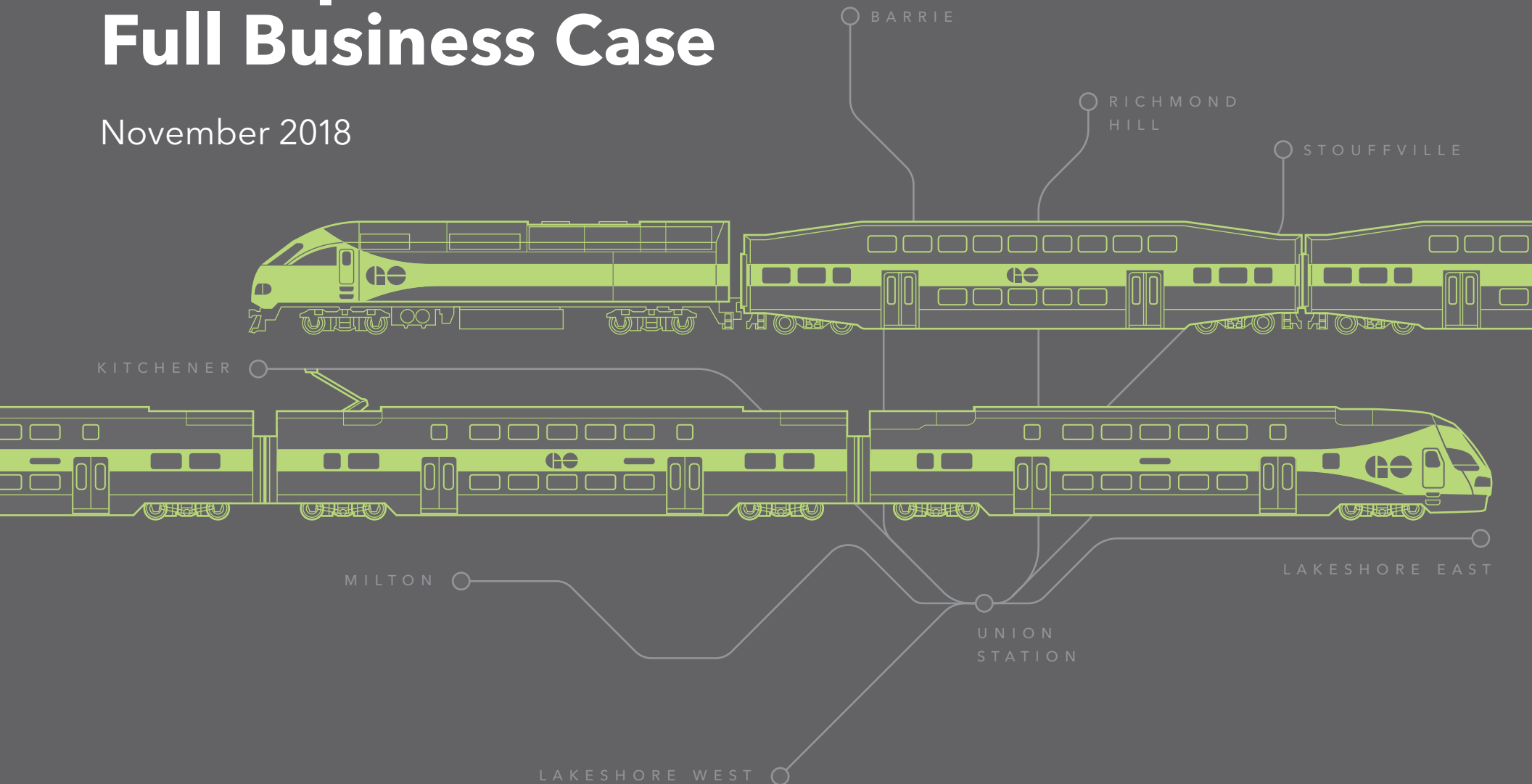


# GO Expansion Full Business Case

November 2018







# **GO Expansion Full Business Case**

November 2018

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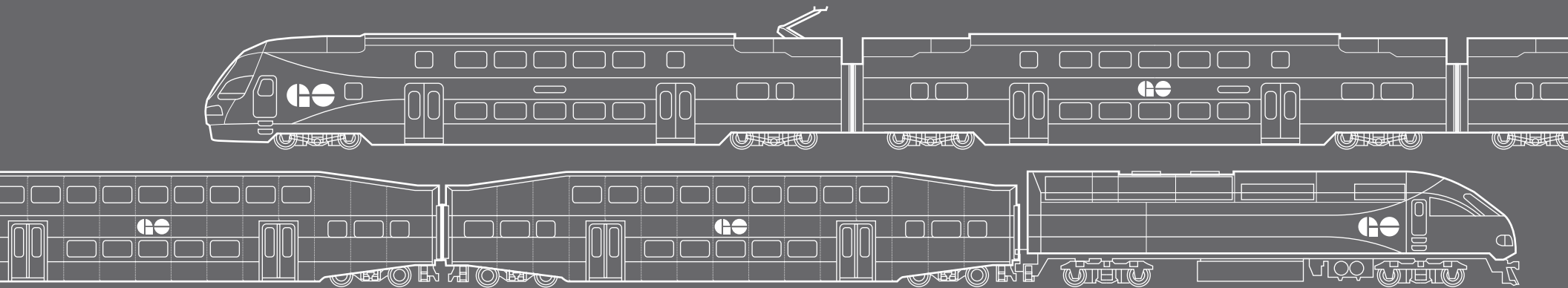
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## Table of Acronyms

<b>AODA</b>	Accessibility for Ontarians with Disabilities Act	<b>P3</b>	Private Public Partnership
<b>BAU</b>	Business As Usual	<b>PDBC's</b>	Preliminary Design Business Cases
<b>BCR</b>	Benefit Cost Ratio	<b>RCD</b>	Reference Concept Design
<b>BRT</b>	Bus Rapid Transit	<b>RCUS</b>	Route and Corridor Utilization Studies
<b>CACs</b>	Criteria Air Contaminants	<b>RER</b>	Regional Express Rail
<b>DBB</b>	Design Bid Build	<b>RFP</b>	Request for Proposal
<b>DBB</b>	Design Build	<b>RFQ</b>	Request for Qualifications
<b>DBFOM</b>	Design, Build, Finance, Operate, Maintain	<b>TDM</b>	Transportation Demand Management
<b>EMUs</b>	Electric Multiple Units	<b>TOD</b>	Transit Oriented Development
<b>FBC</b>	Full Business Case	<b>TOP</b>	Transit Optimization Program
<b>GGHM</b>	Greater Golden Horseshoe Model	<b>TTC</b>	Toronto Transit Commission
<b>GHG</b>	Greenhouse Gas	<b>TYSSE</b>	Toronto York Spadina Subway Extension
<b>GTHA</b>	Greater Toronto and Hamilton Area	<b>USRC</b>	Union Station Rail Corridor
<b>HSR</b>	High Speed Rail	<b>VoT</b>	Value of Time
<b>Hydrail</b>	Hydrogen Powered Trains	<b>WEI</b>	Wider Economic Impacts
<b>IBC</b>	Initial Business Case		
<b>LRT</b>	Light Rail Transit		
<b>NPV</b>	Net Present Value		

# Executive Summary



# Problem and Opportunity: Investing in Regional Transportation to Realize and Manage Urban Growth

## THE PROBLEM: THE CURRENT TRANSPORTATION NETWORK CANNOT MEET THE NEEDS OF A GROWING REGION

By 2041, the GO Service Area, including the Greater Toronto and Hamilton Area (GTHA), Kitchener-Waterloo, Barrie, and Niagara is expected to grow to over 12 million people. While this growth will be spread across the region, Toronto will remain the largest concentration of jobs and will continue to be the economic engine of the province. Travel demand is expected to increase by over 50% by the same year.<sup>1</sup>

Existing infrastructure will not be able to accommodate this growth. Much of the network is already congested today - demand for travel exceeds the network's capacity.

- **Today congestion can increase travel times for drivers by as much as 120%.**
- **Congestion could cost the region's economy up to \$15 billion annually in lost productivity by 2031.<sup>2</sup>**

The transportation network requires new travel choices for trips within cities, between cities, and across the region. Without investment, the region's transportation network will become a bottleneck to further growth and will be a limiting factor for quality of life and economic prosperity.

## WHY NOT USE OTHER MODES TO SOLVE THIS PROBLEM?

Other modes also play a critical role in the GTHA transportation network and are being invested in through other projects and programs - however, they are not optimal solutions to provide more capacity for long distance travel and travel to Downtown Toronto from the rest of the GTHA.

## THE SOLUTION: TRANSFORM GO RAIL INTO A RAPID RAIL SYSTEM

GO Expansion is an investment program that will transform GO Rail into a Rapid Rail System that provides the expanded mobility the GTHA needs to accommodate growth and maintain a high quality of life and prosperous economy.

GO Expansion is one of Canada's largest infrastructure and transport projects. It will cost \$16.8 billion beyond the \$38.9 GO Rail would need to spend over 60 years to continue to operate and maintain the system.



### MORE ALL-DAY SERVICE



### SERVICE IN BOTH DIRECTIONS



### TRAINS EVERY 15 MINUTES

Over 205 km of new track laid to enable 6,000 weekly services with two-way all-day service on Lakeshore West, Kitchener, Barrie, Stouffville, and Lakeshore East.



### FASTER AND MORE EFFICIENT TRAINS

Over 680 km of electrified track to provide trains that are up to 30% faster and 50% cheaper to operate per train KM



### MORE ACCESSIBLE STATIONS

42 Stations are upgraded to improve accessibility



### AN EXPANDED UNION STATION

Union Station's platforms and tracks are upgraded to accommodate demand beyond 2055

**Expanding GO is a cost-effective way to add transport capacity in the GTHA by leveraging existing, under-used rail corridors that span over 400 km of the region.**



## HIGHWAYS

The highway network provides six lanes into the core on the Don Valley Parkway and six lanes on the Gardiner Expressway. These highways are already congested and do not have capacity for further growth.

Both highways cannot realistically be expanded further - the Gardiner runs alongside new urban developments

Investment in highways upstream will not mitigate the Downtown Toronto bottleneck, while investment in rail can decongest highways reducing travel times for people who continue to drive.



## SUBWAYS AND RAPID TRANSIT

Line 1 and Line 2 play a critical role in the GTHA's transportation network. They ensure travellers can access the core and much of the City of Toronto.

New rapid transit to Downtown Toronto is being explored as a means to reduce crowding and expand accessibility - however, using subways or rapid transit to connect the rest of the GTHA to Downtown Toronto will be expensive, while the railway network already provides 400km of coverage across the GTHA.

