Durham-Scarborough Bus Rapid Transit Preliminary Design Business Case

Final
June 2024

METROLINX

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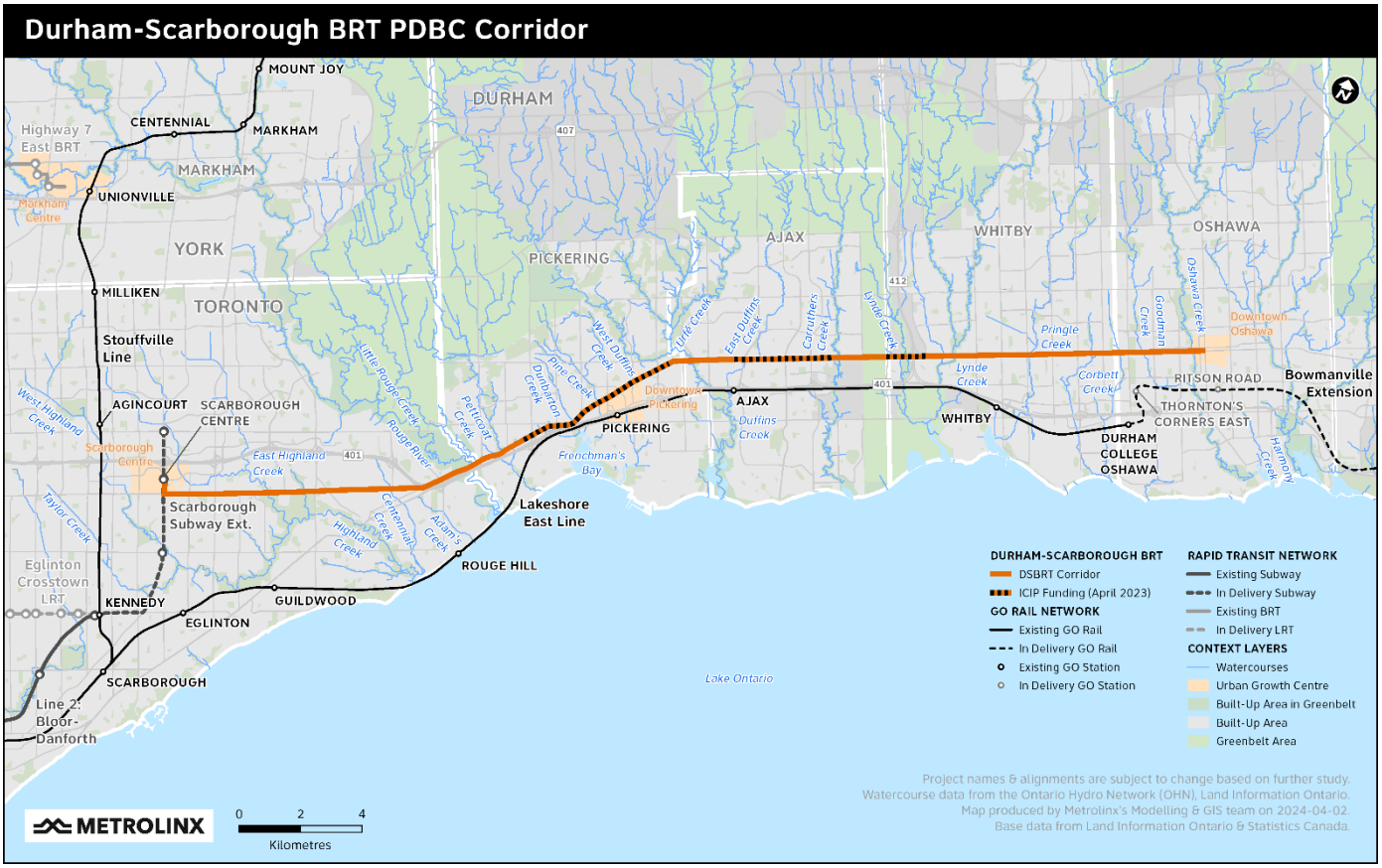
Executive Summary

The purpose of the Durham-Scarborough BRT project (DSBRT) is to create seamless connections with local transit networks along the high-demand Highway 2-Ellesmere corridor, providing residents of Durham Region and City of Toronto more flexibility and choice to get where they need to go faster and more reliably in an area with significant anticipated population and employment growth. This project will increase capacity for people movement along the corridor, providing an alternative to trips that would otherwise be done by automobile.

The Preliminary Design Business Case (PDBC) evaluates Bus Rapid Transit (BRT) options along the Highway 2-Ellesmere corridor, spanning 36 km between Downtown Oshawa and Scarborough Centre Station at the Line 2 Scarborough Subway Extension (SSE) as shown in Figure ES 1. The project links multiple municipalities, including Oshawa, Whitby, Ajax, and Pickering, and Toronto.

Figure ES 1: Map of the Durham-Scarborough BRT Corridor



The Highway 2-Ellesmere corridor is currently served by DRT PULSE 900 bus service, connecting across municipal boundaries between Downtown Oshawa and the University of Toronto Scarborough Campus (UTSC) at Morningside Avenue. The TTC operates bus service along Ellesmere Road between Scarborough Centre and Sheppard Avenue East, within the limits of the City of Toronto. Transit customers wishing to travel between Durham Region and destinations further west than UTSC/Centennial College, such as Scarborough Centre Station, must transfer at UTSC, leading to longer travel times. GO Bus Route 92 provides a one-seat ride between Downtown Oshawa and Scarborough Centre, operating approximately every hour on weekdays and weekends. The DSBRT

provides increased frequency and increased catchment due to dedicated lanes and additional stops in comparison to the GO Bus service. DRT Route 920 connects Scarborough Centre and Harmony Terminal (north Oshawa), operating along the segment of the corridor between Salem Street (Ajax) and Sheppard Avenue. The route does not serve UTSC/Centennial College or Downtown Oshawa like Route 900 does. As of 2024, Route 920 only operates on weekdays.

Transit ridership along much of the corridor is served by DRT's PULSE 900, which had 8,400 boardings on a typical weekday in October 2023. Demand for transit service is expected to further increase with the anticipated population and job growth within a 10-minute walk of the corridor, an additional 43,000 residents (2016: 103,000, 2041: 146,000, +42%) and 26,000 jobs (2016: 51,000, 2041: 77,000, +51%) expected by 2041 according to the Market Land Use forecast). DSBRT will link multiple higher education institutions and improve transit access to future high-density housing and employment areas. This corridor does not always follow a traditional AM/PM commuter pattern; therefore, provision of high-quality all-day service is necessary to serve this corridor.

DSBRT will provide dedicated transit infrastructure, including 25 to 34km of dedicated lanes (depending on investment option), separating buses from general traffic and creating an enhanced passenger travel experience. The new infrastructure will create a higher capacity and reliable form of transit to connect Downtown Oshawa and Scarborough Centre, reducing the total travel time for transit customers end-to-end by up to 19 mins, from 2 hours and 8 minutes to between 1 hour and 49 minutes to 1 hour 54 minutes (depending on the investment option).

The DSBRT is a regional cross-boundary project that strengthens the regional transit network by enabling infrastructure and bus service improvements that connect the Highway 2-Ellesmere corridor to the SSE. With major drivers of ridership being Durham Post Secondary institutions (Ontario Tech, Durham College, Trent University), the connections with SSE and UTSC/Centennial College and provincial Urban Growth Centres (UGC), infrastructure implementation in both Durham Region and Toronto is critical for benefits to be realized. Previous analysis indicated that an integrated service model could also generate more ridership within the Toronto segment of the project.

Durham-Scarborough Bus Rapid Transit Opportunity Statement

The Highway 2-Ellesmere corridor is a crucial transportation corridor connecting people through Durham and Scarborough. The corridor has varied traffic, land use conditions and constraints. With rapid growth in the past decade and an expectation for this growth to continue into the future, demand for travel along the corridor will continue to increase and a higher capacity and more competitive form of transit will be needed to link communities and employment on both sides of the Toronto-Durham boundary.

Preliminary Design and Business Case

The PDBC builds upon the Initial Business Case (IBC) developed in 2018. Since then, a preliminary design was developed and documented in an Environmental Project Report (EPR), which was approved in January 2022 following the Transit Project Assessment Process (TPAP)[1] . The preliminary design primarily includes dedicated centre-median bus lanes, some segments with dedicated curbside bus

[1] For further information, please visit: https://www.metrolinx.com/en/projects-and-programs/durham-scarborough-brt/studies

lanes and some short segments with no dedicated infrastructure. In segments with no dedicated infrastructure, buses would operate in mixed traffic with transit priority measures[2] and curbside stops.

Since the IBC and EPR were published, Durham Region has secured Investing in Canada Infrastructure Program (ICIP) funding for core segments of approximately 8.5 km of BRT infrastructure through portions of Pickering, Ajax and Whitby[3] (as of April 2023), identified in Figure ES 1. The advancement of some portions of the project has necessitated this PDBC to consider two business as usual (BAU) scenarios and report two benefit-cost ratios (BCR) for each option, a unique requirement not seen in most business cases. With]8.5 km of DSBRT funded and scheduled for delivery, this business case evaluates both the complete project and the remaining portions to support investment decision making. The two BAU scenarios are:

- **The Standard BAU** represents the scenario where there is no dedicated BRT infrastructure, and by doing so, the options consider the infrastructure in its entirety (36 km) and its performance, including both segments that are funded and scheduled for delivery, and segments that remain unfunded The Standard BAU provides a consistent narrative between the IBC and the PDBC to understand how benefits and costs have evolved and supports comparison with future business cases required as part of the Business Case Framework. For the Economic Case, this results in the "Project BCR", which reflects the benefits cost ratio for the entire DSBRT project, including the in-delivery segments.
- **The Investment BAU** represents the current scenario of the ICIP-funded segments (8.5 km), and by doing so, the options consider the infrastructure of the project that remains to be unfunded (27.5km) and its performance. The Investment BAU, therefore, reflects the incremental benefits and costs of advancing the remaining 27.5 km of DSBRT to deliver the full DSBRT; from an Economic Case perspective, this results in the "Investment BCR", reflecting the benefit-cost ratio for the unfunded segments of DSBRT. This PDBC focuses on reporting the options analysis results in comparison to the "Investment BAU". The Investment BAU would help inform future discussions and decision-making around the investment required for delivering the unfunded segments of the project, should there be interest in doing so.

In addition to the funded segments, other changes that have occurred since the IBC influenced this PDBC. The following are some of the key changes:

- Further design advancement on the in-delivery **Scarborough Subway Extension (SSE)** resulted in refinements to the DSBRT corridor's western terminus to travel along Grangeway Avenue, as well as updated service plan for TTC bus routes in Scarborough.
- The PDBC also **revised the opening year** from 2029, an IBC assumption, **to 2033** for better alignment with current projects. This refinement better reflects potential construction timelines, changing the impacts of inflation and cost escalation within the financial analysis framework. Capital cost estimates have increased because of **growing construction costs and inflation pressures** in recent years.
- Although the **post-pandemic** world has seen changes in work patterns (e.g. hybrid, remote), the Highway 2-Ellesmere corridor is expected to be minimally impacted because travel demand is

[2] Feasibility and options of transit priority measures in mixed-traffic segments to be further explored in the next phase of this project.
[3] ICIP-funded segments amount to approximately 11 km and reflect funding status as of April 2023. Core segments of 8.5 km include: Kingston Road (from Steeple Hill to Bainbridge) in Pickering; Kingston Road (from Rotherglen to Galea) in Ajax; and Dundas Street (from Lakeridge to Desnewman) in Whitby.

mostly characterized by in-person activities (e.g. students and/or essential workers) and current transit ridership on the corridor has been minimally impacted by post-pandemic changes.

- **Metrolinx Business Case Guidance was updated in 2021**, bringing some changes to methodology and approach for capturing and monetizing benefits, influencing the benefit-cost ratio (BCR).

Investment Options

The PDBC evaluates three potential investment options developed based on the EPR's preliminary design. A key goal of the PDBC within the Metrolinx Business Case Framework is to assess alternative approaches to delivering a project (which these investment options represent) and identify the drivers of and impacts to cost and benefits.

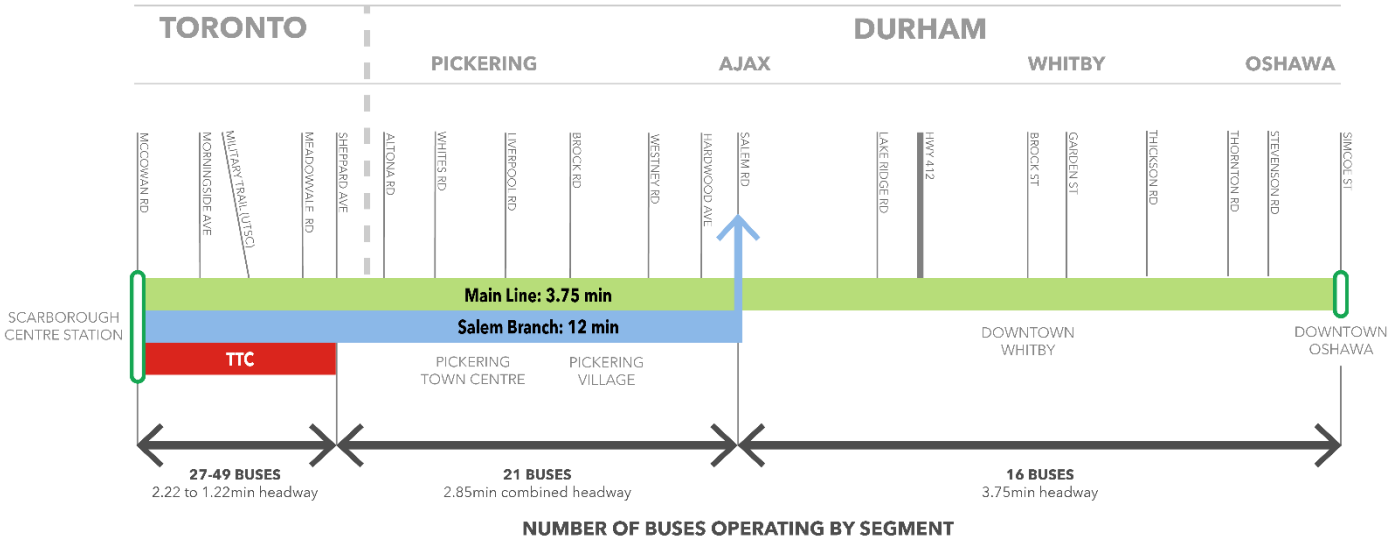
In terms of BRT infrastructure, all options include the 8.5 km that has secured ICIP funding. A major differentiator between options is the approach to timing of implementation, with different criteria for prioritization/deferral of segments, as follows:

- **Option 1:** Full BRT implementation, following the 30% preliminary design documented in the EPR;
- **Option 2:** Defer high-cost segments, deferring segments with above average capital costs and major utility or property impacts with the goal of minimizing the initial investment required; and
- **Option 3:** Prioritize high-traffic segments, deferring segments that have lower traffic volumes with the goal of minimizing impacts to transit operations and customers, while minimizing initial investment required.

In terms of transit service, all options assume that the service routes and frequency are the same. The assumed service plan was reviewed since the IBC: for peak periods, DSBRT corridor will be served by a mainline service operating between Downtown Oshawa and the future Scarborough Centre Station (SSE) with a bus every 4 minutes or less, compared to 6-minute service in the BAUs. A branch service will operate on a section of the corridor between Scarborough Centre Station (SSE) to Salem Road then turning and continuing to Harmony Terminal in north-east Oshawa with a bus every 12 minutes. The TTC would continue to provide frequent service within Toronto, with some routes using the BRT guideway[4], and some continuing to provide local curbside bus services in areas with wider distances between BRT stops (e.g. east of Conlins Road).

[4] TTC Routes 38, 133, 138, 995 would operate in parts of the guideway. Figure 17 in the Major System Assumptions outlines these routings in more detail.

Figure ES 2: Assumed Peak Hour Service Plan



Service integration is a component that could provide a substantial increase in benefits due to increased capacity in Toronto, resulting in more ridership when compared to a Closed Door policy. Two service integration models were considered in the PDBC analysis to understand the potential impact on overall performance:

- The first service integration model is a **Closed Door policy**, currently in place, where DRT buses operating on the DSBRT corridor within Toronto could only drop off passengers when inbound to Scarborough Centre and pick up passengers when outbound from Scarborough Centre. **This is the assumption for all three investment options since it reflects how the service currently operates.**
- The second service integration model is an **Open Door policy**, allowing inbound and outbound DRT buses to pick up and drop off passengers within Toronto, providing Toronto-based travellers with more frequent service. **This policy has been analyzed as "sensitivity"** tested using the same infrastructure assumption as Option 1 (full BRT implementation).

Metrolinx Business Cases incorporate in-delivery and/or confirmed projects and policies as part of assumptions. As of March 2024, service integration is in progress, with Metrolinx and the Ministry of Transportation (MTO) actively collaborating with the TTC and other municipal service providers (MSPs) to explore options for cross-boundary pilots that would allow MSPs to serve TTC and other transit customers within Toronto. Given the status of discussion, this work considers Closed Door policy as the main assumption in the PDBC options. Metrolinx uses sensitivities to examine potential impacts from changes of policies and other variables to inform decisions. Given the cross-boundary nature of DSBRT, this PDBC analyzes the impacts of "Open Door" as a sensitivity analysis[5].

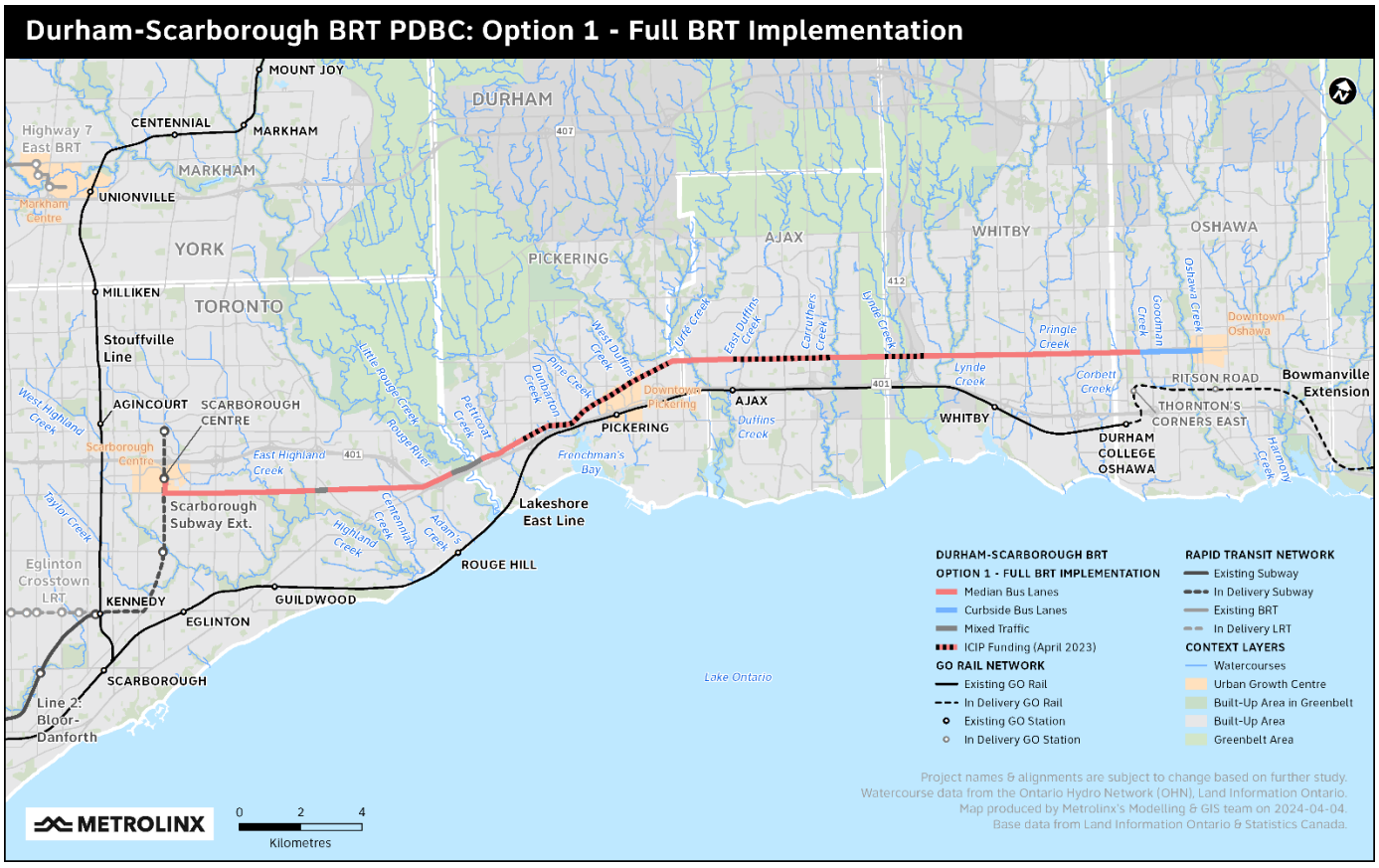
The Ontario One Fare Program allows transit riders to pay only once when connecting to and from the TTC and GO Transit, Brampton Transit, Durham Region Transit, MiWay and York Region Transit. This fare integration program was launched on February 26, 2024, and was included in the analysis of all the PDBC options[6]. Further details on the options are described in the next sections.

[5] Sensitivity analysis for Open Door was fully modelled based on "Option 1 – Full BRT implementation", however, Economic analysis was performed off-model to identify the impacts to benefits-cost ratio (BCR) for Options 2 and 3.
[6] For more information, please visit https://www.metrolinx.com/en/projects-and-programs/fare-integration/one-fare-program

Option 1: Full BRT Implementation

Option 1 represents the delivery of the entire BRT corridor as documented in the EPR (Figure ES 3) and assumes that all preliminary design elements will be delivered and operating by 2033. This option involves the construction of 36 km of BRT between Scarborough Centre and Downtown Oshawa, and 49 BRT stops in each direction. As envisioned in the preliminary design, the majority of the corridor will have dedicated bus lanes (mostly in centre-median configuration, with curbside in Oshawa) and some short segments with no dedicated infrastructure. In segments with no dedicated infrastructure buses would operate in mixed traffic with potential transit priority measures.

Figure ES 3: Option 1 - Full BRT Implementation



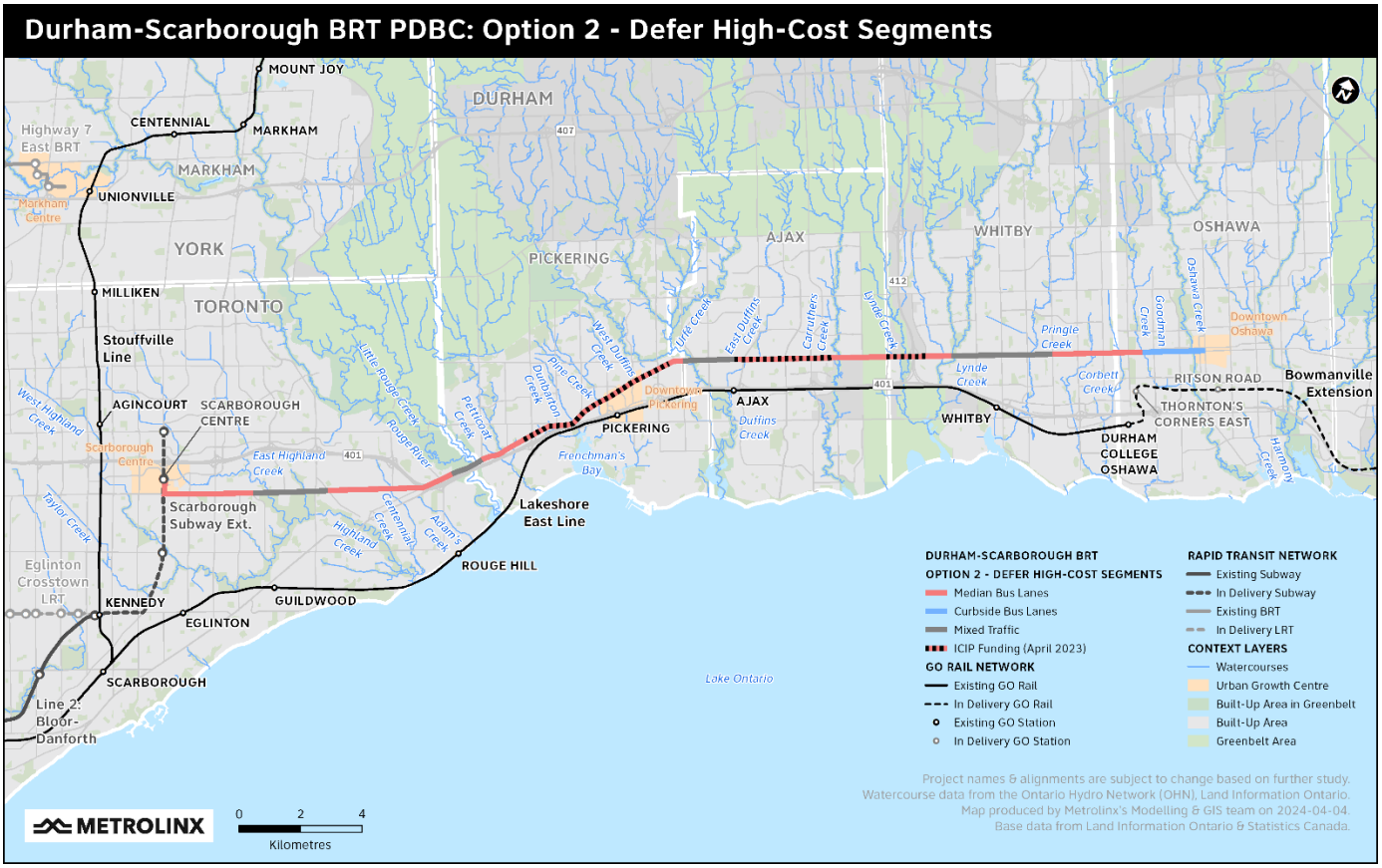
Option 2: Defer High-Cost Segments

Option 2 prioritizes the delivery of BRT infrastructure by minimizing the initial capital investment, deferring areas that require above average capital costs such as major utilities relocation, retaining walls, higher property impacts, and bridges or culverts.

Figure ES 4 shows the infrastructure and operating conditions along the corridor by 2033. This Option has 52 stops in each direction, three more than Option 1 (40 are BRT stops, plus 12 existing standard stops in mixed traffic segments). This option results in the following BRT infrastructure delivered beyond 2033, including:

- Ellesmere Road, between Orton Park Road and Morningside Avenue (2.3 km);
- Kingston Road, between Notion Road and Rotherglen Road (1.0 km); and
- Dundas Street, between McQuay Boulevard/Jeffrey Street and Anderson Street/Hopkins Street (3.7 km).

Figure ES 4: Option 2 - Defer High-Cost Segments



Option 3: Prioritize High-Traffic Segments

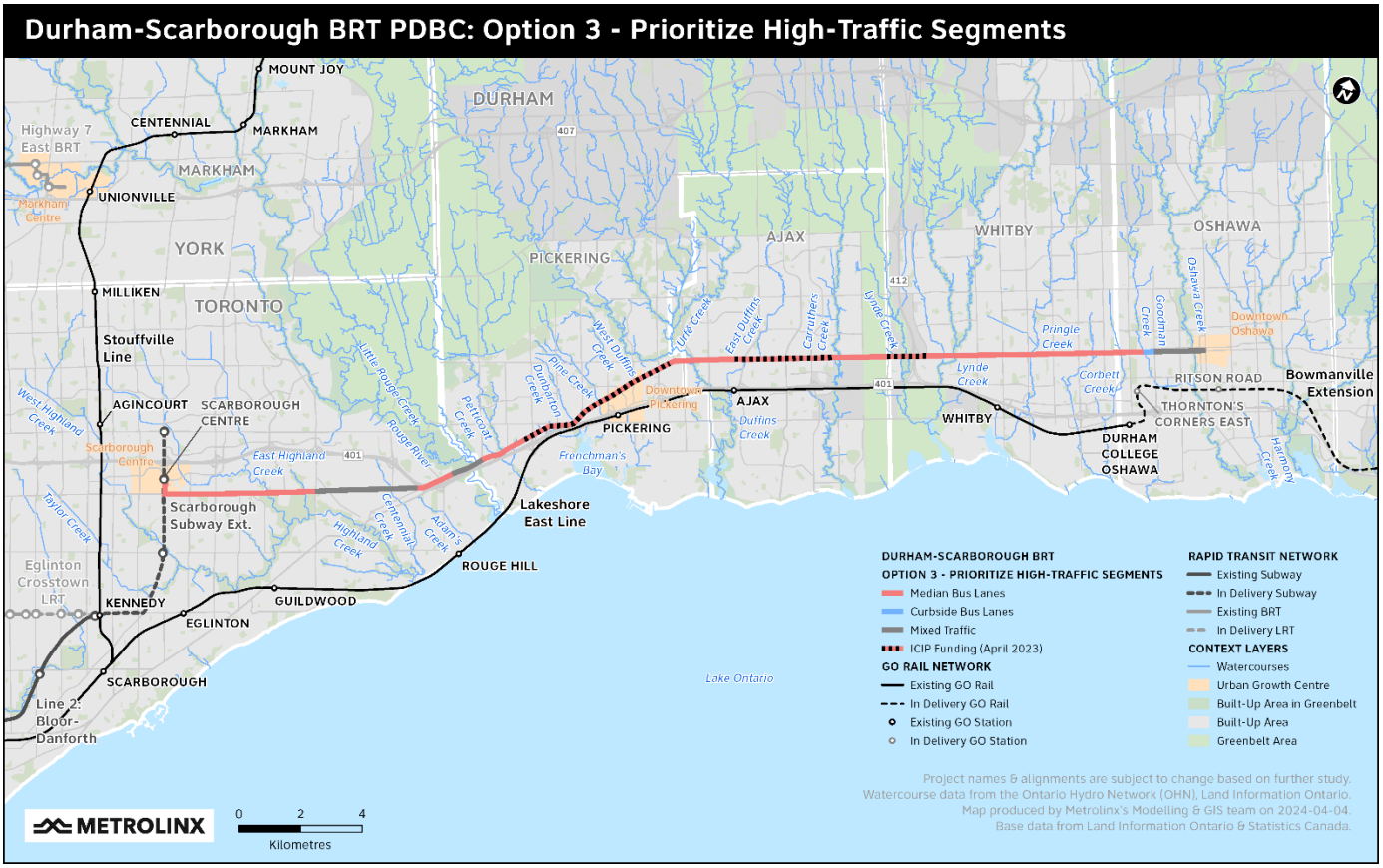
Option 3 prioritizes the delivery of BRT infrastructure that supports land use development and transit passenger demand while minimizing the initial capital investment by deferring areas that have lower traffic volumes (LOS C or better). This Option has 56 stops in each direction, seven more than Option 1 (42 are BRT stops, plus 14 existing standard stops in mixed traffic segments). The traffic volumes were identified through the future traffic analysis with and without DSBRT documented in the EPR. Figure ES 5 shows the infrastructure delivered by 2033.

This option results in the following BRT infrastructure delivered beyond 2033, including:

- Ellesmere Road, between Military Trail and Kingston Road (2.5 km);
- King Street, between Gibbons Street and Simcoe Street (1.3 km); and
- Bond Street, between Stevenson Road and Simcoe Street (1.8 km).

These three segments are distinct from the segments deferred in Option 2.

Figure ES 5: Option 3 - Prioritize High-Traffic Segments



Strategic Case Findings

The strategic case outlines how the investment options will support and help achieve regional and local development objectives for transportation, economic development, and sustainable and healthy communities along the Highway 2-Ellesmere corridor.

A summary of the findings for the 2041 horizon is available in Table ES 1, with the following key takeaways:

- **Strong Connections:** DSBRT will connect people to the places that improve their lives, such as homes, jobs, community services, parks and open spaces, recreation, and cultural activities. All DSBRT investment options will attract new trips (1,200 to 2,400 during the 7-hour peak in 2041), provide a faster journey (saving 10 to 13 hours per passenger per year), and improve connections to frequent transit routes. All options are beneficial in comparison to both BAU scenarios, with Option 1 having 1,300 net new daily AM/PM peak trips, and Options 2 and 3 having 1,200 net new daily peak trips. The sensitivity analysis (Open Door) results in 2,400 net new daily AM/PM peak trips (almost double all options), demonstrating a substantial increase in benefits due to this policy.
- **Complete Travel Experiences:** DSBRT will enable an easy, safe, accessible, affordable, and comfortable door-to-door travel experience that meets the diverse needs of travellers. All options will increase the number of people within a 10-minute walk of a DSBRT stop, create a better transfer experience, and provide more one-seat continuous rides. All options will be within a 10-minute walk of 146,000 residents, including many equity-deserving groups such as immigrants, visible minorities, Indigenous people, seniors, unemployed persons, lower-income households, and those in subsidized/affordable housing. Option 1 delivers the most BRT infrastructure, leading to more travel time savings in the study area and faster travel time to hubs. With an Open Door service integration model, additional capacity in Toronto is provided, especially between UTSC/Centennial College and Scarborough Centre, which leads to increased ridership.
- **Sustainable and Healthy Communities:** DSBRT is a transportation investment that will benefit future generations by supporting land use intensification, climate resiliency, and a low-carbon footprint. All options will attract new trips (36,700 to 37,400 daily trips) and decrease vehicle-kilometres travelled (VKT, 25,400 to 28,000 km in 2041) and the associated greenhouse gas emissions (1,900 to 2,350 tonnes avoided in 2041). All options perform comparably, while the sensitivity analysis (Open Door) produces emissions savings of 4,350 tonnes of GHG, due to more trips being made (45,700 daily trips).
- **Economic Development:** DSBRT will expand access to jobs and economic opportunities while increasing connectivity to foster opportunities and growth for residents and businesses. All investment options perform comparatively well, as they increase the number of jobs within a 45-minute transit trip (206 to 248 additional jobs in 2041), improve access to existing and planned affordable housing units (4,600 as of 2024), and connects to intensification areas. Option 1 offers the most dedicated BRT infrastructure that improves service to employment and intensification areas.

Table ES 1: Strategic Case Summary

RTP Goal	Metrics (by 2041)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Strong Connections	Net new daily riders	*14,300 (45,700*	6,000 (37,400 total)	5,700 (37,100 total)	5,300 (36,700 total)
	Net new daily riders during 1-hour AM peak	*2,200*	1,200	1,100	1,100
	New Trips to Scarborough Subway Extension (AM 2-hour peak)	*1,425*	475	475	475
Complete Travel Experiences	Residents and jobs served within 10-minute walk	146,000 Residents and 77,000 Jobs			
	Average travel time savings for DSBRT commuters during peak period (hours/passenger/year)	*13h (19 minutes saved for each end-to-*	12h *(19 minutes saved for each end-to-end trip)*	10h (14 minutes saved for each end-to-end trip)	11h (17 minutes saved for each end-to-end trip)
	Decrease in number of transfers due to single-seat service	*2,450*[7]	2,750	2,750	2,750
Sustainable and Healthy Communities	Daily DSBRT riders	*45,700*	37,400	37,100	36,700[8]
	Annual vehicle kilometres travelled (VKT) saved (km)	*44,100*	28,000	27,400	25,400
	Annual tonnes of GHG Emissions reduced (tonnes)	*4,350*	2,350	2,050	1,900
Economic Development	Total built affordable housing units within 10-minute walk	3,645			
	Total planned affordable housing units within 10-minute walk	963			
	Additional jobs accessible within 45-minute transit trip during AM peak	*304*	248	206	223

[7] The Open Door scenario has the highest net new daily riders by 2041, which leads to more trips that requires a transfer. As a percentage of total trips, the number of transfers is lowest of the four options.
[8] As demand along the corridor is not evenly distributed, Option 3 has lower forecasted ridership than Option 2 despite its time savings.

Economic Case Findings

The economic case evaluates the investment option's potential costs and benefits to society as a whole based on the different components delivered within each. The economic case quantifies the broader societal benefits and disbenefits and the expected costs to deliver each investment option to understand the value each will deliver, using a metric called the benefit-cost ratio (BCR). The results of this case are summarized in Table ES 2 (Investment BAU).

Table ES 2: The Economic Case compared to Investment BAU (80% Confidence Intervals)

Impact Type	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize high-traffic segments*
Total Costs (2023$, Present Value)[9]	**1,203 M to 1,338 M**	**1,192 M to 1,328 M**	**970 M to 1,061 M**	**1,076 M to 1,192 M**
Capital Costs	879 M to 983 M	879 M to 983 M	671 M to 742 M	778 M to 865 M
Operating Costs	222 M to 222 M	212 M to 212 M	235 M to 235 M	216 M to 216 M
Land Value Opportunity Cost	53 M to 150 M	53 M to 150 M	33 M to 97 M	43 M to 125 M
Total Impacts/Benefits	**703 M**	**520 M**	**449 M**	**477 M**
User Impacts/Benefits	622M	481M	414M	444M
External Impacts/Benefits	81M	39M	34M	33M
Adjustments	30M	15M	13M	14M
Investment BCR	**0.54 to 0.6**	**0.39 to 0.44**	**0.43 to 0.47**	**0.4 to 0.45**
Net Present Value (2023$)	**-602 M to -464 M**	**-792 M to -655 M**	**-598 M to -506 M**	**-700 M to -583 M**

Note: Economic Case uses a 60-year evaluation period from 2033.

The overall takeaways from the economic case include:

- **Societal Benefits:** DSBRT is expected to realize significant benefits related to the two BAU scenarios, particularly for user and external benefit impacts. However, the costs are expected to be high, resulting in lower BCR and negative net present values for the investment options. Option 1 brings benefits of 520 M, Option 2 sees slightly smaller benefits of 449 M, primarily associated with lower travel time savings benefits associated with deferring some higher-cost segments in more congested areas. Option 3 sees benefits in between Option 1 and 2 of 477 M. Open Door unlocks additional benefits by a significant margin in comparison to Closed Door.
- **Benefit-Cost Ratio:** The Investment BCR is highest for Option 2 (0.43 to 0.47), followed by Option 3 (0.4 to 0.45) and Option 1 (Closed Door, 0.39 to 0.44). Option 2 provides an increase to the BCR due to capital cost reduction (approximately by 20%), however, presents a decrease in benefits. Option 3 offers 91% of the benefits at approximately 10% reduced capital costs, which marginally improves the BCR compared to Option 1. The sensitivity test revealed that Open Door policy would

[9] Capital and Operating Costs are different between the Economic and Financial Cases for several reasons. Optimism bias is applied to Economic Case, while only applicable contingency is applied to the Financial Case. Land value is estimated at an opportunity cost for the Economic Case, while the Financial Cases estimates land value to include purchasing cost upfront with an estimate for residual value. The Economic Case presents the real value of costs and the figures include a social discount rate (3.5%) and the effects of any value escalation (general price inflation ignored) based on the timeline over which the expenditure is incurred. The Financial Case is presented in nominal terms and the figures include general inflation, cost escalation, and a financial discount rate of 5.5%.

provide additional economic value, demonstrating a significant benefit increase if the policy is applied. Open Door Investment BCR[10] resulted in the following: Option 1 (0.54 to 0.6); Option 2 (0.59); and Option 3 (0.56).

- **Changes Since IBC:** There have been significant changes to the methodology, assumptions and measures included in the economic case since the IBC was completed. For instance, crowding benefits/disbenefits were not previously included in IBC, which has a negative impact due to the substantial latent demand for more transit service, while other monetary values have been changed. The sensitivity analysis most closely aligns with the IBC results because the IBC included service integration (Open Door).

Financial Case Findings

The financial case outlines the expected financial impacts of delivering each investment option. Unlike the economic case, the financial case does not consider the society-wide benefits. Instead, it is concerned with the financial resources to deliver an option versus the revenue it will generate. The results of this case compared to Investment BAU are summarized in Table ES 3.

Table ES 3: Financial Case Cost Summary of Project Options Compared to Investment BAU

Financial Case Metric (Discounted $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Revenue Impacts	-9 M	-53 M	-45 M	-43 M
Capital Costs	1,170 M	1,170 M	859 M	1,020 M
Operating and Maintenance Costs	227 M	216 M	240 M	221 M
Total Costs[11]	**1,220 M**	**1,210 M**	**985 M**	**1,093 M**
Residual Value of Land	177 M	177 M	114 M	148 M
Net Revenue	**-1,229 M**	**-1,263 M**	**-1,030 M**	**-1,136 M**
Total Cost Recovery Ratio	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**

Note: Financial Case uses a 60-year evaluation period from 2033.

[10] The Open Door Sensitivity Test was fully modelled in comparison to Option 1 infrastructure (Full BRT implementation). This sensitivity demonstrated that a large driver of benefits for the DSBRT project is the implementation of the Open Door policy. While the same sensitivity test was not run for Options 2 and 3, Open Door benefits will provide similar benefits to the project regardless of investment option. An off-model estimate of these benefits was incorporated into each option's benefits to provide an approximate comparison in the BCRs between Options. It is important to note that this is a high order magnitude estimate only and has not been developed by running the GGHMv4 or Monte-Carlo simulations as in the case of the Open Door Sensitivity for Option 1, therefore, only a single value is provided for each result instead of a range.

[11] Capital and Operating Costs are different between the Economic and Financial Cases for several reasons. Optimism bias is applied to Economic Case, while only applicable contingency is applied to the Financial Case. Land value is estimated at an opportunity cost for the Economic Case, while the Financial Cases estimates land value to include purchasing cost upfront with an estimate for residual value. The Economic Case presents the real value of costs and the figures include a social discount rate (3.5%) and the effects of any value escalation (general price inflation ignored) based on the timeline over which the expenditure is incurred. The Financial Case is presented in nominal terms and the figures include general inflation, cost escalation, and a financial discount rate of 5.5%.

The overall takeaways from the financial case include:

- **Capital Costs:** Full BRT implementation (Option 1 and sensitivity) are expected to be highest, followed by Option 3 and then Option 2, relative to both BAU scenarios, reflecting the level of infrastructure implemented. Option 2 requires the lowest initial investment (capital costs), representing $311 M savings in comparison to Option 1, while Option 3 represents $150 M of savings. The 8.5 km of the DSBRT that Durham Region has secured funding for reduces the required capital costs by approximately $250 M for the Investment BAU. [12]
- **Operating Costs:** Option 2 will have the highest costs, as it will require additional fleet to deliver the service plan as buses will operate slower in the more congested, mixed-traffic segments where infrastructure is deferred. Option 1 will have the lowest costs due to better operating conditions (faster travel times and operating speeds). Open door requires more staffing resources than Closed Door in any of the options due to per rider costs associated with higher ridership, such as fare collection and call centre support.
- **Fare Revenue Impacts:** Incremental revenue for all options compared to both BAUs is negative. This is due to the anticipated significant shift of passengers from GO train and GO bus to DSBRT. DSBRT's average passenger fare is a flat fare whereas GO transit is distance-based, resulting in passengers paying about 25% less on DSBRT compared to GO transit. Despite overall increase in transit ridership, loss of the larger fare is not recovered, resulting in negative incremental revenue. Open Door has a lesser negative impact to overall incremental fare revenue due to substantially higher ridership.
- **Cost Recovery:** All options are expected to have a negative cost recovery over the assessment period. This is due to the anticipated significant shift of passengers from GO train and GO bus to DSBRT. Open Door has a lesser negative impact to overall incremental fare revenue due to substantially higher ridership.

