Through the Transit Project Assessment Process (TPAP), traffic impacts would be reassessed with the possibility of developing new recommendations to mitigate adverse impacts. The Kingston Road/Lawrence Avenue East/Morningside Road (KLM) intersections would be of particular importance due to the significant traffic impacts identified previously in the Scarborough Malvern LRT environmental assessment.

Impacts on Surface Network Service

The EELRT project requires further work to identify the appropriate surface transit network to complement and support transit riders along the LRT alignment.

Project Governance

Institutional Roles and Responsibilities

There are a significant number of institutional partners involved in the EELRT whose respective roles in the design, construction, operation, and maintenance of the project would need to be clarified and formalized in order to successfully and seamlessly deliver any of the options. The coordination required introduces schedule and cost risk.

The City of Toronto and TTC continue to lead the planning stage for the EELRT without significant involvement from the Province or Metrolinx.

However, coordination with Metrolinx with Scarborough Subway Extension (SSE) construction and Durham-Scarborough Bus Rapid Transit (DSBRT) design are ongoing, and coordination with the Sheppard Extension study recently initiated by Metrolinx is required. Additionally, the MTO is involved in decisions regarding the Highway 401-Morningside Bridge.

Procurement Plan

Financial/Procurement

Preliminary analysis has been undertaken on implementation scenarios for the governance framework for advancing the EELRT through Preliminary Design and Engineering (PDE) to a stage of procurement-readiness. Each scenario comes with opportunities, but also risks. Further detailed analysis, and discussion with project partners, is required prior to advancing the project to the PDE phase of work.

Construction Labour Market

As with all major infrastructure projects, there are construction labour market considerations. There is a potential for capital cost increases if other major infrastructure projects are being constructed at the same time across the Greater Toronto-Hamilton Area (GTHA), placing a large demand for labour from a limited labour pool.

Utility Relocations

As detailed design, enabling works, and construction advances, utility relocations can add to the cost of construction. Coordination with Metrolinx would be required to minimize additional relocations in the Kennedy Road/Midland Avenue/Falmouth Avenue and Sheppard and McCowan Road area.

Deliverability & Operations Analysis Summary

While the EELRT introduces several deliverability considerations, the Base Case also has substantial challenges. The biggest challenge with the Base Case is its ability to meet projected ridership demand. The Base Case cannot sustainability, comfortably, and reliability maintain the level of service required to support the transit demand. As a result, the physical challenges relating to the deliverability of the EELRT are a necessary trade-off to the operational challenges of the Base Case.

8. Conclusions

The purpose of this updated IBC was to provide an updated assessment on higher-order transit for a study area located in eastern Scarborough as compared to a Base Case or Business-as-Usual (BAU) scenario to determine a preferred option for further design and analysis.

This report used a four-case evaluation methodology to evaluate the different aspects of the project, each of which can be used independently or in concert to justify the preferred investment option.

A summary of the results from each case is provided below:

Strategic Case

- Option 1: Eglinton East LRT (EELRT) is preferred over the Base Case as the projected demand in 2041 along the study corridor far exceeds the capacity that can be practically provided by the Base Case. Option 1 would better address the Rapid Transit Evaluation Framework (RTEF) criteria used to determine if a project achieves wider policy objectives. Option 1 provides new and additional higher-order transit in reach of seven of the City's Neighbourhood Improvement Areas (NIAs), supporting sustainable mobility in historically underserved communities.
- Option 1 is designed to support further improvements in the surrounding transit network by accommodating increased ridership and changing travel patterns.
- A peak point ridership of over 3,700 passengers per hour would require buses every one minute or less. While it is theoretically possible to serve this ridership with buses, large expansions to the Kennedy Station bus terminal and bus maintenance and storage facilities would be required. Operating costs would increase proportionally and would make the Base Case impractical. Operations of this terminal and the buses along the corridor would be a challenge, and reliability and comfort would be low. Higher-order transit is required to serve the study area reliably, comfortably, and sustainably. Option 1 offers improved experiences due to greater reliability, smoother rides, and reduced crowding for transit riders.

Economic Case

- Option 1: EELRT is expected to deliver almost $1.4 billion in discounted benefits with an expected Net Present Value (NPV) of -$4.4 billion and a Benefit-Cost Ratio (BCR) of 0.2 at a 3.5% discount rate.

Financial Case

- Option 1: EELRT is estimated to cost $4.4 billion at a 5.5% discount rate inclusive of capital costs, incremental rehabilitation costs, incremental fleet replacement costs, operations and maintenance costs, and incremental fare revenue.

Deliverability & Operations Case

- Option 1: EELRT introduces deliverability challenges as it involves the construction of a new transit line. However, the significant operational challenges of the Base Case outweigh the deliverability challenges of Option 1. As a result, Option 1 is preferred over the Base Case for the Deliverability and Operations Case.

In conclusion, this analysis found that higher-order transit investment is required to serve this corridor. Despite performing poorly in the Economic and Financial Cases, Option 1 – EELRT is the preferred option over the Base Case due to operational concerns. There is evidence that implementation of LRT can provide an uplift in property values, investment, and associated economic activity, particularly if it is coordinated with other policy initiatives. Consequently, development of an appropriate funding and financing strategy including exploration of ways to reduce cost and optimize benefits should be considered for future phases of project development.