<sup>1</sup> Population, Employment, and Demand statistics drawn from the Greater Golden Horseshoe Model v4

<sup>2</sup> Metrolinx Cost of Congestion ([www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP\\_08-015\\_Cost\\_of\\_Congestion\\_report\\_1128081.pdf](http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf))

# The Benefit:

## Unlocking Regional Growth through Transportation Investment

**GO Expansion was evaluated using Metrolinx's Business Case Guidance to complete a Full Business Case - the most rigorous analysis of a potential investment.<sup>3</sup>**



### STRATEGIC CASE

Realizing regional policy

- GO Rail will become one of the busiest railways in North America with over 200 million annual riders – allowing seamless access to the downtown core
- Passengers will save over 10 minutes a trip on average, while drivers benefit from less congested roads
- Over 40% of all homes and 45% of all jobs will have direct access to a station with two-way all-day service with a train every 15 minutes or better
- GO Rail will provide more service with up to 70% less pollution per passenger trip
- Investment in GO Expansion will generate 8,300 annual job equivalents in the first twelve years of construction and delivery



### ECONOMIC CASE

Realizing value for society

- **Total benefits of \$42.2 billion compared to \$16.2 billion in economic costs** resulting in a benefit cost ratio of 2.6 to 1 – meaning every dollar invested generates \$2.60 for Ontario.<sup>4</sup>
- Benefits include:
  - **Transit User Benefits of \$35.4 billion**
  - **Auto Traveller Benefits of \$3.3 billion**
  - **Auto Operating Cost savings of \$1.9 billion**
  - **Health and Safety Benefits of \$1.1 billion.**
  - **Emission Reduction Benefits of \$330 million**



### FINANCIAL CASE

Managing financial resources accountably to maximize returns

- **GO Rail's incremental revenue is \$12.3 billion, which means that most of the \$16.8 billion in incremental costs can be paid for by farebox revenue, leading to a net incremental investment of \$4.5 billion**
- GO Expansion recovers 110% of all operating costs over its lifecycle (up to 130% per year after 2055)



### DELIVERABILITY AND OPERATIONS CASE

Ensuring benefits are realized through innovative delivery mechanisms

- Metrolinx has already secured most necessary environmental approvals and has begun early and enabling works
- Metrolinx is shortlisting international consortia to deliver GO Expansion through a Public Private Partnership model, where a private partner consortium will Design Build Operate Finance (partially) and Maintain the system through construction and the first 30 years of operations

The case for GO Expansion is robust – it will realize significant benefits to transit users, drivers, and the region as a whole. By leveraging an existing network of over 400 km of railway, GO Expansion will break the development bottleneck and unlock the development potential of the region. This means:

- **More time with family, for everyone** – travellers using GO Rail will get from where they are to where they want to go faster, while drivers will benefit from decongested roads.
- **More money in pockets** – travellers who switch to GO Rail will save money by not paying for gas and parking.
- **More jobs and increased productivity** – investing in rail will create new jobs in the transport sector and make the GTHA a more competitive place to invest and do business.
- **Better business for Metrolinx** – more efficient trains will reduce operating subsidy requirements, and improved service will grow ridership and revenue.
- **Partnering with Private Sector** – private sector partnerships will minimize delivery risk and support job growth and industrial investment in the GTHA, while ensuring GO Rail service meets customer needs.

<sup>3</sup> Metrolinx Business Case Guidance (<http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/Metrolinx%20Business%20Case%20Overview%20Volume%201.pdf>)

<sup>4</sup> Benefits indicated in the table do not add to \$42.2 due to rounding. Table E.4 provides a detailed summary of benefits and costs.



## Preface

**This document is Metrolinx's Full Business Case (FBC) for GO Expansion – an investment program that will transform GO Rail into a Rapid Rail system that will provide faster and more frequent two-way all-day service across the GO Rail network.** The purpose of this document is to illustrate the proposed investment program, its benefits and costs, and core requirements to successfully implement the program to decision makers, the public, and funding partners. This document has been prepared in accordance with Metrolinx's business case guidance, which specifies a common structure for each Business Case to analyze potential investments:



### Case for Change

What challenges and opportunities does the investment address?



### Investment Definition

What is the proposed investment?



### Strategic Case

How does the investment support regional plans, policies, and goals?



### Economic Case

What are the socio-economic benefits and costs of the investment?



### Financial Case

What are the financial impacts of the investment?



### Deliverability & Operations Case

What is required to successfully deliver and operate the investment?

## Background

For over fifty years, GO Rail has provided high-quality, fast, and reliable commuter rail service. GO Rail began as a one line pilot in 1967 and has now grown into one of North America's largest and most successful commuter rail systems, exemplified by:

- Daily ridership of over 200,000 passengers and over 70 million annual passengers.
- Consistent ridership growth for the last 20 years.
- Passenger rail service on seven lines covering over 400 km of railway corridors and 66 stations.
- Service is integrated with municipal bus networks and rapid transit systems with new connections being added alongside the development of new rapid transit.

Today, the GO Rail Service Area covers a population of over 8.8 million people living in the Greater Toronto Hamilton Area (GTHA), Kitchener-Waterloo, Barrie, and Niagara. Since its inception as a pilot, GO Rail has evolved into a core service for these communities and each day nearly 40% of commuters headed to Downtown Toronto make use of GO Rail services.

While GO Rail has played a crucial role in shaping regional growth and economic development in the GTHA, it is only realizing a portion of its overall potential and requires new investment to meet the evolving needs of the region.

GO Rail can be transformed into a Rapid Rail system that provides services all day in both directions with faster trains. This transformation will significantly expand transportation capacity to support growing communities and changing economies across the GO Rail Service Area.

The analysis in this Full Business Case (FBC) builds on over three years of analysis and investment planning to put forward the case for this transformation.

# From a Pilot Project to a Region-Shaping Service: The Evolution of GO Rail

## 1967-1978

### 1967

- Service launched between Oakville (Lakeshore West line) and Pickering (Lakeshore East line), with hourly two-way all-day service and peak service to Hamilton

### 1968

- Exhibition station opens (Lakeshore West line)

### 1974

- Georgetown line (now Kitchener line) opens

### 1978

- Richmond Hill line opens

## 1981-1990

### 1981

- Milton line opens

### 1982

- VIA's commuter services to Bradford and Stouffville transferred to GO Rail

### 1988

- Lakeshore East line extended to Whitby

### 1990

- Georgetown line extended to Guelph via Acton
- Barrie line extended from Bradford to Barrie

## 1992-2002

### 1992

- Lakeshore West line extended to Aldershot

### 1995

- Lakeshore East line extended to Oshawa

### 2000

- Off-peak weekday service extended to Burlington (Lakeshore West line) and Oshawa (Lakeshore East line)

### 2002

- Off-peak service added to Georgetown line as far as Bramalea

## 2006-2011

### 2006

- Lakeshore East line weekend service extended from Pickering to Oshawa

### 2008

- Stouffville line service extended to Lincolnville

### 2009

- Summer weekend and holiday service to Niagara Falls launches

### 2011

- Georgetown line extended to Guelph and Kitchener and re-named to Kitchener line

## 2013-2016

### 2013

- 30-minute service on Lakeshore East and Lakeshore West lines launched

### 2015

- Lakeshore West line extended to West Harbour
- Off-peak service added to Kitchener line as far as Mount Pleasant
- UP Express service to Pearson Airport starts with all-day service every 15 minutes

### 2016

- Weekend service added to Barrie line
- Richmond Hill line service extended to Gormley

## 2017-2030

### 2017

- Hourly off-peak service starts on Stouffville line

### 2018

- Lakeshore East and West lines mid-day service increased to nearly every 15 minutes

### 2019

- Procurement for GO Expansion

### 2025 – 2030

- GO Rapid Rail services launch on Lakeshore West, Kitchener, Barrie, Stouffville, and Lakeshore East lines



## The Case for Change

### The Problem: the Current Transportation Network Cannot Meet the Needs of a Growing Region

The GTHA is one of the fastest growing city-regions in North America and is a national centre for business, culture, and education. By 2041, regional population is expected to increase by 42% to more than 10 million people and total regional employment is estimated to grow by 41% to 4.8 million. In the same year, the GTHA's commute shed (the GO Service Area) will reach a total population of 12.4 million with many people living and working in different communities. While this growth will be spread across the region, Toronto will remain the largest employment centre in the region with over 40% of all jobs.<sup>5</sup>

The regional transportation network has an important role to play in ensuring the region can manage this significant growth. Travel demand is expected to grow alongside population and is forecast to increase by 50% from 8 peak million trips to over 12 million by 2041. By 2031, demand for travel into downtown Toronto will exceed the capacity of the highway network and the rapid transit network will similarly be crowded.

A congested transportation network will not support regional plans and policies for urban development because:

- Congestion can increase travel times for drivers by as much as 120% compared to uncongested conditions with today's travel demand.<sup>6</sup>
- Congestion is estimated to cost the region's economy up to \$15 billion annually in lost productivity by 2031.<sup>7</sup>

In order to accommodate growth, the network will need to:

- Enable travel between emerging Urban Growth Centres and major employment, education, and recreation centres.
- Provide reliable and high capacity transportation options to downtown Toronto, which will remain the heart of the region's economy.
- Support broader development goals for quality of life, economic development, and a protected environment.

As a result, investment is required to reduce congestion and provide fast and reliable travel within cities and across the region in order for the GTHA to remain a globally competitive region to live in and do business.

### The Solution: Transform GO Rail into a Rapid Rail System

A rail based investment is proposed to expand travel choices across the region and to Downtown Toronto in order to manage congestion and support a high quality of life and economic competitiveness.

There is significant untapped potential for the network to provide new rail based transportation options that are faster, more efficient, and more frequent. Investment in rail is the best option to provide additional capacity in the GTHA because GO Rail:

- **Offers competitive travel times** – GO Rail saves travellers time each day compared to other modes.
- **Covers the region** – GO Rail allows customers to travel across the GTHA and beyond on a network spanning over 400km of corridors.
- **Provides readily expandable capacity** – GO rail trains can carry 2,000 travellers, which is more than a new lane of highway can carry in an hour. Every morning GO Rail can move 80,000 passengers – this is the same capacity as 40 lanes of highway.
- **Generates revenue that can cover some or all operating and maintenance costs** – a full GO Rail train in the peak period does not require operating subsidy.
- **Integrates with other modes** – GO Rail is connected to existing and in delivery rapid transit and local bus systems.

<sup>5</sup> Population, Employment, and Demand statistics drawn from the Greater Golden Horseshoe Model v4.

<sup>6</sup> 2016 TomTom Historic Traffic Congestion Statistic ([https://www.tomtom.com/en\\_gb/trafficindex/city/toronto](https://www.tomtom.com/en_gb/trafficindex/city/toronto))

<sup>7</sup> Metrolinx Cost of Congestion ([http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP\\_08-015\\_Cost\\_of\\_Congestion\\_report\\_1128081.pdf](http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf))

### **Rapid Rail: Faster, More Frequent, Two-Way All-Day Service**

Rapid Rail systems differ from commuter rail systems in that they provide two-way all-day service with high frequencies (typically a train every fifteen minutes or better) using higher speed trains (typically electrified with faster braking/acceleration and maximum speeds of 120 km/h). Rapid Rail systems have successfully been deployed to manage demand and support economic prosperity in over 60 cities around the world as shown in Figure E.1.

### **Why Not Invest in Other Modes?**

Other modes play a critical role in the GTHA transportation network and are being invested in through other projects and programs – however, they are not optimal solutions to provide more capacity for long distance travel and travel to Downtown Toronto from the rest of the GTHA.



#### **Highways**

The highway network provides six lanes into the core on the Don Valley parkway and six lanes on the Gardiner Express way. These highways are already congested and do not have capacity for further growth. Both highways cannot realistically be expanded further:

- Recent urban developments alongside the Gardiner Expressway have left no room for widening.
- The Don Valley parkway runs through a sensitive environmental area.

Investment in highways upstream will not mitigate the Downtown Toronto bottleneck, while investment in rail can decongest highways reducing travel times for people who continue to drive.



#### **Subways and Rapid Transit**

The TTC subway network serves a critical role in ensuring travellers can travel across Toronto and through downtown. New rapid transit to Downtown Toronto is being explored as a means to reduce crowding and expand accessibility – however, using subways or rapid transit to connect the rest of the GTHA to Downtown Toronto will be cost prohibitive, while the railway network already provides 400km of coverage across the GTHA. Other forms of rapid transit, such as Light Rail Transit is being explored to allow for intra-municipal mobility but is not fast enough to provide competitive regional travel.

**Figure E.1:** International Rapid Rail Examples



### PARIS, FRANCE

Paris' railway blends radial and cross city lines to provide high levels of accessibility across the city throughout the day.



### LONDON, ENGLAND

London has frequent electric railway services on 40 routes in a network that has developed progressively since the 1920s into a Rapid Rail style system.