Deliverability and Operations Case Findings

The deliverability and operations case analyzes the delivery, operations and maintenance, and service plans for the DSBRT project, as well as any issues that should be considered during the project's continued development. The results of this case are summarized in Table ES 4. Because the sensitivity analysis (Open Door) assumes full BRT implementation, the summary of findings for Option 1 presented in this table also apply to the sensitivity analysis.

Table ES 4: Summary of Deliverability and Operations Case (Total, Including ICIP-funded Segments)

	Option 1 *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
BRT Infrastructure			
Bus-only Guideway	36 km	25 km	27 km
BRT Stops (two-way)	49	40 (+24 existing)	42 (+26 existing)
Property Impacts[1]	649 properties	454 properties	487 properties
Constructability			

[12] Escalation: Metrolinx applied sliding rates recommended by IO and MTO, from 6.5% for (2022) then, 6.5%, 5%, 5%, 3.5%, 3.5% and 3% for subsequent years, based on the assumed cash flow.

	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Utility Relocation	Most extensive	Least extensive	Between Option 1 and 2
Rail Crossings[2]	Two rail crossings	1 rail crossing	Two rail crossings
Interface with SSE	All options provide same conditions for integration with SSE		
Interface with Planned EELRT	Requires review at Morningside	Mostly accommodated	Mostly accommodated
BRT Operations			
Transit Reliability	Lower risk to on-time performance (OTP)	Higher risk to OTP	Lower risk to OTP
Maintenance & Facilities	Requires least staff to operate	Requires most staff to operate	Between Option 1 and 2
Fleet Requirements (+net vs. Investment BAU)	86 buses (+25 net)	89 buses (+28 net)	87 buses (+26 net)

Notes:

1. These small slivers of property requirements are due to regrading. Includes properties already being acquired by Durham Region for in-delivery segments (about 98 properties).

2. All options include the Pickering Bridge (CN) that Durham Region is advancing works on as part of the in-delivery segments.

3. A "Do Nothing" scenario is assumed for all deferred segments. Costs are not included for infrastructure interventions to existing stops in deferred segments.

The overall takeaways from the deliverability and operations case include:

- **Major Project Components and Fleet:** Each investment option has similar major components, reflecting the dedicated centre-median and curbside guideway that will be delivered. Option 2 and 3 will have more overall stops than Option 1, as they will continue to use standard curbside stops; however, these will generally be less complex than the full BRT stops.
- **Constructability:** Option 1 will have the greatest property and utility impacts and involve the delivery of more complex works (e.g. widening two rail bridges) since it is constructing the most infrastructure. Option 2 will have the lowest property and utility impacts, as it involves constructing 27% less linear BRT guideway (7 km less) than Option 1 and was developed to defer the more complex works. Further considerations need to be explored in the next phase of the project to understand how deferral of segments impact/benefit the environment and cultural heritage.
- **Deferring Project Components:** Deferring delivery of some segments would result in initial capital costs savings for Option 2 and 3. However, doing so will likely produce loss economies of scale and throwaway costs. For instance, there will be additional procurement and mobilization costs that parties will incur when the deferred segments are ultimately delivered. Similarly, there will potentially be throwaway costs by having to remove infrastructure built at the segment transition points to deliver the full BRT. Impacts of construction along the deferred portions would also impact future BRT operations, potentially diminishing some of the anticipated benefits until the project is fully completed.
- **Maintenance and Storage Facilities (MSF):** This PDBC assumed sufficient capacity at MSFs, since the focus of the analysis was on the transit service and corridor infrastructure. The next phase of the project should better understand the requirements for fleet storage and maintenance, as well as align with a detailed operating plan to determine whether additional MSFs are required for DSBRT.

The lack of MSF capacity can bring risks to the benefits of the project, since it would limit the service being provided along the corridor.

- **Governance Agreement, Operations and Maintenance, and Procurement Responsibilities:** Regardless of which investment option advances, further work is required to define the roles and responsibilities of the project partners for the delivery, operations, and maintenance of the DSBRT (Concept of Operations).

Conclusions

The following conclusions can be drawn from the PDBC analysis:

1. DSBRT will enable frequent, faster (14 to 19 min travel time savings) and more reliable transit connections from Downtown Oshawa to the Scarborough Subway Extension, serving multiple higher education institutions and future high-density population and jobs along the Highway 2-Ellesmere corridor.
    - **Intensification**: Demand will increase as **population and jobs growth in most municipalities are expected to increase by greater than 50%** (2016 to 2041), with Pickering expected to double population and jobs. The UTSC/Centennial College area will continue to be a driver of demand due to intensification and new student housing, to reach activities beyond the immediate community, such as employment, medical, cultural and leisure opportunities.
    - **Equity**: Within a 10-minute walk of a DSBRT stop, 37% of the population are visible minorities. There are also approximately **4,600 existing and planned affordable housing units** within the same distance. The corridor **supports students**, with UTSC/Centennial College being a main driver of demand that will continue to grow with expected densification and new student housing planned for this area. The corridor also **supports essential workers**, particularly those connecting with Markham Road – a north/south corridor with major essential employment areas.
2. **Cross-boundary service integration and regional implementation** of BRT infrastructure are essential for the project's success in meeting demand and realizing benefits (e.g. reliability, travel time savings).
    - **Building Capacity:** DSBRT infrastructure substantially increases in capacity, expanding the ridership from 3,100 boardings in the morning one-hour peak (Investment BAU) to 4,300 boardings under a Closed Door scenario. Significant drivers of ridership are the connection with SSE and with UTSC; therefore, **infrastructure implementation in Toronto is critical for benefit realization.**
    - **Service Integration**: An Open Door service integration model substantially increases DSBRT's benefits due to additional capacity in Toronto. **In other words, with the same investment in infrastructure, Open Door's total ridership (peak and daily) can be about 20% higher compared to Closed Door.** The PDBC analysis demonstrated that Open Door resulted in an additional 1,000 AM 1h peak boardings and 5,300 daily boardings compared to Closed Door (Option 1).
3. Further refinements can be made to support enhancing the DSBRT benefit-cost ratio.
    - **Project Refinement:** Opportunities to value engineer the project can help refine the initial investment that is required. **This can help maximize the project's benefits**, by tailoring the initial delivery to those sections that enhance operational and passenger benefits the most.

- **Service Planning:** Further **adjustments to the service strategy can help improve overall benefits** for DSBRT, particularly concerning crowding.

Next Steps

Based on the information, data, and findings presented in this PDBC, the following next steps are suggested for the investment option that will be advanced:

- **Service Integration:** Metrolinx and MTO are actively collaborating with the TTC, MiWay, Brampton Transit, YRT, and DRT to explore options that would support cross-boundary pilots that would allow these operators to serve TTC customers within Toronto. Advancing the implementation of Open Door service integration policies for DRT buses that cross the municipal boundary would further support ridership growth and DSBRT benefits. Metrolinx will continue to work with stakeholders to advance Open Door so that a solution is in place to support the DSBRT by 2033.
- **Refine the DSBRT Service Plan:** Undertake further analysis to optimize the corridor's guideway speeds and overall operations to help improve the project benefits.
- **Advance Concept of Operations:** Refine operational and maintenance requirements, as well as areas that require integration of systems or service cross-boundary (e.g. transit-signal priority, call centre/customer support).
- **Consider Complementary Transit Priority Measures:** Identify other transit priority measures to improve bus operation in mixed-traffic segments.
- **Advance Grangeway Avenue Design:** Refine the design of the Grangeway Avenue connection as part of the Scarborough Centre Station design and in coordination with future plans for the decommissioned SRT bridge.
- **Examine Connectivity to Bowmanville GO Rail Extension:** Examine opportunities to connect DSBRT to the future rail extension, including bus bay/layover requirements at the proposed Ritson Road GO Station in Central Oshawa and the need to protect for potential eastward expansion of DSBRT.
- **Coordinate with the Eglinton East LRT:** Continue engaging with the City of Toronto on the interface between DSBRT and planned LRT near Morningside Avenue. Consideration should be given to the design of the overlapping guideway, future operations, and construction timing.
- **Explore DSBRT's Relationship with the GO Bus in Durham:** Understand the future relationship between the DSBRT and the GO Bus system in Durham. The PDBC indicates that DSBRT is often more attractive than the GO Bus due to its lower fare and easier access, which leads to riders choosing DSBRT to reach destinations like Scarborough Centre, UTSC/Centennial College, and Downtown Oshawa. Further discussion should explore the future GO Bus strategy for the Highway 2-Ellesmere corridor to best optimize the rider experience.
- **Value Engineering:** Further opportunities to refine capital costs should be explored as the project advances. Opportunities may include refining the typical BRT stop design to reduce the initial investment, while still preserving the broader benefits of rapid transit.
- **Identify Order of Magnitude of Cost Impacts of Deferring Segments Beyond 2033:** If Option 2 or 3 are selected, considering aspects such as duplication of effort in procurement, construction phasing and/or loss of economy of scale during construction of the initial infrastructure.

- **Confirm Status of the ICIP-Funded Segments:** The status of segments being delivered by Durham Region should be confirmed, with any changes to the length of delivered segments reflected in the capital cost and respective cases.
- **Actively and continuously consult and engage with Indigenous communities**: Metrolinx is committed to consulting with Indigenous communities with respect to any decision or action that may have the potential to adversely impact Aboriginal and/or Treaty rights. This includes but is not limited to future environmental studies and fieldwork related to natural heritage, cultural heritage, and archaeology.
- **Continue to Meet Future Commitments from the Environmental Assessment:** The Environmental Project Report made several future commitments. The commitments result from proposed mitigation measures to address potential impacts of the DSBRT, as well as commitments to future consultation with MECP, Indigenous Nations, regulatory agencies, applicable stakeholders, and property owners. Table 8.1 of the Environmental Project Report summarizes the commitments, which are separated by environmental component, including the general or specific commitment and during which phase of the Project it will be implemented.

1

Introduction

Introduction

The Durham-Scarborough Bus Rapid Transit (DSBRT) project is a 36-kilometre regional cross-boundary service connecting Downtown Oshawa, Whitby, Ajax, Pickering, and Scarborough Centre Station along the Highway 2 corridor. The 2041 RTP identifies the as a priority 'In Development' project in the advanced planning and design stages. The project forms part of the 2041 Regional Frequent Rapid Transit Network that will provide:

- Frequent service, all day, seven days a week;
- Faster and reliable service due to dedicated bus lane providing separation from traffic, signal priority measures, and better passenger boarding experience; and
- Efficient transfers between routes, enabling a traveller to get anywhere in the GTHA easily and reliably.

Advancing key 'In Development' projects, like the DSBRT, is a priority action key in the 2041 RTP, captured in Strategy 1: Complete the Delivery of Current Regional Transit Projects, and Strategy 2: Connect More of the Region with Frequent Rapid Transit through the FRTN. A specific study for this corridor was taken through the Initial Business Case (IBC) process. It identified a high-performing option to provide a BRT connection between Durham and Toronto by evaluating each alternative's strategic, economic, financial, and deliverability and operations cases. The 2018 IBC[13] recommended that planning work advance to the new stage of the process, which includes a preliminary design business case (PDBC) and completing an environmental assessment.

Background

A rapid transit corridor connecting Durham and Scarborough was first proposed in 2007 in response to federal and provincial funding programs to improve mobility in the GTHA (Figure 1). The Province provided $82.3 million to Durham Region to support the introduction of the PULSE service between Oshawa and UTSC. Durham Region Transit (DRT) commenced operations of PULSE 900: Highway 2 in June 2013 with frequent, limited-stop service, operated with new buses, facilities, road, and traffic improvements, upgraded stops and branded shelters.

The Region's 2010 Long Term Transit Strategy confirmed a rapid transit corridor in the Highway 2 corridor, connecting to Scarborough Centre via Ellesmere Road. The Metrolinx DSBRT Benefits Case was also completed in 2010 and concluded that the project would generate significant transportation, environmental and socio-economic benefits. In 2018, Metrolinx completed the Planning Study and IBC in partnership with the Region of Durham, DRT, the City of Toronto, and the TTC, which identified a preferred rapid transit corridor between Durham and Toronto. The 2041 RTP identifies the Durham-Scarborough BRT as an 'In Development' project with advanced stages of planning and design and is required to meet the region's needs in the near term.

Durham Region has continually invested in transit priority along the Highway 2 corridor, with Phase 1 improvements implemented through the Highway 2 Transit Priority Measures Environmental Assessment (completed 2012, amended 2014). This has resulted in approximately 5 km of curbside bus lane operations and transit signal priority along Highway 2.

Since the completion of the DSBRT IBC, Durham Region has received funding from the Investment in Canada Infrastructure Program (ICIP) to advance implementation on about 8.5 km out of approximately

[13] Durham-Scarborough IBC: https://assets.metrolinx.com/image/upload/v1663237565/Documents/Metrolinx/2019-01-24-DSBRT_Final-for-Publication_updated.pdf

36 km of the DSBRT corridor. Works developed as part of the IBC and the environmental assessment help funding decisions and inform detailed design of in-delivery segments. The analysis conducted in this PDBC acknowledges the ICIP-funded segments in-delivery by providing results that demonstrate the performance, benefits, and challenges for advancing funding for the remaining unfunded portions of the corridor.

Figure 1: Timeline of Key Milestones for the DSBRT Corridor

Corridor Description

The Durham-Scarborough Bus Rapid Transit (DSBRT) project is a 36-kilometre corridor connecting Oshawa, Whitby, Ajax, Pickering, and Scarborough (Figure 2). A rapid transit corridor connecting Durham Region and Scarborough was identified in The Big Move RTP (2008) as a top 15 priority project. The Province provided funding to Durham Region to support the launch of the PULSE 900 bus service, a service that started operations in June 2013. Since then, Durham Region has constructed dedicated curbside bus lanes along Highway 2 in Ajax and Pickering.

As of 2024, DRT operates two main services connecting Oshawa and Scarborough:

- PULSE 900 operates between Oshawa to the University of Toronto – Scarborough Campus (UTSC), running along Highway 2 in Durham, and Kingston Road and Ellesmere Road in Toronto, carrying 8,400 people per weekday as of October 2023. In Durham, PULSE 900 operates throughout the day on weekdays and weekends every 10 to 15-minutes. In Toronto, PULSE 900 has a Closed Door[14] service policy and operates throughout the day on weekdays and weekends every 20 and 30 minutes respectively.
- Route 920 has a Closed Door service policy and operates between Oshawa's Harmony Terminal and Scarborough Centre, running on Progress Avenue, Milner Avenue, Sheppard Avenue and Kingston Road within Toronto, and along Highway 2 in Durham before turning onto Salem Road. It operates every 15 minutes on weekdays during the day.

The TTC operates multiple routes within Toronto between Scarborough Centre and the Durham Region border, including routes 38, 95, 938 and 995. Ellesmere Road between Scarborough Centre and Military Trail/UTSC is part of the TTC's 10-minute or better surface network and has 18 buses per hour scheduled during the morning peak period, providing a frequent service to campus for students, staff, and faculty.

DSBRT will provide a new rapid transit connection, enhancing intra-regional mobility and connecting residents, employment, and post-secondary institutions across both sides of the boundary. The BRT will connect local and regionally significant areas including:

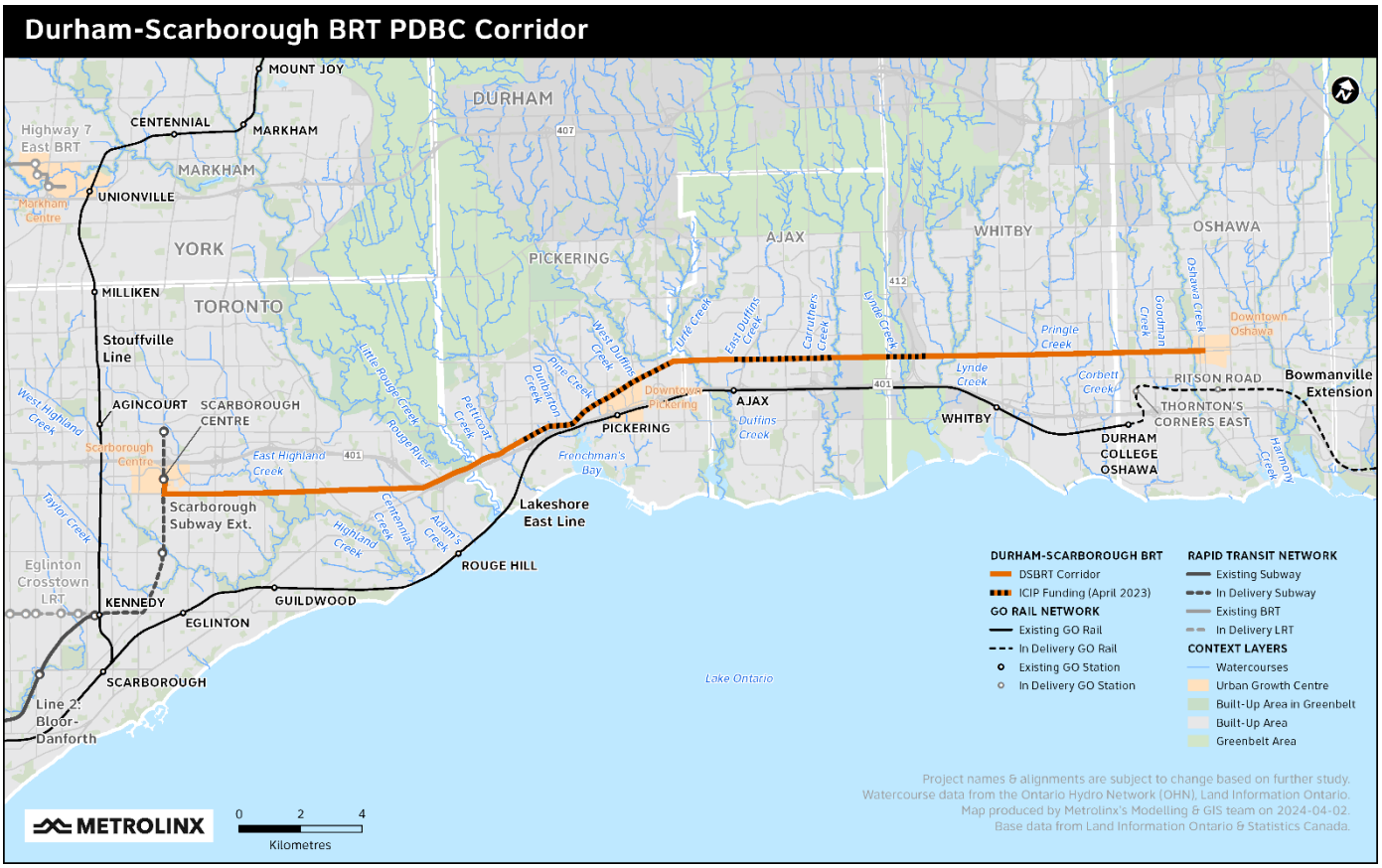
- Provincially designated Urban Growth Centres (UGCs) of Scarborough Centre and Downtown Oshawa;
- Downtown areas of Pickering, Ajax, Whitby, and Oshawa;
- Major post-secondary institutions, including UTSC/Centennial College, Trent University – Oshawa Campus, Durham College, and Ontario Tech University;
- Connection to the TTC Line 2 – Scarborough Subway Extension (SSE);
- Major malls, including Scarborough Town Centre, Pickering Town Centre, Durham Centre in Ajax, and Oshawa Centre; and
- Potential connection to planned transit corridors, including the Simcoe Street Rapid Transit, led by Durham Region, and Eglinton East LRT (EELRT), in Initial Business Case stage being planned by the City of Toronto.

Building upon the established DRT PULSE 900 route, DSBRT seeks to enhance connectivity between Durham Region and Toronto. It will achieve this by establishing a more efficient and cost-effective one-

[14] A Closed Door policy is where DRT buses operating within Toronto can only drop off passengers when inbound to Scarborough Centre and pick up passengers when outbound from Scarborough Centre.

seat bus rapid transit system with increased frequency and enhanced bus stops, extending the transit connection to Scarborough Centre. This involves more dedicated transit infrastructure along Highway 2 and Ellesmere Road to reduce transit travel time and provide more frequent and reliable bus service eliminating the need for transfers for travel between Toronto and Durham. Moreover, it will provide direct connection to the Toronto Transit Commission (TTC) subway network at the future Scarborough Centre Station. For the purposes of this PDBC, it is assumed that the services running in the dedicated guideway include two DRT routes (mainline and Salem Branch) and four TTC routes; more details on service plan are provided in Chapter 3: Investment Options.

Figure 2: Map of the Durham-Scarborough BRT Corridor



The corridor has varied traffic, land use conditions, and space constraints. With rapid population and job growth in the past decade expected to continue, the high travel demand along the corridor will be exacerbated, requiring higher capacity transit to link communities and employment on both sides of the Toronto-Durham boundary. Furthermore, post-secondary institutions located on and near the corridor are a vital travel market that the DSBRT will serve.

The proposed BRT infrastructure includes a range of design solutions in different corridor segments to optimize travel time and road capacity for buses while accommodating context-specific characteristics and constraints. A preliminary design was developed and subsequently included in the Environmental Project Report (EPR), which was approved in January 2022 following the Transit Project Assessment Process (TPAP)[15]. The preliminary design includes segments with buses operating in mixed-traffic with

[15] For further information on the preliminary design, the TPAP, or other studies for this project, visit: https://www.metrolinx.com/en/projects-and-programs/durham-scarborough-brt/studies

transit priority measures and segments with dedicated curbside or centre-median transit lanes across the corridor, including 49 stops in each direction. The design concept varies by segment based on space, travel demand, and land use context.

Since the initial EPR was approved in January 2022, a TPAP Addendum was filed to modify a short section of the corridor due to advances in the design of the SSE project. The EPR originally stopped the transit infrastructure design at the intersection of Ellesmere Road and Grangeway Avenue, protecting for buses to turn onto Grangeway Avenue to access the future SSE Scarborough Centre station proposed between McCowan Road and Grangeway Avenue, north of Bushby Drive. The TPAP Addendum extends the design to accommodate transit infrastructure along Grangeway Avenue between Ellesmere Road and Bushby Drive, allocating dedicated bus lanes for a more efficient connection to SSE and reflects the SSE's design advancements since the DSBRT EPR was completed.

Business Case Overview

The Business Case process sets out the rationale for implementing an investment to solve a problem and/or address an opportunity. Business Cases provide evidence to decision-makers, stakeholders, and the public as a crucial part of transparent and evidence-based decision-making processes.

This Preliminary Design Business Case has been prepared, following the Metrolinx Business Case Guidance (August 2021), and is the second business case that forms part of the Business Case Development process (Figure 3). The PDBC takes the recommended option of the IBC and reviews different approaches to refine and optimize delivery options, which are discussed later in this report. The PDBC ultimately identifies a preferred alternative and revised project costs to secure procurement and construction funding.

The business case approach evaluates rapid transit alternatives in four cases to understand the strategic and economic benefits, costs and impacts of a transportation investment, as well as operational and constructability challenges. The economic and financial analyses use a 60-year evaluation period. For the purposes of this business case, it is assumed that detailed design starts in 2025 and that all sections of the corridor will be designed, constructed, commissioned and operational by 2033. The four cases of this evaluation are:

- **Strategic Case:** Examines how an option achieves transportation objectives, and establishes how an option will change the way people move (with forecast horizon being 2041);
- **Economic Case:** Assesses the economic cost and benefits of an option and quantifies the benefit to society in economic terms;
- **Financial Case:** Evaluates the capital and resource requirements and establishes how much an option will cost in financial terms; and
- **Deliverability and Operations Case:** Provides evidence on the feasibility and constructability of project options, considers risks and establishes what is required to deliver and operate an option.

Figure 3: Metrolinx Business Case Development Process[16]

This Business Case analysis also incorporates the following aspects that have occurred since the 2018 IBC, including:

- **Funding for 8.5 km of the corridor:** Durham Region secured funding through the Investing in Canada Infrastructure Program (ICIP) federal funding to construct approximately 8.5 km of BRT infrastructure in Pickering, Ajax, and Whitby. More information on the funded segments is provided in Chapter 3.
- **Fare integration:** The PDBC analysis reflects the Ontario One Fare Program that allows transit riders to only pay once when connecting to and from the TTC and GO Transit, DRT, MiWay, Brampton Transit, and York Region Transit. This fare integration program was launched on February 26, 2024.
- **Service integration:** The IBC assumed an Open Door policy for DRT buses within City of Toronto limits. An Open Door policy means DRT buses can pick-up and drop-off passengers in both westbound and eastbound directions within City of Toronto limits. Service integration is still in progress, with Metrolinx and MTO actively collaborating with the TTC, MiWay, Brampton Transit, YRT, and DRT to explore options that would support cross-boundary pilots that would allow 905 buses to serve TTC customers within Toronto[17]. As of December 2023, no single option or approach has been accepted by both the TTC and neighbouring 905 transit agencies., therefore, the PDBC assumes the current Closed Door policy for DRT buses within City of Toronto limits remains in place. The Closed Door policy means DRT buses travelling westbound to Scarborough Centre may only drop off passengers and may not pick up passengers; DRT buses travelling eastbound may only pick up passengers and may not drop off passengers within City of Toronto limits. However, the Open Door sensitivity test has been used to evaluate DSBRT project costs/benefits in a future state where 905 transit agencies pick up/drop off customers within the City of Toronto municipal boundary.
- **Changing work patterns:** Metrolinx assessed employment sectors, PRESTO data, and travel study data along the corridor to assess a potential impact measure due to recent working formats (e.g., increase in hybrid and work from home for certain employment sectors). The analysis concluded that impacts to travel patterns along the DSBRT route are generally low, given the purpose for the majority of trips is for in-person activities (e.g., school, institutions, employment). Therefore, no demand adjustments were recommended for the DSBRT.
- **Bowmanville GO Rail Service Extension:** Planning and design work has advanced on an extension of the Lakeshore East GO Rail corridor to Bowmanville. The plan identifies a proposed Ritson Road GO station[18], located in Central Oshawa, approximately 1 km south of the DSBRT corridor. The DSBRT services are expected to connect to Ritson Road GO once the station design advances.
- **Advancements in other projects:** The PDBC incorporates other rapid transit projects that have advanced or been announced since the IBC within the travel demand modelling, including the Provincial subways program that was announced in 2019. This includes the SSE, Yonge-North Subway Extension, Ontario Line, and the Eglinton Crosstown West Extension. The TTC's service plan for SSE is also reflected within the PDBC.

[16] Source: Metrolinx Business Case Manual Volume 1: Overview
[17] Source: https://www.toronto.ca/legdocs/mmis/2022/cc/bgrd/backgroundfile-223489.pdf
[18] The PDBC assumes the corridor terminates in downtown Oshawa, with customers from DSBRT being able to connect with Ritson Road GO by transferring to local transit services. For the next phase of the project, the PDBC recommends that the connection of DSBRT with Ritson Road GO is refined once station design and nearby projects advance.

- **Alignment with the Latest Business Case Guidance:** The current version of the Metrolinx Business Case Manual Volume 2: Guidance was released in August 2021. The manual reflects the newest state of practice for assessing investments, resulting in a different method as to how benefits and costs are computed compared to the IBC.
- **The Increasing Cost of Construction/Inflation:** There has been a significant rise in the cost of building and constructing new infrastructure and facilities over the past five years. Statistic Canada's Building Construction Price Index (non-residential, 2017 = 100) increased from 109.7 to 156.2 for the Toronto area between Q4 2019 and Q4 2023[19]. The Ministry of Transportation's Asphalt Concrete Price Index[20], which reports the monthly cost per tonne of the material, increased from $709.60 in December 2019 to $1017.50 in December 2023. While the construction requirements of every project are unique, inflation in the construction industry has increased significantly in a short period and is impacting all project types.

Document Structure

This document is structured to align with Metrolinx's Business Case Guidance. It contains the following sections:

- **Chapter 2: The Case for Change** defines the vision and guiding principles of the project and outlines the benefits of introducing rapid transit on the corridor.
- **Chapter 3: Investment Options** outlines the distinct rapid transit technology investment options assessed in the business case.
- **Chapter 4: Strategic Case** explores how the investment options achieve strategic goals and objectives.
- **Chapter 5: Economic Case** quantifies the overall value to individuals and society by apprising the costs and benefits of each investment option.
- **Chapter 6: Financial Case** monetizes the financial considerations of each investment option, including the capital, operating, and revenue implications.
- **Chapter 7: Deliverability and Operations Case** outlines the risks and requirements of each investment option.
- **Chapter 8: Business Case Summary** summarizes the document's findings and next steps.

[19] Statistics Canada. Table 18-10-0276-01 Building construction price indexes, non-residential for the Toronto area
[20] MTO AC Price Index, https://www.onasphalt.org/about/ac-index

2

The Case for Change

Introduction

This chapter of the PDBC presents the problem statement for Durham Scarborough Bus Rapid Transit, indicating the drivers that shape the problem and the impacts of not addressing it. The chapter provides a summary of the strategic value of addressing the problem and how the project aligns with broader policy initiatives.

The corridor plays an important role within the regional rapid transit network by supporting sustainable and inclusive growth to serve current and new residents, educational institutions, and jobs in a manner consistent with local, regional, and provincial policies. Moreover, the DSBRT infrastructure provides the opportunity for municipal service providers to review the local transit network and optimize bus service, benefitting transit users across Durham Region and Scarborough.

Opportunity Statement

The Highway 2-Ellesmere corridor is a crucial transportation corridor connecting people through Durham and Scarborough. The corridor has varied traffic, land use conditions and constraints. With rapid growth in the past decade and an expectation for this growth to continue into the future, demand for travel along the corridor will continue to increase and a higher capacity form of transit will be needed to link communities and employment on both sides of the Toronto-Durham boundary.

Key Drivers

The problem is shaped by key drivers that are internal and external to the transport network. These drivers support the existence of the problem and explain the impetus to address it, as shown in Table 1. The analysis considers existing conditions and future trends identified from a range of data and policy sources.

Table 1: Key Drivers of the Durham-Scarborough Bus Rapid Transit Project

Driver	How does this driver influence the problem/opportunity?	What is the impact of not addressing the problem/opportunity?
Travel Behaviour[21]	Customers along the DSBRT corridor currently depend on automobile for commuter trips, and congestion issues will be exacerbated if transit is not a viable transportation option. Transit mode share (excluding GO) for trips originating or destinated for the corridor is 11% for the 3-hour morning peak period. Connectivity to downtown areas, employment areas, post-secondary education institutions that generate **high demand.** The PULSE 900 stop at UTSC has over 100 alightings during the morning peak hour, making it the single busiest stop along the westbound route. Similarly, the TTC's stops at UTSC, Markham Road and Scarborough Centre have over double the number, demonstrating the strong demand for transit to these institutional, employment and mixed-used areas, respectively.	Automobile congestion will only exacerbate over time, resulting in loss of productivity and reduction in air quality. Traffic analysis completed as part of the environmental assessment found that seventeen signalized intersections along the corridor will have their level of service deteriorate. Without transit priority measures and dedicated infrastructure, transit will not be a viable and competitive choice in comparison to automobile, due to unreliable schedule and longer/inconsistent travel time. Certain demographics that rely more on transit (e.g. students, low-income) will be disproportionally impacted due to poor access to opportunities and/or better quality of life (education, job, essential services).
Transport Infrastructure	**Local bus service coverage and frequency are limited by roadway capacity and lack of transit priority measures.** The existing DRT PULSE 900 route operates in mixed traffic and in curbside lanes in certain locations. Enhanced transit service and reliability is expected to encourage further transit ridership and will provide time savings for existing users. In addition, enhanced transit service will be provided to access destinations served by the broader transit network.	Bus operation in congested mixed traffic increases transit travel times, making auto travel a more attractive option and exacerbating overall roadway congestion. For instance, it is expected that a bus trip between Downtown Oshawa (Simcoe Street) and Pickering Town Centre (Liverpool Road) will take 16% longer (additional 8 mins) in 2041, than today, if buses continue to operate in mixed traffic. An integrated solution that prioritizes transit across the entire corridor is necessary to optimize travel time and service frequency and increase transportation capacity.

[21] Transportation Tomorrow Survey 2016, Data Management Group.

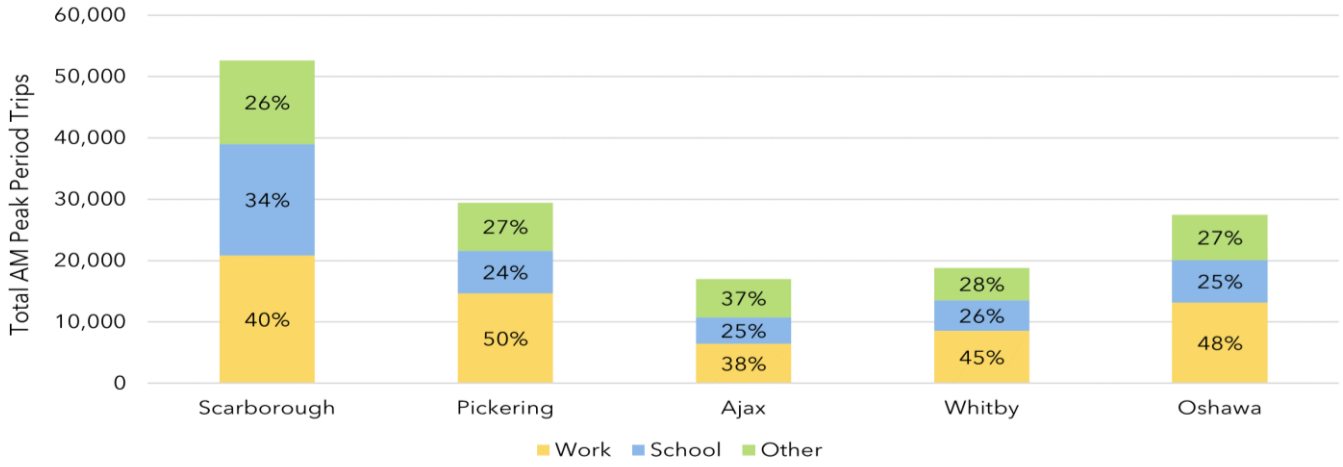
Driver	How does this driver influence the problem/opportunity?	What is the impact of not addressing the problem/opportunity?
Transport Service Provision	GO Bus (92/92A) is the only **one-seat service between downtown Oshawa and Scarborough Centre**. One seat refers to the ability for transit riders to travel this whole distance without having to transfer to other services to complete their trip. This service operates at a low frequency while also having an average fare cost higher than DRT/TTC and demand between Durham and Toronto due to limited stops (17), including no stop at UTSC. **DRT's PULSE 900 bus operates two branches along the corridor.** DRT's Route 920 operates parallel to the corridor, connecting at Scarborough Centre. These overlapping routes provide frequent service along the corridor and adjacent areas, providing important connections from Durham Region to destinations in eastern Toronto, however congestion can cause reliability issues. Dedicated rapid transit will make bus operations more efficient and reliable, connecting Durham Region directly to the subway system to allow the two-way flow of workers, learners, and other travellers. **The TTC operates several routes that use portions of the corridor between Scarborough Centre and the border with Durham Region**. These provide frequent service throughout the day, particularly between Scarborough Centre and UTSC, with 16 buses per hour during the morning peak hour. There is an opportunity to provide infrastructure that will support operational efficiency and provide relief capacity to Toronto transit riders.	Bus transfers increase travel time and discomfort for customers, discouraging the shift from automobile to transit. Limited local bus service connecting Durham and Toronto reduces the potential for serving the demand, increasing automobile dependency in the area. The lack of cross-boundary transit options will deter people from using transit, despite the large travel demand. Travel demand modelling analysis indicated that DSBRT could increase ridership along the corridor by 10 to 16% by 2041. Increasing congestion along the corridor will lead to inefficient local and regional bus operations by increasing travel times and reducing on-time performance. More buses will be required to deliver comparable service as to today, leading to higher operating costs and suboptimal performance for the TTC and DRT.

Driver	How does this driver influence the problem/opportunity?	What is the impact of not addressing the problem/opportunity?
Government Policy and Planning	**The Growth Plan:** The Government of Ontario's Growth Plan is the province's long-term framework for managing where and how growth and development will occur in the Greater Golden Horseshoe (GGH). From 2016 to 2041, the population within a 10-minute walkshed will increase from 103,000 to 146,000 (+43,000, +42%), while the number of jobs will grow from 51,000 to 77,000 (+26,000, +51%). The intensification will be accommodated in the three urban growth centres along the corridor (Scarborough Centre, Downtown Pickering, and Downtown Oshawa) and five Major Transit Stations Areas. The plan's land use policies support building a strong and thriving economy, conserving the natural environment, and developing prosperous communities. **The Province, Durham Region, and City of Toronto recognize the project as a priority higher order transit corridor**. DSBRT has been incorporated in governing plans and policies to support the implementation of the project and to direct growth to planned areas of intensification.	Without rapid transit projects, population, jobs, and services in areas identified by the Growth Plan as Urban Growth Centres (UGCs) will have few mobility options, limiting the economic potential for intensification and growth. By not implementing the rapid transit corridor, transit connections will remain slow and unreliable across the corridor, resulting in increased reliance on auto travel. This will have negative implications on the environment and quality of life of the residents and businesses along the corridor. For instance, the future year air modelling work found that Particulate Matter 10 rates will increase by 5% in 2041 without DSBRT. In addition to that, policies for densification and connectivity will not meet current plans from local and provincial levels.
Economic Activity, Land Use, and Demographics	**Significant population and employment growth is expected in the corridor in the next 25 years.** Based on the Metrolinx 2041 model forecasts, the corridor is expected to add 43,000 new residents between 2016 and 2041 (103,000 to 146,000, +42%), while 26,000 new jobs will be added over the same time (51,000 to 77,000, +51%). Improving transit could also help attract more businesses to economic nodes and the provincially significant employment zones along the corridor. Improving accessibility could help attract workers and staff and support local development objectives.	The success of intensification along the corridor, and other areas nearby, relies on the implementation of rapid transit. Without rapid transit, the corridor may not achieve the expected development and continue to be predominantly shaped by private vehicle travel needs.
Stakeholder Input	The lower-tier municipalities in Durham Region were consulted through TPAP to provide feedback and recommendations on the preferred design. Community and industry representatives and the public were also engaged. Post-secondary students identified that getting to campus by transit was unreliable, and they often experienced crowded buses. The TTC has noted that in recent years, the number of international students attending local post-secondary institutions has grown, many of whom are transit dependent.	Without this consultation, the ultimate design may not address the concerns of the lower-tier municipalities, community and industry stakeholders, and members of the public.

Existing Travel Market/ Travel Behaviour

According to the 2016 Transportation Tomorrow Survey (TTS) data, the total number of trips destined for Scarborough (52,600) during the 3-hour a.m. peak period far exceeds the number of trips destined to for all other areas within the study area. Work-based trips represent 43% of all trips, while school-based trips represent 30% of all trips, due in part to major campuses like Centennial College and UTSC. Figure 4 provides a breakdown of trip purpose in the a.m. peak period by each local within the study area.

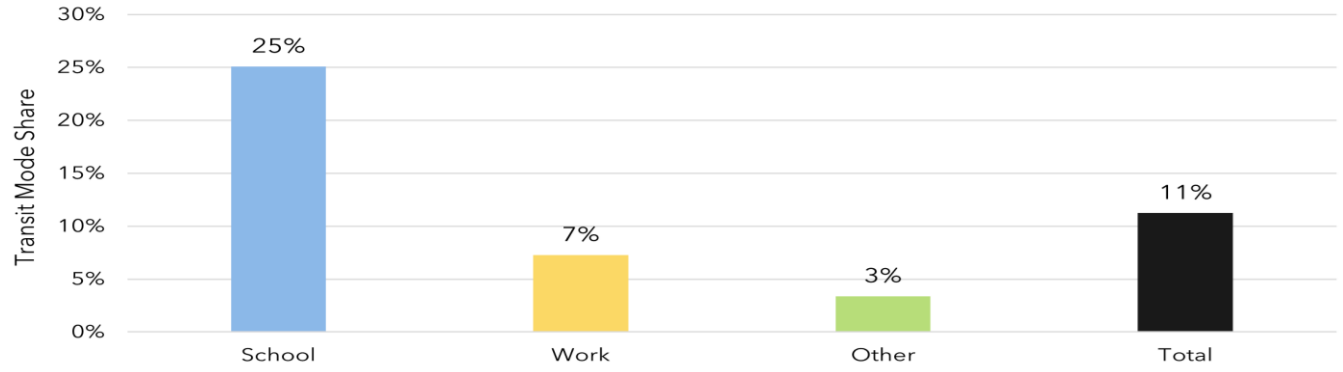
Figure 4: 2016 Trip Purpose in the DSBRT Study Area



Source: 2016 Transportation Tomorrow Survey

The data suggests that transit usage and mode share has been positively influenced from new and expanded bus service, like the introduction of DRT PULSE 900 in 2013 (Figure 5). The mode share for all trips destined to the study area in the 3-hour a.m. peak period was 11% in 2016, up 1 percentage point from 2011. Trips to and from school use transit 25% of time, up two percentage points from 2011, while work trips also grew.