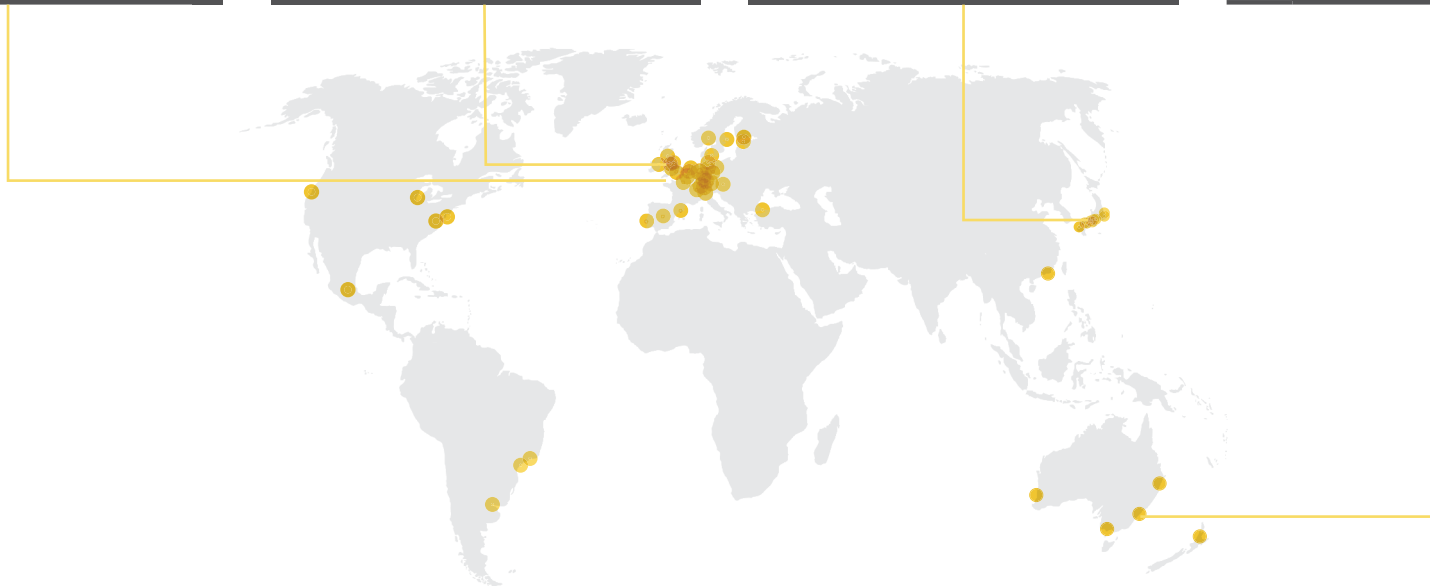
### TOKYO, JAPAN

The Tokyo rail network, provides high frequency services across the metropolitan region and into neighboring regions using fast electric trains.



### SYDNEY, AUSTRALIA

Sydney has frequent two-way all-day services extending over a large network. Nearer the city centre, trains run every 5-10 minutes, while further out, headways extend to 15 or 30 minutes.







## Proposed Investment

### GO Expansion Program Overview

Today the GO Rail system is a commuter rail system that largely serves trips in the peak period to and from the core. Investment will transform GO Rail into a Rapid Rail system to support a growing region - this means:

- **Faster and More Efficient Trains** - new trains will realize travel time savings (up to 29% faster) for customers and reduced costs to operate (up to 60% cheaper).
- **Two-way, all-day service** - whether a traveller's destination is work, education, or recreation, they can access more of the region on GO Rail with up to 6,000 weekly services.
- **A train every 15 minutes, or better** - travellers can turn up and go at their station and the system will provide capacity to accommodate growth in travel demand into the future.

### Parallel Programs

Metrolinx is currently developing two additional GO Rail programs alongside GO Expansion:

- New Stations across the GO Rail network, which will allow more people to make use of GO Rail.
- GO Rail Extensions to Niagara, Kitchener, and Bowmanville, which will add new service and connectivities to the Kitchener, Lakeshore West, and Lakeshore East lines.

These programs are being designed and evaluated through their own Business Case processes.

A Rapid Rail system will provide a range of benefits and opportunities for the region, including:

- **More time with family, for everyone** - travellers using GO Rail will get from where they are to where they want to go faster, while drivers will benefit from decongested roads.
- **More money in pockets** - travellers who switch to GO Rail will save money by not paying for gas and parking.
- **More jobs and increased productivity** - investing in rail will create new jobs in the transport sector and make the GTHA a more competitive place to invest and do business.
- **Better business for Metrolinx** - more efficient trains will reduce operating subsidy requirements, and improved service will grow ridership and revenue.
- **Partnering with Private Sector** - private sector partnerships will minimize delivery risk and support job growth and industrial investment in the GTHA, while ensuring GO Rail service meets customer needs.
- **A healthier and more sustainable region** - GO Expansion will realize reduced air pollution, fewer road accidents, and improved health for the region.

*The specific benefits GO Expansion will realize for the region and the requirements to deliver are further explored in the four cases in this FBC.*

### Reference Concept Design for GO Rail

Metrolinx has developed a Reference Concept Design (RCD) that illustrates how the GO Expansion program can be delivered and the scope of benefits the region could realize as a proof of concept (further detailed in Table E.1).

This reference concept design is used to:

- Demonstrate that a working approach to deliver GO Expansion is possible.
- Determine a budget and construction schedule to be approved by Treasury Board.

This RCD was developed based on over three years of engineering, economic, and modelling analysis to present a realistic and deliverable concept for GO Expansion.

This means a private sector partner will collaborate with Metrolinx to design, build, finance, and operate GO Rail as an Rapid Rail system. As a result, the exact specifications of the future GO Rail system will be determined through the GO Expansion procurement process where potential partners will submit proposals to realize the core benefits and objectives of GO Expansion defined in Table E.1 and Figures E.1 and E.2.

The RCD is just one of many potential infrastructure and service investment programs that could be deployed to reach these objectives. Proposals submitted to Metrolinx may vary in their design and delivery (example: different signalling approaches, different track designs) - however they all must deliver the performance objectives specified in this FBC.

**Table E.1:** GO Expansion Program Summary

GO Expansion Program Element	Description	Performance Objectives	Reference Concept Design Features
 <b>MORE ALL-DAY SERVICE</b>	Provide service throughout the day and on weekends, not just on weekday peak periods	<b>6,000 weekly services, including:</b> <ul style="list-style-type: none"> <li><b>Lakeshore West</b> - two-way all-day service between Union and Hamilton, fifteen minute service or better between Burlington and Union</li> <li><b>Kitchener</b> - two-way all-day between Mount Pleasant and Union, fifteen minute service or better between Bramalea and Union</li> <li><b>Barrie</b> - two-way all-day between Allandale and Union, fifteen minute service or better between Aurora and Union</li> <li><b>Stouffville</b> - two-way all-day between Mount Joy and Union, fifteen minute service or better between Unionville and Union</li> <li><b>Lakeshore East</b> - two-way all-day with fifteen minute or better service between Oshawa and Union</li> </ul>	<ul style="list-style-type: none"> <li>Expanded track and on-corridor works to accommodate more frequent service in both directions: <ul style="list-style-type: none"> <li>Eleven new rail/road and two rail/rail grade separations</li> <li>205 km of new track</li> <li>Eleven new Pedestrian bridges</li> </ul> </li> </ul>
 <b>SERVICE IN BOTH DIRECTIONS</b>	Provide two-way service on more of the GO Rail network		
 <b>TRAINS EVERY 15 MINUTES</b>	Increase frequencies to a train every fifteen minutes or better where possible on the GO Rail network		
 <b>FASTER AND MORE EFFICIENT TRAINS</b>	Make use of fleet that are more cost effective to operate and have faster acceleration and stopping	<ul style="list-style-type: none"> <li><b>Making use of trains that are up to 29% faster and up to 50% cheaper to operate per train kilometer</b></li> </ul>	<ul style="list-style-type: none"> <li>Combination of Electric Multiple Units (EMUs) or Electric Hauled Locomotives</li> <li>Over 680 km of GO Rail track is electrified</li> </ul>
 <b>MORE ACCESSIBLE STATIONS</b>	Provide improved stations, allowing for easier access to GO Rail	<ul style="list-style-type: none"> <li><b>Customers can board and alight faster, reducing trip times times by 2-5 minutes</b></li> </ul>	<ul style="list-style-type: none"> <li>Level boarding included at 42 stations to decrease boarding, alighting, and platform clearance time, which will decrease train dwell times</li> </ul>
 <b>AN EXPANDED UNION STATION</b>	Improve Union Station's capacity and passenger facilities, improving train operations and passenger experience	<ul style="list-style-type: none"> <li><b>Ability to accommodate reference frequencies on each GO Rail Line</b></li> </ul>	<ul style="list-style-type: none"> <li>Widened platform and improved vertical circulation (stairs, elevators)</li> </ul>

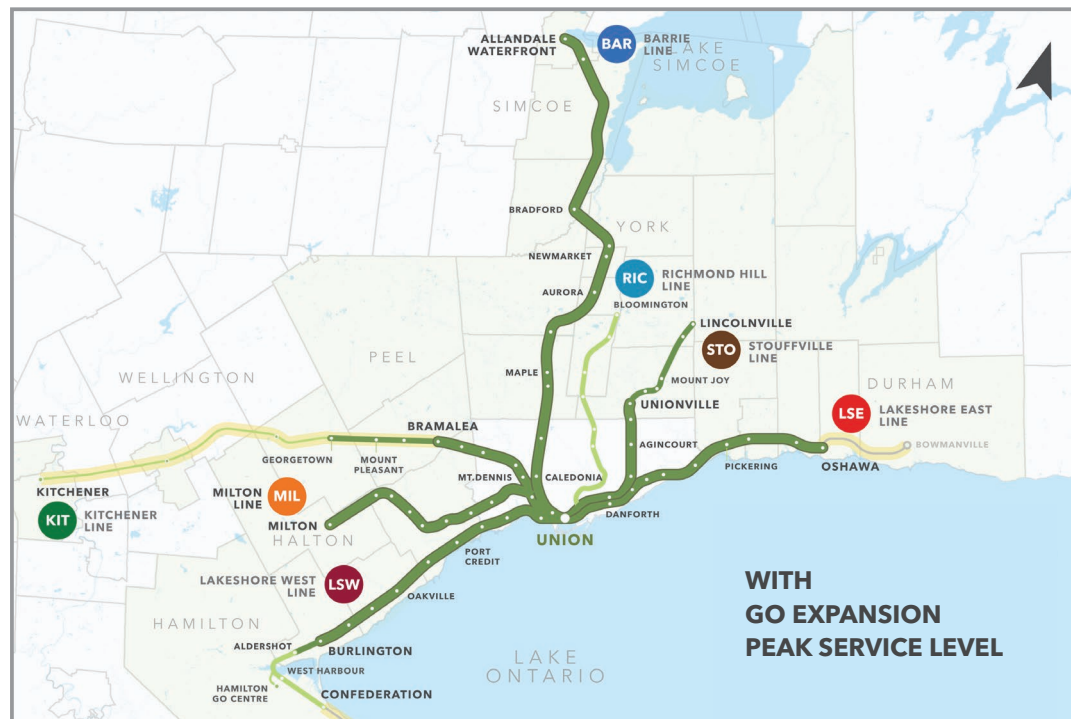




**Figure E.2:**  
GO Rail Off-Peak Service  
With and Without GO Expansion



**Figure E.2 (continued):**  
GO Rail Peak Service  
With and Without GO Expansion



SERVICE LEVEL:

15 MINS OR BETTER

20 MINS

30 MINS

60 MINS

NO SERVICE

EXTENSIONS UNDER DEVELOPMENT



## The Strategic Case for GO Expansion

### Overview

Metrolinx Strategic Cases articulate how a proposed investment supports or achieves regional plans, policies, and goals. Urban and regional development policies in the GTHA and GO Service Area have been organized into four broad policy themes to communicate the strategic benefits of Metrolinx investments:

- **Transportation Benefits** - increasing efficiency, effectiveness, and resiliency of the transportation system.
- **Quality of Life Benefits** - making it easier for people to access more of the region with safe and convenient services.
- **Economic Prosperity Benefits** - supporting economic development by reducing commute times, connecting businesses, and supporting investment.
- **Protected Environment Benefits** - supporting conservation by reducing the environmental impact of travel.