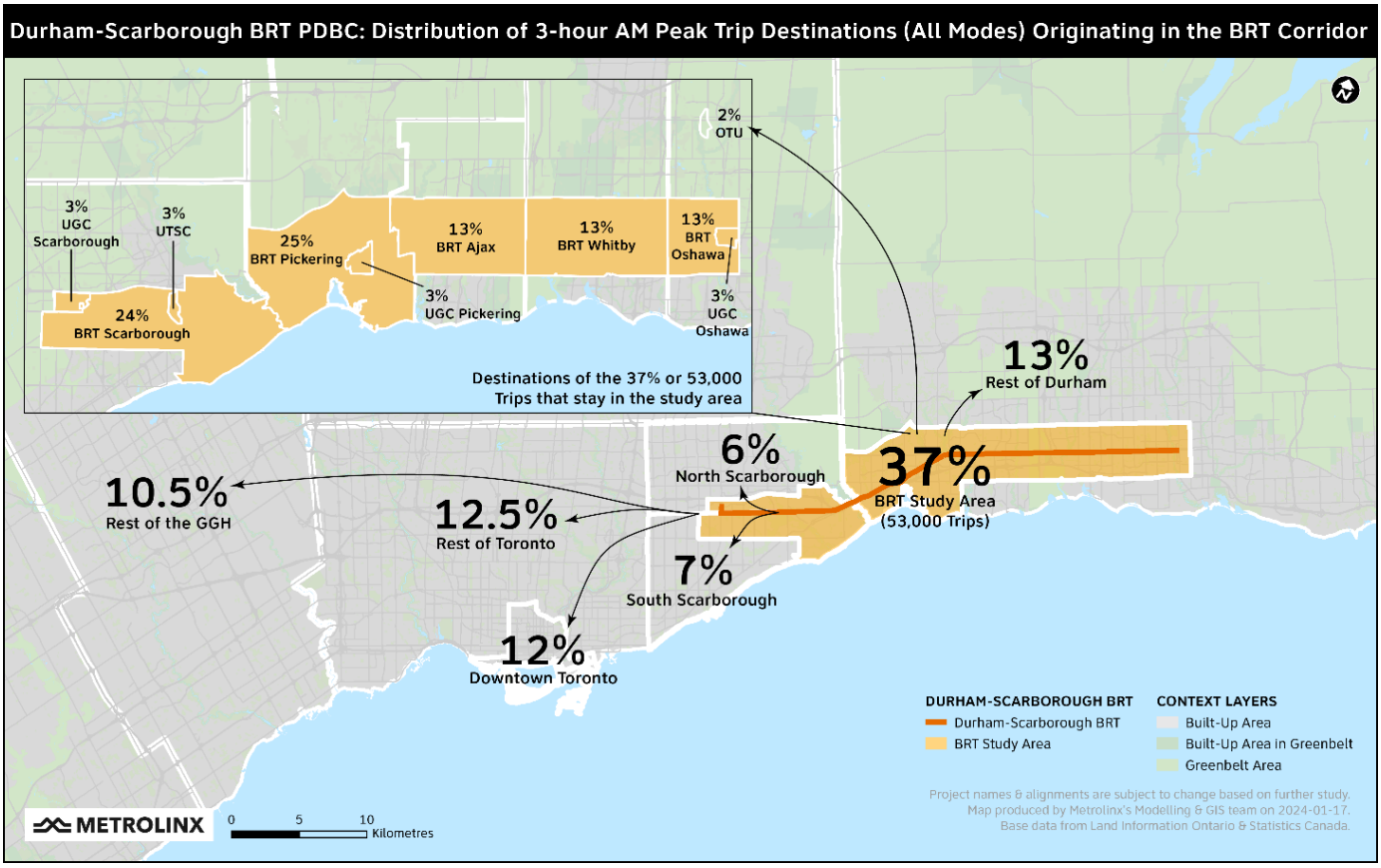
Figure 5: Transit Mode Share by Trip Purpose in 2016



Source: 2016 Transportation Tomorrow Survey

Travel in the study area is highly directional with a strong westbound flow in the a.m. peak reflecting the higher employment and education areas in the western section of the corridor. Transit travel between Durham and Scarborough Centre represent a significant portion of the total corridor ridership, due in part to the number of major destinations in that area, such as UTSC, Scarborough Centre and Centennial college. During the 3-hour a.m. peak, 37% of trips (53,000 of a total 145,000 trips) generated in the study area are destined for the study area. The balance of the trips are destined for locations outside the study area (Figure 6), including to South Scarborough (7%), North Scarborough (6%), Downtown Toronto (12%), the rest of Toronto (12.5%), the rest of Durham Region (13%), and elsewhere in the Greater Golden Horseshoe (10.5%).

Figure 6: Distribution of 3-hour AM Peak Trip Destinations (All Modes) Originating in the BRT Corridor



Source: 2016 Transportation Tomorrow Survey

It is important to recognize that less than one in eight trips that originate along the corridor are destined for Downtown Toronto, whereas over three times as many trips are destined for the study area. This suggests the need for a high-quality transit connection between Durham Region and Scarborough and the broader Regional Frequent Transit Network, as laid out in the 2041 RTP.

While the main Ontario Tech University campus in Oshawa is not located within the study area, there are over 1,100 transit trips from the study area to the Durham College campus at a transit mode share of 50%. With the introduction of the DRT PULSE 901 service on Simcoe Street and DSBRT, transit travel to the main campus will become even more attractive. Also, the post-secondary institutions are investing in new facilities in Downtown Oshawa, which further support the project.

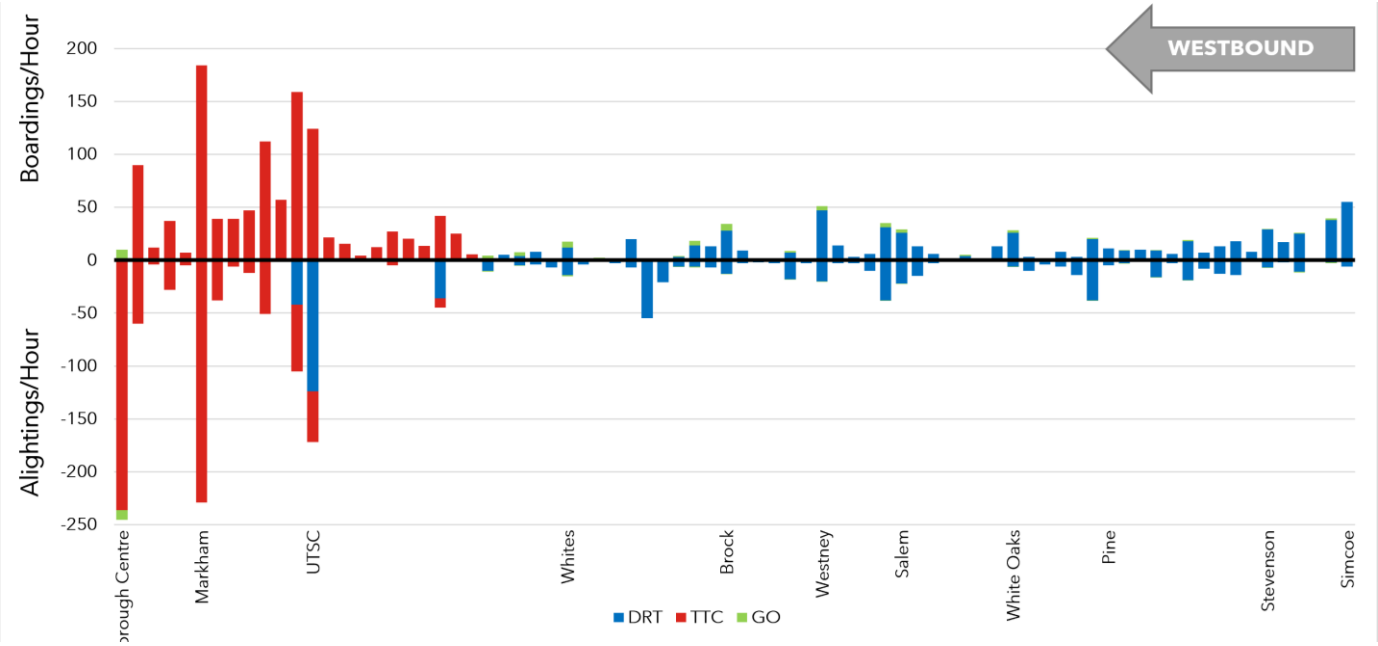
Transit Ridership

The PULSE 900 route that operates along Highway 2-Ellesmere is DRT's highest ridership route, with higher rates of boarding and alighting observed in major activity centres (e.g. Downtown Oshawa, Pickering Village) and at streets with connecting transit. The stops near Centennial College and UTSC are the busiest in the area, demonstrating the importance of the corridor for post-secondary students destined for those campuses and cross-boundary travellers who will connect to TTC service to continue into Toronto.

The TTC sees strong transit ridership along the Ellesmere section of the corridor, particularly between Scarborough Centre and the UTSC/Centennial College area. Transfers at Markham Road are high, as that corridor has emerged as a significant north-south route in the east-end, post-pandemic. This can be attributed to resilient and essential employment areas along Markham Road, between Progress Road and Steeles Avenue, and the recent opening of an online retailer fulfilment centre near the Steeles intersection. The TTC has improved service along Markham Road in response.

GO Bus service also operates along the corridor, though it carries fewer riders than the other agencies. The GO Bus is a premium service priced using a fare-by-distance model. This may deter price-conscious travellers who can complete their trip using DRT and TTC.

Figure 7: Existing Peak Hour Transit Demand Along the BRT corridor

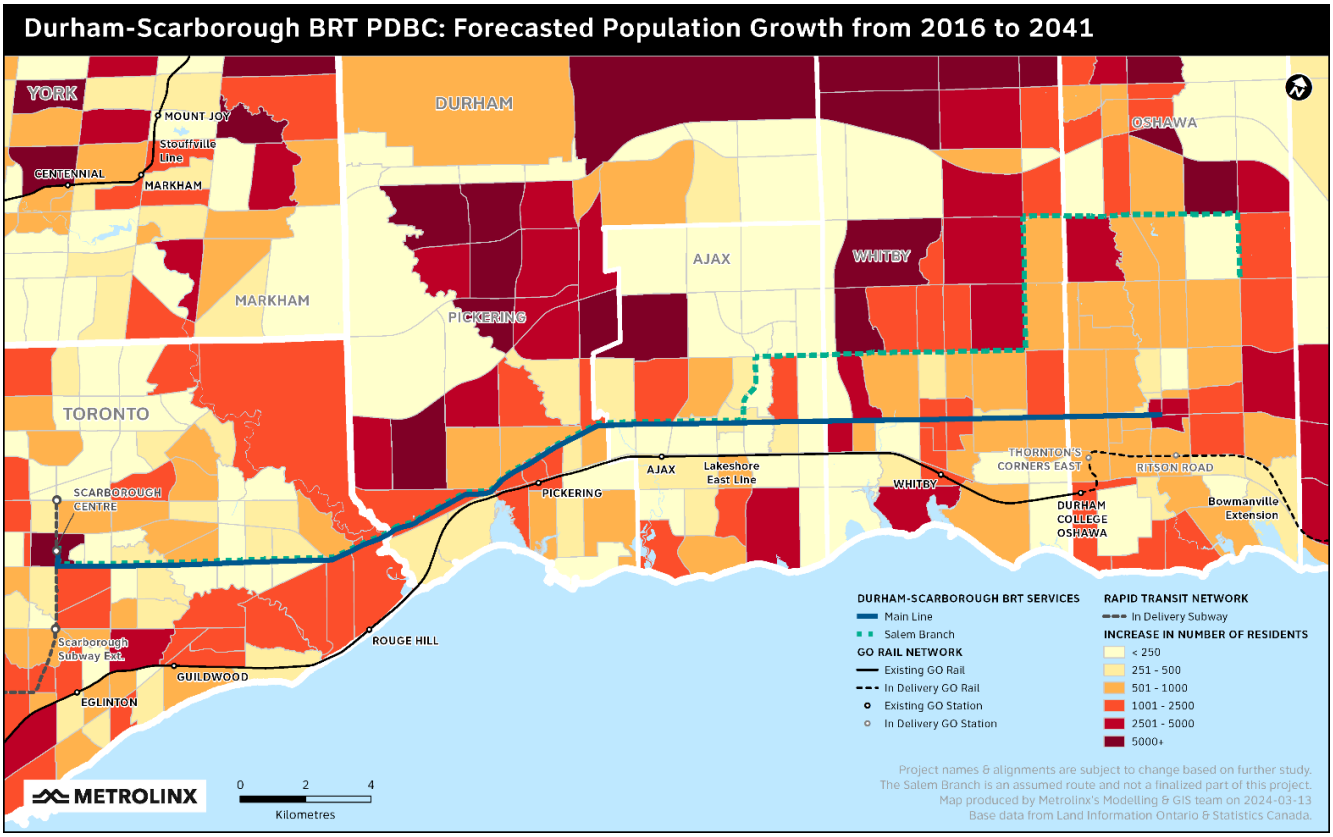


Sources: TTC ridership from September 2023, DRT ridership form October 2023, and GO Bus ridership from October 2023.

Population and Employment Growth

The corridor is forecasted to have significant population and employment growth over the coming decades. From 2016 to 2041, the population within a 10-minute walkshed of the corridor is expected to grow from 103,000 to 146,000 (+43,000, +42%), while the number of jobs will grow from 51,000 to 77,000 (+26,000, +51%) under the Market Land Use forecasts[22]. Higher increases in population are forecasted to happen in Downtown Oshawa, along the Salem Branch in Whitby, near Pickering Town Centre, and Scarborough Centre (Figure 8). Forecasted population within walking distance to DSBRT stops (Figure 9) is above 1,000 within 10-minute walking distance from stops for most of the extents of the corridor, demonstrating a major opportunity to attract transit riders. Figure 10 shows the employment growth is expected in the downtown areas, especially in Pickering and Scarborough Centre. All these major employment areas are within walking distance of DSBRT stops (Figure 11). Please note that the following maps show DSBRT services assumed for the purposes of the PDBC (Mainline and Salem Branch). More refinements to the service plan in the next phase of the project may result in changes to bus services that will operate in this corridor.

Figure 8: Forecasted Population Growth from 2016 to 2041



[22] The Market Land Use Scenario is based on future land use projections by Metrolinx through the Greater Golden Horseshoe Model Version 4 (GGHMv4) regional travel demand model, which are based on approved plans filed with the Ministry of Municipal Affairs and Housing. This is a standard land use scenario tested in Metrolinx Business Cases. It is based on observed growth trends and development potential.

Figure 9: 2041 Population within a 10-Minute Walk to Stops

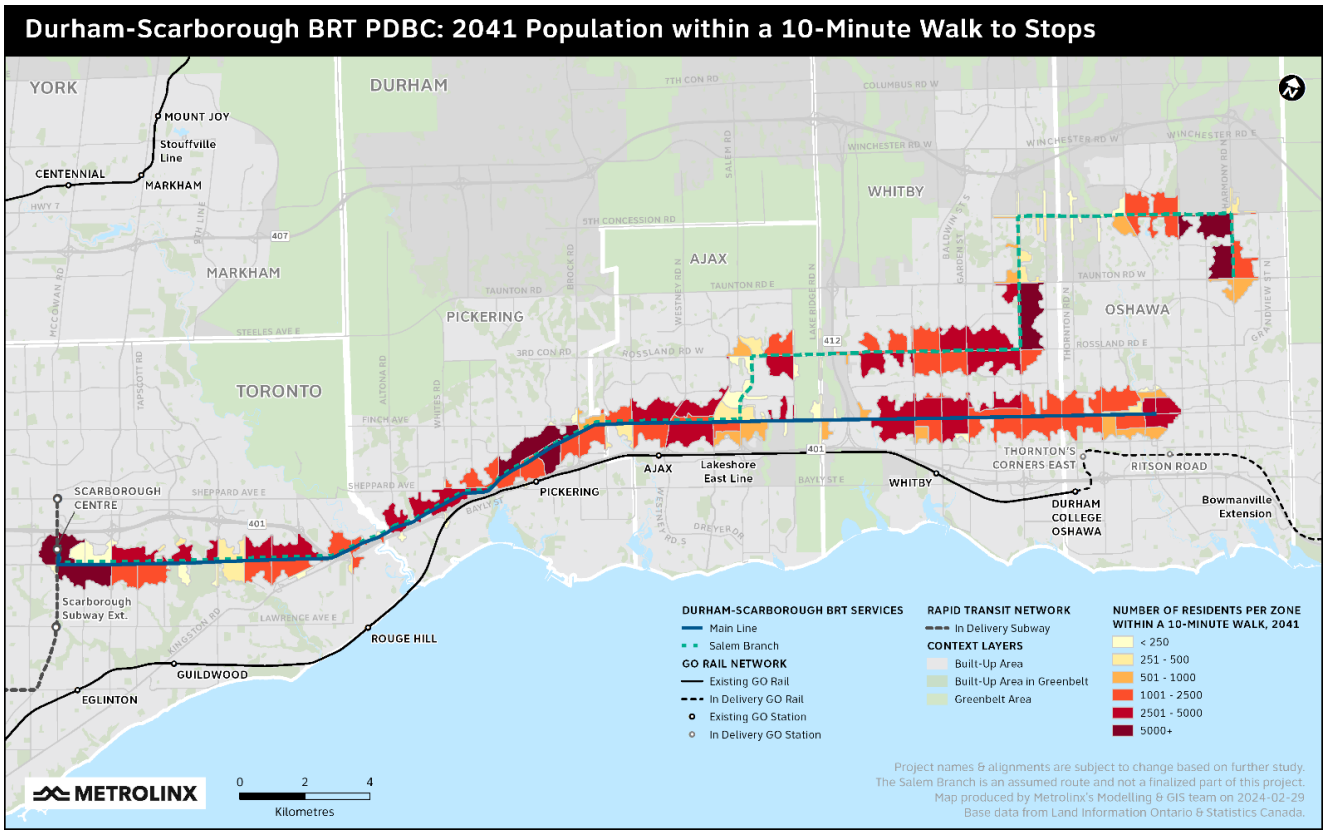


Figure 10: Forecasted Employment Growth from 2016 to 2041

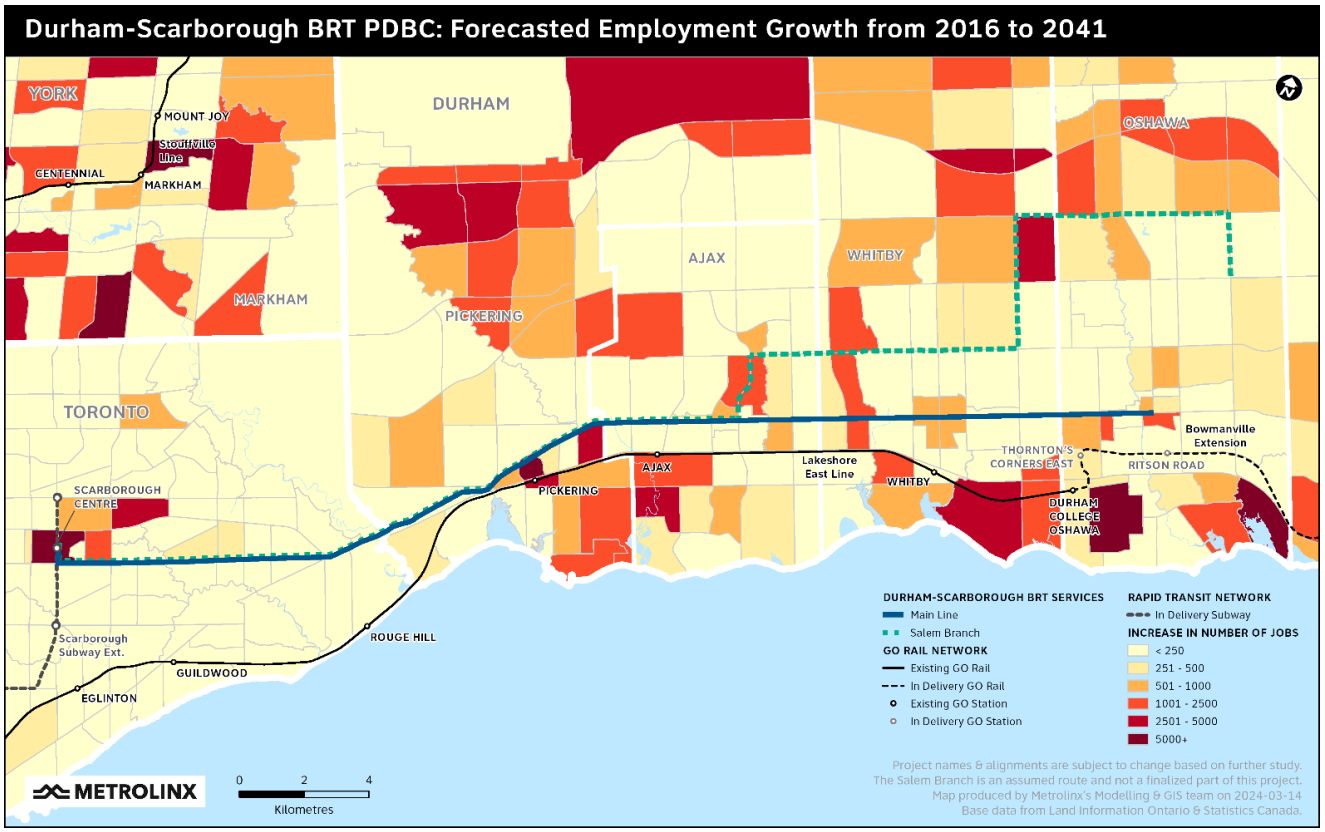
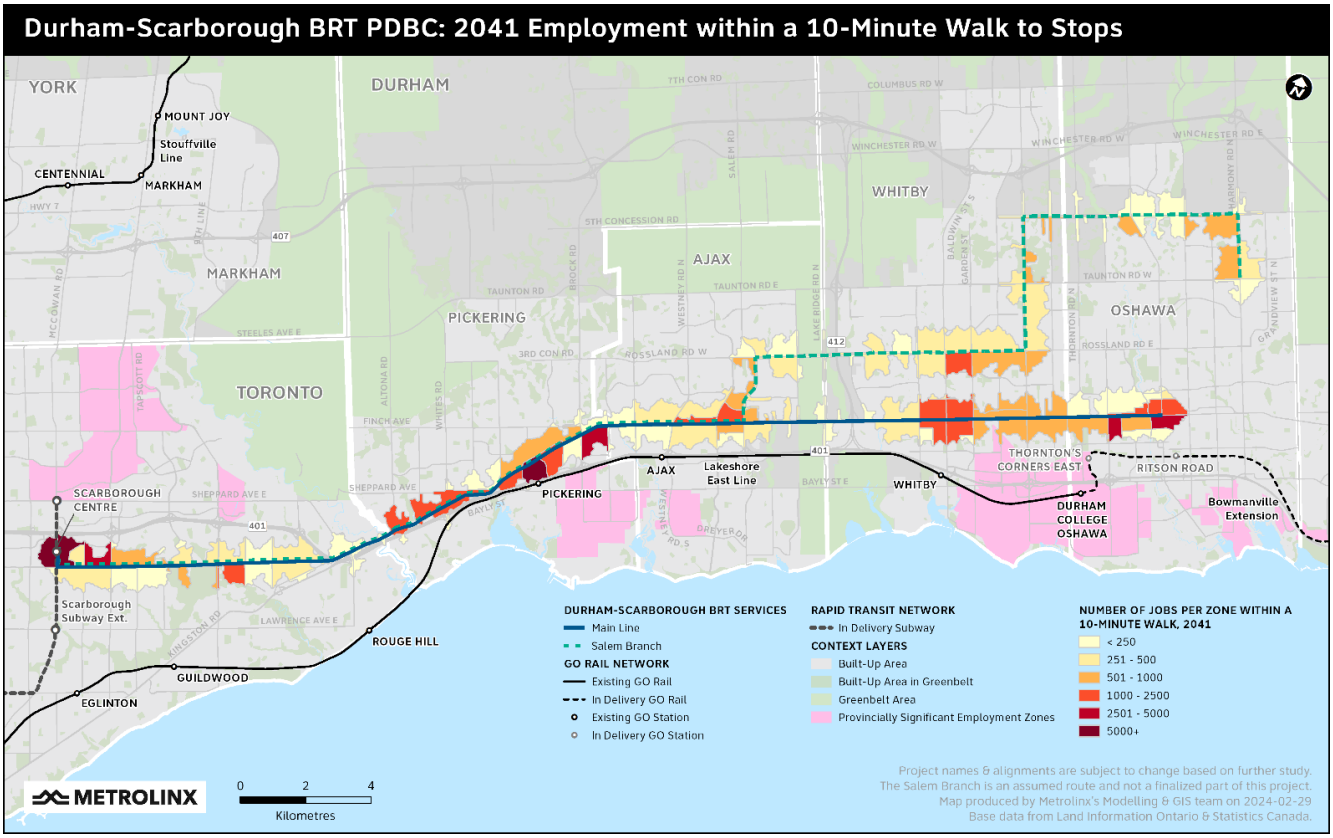


Figure 11: 2041 Employment within a 10-Minute Walk to Stops



Future Traffic Operations

To identify transportation demand and future traffic conditions, the PDBC analyzed population and jobs projections for the 2041 horizon, reflecting the Growth Plan for the Greater Golden Horseshoe. In addition to that, the modelled transportation network included in-delivery road and transit projects[23].

The forecasted traffic conditions were studied through the TPAP and informed the development of the preliminary design. The traffic forecasts modeled the preliminary design of the roadway, which includes general vehicle lanes along the corridor and dedicated BRT lanes, either through widening the roadway or repurposing existing lanes. Overall, implementation of BRT lanes is generally expected to result in a minor deterioration of peak hour traffic operations when compared against future background conditions. This is due to several factors including the conversion of eastbound and westbound left-turns to protected-only signal phasing where centre-median transit lanes are proposed, anticipated traffic diversions and U-turn traffic generation, and proposed lane reductions along pinch-point segments. While rapid transit can help improve people-carrying capacity and travel times along

[23] The Greater Golder Horseshoe Model Version 4 (GGHMv4) was used to develop 2041 travel demand forecast for DSBRT. The GGHM is the Province's multi-modal Regional Travel Demand Model and is applied by both the Ontario Ministry of Transportation (MTO) and Metrolinx to forecast future transportation demand. The model forecasts the choices that individual travellers will make including where to travel, what mode to use, and when to travel based on baseline population and employment forecasts. It represents a full 24-hour weekday period, enabling integrated peak and off-peak modelling and analysis. The land use scenario reflects the 2041 targets defined by the Growth Plan, allocating land use based on market trends. This is the standard land use forecast tool that Metrolinx applies for business cases and planning studies, including the 2041 Regional Transportation Plan – 2041 RTP.

the corridor for transit users, centre-median lanes are designed to minimize circulation conflicts between buses and general traffic, particularly private vehicles making a right turn on or off the corridor.

Corridor segments experiencing poor eastbound and westbound level-of-service (LOS[24]) may be candidates for earlier BRT implementation, as this is indicative of transit delays to be expected under mixed traffic conditions (i.e., without BRT lanes). The analysis identified which segments are generally expected to be the most congested, and therefore may yield the greatest immediate benefit for BRT in terms of reduced transit delay. More information can be found in the Environmental Project Report, Appendix B1.

Impacts of Working from Home

The prevalence of teleworking post-pandemic is expected to impact travel demand across the Greater Golden Horseshoe, particularly among office-based workers. Metrolinx assessed employment sectors, PRESTO data, and travel study data along the DSBRT corridor to identify level of potential impact. Based on the assessment, impacts to DSBRT ridership are expected to be at the lower end (5 to 10%) given that this corridor serves demographics that still require higher frequency in transit commute trips along the week (e.g., students, in-person professional services/essential workers).

In December 2023, the TTC reported that average weekday bus boardings in mid-November 2023 was at 94% of seasonally adjusted pre-COVID levels, while weekend ridership was over 100%[25]. Durham Region Transit reported that ridership had recovered to pre-pandemic levels as of May 2023[26].

Defining the Strategic Value of the Proposed Solution

Higher-order transit on the Highway 2-Ellesmere corridor will improve the quality and convenience of the transit travel experience and enhance intra-regional mobility by linking communities and institutional/employment destinations between Durham and Toronto through bus priority measures. Bus rapid transit (BRT) infrastructure provides the following benefits:

- **Faster, increased, and more reliable bus service** due to dedicated bus lanes, reduced conflicts with general traffic, fare payment at stops, and transit signal prioritization.
- **Better customer experience** with standardized shelters and stops providing weather-protected platforms, consistency on payment experience across municipal service providers (DRT and TTC), and consistent user experience along the cross-boundary corridor.
- **Improved conditions for emergency services:** emergency vehicles can use the guideway to avoid congestion.
- **Faster implementation** in comparison to rail transit projects, due to reduced requirements for utilities relocation and better flexibility at physically constrained locations.

A Vision for Rapid Transit

The 2041 RTP for the GTHA identifies the DSBRT as a priority "In Development" project in the advanced planning and design stages. The project is also a critical component of the Frequent Rapid Transit

[24] Level of Service (LOS) is a metric used in the analysis of existing and future traffic conditions to describe the operating conditions on a road experienced by travelers.
[25] Chief Executive Officer's Report: December 2023: https://www.ttc.ca/All-public-meetings/board/2023/Board-Meeting-Dec-7?tab=0
[26] General Manager's Report: December 2023: https://pub-durhamregion.escribemeetings.com/Meeting.aspx?Id=cff4f098-bfca-463b-bee5-56ea24080168&Agenda=Agenda&lang=English

Network. It contributes to the shared vision for the region to have a sustainable transportation system aligned with land use and supporting healthy and complete communities. DSBRT will provide safe, convenient, and reliable connections and support a high quality of life, a prosperous and competitive economy, and a protected environment supporting the following:

- Strategy 1: Complete the Delivery of Current Regional Transit Projects; and
- Strategy 2: Connect more of the Region with Frequent Rapid Transit through the FRTN to achieve the common vision for the region presented in the 2041 RTP.

The DSBRT aligns with the goals of the 2041 RTP, which provides a framework for the development of the strategic case, described later in this document:

- **Strong Connections:** Connecting people to the places that make their lives better, such as homes, jobs, community services, parks and open spaces, recreation, places of worship, and cultural activities.
- **Complete Travel Experiences:** Designing an easy, safe, accessible, affordable, and comfortable door-to-door travel experience that meets the diverse needs of travellers.
- **Sustainable and Healthy Communities:** Investing in transportation for today and future generations by supporting land use intensification, climate resiliency, and a low-carbon footprint while leveraging innovation.
- **Economic Development:** Supporting access to jobs and economic opportunities while increasing connectivity to foster opportunities and growth for residents and businesses.

The 2041 RTP goals above mentioned serve as basis for analyzing strategic metrics for the projects. These are further detailed in Chapter 4 - Strategic Case.

Alignment with Broader Policy

The DSBRT project aligns with several provincial, regional, and local policy documents, being instrumental for growth in population and jobs, as well as for improvements to transit network plans. These are summarized in Table 2.

Table 2: Stakeholder Review Alignment of the DSBRT Project

Stakeholder	Strategy, Policy, or Plan	Link to Problem/Opportunity	Relationship
Metrolinx	2041 Regional Transportation Plan (RTP)	The RTP outlines how governments and transit agencies can collaboratively work together to continue building an integrated transportation network for the GTHA. The plan is a mobility blueprint to create the integrated network that will serve the needs of residents, businesses, and institutions. The Durham-Scarborough BRT is identified as a project In Development in the 2041 RTP. The project forms a key part of the 2041 FRTN as discussed in Section 1. Advancing In Development projects, which includes the DSBRT, is a priority in the 2041 RTP, as captured in Strategy 1: Complete the Delivery of Current Regional Transit Projects, and Strategy 2: Connect More of the Region with Frequent Rapid Transit through the FRTN.	Rationalization

Stakeholder	Strategy, Policy, or Plan	Link to Problem/Opportunity	Relationship
Ministry of Transportation	Connecting the GGH: A Transportation Plan for the GGH (2022)	The plan includes a Vision for Mobility in 2051 that sets out a 30-year vision of a transportation system that provides safe, efficient, and convenient options for people and businesses and supports the well-being and economic prosperity of the region into the future. The 2051 network represents a long-term vision to guide future planning, with a higher-order transit network that includes GO Rail, subways, LRT and BRT. Action #22 of the plan calls for advancing the preliminary design of future higher-order transit corridors, including DSBRT, which is identified as part of the 2051 higher-order transit network.	Rationalization
Region of Durham	2017 Durham Transportation Master Plan (TMP)	The TMP provides a multi-modal plan that defines infrastructure, policies, and programs to meet projected transportation needs to 2031. The Durham-Scarborough BRT is identified as an integral part of the Region of Durham's 2031 Higher-Order Transit Network, operating as a BRT between Simcoe Street and the Durham-Toronto boundary with an assumed connection to Scarborough Centre.	Rationalization
	Durham Long Term Transit Strategy (LTTS) (2010)	The LTTS developed a long-term (2031) regional transit strategy, with a focus on higher-order transit. The Region's LTTS identified Highway 2 as the Region's highest priority rapid transit corridor, with assumed connection to Scarborough Centre with a major transit hub at Sheppard Avenue/ Kingston Road to support transfers to other TTC routes.	Rationalization
	Class EA Highway 2 Transit Priority Measures (2012) and Addendum (2014)	To progress Phase 1 of the rapid transit corridor, this EA study examined alternatives for widening Highway 2 in key transit priority opportunity areas. The 2014 Addendum addressed the widening of the Highway 2 segment at the CN Rail crossing, as well as modifications on three of the arterial roads that cross the Highway 2 corridor. As a result of the EA study, Durham Region Transit operates the PULSE service from UTSC to downtown Oshawa. The service runs in curbside bus lanes and with transit signal priority along sections of Highway 2: in Ajax (from Westney Road to Salem Road), in Pickering (from west of Liverpool Road to Glenanna Road, Whites Road, and west of Brock Road to east of Bainbridge Drive).	Rationalization
City of Toronto	15 Year Rapid Transit Network Plan/ Toronto's 2031 Rapid Transit Network Plan (2016)	As part of the City's Five Year Official Plan Review, the City of Toronto undertook a review of the transportation components of the Official Plan referred to as Feeling Congested? In coordination with TTC and Metrolinx, a plan was presented that illustrated an integrated transit network in Toronto. The Plan identifies the Durham-Scarborough BRT as a project that is currently being planned. Ellesmere Road, between Scarborough Centre and the Toronto-Durham border, has been identified as a higher order rapid transit corridor by the City. Local and express TTC bus service is provided, and, west of Military Trail, the transit service is part of the TTC's Ten Minute Network.	Rationalization

Stakeholder	Strategy, Policy, or Plan	Link to Problem/Opportunity	Relationship
	Scarborough Centre on the Move Master Plan (SCTMP) (2018)	The SCTMP builds on the Scarborough Centre Secondary Plan and supports the development of Scarborough Centre as a vibrant, mixed-use urban hub by providing transportation policies, initiatives and implementation priorities that are necessary to achieve the guiding vision of the centre. The Durham-Scarborough BRT is included in the SCTMP's recommended transportation network as a proposed project. The project, along with other rapid transit investments and the development of a finer grid will support greater transit use. The Plan recommends implementing sidewalks alongside multi-use paths on Ellesmere Road to accommodate active transportation users. It also recommends completing this work in coordination with BRT construction, as it is likely that a complete reconstruction of Ellesmere Road is required.	Rationalization
Toronto Transit Commission	5-Year Service Plan & 10-Year Outlook (2019)	The Plan identifies anticipated growth for the next five years and sets a vision to accommodate the growth. Recommendations focus on enhancing the ability to deliver mass transit that moves people safely, reliably, and swiftly. A new Five-Year Service Plan (2024-2028) is currently being developed and will be presented for TTC Board approval in May 2024. The Plan mentions the Durham-Scarborough BRT as a project that will strengthen regional connections and support growth. The corridor will be shared by TTC, Durham Region and GO Transit buses.	Synergistic
Town of Ajax	Official Plan (2016)	The OP includes transit policies that support the expansion of Durham Region Transit, Kingston Road BRT, and transit priority measures.	Synergistic
Town of Pickering	Official Plan (2018)	Kingston Road is identified as a Transit Spine on Schedule II of the Official Plan. The transportation policies in the plan support transit priority lanes along Kingston Road, with focus on maintaining the existing right-of-way.	Synergistic
Town of Whitby	Official Plan (2018)	Schedule D of the Official Plan identifies Dundas Street West as a Transit Spine.	Synergistic
City of Oshawa	Official Plan (2019)	The Plan identifies Highway 2 (King Street/Bond Street) as one of the most significant transit spines in the City and identifies the corridor as a Regional Transit Spine on Schedule B-1. Public transit policies in the OP support the planning, implementation, and operation of transit along Regional Transit Spines.	Synergistic

3

Investment Options

Introduction

This chapter describes the Durham-Scarborough Bus Rapid Transit (DSBRT) investment options analyzed as part of this PDBC, outlining the development process, methodology and rationale for all options. The DSBRT options have been scoped based on the requirements of a PDBC, including:

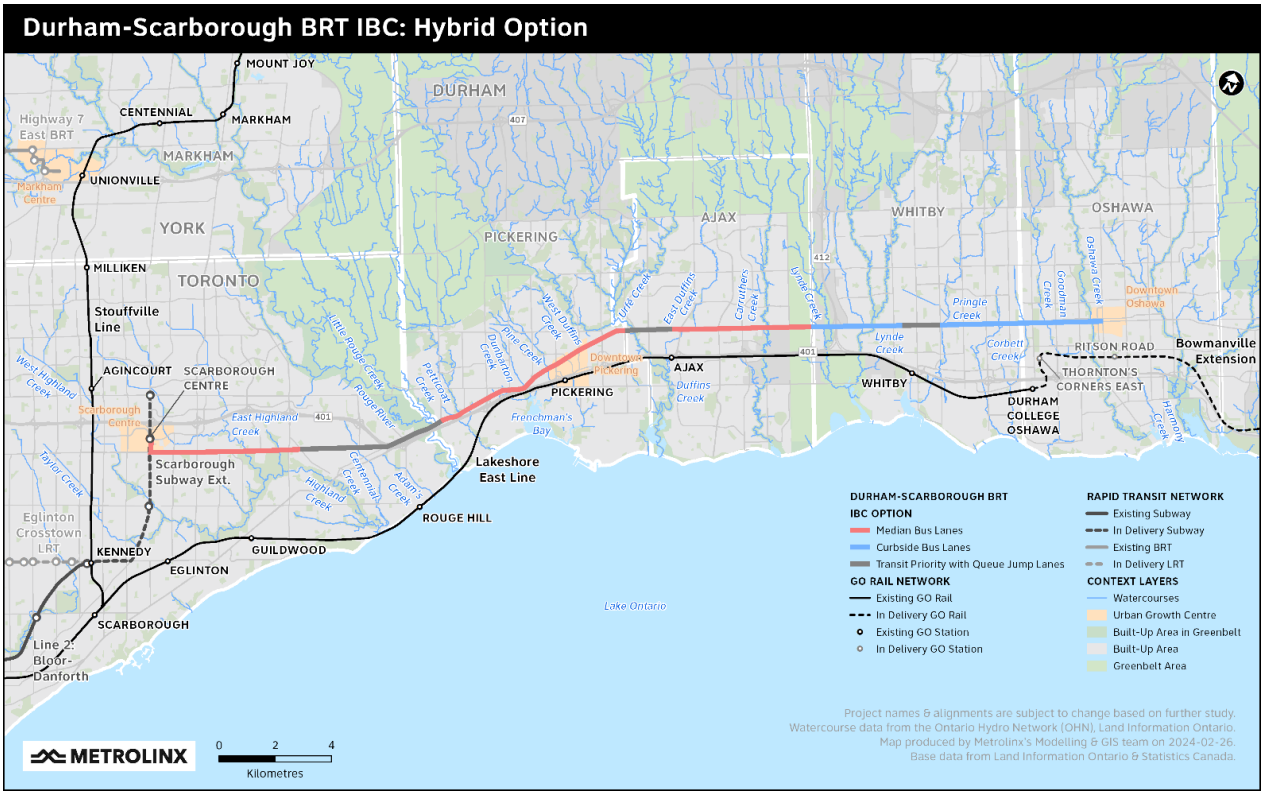
- Refining investment options to reflect advances in planning and design work, since the IBC was published;
- Exploring distinct infrastructure delivery options based on the findings of the IBC, that are mutually exclusive and are intended to understand the costs, benefits, and delivery issues along the corridor; and
- Adjusting background assumptions used within the analysis that reflect broader policy, investment, and societal changes.

This chapter seeks to provide an overview of the options that will be considered for the PDBC as well as the process that was used to develop these options.

Strategic Mechanisms

Following the 2018 DSBRT IBC, Metrolinx initiated the preliminary design to advance work using the IBC's preferred option as initial concept (Figure 12) and develop a recommended solution that addresses strategic objectives, high level functionality, environmental, social, and cultural impacts, and garners public support. In addition, project costs are refined based on the recommended solution to inform decision-makers on funding for procurement and construction.

Figure 12: DSBRT IBC Option



Source: 2018 DSBRT Initial Business Case Preferred Hybrid Alternative Concept. Updated for formatting.

The planning and environmental assessment for the project followed the TPAP as prescribed in Ontario Regulation 231/08 under the Environmental Assessment Act. The findings of the study have been documented in an Environmental Project Report (EPR) and made available for review by the public, agencies, Indigenous Communities, and all other interested parties. The Notice to Proceed was issued by the Minister of Environment, Conservation and Parks in March 2022. Further refinements were made through an Addendum filed on April 2024 to provide transit infrastructure along Grangeway Avenue between Ellesmere Road and Bushby Drive and connect with the proposed SSE Scarborough Centre station.

Options Development

Preliminary Design for TPAP

The DSBRT preliminary design was developed using the IBC Hybrid option as initial concept to determine the most appropriate infrastructure to maintain the reliability of BRT service throughout the entire corridor. The IBC did not produce a design for DSBRT; instead, it identified a preliminary lane configuration for each evaluated option. Updates to lane configuration were identified for the corridor, with additional focus placed on the constrained sections of the corridor. The following constrained sections or 'pinch points' were identified in the IBC:

- Ellesmere Road, between east of UTSC and the Toronto-Durham boundary;
- Pickering Village, between Elizabeth Street and Rotherglen Road;
- Downtown Whitby, between Frances Street and Garden Street; and
- Downtown Oshawa, between Thornton Street and Simcoe Street.

The preliminary design was informed by public feedback through four rounds of Public Information Centres (PICs) and in collaboration with the Project Working Group (PWG) to refine each pinch point and develop the technically preferred option. The elements from the preferred IBC Hybrid alternative were reviewed for appropriateness and feasibility to develop a long list of options for each pinch point. This list of options was brought forward to the PWG to analyze and refine. Through this analysis and refinement, a condensed list of options was developed. The design team and PWG collaboratively evaluated and iterated the condensed list using selected evaluation criteria (

Table 3) and feedback from stakeholders and the public, which resulted in a technically preferred option.