### The Strategic Case for GO Expansion

GO Expansion is expected to contribute significantly to regional plans and policies by improving transportation and promoting a high quality of life, continued economic prosperity, and measures to protect the environment. The ten core benefits for GO Expansion are described in Figure E.3

**Figure E.3:** Ten Reasons Communities in the GO Service Area Benefit From GO Expansion



#### TRANSPORTATION

1

**Doubling rail ridership** - GO Expansion will nearly double GO Rail's ridership. By 2055, annual ridership will exceed 200 million (compared to 105 million without GO Expansion). This ridership gain includes nearly 60 million additional off-peak and counter peak trips, a net increase of 210%. This ridership increase reflects the latent demand for improved rail service in the region. Delivering GO Expansion alongside the delivery of rapid transit projects and improved station access will allow GO Rail to act as the foundation of a region wide transit network and realize these significant ridership increases. Ridership changes are shown in Figure E.4 and Table E.2.

2

**Capacity for a growing region** - GO Expansion will allow GO Rail to add over 1,000 new rail services a day by upgrading rail corridors and Union Station. Once upgraded, GO Rail can increase capacity until the end of the century to meet increased demand as the region's population and employment continue to grow.

3

**A self-sustaining railway** - GO Expansion will reduce the costs of operating trains and increase ridership, leading to a railway system that covers all operating costs with fare box revenue. With GO Expansion, GO Rail revenues will exceed 110% of operating costs over the next sixty years, with revenue equalling 150% of costs in 2055.

4

**A railway that meets customer needs** - GO expansion will transform the customer experience for railway passengers. GO Rail will pivot from a peak only railway to a two-way all-day service with 15 minute or better frequencies that will let customers turn up and go for their service. This transition to a 'subway' style service will appeal to a range of customers and make GO Rail a competitive mode for many more trips than today's commuter focussed customer experience.



#### QUALITY OF LIFE

5

**New regional connections** - After GO Expansion, 41% of the region's people will be able to access a GO Rail station with two-way all-day service by transit (compared to 34% without GO Expansion). In addition, over 4,000 cultural, educational, and social service facilities will be readily accessible with two-way all-day GO Rail service. This will allow people to choose transit to take them from where they are to where they want to go - greatly improving their quality of life.

6

**A healthier region with a safer transportation network** - GO Expansion will generate 15 million new walking and cycling trips to access GO Rail station a year. Active travel options tend to promote improved health. In addition, as more drivers choose GO Rail, there will be less traffic and an estimated 7,000 fewer accidents resulting in death or injury over the project lifecycle in the GTHA.



## ECONOMIC PROSPERITY

**7 Faster commutes** - GO Expansion will reduce commuter times by an average of 10 minutes per trip and as much as 20-30 minutes for other trips. After GO Expansion is delivered, 45% of all jobs in the region will be accessible by transit from a GO Rail station with two-way all-day service, compared to 35% in the off-peak. In addition, nearly 60% (a net increase of 30%) of all jobs in the GTHA will be accessible within a one hour trip on the GO Rail network from Union Station. This means people will have less stressful commutes and more productive time for work, supporting to an overall more prosperous region.

**8 Catalyzing regional development** - GO Expansion will reduce travel times between Urban Growth Centres and downtown Toronto by 25 minutes in the off-peak and 10 minutes in the peak. This 'shrinking' effect has been seen to unlock investment and urban development in other city-regions. As more of the region's planned Urban Growth Centres are closer to downtown, they become more attractive places to do business, invest or live, which in turn could accelerate development. New developments could lead to a more productive region or address housing affordability by unlocking more of the region for denser and complete community style development.

**9 Creating new jobs across the region** - GO Expansion is a regional project that will generate trades and professional jobs during its design, construction, and operations. An estimated 8,300 annual job equivalents for the first twelve years of delivery will be created over the lifecycle of the program.



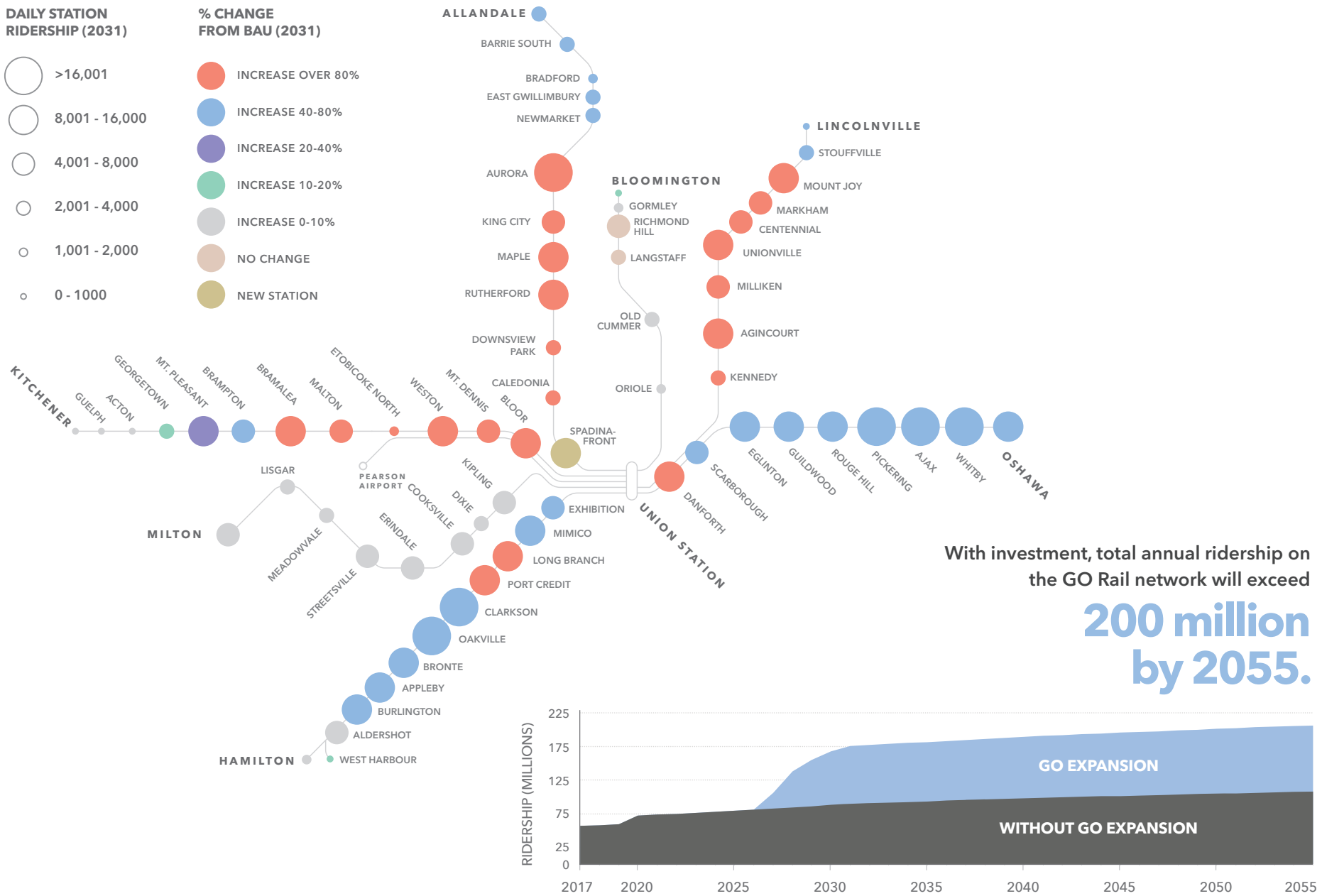
## PROTECTED ENVIRONMENT

**10 Cleaner air and energy conservation** - GO Expansion will reduce Criteria Air Contaminants that impact human health and up to 13.5 megatonnes of Greenhouse Gases that contribute to climate change. After the project is delivered, nearly 145,000 cars trips per day will shift to rail and with more efficient trains, rail Greenhouse Gas emissions will drop from 1.85 kg/trip to 0.5 kg/trip.

Table E.2: GO Expansion Ridership Impacts

Annual Ridership (millions)	2017 Peak Ridership	2017 Off-Peak, Contra-Peak, and Weekend Ridership	2017 Total Ridership	2031 Peak Ridership	2031 Off-Peak, Contra-Peak, and Weekend Ridership	2031 Total Ridership	Ridership Percent Change 2017-2031
Lakeshore West	11.6	6.1	17.7	22.5	15.3	37.8	113%
Lakeshore East	9.0	4.7	13.7	23.9	14.7	38.6	181%
Milton	7.0	0.0	7.0	9.3	0.0	9.3	33%
Kitchener	5.2	2.9	8.0	19.5	25.1	44.6	395%
Barrie	4.5	0.1	4.6	14.0	14.1	28.1	505%
Richmond Hill	2.5	0.0	2.5	3.8	0.0	3.8	54%
Stouffville	3.2	0.7	3.9	10.1	6.3	16.5	323%
<b>GO Rail Network</b>	<b>42.9</b>	<b>14.5</b>	<b>57.4</b>	<b>103.2</b>	<b>75.5</b>	<b>178.7</b>	<b>211%</b>

**Figure E.4:** GO Expansion Ridership Impacts





Strategic Case Conclusion

GO Expansion has a robust Strategic Case based on the core benefits it realizes for the Region:

- It will transform how people travel across the region – allowing customers to use the transit network in new ways that improve their journey travel time and experience.
- It provides the capacity that allows the region to manage population and employment growth through to the end of the century.
- It will make significant contributions to regional and provincial policy objectives by directly improving quality of life, economic prosperity, and environmental quality.

These strategic benefits are summarized by transit users, drivers, and the GTHA as whole in Table E.3

Table E.3: Benefits of GO Expansion to Rail Passengers, Drivers, and the Region

Background	
Rail and Transit Passengers	<ul style="list-style-type: none"><li>• Faster service (average of 10 minutes saved per trip)</li><li>• Expanded choices – 29% of places to live and 32.5% of places to work are accessible with a fast, frequent, two-way all-day GO Rail service</li><li>• More of the region can be reached by GO Rail including 4,000 cultural, educational, social service, and recreational sites within transit access distance of a station with two-way all-day service</li><li>• Increased connectivity to the rapid transit network</li></ul>
Drivers	<ul style="list-style-type: none"><li>• Reduced congestion (over 145,000 cars off the road each day) on major highways leading to more reliable and quicker travel times</li></ul>
Region	<ul style="list-style-type: none"><li>• A more connected region can attract investment in urban development or businesses – GO Expansion will bring major urban growth centres closer together by reducing travel time by 10-25 minutes</li><li>• For the first twelve years of program delivery there will be 8,300 job equivalents created annually in construction and supply-chain industries</li><li>• Improved health due to cleaner air and a more active population</li><li>• A more resilient transportation network with reduced operating subsidy, expanded choice, and substantial additional capacity for the rest of the century</li><li>• Reduced traffic accidents and emissions</li></ul>



## The Economic Case for GO Expansion

### Overview

Metrolinx Economic Cases applies international and local best practice for socio-economic economic appraisal to answer the following key questions:

- What does the investment cost in economic terms?
- What benefits will the investment realize?
- Do benefits exceed costs?

### GO Expansion Economic Costs

GO Expansion will require incremental investment of \$16.2 billion over its lifecycle, including:

- **Capital Costs (stations, trains, on-corridor works) of \$12.2 billion**
- **Operating and Maintenance Costs of \$4.3 billion**

These costs include all incremental costs above and beyond business as usual investment (including state of good repair, fleet replacement, and basic service upgrades under a commuter rail model) to deliver GO Expansion. For an incremental investment of \$16.2 billion in economic terms, GO Rail will have two-way all-day service, faster and more efficient trains, improved stations, and an expanded Union Station. Costs are offset by a terminal value of \$340 million at the end of the project lifecycle.

### GO Expansion Economic Benefits

GO Expansion is expected to realize \$42.2 billion in economic benefits across the GTHA and GO Service area to travellers and society. GO Expansion realizes benefits in three ways:

1. Reducing travel time for existing and new customers by increasing frequencies and reducing travel times. This means customers can access more of the region with GO Rail and will benefit from faster travel times and frequent services that reduce customer need to plan ahead.
2. Reducing the number of automobile trips, which in turn reduces emissions and car accidents and encourages more active travel.
3. Increasing the energy and fuel efficiency of GO Rail trains, leading to emission and pollution reductions.

These benefits include:<sup>8</sup>

- **Transit User Benefits of \$35.4 billion due to reduced travel times** – on average travellers could save 10 minutes per trip compared to today's service levels and speeds, with some travellers saving over 20 minutes.
- **Auto Operating Cost Savings of \$1.9 billion** due to people spending less on gas, parking, and other car based travel costs.
- **Auto Traveller Benefits of \$3.3 billion** due to reduced congestion on major roadways, which allows for faster and less stressful travel for the region's drivers.

- **Health and Safety Benefits of \$1.1 billion** due increased walking and cycling to GO Rail stations (health benefits) and fewer vehicles on the road leading to fewer car accidents (safety benefits).
- **Emission Reduction Benefits of \$330 million** due to reduced emissions that cause health impacts and climate change

### The Economic Case for GO Expansion - GO Expansion's Benefits Significantly Exceed Costs

The Economic Case for GO Rail is summarized in Table E.4. GO Expansion's benefits significantly exceed its costs leading to a Benefit Cost Ratio (BCR) of 2.6 – that means for every \$1.00 invested in GO Expansion, the province can realize an economic benefit of \$2.60. This BCR reflects how transformative GO Expansion will be for how the region travels and conducts business. Each line in the GO Expansion program is expected to realize benefits that exceed costs, with the range of BCRs running from 1.7 to 4.2.

The Net Present Value (NPV – benefits minus costs) for GO Expansion is \$26 billion. This means the province invests \$16.2 billion to realize benefits of \$42.2 billion, leading to a net return of \$26 billion distributed across the region – equal to \$9,000 per household in the GTHA.

Based on a strong BCR and NPV, the Economic Case for GO Expansion is clearly established. From an economic viewpoint, transforming GO Rail into a Rapid Rail system is a crucial and high value investment that will not only benefit travellers but also realize economic value for the entire region.

<sup>8</sup> Benefits indicated in this list do not add to \$42.2 due to rounding. Table E.4 provides a detailed summary of benefits and costs.

**Table E.4:** Economic Case Summary

Present Value of Economic Impact (Million 2017 CAD \$)	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East	System-Wide
<b>Total Incremental Costs</b>	<b>\$16,220</b>	<b>\$2,520</b>	<b>\$1,930</b>	<b>\$3,520</b>	<b>\$2,450</b>	<b>\$2,000</b>	<b>\$3,800</b>
<b>Capital</b>	<b>\$12,220</b>	<b>\$2,240</b>	<b>\$960</b>	<b>\$2,550</b>	<b>\$1,680</b>	<b>\$2,150</b>	<b>\$2,640</b>
Corridor	\$8,500	\$1,160	\$630	\$2,130	\$1,140	\$1,540	\$1,900
Fleet	\$3,720	\$1,080	\$330	\$420	\$540	\$610	\$740
<b>Operating &amp; Maintenance Costs</b>	<b>\$4,340</b>	<b>\$360</b>	<b>\$1,000</b>	<b>\$1,020</b>	<b>\$830</b>	<b>-\$100</b>	<b>\$1,230</b>
Operating	\$1,860	\$170	\$720	\$500	\$440	-\$130	\$160
Maintenance	\$2,480	\$190	\$280	\$520	\$390	\$30	\$1,070
<b>Terminal Value</b>	<b>-\$340</b>	<b>-\$80</b>	<b>-\$30</b>	<b>-\$50</b>	<b>-\$60</b>	<b>-\$50</b>	<b>-\$70</b>
<b>Total Benefits</b>	<b>\$42,145</b>	<b>\$7,120</b>	<b>\$5,590</b>	<b>\$13,040</b>	<b>\$4,270</b>	<b>\$8,330</b>	<b>\$3,795</b>
<b>Total User Benefits</b>	<b>\$40,700</b>	<b>\$6,930</b>	<b>\$5,510</b>	<b>\$12,830</b>	<b>\$4,190</b>	<b>\$8,100</b>	<b>\$3,140</b>
Transit User (reduced travel times and increased frequencies)	\$35,430	\$5,720	\$5,020	\$11,720	\$3,700	\$6,690	\$2,580
Auto Operating Cost Savings	\$1,940	\$420	\$180	\$460	\$170	\$500	\$210
Auto User (Decongestion)	\$3,330	\$790	\$310	\$650	\$320	\$910	\$350
<b>Total External Benefits</b>	<b>\$1,445</b>	<b>\$190</b>	<b>\$80</b>	<b>\$210</b>	<b>\$80</b>	<b>\$230</b>	<b>\$655</b>
Reduction in Accidents Resulting in Death or Injury	\$550	\$120	\$50	\$130	\$50	\$140	\$60
Increased Physical Activity	\$565						\$565
GHG Emission Reductions	\$220	\$50	\$20	\$50	\$20	\$60	\$20
Reduced Air Pollution	\$110	\$20	\$10	\$30	\$10	\$30	\$10
<b>Economic Case Factors</b>							
<b>Net Present Value</b>	<b>\$25,925</b>	<b>\$4,600</b>	<b>\$3,660</b>	<b>\$9,520</b>	<b>\$1,820</b>	<b>\$6,330</b>	<b>N/A</b>
<b>Benefit Cost Ratio</b>	<b>2.6</b>	<b>2.8</b>	<b>2.9</b>	<b>3.7</b>	<b>1.7</b>	<b>4.2</b>	<b>N/A</b>





## The Financial Case for GO Expansion

### Overview

The Metrolinx Financial Case assesses the overall financial impact of a proposed investment, including:

- How much will the investment cost to build, operate, and maintain?
- How will the investment impact Metrolinx's revenues?
- How will the investment be funded?
- What is the net financial impact of the investment?

**NOTE:** the Financial Case and Economic Case both assess the costs of an investment, but do so for different purposes. The Financial Case is concerned with the net impact on Metrolinx and Provincial finances in nominal (inflation adjusted) terms in order to support investment and financial planning.

The Economic Case is concerned with the overall cost to society and is expressed in real terms (impact of inflation removed) to illustrate the opportunity cost of spending on GO Expansion.

**As a result, the costs included in the two cases do not directly align.** For example, the Economic Case could be used to assess the question: is spending resources on GO Rail the best use of these resources? While the Financial Case answers the question: how much money is required to deliver new GO Rail service?

**Only the Financial Case should be used for investment planning.**

### GO Expansion Incremental Costs

The business as usual scenario (the future state of GO Rail without GO Expansion) for GO Rail will require continued capital and operating investment. Over the next 60 years, GO Rail will require \$39 billion in investment (\$12 billion in capital, \$27 billion in operating cost) without GO Expansion. These investments will not significantly expand service or support ridership growth in off-peak or counter-peak markets.

GO Expansion requires an incremental investment of \$16.6 billion (\$12.2 billion capital and \$4.4 billion operating costs) that will generate new ridership, benefits, and revenue beyond what GO Rail would generate under the business as usual scenario.

### GO Expansion Revenue Impacts

GO Expansion will attract more passengers, significantly increasing revenues generated by both peak and off-peak service. Without GO Expansion, GO Rail will generate revenues of \$22.3 billion. With Go Expansion, forecasted incremental revenues are \$12.3 billion, which will increase GO Rail's Revenue to \$34.6 billion.

### Financial Case Summary

Table E.5 summarizes the key financial indicators for GO Expansion. Investment in GO Expansion allows Metrolinx and the GTHA to provide a step change in service with an incremental investment of \$4.5 billion (incremental costs – incremental revenue) between 2019 and 2085.

This incremental subsidy will allow GO Rail to:

- Provide over 1,000 new services a day, leading to 630 thousand daily riders (in 2031 compared to 340 thousand in a scenario without GO Expansion), an increase of 87% from today's ridership by increasing investment by 27%.
- Cover up to 110% of all operating costs with farebox revenue and up to 130% per year by 2055. This will be achieved by implementing more efficient trains and attracting more demand per train. Incremental revenues not only cover incremental operating costs but will also cover \$7.8 billion of GO Expansion's capital costs.

Based on these financial results, GO Expansion has a robust financial case. Investment in GO Expansion will realize a step change in service while also generating new revenues that will allow GO Rail to be self sustaining.

**Table E.5:** GO Rail Costs with and without GO Expansion

(\$ billion)	Without GO Expansion	With GO Expansion	Incremental Investment
<b>Capital Expenditure</b>	(\$12)	(\$24.3)	(\$12.3)
<b>Operating and Maintenance</b>	(\$26.9)	(\$31.4)	(\$4.5)
<b>Total Costs</b>	(\$38.9)	(\$55.7)	(\$16.8)
<b>Revenue</b>	\$22.3	\$34.6	\$12.3
<b>Net Investment</b>	(\$16.6)	(\$21.1)	(\$4.5)
<b>Operating Subsidy or Surplus</b>	(\$14.6)	\$3.2	\$7.8
<b>Illustrative Annual Financial Case Values (\$ Million)</b>			
<b>2031-2032 Operating Costs</b>	(\$790)	(\$950)	(\$160)
<b>2031-2032 Revenues</b>	\$605	\$1,000	\$395
<b>2031-2035 Revenue/ Operating Costs</b>	76.5%	105%	240%
<b>2031-2032 Forecasted Average Daily Ridership</b>	340,000	635,000	295,000



## Deliverability and Operations Case

### Overview

The Metrolinx Deliverability and Operations case demonstrates that the proposed investment can be delivered successfully and key risks can be managed. It focuses on the following questions:

- How will the project be managed and governed?
- What approach will be used to deliver and procure the investment?
- What are key project risks and can they be mitigated?

### Project Governance

Key decisions are subject to approval by the Metrolinx Senior Management Team, the Metrolinx Investment Panel, the Metrolinx Board, and the Provincial Treasury Board. Metrolinx will own GO Expansion and has overall responsibility to deliver it efficiently and effectively, achieving the benefits set out in this FBC within available funds. To ensure efficient delivery, Metrolinx has developed an integrated project team including:

- Program management – monitors performance and progress of all components of the GO Expansion program
- Project Control – ensures adequate monitoring and oversight of the budget and schedule
- Sponsorship – ensures the project realizes its intended benefits

### Procurement Approach

The procurement approach for the GO Expansion program has been developed to address the following objectives to:

- Achieve effective transfer of design cost and schedule risk to those who are best able to manage them.
- Mobilize private sector and international expertise, where appropriate, to optimize design, delivery and operations.
- Retain control and flexibility to meet future needs.
- Achieve competitive pricing.

Metrolinx will use an Alternative Finance and Procurement model where responsibility to Design, Build, Operate, Maintain, and partially Finance (DBFOM) will be shared with private sector delivery partner. This approach is aligned with the overall objectives of the procurement approach and transfers delivery and design risk to private sector partners. To the extent these risks are transferred, specifications can be less prescriptive and more performance based. This incentivizes contractors to optimize their design and delivery approach to maximize long term benefits and minimize life cycle costs. While a private partner will operate GO Rail under the GO Expansion program, Metrolinx retains accountability for revenue risk, customer experience, connectivity between other agencies, and decisions on service planning and fares.

### Risk Management

The core risks identified for this program are:

- **System performance risk** – where the railway may not operate as planned due to the technical delivery approach used. This risk is transferred to the delivery partner as they are responsible to deliver the outputs specified within this FBC.
- **System Integration Risk** – where individual components of the program may not function together as intended. The procurement approach requires all major elements to be delivered by one partner (made up of smaller entities as needed) with ultimate responsibility to ensure all elements are integrated.
- **Construction Disruption Risks** – where current services could be disrupted by the construction of new infrastructure for GO Expansion. A performance regime has been developed to ensure that delivery partners minimize impact on existing service through careful planning and staging in order to reduce this risk.