Table 3: Summary of Evaluation Criteria Used to Develop the Preliminary Design for TPAP

Category	Evaluation Criteria	Category	Evaluation Criteria
Compatible with Adjacent Communities	• Noise, vibration & air quality • Community character • Area business viability • Development incentives	Protect, Improve & Restore the Natural Environment	• Surface water and groundwater • Aquatic and terrestrial habitat • Flora and Fauna • Ecological linkages
Protect Historical, Cultural & Archaeological Resources	• Archaeological resources • Cultural heritage resources • Protection of public open spaces	Support A Sustainable Transportation System	• Pedestrian & cycling networks • Transportation system capacity • Goods movement
Provide a Wise Investment	• Existing & future investments • Capital costs • Operation & maintenance costs • Land acquisition costs	Increase Transit Ridership, Quality & Access	• Connectivity with other transit • Quality & reliability of transit • Accessibility to transit • Safety & security
Connect Major Facilities and Support Development	• Catchment potential • Transit-oriented development		

As a result of the engagement and feedback received, the design evolved from the IBC Hybrid option to the 30% preliminary design developed at the PDBC phase, resulting in more dedicated lanes throughout the corridor. A comparison between the IBC and PDBC design by corridor segment is provided in Table 4.

Table 4: Comparison of IBC Configuration and Preliminary Design by Segment (West to East)

Segment and Limits	Initial Business Case Configuration	Preliminary Design (PDBC configuration)	Driver of Change
Grangeway Avenue Bushby Avenue to Ellesmere Road	Not included	Centre Median or Curbside lanes	• Provides a direct connection to the SSE. • Widen to maintain 2 lanes of general traffic and add 2 dedicated transit lanes
Ellesmere Road McCowan Road to Grangeway Avenue	Centre Median	Removed	• Grangeway Avenue provides a direct connection to the SSE Scarborough Centre station.
Ellesmere Road Grangeway Avenue to Morningside Avenue	Centre Median	Centre Median	• Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.

Segment and Limits	Initial Business Case Configuration	Preliminary Design (PDBC configuration)	Driver of Change
Ellesmere Road Morningside Avenue to Military Trail	Centre Median	Mixed Traffic	• Between Morningside Avenue and Conlins Road, buses will operate in general purpose lanes to protect space for the planned Eglinton East LRT. • Requires further coordination to interface with the planned Eglinton East LRT due to geometric and environmental constraints on this segment.
Ellesmere Road Military Trail to Meadowvale Road	Mixed Traffic with Queue Jump Lanes	Centre Median	• Provides highest priority for transit, improving speed, reliability, comfort, and convenience. • Convert 2 existing general traffic lanes to dedicated transit lanes
Ellesmere Road Meadowvale Road to Kingston Road	Mixed Traffic with Queue Jump Lanes	Centre Median	• Provides highest priority for transit, improving speed, reliability, comfort, and convenience. • Widen Ellesmere Road to maintain 2 lanes of general traffic and add 2 dedicated transit lanes. • Convert 2 existing general traffic lanes on Kingston Road to dedicated transit lanes.
Kingston Road Ellesmere Road to Raspberry Road			
Kingston Road Raspberry Road to Alton Road	Mixed Traffic with Queue Jump Lanes	Mixed Traffic	• Buses will operate in general purpose lanes to avoid impacts to the Rouge River valley
Kingston Road Altona Road to Elizabeth Street	Centre Median	Centre Median	• Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.
Kingston Road Elizabeth Street to Rotherglen Road	Mixed Traffic with Queue Jump Lanes	Centre Median	• Further design investigation identified the ability to widen the road to accommodate one lane, which enables centre median transit lanes. • Widen to maintain 3 lanes of general traffic and add 2 dedicated transit lanes.
Kingston Road Rotherglen Road to Lake Ridge Road	Centre Median	Centre Median	• Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.
Dundas Street Lake Ridge Road to Frances Street	Curbside	Centre Median	• Simplifies the Highway 412 interchange crossing by eliminating automobiles merging across transit lanes. • Matches the design solution to the west and east. • Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.

Segment and Limits	Initial Business Case Configuration	Preliminary Design (PDBC configuration)	Driver of Change
Dundas Street Frances Street to Cochrane South	Mixed Traffic with Queue Jump Lanes	Centre Median	• Traffic forecasts identified the need for dedicated lanes to provide efficient and reliable transit lanes through Downtown Whitby. • Maintain 3 lanes of general traffic, convert one general lane for a dedicated transit lane and widen to add a new dedicated transit lane.
Dundas Street Cochrane Street to Byron Street South	Mixed Traffic with Queue Jump Lanes	Centre Median	• Traffic forecasts identified the need for dedicated lanes to provide efficient and reliable transit lanes through Downtown Whitby. • Maintain 2 lanes of general traffic and convert 2 lanes to dedicated transit lanes.
Dundas Street Byron Street South to Perry Street	Mixed Traffic with Queue Jump Lanes	Centre Median Eastbound; Mixed Traffic Westbound	• Maintain 2 lanes of general traffic and convert 1 lane to dedicated transit lane while providing wider sidewalks.
Dundas Street Perry Street to Garden Street	Mixed Traffic with Queue Jump Lanes	Centre Median	• Traffic forecasts identified the need for dedicated lanes to provide efficient and reliable transit lanes through Downtown Whitby. • Maintain 2 lanes of general traffic and convert 2 lanes to dedicated transit lanes.
Dundas Street Garden Street to east of Powell Road	Curbside	Centre Median	• Provides the highest priority for transit, improving speed, reliability, comfort, and convenience. • Matches the design solution to the west and east. • Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.
King Street West East of Powell Road to Waverly Street South	Curbside	Centre Median	• Matches the design solution to the west. • Widen to maintain 4 lanes of general traffic and add 2 dedicated transit lanes.
King Street West Waverly Street South to Simcoe Street One-Way Eastbound	Curbside Eastbound	Curbside Eastbound	• Maintain 2 lanes of general traffic and convert 1 lane to dedicated transit lane while providing wider sidewalks and boulevards.
Bond Street West Waverly Street to Simcoe Street One-Way Westbound	Curbside Westbound	Curbside Westbound	• Maintain 2 lanes of general traffic and convert 1 lane to dedicated transit lane while providing wider sidewalks and boulevards.

The evaluation was brought forward to stakeholders at the Stakeholder Advisory Group (SAG), Municipal Technical Advisory Group (MTAG), and Technical Advisory Group (TAG) and then the public through PICs (Table 5). The preliminary design was assessed through the TPAP to understand the expected impacts the project footprint would have on the environment, including the natural

environment, cultural/heritage environment, social environment and built environment. The assessment and proposed mitigation measures are documented in the Environmental Project Report. Refer to the report for more information.

Table 5: Summary of Public Information Centre Events Held during Pre-TPAP and TPAP Phases

Public Information Centre #1 (Pre-TPAP)	Public Information Centre #2 (Pre-TPAP)
• June 6, 2019: Pickering Recreation Centre • June 11, 2019: McLean Community Centre (Ajax) • June 12, 2019: Civic Recreation Centre (Oshawa) • June 12, 2019: Anderson Collegiate Institute (Whitby) • September 26, 2019: UTSC	• November 18, 2019: UTSC • November 19, 2019: Oshawa City Hall • November 19, 2019: Durham Region Headquarters (Whitby) • November 20, 2019: Pickering Town Centre • November 20, 2019: St. George's Church (Ajax)
Public Information Centre #3 (Pre-TPAP)	**Public Information Centre #4 (TPAP)**
• Virtual event held from November 16, 2020, to January 10, 2021	• Virtual event held from October 14 to November 11, 2021 • Three live events held October 21, 26 and 28, 2021

PDBC Options Development

The PDBC evaluates potential investment options developed based on the 2022 EPR's preliminary design. A key goal of the PDBC within the Metrolinx Business Case Framework is to assess alternative approaches to delivering a project, which these investment options represent, and identify the impacts to cost and benefits. In terms of BRT infrastructure, all options include the 8.5 km that Durham Region is delivering.

All options are built based on the 30% preliminary design developed during TPAP. A major differentiator between options is the approach on implementation, with different criteria for prioritization and deferral of segments, as follows:

- **Option 1: Full BRT Implementation:** Full implementation of the DSBRT, following the 30% preliminary design;
- **Option 2: Defer High-Cost Segments:** Defer high-cost segments, deferring segments with above average capital costs and major property impacts with the goal of minimizing initial investment required; and
- **Option 3: Prioritize High-Traffic Segments:** Prioritize high-traffic segments, deferring segments that have lower traffic volumes with the goal of minimizing impacts to transit operations and customers, while minimizing initial investment required.

For segments where DSBRT would operate in mixed traffic, it was assumed that buses would continue serving the existing curbside stops. The three base options assume fare integration, but no service integration (i.e. Closed Door policy) to reflect the current context. Service integration is a policy that can bring major impacts to DSBRT due to cross-boundary service; this PDBC includes a **sensitivity analysis that assumes Open Door policy**, and the infrastructure assumption for this sensitivity analysis is the full BRT implementation.

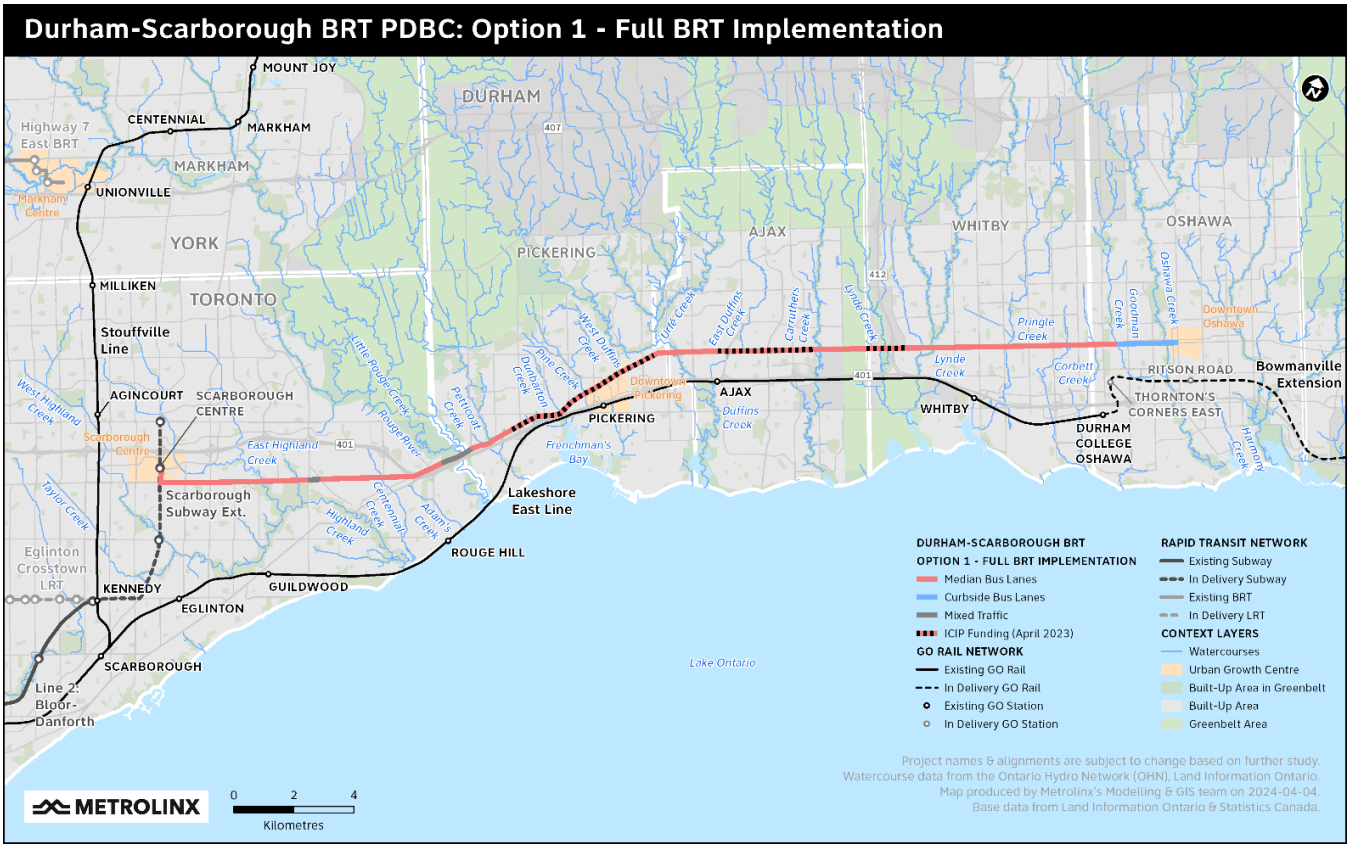
Investment Options

This section provides further description for each investment option being analyzed as part of the PDBC.

Option 1: Full BRT Implementation

Option 1 represents delivery of the entire BRT corridor developed during the environmental assessment (Figure 13). This assumes that all elements of the preliminary design will be delivered and operating by 2033. This option involves construction of 36 km of BRT infrastructure between Scarborough Centre and Downtown Oshawa, as envisioned in the preliminary design, with 49 BRT stops in each direction. This option assumes no service integration (i.e. Closed Door).

Figure 13: Option 1 - Full BRT Implementation



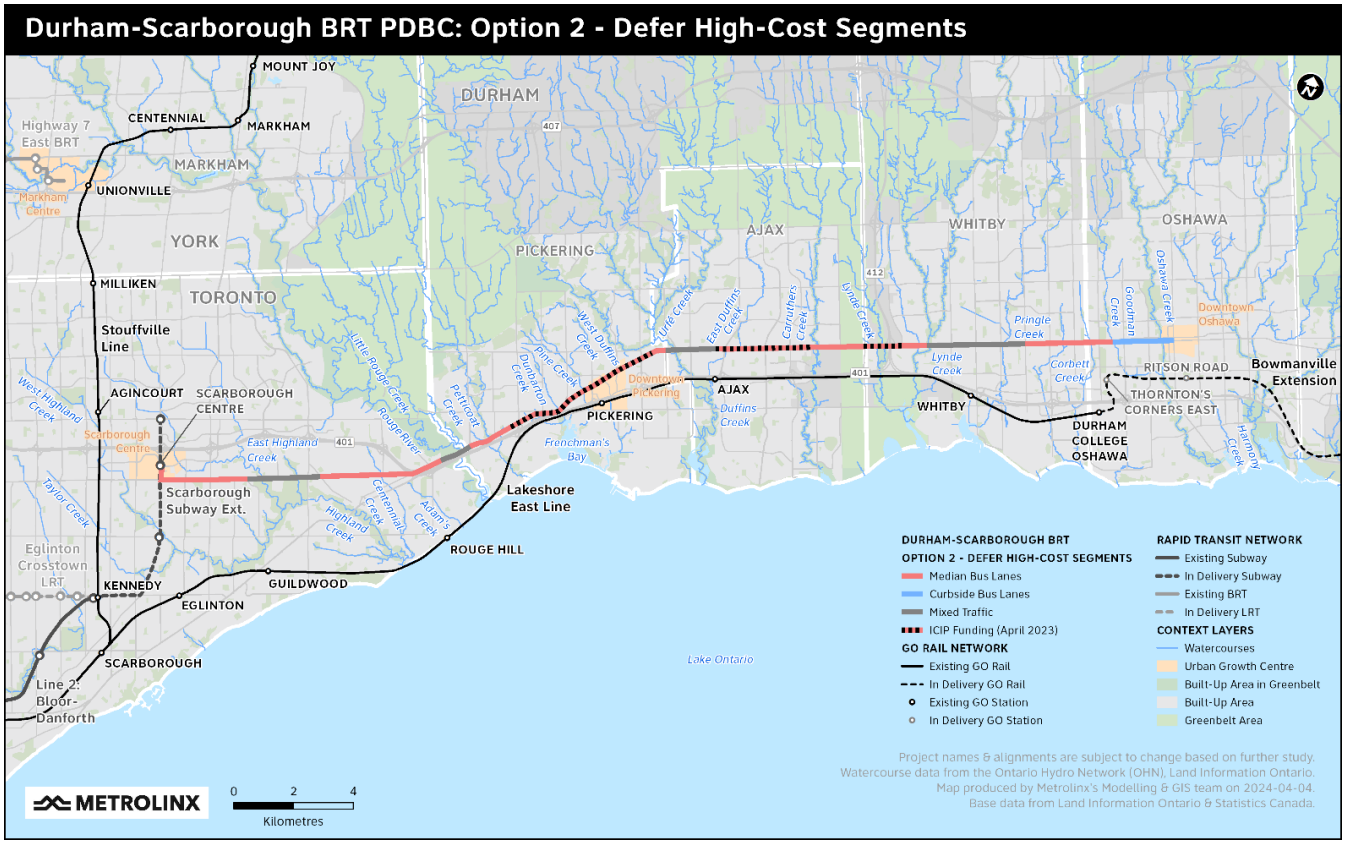
Option 2: Defer High-Cost Segments

Option 2 prioritizes the delivery of the segments that support land use development and transit passenger demand, while minimizing the initial capital investment by deferring areas that require major utilities relocation, retaining walls, higher property impacts, bridges/structures, and other elements above average cost. Figure 14 shows the infrastructure and operating conditions along the corridor by 2033. This Option has 52 stops in each direction, three more than Option 1 (40 are BRT stops, plus 12 existing standard stops in mixed traffic segments). The remaining segments could be implemented after 2033. This option is expected to reduce total capital costs by $297 million[27], relative to Option 1 (total capital cost of $1,115 million).

This option results in the following BRT infrastructure to be delivered as a separated project, including:

- Ellesmere Road, between Orton Park Road and Morningside Avenue (2.3 km);
- Kingston Road, between Notion Road and Rotherglen Road (1.0 km); and
- Dundas Street, between McQuay Boulevard/Jeffrey Street and Anderson Street/Hopkins Street (3.7 km).

Figure 14: Option 2 - Defer High-Cost Segments



[27] Values compared to Investment BAU.

Option 3: Prioritize High-Traffic Segments

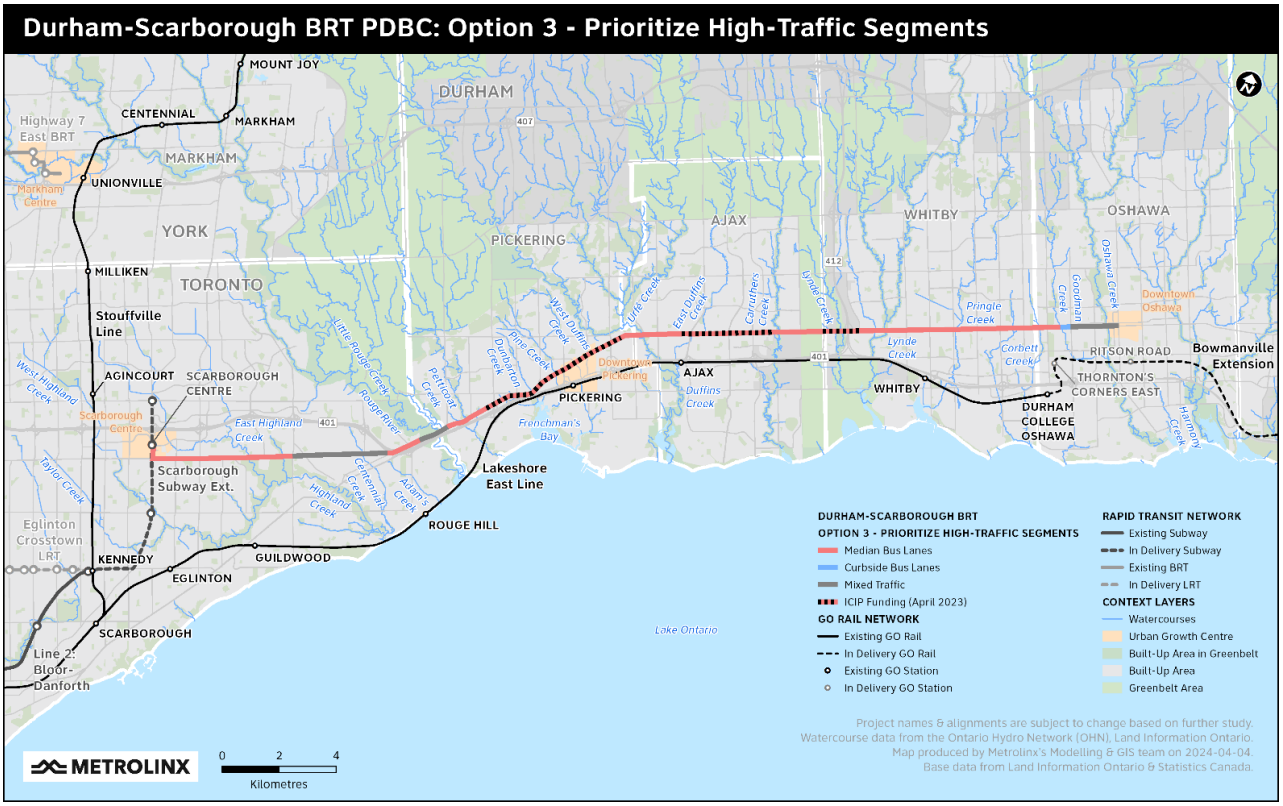
Option 3 prioritizes delivery of the segments that were identified through the TPAP as experiencing poor eastbound and westbound traffic conditions for earlier BRT implementation. In this option, the remaining segments will have buses operating in mixed traffic. Figure 15 shows the infrastructure and operating conditions along the corridor by 2033. This Option has 56 stops in each direction, seven more than Option 1 (42 are BRT stops, plus 14 existing standard stops in mixed traffic segments). The remaining segments could be implemented after 2041. This is expected to reduce capital cost by $144 million[28], relative to Option 1.

This option will see of the following lower-traffic segments, which are distinct from the segments in Option 2, delivered as a separated project, including:

- Ellesmere Road, between Military Trail and Kingston Road (2.5 km);
- King Street, between Gibbons Street and Simcoe Street (1.3 km); and
- Bond Street, between Stevenson Road and Simcoe Street (1.8 km).

To identify the segments that would be included, the 2041 traffic operations with and without the DSBRT were compared. Intersections with a LOS C or better for eastbound and westbound vehicles were identified. These intersections were then reviewed and bundled if the intersections formed a segment at least 1.5 km long. The findings were reviewed with Durham Region and the City of Toronto as part of the development of Option 3.

Figure 15: Option 3 - Prioritize High-Traffic Segments



[28] Values compared to Investment BAU.

Sensitivity Analysis: Service Integration (Open Door Policy)

All options and both BAU scenarios assume that the current Closed Door policy for DRT buses within City of Toronto limits. The Closed Door policy means DRT buses travelling westbound to Scarborough Centre may only drop off passengers but not pick up passengers. DRT buses travelling eastbound may only pick up passengers but not drop off passengers within City of Toronto limits. The current Closed Door policy limits the ability of DRT buses to serve Toronto passengers in both directions of travel, in other words limiting the transit capacity of the DSBRT. DRT buses operating on the guideway within Toronto could face additional travel time as they would be unable to pass TTC buses serving passengers at the DSBRT stops.

Conversely, an Open Door policy within City of Toronto limits would increase transit capacity for passengers in both directions and reduce the potential for buses to be delayed by other buses. Recognizing the potential benefits of service integration for smoother operations and increased transit capacity, the PDBC provides a **sensitivity analysis with an Open Door policy** using Full BRT implementation as the infrastructure assumption. Although the impacts of Open Door policy can be best read in comparison to Option 1 due to same infrastructure assumptions, it is important to highlight that the trends observed would be applicable to any of the other PDBC options.

Major System Assumptions

This section describes the key assumptions for the investment options analysed in this business case. Average guideway speeds for each option are described in the *Strategic Case, Strategic Objective 1: Improve transit times and connections for transit users*.

Design Enhancements

Each investment option reflects the design developed during the environmental assessment. This means that if a segment of BRT infrastructure is included in a specific option, it reflects the curb side, centre median or mixed traffic conditions identified in the preliminary design.

Service Plan

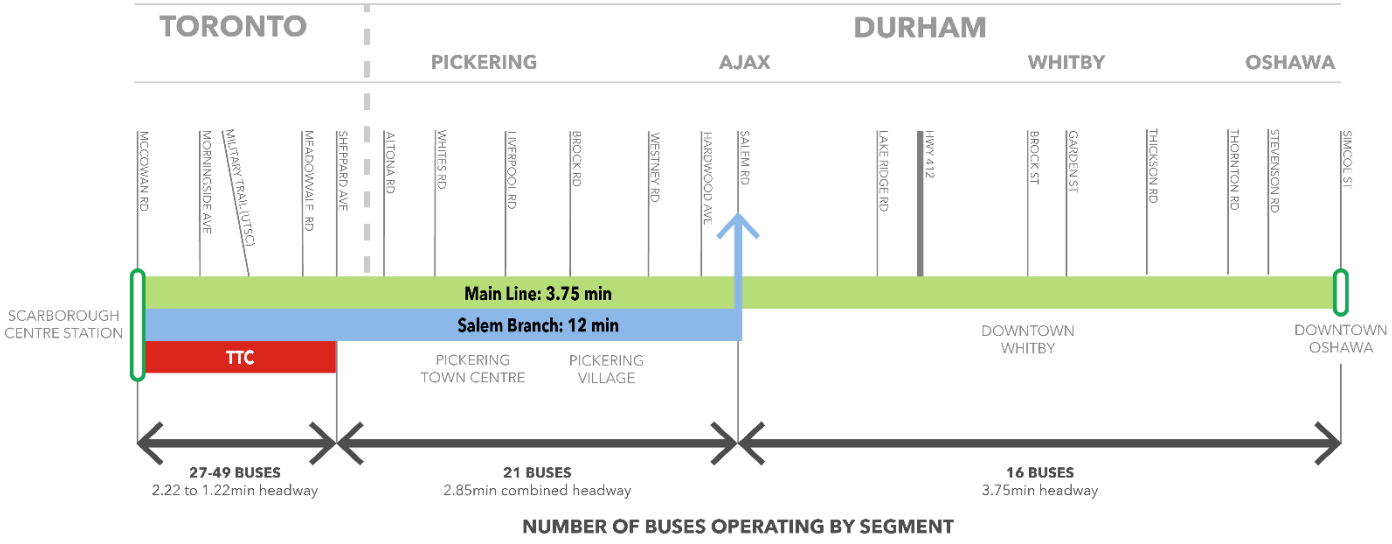
The DSBRT service plan is assumed to be the same for all options (Table 6). The DSBRT Mainline will operate between Downtown Oshawa to a new terminus at Scarborough Centre Station, where it will connect to the SSE. The Salem branch will operate along the corridor from Scarborough Centre to Salem Road, where it will turn and continue to Harmony Terminal in north-east Oshawa. The branch will help provide additional capacity between Toronto and the Ajax/Pickering area, where passenger loads build up. When combining service frequency of DRT routes, the segment between Salem Road and the Toronto-Durham border result in an average headway of less than 3 minutes.

The TTC will operate four routes along all or portions of the corridor within Toronto. When adding the TTC routes, the Toronto segment of DSBRT achieves an on average peak service frequency of 49 buses/hour. The TTC service plan provided for DSBRT is consistent with the latest service plan designed for SSE and EELRT projects, as of March 2024.

Table 6: Assumed Peak Hour Service Plan (Subject to further refinement as the project definition matures)

Bus service	Route	Headway (BAU)	Headway (Options 1 to 3)
DSBRT Mainline	Downtown Oshawa to Scarborough Centre Station	Peak: 6 min	Peak: 3.75 min Off-peak: 10 min
DSBRT Salem Branch	Harmony Terminal to Scarborough Centre Station	Peak: 12 min	Peak: 12 min Off-peak: 20 min
TTC Route 38 Highland Creek	Scarborough Centre Station to Military Trail	Peak: Every 6 minutes	Peak: Every 6 minutes
TTC Route 133 Neilson	Scarborough Centre Station to Neilson	Peak: Every 10 minutes	Peak: Every 10 minutes
TTC Route 138 Ellesmere East	Scarborough Centre Station to Sheppard	Peak: Every 10 minutes	Peak: Every 10 minutes
TTC Route 995 York Mills Express	Scarborough Centre Station to Military Trail	Peak: Every 10 minutes	Peak: Every 10 minutes

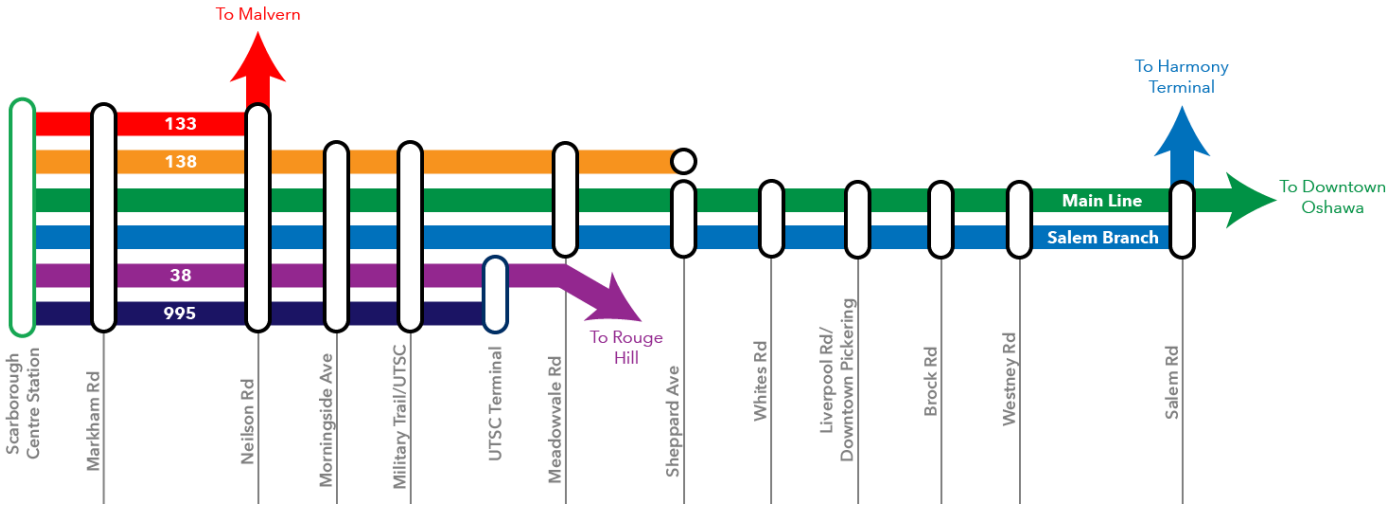
Figure 16: DSBRT PDBC Service Strategy for the Corridor (Peak Hour)29



It is important to note for the purposes of this PDBC, that DRT and TTC service plans (Figure 17) are subject to consultation and board approval through each transit agency's annual service planning process.

[29] There are 49 buses per hour in the Toronto segment between Scarborough Centre Station and Neilson, 43 buses per hour between Neilson and Military Trail (UTSC), and 27 buses per hour beyond Military Trail.

Figure 17: Bus Routes Included in the DSBRT Service Plan



The service plan has been reviewed and refined since the IBC, based on the following changes. Key changes include:

- **Peak Headway:** The PDBC assumes a peak headway of less than four minutes along the whole corridor based on updated ridership forecasts. The IBC had assumed a five-minute headway.
- **Salem Branch Routing:** The PDBC assumes that the Salem Branch will operate on the DSBRT infrastructure between Salem Road and Scarborough Centre. The IBC had assumed that it would use the infrastructure between Salem Road and Sheppard Avenue, before travelling in mixed traffic on Sheppard Avenue and Progress Road to/from Scarborough Centre.
- **TTC Service Plan:** The PDBC reflects the current TTC service plan following the opening of the SSE, which will see up-to 49 buses per hour using the guideway. The IBC had assumed that up-to 27 TTC buses per hour would use it.
- **Vehicle Capacity:** The PDBC assumes an articulated bus capacity of 78 passengers, while the IBC had assumed a capacity of 90 passengers. This factors into the required headway needed to meet passenger demand.

Fare Strategy

Fare integration is assumed along the corridor, reflecting the One Fare Program that started on February 26, 2024.

Other Rapid Transit Projects

The base transportation modelling network used to develop forecasts was updated to reflect other transit project designs and service plans that have advanced (implemented, funded, and/or in-delivery) since the IBC. These changes include:

- Three stops for the SSE;
- Ontario Line;
- Yonge North Subway Extension;
- Eglinton Crosstown West Extension;

- GO Rail Expansion, including the Lakeshore East Bowmanville Extension (December 2022 service plan), which includes a new Ritson GO Station in Central Oshawa; and future plans for GO Bus with increased frequencies, connecting Ontario Tech/Durham College to Highway 407 Bus Terminal via Downtown Oshawa and Scarborough Centre, running parallel to the DSBRT corridor.
- Latest TTC and DRT service plans.

For all options, changes between Morningside Avenue and Military Trail have been minimized as the Eglinton East Light Rail Transit (EELRT) project is planned to be built along this segment. Thus, any future BRT improvements along this section would seek to minimize throwaway costs associated with reconstruction. Further design coordination between both projects would be required if implementation timelines are similar.

Opening Year

All investment options assume the project will open in 2033. The construction schedule as of April 2023 for implementation is completion of ICIP-funded segments by 2025, and additional segments in Durham Region to be completed by the end of 2030. The remaining segments in Toronto would be completed by 2033.

Maintenance and Storage Facilities (MSF)

Sufficient capacity is assumed at MSFs. The next phase of the project should better understand the requirements for fleet storage and maintenance, as well as align with a detailed operating plan to determine whether additional MSFs are required for DSBRT. The lack of MSF capacity can bring risks to the benefits of the project, since it would limit the service being provided along the corridor.

Business As Usual (BAU)

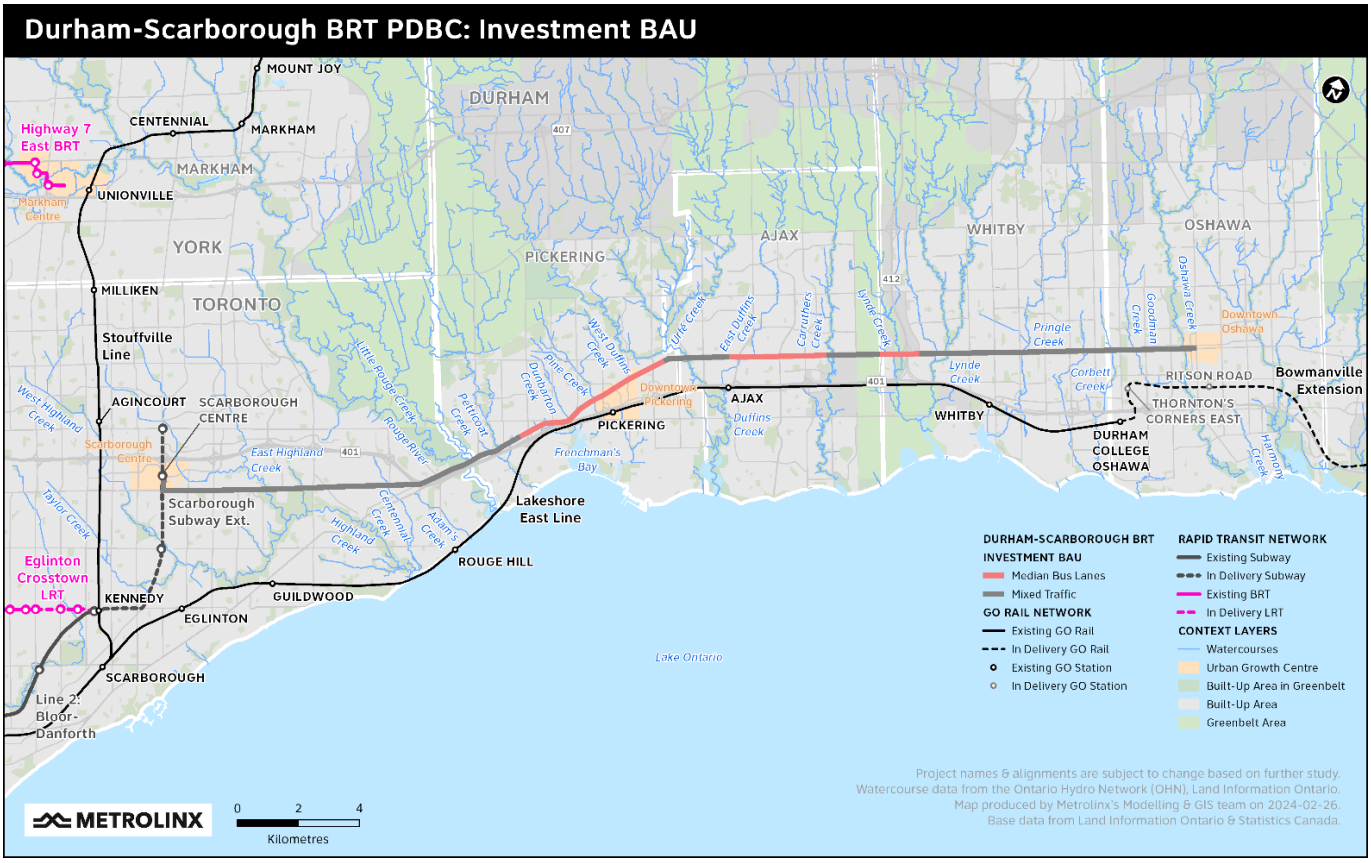
Metrolinx business cases compare the performance of options against a "business-as-usual" scenario that aims to reflect a "no project build" condition. Since the publication of the DSBRT IBC, Durham Region has successfully secured Investing in Canada Infrastructure Program (ICIP) federal funding to construct BRT on three sections of the corridor in Durham, that will typically reflect the design and intent of the preliminary design (Figure 18).

As a result of this advancement, the DSBRT PDBC will compare all options, including the sensitivity analysis, against two BAU scenarios, as follows:

- **Standard BAU,** represents the scenario where there is no dedicated BRT infrastructure, and by doing so, the options consider the infrastructure in its entirety (36 km) and its performance, including both segments that are funded and scheduled for delivery, and segments that remain unfunded. The Standard BAU provides a consistent narrative between the IBC and the PDBC to understand how benefits and costs have evolved and supports comparison with future business cases required as part of the Business Case Framework. For the Economic Case, this results in the "Project BCR", which reflects the benefit-cost ratio for the entire DSBRT project, including the in-delivery segments.
- **Investment BAU**, represents the current scenario of the in-delivery segments (8.5km), and by doing so, the options consider the infrastructure of the project that remains unfunded (27.5km) and its performance (Figure 18). The Investment BAU, therefore, reflects the incremental benefits and costs of advancing the remaining 27.5 km of DSBRT to deliver the full DSBRT; from an Economic Case perspective, this results in the "Investment BCR", reflecting the benefit-cost ratio for the unfunded segments of DSBRT.

This PDBC focuses on reporting the options analysis results in comparison to the Investment BAU, since this document helps inform further potential investment in the corridor.

Figure 18: Investment BAU (ICIP-funded segments as of April 2023)



For both BAU scenarios, buses will operate in mixed traffic where bus lanes do not exist today or are not in-delivery. It is assumed that the DRT will operate the following peak headways:

- PULSE 900: 6 minutes;
- Route 920: 12 minutes; and,
- GO Bus (running parallel to DSBRT): 10 minutes.

The TTC service plan is the same for the BAU and investment option scenarios.

Investment Options Summary

Table 7 compares the major elements of the IBC and PDBC, demonstrating how the project has become more defined since the initial work was completed.

Table 7: Comparison of Project Definition between IBC and PDBC

Project Element	Initial Business Case (2019)	Preliminary Design Business Case (2023)
DSBRT Service Plan	• Mainline: 5min headway • TTC service plan pre-SSE • Vehicle: articulated bus, 90 people	• Mainline: 3.75min headway • TTC service plan for SSE/EELRT • Vehicle: articulated bus, 78 people (DRT standard)
Design	• No design developed • Hybrid option was the best performing	• 30% preliminary design (Option 1: Full BRT Implementation) • More centre-median lanes than IBC Hybrid, therefore, more property requirements
Network Assumptions	• Open Door • Fare Integration • In-delivery projects only: • SSE (1 stop), GO Expansion Reference Concept Design	• Closed Door; Open Door as sensitivity for Option 1 • Fare Integration • In-delivery projects only: • SSE (3 stops), Ontario Line, YNSE, ECWE, GO Expansion (Dec. 2022), • TTC and DRT latest service plans (2023)

BAU	• Mainline: 7.5 min peak headway
	• Salem Branch: runs along Sheppard, terminating at McCowan
	• Single BAU scenario (no segment in-delivery)
		• Mainline: 6 min peak headway
		• Salem Branch: turns at Salem Road and uses the DSBRT guideway, connecting with SSE
		• Two BAU Scenarios:
		  • Standard BAU: no segment in-delivery (for consistency with IBC)
		  • Investment BAU: incorporated ICIP-funded segments in-delivery

Opening Year	2029	2033

4

Strategic Case

Introduction

The Strategic Case outlines how the proposed investment will support and help achieve regional and local development objectives for transportation and urban development along the Highway 2-Ellesmere corridor.

The strategic objectives of investment in the Durham-Scarborough Bus Rapid Transit (DSBRT) corridor align with the Regional Transportation Plan's goals:

- **Strong Connections:** Connecting people to the places that make their lives better, such as homes, jobs, community services, parks and open spaces, recreation, and cultural activities.
- **Complete Travel Experiences:** Designing an easy, safe, accessible, affordable, and comfortable door-to-door travel experience that meets the diverse needs of travellers.
- **Sustainable and Healthy Communities:** Investing in transportation for today and for future generations by supporting land use intensification, climate resiliency and a low-carbon footprint, while leveraging innovation.
- **Economic Development:** Supporting access to jobs and economic opportunities while increasing connectivity to foster opportunities and growth for residents and businesses.

The strategic objectives have been identified through qualitative and quantitative analysis. These objectives expand on previous technical efforts that evaluated the feasibility of implementing BRT along the Highway 2-Ellesmere corridor.

Table 8 sets out the core strategic objectives of DSBRT and their relationship to the four 2041 RTP goals.

Table 8: Benefits and Performance Measures by Strategic Outcome

RTP Goal	Benefits	Measure
Strong connections	Improve transit times and connection for transit users	• Travel Time Savings between higher education institutions • Connections to frequent transit routes • Net daily transit trips during AM and PM Peak periods
	Strengthen the regional transit network	• AM Peak ridership for transit trips to and from SSE • Westbound transit ridership along the corridor
Complete Travel Experiences	Increase transit reliability and choice	• 2041 population within 10-minute walk to stops • Average travel time savings for all transit trips • Travel time savings for transit trips to major hubs
	Increase equitable access to transit and opportunities	• Accessibility of DSBRT by equity-deserving persons • Accessibility of DSBRT by equity-deserving households • Existing and new affordable housing within 800m of DSBRT stops • Enhanced transfer experience • Decrease in transfers as a result of single-seat service along the corridor
Sustainable & Healthy Communities	Move people with less energy and pollution	• Decrease in annual VKT compared to BAU • Decreased Greenhouse Gas Emissions from DSBRT
	Increase attractiveness of transit	• Daily DSBRT ridership in 2041
Economic Development	Expand access to regional jobs and opportunities	• Change in number of jobs within a 45-minute transit trip • Number of jobs and economic hubs within 800m of the DSBRT corridor
	Increase connectivity and foster economic development	• Connectivity to areas intended for intensification along the corridor

Strong Connections

Durham-Scarborough BRT will connect people to key destinations across Scarborough and Durham Region, facilitating more seamless movement between homes, jobs, community services, recreational and cultural spaces.