# Conclusion

## Business Case Conclusions

This FBC for GO Expansion builds upon over three years of study, analysis, design, and investment planning to present a deliverable plan to transform GO Rail into a Rapid Rail system. This transformation is a critical investment that will allow the GTHA to grow by over 40% by 2041 while providing a high quality of life and remaining a competitive place to do business. The four cases in this FBC together articulate a compelling case to invest in GO Expansion (illustrated in Table E.4) based on its ability to:

- **Leverage existing corridors** - the GO Rail network already connects major population and employment centres across the GTHA. GO Expansion adds more and faster service to these existing corridors. This allows passengers to access more of the region with shorter and more reliable travel times. This time saved generates significant economic benefits for the region and its people.
- **Break the bottleneck** - more rail capacity and improved connectivity to Downtown Toronto will unlock economic development potential by allowing more people to commute to the core each day.
- **Unlock development** - expanded off-peak and counter-peak services will make Urban Growth Centres across the region more attractive places to live, work, and invest. This will catalyze regional development in line with plans and policies across the region.

## Recommendations





Based on the performance across these four cases, Metrolinx will submit this FBC to the Minister of Transportation to inform decision making on future transportation investment.

## Next Steps

Following Metrolinx's stage-gate process, the GO Expansion program will continue to progress through several next steps:

- The program is moving forward to the Province for investment decisions, informed by this Full Business Case.
- As of November 2018, Metrolinx is conducting a Request for Qualifications (RFQ) process to shortlist potential partner consortiums to deliver the GO Expansion program.
- Pending approval by the Province and the successful shortlisting of potential partners, Metrolinx will launch a Request for Proposal (RFP) for GO Expansion.
- Metrolinx will develop a benefits realization plan to ensure that the benefits described in this FBC are protected through the procurement process.
- If significant changes are made to the program during procurement, an updated Full Business Case will be produced.
- Once the program is in service, Metrolinx will produce a Post In-Service Business Case to review the actual costs and performance of the program.

**Table E.5:** The Case for Investment in GO Expansion

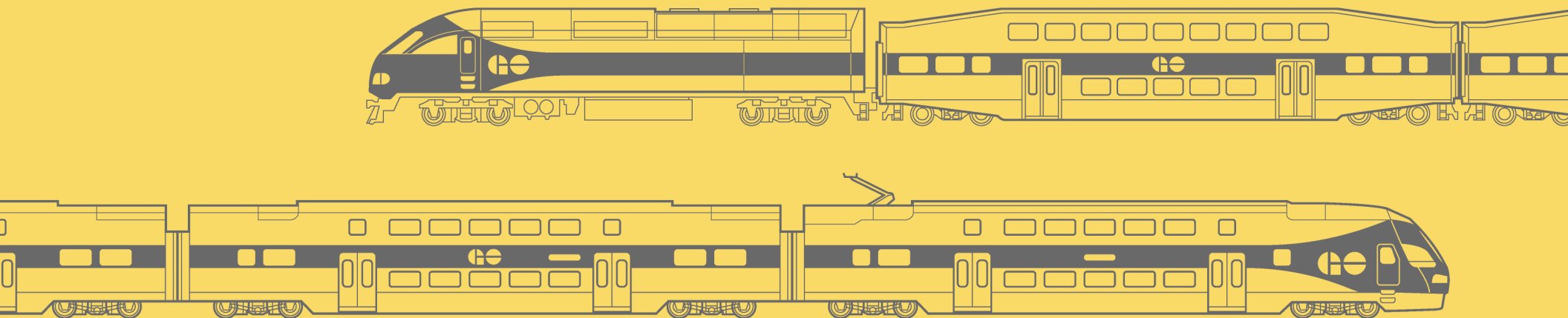
Case	Case Evidence	Conclusions
 <b>Strategic Case</b>	<p>GO Expansion will realize four types of benefits:</p> <ul style="list-style-type: none"> <li>• <b>Transportation Benefits</b> - faster journey times and higher frequencies will double annual ridership to over 200 million (daily trips exceeding 630 thousand, with less congestion for drivers due to 165,000 fewer car trips a day) while ensuring the network has reduced subsidy requirements and can accommodate demand growth past 2055.</li> <li>• <b>Quality of Life Benefits</b> - connecting nearly 30% of the GTHA's population with fast, frequent, and reliable services while also supporting a healthier region by adding 15 million walk and cycle trips to stations a year.</li> <li>• <b>Economic Prosperity</b> - reducing congestion and saving commuters up to 10 minutes a trip while also creating 8,300 annual job equivalents over twelve years in construction and supply-chain industries and decreasing journey times by up an average of 25 minutes between Urban Growth Centres in the off-peak.</li> <li>• <b>Protected Environment</b> - reducing emissions per rail trip by 70% and total Greenhouse Gas emissions by 13.5 megatonnes, while also reducing Criteria Air Contaminants and other pollutants that impact human health.</li> </ul>	<p>These strategic benefits illustrate how GO Expansion will directly address the problem statement:</p> <ul style="list-style-type: none"> <li>• It will provide new transportation choices that can accommodate significant population growth and help tackle congestion.</li> <li>• It will provide the foundations of a region wide Frequent Rapid Transit Network (as described in the 2041 RTP).</li> <li>• It will support the GTHA in maintaining a high quality of life, prosperous economy, and protected environment as its population grows by over 40%.</li> </ul> <p><b>Based on this evidence, the Strategic Case for GO Rail justifies it as an investment to achieve regional policy and realize the benefits of rapid growth.</b></p>
 <b>Economic Case</b>	<p>The Economic Case for GO Expansion assessed a range of benefits and costs:</p> <ul style="list-style-type: none"> <li>• <b>Incremental economic costs of \$16.2 billion</b> over the investment lifecycle</li> <li>• <b>Economic benefits of 42.2 billion</b>, including: <ul style="list-style-type: none"> <li>• Transit user benefits of \$35.4 billion</li> <li>• Road user benefits of \$3.3 billion</li> <li>• Auto Operating Cost savings of \$1.9 billion</li> <li>• Accident reduction and health improvement benefits of \$1.1 billion</li> <li>• Emission reduction benefits of \$330 million</li> </ul> </li> </ul>	<p>GO Expansion's benefits significantly exceed costs:</p> <ul style="list-style-type: none"> <li>• GO Expansion realizes \$42.1 billion in benefits by investing \$16.2 billion resulting in a BCR of 2.6 to 1 - this means for every \$1.00 invested in GO Expansion, the region will benefit by \$2.60.</li> <li>• This is an NPV of \$25.9 billion, meaning a benefit of nearly \$9,000 per household.</li> </ul> <p><b>Based on this evidence, the Economic Case justifies investment GO Expansion as means to realize economic benefits in Ontario.</b></p>
 <b>Financial Case</b>	<ul style="list-style-type: none"> <li>• Without GO Expansion, GO Rail will require a net investment (capital and operating costs minus revenues) of \$16.6 billion over the next 60 years.</li> <li>• GO Expansion requires a net investment of \$21 billion in the same time period, meaning the net incremental investment for GO expansion is \$4.5 billion.</li> <li>• In addition the incremental revenue generated by GO Expansion could allow GO Rail to run without subsidy beyond 2031 and achieve an revenue/operating ratio of 130% by 2055.</li> </ul>	<p>GO Expansion's incremental investment of \$4.5 billion will allow Metrolinx to transform GO Rail from a commuter system into a world class Rapid Rail system that doubles ridership, saves passengers 10 minutes per trip, and realizes significant benefits while reducing the need for operating subsidy.</p> <p><b>Based on this evidence, the Financial Case suggests that GO Expansion is a beneficial investment with a manageable level of required investment.</b></p>
 <b>Deliverability and Operations Case</b>	<p>Metrolinx has conducted extensive project development, environmental assessment, and operational planning projects to ensure GO Expansion is deliverable. In addition, an innovative P3 model will minimize risk and support delivery on time and budget.</p>	<p>GO Expansion has undergone significant development - from a technical design perspective as well as from a project governance and procurement practice that draws from international best practice.</p> <p><b>Based on this evidence, the Deliverability and Operations Case, is found to demonstrate GO Expansion is readily deliverable.</b></p>





# 1

## Introduction





## How is the chapter structured?

Section	Content
Background	Provides a high level background on the topic of this Full Business Case – expanding the GO Rail Network
What is GO Expansion?	Provides a brief summary of the proposed investment, which is described in more detail in Chapter 3
What is a Full Business Case?	Describes why a Full Business Case is prepared and what role it plays in the project lifecycle
Full Business Case Structure	Provides an overview of the remaining seven chapters in the document
Acknowledgments	Recognizes key contributors to this Full Business Case

# Background

The GO service area, including the Greater Toronto and Hamilton Area (GTHA) together with Niagara, Kitchener, and Barrie, is one of the fastest growing city-regions in North America. Cities across this region are known for their livability and prosperity, while Toronto has become an international economic and cultural centre. By 2041 the communities across this region will be home to over 12 million people and 5 million jobs. With this growth, daily travel will grow by more than 50%.<sup>1</sup>

Regional plans and policies aim to guide this rapid growth and harness its potential benefits: improved livability and economic opportunities. However, with rapid growth comes potential challenges. As the region grows, the mobility needs of its people will continue to increase – and evolve – which will put ever increasing demands on the existing system. This has consequences such as traffic congestion that affects economic productivity, impacts the environment and people’s health, reduces quality of life, and limits urban development.

Developing a transportation network that can serve future demands is essential to serve imminent needs and manage growth to enable a high quality of life and continued economic prosperity.

This document is the Full Business Case (FBC) for GO Expansion, which is a transformational investment that will improve the GO Rail network to ensure that the region remains one of the most desirable places in the world to live and work.

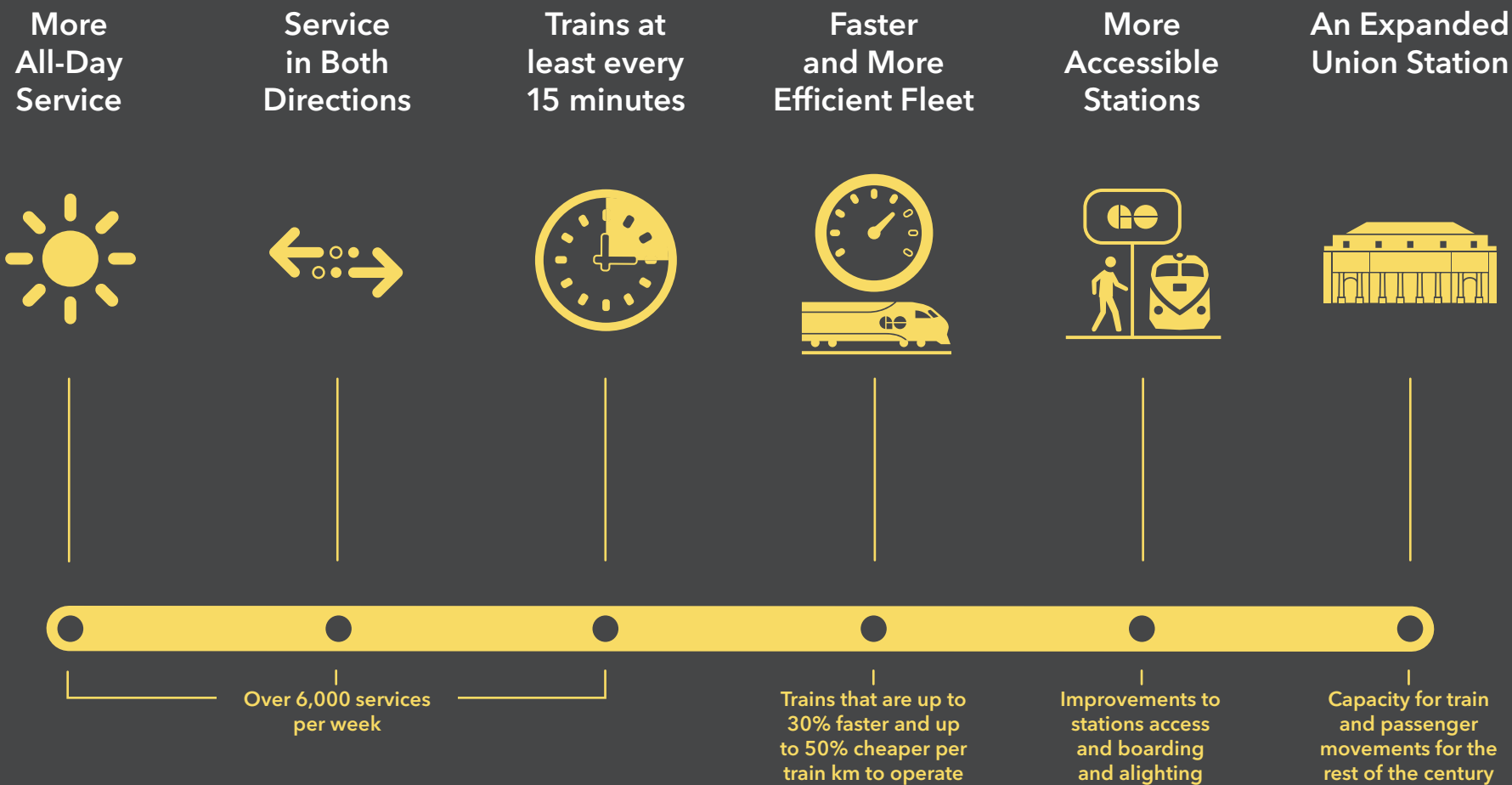
## What is GO Expansion?

The GO Expansion program will transform the existing GO Rail network into a world class rail system. It is part of over \$30 billion in ongoing provincial investment in public transit that includes Light Rail Transit (LRT), subway, and bus projects across the GTHA. Upon delivery, the GO Expansion program will transform GO Rail from a commuter focused rail system to the backbone of the GTHA’s Frequent Rapid Transit Network. These improvements will expand the GO Rail network to new markets which will enable seamless travel across the region.

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<sup>1</sup> Ontario Population Projections Update: <https://www.fin.gov.on.ca/en/economy/demographics/projections/>

The GO Expansion program will provide a range of improvements across the GTHA:



**Figure 1.1:** Mapping the evolution of GO Expansion

The rail improvement projects included in the GO Expansion program have been refined over ten years of planning and study – including the GO 2020 Strategic Plan, the 2008 Regional Transportation Plan (the Big Move), and the GO Electrification Study. Significant rail improvements were also included in the 2041 Regional Transportation Plan (RTP), which defines the policies and plans for transportation in the GTHA. Elements of these plans were included in the 2014 Provincial Budget, which first announced the creation of a two-way all-day electrified service across the GO Rail network as a government priority. This announcement launched the development of the GO Expansion program, which was formally defined in the 2015 Initial Business Case (IBC) for RER and the 2015 Provincial Budget.

This document is the next step in developing and delivering the GO Expansion program for 2025.

**Note - the program previously referred to as Regional Express Rail (RER) is now referred to as GO Expansion, which will transform GO Rail from a commuter rail network into a Rapid Rail Network.**

### Ambition for improved rail (2008 – 2012)

Studies and plans articulate the potential of different rail improvements.

*Key Documents:*

- GO 2020
- Regional Transportation Plan - the Big Move
- GO Electrification Study
- Express Rail Study

### GO Expansion Takes Shape (2014 – 2016)

- Regional Express Rail Initial Business Case demonstrates a strong case for electrified two-way, all-day service (2015)
- Plans and priorities to implement improved service on the five GO-owned corridors
- Regional Express Rail program integrated with State of Good Repair and Optimization and Expansion programs
- Initial Business Cases prepared for possible new stations
- UP Express opens, which demonstrates significant demand for two-way, all-day fast and frequent rail in Toronto
- Early enabling works underway on five corridors including Davenport Diamond bridge and 401 tunnel
- GO Rail Electrification Reference Design completed

### Commitment to invest in GO Rail (2012 – 2014)

- Georgetown South project – delivered
- East Rail Maintenance Facility – delivered
- Union Station Resignalling – in progress

### GO Expansion Optimization (2017 – 2018)

- Metrolinx establishes Business Case Guidance, a Sponsor Office, and stage gate process to advance transportation projects and realize their benefits
- Decision to procure On-Corridor works and services as a single Design-Build-Finance-Operate-Maintain (DBFOM) with a Request for Qualifications (RFQ) issued in 2018
- Preliminary Design Business Cases for New GO Rail stations completed
- Integrated Metrolinx - Infrastructure Ontario procurement team established
- Route and corridor studies optimize infrastructure and service plans
- 2041 Regional Transportation Plan published with expanded rail as a key component of the future transportation network
- Technical concepts developed and an Initial Business Case prepared for migration to level boarding, with step-free access onto trains
- Full Business Case for GO Expansion (this document) published in November 2018
- Interim service improvements bring more frequent all-day diesel services
- Bidders (delivery partners) shortlisted for GO Expansion delivery

**Figure 1.2:**  
Illustration of the Business  
Case and Stage Gate  
Process

### What is a Full Business Case?

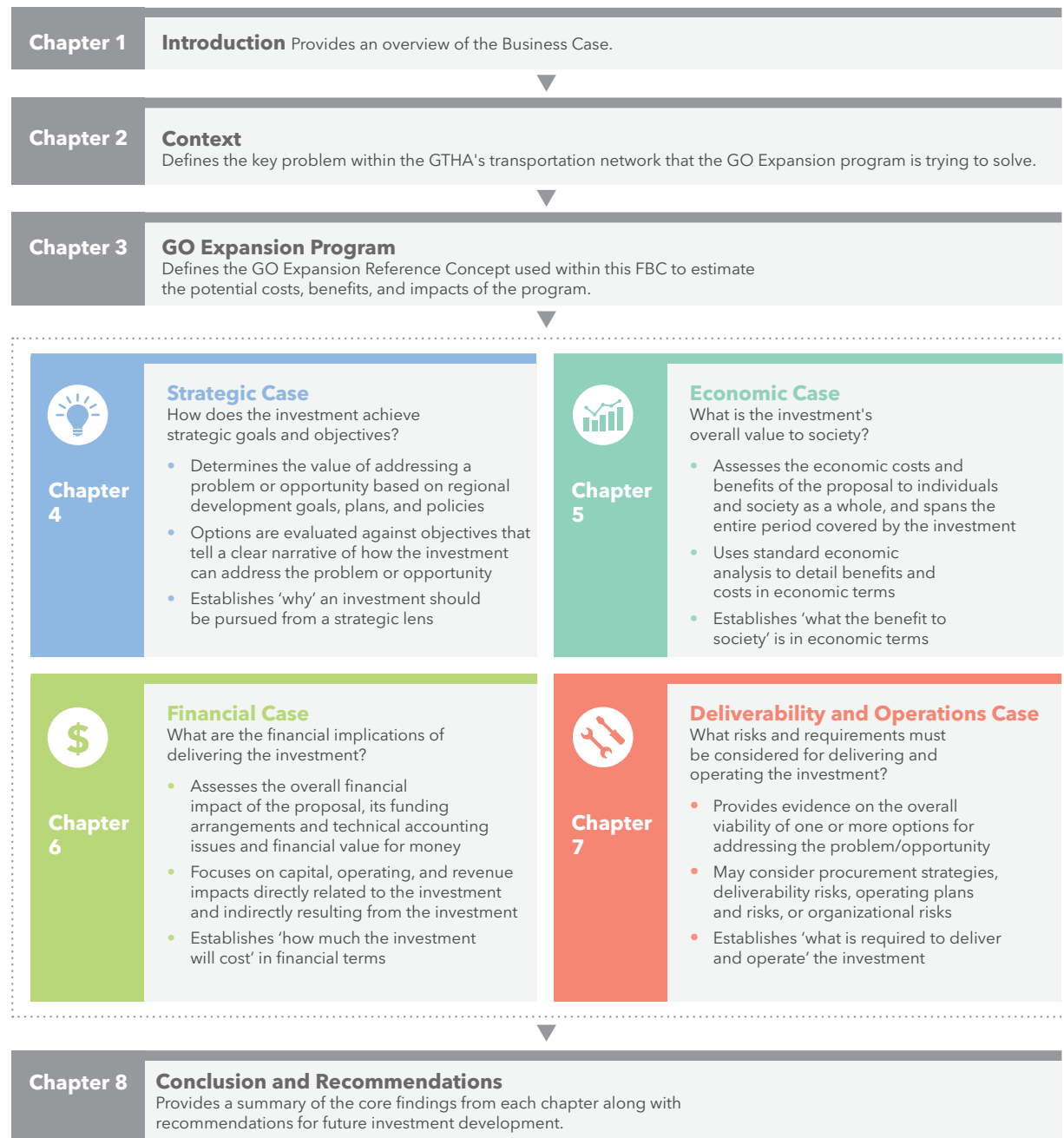
Metrolinx follows a seven stage lifecycle (outlined in Figure 1.2) to plan and deliver transportation network investments. Throughout this lifecycle, Business Cases are completed to define the rationale and requirements for delivering an investment. The FBC is prepared as part of this lifecycle, and informs decision makers on whether and how an investment should be procured.

Since the publication of the IBC in 2015 there has been significant work undertaken in refining and developing options, and in seeking to optimize the GO Expansion program improvements. The FBC builds upon the work undertaken in the IBC, drawing upon best available evidence, updated forecasts and revised costs and designs. As a result, there is some variation between the IBC and this FBC based on program evolution.

### Full Business Case Structure

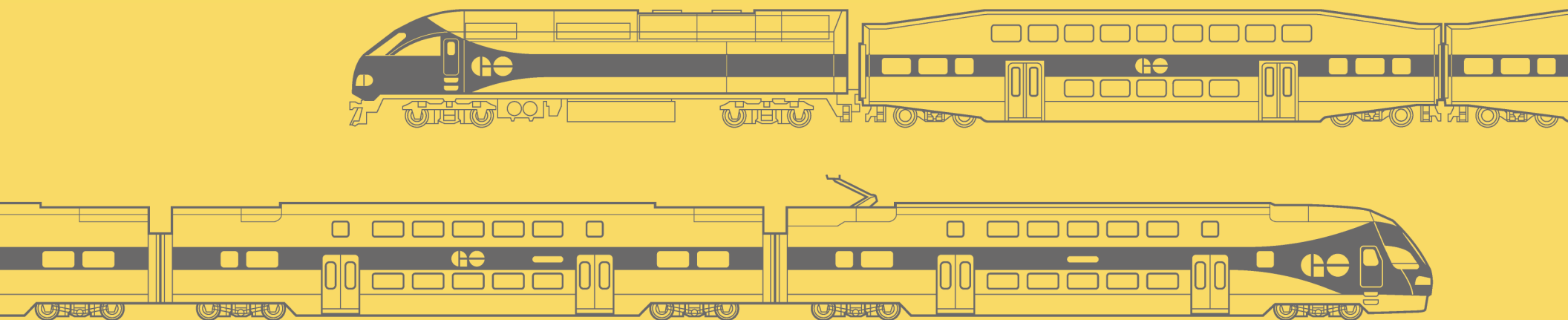
The structure of the FBC is outlined in Figure 1.3.



**Figure 1.3:** The Business Case structure

# 2

## Context





# Overview

The Context Chapter describes the rationale for investing in GO Expansion by articulating the central problem it will address, what will happen if the problem is not addressed, and why investment in GO Rail is the most effective way to address it .

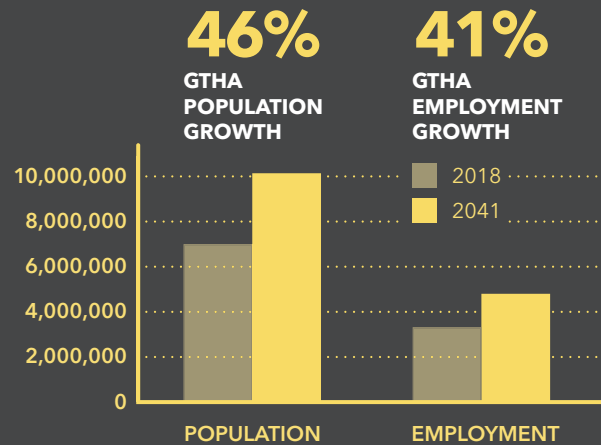
# How is the chapter structured?