Strategic Objective 1: Improve transit times and connections for transit users.

A peak hour one-way end-to-end trip between Downtown Oshawa and Scarborough Centre Station will achieve time savings of 14 to 19 minutes, depending on the option. This is also summarized in the following section in Figure 19. Bus speeds in the corridor increase between 8-14% in the peak direction, and 2-7% in the counter-peak direction in comparison to Investment BAU, depending on the investment option.

Transit trips to and from higher education institutions

DSBRT will be critical in delivering transit travel time savings and better connect students, staff, and other employees to and from higher education institutions that are situated along the Highway 2-Ellesmere corridor. In Scarborough, this includes Centennial College, Woburn Collegiate Institute and UTSC. In Durham Region, this includes Trent University, Durham College, and Ontario Tech University. These institutions have highly diverse student and staff bases, and serve as important hubs for local employment opportunities, including for students with part time jobs on campus. Trips generated by these institutions also do not always follow a traditional AM/PM commuter pattern; therefore, provision of high-quality all-day service is necessary to serve these trips.

The campus demographics are also changing in ways that require transit service to be more flexible, adaptive, and accessible to changing traveller needs[30]. During the 2022-2023 school year, UTSC had 1,902 students register as having a disability with the Accessibility Service Centre, a 63% increase over five years, and a 351% increase over ten years, demonstrating the need for transit that is accessible and accommodating for people of different abilities. Similarly, students are also spending more time on-campus and getting involved: during the 2022-2023 school year, 2,438 extracurricular student leadership positions were validated on their co-curricular records, a 28% increase over five years. Often, these activities are done in the evenings and on weekends, meaning that transit needs to be available outside of typical hours to help get students and others to and from campus. Centennial College's *Indigenous Strategic Framework* has a pillar dedicated to Equitable Access Opportunities that establishes a commitment to 'continue to increase the number of Indigenous learners at the College.' The commitment is support by actions to make the campus an accessible and welcoming location, which transit can support.

Figure 19 and Figure 20 illustrate a series of typical intermodal trips that transit riders may take to higher education institutions that will be served by DSBRT. These 'Travel Time Stories' compare each investment option to the Investment BAU, showing the travel time savings for AM Peak transit trips.

Figure 19: This Travel Time Story illustrates a trip along the full length of the DSBRT. The travel time story also describes a one-way trip from Downtown Oshawa, which is home to Trent University Durham and Ontario Tech University, to Scarborough Centre Station. Today, this trip takes around 139 minutes by transit and includes a transfer at UTSC from DRT to the TTC. Compared to the Investment BAU, Option 1 and Option 3 will reduce the overall travel time by 19 and 17 minutes each. The time saved is a combination of eliminating the transfer at UTSC and providing a "one seat ride," reduced wait times with more frequent service, and reduced travel time due to faster transit operating speeds in dedicated

[30] UTSC Institutional Planning and Research Office, https://www.utsc.utoronto.ca/ipro/institutional-data

lanes. This trip would be made on dedicated guideway for 97% of the distance with Option 1, 78% with Option 2 and 81% with Option 3.

Figure 20: This travel time story describes a person's one-way trip between Pickering Town Centre and UTSC. Today, this trip takes around 51 minutes by transit. Compared to the Investment BAU, Option 1 and Option 2 will provide a time savings of around 4.5 minutes as they both include dedicated guideway for 90% of this trip compared to Option 3 where 58% of this trip occurs on guideway due to deferral of some segments. The time saved is a combination of reduced transfer time due to more frequent service, and reduced travel time due to faster transit operating speeds in dedicated lanes. These benefits also reflect in the ridership for the options: Option 2 presents a higher net new daily ridership than Option 3 (further details are included in "Strategic Objective 6: Increase attractiveness of transit" presented later in this chapter).

Figure 19: Travel Time Story: Downtown Oshawa to Scarborough Centre Station in 2041

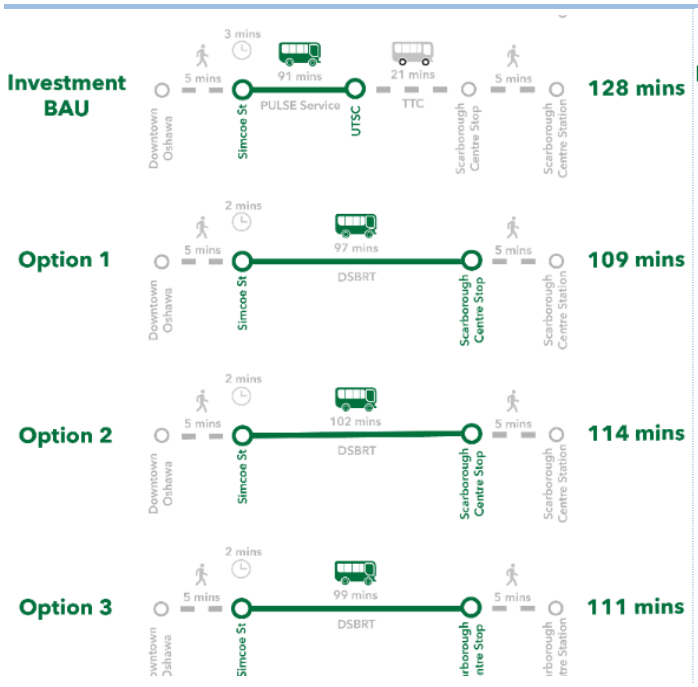
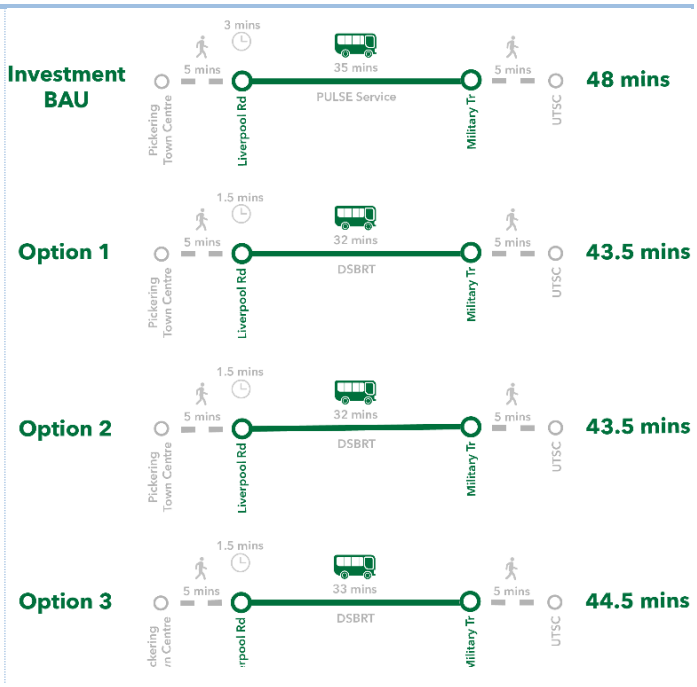


Figure 20: Travel Time Story: Pickering Town Centre to UTSC in 2041



Connections to frequent transit routes

Both Scarborough and Durham Region are home to diverse concentrations of employment opportunities, higher education institutions and other places where many people live, work and play. Providing BRT infrastructure will enable the corridor to support more reliable connections and increase service frequency, solidifying this corridor as a spine in the transit network for Durham Region and Scarborough. Figure 21 illustrates the frequent transit routes that connect to in-delivery segments of DSBRT. The extent of dedicated bus lanes of the Investment BAU scenario are shown in Pickering, Ajax, and a short segment in Whitby. Without investing in the rest of the corridor, the majority of the DSBRT corridor will have transit operating in mixed traffic lanes and existing stops, which will not deliver the same passenger experience, nor provide the same level of amenities as the three options provide.

In comparison, Figure 22 illustrates the same frequent transit routes that connect to DSBRT. The extent of dedicated bus lanes from Option 1 is shown covering nearly the entire 36 km length. In this scenario, the majority of the DSBRT corridor will have transit operating in dedicated centre-median bus lanes.

Investing in BRT along the balance of the corridor will realize higher service frequencies resulting in shorter transfer wait times, higher capacities, and more seamless and reliable connections because of the dedicated guideway and enhanced stop amenities.

Figure 21: Investment BAU - Connections to Frequent Transit Routes

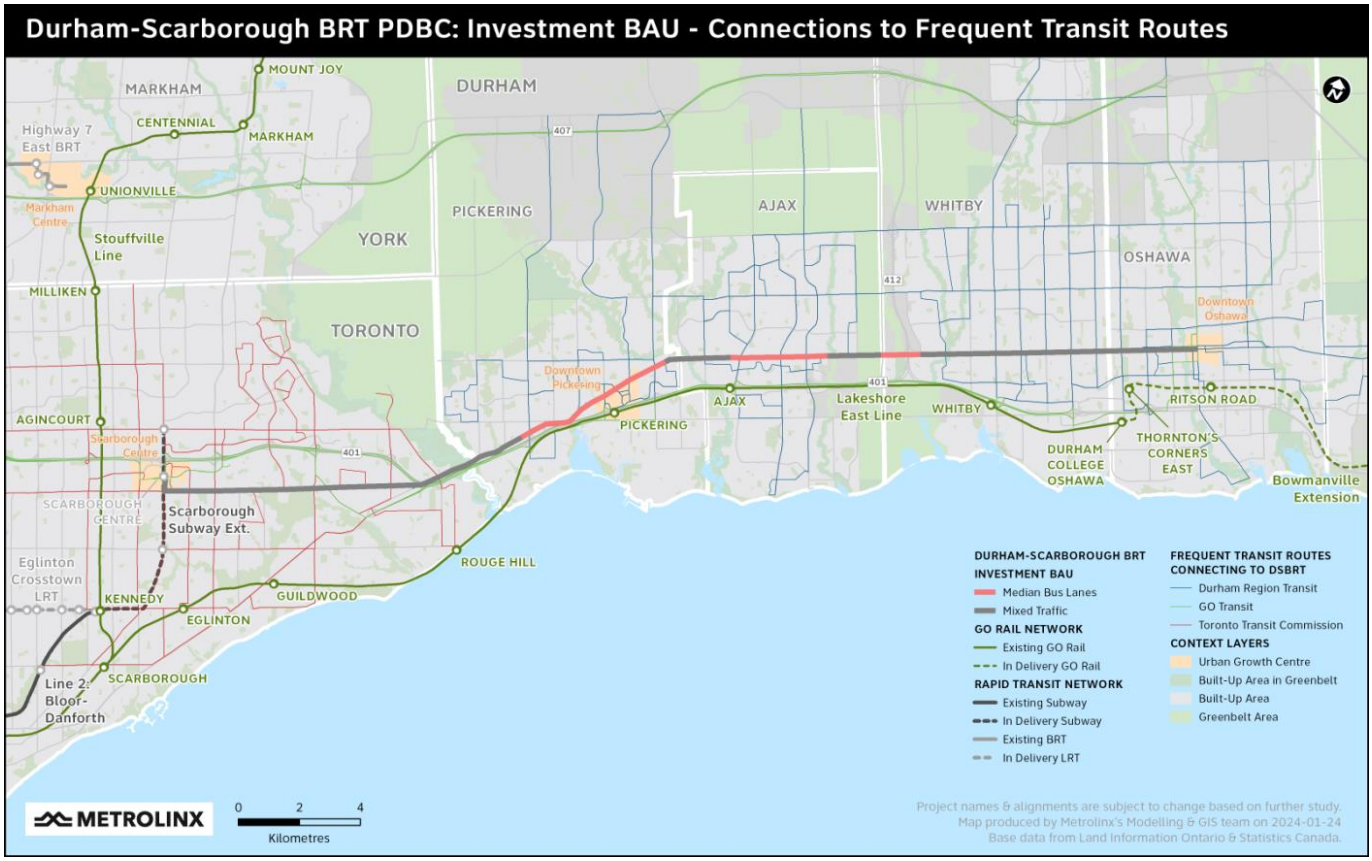
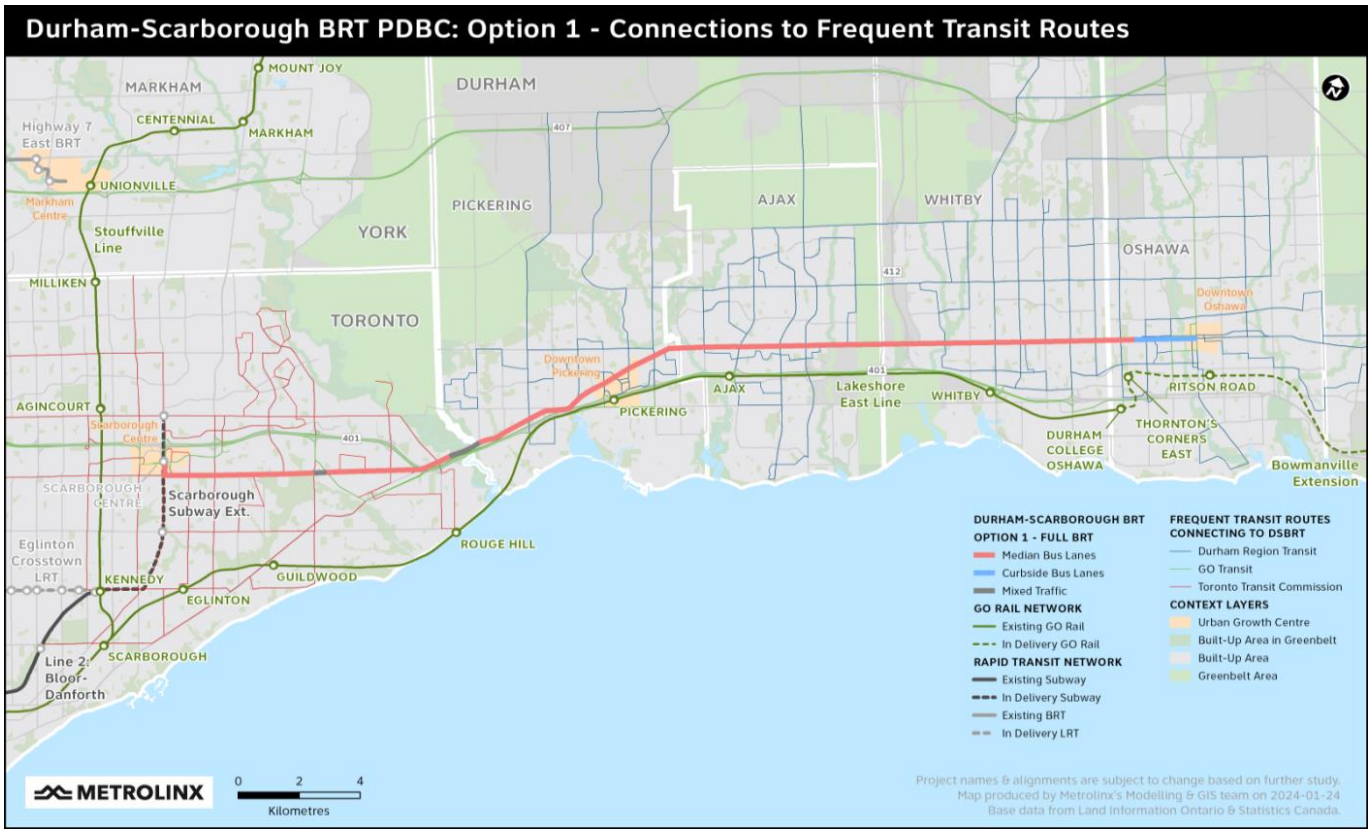


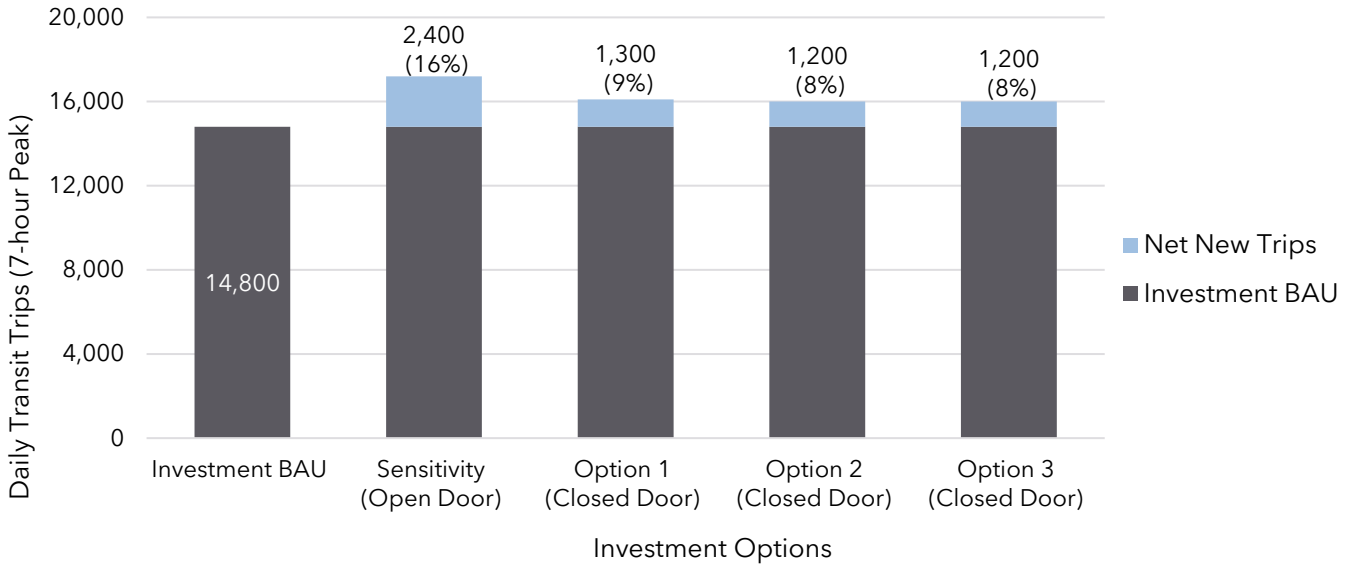
Figure 22: Option 1 - Connections to Frequent Transit Routes



Generating new daily transit trips during peak periods

Investing in DSBRT will encourage mode shift and attract new transit riders to this crucial transportation corridor, particularly as the population grows. Figure 23 illustrate the number of net new daily trips that each DSBRT investment option will generate compared to the Investment BAU.

Figure 23: Transit Trips during AM and PM Peak periods (7-hour period) in 2041



Summary of Strategic Objective 1

- **Saving travel time for higher education trips:** The DSBRT will be critical in providing faster transit service for students, staff, and other full- or part-time employees of the various higher education institutions located along and near the Highway 2-Ellesmere Corridor. **Campus demographics demonstrate that there are more students with disabilities, students involved in extra-curricular and an emphasis on Indigenous student recruitment.** Many of these institutions are among the most diverse in the Region and are important hubs for local employment opportunities, including for students with part time jobs or other activities on campus. Option 1 results in significant time savings for trips to or from a higher education institution along the corridor, in some cases producing nearly up to 20 minutes in travel time savings compared to the Investment BAU. Option 2 and Option 3 also support faster travel to and from these destinations, resulting in travel time savings that are only slightly less than Option 1 in different trip scenarios along the corridor because of less dedicated guideway.
- **Improved connections to frequent transit:** Investing in DSBRT will facilitate direct, seamless transfers between transit modes throughout the Region and particularly in Downtown Pickering and Downtown Oshawa Urban Growth Centres. In Scarborough, DSBRT will support direct connections to and from TTC bus services and the in-delivery Scarborough Subway Extension. In Durham Region, the majority of DSBRT stops in Option 1 intersect with the Durham Region Transit bus network, which provides connections to GO Stations along the Lakeshore East Line and the in-delivery Bowmanville Extension.
- **New daily transit peak period trips:** Each investment option will generate a considerable number of new daily transit trips compared to the Investment BAU. Each of the Closed Door investment options ultimately perform similarly, with Option 1 supporting a marginally higher number of new daily transit trips over Options 2 and 3. **Open Door increases ridership in peak periods by 16%** in comparison to Option 1 because customers are enabled to board more buses in Scarborough, resulting in a net service increase in the Ellesmere Road corridor.

Strategic Objective 2: Strengthen the regional transit network

By providing faster and more reliable east-west service that better connects the Downtown Oshawa, Downtown Pickering, and Scarborough Centre Urban Growth Centres, the DSBRT will strengthen the regional transit network and support increased transit ridership throughout the GTHA.

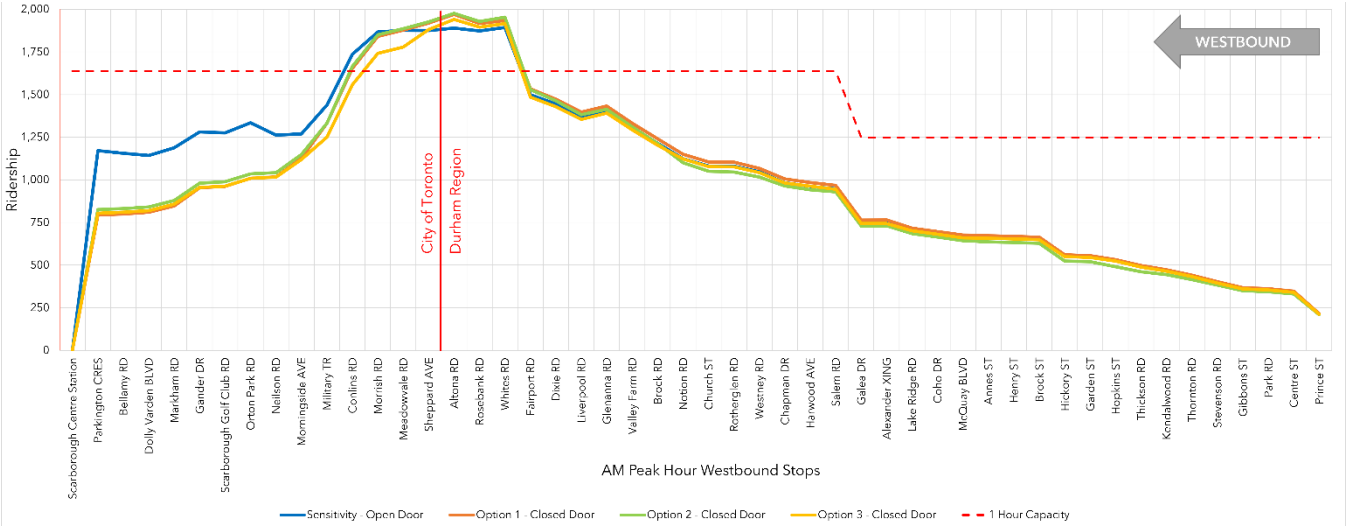
Fostering additional transit connections to and from Scarborough Subway Extension

Figure 24 illustrates westbound transit ridership for each DSBRT investment option along the corridor during the 1-Hour AM Peak, westbound. The dashed line represents the capacity of DSBRT, including the Salem branch, and does not include capacity of other routes that may operate on segments of the section, such as TTC service in Toronto. Demand builds up when approaching Pickering, with all investment options seeing their ridership exceed the one hour peak capacity on either side of the City of Toronto and Durham Region border, between the Military Trail and Whites Road stops. From the Whites Road stop to the final westbound stop at Pine Street, ridership across all investment options gradually falls, with substantial drops at the Salem Road stop in Downtown Ajax, and Whitby's Brock Street stop. Open Door generates the highest westbound ridership due to additional capacity within Toronto limits.

Based on these findings, the following considerations should be advanced in the next phase of the project:

- Implementation of Open Door policy to attract additional ridership for DSBRT.
- Potential TTC cross-boundary service to provide additional capacity between the Toronto-Pickering border.
- Service plan refinements to optimize operations in the Toronto segment, including crowding relief.

Figure 24: Westbound Transit Ridership Along the Corridor (A.M. Peak Hour) in 2041



The DSBRT will attract more transit trips to and from the Scarborough Subway Extension. In comparison to the Investment BAU scenario, all options are forecasted to result in 475 additional BRT trips to the Scarborough Subway Extension via Scarborough Centre. The DSBRT will also provide much needed transit capacity in Toronto, where demand on TTC routes is expected to exceed capacity in 2041. Open Door provides the most relief for TTC routes while creating the most transit capacity on the corridor and is forecasted to add 1,425 additional trips to the SSE.

Summary of Strategic Objective 2

- **Improved connections to Scarborough Subway Extension:** Investment Option 1 (Open Door) results in the highest number of trips to and from the Scarborough Subway Extension during the AM peak window of all the investment options, whereas each Closed Door Investment will perform identically, supporting fewer additional trips. In total, Option 1 (Open Door) will support an additional 1,425 trips when compared against the Investment BAU. Comparatively, all Closed Door investment options are forecast to support an additional 475 connections to and from SSE during the AM peak. The Closed Door policy means customers have less choice and less frequent service.

Complete Travel Experiences

The DSBRT will maintain and enhance quality of life along the corridor by providing complete travel experiences, increasing transit reliability, and fostering connections to key residential, employment, educational and recreational zones in Scarborough and across Durham Region.

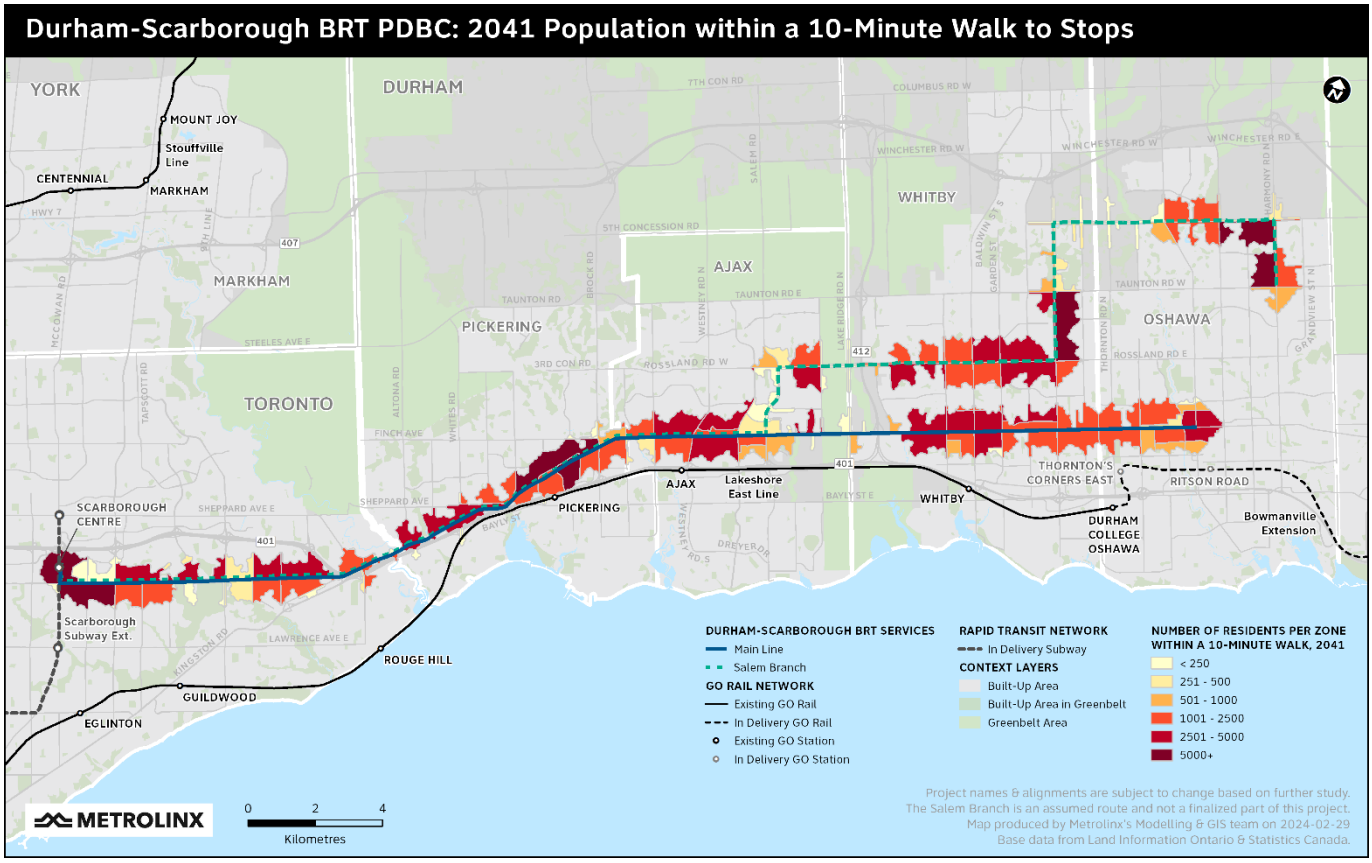
Strategic Objective 3: Increase transit reliability and choice.

Investing in BRT along the Highway 2-Ellesmere corridor will provide transit riders with better choices and more reliable transit service between Downtown Oshawa and Scarborough Centre, supporting safe, accessible, affordable, and comfortable door-to-door travel experiences that meet the diverse needs of travellers.

People within a 10-minute walk of the DSBRT

In 2041, the corridor is expected to connect a total population of 146,000 residents within a 10-minute walk of DSBRT stops, an increase of 43,000 people compared to the 2016 population of 103,000 (+42%). DSBRT will bring benefits to residents, visitors, employees, and employers located along and near the corridor by enhancing speed and frequency of east-west connectivity. The concentration of residents that will live within 800 metres of a stop in 2041 is shown in Figure 25.

Figure 25: 2041 Population within 10-Minute Walk Time to Stops



Note: the map indicates DSBRT services assumed for the purposes of the PDBC (Mainline and Salem Branch). More refinements to the service plan in the next phase of the project may result in changes to bus services that will operate in this corridor.

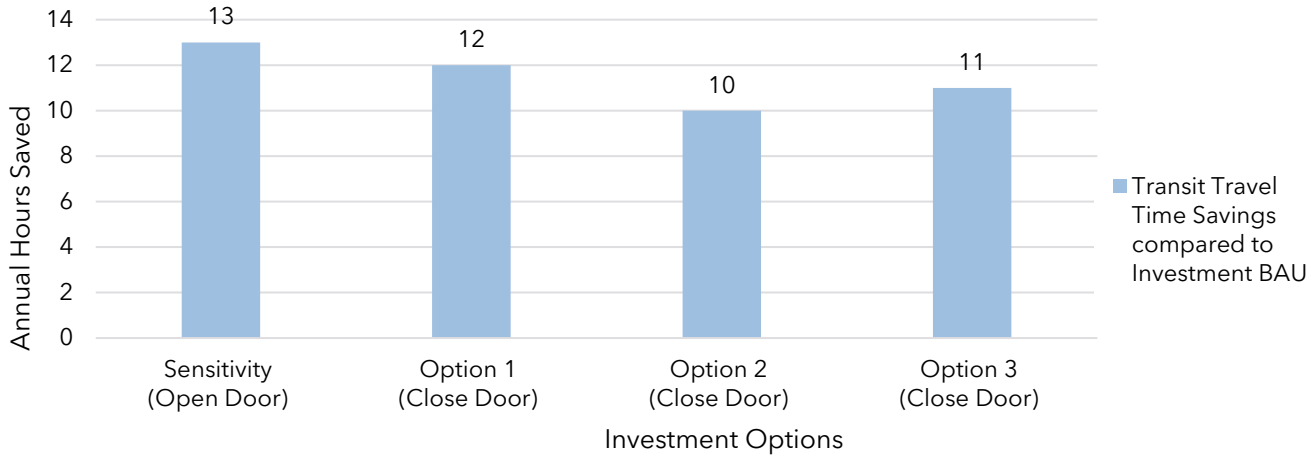
The map shows that most zones traversed by the DSBRT have concentrations of at least 500 residents within a 10-minute walk of a stop. In a majority of these zones, at least 1,000 residents fall within this walkshed. In certain zones along the corridor, such as Scarborough Centre, Downtown Pickering,

Downtown Whitby and Downtown Oshawa, population densities range between 2,500 and 5,000+ residents. The projected population growth along the corridor was shown in Chapter 2 under Figure 9. Overall, much of the corridor will have a significant increase in population, with Scarborough Centre seeing the greatest growth along the corridor.

Forecasted travel time savings for all transit trips

Travel time savings will be achieved as a result of the DSBRT project, generated through faster travel speeds, dedicated bus lanes, more frequent service, and transit signal priority intersections. Together, these contribute to improved transit service reliability and decreased transit travel times. Figure 26 illustrates average annual travel time savings for each option based on changes in in-vehicle travel time.

Figure 26: Average Travel Time Savings (hours saved per person annually) for DSBRT commuters during peak period in 2041



Forecasted travel time savings to and from major hubs

Figure 27 and Figure 28 illustrate two intermodal Trip Time Stories to and from major hubs along the corridor. The trip time savings achieved in each investment option are illustrated and compared to the Investment BAU.

Figure 27: This travel time story describes a transit rider's one-way trip between Scarborough Centre Station and Pickering Village. Today, this trip takes around 93 minutes by transit. Compared to the Investment BAU, Option 1 (92% of the distance on dedicated guideway) will provide a time savings of around 13.5 minutes. The time saved is a combination of reduced transfer time due to more frequent service, and reduced travel time due to faster transit operating speeds in dedicated lanes.

Figure 28: This travel time story describes a transit rider's one-way trip between Pickering Town Centre and Downtown Oshawa. Today, this trip takes around 77 minutes by transit. Compared to the Investment BAU, Option 1 (100% on dedicated guideway) and Option 3 (88% on dedicated guideway) will provide a time savings of around 10 minutes. The time saved is a combination of reduced transfer time due to increased service frequency, and reduced travel time due to faster transit operating speeds in dedicated lanes.

Figure 27: Travel Time Story: Pickering Village to Scarborough Centre Station in 2041

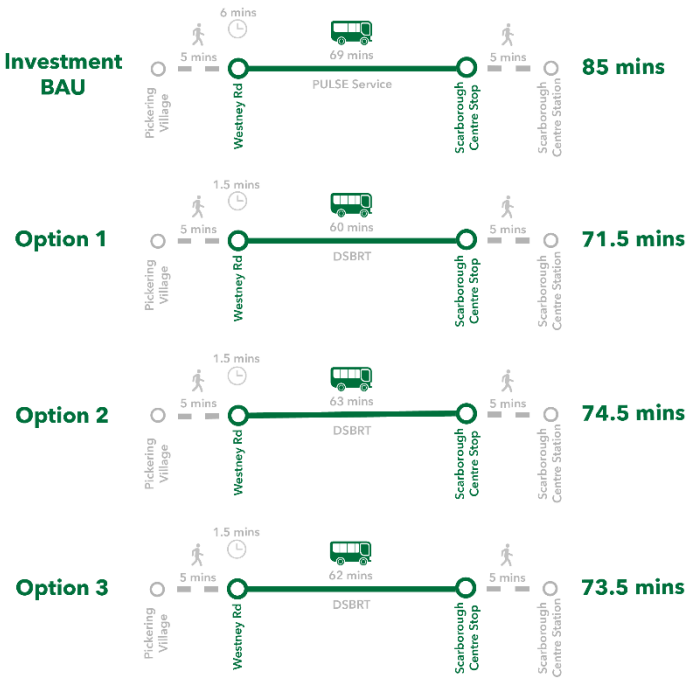
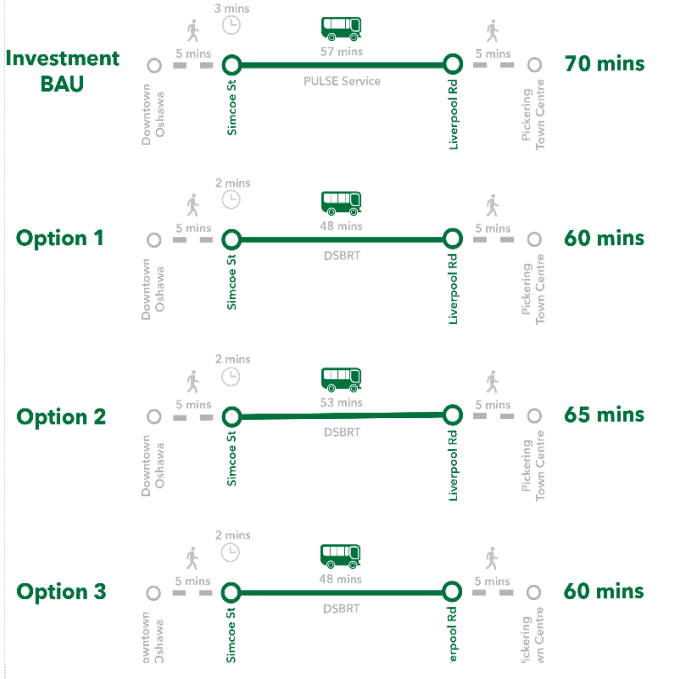


Figure 28: Travel Time Story: Downtown Oshawa to Pickering Town Centre in 2041



Summary of Strategic Objective 3

- **People within a 10 minute walk of DSBRT:** In 2041, the corridor will connect a total population of over 146,000 residents within a 10-minute walk of DSBRT stops, an increase of 43,000 people compared to the 2016 population of 103,000 (+42%).
- **Average travel time savings for all transit trips**: DSBRT will generate average travel time savings for all trips in the Highway 2-Ellesmere Corridor, including TTC trips and shorter trips. Option 1 results in the greatest travel time savings per DSBRT commuter, a combination of transfer elimination at UTSC and providing a "one seat ride," reduced wait times with more frequent service, and reduced travel time due to faster transit operating speeds since there is more dedicated guideway (94% of the end-to-end corridor). Option 3 (75% dedicated guideway) generates the next highest average travel time savings among the options, as the guideway is targeted towards congested locations. Option 2, which includes the greatest amount of mixed traffic segments (70% dedicated guideway) of the options, results in the least average travel time savings. Open Door improves the average travel time savings per person due to higher number of people receiving benefits of the DSBRT project.
- **Forecasted travel time savings to and from major hubs**: Each of the investment options will provide travel time savings between major hubs. DSBRT will connect many hubs including Scarborough Centre, Pickering Village, Pickering Town Centre, and Downtown Oshawa. Option 1 provides the greatest time savings between major hubs. These average travel time savings are more pronounced over longer trips, where the maximum travel time savings compared to the Investment BAU may result in up to 19 minutes saved as shown in Figure 27.

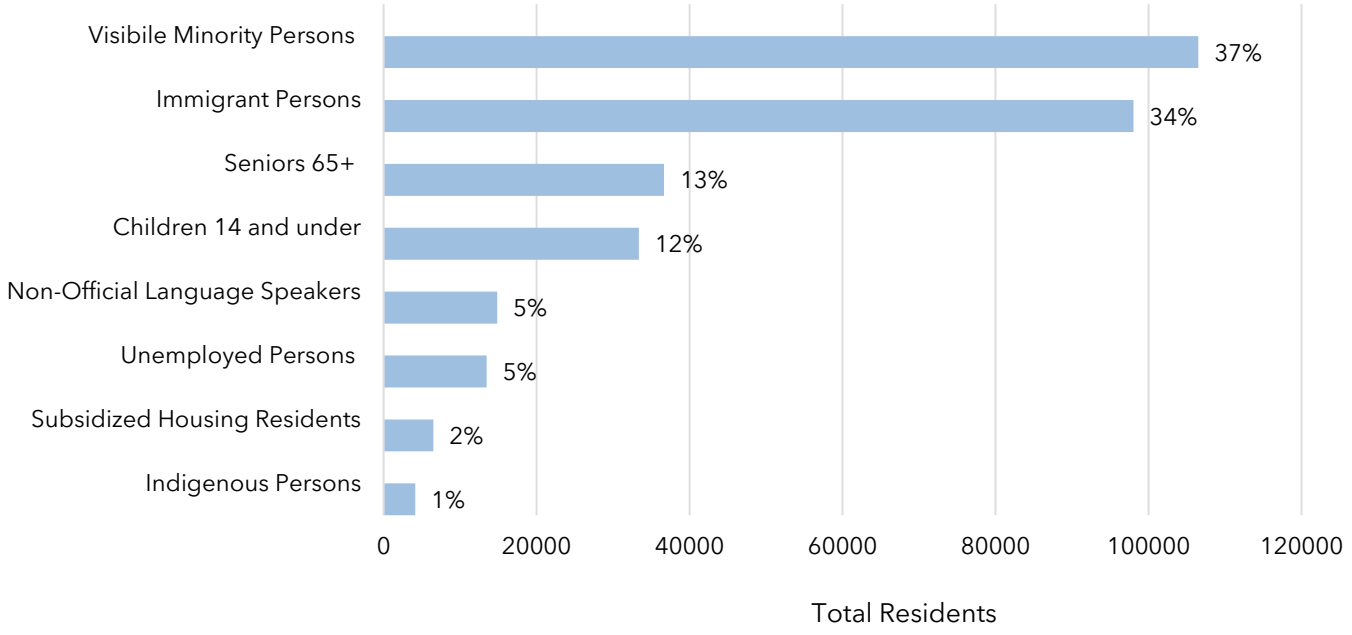
Strategic Objective 4: Increase equitable access to transit and opportunities.

By supporting higher transit capacities and faster east-west connectivity for transit riders, DSBRT will play a key role in increasing equitable access to opportunities across the region. More reliable and frequent transit service will connect residents and employees who live and work in Scarborough and Durham Region.

Accessibility by low-income and other equity-deserving groups

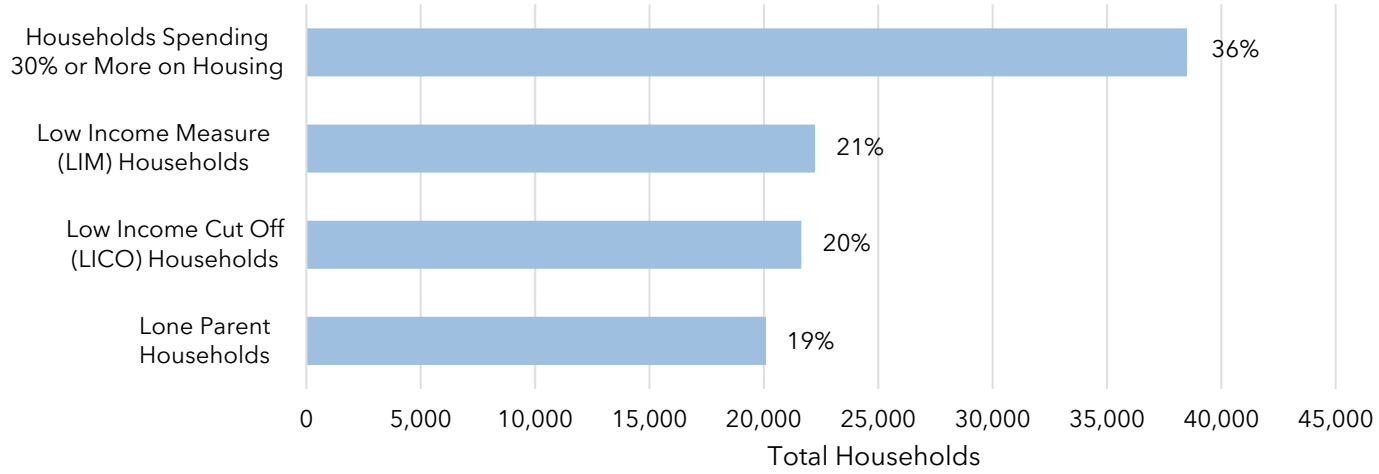
According to the 2016 Census, multiple equity-deserving persons currently reside within 800-metres, or a 10-minute walk, of the DSBRT corridor. Figure 29 displays the distribution of different equity-deserving groups, while Figure 30 displays the distribution of different equity-deserving households situated within this walkshed in 2016. A person or household may fall under more than one of these categories. The development of DSBRT will provide these equity-deserving groups with more convenient and reliable rapid transit service that enables faster east-west travel. This investment will provide connections to employment and educational opportunities, and recreational activities in Durham Region and Scarborough. It will also strengthen connections to other transit systems to better connect residents along the corridor to opportunities across the GTHA.

Figure 29: Accessibility of DSBRT by equity-deserving persons in 2016



Source: Statistics Canada (2016 Census)

Figure 30: Accessibility of DSBRT for equity-deserving households in 2016

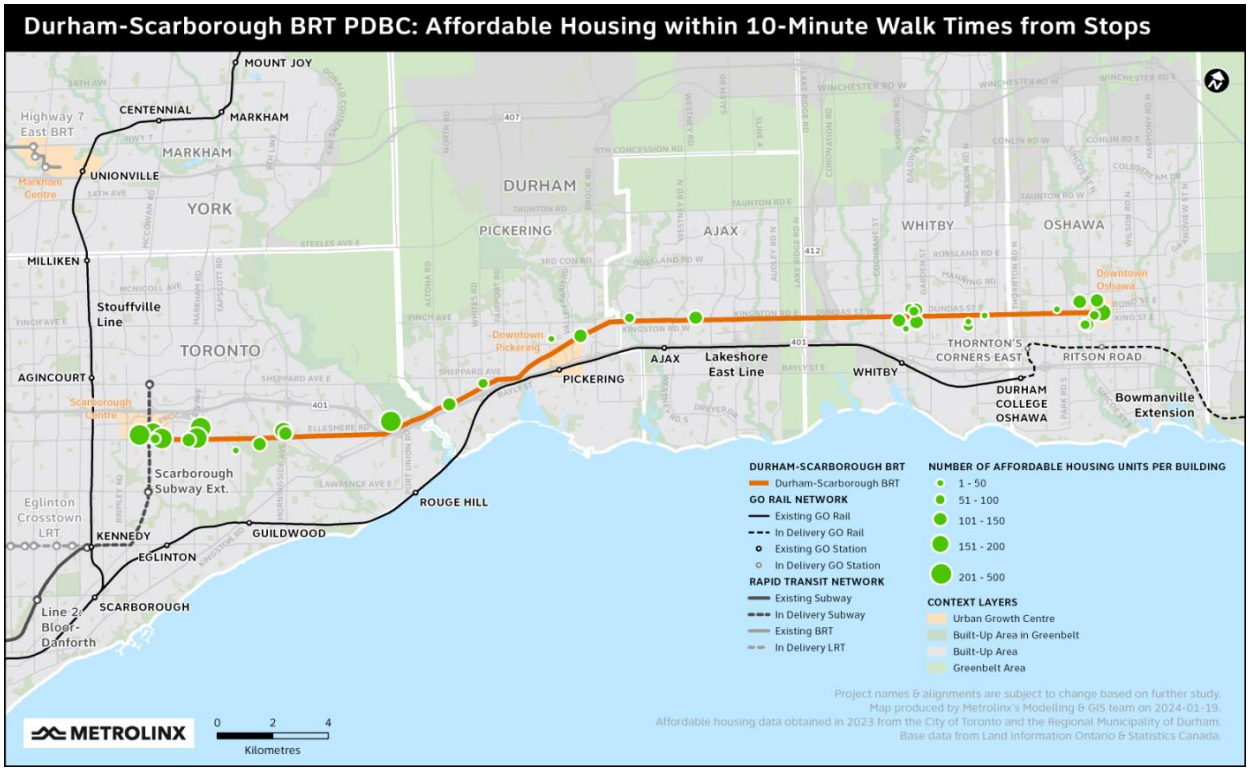


Source: Statistics Canada (2016 Census)

Accessibility to transit for existing and new affordable housing residents

Increasing transit service for low-income and affordable housing residents is an important priority in transit-oriented communities since this offers a cheaper commute option and improves access to education, job opportunities, services, and cultural activities. A total 3,645 built affordable housing units, and 963 planned affordable housing units (total 4,608 units) fall within a 10-minute walk of DSBRT. Figure 31 illustrates the concentrations of affordable housing units per building that are located within this walkshed. Affordable housing units are spread over both Scarborough and Durham Region, with significant concentrations located in Scarborough Centre, Downtown Whitby, and Downtown Oshawa.

Figure 31: Existing and new affordable Housing within 800m of DSBRT Stops in 2024



Enhancing the transfer experience

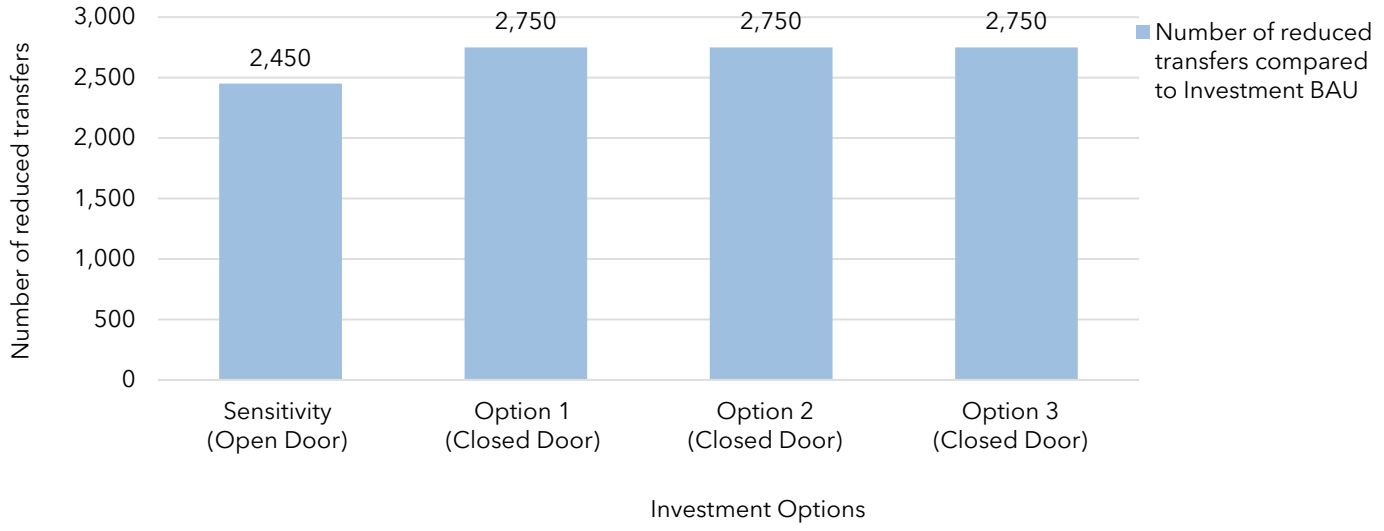
The DSBRT will produce an increase in the number of transit riders transferring along the corridor as a result of supporting higher volumes of daily transit riders, while reducing transfer wait times and enhancing the transfer experience with larger and more comfortable transit shelters. The following points illustrate how the transfer experience will be enhanced by DSBRT:

- **Transfer Experience:** Every new stop along the DSBRT corridor will include accessible waiting areas for transit riders that include amenities, such as seating and shelter areas, lighting, and security technologies to increase both the comfort and visibility of the rider experience. Together, these will serve to improve the waiting experience for current and new riders and increase equitable access to transit. At the same time, accessing, waiting for, and transferring between transit services will become a more seamless experience for transit riders due to higher frequency of services in the DSBRT corridor.
- **Wait Times:** More frequent service will reduce transfer and wait times from approximately three minutes to less than two minutes for each investment option. To calculate the total transfer time savings that each investment option may achieve at a high level, the total number of transfers at key stops is multiplied by four (minutes), representing the two minutes saved in transferring in each direction. Open Door provides the greatest improvement to transit riders' transfer experience in terms of reduced transfer wait times on a daily basis. This is due to this investment supporting the greatest number of transfers at most DSBRT stops compared to the other options. While these values appear small, it's important to realize the scope of the impact, as there will be over 5,500 people transferring daily at UTSC (Investment BAU) who will realize these time savings.

Change in number of transfers as a result of single-seat service

DSBRT will decrease required transfers and save people time as a result of single-seat service introduced along the corridor, as shown in Figure 32. Reducing transfers also provides more direct and predictable journeys, minimizing the possibility of extended wait times and delays that may result in transferring from one transit vehicle or route to another. The Open Door option attracts more net daily transit riders in 2041 that make a transfer as part of their trip. While the value is lower, the percentage of trips making a transfer relative to net daily ridership, is lower for it, relative to Options 1 to 3.

Figure 32: Decrease in transfers as a result of single-seat service along the corridor in 2041



Summary of Strategic Objective 4

- **Accessibility by low-income and other equity-deserving groups and affordable housing**: DSBRT will benefit residents of affordable housing units located along the BRT corridor. Given that Option 1 provides dedicated rapid transit infrastructure along almost the entirety of the corridor, servicing all areas with concentrations of affordable housing units, these options will have the highest positive impact on affordable housing unit residents. Option 3 delivers the second highest benefit overall for affordable housing residents. In this investment option, affordable housing residents in Scarborough's Rouge Hill neighbourhood may experience less reliable access and slower travel times because the portion of the BRT corridor in their neighbourhood would operate in a mixed traffic environment. Option 2 would deliver the least benefit to affordable housing residents along the corridor, because this Investment includes mixed traffic segments in areas with high concentrations of affordable housing units, namely in the Morningside neighbourhood in Scarborough, Pickering Village in Ajax and in Downtown Whitby.
- **Enhancing the transfer experience:** In certain instances, Option 1 (Closed door) achieves a greater number of transfers than all the Investments. At UTSC and the Simcoe BRT Stop for instance, Option 1 (Closed Door) will facilitate 2,500 and 4,400 transfers respectively, whereas Options 2 and 3 each perform similarly, overall facilitating fewer transfers at key transfer stops than Option 1. Open Door will support the highest number of transfers at most stations by virtue of this Investment's ability to capture transit ridership in both Scarborough and Durham Region, thereby accommodating the greatest transit capacity.
- **Change in number of transfers as a result of single-seat service:** Each investment option delivers benefits by reducing transfers for transit riders compared to the Investment BAU. Options 1, 2 and 3 perform identically, reducing transfers by 2,750 transfers compared to the Investment BAU. Open Door results in a smaller decrease in transfers relative to the Investment BAU compared to the Closed Door options. Transfers in this option would only decrease by 2,450 compared to the Investment BAU.

Sustainable and Healthy Communities

DSBRT will contribute to the growth of sustainable and healthy communities along the corridor by supporting land use intensification, climate resiliency and mode shift, reducing both vehicle-kilometres travelled (VKT) and greenhouse gas (GHG) emissions associated with driving.

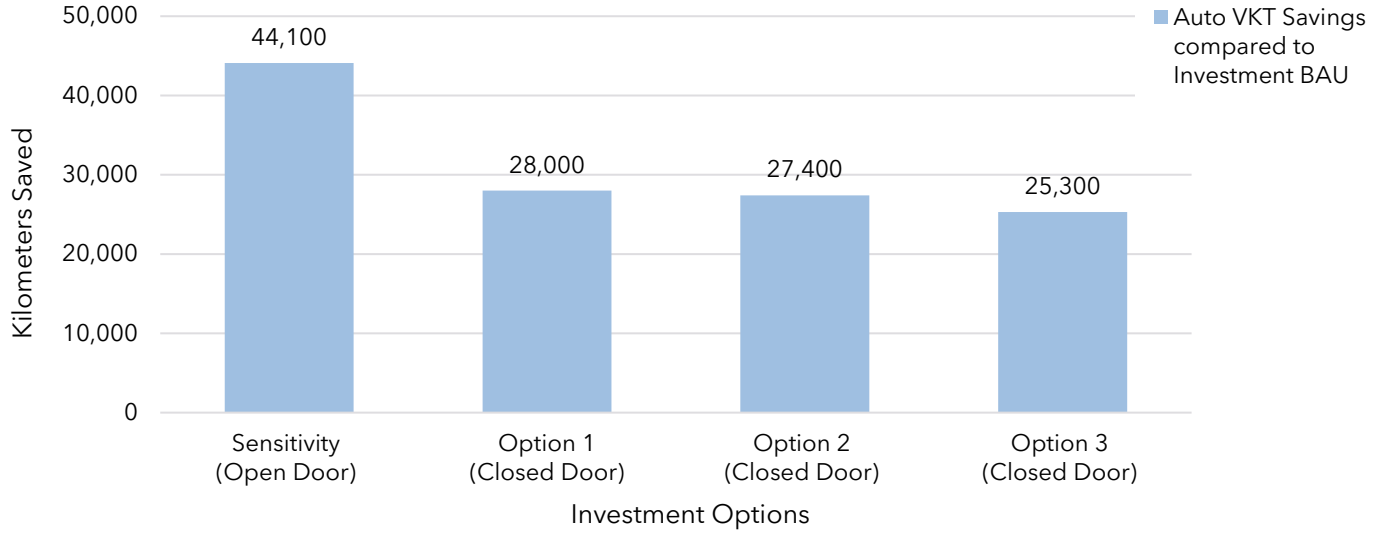
Strategic Objective 5: Move people with less energy and less pollution

The transportation network is a major source of greenhouse gas (GHG) emissions and a key contributor to the region's carbon footprint. As a critical corridor that connects people through Scarborough and Durham Region, the Highway 2-Ellesmere corridor frequently experiences high levels of congestion during peak hours. These strategic metrics capture the impacts due to mode shift from automobile to transit.

Reducing Vehicle-Kilometres Travelled

DSBRT will be essential in alleviating congestion and reducing VKT along the Highway 2-Ellesmere corridor during peak hours. Figure 33 illustrates how each investment option will decrease VKT along the corridor annually compared to the Investment BAU during the AM and PM peaks.

Figure 33: Decrease in annual VKT compared to BAU in 2041

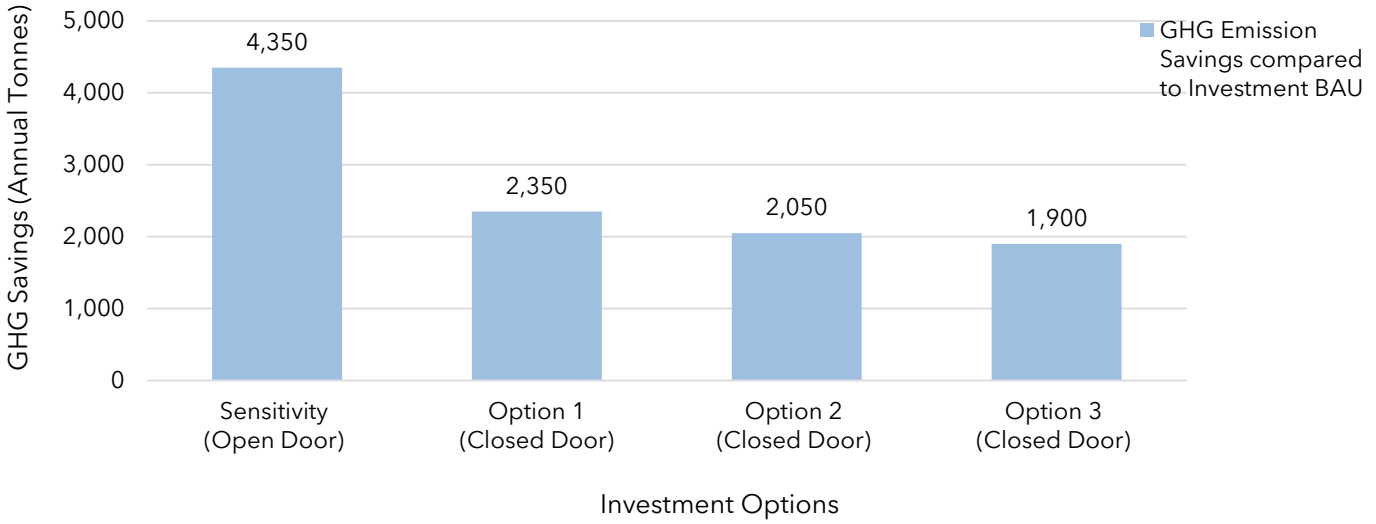


Reducing GHG Emissions

The DSBRT will deliver positive environmental benefits by reducing transportation emissions along the corridor, including GHGs that contribute to climate change when drivers opt to take transit instead of their vehicles.

Figure 34 illustrates the net GHG emissions reductions of each Investment measured in tonnes annually compared to the Investment BAU.

Figure 34: Decreased Greenhouse Gas Emissions from DSBRT in 2041



Summary of Strategic Objective 5

- **Decrease in VKT and GHG Emissions:** Option 1 sees a 28,000 VKT reduction and 2,350 GHG emissions savings, with Options 2 and 3 having similar but slightly less improvements in VKT and GHG emissions as well. Option 1 includes the most dedicated rapid transit infrastructure, minimizing the amount of time DSBRT vehicles would operate in mixed-traffic environments, which are prone to delays, idle time, and emissions increases. Open Door is expected to achieve the largest reduction of VKT and GHG emissions of all the options (57% VKT reductions and 85% GHG

emissions reductions). This is because the Open Door policy achieves higher transit capacities in both directions along the DSBRT corridor, capturing increased ridership in Scarborough and Durham Region. This results in a reduction of VKT and GHG emissions that would have otherwise been incurred by a portion of those riders had they opted to drive instead.

Strategic Objective 6: Increase attractiveness of transit

Faster, more seamless, and reliable transit contributes to the perceived attractiveness of transit services. The attractiveness of transit as a viable alternative to other modes can be inferred from ridership forecasts among different demographic groups, and in forecasted daily ridership totals at key stops along a transit route.

Increased ridership

The prospect of faster and more efficient east-west travel between Durham Region and Scarborough represents a key step to shifting people's modal choice when accessing key destinations along the corridor. Table 9 illustrate AM peak ridership changes and daily ridership on DSBRT across each option compared to the Investment BAU.

Table 9: Daily DSBRT Ridership for Investment Options in 2041

	Sensitivity *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Total Riders	45,700	37,400	37,100	36,700

Summary of Strategic Objective 6

- **DSBRT Daily Ridership:** Option 1 would generate a total daily ridership on the DSBRT of 37,400 trips, whereas Option 2 and Option 3 represent a total daily ridership of 37,100 trips and 36,700 trips respectively. Option 2 presents a higher ridership than Option 3 due to BRT infrastructure implemented between Military Trail and Sheppard Road, impacting travel times for trips from/to UTSC/Centennial College as observed in Figure 20. Open Door yields a daily ridership total of 45,700 trips. Option 1 (Closed Door) results in a total of 4,400 one-hour AM peak trips. Options 2 and 3 each result in a total of 4,300 one-hour AM peak trips. Open Door results in 5,400 one-hour AM peak trips.

Economic Development

DSBRT will support and help spur more economic activity and development in Durham Region and Scarborough, improving access to regional jobs and economic opportunities, increasing connectivity, and attracting new mixed-use development opportunities. Together, these outcomes contribute to provincial intensification objectives that aim to foster the growth of transit-oriented communities.

Strategic Objective 7: Expand access to regional jobs and economic opportunities

DSBRT will increase improved access to jobs and economic opportunities situated along and beyond the Highway 2-Ellesmere corridor, as well as Provincially Significant Employment Zones (PSEZ) in Scarborough, Picking, Ajax, Whitby, and Oshawa.

Increasing access to key areas of employment

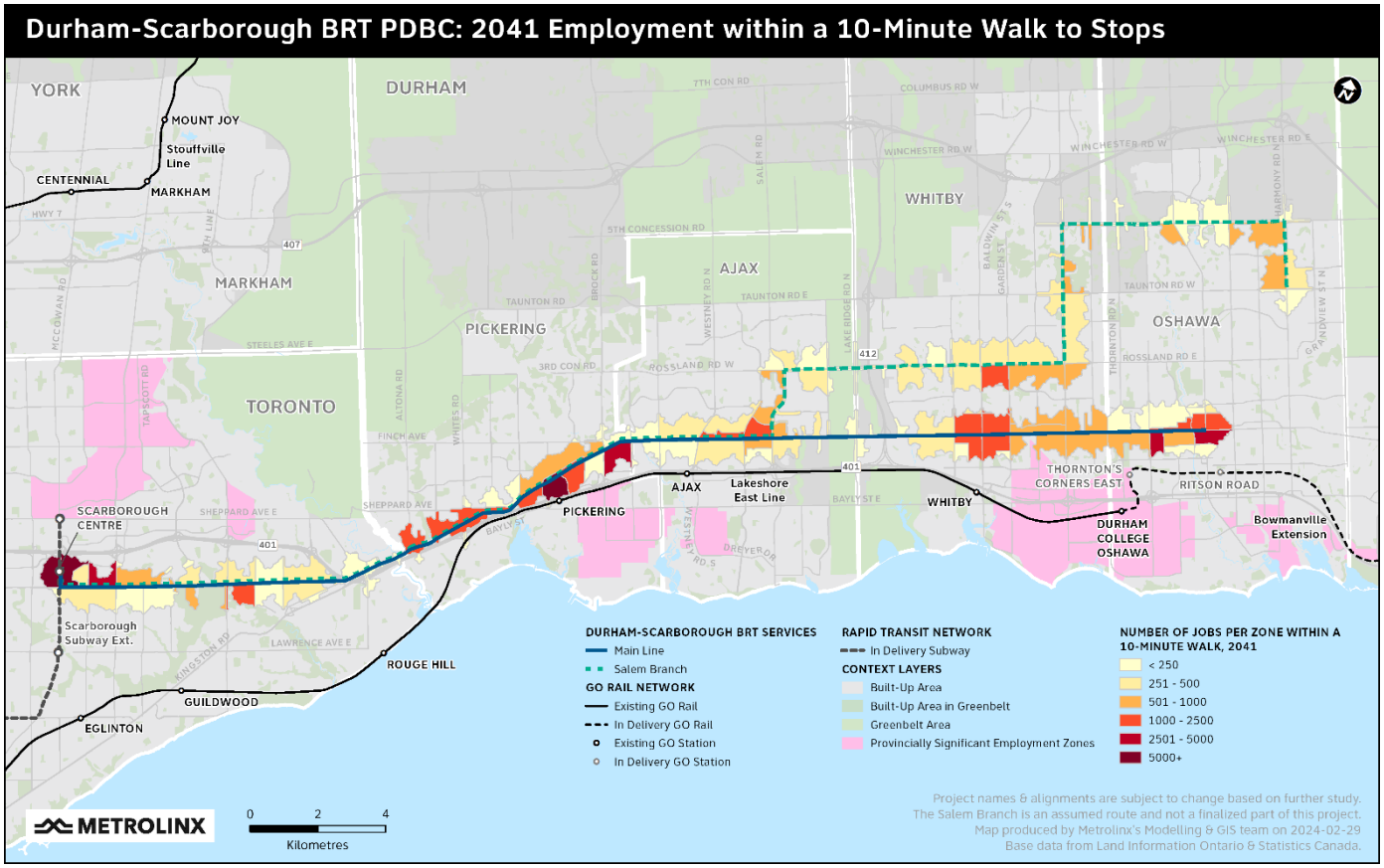
DSBRT is strategically located and provides crucial access to economic hubs and provincially significant employment zones (PSEZ) for transit riders. Figure 35 illustrates the projected concentration of jobs for 2041 within an 800 metre or 10-minute walk from a DSBRT stop. The PSEZs are illustrated along the DSBRT corridor. High concentrations of jobs can be seen in Scarborough Centre, Pickering, central Ajax, Downtown Whitby, and Oshawa. As both Scarborough and Durham Region experience

population and employment growth leading up to 2041, DSBRT will be critical in connecting riders to places of work and other employment opportunities across the region and the wider GTHA.

Supporting increased access to jobs

DSBRT will provide transit riders with faster access and more reliable connections to a host of employment opportunities across Scarborough and Durham Region, illustrated by the change in the number of jobs within a 45-minute transit trip in the AM peak. Option 1 and Option 3 (Closed Door) perform comparatively, resulting in an increase of 248 and 223 jobs respectively. Option 2 would result in the lowest change, increasing access to 206 more jobs within a 45-minute transit trip. As a result of supporting higher transit capacities along the entirety of the corridor, Open Door results in 304 jobs accessible by transit in the AM peak.

Figure 35: Number of jobs and economic hubs within 800m of the DSBRT corridor in 2041



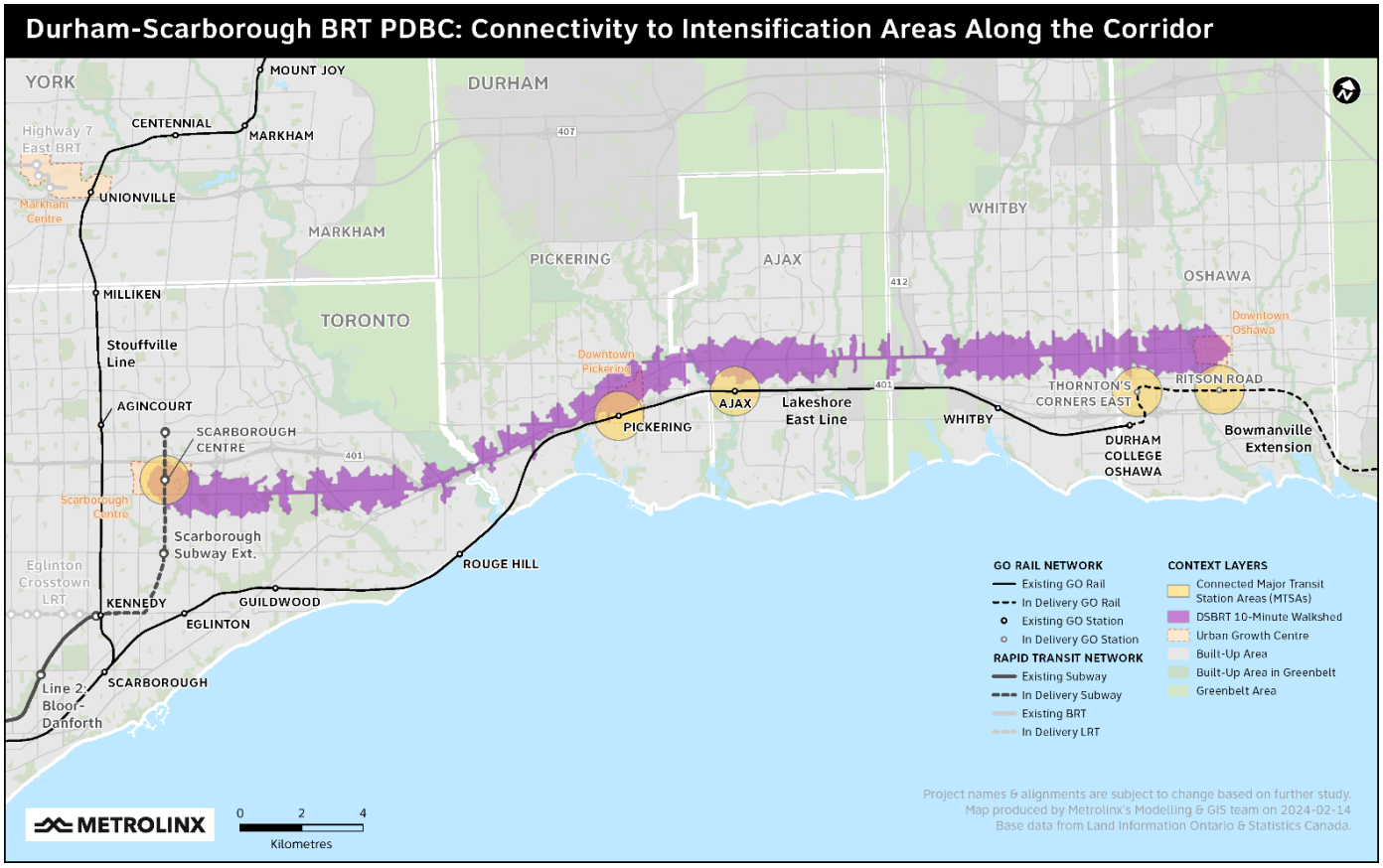
Summary of Strategic Objective 7

- **Increasing access to key areas of employment:** Option 1 is expected to provide a reliable and efficient way to access to the economic hubs and employment areas across all zones along the corridor. Option 2 includes mixed-traffic segments at several locations along the DSBRT corridor that have high concentrations of jobs per zone, including in the Morningside neighbourhood in Scarborough, Downtown Pickering, and Downtown Whitby.
- **Supporting increased access to jobs:** Options 1 and 3 have a comparable increase in access to additional jobs within a 45-minute transit trip in the AM peak when compared to the Investment BAU. Open Door brings a substantial increase in access since it allows for the greatest overall increase in transit capacity and choice among the options.

Strategic Objective 8: Increasing connectivity and fostering economic development

The provision of fast and reliable rapid transit will be a catalyst for intensification along the Highway 2-Ellesmere corridor. DSBRT will play an important role in connecting Major Transit Station Areas along the corridor, notably in Scarborough Centre, and surrounding the Pickering, Ajax, Durham College Oshawa, and Ritson Road GO Stations. DSBRT will also connect provincially-designated Urban Growth Centres (UGC) of Scarborough Centre; Downtown Pickering and Downtown Oshawa. Figure 36 illustrates how DSBRT will connect these areas where higher levels of intensification are planned, providing the growing residential population with more seamless access to employment and economic opportunities across the region.

Figure 36: Connectivity to areas intended for intensification along corridor



Summary of Strategic Objective 8

- **Connectivity to areas of intensification:** The DSBRT will provide fast and efficient connections between important Major Transit Station Areas situated along the corridor, including around Scarborough Centre, and the Pickering, Ajax, Durham College Oshawa, and the proposed Ritson Road GO Station. Option 1 will provide the fastest connections along the corridor as this Investment will implement the most amount of RT infrastructure. Option 2 includes a mixed-traffic segment that intersects with the Ajax GO Station MTSA, whereas Option 3 includes a mixed-traffic segment that intersects with the Ritson Road GO Station MTSA. As a result, these Investments may reduce the efficiency of connections in these intensification areas.

Strategic Case Summary

The strategic case objectives and outcomes are summarized in Table 10. Overall, all options bring benefits in comparison to the Investment BAU, with Option 1 performing best in most of the metrics. Open Door increases the strategic benefits.

Table 10: Summary of the Strategic Case

RTP Goal	Metrics (by 2041)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Strong Connections	**Net new daily riders**	*14,300 (45,700 total)*	6,000 (37,400 total)	5,700 (37,100 total)	5,300 (36,700 total)
	Net new daily riders during 1-hour AM peak	*2,200*	1,200	1,100	1,100
	New Trips to Scarborough Subway Extension (AM 2-hour peak)	*1,425*	475	475	475
Complete Travel Experiences	**Residents and jobs served within 10-minute walk**	146,000 Residents and 77,000 Jobs			
	Average travel time savings for DSBRT commuters during peak period (hours/passenger/year)	*13h (19 minutes saved for each end-to-end trip)*	12h *(19 minutes saved for each end-to-end trip)*	10h (14 minutes saved for each end-to-end trip)	11h (17 minutes saved for each end-to-end trip)
	Decrease in number of transfers due to single-seat service	*2,450*[31]	2,750	2,750	2,750
Sustainable and Healthy Communities	**Daily DSBRT riders**	*45,700*	37,400	37,100	36,700
	Annual vehicle kilometres travelled (VKT) saved (km)	*44,100*	28,000	27,400	25,400
	Annual tonnes of GHG Emissions reduced (tonnes)	*4,350*	2,350	2,050	1,900
Economic Development	**Total built affordable housing units within 10-minute walk**	3,645			
	Total planned affordable housing units within 10-minute walk	963			
	Additional jobs accessible within 45-minute transit trip during AM peak	*304*	248	206	223

[31] The Open Door scenario has the highest net new daily riders by 2041, which leads to more trips that requires a transfer. However, the percentage of total trips that transfer is lower overall.

5

Economic Case

Introduction and Assumptions

The Economic Case is one of two chapters in this PDBC that presents the rationale for pursuing an investment in the Durham-Scarborough Bus Rapid Transit (DSBRT) project (the other being the Strategic Case). While the Strategic Case evaluates options and sensitivities 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 each investment option. This analysis considers the magnitude of costs and benefits for a 60-year lifecycle as well as:

- **Benefit Cost Ratio (BCR):** the present value of the total benefits divided by the present value of the total costs, which is used to indicate benefits that are realized per dollar spent.
- **Net Present Value (NPV):** the total present value of all future benefits minus the total present value of all future costs, which is used to indicate total net benefits to the region.

The Economic Case is structured in the following sections:

- **Assumptions:** summary of core economic analysis and modelling assumptions.
- **Costs analysis:** estimated economic costs of DSBRT.
- **Impacts analysis:** estimated economic benefits of DSBRT.
- **Economic Case Summary:** summary of economic benefit cost analysis, including BCR and NPV.

Economic Case Assumptions

Since the 2018 IBC, a new Metrolinx Business Case Guidance was released in 2021, bringing updated and/or new methodology and assumptions for economic evaluation. Table 11 summarizes the economic case assumptions used in this PDBC.

Table 11: List of Economic Assumptions

Input	Impact Type
Analysis Approach	**All benefits/costs are expressed in real terms in 2023 $** Appraisal begins in 2033 Construction period: 2024-2033
Evaluation Period	Over 60 years of Operation
Economic Discount Rate	3.50%
Inflation Rate	2%
Value of Time (VoT) (2021 $)	$18.79/hour
VoT Growth Rate	0%
Ridership Growth Rate	1% capped after 30 years from year of evaluation (2023 to 2052)
Reliability improvement[1]	Typically estimated in model by applying a weighting to value of time: a multiplier of 1.76 applied to the standard deviation of reliability (minutes)
Crowding (transit)[2]	Typically estimated in model by converting into units of time either within the GGHMv4 model or through the application of an equation that is consistent with the GGHMv4.
Auto Operating Cost Savings (2021 $)	Marginal operating cost: $0.10/km

Input	Impact Type
Congestion Reduction (Hours/change in VKT)	0.01
Safety Improvements (Accident Mitigation/Relief) (2021 $)	$0.09 per auto vehicle kilometres travelled reduction
Accident Reduction Growth Rate	-5.30%
Social Cost of Carbon Emissions (2023 $)	Growth capped 30 years from year of evaluation (2023 to 2052) 2030 - $64.51/tonne; 2035 - $70.51/tonne; 2040 - $76.64/tonne; 2045 - $82.59/tonne; 2050 - $88.54/tonne
Health Benefit (2021 $)	$4.08 per kilometre walked
Optimism Bias (OB) by Level of Design (LD)	LD <10% - 64% OB; LD 11-20% - 18% OB; LD 21-30% - 9% PB; LD >30%: 4% OB

Notes: Technical guidance for valuing User Impacts based on Change in Generalized Cost or Time to capture crowding and reliability are provided in the Business Case Guidance.

(1) Reliability is the variability in all elements of journey travel time. Improvements to reliability are a benefit, while reduced reliability is a disbenefit.

(2) The level of crowding (transit) impacts user perception of the service: increased crowding is considered a disbenefit, while reduced crowding is considered a benefit.

Costs Analysis

The investment required to deliver the DSBRT project is divided into the following categories:

- **Capital Costs:** fixed one-time costs incurred during the implementation of the investment. The capital costs include the labour and materials required for construction, as well as contingency.
- **Fleet:** vehicles required for operation along the corridor, with 18m Articulated Diesel Buses assumed for all options.
- **Rehabilitation Costs:** interventions to restore infrastructure and ensure operational conditions throughout DSBRT's lifecycle.
- **Terminal Value:** This is the residual value of the assets at the end of the analysis period.
- **Lifecycle Operating and Maintenance Costs:** ongoing costs required to operate the service and provide day to day maintenance.
- **Land value opportunity cost:** method of capturing the value of land that is based on how much one could have made by renting it out for other uses instead of using it to build the project being evaluated.

The capital, operating, maintenance and rehabilitation costs for the entire lifecycle of the investment are listed in

Table 12 and Table 13. These costs are incremental to the Investment BAU scenario and Standard BAU scenario, respectively, and have been discounted based on the assumptions noted.

A standardized approach was applied to account for uncertainty in project costing. This approach is applied to all projects based on the level of design development.

Capital cost estimations include consideration of optimism bias. Optimism bias is the tendency of individuals to expect better than average outcomes. In the context of infrastructure projects, optimism bias can lead to underestimation of costs and project duration.

To account for optimism bias, the economic analysis included an uplift to the expected value of capital costs. The uplift associated with optimism bias decreases as the project's level of design increases. Costs were provided separately for each infrastructure component, and each had a different level of design. Lifecycle operating and maintenance costs do not carry any optimism bias.

Table 12: Summarizing Economic Costs for Project Options (in million $) compared to Investment BAU

Cost Category (2023 $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Capital Costs	**879 M to 983 M**	**879 M to 983 M**	**671 M to 742 M**	**778 M to 865 M**
Infrastructure	*692 M to 787 M*	*692 M to 787 M*	*490 M to 554 M*	*595 M to 675 M*
Fleet	*120 M to 139 M*	*120 M to 139 M*	*130 M to 150 M*	*123 M to 143 M*
Rehab	*67 M to 77 M*	*67 M to 77 M*	*48 M to 53 M*	*58 M to 66 M*
Terminal Value	*-11 M to -10 M*	*-11 M to -10 M*	*-8 M to -7 M*	*-10 M to -9 M*
Lifecycle Operating & Maintenance Costs	222 M to 222 M	212 M to 212 M	235 M to 235 M	216 M to 216 M
Land Value Opportunity Cost	53 M to 150 M	53 M to 150 M	33 M to 97 M	43 M to 125 M
Total Present Value of Costs	**1,203 M to 1,338 M**	**1,192 M to 1,328 M**	**970 M to 1,061 M**	**1,076 M to 1,192 M**

Table 13: Summarizing Economic Costs for Project Options (in million $) compared to Standard BAU

Cost Category (2023 $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Capital Costs	**1,084 M to 1,187 M**	**1,084 M to 1,187 M**	**874 M to 945 M**	**981 M to 1069 M**
Infrastructure	*896 M to 990 M*	*896 M to 990 M*	*693 M to 757 M*	*798 M to 878 M*
Fleet	*107 M to 123 M*	*107 M to 123 M*	*117 M to 135 M*	*110 M to 126 M*
Rehab	*86 M to 95 M*	*86 M to 95 M*	*66 M to 72 M*	*76 M to 84 M*
Terminal Value	*-14 M to -12 M*	*-14 M to -12 M*	*-11 M to -10 M*	*-12 M to -11 M*
Lifecycle Operating & Maintenance Costs	**195 M to 195 M**	**185 M to 185 M**	**208 M to 208 M**	**189 M to 189 M**
Land Value Opportunity Cost	75 M to 172 M	75 M to 172 M	56 M to 119 M	65 M to 147 M
Total Present Value of Costs	**1,398 M to 1,536 M**	**1,388 M to 1,526 M**	**1,166 M to 1,259 M**	**1,273 M to 1,389 M**

Note: Cost estimates reflect a range representing low to high forecasts to account for optimism bias at the early stages of project design. The range displayed for capital costs represent the variability in the sum of the infrastructure, fleet, rehabilitation costs and terminal value (i.e., the range of capital costs are not a simple sum of the ranges, but rather confidence interval of the capital costs, which is a variable that is dependent on infrastructure, fleet, rehabilitation costs and terminal value).

User Impacts Analysis

User benefits are a key area of analysis for transport investments (Table 14 and Table 15). They capture how the investment would improve the welfare of transport network users or travelers. This includes both transit riders and all other transportation network users, since both groups could benefit from travelers switching to transit from other modes.

Model runs indicate that the level of congestion and auto operating costs for vehicles on the road would impact:

- **Existing Passengers:** This investment could provide a direct benefit to existing users, who have new opportunities to shift their journeys from other modes to DSBRT and benefit from faster, more frequent, and more reliable service. However, these users could also experience crowding disbenefits due to increase in new passengers.
- **New Passengers:** The investment could reduce the generalized cost of travel on transit. This could attract new users to transit that used to travel via other modes. These new users could receive a benefit equal to the difference in what they were willing to pay and the new generalized cost of travel on transit. As with existing passengers, new users could experience crowding disbenefits.
- **Auto Users:** The investment could attract some auto users off local roads; this could generate congestion reduction benefits (in addition to the benefits travellers receive when they switch to transit) when compared to both BAU scenarios for the remaining auto users.

Table 14: Summarizing User Benefits Compared to Investment BAU

User Type	Impact Type (2023 $)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Transit	Travel Time Savings	389 M	339 M	299 M	326 M
	Crowding Reduction	1 M	-13 M	-12 M	-12 M
	Reliability Improvement	52 M	47 M	24 M	30 M
Automobile	Congestion Reduction	149 M	87 M	85 M	83 M
	Operating Cost Reduction	31 M	19 M	19 M	18 M

Table 15: Summarizing User Benefits Compared to Standard BAU

User Type	Impact Type (2023 $)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Transit	Travel Time Savings	435 M	385 M	345 M	372 M
	Crowding Reduction	-2 M	-16 M	-16 M	-16 M
	Reliability Improvement	74 M	69 M	49 M	52 M
Automobile	Congestion Reduction	149 M	88 M	85 M	83 M
	Operating Cost Reduction	32 M	21 M	21 M	19 M

Transit travel time benefits are anticipated to be greatest for Option 1 when compared to both BAUs, and these benefits are increased with the Open Door policy. This is due to the greatest provision of BRT infrastructure. It is to be noted that the Open Door sensitivity compared to the Investment BAU is the only option presented that does not experience crowding disbenefits. The high volume of passengers attracted to DSBRT will be constrained by Closed Door operations. Open Door

operations allow DSBRT to accommodate some of the demand within Toronto, leading to higher ridership relative options, as shown in Figure 24 on page 48. However, the same figure indicates that the corridor will operate overcapacity near the Toronto and Durham border which leads to crowding disbenefits. Further review and optimization of the service plan could help minimize crowding issues, increasing benefits of the project.

All options and sensitivities are expected to have automobile congestion reduction benefits when compared to both BAUs, due to the mode shift of existing drivers to transit while still maintaining the same number of auto travel lanes in most of the corridor.

External Impacts

DSBRT is also expected to generate external (also known as 'societal') impacts. External impacts considered in the Economic Case include health, safety (accident reductions on the road network) and GHG emission reductions. External impacts are estimated based on the modal shift generated by the proposed investment. If travelers move from another mode to DSBRT, there is an impact equivalent to the externalities per trip on the new transit option, minus the externalities on their previously chosen mode,

Table 16 and Table 17 summarize health, safety and environmental impacts calculated based on change in automobile Vehicle Kilometres Travelled (VKT) compared to the Investment BAU and Standard BAU, respectively.

Table 16: Communicating Present Value of External Impacts Compared to Investment BAU

Impact Type	**Impact (2023 $)**	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Wellbeing	Health	67 M	31 M	27 M	26 M
	Safety	7 M	5 M	4 M	4 M
Environment	Greenhouse gases	7 M	4 M	3 M	3 M

Table 17: Communicating Present Value of External Impacts Compared to Standard BAU

Impact Type	**Impact (2023 $)**	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Wellbeing	Health	68 M	32 M	28 M	28 M
	Safety	8 M	5 M	5 M	5 M
Environment	Greenhouse gases	7 M	4 M	4 M	4 M

All options perform positively, where Option 1 is projected to have marginally higher benefits in terms of health, safety, and greenhouse gas reduction. These benefits more than double with Open Door operations. This is largely due in part to the increased ridership or travel-time savings associated with the Open Door scenario.

Table 18 and Table 19 below outline adjustments for project options. User costs/impacts are estimated, monetized, and presented in previous tables. These values are converted into societal costs relevant in a cost-benefit analysis context through these post-model adjustments below.

Table 18: Adjustments for Project Options Compared to Investment BAU

Adjustment	Correction Type (2023 $)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Resource Correction	Fare Revenue	45 M	24 M	23 M	22 M
	Fuel Tax Adjustment	-13 M	-8 M	-8 M	-7 M
	Auto Maintenance Adjustment	-2 M	-1 M	-1 M	-1 M

Table 19: Adjustments for Project Options Compared to Standard BAU

Adjustment	Correction Type (2023 $)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Resource Correction	Fare Revenue	47 M	26 M	25 M	25 M
	Fuel Tax Adjustment	-14 M	-9 M	-9 M	-8 M
	Auto Maintenance Adjustment	-2 M	-1 M	-1 M	-1 M

Economic Case Summary

The overall economic impacts of the different PDBC options and the sensitivity can be summarized through the BCR and NPV estimations, which are summarized in Table 20 and Table 21 below.

Table 20: Summarizing the Economic Case of Project options compared to Investment BAU (80% Confidence Intervals)

Impact Type	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Total Costs (2023$, PV)	**1,203 M to 1,338 M**	**1,192 M to 1,328 M**	**970 M to 1,061 M**	**1,076 M to 1,192 M**
Capital Costs	879 M to 983 M	879 M to 983 M	671 M to 742 M	778 M to 865 M
Operating Costs	222 M	212 M	235 M	216 M
Land Value Opportunity Cost	53 M to 150 M	53 M to 150 M	33 M to 97 M	43 M to 125 M
Total Impacts/Benefits	**703 M**	**520 M**	**449 M**	**477 M**
User Impacts/Benefits	622M	481M	414M	444M
External Impacts/Benefits	81M	39M	34M	33M
Adjustments	30M	15M	13M	14M
BCR	**0.54 to 0.6**	**0.39 to 0.44**	**0.43 to 0.47**	**0.40 to 0.45**
NPV (2023$)	**-602 M to -464 M**	**-792 M to -655 M**	**-598 M to -506 M**	**-700 M to -583 M**

Table 21: Summarizing the Economic Case of Project options compared to Standard BAU (80% Confidence Intervals)

Impact Type	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Total Costs (2023$, PV)	**1,398 M to 1,536 M**	**1,388 M to 1,526 M**	**1,166 M to 1,259 M**	**1,273 M to 1,389 M**
Capital Costs	1,084 M to 1,187 M	1,084 M to 1,187 M	874 M to 945 M	981 M to 1069 M
Operating Costs	195 M	185 M	208 M	189 M
Land Value Opportunity Cost	75 M to 172 M	75 M to 172 M	56 M to 119 M	65 M to 147 M
Total Impacts/Benefits	**771 M**	**588 M**	**520 M**	**545 M**
User Impacts/Benefits	688M	547M	483M	509M
External Impacts/Benefits	83M	41M	36M	36M
Adjustments	32M	16M	15M	15M
BCR	**0.52 to 0.57**	**0.4 to 0.44**	**0.43 to 0.46**	**0.41 to 0.44**
NPV (2023$)	**-731 M to -591 M**	**-920 M to -781 M**	**-723 M to -629 M**	**-827 M to -710 M**

The overall Investment BCR for the DSBRT project is below 1 for all PDBC options and the sensitivity compared to both BAUs, ranging from 0.39 to 0.6, while the NPV ranges between $-792 M and $-464M. While the Durham Scarborough BRT project does show significant benefits compared to the 2 BAU scenarios through various user benefits and external impacts, costs are expected to be disproportionately high compared to benefits achieved, resulting in a low BCR and negative net present value. Based on analysis completed, all options for both BAUs are anticipated to have a similar economic case, with estimated total economic benefits between $449 M to $588 M. The Open Door sensitivity increases the maximum possible economic benefits to $703M compared to Investment BAU and $771 M compared to Standard BAU, demonstrating a major increase in benefits due to higher ridership. This PDBC ran the full analysis of costs and benefits of Open Door on Option 1 only. However, Open Door benefits will be similar across all options. An estimate of the BCR for Options 2 and 3 is outlined in the following section.

It is important to highlight that the analysis in this PDBC is based on the latest Metrolinx Business Case Guidance (August 2021). Moreover, there were changes to base assumptions after the 2018 IBC (as described in Chapter 1) that influence the results of this PDBC. Major changes to the previous evaluation in the IBC include refined and updated capital and operating costs, and assuming Closed Door operations as the primary scenario. Economic benefits of the Open Door sensitivity are more aligned with the IBC estimates. Furthermore, the methodology for calculating the BCR has been refined from the IBC stage to capture additional metrics. Crowding benefits/disbenefits were not previously captured in the IBC and represent a disbenefit for DSBRT under Closed Door operations. Other aspects have either been removed, added, or refined in the calculation, although overall impact to BCR by these adjustments is insignificant.

Open Door Analysis for Other Options

The Open Door Sensitivity Test was fully modelled in comparison to Option 1 infrastructure (Full BRT implementation). This sensitivity demonstrated that a large driver of benefits for the DSBRT project is the implementation of the Open Door policy. While the same sensitivity test was not run for Options 2 and 3, Open Door benefits will provide similar benefits to the project regardless of investment option. An **off-model estimate** of these benefits was incorporated into each option's benefits to provide an approximate comparison in the BCRs between Options. It is important to note that this is a high order

magnitude estimate only and has not been developed by running the GGHMv4 or Monte-Carlo simulations as in the case of the Open Door Sensitivity for Option 1, therefore, only a single value is provided for each result instead of a range.

Table 22. Estimate of the BCR and NPV for Open Door Policy for Options 2 and 3.

Impact Type	**Sensitivity** ***Open Door (Option 1)***	**Option 2** ***Defer High-Cost Segments Open Door***	**Option 3** ***Prioritize High-Traffic Segments Open Door***
BCR compared to Investment BAU	0.54 to 0.60	0.63	0.59
BCR compared to Standard BAU	0.52 to 0.57	0.59	0.56

It is estimated that for Open Door policy would improve the project performance for both options. The Investment BCR for Option 2 and is 0.63 as compared to the range 0.43 to 0.47. Similarly for Option 3, it increases to 0.59 as compared to the range 0.4 to 0.45 for Closed Door.

6

Financial Case

Introduction

The Financial Case assesses overall financial impact of proposed investment options and sensitivities. 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 requirements to successfully deliver an investment. This includes a review of total revenue (fares) gained and expenditures (capital, lifecycle operating and maintenance) required over the investment's lifecycle and is considered incremental to the base case scenario. The Financial Case is structured in the following sections:

- **Assumptions:** summary of the core financial analysis assumptions and approaches used in this PDBC.
- **Capital Costs:** estimated capital costs for Durham-Scarborough Bus Rapid Transit (DSBRT).
- **Lifecycle operating and maintenance costs:** estimated operating and maintenance costs for DSBRT (60 years).
- **Incremental revenue impacts:** estimated changes to revenue from fares (or other ticketing products).
- **Financial case summary:** summary of the financial case for DSBRT.

Assumptions

The Financial Case summary was conducted based on modelling scenarios (PDBC Options and Sensitivity Scenarios) outlined in the Economic Case. Table 23 sets out assumptions used in the Financial Case.

Table 23: List of Financial Assumptions

Parameter	Value
Discount Rate	5.5% (nominal)
Inflation Rate	2%
Escalation Rates	Metrolinx applied sliding rates recommended by IO and MTO, from 6.5% for (2022) then, 6.5%, 5%, 5%, 3.5%, 3.5% and 3% for subsequent years, based on the assumed cash flow

Capital Costs

The largest component of overall project costs is the capital cost of building and delivering the proposed investment options. Capital cost estimations include the following elements:

- **Infrastructure:** Components related to new physical installations for the line to operate, such as stops, terminals, track elements, facilities, and systems, among others. This element also considers property acquisition allowances and professional design services.
- **Project Fleet:** The required number of buses for operations of DSBRT.
- **Rehabilitation:** Required major rehabilitation to restore infrastructure to ensure operational continuity throughout DSBRT's lifecycle.

- **Terminal Value:** This is the residual value of assets at the end of the analysis period.

Table 24 and Table 25 present the detailed discounted capital costs for DSBRT compared to the Investment BAU and Standard BAU, respectively. These are the incremental costs to deliver DSBRT. Table 26 and Table 27 present the undiscounted costs. These costs are based on funding status of segments as of April 2023. This PDBC does not account for any potential budget pressures to funded segments as those segments are advanced.

Table 24: Capital Costs in Financial Terms Compared to Investment BAU, Discounted

Capital Costs (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Infrastructure	980 M	980 M	675 M	834 M
Project Fleet[32]	130 M	130 M	142 M	134 M
Rehabilitation	68 M	68 M	48 M	59 M
Terminal Value	-9 M	-9 M	-6 M	-7 M
Total Capital Costs	**1,170 M**	**1,170 M**	**859 M**	**1,020 M**

Table 25: Capital Costs in Financial Terms Compared to Standard BAU, Discounted

Capital Costs (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Infrastructure	1,230 M	1,230 M	925 M	1,084 M
Project Fleet[30]	116 M	116 M	127 M	119 M
Rehabilitation	87 M	87 M	67 M	77 M
Terminal Value	-11 M	-11 M	-8 M	-10 M
Total Capital Costs	**1,421 M**	**1,421 M**	**1,110 M**	**1,271 M**

Fleet renewal is assumed to be every 12 years. Deferral of implementation of some segments will minimize the initial investment required by $150 - $311 million in comparison to full implementation of the corridor (Option 1). Option 1 and Option 1 Open Door require the same initial capital investment.

Table 26: Capital Costs in Financial Terms Compared to Investment BAU, Undiscounted

Capital Costs (Undiscounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Infrastructure	1,262 M	1,262 M	865 M	1,072 M
Project Fleet	808 M	808 M	877 M	831 M
Rehabilitation	602 M	602 M	424 M	516 M
Terminal Value	-344 M	-344 M	-242 M	-295 M
Total Capital Costs	**2,328 M**	**2,328 M**	**1,924 M**	**2,125 M**

[32] Fleet costs include the purchase, refurbishment, and renewal of fleet throughout the lifecycle of the project.

Table 27: Capital Costs in Financial Terms Compared to Standard BAU, Undiscounted

Capital Costs (Undiscounted $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Infrastructure	1,549 M	1,549 M	1,153 M	1,360 M
Project Fleet	715 M	715 M	785 M	738 M
Rehabilitation	764 M	764 M	586 M	679 M
Terminal Value	-436 M	-436 M	-335 M	-388 M
Total Capital Costs	**2,593 M**	**2,593 M**	**2,189 M**	**2,390 M**

Operating and Maintenance Costs

Operating and Maintenance (O&M) costs of the PDBC options and sensitivities were compared to both BAUs (Table 28 to Table 31) These costs cover all aspects of operating DSBRT, including staffing and administration, in addition to vehicle and station maintenance. There are also operating cost impacts due to changes in the bus network in both Durham Region and City of Toronto.

Table 28: Operating and Maintenance Cost in Financial Terms Compared to Investment BAU, Discounted

Operating Costs (Discounted $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Total Operating and Maintenance Costs	227 M	216 M	240 M	221 M

Table 29: Operating and Maintenance Cost in Financial Terms Compared to Standard BAU, Discounted

Operating Costs (Discounted $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Total Operating and Maintenance Costs	199 M	189 M	212 M	193 M

Table 30: Operating and Maintenance Cost in Financial Terms Compared to Investment BAU, Undiscounted

Operating Costs (Undiscounted $)	**Sensitivity Open Door**	**Option 1 Full BRT**	**Option 2 Defer High-Cost Segments**	**Option 3 Prioritize High-Traffic Segments**
Total Operating and Maintenance Costs	1,759 M	1,677 M	1,856 M	1,710 M

Table 31: Operating and Maintenance Cost in Financial Terms Compared to Standard BAU, Undiscounted

Operating Costs (Undiscounted $)	**Sensitivity** ***Open Door***	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Total Operating and Maintenance Costs	1,544 M	1,462 M	1,641 M	1,495 M

Option 1 has the lowest overall O&M costs due to having the quickest end-to-end travel time, resulting in fewer vehicles being required for operation. Option 2 has the longest end-to-end travel time, resulting in the highest O&M costs of all options. Open Door has slightly higher O&M costs than Option 1 Closed Door due to per rider costs (e.g., fare collection and call centre operations), since Open Door has substantially higher ridership. These costs may be further refined in the future.

Revenue Impacts

Revenue impacts provided in Table 32 and Table 33 were derived from the transportation demand model used to estimate ridership. Incremental revenue impacts include revenue resulting from changes in fares paid and number of trips taken.

Table 32: Incremental Revenue for Project options compared to Investment BAU

Revenue (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Incremental Fare Revenue	-9 M	-53 M	-45 M	-43 M

Table 33: Incremental Revenue for Project options compared to Standard BAU

Revenue (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Incremental Fare Revenue	-1 M	-46 M	-38 M	-35 M

Incremental revenue for all options and sensitivities compared to both BAUs is negative. This is due to the anticipated significant shift of passengers from GO train and GO bus to DSBRT. DSBRT's average passenger fare is a flat fare whereas GO transit is distance-based, resulting in passengers paying about 25% less on DSBRT compared to GO transit. Despite overall increase in transit ridership, loss of the larger fare is not recovered, resulting in negative incremental revenue. Open Door has a lesser negative impact to overall incremental fare revenue due to substantially higher ridership.

Funding Sources

The majority of the DSBRT corridor is currently unfunded, except for ICIP-funded segments in Durham Region which received funding approval in 2021. A concept of operations is being developed to inform distribution of operating costs. A project funding and financing approach is currently under consideration with all levels of government. This business case analysis is provided to inform funding decisions for unfunded segments of the corridor.

Financial Case Summary

Table 34 and Table 35 provide a summary of the overall financial impact of the investment compared to Investment BAU and Standard BAU, respectively.

Table 34: Financial Case Cost Summary of Project Options Compared to Investment BAU

Financial Case Metric (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Revenue Impacts	-9 M	-53 M	-45 M	-43 M
Capital Costs	1,170 M	1,170 M	859 M	1,020 M
Operating and Maintenance Costs	227 M	216 M	240 M	221 M
Total Costs	**1,220 M**	**1,210 M**	**985 M**	**1,093 M**
Residual Value of Land	177 M	177 M	114 M	148 M
Net Revenue	**-1,229 M**	**-1,263 M**	**-1,030 M**	**-1,136 M**
Total Cost Recovery Ratio	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**

Note: Total Costs are estimated as sum of all capital costs and operating less Residual Value of Land.
Net Revenue is estimated Revenue less Total Costs.

Table 35: Financial Case Cost Summary of Project Options Compared to Standard BAU

Financial Case Metric (Discounted $)	**Sensitivity** *Open Door*	**Option 1** *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
Revenue Impacts	-1 M	-46 M	-38 M	-35 M
Capital Costs	1,421 M	1,421 M	1,110 M	1,271 M
Operating and Maintenance Costs	199 M	189 M	212 M	193 M
Total Costs	**1,413 M**	**1,402 M**	**1,177 M**	**1,286 M**
Residual Value of Land	208 M	208 M	145 M	178 M
Net Revenue	**-1,414 M**	**-1,448 M**	**-1,215 M**	**-1,321 M**
Total Cost Recovery Ratio	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**

Note: Total Costs are estimated as sum of all capital costs and operating less Residual Value of Land.
Net Revenue is estimated Revenue less Total Costs.

The net revenue of all PDBC options and sensitivities is projected to fall within the -$1,030 M to -$1,263 M range compared to the Investment BAU, and -$1,215 M to -$1,448 M range compared to Standard BAU. The net revenue loss of Option 2 is expected to be the lowest when compared to both BAU scenarios due to the lowest capital costs, however Option 2 has the highest operating costs of all options and greater negative revenue impacts than Option 3 and the sensitivity. The highest operating costs are a result of more stops to maintain and less travel-time savings, resulting in longer running times.

Each option and sensitivity has a different Total Cost Recovery Ratio, however, all are negative and shown as All Loss in the tables above.

7

Deliverability and Operations Case

Introduction

The Deliverability and Operations Case analyzes the delivery, operations and maintenance, and service plans for the Durham-Scarborough Bus Rapid Transit (DSBRT) project, as well as any issues that should be considered during the continued development of the project. This includes delivering the project from original concept through to planning, design, environmental assessment, stakeholder engagement, procurement, construction, and operations. This chapter includes the following sections:

- **Project Delivery:** summary of project governance and of the plans and approach to construct and deliver required infrastructure for DSBRT.
- **Operations and Maintenance Plan:** an overview of the proposed operations and maintenance plan for DSBRT.
- **Deliverability and Operations Case Conclusions:** a summary of the case including a review of key risks and issues for future consideration.

The Deliverability and Operations Case is aligned with the draft Concept of Operations, which outlines preliminary requirements for DSBRT operations. The Concept of Operations should be reviewed as the project evolves, deliverability model advances, and roles/responsibilities for each project partner are better delineated.

Project Delivery

This section explains DSBRT project governance, key project components and assumptions, and other management/delivery arrangements necessary to deliver the project successfully. This section comprises the following sub-sections:

- Project Sponsor and Governance Arrangements;
- Major Project Components;
- Fleet Requirements;
- Constructability Review/Construction Impacts; and
- Environmental Assessment Requirements.

Project Sponsor and Governance Agreements

Project partners for DSBRT include Metrolinx, Durham Region, DRT, City of Toronto, and TTC. Metrolinx, the regional transportation agency, is responsible for the project's planning phase to inform decision-makers on the next phases of the project, but currently has no mandate beyond this current phase of work.

Under the in-delivery segments of DSBRT (8.5km), the overall responsibility of the delivery of the ICIP-funded segments is with Durham Region, who is working closely with the Province and the Federal government under the terms of its agreement.

The accountability structure is detailed in Table 36.

Table 36: Roles and Responsibilities for Delivery

Organization	Role
Metrolinx	Metrolinx bears responsibility for the Planning phase of the project, with a primary objective of optimizing project benefits and value management. Metrolinx's role is to provide decision-makers with evidence-driven information to enable well-informed choices for any upcoming phases of the project, and currently has no mandate beyond this current phase of work.
Operator(s)	During project development, the operator is responsible for providing review through project planning and delivery, including operational and design requirements (e.g., rules and standard operating procedures). During the operations phase, the operator is responsible for implementing the rules and standard operating procedures, and responsible for stop and vehicle operations across the line.
Durham Region/DRT	Durham Region/DRT is a key partner regarding the impact and integration of the DSBRT with the public realm and municipal infrastructure within Durham. Durham Region/DRT participates in providing design inputs and requirements that relate to or affect the services they provide. Specific requirements that will have to be implemented during design and operations phase require coordination with Durham Region/DRT. Durham Region/DRT is responsible for delivery of currently ICIP-funded segments of the corridor within Durham Region.
City of Toronto/TTC	The City of Toronto/TTC is a key partner regarding the impact and integration of the DSBRT line with the public realm and municipal infrastructure within Toronto. The City of Toronto/TTC participates in providing design inputs and requirements that relate to or affect the services they provide. Specific requirements that will have to be implemented during design and operations phase require coordination with the City of Toronto/TTC.
Civil Contractor(s)	Civil contractors are the design and construction contractors for DSBRT civils work, including all conflicting underground utilities, both public and private. This encompasses all disturbed roads, curbs, sidewalks, and hard/soft landscape areas, as well as all required structures and retaining walls. Civil contractors will prepare training documentation and operations maintenance manuals for civil contractors' infrastructure.
GO Transit	GO Transit is a regional transit service provider with service connecting Durham Region and City of Toronto. The detailed design/delivery of DSBRT will need to protect for GO Bus non-revenue operation within the guideway.
PRESTO	PRESTO is the fare payment and collection system used for transit in the GTHA, including DRT, TTC and GO Transit services. The system will be used for DSBRT.

Major Project Components

Major components for the DSBRT system are listed in Table 37, including information about alignment, fleet, and stops. Note that some details are likely to change with the finalization of design. As the sensitivity analysis (Open Door) assumes full BRT implementation, most of the findings of Option 1 are applicable to the sensitivity analysis.

Table 37: Major Capital Components for Project options

Component	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Rapid Transit Alignment	36 km corridor 35 km bus-only lanes Combination of centre median and curbside bus-only guideway Median guideway along whole corridor except: - Mixed traffic lanes between Morningside Avenue along Ellesmere Road to Military Trail - Mixed traffic lanes between Raspberry Road along Kingston Road to Altona Road - Curbside bus lanes between Waverly Street along King Street West/Bond Street West to Simcoe Street	36 km corridor 28 km bus-only lanes Combination of centre median and curbside bus-only guideway Median guideway along whole corridor except: - Mixed traffic lanes between Orton Park Road along Ellesmere Rd to Military Trail - Mixed traffic lanes between Raspberry Road along Kingston Road to Altona Road - Mixed traffic lanes between Notion Road along Kingston between to Rotherglen Road - Mixed traffic lanes between McQuay Boulevard along Dundas Street to Anderson Street/Hopkins Street - Curbside bus lanes between Waverly Street along King Street West/Bond Street West to Simcoe Street	36 km corridor 29 km bus-only lanes Combination of centre median and curbside bus-only guideway Median guideway along whole corridor except: - Mixed traffic lanes between Morningside Avenue along Ellesmere Road to Kingston Road - Mixed traffic lanes between Raspberry Road along Kingston Road to Altona Road Curbside bus lanes between Waverly Street along King Street West/Bond Street West to Stevenson Road - Mixed traffic lanes between Stevenson Road along King Street West/Bond Street West to Simcoe Street
Stops and Platforms	49 stops in each direction. Combination of centre and curbside platforms and stop at Scarborough Centre Station Platforms between 20m and 40m in length	52 stops in each direction (40 BRT stops plus 12 existing standard stops in mixed-traffic segments)	56 stops in each direction (42 BRT stops plus 14 existing standard stops in mixed-traffic segments)
Transit signal priority (TSP)	Selected DRT fixed route buses (PULSE) are equipped with TSP radios, which communicate TSP requests to roadside modules via 900MHz radios. All TTC fixed route buses are equipped with TSP transponders. Selected signalized intersections are equipped with TSP antennas installed in-pavement. Further evaluations are required to assess TSP implementation for DSBRT, including cross-boundary integration.		

Fleet

DSBRT is anticipated to use a combination of existing fleet and new buses to be procured separately by its respective operators. For the purposes of PDBC reference, vehicles were assumed to be consistent with buses used on existing TTC and DRT routes. Diesel vehicles are assumed, due to the limitations of zero emission vehicles for a corridor of this length however there are initiatives, independent of this business case, underway by all operators exploring zero emission vehicles. The service plan is agnostic of operator. This was done to provide an indication of vehicle capacities and how different operating concepts impact fleet requirements.

Vehicle requirements vary between DSBRT options due to reduction in travel-time savings associated with fewer transit-only lanes (Option 2 requires a higher number of buses in comparison to Options 1 and 3). Fleet requirements for Option 1 are the same under Open Door and Closed Door service integration assumptions.

Table 38: Fleet Requirements for Service Concepts

Fleet Requirements	**Option 1** ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Service	Two branches – Main branch Scarborough Centre Station to Downtown Oshawa and Salem Branch		
Reference Vehicle	18m articulated diesel bus, 78 person peak capacity, typically 3 doors		
Peak Headway	3.75 minutes on main branch; 12 minutes on Salem branch		
In-service	71 buses	74 buses	72 buses
Spare	15 buses	15 buses	15 buses
Total vehicles	86 buses *(25 net new from Investment BAU)*	89 buses *(28 net new from Investment BAU)*	87 buses *(26 net new from Investment BAU)*

Constructability Review/Construction Impacts

Constructability review describes the degree of construction complexity and any constraints or modifications to existing assets required to accommodate the DSBRT project. In summary, the options have the following key differences in comparison to full implementation of DSBRT (Option 1 and sensitivity):

Option 2 results in the lowest number of properties impacted (approximately 195 less than Option 1), with most of the reduction located in Durham Region. Because this option is deferring high-cost segments, it is also minimizing utility relocation needs. This option also reduces constructability complexity because it defers the widening in Whitby (CPKC) rail crossing.

Option 3 also results in fewer property impacts (approximately 162 less than Option 1), with most of the reduction located in the City of Toronto. Utility relocations are also minimized, but not at the same scale as Option 2.

Options 1 and 3 require coordination on the rail crossing area in Whitby to minimize disruptions to rail operations, which could impact project schedule. Further construction considerations are outlined in Table 39.

Table 39: Key Construction Considerations for Project Options

Impact	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Alignment Construction	Construction is planned to occur in phases to construct 34 km of transitways. This option sees the complete delivery of the project, as detailed in the EPR (Figure 37).	Construction is planned to occur in phases to construct 25 km of transitways. This option aims to optimize capital spending.	Construction is planned to occur in phases to construct 27 km of transitways. Areas with existing congestion are proposed to be prioritized.
Stops and Platforms	Requires that **49 new BRT stops and platforms** be installed across the corridor. Select stops may be customized to highlight local cultural heritage features, such as Pickering Village and Downtown Whitby.	Requires that **40 new BRT stops and platforms** be installed across the corridor. **24 existing stops and platforms are assumed to be used in mixed traffic areas, so** customized features are minimal.	Requires that **42 new BRT stops and platforms** be installed across the corridor. Select stops may be customized to highlight local cultural heritage features, such as Pickering Village and Downtown Whitby. **26 existing stops and platforms are assumed to be used in mixed traffic areas**
Property Impacts	Property is required at some major intersections to allow for daylighting and to permit stops and platforms. Smaller frontages are required in some midblock locations, which are generally in-line with the respective Official Plan right-of-way widths. Exact property requirements will be confirmed during detailed design, as per the EPR.		
	There are five pinch point locations where the right-of-way is constrained, where more properties may be required: • Ellesmere Road in Scarborough (Military Trail to Meadowvale Road and Meadowvale Road to Kingston Road); • Pickering Village (Ajax); • Downtown Whitby; and • Downtown Oshawa. **This Option will have the greatest property impacts**. Assuming Durham Region will have acquired property needed in the Investment BAU scenario (in-delivery ICIP-funded segments), the project would impact approximately 551 properties.	This option reduces property impacts in two pinch point locations: Pickering Village and Downtown Whitby. In these areas, transit will operate in mixed traffic. **This Option will have the least property impacts,** with **reduced property impacts** primarily in the pinch point location **in Durham.** Assuming Durham Region will have acquired the properties needed in the Investment BAU scenario (in-delivery ICIP-funded segments), the project would impact approximately 356 properties.	This option reduces property impacts along the Ellesmere Road and Downtown Oshawa pinch point locations, by operating in mixed traffic. This Option will have comparable property impacts within Ajax and Whitby as the Full BRT scenario, and **reduced property impacts within Toronto and Oshawa**. Assuming Durham Region will have acquired property needed in the Investment BAU scenario (in-delivery ICIP-funded segments), the project would impact approximately 389 properties.
Traffic Staging	A Traffic Management and Control Plan will be prepared during detailed design to ensure adequate operations for general traffic and local transit along the corridor. Although full closures are not suggested, partial land closures will need to be implemented for staged construction. Transit stop locations may need to be temporarily relocated during construction, and cyclist and pedestrian access routes may need to be modified.		
	Plan for construction staging is required for **27 km of transit lanes** under the Investment BAU, which is greater in the Standard BAU.	Plan for construction staging is required for **19 km of transit lanes** under the Investment BAU, which is greater in the Standard BAU.	Plan for construction staging is required for **21 km of transit lanes** under the Investment BAU, which is greater in the Standard BAU.

Impact	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Utility Works	Existing utilities within and across the corridor will require relocation to address conflicts with DSBRT infrastructure and permit roadway widening. Utilities within the proposed stop locations will generally be relocated to minimize disruption during maintenance and repair activities.		
	This option requires the **most extensive utility relocations** as it contains the most median-centre operations.	This option requires the **least utility relocation** as it has the least amount of centre medians.	This option requires more utility relocations than Option 2 but fewer utility relocations than Option 1.
Future Proofing	This option represents the full build-out envisioned as part of the EPR. The preliminary design makes use of existing transit facilities constructed along the corridor, wherever possible.	Provisions will need to be incorporated during detailed design to enable the remaining 9 km/three segments to be delivered at a future date with minimal disruption.	Provisions will need to be incorporated during detail design to enable the remaining 7 km/two segments to be delivered at a future date with minimal disruption.
Rail Crossings	**Two rail crossings will need to be replaced** to allow the road to be widened to accommodate DSBRT in **Pickering Bridge (CN) and Whitby (CPKC).** Rail operations will need to be maintained at both locations, which may necessitate a temporary track detour or a temporary closure. The CN bridge in Pickering is within the extents of the Investment BAU as Durham Region is undertaking the project using ICIP funding.	**The Pickering Bridge (CN)** will need to be replaced to allow the road to be widened to accommodate DSBRT. The replacement of this bridge is included within the Investment BAU as Durham Region is undertaking the project using ICIP funding.	**Two rail crossings** will need to be replaced to allow the road to be widened to accommodate DSBRT in **Pickering Bridge (CN) and Whitby (CPKC).** Rail operations will need to be maintained at both locations, which may necessitate a temporary track detour or a temporary closure. The CN bridge in Pickering is within the extents of the Investment BAU as Durham Region is undertaking the project using ICIP funding.

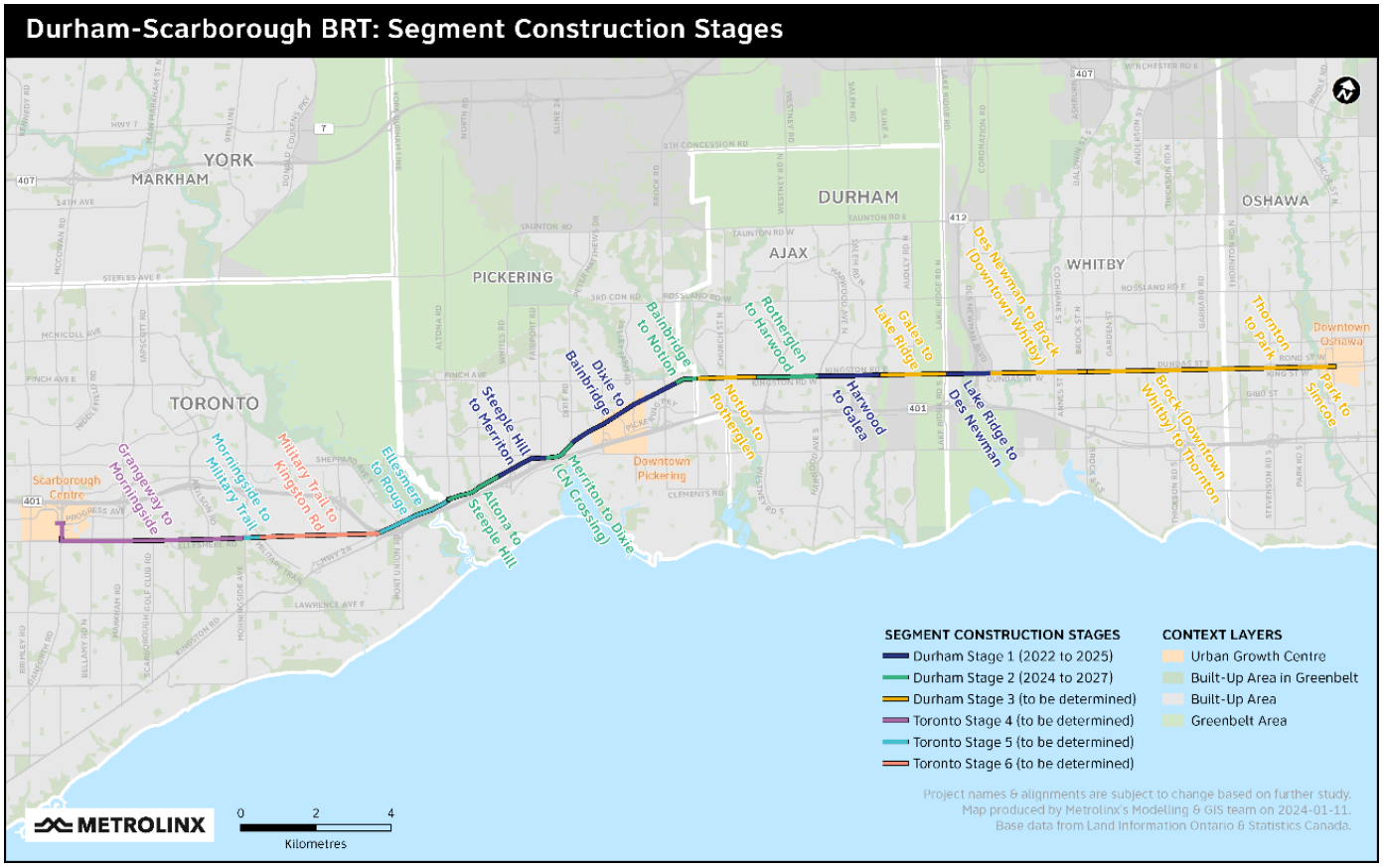
Construction phasing (Figure 37) incorporates the expected timing of in-delivery segments and proposes prioritization of areas with existing congestion to be delivered first. Some segments require further coordination due to concurrent projects (further details can be found in Table 47). As of March 2024, these are the key areas identified for coordination in the next phase:

- **Durham Stage 3:** The area in downtown Oshawa may require further implementation coordination with the following projects:
  - Simcoe Street Rapid Transit: Should this project advance, further refinements on the DSBRT terminus area in downtown Oshawa may be required.
  - Lakeshore East GO Rail - Bowmanville Extension: As the Ritson Road GO station design advances, further refinements on service connection and terminus requirements will need to be coordinated, including how implementation schedule would fit in the overall construction phasing of DSBRT.
- **Toronto Stage 4:** This segment requires coordination for refining design and construction timing alongside with two other components:
  - Scarborough Rapid Transit bridge: Decommissioned in 2023, the PDBC assumed that the bridge remains. Should a decision on demolition occur, the design and constructability should be reviewed.

- Scarborough Centre Station: Western terminus of the DSBRT. Should any schedule changes occur, an interim solution for DSBRT should be considered.

- **Toronto Stage 2:** should the EELRT project advance into implementation, this segment requires coordination for design refinement and implementation timing.

Figure 37: Durham-Scarborough BRT: Segment Construction Stages



Environmental Assessment Requirements

Table 40 describes the environmental assessment process required for each of DSBRT project options, including any completed or outstanding requirements. The full list of commitments to future work can be found in the 2022 Environmental Project Report[33].

Table 40: Environmental Assessment Requirements

	Option 1 ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
EA Process and consultation requirements	TPAP approved and Grangeway EPR addendum No consultation commitment changes Indigenous Nations/Communities commitments		
Changes from the 2022 EPR	N/A	25 km of bus-only lanes to be delivered initially, less the 8.5 km of ICIP segments.	27 km of bus-only lanes to be delivered initially, less the 8.5 km of ICIP segments.

Durham Region will be involved in the operations and maintenance of the roadways and guideways. For segments in-delivery, Durham Region will refine snow clearing, and salting practices to reduce the overall salt application on roadways. In the event that Metrolinx funds and delivers segments of the DSBRT, Metrolinx is committed to consulting with Indigenous communities regarding any decision or action that may have the potential to adversely impact Aboriginal and/or Treaty rights. This includes but is not limited to future environmental studies and fieldwork related to natural heritage, cultural heritage, and archaeology, as well as design refinements, and mitigation measures during construction.

Operations and Maintenance Plan

This section provides an overview of the current Operations and Maintenance Plan for DSBRT, which comprises the following subsections:

- Operations Plan Overview.
- Operations and Maintenance Responsibilities.
- Service and Maintenance Plan.
- Human Resources Implications.

Operations Plan Overview

DSBRT will connect Durham Region to the Toronto subway network via Scarborough Subway Extension (SSE) to Scarborough Centre Station for seamless connections with DRT, TTC and GO Transit services. Further details on the service plan assumed for the PDBC can be found in Chapter 3.

DSBRT Operations

The following is assumed for all options (including sensitivity):

[33] The 2022 Environmental Project Report is available here: https://www.metrolinx.com/en/projects-and-programs/durham-scarborough-brt/studies

- DSBRT peak headways will be 3.75 minutes on the main branch and 12 minutes on the Salem branch during peak periods, for a combined frequency of 21 buses per hour west of Salem Road, with off-peak headways between 10-30 minutes on each branch.
- Some TTC services will also operate in the guideway in the Toronto segment of the corridor, allowing for easy transfers to routes throughout the Toronto corridor.
- Fare collection will occur within fare paid zones using the PRESTO smart card fare collection system, requiring proof of payment within the fare paid zone. This means that customers would validate a fare at the stop prior to boarding the bus, minimizing bus dwell times, and improving customer experience.

Each PDBC option and sensitivity was evaluated based on service during the peak period; however, service levels will differ during the early morning, midday, night, and weekend service periods. Table 41 and Table 42 shows the weekday and weened service plan assumptions, respectively, used for estimating operating costs, which reflect the level of service expected to meet the 2041 projected demand.

This service plan has been refined from the DSBRT IBC service plan that assumed 5-minute headways during peaks, for the purpose of ridership modelling at the PDBC stage. The service plan is subject to further change through ridership monitoring as data on actual demand becomes available.

Table 41: Weekday service plan assumed for the PDBC (headways)

Headway – Weekday (minutes)	Early Morning	AM Peak	Midday	PM Peak	Evening	Night
From	5:00 AM	7:00 AM	9:00 AM	3:00 PM	7:00 PM	10:00 PM
To	7:00 AM	9:00 AM	3:00 PM	7:00 PM	10:00 PM	1:00 AM
DSBRT Mainline	30	3.75	10	3.75	15	30
DSBRT Salem Branch	0	12	20	12	0	0

Table 42: Weekend service plan assumed for the PDBC (headways)

Headway – Weekend (minutes)	Early Morning	Morning	Afternoon	Early Evening	Late Evening
From	6:00 AM	8:00 AM	12:00 PM	7:00 PM	10:00 PM
To	8:00 AM	12:00 PM	7:00 PM	10:00 PM	1:00 AM
DSBRT Mainline	30	10	10	10	15
DSBRT Salem Branch	0	30	30	30	0

Table 43 details key distinctions of the proposed Operations Plans for each of the DSBRT options and sensitivities considered in this PDBC.

Table 43: Key Distinctions in the Operations Plan for Project Options

	Option 1 ***Full BRT***	**Option 2** ***Defer High-Cost Segments***	**Option 3** ***Prioritize High-Traffic Segments***
Service integration	DRT pickups and drop-offs, as well as DRT-TTC transfers can occur at any stop in Toronto	• Closed Door policy within Toronto, pickups and drop-offs for DRT can occur at Scarborough Centre Station • DRT-TTC transfers are limited by direction due to Closed Door policy	
BRT Operations	Signalized crossings will be provided for all DSBRT stops	Signalized crossings will be provided for all new DSBRT stops. Some standard stops at minor intersections in delayed segments are not planned to have signals	

The following aspects were identified in the PDBC as impacts to operations, including:

- Deferring implementation of segments (Options 2 and 3) impacts total travel times and can impact on-time performance/service reliability. This can also have effects on terminus requirements, for reasons such as multiple vehicles arriving at the same time during peak period.
- Ridership demand builds up at the Pickering-Toronto border, resulting in passenger crowding on-board BRT vehicles.
- There is a high volume of buses in the Toronto segment, which can impact average speeds in the guideway. This can result in longer travel times and impact on-time performance/service reliability.
- The cross-boundary service will require coordination between project partners and across jurisdictions to ensure seamless operations and customer experience along the entire corridor.
- Refinements are recommended to improve and optimize the operations of DSBRT, as follows:
- Further assessment on impacts to reliability, travel time, and terminus requirements for Options 2 and 3.
- Implementation of Open Door policy change can bring substantial relief to crowding issues. Assessment of a TTC cross-boundary service to relieve passenger crowding and optimize the number of buses in the guideway during peak periods.
- Review and refinement of the service plan (TTC and DRT) to improve aspects such as guideway speeds in Toronto, fleet requirements, and passenger crowding.
- Advancement and refinement of the concept of operations, including cross-boundary and inter-agency coordination for aspects such as traffic signal timings and transit priority operations.
- Review and confirm terminus requirements (bus bays and layovers) to ensure appropriate capacity for the service frequency being proposed. This includes incorporation of the latest information on the bus terminal at the Scarborough Centre Station (SSE) and status of Ritson Road GO. It is also important to a potential need for interim solutions if there are changes to timelines for implementation of terminus infrastructure.
- The EPR documents several transportation-related commitments with respect to the full BRT (Option 1). Should the preferred option significant vary in terms of continuous guideway length, updating the traffic analysis may need to be considered to understand if there are any changes to the operating conditions of the corridor.

Operations and Maintenance Responsibilities

Table 44 describes the relevant possible operations and maintenance responsibilities for the DSBRT project. The accountable party of each responsibility will be defined during the early development stages of the DSBRT project. Major partners in this process are Metrolinx (including GO Transit and PRESTO), DRT, Durham Region, TTC, City of Toronto, contractors, and development companies. Specific roles will be defined as the project advances.

Table 44: Operations and Maintenance Roles and Responsibilities

Functions	All options and sensitivities
Operations	Revenue vehicle operation and maintenance Staffing of Operations Control Centre (OCC) Operation of Maintenance and Storage Facility (MSF) Custodial maintenance of stops, vehicles, guideway, and roadway Transit Signal Priority (TSP) operations and maintenance Staffing and management of field staff (i.e. System Ambassadors, Transit Supervisors, and Fare Enforcement and Security Special Constables) Provide bus substitution services during planned and unplanned service disruptions
Safety and Security	Passenger safety and security Security of DSBRT infrastructure Liaising with emergency services
Customer Service	Operation of lost and found facility Dissemination of DSBRT and interchanging transit service information (i.e., TTC and GO Transit) through the passenger visual information system Media relations related to DSBRT including social media, TV, and radio Management of project website Responding to customer enquiries through email and telephone
Fares	Fare Collection Systems (ticket vending machines) and Fare Collection (collect cash, distribute PRESTO cards) Fare enforcement

Service and Maintenance Plan

Table 45 outlines the expected service and maintenance responsibilities for each of DSBRT options. A complete maintenance plan to deliver the project will be developed as DSBRT evolves.

Table 45: Service and Maintenance Plan for Project Options

Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Expected responsibilities include operating labour, and maintenance of vehicles, stops, guideway and BRT facilities		
	Reduction in stops and guideway maintenance costs but greater transportation operations costs from Option 1 due to reduced travel-time savings	Slight reduction in stops and guideway maintenance costs and transportation costs from Option 1

Human Resources Implications

Table 46 outlines the required role and staff by functional area. A complete staffing plan to deliver the project's operation and maintenance plan will be developed as DSBRT evolves.

Table 46: Human Resources Implications for Project Options

Functional Area	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Management, Business Administration, and Procurement	Management and administration Communications Trainers/HR/Staffing/Labour Relations Procurement and Contracts Financial and Commercial Health, Safety, Security, Quality and Environment		
Operations	Operations supervisors Operations of Revenue Vehicles Operations of MSF Operational performance and planning Customer service Fare enforcement and security	Reduction in ridership may require reduced number of staff for customer service and fare enforcement Reduction in travel-time savings may require increased number of staff for operations of revenue vehicles	
Maintenance	Storage Vehicle maintenance Guideway and systems Asset engineering and maintenance planning/ infrastructure access	May require fewer number of guideway maintenance staff due to reduced guideway length	
Facilities	Custodial maintenance of stops, drivers, facilities, MSF, and vehicles Landscaping	May require fewer number of stop maintenance staff due to reduction in number of full BRT stops and other deferred infrastructure	

Procurement Plan

Compared to other forms of rapid transit, BRT construction is relatively straightforward to design and construct due to relative reduction of utility relocations in comparison to rail. However, specialised transit design is still essential for any type of rapid transit. Elements that may call for specialised BRT design expertise include BRT stops and transit interchanges, traffic intersection interface, and signal design.

There are several procurement options available to the Project Owner for DSBRT. For purposes of PDBC analysis, a traditional Design-Bid-Build (DBB) model was assumed to develop staging plans for construction, consistent with the approach Durham Region is using to deliver ICIP-funded segments. As more data emerges in detailed design, the selection of a procurement model may be reflective of numerous points of consideration in terms of:

- Cost certainty;
- Construction length, complexity, and anticipated schedule;
- Level of risk to be passed onto the private sector vs. retained risk;
- Level of prescriptiveness and involvement in decision making pertaining to construction methodology and impacts; design, materials, and aesthetics; operations and maintenance; and

- Consideration for any unique aspects to the project that could benefit from industry innovation that is not easily found in the region.

Deliverability and Operations Conclusions

Metrolinx bears responsibility for the Planning phase of the project, with a primary objective of optimizing project benefits and value management. Metrolinx's role is to provide decision-makers with evidence-driven information to enable well-informed choices for upcoming phases of the project with a to-be-identified delivery lead. No significant legislative changes are required for any of the options assessed, however, if there is a desire to maximize service capacity on the Toronto segment, policies on intra-Toronto operations would need to be updated to allow for Open Door operations, as observed in the results of the Open Door sensitivity analysis. In terms of project dependencies, DSBRT requires sufficient maintenance and Storage Facilities (MSF) capacity for the fleet, and requirements should be better understood in the next phase of this project.

The preceding sections of the Deliverability and Operations Case outline a preliminary approach for delivering, procuring, operating, maintaining, and managing DSBRT. A range of risks has been identified across these elements of the DSBRT project, which are presented in Table 47. The PDBC has not identified major risks that arise from this project; specific risks beyond what is presented in Table 47 should be further assessed in the next phase of this project.

Table 47: Durham-Scarborough BRT Delivery and Operations Risks

Risk Description	Risk Mitigation Approach
The design of Scarborough Centre Station (SCS) Bus Terminal, being the western terminus of Durham-Scarborough DSBRT, has a constrained footprint. The allocation of bus bays and layover bays may impact circulation on the site and the Durham-Scarborough DSBRT's ability to connect to SSE. This may result in operational impacts.	Review service plan to confirm requirements for SCS, with potential to optimize service in Toronto for both TTC and DRT, reducing total bus bay and layover requirements. In the absence of sufficient space, additional DSBRT layover may be allocated to downtown Oshawa, the eastern terminus.
The GO Rail extension to Bowmanville is funded, but there is no advanced information on station projects. A direct connection to Ritson Road GO may be requested, resulting in additional operational costs.	Conduct analysis to identify cost for direct connection to Ritson Road GO and make necessary changes to design if proceeding with this connection.
The cross-boundary operations between Toronto and Durham Region may result in governance clarity issues on ownership of different assets and responsibilities.	Establish a clear concept of operations that explicitly outlines each stakeholder's role, including customer service.
There are up to 49 buses per hour anticipated to operate in the guideway between SCS and Neilson Road, which will likely lead to bus-bus conflicts at stops. Realized bus speeds may be degraded.	Review service plan to confirm requirements within Toronto, with potential to optimize service for both TTC and DRT. Any TTC service plans used to formulate DSBRT corridor capacity assumptions are subject to consultation and board approval via TTC's Annual Service Planning process.
Working assumption is a Closed Door policy within the Toronto portion of the corridor. An Open Door policy would benefit the project but would require changes in legislation, which could result in schedule delay.	Identify ways to expedite Open Door policy if overall policy timing does not align with DSBRT opening year. Operate Closed Door system in absence or delay of legislation changes.

Risk Description	Risk Mitigation Approach
Eglinton East LRT (EELRT) is in earlier stages of planning and proposed to operate within a constrained portion of the corridor. Realized speeds may be reduced for DSBRT and corridor configuration may differ from the 30% preliminary design, resulting in cost, schedule, and operational impacts.	Conduct further analysis to ensure customers of both projects are not negatively impacted in terms of travel-time, connectivity, transfers, etc. Coordinate with City of Toronto on design of the planned EELRT to ensure ideal operating conditions for both projects.
GO transit buses require different infrastructure from standard buses and could be precluded from operating in the guideway in the future.	GO Transit should not duplicate municipal service and therefore would not use stops along corridor. Ensure design of guideway is sufficient to allow for non-revenue service of GO buses to operate within the guideway.
The Grangeway Avenue connection to the SCS bus terminal has confirmed the required right-of-way as part of the TPAP addendum. Additional right-of-way or infrastructure requirements could result in property impacts and additional design requirements.	The footprint is conservative and assumes SRT bridge is not demolished, in an attempt to passive protect for the worst-case scenario in terms of space.
It has not been confirmed whether the SRT bridge will be removed with the closure of Line 3. If the structures are not removed, there is a need to incorporate information of foundations to determine impacts to design which may result in cost increase and schedule delay.	Consider alternative configurations of active transportation infrastructure that will maximize efficiency of the cross-section, even in constrained locations.
Existing MSF capacity may be insufficient to house the new vehicles, requiring additional facilities for the new fleet. This would result in cost, schedule, and operational impacts.	Confirm capacity of current facilities by DRT and TTC and identify any additional storage requirements.
DRT does not currently have a fare enforcement team and some services operate in mixed-fare environments. Further evaluations are required to implement off-board fare collection.	Confirm the responsible party on fare collection and identify staffing requirements. Conduct further coordination between Durham Region/DRT and TTC/City of Toronto on developing a seamless system.
Although TSP is an important component of DSBRT performance, compatibility, and interoperability between DRT and TTC are seen as challenges due to operational differences. Further evaluations are required to assess TSP implementation for DSBRT.	Conduct further coordination between Durham Region/DRT and TTC/City of Toronto on developing a seamless system.
Zero emission buses are not yet effective at servicing a long-distance corridor such as DSBRT. Fossil fuel alternatives such as electrification of fleet would require additional charging infrastructure and would result in additional costs to replace or retrofit existing fleet.	Continue monitoring technology to determine whether fleet assumption will change and identify operational and infrastructure requirements of incorporating electrification in the corridor.
Supply of skills may be constrained due to many other capital projects underway. This may result in escalating costs for labour and materials due to competing local demand for resources, equipment supply (such as trucks), sub-contractor availability, and some material.	Develop a procurement plan that optimizes timing and accounts for supply of skills.

8

Business Case Summary

Introduction

This PDBC has advanced the planning, refinement, and optimization of the Durham-Scarborough Bus Rapid Transit (DSBRT), following the completion of the EPR, including the 30% preliminary design.

The PDBC considers three distinct investment options:

- **Option 1: Full BRT Implementation:** Full implementation of the DSBRT, following the 30% preliminary design;
- **Option 2: Defer High-Cost Segments:** Defer high-cost segments, deferring segments with above average capital costs and major property impacts with the goal of minimizing initial investment required; and
- **Option 3: Prioritize High-Traffic Segments:** Prioritize high-traffic segments, deferring segments that have lower traffic volumes with the goal of minimizing impacts to transit operations and customers, while minimizing initial investment required.

In addition, an Open Door sensitivity test[34] was applied to identify the effects of service integration of DSBRT between the Durham Region border and Scarborough Centre.

Key Findings

The following conclusions can be drawn from the PDBC analysis:

1. DSBRT will enable faster (14 to 19 min travel time savings) and more reliable connection from Downtown Oshawa to the Scarborough Subway Extension, serving multiple higher education institutions and future high-density population and jobs along the Highway 2-Ellesmere corridor.
    - **Intensification**: Demand will increase as **population and jobs growth in most municipalities are expected to increase by greater than 50%** (2016 to 2041), with Pickering expected to double population and jobs. The UTSC/Centennial College area will continue to be a driver of demand due to densification and new student housing.
    - **Equity**: Within a 10-minute walk of a DSBRT stop, 37% of the population are visible minorities. There are also approximately **4,600 existing and planned affordable housing units** within the same distance. The corridor **supports students**, with UTSC/Centennial College being a main driver of demand that will continue to grow with expected densification and new student housing planned for this area. The corridor also **supports essential workers**, particularly those connecting with Markham Road – a north/south corridor with major essential employment areas.
2. **Cross-boundary service integration and regional implementation** of BRT infrastructure would contribute to the project's success in meeting demand and realizing benefits (e.g. reliability, travel time savings).
    - **Building Capacity:** DSBRT infrastructure substantially increases in capacity, expanding the ridership from 3,100 boardings in the morning one-hour peak (Investment BAU) to 4,300 boardings under a Closed Door scenario. Significant drivers of ridership are the connection

[34] The sensitivity analysis assumes full implementation of BRT infrastructure, similar to Option 1

with SSE and with UTSC/Centennial College; therefore, **infrastructure implementation in Toronto is critical for benefit realization.**

- Service Integration: An **Open Door service integration model substantially increases to DSBRT's benefits** due to increased capacity in Toronto, resulting in more than 20% additional boardings in comparison to Closed Door: 5,300 (AM peak) and 45,700 (daily).

3. Further refinements can be made to support enhancing the DSBRT benefit-cost ratio.
    - **Project Refinement:** Opportunities to value engineer the project can help refine the initial investment that is required. **This can help maximize the project's benefits**, by tailoring the initial delivery to those sections that enhance operational and passenger benefits the most.
    - **Service Planning:** Further **adjustments to the service strategy can help improve benefits** for DSBRT, particularly concerning crowding.

Investment Review

The PDBC was developed following the Metrolinx Business Case Manual Volume 2: Guidance (August 2021) approach. The PDBC uses four cases, which are summarized below. All options are compared against a Business As Usual (BAU), which represents the future if no rapid transit is built by 2041.

Strategic Case

The Strategic Case outlines how the investment options will support and help achieve regional and local development objectives for transportation, economic development, and sustainable and healthy communities along the Highway 2-Ellesmere corridor. All investment options provide a benefit over the BAU.

The key findings of the strategic case are summarized by goal:

- **Strong Connections:** DSBRT will connect people to the places that improve their lives, such as homes, jobs, community services, parks and open spaces, recreation, and cultural activities. All DSBRT investment options will attract new trips (1,200 to 2,400 during the 7-hour peak in 2041), provide a faster journey (saving 10 to 13 hours per passenger per year), and improve connections to frequent transit routes. All options are beneficial in comparison to both BAU scenarios, with Option 1 having 1,300 net new daily AM/PM peak trips, and Options 2 and 3 having 1,200 net new daily peak trips. The sensitivity analysis (Open Door) results in 2,400 net new daily AM/PM peak trips (almost double all options), demonstrating a substantial increase in benefits due to this policy.
- **Complete Travel Experiences:** DSBRT will enable an easy, safe, accessible, affordable, and comfortable door-to-door travel experience that meets the diverse needs of travellers. All options will increase the number of people within a 10-minute walk of a DSBRT stop, create a better transfer experience, and provide more one-seat continuous rides. All options will be within a 10-minute walk of 146,000 residents, including many equity-deserving groups such as immigrants, visible minorities, Indigenous people, seniors, unemployed persons, lower-income households, and those in subsidized/affordable housing. Option 1 delivers the most BRT infrastructure, leading to more travel time savings in the study area and faster travel time to hubs. With an Open Door service integration model, additional capacity in Toronto is provided, especially between UTSC/Centennial College and Scarborough Centre, which leads to increased ridership.

- **Sustainable and Healthy Communities:** DSBRT is a transportation investment that will benefit future generations by supporting land use intensification, climate resiliency, and a low-carbon footprint. All options will attract new trips (36,700 to 37,400 daily trips) and decrease vehicle-kilometres travelled (VKT, 25,400 to 28,000 km in 2041) and the associated greenhouse gas emissions (1,900 to 2,350 tonnes avoided in 2041). All options perform comparably, while the sensitivity analysis (Open Door) produces emissions savings of 4,350 tonnes of GHG, due to more trips being made (45,700 daily trips).
- **Economic Development:** DSBRT will expand access to jobs and economic opportunities while increasing connectivity to foster opportunities and growth for residents and businesses. All investment options perform comparatively well, as they increase the number of jobs within a 45-minute transit trip (206 to 248 additional jobs in 2041), improve access to existing and planned affordable housing units (4,600 as of 2024), and connects to intensification areas. Option 1 offers the most dedicated BRT infrastructure that improves service to employment and intensification areas.

Economic Case

The economic case evaluates the investment option's potential costs and benefits to society as a whole based on the different components delivered within each. The economic case quantifies the broader societal benefits and disbenefits and the expected costs to deliver each investment option to understand the value each will deliver, using a metric called the benefit-cost ratio (BCR). The results of this case are summarized in Table 48 (Investment BAU).

Table 48: Economic Case compared to Investment BAU (80% Confidence Intervals)

Impact Type	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize high-traffic segments*
Total Costs (2023$, PV[35])	**1,203 M to 1,338 M**	**1,192 M to 1,328 M**	**970 M to 1,061 M**	**1,076 M to 1,192 M**
Capital Costs	879 M to 983 M	879 M to 983 M	671 M to 742 M	778 M to 865 M
Operating Costs	222 M	212 M	235 M	216 M
Land Value Opportunity Cost	53 M to 150 M	53 M to 150 M	33 M to 97 M	43 M to 125 M
Total Impacts/Benefits	**703 M**	**520 M**	**449 M**	**477 M**
User Impacts/Benefits	622M	481M	414M	444M
External Impacts/Benefits	81M	39M	34M	33M
Adjustments	30M	15M	13M	14M
Investment BCR	**0.54 to 0.6**	**0.39 to 0.44**	**0.43 to 0.47**	**0.4 to 0.45**
NPV[36] (2023$)	**-602 M to -464 M**	**-792 M to -655 M**	**-598 M to -506 M**	**-700 M to -583 M**

[35] PV: Present Value
[36] NPV: Net Present Value

The overall takeaways from the economic case include:

- **Societal Benefits:** DSBRT is expected to realize significant benefits related to the two BAU scenarios, particularly for user and external benefit impacts. However, the costs are expected to be high, resulting in lower BCR and negative net present values for the investment options. Option 1 brings benefits of 520 M, Option 2 sees slightly smaller benefits of 449 M, primarily associated with lower travel time savings benefits associated with deferring some higher-cost segments in more congested areas. Option 3 sees benefits in between Option 1 and 2 of 477 M. Open Door unlocks additional benefits by a significant margin in comparison to Closed Door.
- **Benefit-Cost Ratio:** The Investment BCR is highest for Option 2 (0.43 to 0.47), followed by Option 3 (0.4 to 0.45) and Option 1 (Closed Door, 0.39 to 0.44). Option 2 provides an increase to the BCR due to capital cost reduction (approximately by 20%), however, presents a decrease in benefits. Option 3 offers 91% of the benefits at approximately 10% reduced capital costs, which marginally improves the BCR compared to Option 1. The sensitivity test revealed that Open Door policy would provide additional economic value, demonstrating a significant benefit increase if the policy is applied. Open Door Investment BCR[37] resulted in the following: Option 1 (0.54 to 0.6); Option 2 (0.59); and Option 3 (0.56).
- **Changes Since IBC:** There have been significant changes to the methodology, assumptions and measures included in the economic case since the IBC was completed. For instance, crowding benefits/disbenefits were not previously included in IBC, which has a negative impact due to the substantial latent demand for more transit service, while other monetary values have been changed. The sensitivity analysis most closely aligns with the IBC results because the IBC included service integration (Open Door).

Financial Case

The financial case outlines the expected financial impacts of delivering each investment option. Unlike the economic case, the financial case does not consider the society-wide benefits. Instead, it is concerned with the financial resources to deliver an option versus the revenue it will generate. The results of this case are summarized in Table 49.

[37] The Open Door Sensitivity Test was fully modelled in comparison to Option 1 infrastructure (Full BRT implementation). This sensitivity demonstrated that a large driver of benefits for the DSBRT project is the implementation of the Open Door policy. While the same sensitivity test was not run for Options 2 and 3, Open Door benefits will provide similar benefits to the project regardless of investment option. An off-model estimate of these benefits was incorporated into each option's benefits to provide an approximate comparison in the BCRs between Options. It is important to note that this is a high order magnitude estimate only and has not been developed by running the GGHMv4 or Monte-Carlo simulations as in the case of the Open Door Sensitivity for Option 1, therefore, only a single value is provided for each result instead of a range.

Table 49: Financial Case Cost Summary of Project Options Compared to Investment BAU

Financial Case Metric (Discounted $)	Sensitivity *Open Door*	Option 1 *Full BRT*	Option 2 *Defer High-Cost Segments*	Option 3 *Prioritize High-Traffic Segments*
Revenue Impacts	-9 M	-53 M	-45 M	-43 M
Capital Costs	1,170 M	1,170 M	859 M	1,020 M
Operating and Maintenance Costs	227 M	216 M	240 M	221 M
Total Costs[38]	**1,220 M**	**1,210 M**	**985 M**	**1,093 M**
Residual Value of Land	177 M	177 M	114 M	148 M
Net Revenue	**-1,229 M**	**-1,263 M**	**-1,030 M**	**-1,136 M**
Total Cost Recovery Ratio	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**	**ALL LOSS**

The overall takeaways from the financial case include:

- **Capital Costs:** Full BRT implementation (Option 1 and sensitivity) are expected to be highest, followed by Option 3 and then Option 2, relative to both BAU scenarios, reflecting the level of infrastructure implemented. Option 2 requires the lowest initial investment (capital costs), representing $311 M savings in comparison to Option 1, while Option 3 represents $150 M of savings. The 8.5 km of the DSBRT that Durham Region has secured funding for reduces the required capital costs by approximately $250 M for the Investment BAU.[39]
- **Operating Costs:** Option 2 will have the highest costs, as it will require additional fleet to deliver the service plan as buses will operate slower in the more congested, mixed-traffic segments where infrastructure is deferred. Option 1 will have the lowest costs due to better operating conditions (faster travel times and operating speeds). Open door requires more staffing resources than Closed Door in any of the options due to per rider costs associated with higher ridership, such as fare collection and call centre support.
- **Fare Revenue Impacts:** Incremental revenue for all options compared to both BAUs is negative. This is due to the anticipated significant shift of passengers from GO train and GO bus to DSBRT. DSBRT's average passenger fare is a flat fare whereas GO transit is distance-based, resulting in passengers paying about 25% less on DSBRT compared to GO transit. Despite overall increase in transit ridership, loss of the larger fare is not recovered, resulting in negative incremental revenue. Open Door has a lesser negative impact to overall incremental fare revenue due to substantially higher ridership.

[38] Capital and Operating Costs are different between the Economic and Financial Cases for several reasons. Optimism bias is applied to Economic Case, while only applicable contingency is applied to the Financial Case. Land value is estimated at an opportunity cost for the Economic Case, while the Financial Cases estimates land value to include purchasing cost upfront with an estimate for residual value. The Economic Case presents the real value of costs and the figures include a social discount rate (3.5%) and the effects of any value escalation (general price inflation ignored) based on the timeline over which the expenditure is incurred. The Financial Case is presented in nominal terms and the figures include general inflation, cost escalation, and a financial discount rate of 5.5%.

[39] Escalation: Metrolinx applied sliding rates recommended by IO and MTO, from 6.5% for (2022) then, 6.5%, 5%, 5%, 3.5%, 3.5% and 3% for subsequent years, this would be based on the assumed cash flow.

- **Cost Recovery:** All options are expected to have a negative cost recovery over the assessment period. This is due to the anticipated significant shift of passengers from GO train and GO bus to DSBRT. Open Door has a lesser negative impact to overall incremental fare revenue due to substantially higher ridership.

Deliverability and Operations Case

The deliverability and operations case analyzes the delivery, operations and maintenance, and service plans for the DSBRT project, as well as any issues that should be considered during the project's continued development. The results of this case are summarized in Table 50.

Table 50: Summary of Deliverability and Operations Case (Total, Including ICIP-funded Segments)

	Option 1 *Full BRT*	**Option 2** *Defer High-Cost Segments*	**Option 3** *Prioritize High-Traffic Segments*
BRT Infrastructure			
Bus-only Guideway	36 km	25 km	27 km
BRT Stops (two-way)	49	40 (+24 existing)	42 (+26 existing)
Property Impacts[1]	649 properties	454 properties	487 properties
Constructability			
Utility Relocation	Most extensive	Least extensive	Between Option 1 and 2
Rail Crossings[2]	Two rail crossings	1 rail crossing	Two rail crossings
Interface with SSE	All options provide same conditions for integration with SSE		
Interface with Planned EELRT	Requires review at Morningside	Mostly accommodated	Mostly accommodated
BRT Operations			
Transit Reliability	Lower risk to on-time performance (OTP)	Higher risk to OTP	Lower risk to OTP
Maintenance & Facilities	Requires least staff to operate	Requires most staff to operate	Between Option 1 and 2
Fleet Requirements (+net vs. Investment BAU)	86 buses (+25 net)	89 buses (+28 net)	87 buses (+26 net)

Notes:

1. These small slivers of property requirements due to regrading. Includes properties already being acquired by Durham Region for in-delivery segments (about 98 properties).
2. All options include the Pickering Bridge (CN) that Durham Region is advancing works on as part of the in-delivery segments.

The overall takeaways from the deliverability and operations case include:

- **Major Project Components and Fleet:** Each investment option has similar major components, reflecting the dedicated centre-median and curbside guideway that will be delivered. Option 2 and 3 will have more overall stops than Option 1, as they will continue to use standard curbside stops; however, these will generally be less complex than the full BRT stops.
- **Constructability:** Option 1 will have the greatest property and utility impacts and involve the delivery of more complex works (e.g. widening two rail bridges) since it is constructing the most infrastructure. Option 2 will have the lowest property and utility impacts, as it involves constructing

27% less linear BRT guideway (7 km less) than Option 1 and was developed to defer the more complex works. Further considerations need to be explored in the next phase of the project to understand how deferral of segments impact/benefit the environment and cultural heritage.

- **Deferring Project Components:** Deferring delivery of some segments would result in initial capital costs savings for Option 2 and 3. However, doing so will likely produce loss economies of scale and throwaway costs. For instance, there will be additional procurement and mobilization costs that parties will incur when the deferred segments are ultimately delivered. Similarly, there will potentially be throwaway costs by having to remove infrastructure built at the segment transition points to deliver the full BRT. Impacts of construction along the deferred portions would also impact future BRT operations, potentially diminishing some of the anticipated benefits until the project is fully completed.
- **Maintenance and Storage Facilities (MSF):** This PDBC assumed sufficient capacity at MSFs, since the focus of the analysis was on the transit service and corridor infrastructure. The next phase of the project should better understand the requirements for fleet storage and maintenance, as well as align with a detailed operating plan to determine whether additional MSFs are required for DSBRT. The lack of MSF capacity can bring risks to the benefits of the project, since it would limit the service being provided along the corridor.
- **Governance Agreement, Operations and Maintenance, and Procurement Responsibilities:** Regardless of which investment option advances, further work is required to define the roles and responsibilities of the project partners for the delivery, operations, and maintenance of the DSBRT (Concept of Operations).

Next Steps

Based on the information and data presented in this PDBC, the following next steps are suggested for the investment option that will be advanced:

- **Service Integration:** Metrolinx and MTO are actively collaborating with the TTC, MiWay, Brampton Transit, YRT, and DRT to explore options that would support cross-boundary pilots that would allow these operators to serve TTC customers within Toronto. Advancing the implementation of Open Door service integration policies for DRT buses that cross the municipal boundary would further support ridership growth and DSBRT benefits. Metrolinx will continue to work with stakeholders to advance Open Door so that a solution is in place to support the DSBRT by 2033.
- **Refine the DSBRT Service Plan:** Undertake further analysis to optimize the corridor's guideway speeds and overall operations to help improve the project benefits, particularly related to crowding. Some areas for consideration include:
    - Optimization of DRT and TTC services balancing passenger capacity and guideway speeds in Toronto.
    - Refinement of branch service (currently assumed as “Salem Branch”) and assess potential TTC cross-boundary service to Pickering.
    - Refinement of service frequency, fleet, and terminus requirements (bus bays and layovers).

- **Advance Concept of Operations:** Refine operational and maintenance requirements, as well as areas that require integration of systems or service cross-boundary (e.g. transit-signal priority, call centre/customer support).
- **Consider Complementary Transit Priority Measures:** Identify other transit priority measures to improve bus operation in mixed-traffic segments.
- **Advance Grangeway Avenue Design:** Refine the design of the Grangeway Avenue connection as part of the Scarborough Centre Station design and in coordination with future plans for the decommissioned SRT bridge.
- **Examine Connectivity to Bowmanville GO Rail Extension:** Examine opportunities to connect DSBRT to the future rail extension, including bus bay/layover requirements at the proposed Ritson Road GO Station in Central Oshawa and the need to protect for potential eastward expansion of DSBRT.
- **Coordinate with the Planned Eglinton East LRT:** Continue engaging with the City of Toronto on the interface between DSBRT and planned LRT near Morningside Avenue. Consideration should be given to the design of the overlapping guideway, future operations, and construction timing.
- **Explore DSBRT's Relationship with the GO Bus in Durham:** Understand the future relationship between the DSBRT and the GO Bus system in Durham. The PDBC indicates that DSBRT is often more attractive than the GO Bus due to its lower fare, shorter end-to-end travel time, and easier access, which leads to riders choosing DSBRT to reach destinations like Scarborough Centre, UTSC/Centennial College, and Downtown Oshawa. Further discussion should explore the future GO Bus strategy for the Highway 2-Ellesmere corridor to best optimize the rider experience.
- **Examine Connectivity to Bowmanville GO Rail Extension:** Examine opportunities to connect DSBRT to the future rail extension, including bus bay/layover requirements at the proposed Ritson Road GO Station in Central Oshawa and the need to protect for potential eastward expansion of DSBRT.
- **Coordinate with the Eglinton East LRT:** Continue engaging with the City of Toronto on the interface between DSBRT and planned LRT near Morningside Avenue. Consideration should be given to the design of the overlapping guideway, future operations, and construction timing.
- **Explore DSBRT's Relationship with the GO Bus in Durham:** Understand the future relationship between the DSBRT and the GO Bus system in Durham. The PDBC indicates that DSBRT is often more attractive than the GO Bus due to its lower fare and easier access, which leads to riders choosing DSBRT to reach destinations like Scarborough Centre, UTSC/Centennial College, and Downtown Oshawa. Further discussion should explore the future GO Bus strategy for the Highway 2-Ellesmere corridor to best optimize the rider experience.
- **Value Engineering:** Further opportunities to refine capital costs should be explored as the project advances. Opportunities may include refining the typical BRT stop design to reduce the initial investment, while still preserving the broader benefits of rapid transit.
- **Identify Order of Magnitude of Cost Impacts of Deferring Segments Beyond 2033:** If Option 2 or 3 are selected, considering aspects such as duplication of effort in procurement, construction phasing and/or loss of economy of scale during construction of the initial infrastructure.
- **Confirm Status of the ICIP-Funded Segments:** The status of segments being delivered by Durham Region should be confirmed, with any changes to the length of delivered segments reflected in the capital cost and respective cases.

- **Actively and continuously consult and engage with Indigenous communities**: Metrolinx is committed to consulting with Indigenous communities with respect to any decision or action that may have the potential to adversely impact Aboriginal and/or Treaty rights. This includes but is not limited to future environmental studies and fieldwork related to natural heritage, cultural heritage, and archaeology.
- **Continue to Meet Future Commitments from the Environmental Assessment:** The Environmental Project Report made several future commitments. The commitments result from proposed mitigation measures to address potential impacts of the DSBRT, as well as commitments to future consultation with MECP, Indigenous Nations, regulatory agencies, applicable stakeholders, and property owners. Table 8.1 of the Environmental Project Report summarizes the commitments, which are separated by environmental component, including the general or specific commitment and during which phase of the Project it will be implemented.

Appendix A – Capital Costs

The tables below provide capital costs (undiscounted) per Municipality in comparison to the Investment BAU, therefore, reflecting the investment required for the unfunded segments. Costs are presented following the year of expenditure based on construction phasing. Note: values may add to 100% due to rounding.

Table 51 - Sensitivity and Option 1: Full BRT Implementation

Capital Costs (Undiscounted $)	Sensitivity Open Door			Option 1 Full BRT Implementation		
	Toronto	Durham	Total	Toronto	Durham	Total
Infrastructure	421 M	840 M	**1,262 M**	421 M	840 M	**1,262 M**
Fleet	0 M	808 M	**808 M**	0 M	808 M	**808 M**
Rehabilitation	197 M	405 M	**602 M**	197 M	405 M	**602 M**
Terminal Value	-112 M	-231 M	**-344 M**	-112 M	-231 M	**-344 M**
Total Capital Cost	**506 M**	**1,822 M**	**2,328 M**	**506 M**	**1,822 M**	**2,328 M**

Table 52 - Option 2: Defer High-Cost Segments

Capital Costs (Undiscounted $)	Option 2 Defer High-Cost Segments		
	Toronto	Durham	Total
Infrastructure	318 M	547 M	**865 M**
Fleet	0 M	877 M	**877 M**
Rehabilitation	135 M	288 M	**424 M**
Terminal Value	-77 M	-165 M	**-242 M**
Total Capital Cost	**376 M**	**1,548 M**	**1,924 M**

Table 53 - Option 3: Prioritize High-Traffic Segments

Capital Costs (Undiscounted $)	Option 3 Prioritize High-Traffic Segments		
	Toronto	Durham	Total
Infrastructure	322 M	751 M	1,072 M
Fleet	0 M	831 M	831 M
Rehabilitation	159 M	357 M	516 M
Terminal Value	-91 M	-204 M	-295 M
Total Capital Cost	**390M**	**1,735 M**	**2,125 M**

The next tables provide further details on Capital Costs for each option in comparison to the Investment BAU in $2023 values. These costs estimates were used as basis for the Financial Case, which escalates costs to year of expenditure, following the expected construction phasing. Below are the key assumptions for the Capital Cost estimates:

- Cost estimates are based on the 30% Preliminary Design (Class 3) and high-level estimate for Grangeway Avenue (Class 5)
- Costs estimates do not include ICIP-funded segments (as of April 2023), therefore, the estimates in comparison to Investment BAU do not include the following segments:
    - Kingston Road, west of Steeple Hill to east of Bainbridge Drive (51+650 to 57+295);
    - Kingston Road, west of Westney Road to west of Wicks Drive (61+745 to 64+425); and
    - Dundas Street, west of Lake Ridge Road to east of Des Newman Boulevard (66+310 to 71+400).
- The BRT stops in the ICIP-funded segments only include partial implementation of shelters (20 metres instead of 40 metres). The capital cost estimation assumes that additional funding is required to implement the remaining 20 metres of shelters within the ICIP-funded segments for all options.
- Termini requirements: assumes additional three layover spaces in Oshawa.
- Vehicles: additional fleet required in comparison to Investment BAU. Vehicles assumed to be diesel articulated buses.
- Professional services and Agency costs: soft costs, including aspects such as project management, preliminary design, detail design, etc.

Table 54 - Option 1: Full BRT Implementation ($2023)

	Option 1 Full BRT Implementation		
	Toronto	**Durham**	**Total**
Roadway, Intersections, BRT Guideway, and Stops	**147 M**	**245 M**	**392 M**
Termini infrastructure (bus layovers)	**-**	**0.19 M**	**0.19 M**
Incremental cost of stop shelter upgrades (ICIP-funded segments)	**-**	**73 M**	**73 M**
Steeple Hill to Merritton Rd	-	*11 M*	*11 M*
Dixie Rd to Bainbridge Dr	-	*28 M*	*28 M*
Rotherglen Rd to Harwood Ave	-	*11 M*	*11 M*
Harwood Ave to Galea Dr	-	*12 M*	*12 M*
Lake Ridge Rd to Des Newman Blvd	-	*10 M*	*10 M*
Site work and Special Conditions	**27 M**	**38 M**	**65 M**
Systems	**6 M**	**10 M**	**15 M**
Vehicles	**-**	**39 M**	**39 M**
Professional services and Agency costs	**86 M**	**141 M**	**227 M**
Land Acquisition	**84 M**	**191 M**	**276 M**
TOTAL	350 M	737 M	1,086 M

Note: totals may not add up due to rounding.

Table 55 - Option 2: Defer High-Cost Segments ($2023)

	Option 2 Defer High-Cost Segments		
	Toronto	**Durham**	**Total**
Roadway, Intersections, BRT Guideway, and Stops	**102 M**	**161 M**	**263 M**
Termini infrastructure (bus layovers)	**-**	**0.19 M**	**0.19 M**
Incremental cost of stop shelter upgrades (ICIP-funded segments)	**-**	**73 M**	**73 M**
Steeple Hill to Merritton Rd	-	*11 M*	*11 M*
Dixie Rd to Bainbridge Dr	-	*28 M*	*28 M*
Rotherglen Rd to Harwood Ave	-	*11 M*	*11 M*
Harwood Ave to Galea Dr	-	*12 M*	*12 M*
Lake Ridge Rd to Des Newman Blvd	-	*10 M*	*10 M*
Site work and Special Conditions	**19 M**	**24 M**	**43 M**
Systems	**5 M**	**6 M**	**11 M**
Vehicles	**-**	**43 M**	**43 M**
Professional services and Agency costs	**60 M**	**92 M**	**152 M**
Land Acquisition	**78 M**	**99 M**	**177 M**
TOTAL	265 M	498 M	763 M

Note: totals may not add up due to rounding.

Table 56 - Option 3: Prioritize High-Traffic Segments ($2023)

	Option 3 Prioritize High-Traffic Segments		
	Toronto	**Durham**	**Total**
Roadway, Intersections, BRT Guideway, and Stops	**121 M**	**210 M**	**330 M**
Termini infrastructure (bus layovers)	**-**	**0.19 M**	**0.19 M**
Incremental cost of stop shelter upgrades (ICIP-funded segments)	**-**	**73 M**	**73 M**
Steeple Hill to Merritton Rd	-	*11 M*	*11 M*
Dixie Rd to Bainbridge Dr	-	*28 M*	*28 M*
Rotherglen Rd to Harwood Ave	-	*11 M*	*11 M*
Harwood Ave to Galea Dr	-	*12 M*	*12 M*
Lake Ridge Rd to Des Newman Blvd	-	*10 M*	*10 M*
Site work and Special Conditions	**21 M**	**34 M**	**55 M**
Systems	**4 M**	**8 M**	**12 M**
Vehicles	**-**	**40 M**	**40 M**
Professional services and Agency costs	**70 M**	**121 M**	**191 M**
Land Acquisition	**51 M**	**178 M**	**229 M**
TOTAL	267 M	664 M	931 M

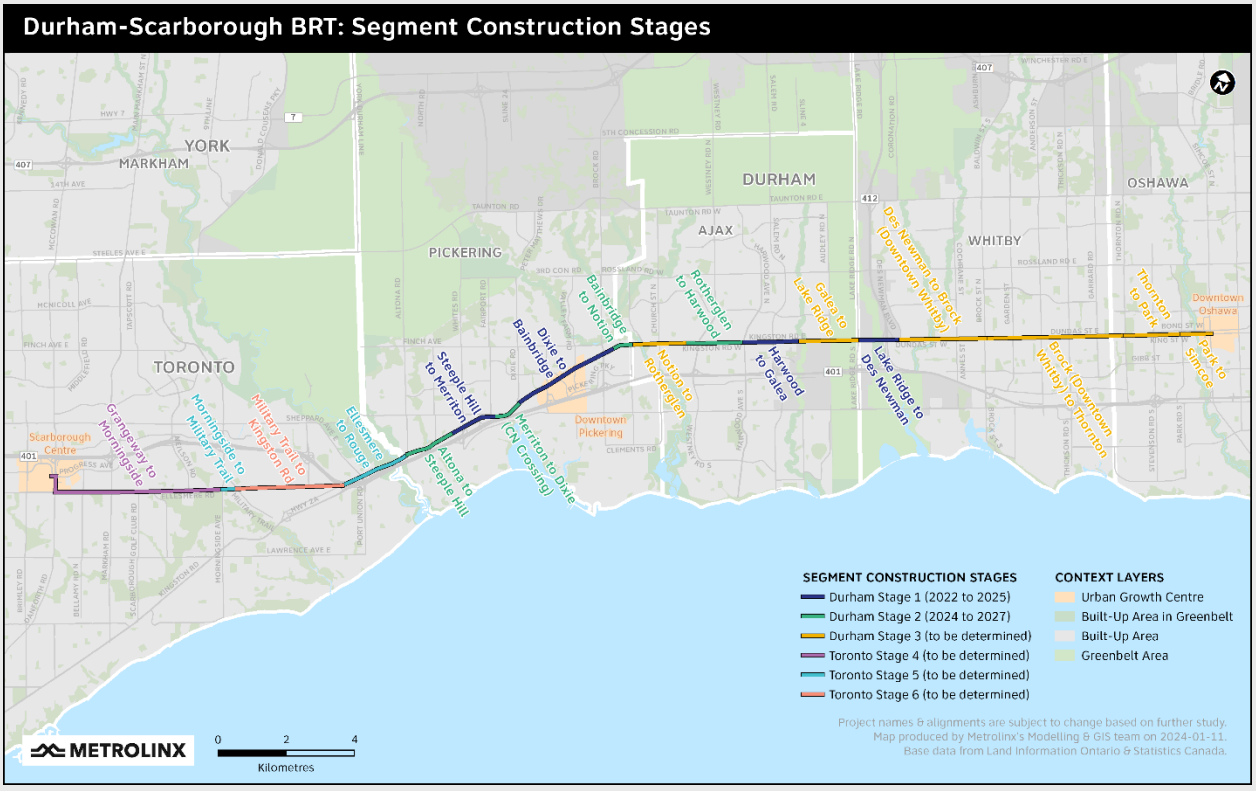
Note: totals may not add up due to rounding.

Appendix B – Construction phasing

Construction phasing informed the update on opening year for DSBRT and the escalation of costs from $2023 into year of expenditure. The following assumptions were considered for the construction phasing:

- Informed by a first draft of construction phasing developed as part of the Transit Project Assessment Process (TPAP) Environmental Project Report.
- Timelines of phasing as follows:
    - Durham Stage 1 –ICIP-funded timelines, with the latest segments to be delivered by end of 2027;
    - Durham Stage 2 – 2025 to 2026 (For Rotherglen-Harwood and Merritton-Dixie, refer to ICIP-funded segments timelines above);
    - Durham Stage 3 – 2025 to 2030;
    - Toronto Stage 4 – 2025 to 2028;
    - Toronto Stage 5 – 2029 to 2030; and
    - Toronto Stage 6 – 2031 to 2033.

Table 57 - Segment Construction Stages



Glossary

Term	Definition
BAU	Business As Usual
BCR	Benefit-Cost Ratio
BRT	Bus Rapid Transit
DRT	Durham Region Transit
DSBRT	Durham-Scarborough Bus Rapid Transit
EELRT	Eglinton East Light Rail Transit
EPR	Environmental Project Report
GGHMV4	Greater Golder Horseshoe Model Version 4
GHG	Greenhouse Gas
IBC	Initial Business Case
ICIP	Investing in Canada Infrastructure Program
LOS	Level of Service
MSF	Maintenance and Storage Facility
MSP	Municipal Service Providers
MTO	Ontario Ministry of Transportation
NPV	Net Present Value
O&M	Operating and Maintenance
PDBC	Preliminary Design Business Case
PSEZ	Provincially Significant Employment Zones
PWG	Project Working Group
SSE	Scarborough Subway Extension
TPAP	Transit Project Assessment Process
TSP	Transit Signal Priority
TTC	Toronto Transit Commission
UTSC	University of Toronto – Scarborough Campus
VKT	Vehicle-Kilometres Travelled
VoT	Value of Time