Section	Content
2.1	<div>The Need for Regional Transportation Investment: Managing Growth and Congestion</div> <div>A summary of key issues that shape the need for transportation investment, including a review of existing and future population, employment, and transportation demand.</div>
2.2	<div>Problem Statement</div> <div>A clear articulation of the problem that the proposed investment in this FBC will address.</div>
2.3	<div>The Opportunity: Invest in Rail to Accommodate Growth</div> <div>A description of the general benefits that can be realized by investing in rail to address the problem statement.</div>
2.4	<div>The Solution: Transform GO Rail into an Rapid Rail System</div> <div>A summary of the proposed investment (Rapid Rail) and why it should be considered.</div>

## Chapter Summary Problem and Opportunity: Investing in Regional Transportation to Enable Growth and Prosperity

### THE GREATER TORONTO AND HAMILTON AREA (GTHA) IS UNDERGOING RAPID GROWTH

Regional plans and policies seek to ensure the region maintains a high quality of life, competitive and productive economy, and protected environment as it grows.



**40%**  
of all jobs will be in Toronto, making it the largest employment centre and engine of economic growth in the region.

**New rapid transit infrastructure is being planned and delivered to provide travellers with fast and reliable travel choices.**

These projects will support regional growth but do not provide increased capacity into Downtown Toronto or high speed options for longer distance trips across the region.

**Existing infrastructure will not be able to accommodate this growth.**

Much of the network is already congested today - demand for travel exceeds the network's capacity.

Today congestion can increase travel times for drivers by as much as

**120%**

Congestion could cost the region's economy up to

**\$15 billion**

annually in lost productivity by 2031.

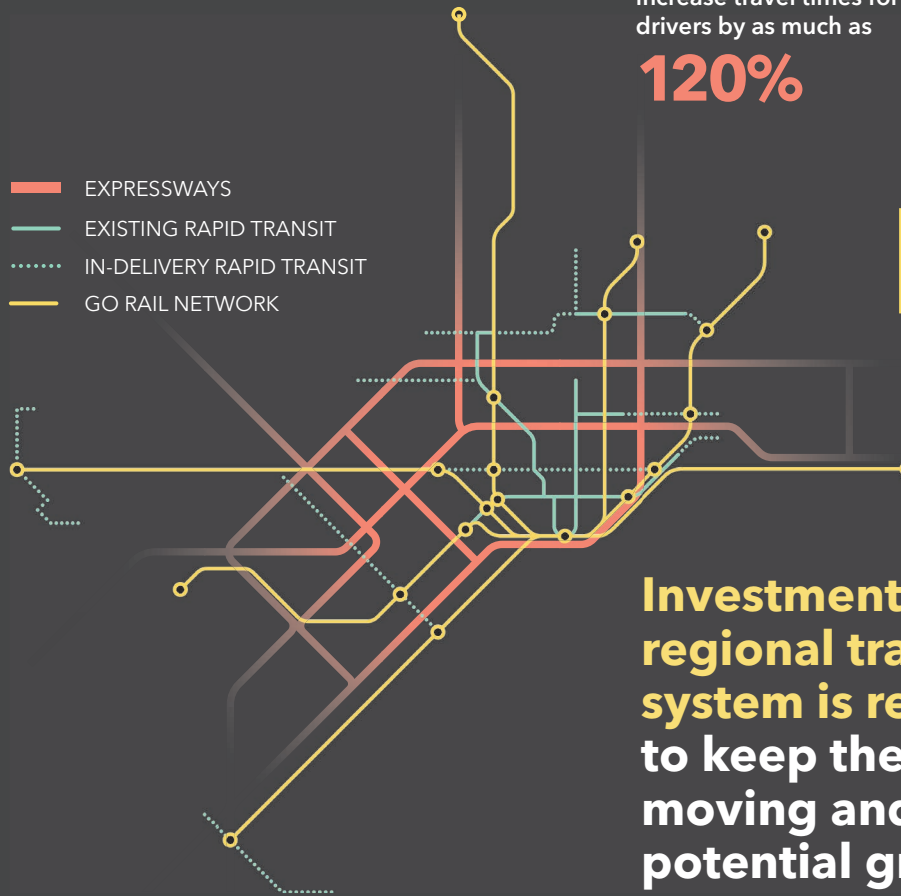
**As the region grows, so will demand.**

Daily peak trips will grow from 8 million to over 12 million by 2041 - this is an increase of over

**50%**

**Investment in the regional transportation system is required to keep the GTHA moving and to realize potential growth.**

EXPRESSWAYS  
EXISTING RAPID TRANSIT  
IN-DELIVERY RAPID TRANSIT  
GO RAIL NETWORK



# Proposed Solution: Transform GO Rail into a Rapid Rail System

## WHY CONSIDER RAIL?

A rail based investment is proposed to expand travel choices across the region and to Downtown Toronto in order to manage congestion and support high quality of life, economic competitiveness, and sustainable environment because GO Rail:

- **OFFERS COMPETITIVE TRAVEL TIMES**  
more than a quarter of trips into Downtown Toronto from outside the City of Toronto already use GO Rail because it saves travellers time
- **COVERS THE REGION**  
spanning the entire GTHA and beyond with over 400km of track, GO Rail allows customers to travel across the GTHA.
- **PROVIDES READILY EXPANDABLE CAPACITY**  
each train can carry 2,000 travellers, which is more than a new lane of highway can carry in an hour.
- **GENERATES REVENUE THAT CAN COVER SOME OR ALL OPERATING AND MAINTENANCE COSTS**  
a full GO Rail train in the peak period does not require operating subsidy.

## WHY NOT USE OTHER MODES TO SOLVE THIS PROBLEM?

Other modes also play a critical role in the GTHA transportation network and are being invested in through other projects and programs - however, they are not optimal solutions to provide more capacity for long distance travel and travel to Downtown Toronto from the rest of the GTHA.

### WHAT IS RAPID RAIL?

Today the GO Rail system is a commuter rail system that largely serves trips in the peak period to and from the core. Investment will transform GO Rail into a Rapid Rail support a growing region.

Rapid Rail systems typically run fast, frequent, reliable, and electrified rail services. These systems have been developed in over 60 cities, including the world's most prosperous and livable city-regions.

### TRANSFORMING GO RAIL INTO A RAPID RAIL SYSTEM MEANS:



#### FASTER AND MORE EFFICIENT FLEET

New trains will realize travel time savings for customers and reduced costs to operate.



#### TWO-WAY, ALL-DAY SERVICE

Whether travellers travel for work or for recreation, they can access more of the region on GO Rail.



#### A TRAIN EVERY 15 MINUTES, OR BETTER

This means travellers can turn up and go at their station and that the system will provide capacity to accommodate growth in travel demand into the future.

### RESULTING IN:



#### Travellers Benefit

Travellers on GO Rail will save time and money, while travellers using automobiles benefit from reduced congestion



#### Increased Productivity

A growing population has better access to a growing job market



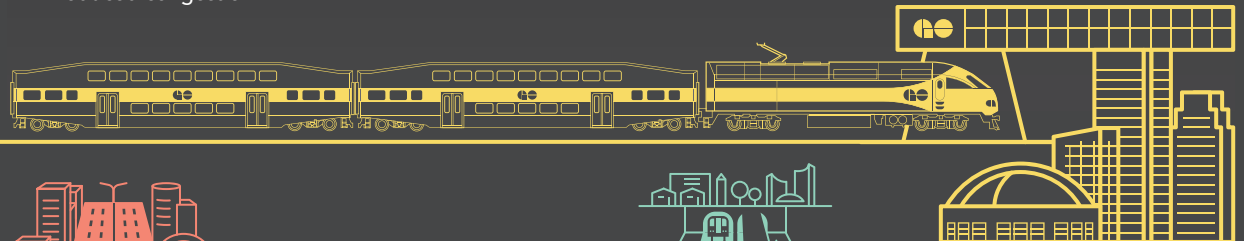
#### Higher Quality of Life

People have more time to spend with their families and have greater access to the region



#### Protected Environment

The transportation network will use less energy and produce fewer emissions



### HIGHWAYS

The highway network provides six lanes into the core on the Don Valley Parkway and six lanes on the Gardiner Expressway. These highways are already congested and do not have capacity for further growth.

Both highways cannot realistically be expanded further - the Gardiner runs alongside new urban developments

Investment in highways upstream will not mitigate the Downtown Toronto bottleneck, while investment in rail can decongest highways reducing travel times for people who continue to drive.



### SUBWAYS AND RAPID TRANSIT

Line 1 and Line 2 play a critical role in the GTHA's transportation network. They ensure travellers can access the core and much of the City of Toronto.

New rapid transit to Downtown Toronto is being explored as a means to reduce crowding and expand accessibility - however, using subways or rapid transit to connect the rest of the GTHA to Downtown Toronto will be expensive, while the railway network already provides 400km of coverage across the GTHA.

## 2.1 The Need for Regional Transportation Investment: Managing Growth and Congestion

### Vision for Transportation in the GTHA in 2041

The 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area (The RTP) is the blueprint for creating an integrated, multi-modal regional transportation system that will serve the needs of residents, businesses, and institutions. The infrastructure, services, and policies in the plan will keep GTHA and its people moving as the region grows and evolves.

The RTP sets out a vision for transportation in the GTHA:

**“The GTHA will have a sustainable transportation system that is aligned with land use, and supports healthy and complete communities. The system will provide safe, convenient and reliable connections; and support a high quality of life, a prosperous and competitive economy, and a protected environment”**

Four key elements included in this vision were adapted to create a strategic framework to assess challenges and opportunities in Metrolinx Business Cases (shown in Figure 2.1).

**Figure 2.1:** Applying the 2041 Regional Transportation Plan Vision in the GO Expansion Full Business Case Strategic and Policy Considerations for Transportation Investment



#### Safe, Reliable, and Convenient Connections

If the transportation system is to support a high quality of life, prosperous economy, and protected environment it must provide a range of travel choices that evolve to meet changing customer needs and expand over time based on population growth and urban development.



#### High Quality of Life

Transportation is a key determinant of quality of life – the harder it is to move from where people are to where they want to go, the lower their quality of life is. Transportation that augments quality of life aims to expand the range of places people can access while also improving journey experience (reduced travel time and stress) and minimizing risks to health and safety.



#### Prosperous Economy

Transportation can enable regional prosperity. The region prospers when people have a wide range of job choices, employers can draw from a broad and talented labour pool, goods can be moved efficiently, and firms invest and innovate. Transportation that supports prosperity will offer reliable and fast journey opportunities from home to work, home to businesses, and between businesses.



#### Protected Environment

Transportation networks require energy and resources to operate and they also produce pollution – as a result they have an impact on regional sustainability. Transportation investments that increase sustainability aim to reduce the resources required and the negative impacts – like pollution – per trip taken.

## 2.2 Problem Statement: the Current Transportation Network Cannot Meet the Needs of a Growing Region

The role of the problem statement in a Business Case is to describe a key challenge related to the successful realization of the RTP vision that can be addressed through the delivery of a new investment - including new transportation services, policies, or infrastructure.

### PROBLEM STATEMENT

If the GO Service Area is to continue to grow, prosper, and function as a single integrated region, it needs fast, frequent, efficient, and high capacity regional transportation that provides reliable mobility between its key population and employment centres and Downtown Toronto.

Without investment, the regional transportation system will not meet this need and will reduce the region's attractiveness as a place to live and do business in, because:

#### DEMAND WILL EXCEED THE CAPACITY OF THE NETWORK LEADING TO INCREASED CONGESTION

Today the regional road network is congested in the peak period and is increasingly congested throughout the day. This leads to decreased travel times and reliability. GO Rail and Rapid Transit services are crowded in the peak, and there is limited capacity to accommodate new passengers. As the population grows, it is expected that travel demand will also increase leading to further congestion that will cost the region up to \$15 billion annually in lost productivity by 2031.<sup>1</sup>

#### THE TRANSIT NETWORK IS INCOMPLETE AND DOES NOT SERVE ALL TRAVELLERS

While advances have been made to provide a range of mobility choices for travellers across the region, many areas, including those targeted as centres for regional development, do not have access to reliable all-day regional transit services. This means travellers may have to deal with congested roadways and further contribute to congestion.

<sup>2</sup> Metrolinx Cost of Congestion  
([http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP\\_08-015\\_Cost\\_of\\_Congestion\\_report\\_1128081.pdf](http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf))

### What happens if the problem is not addressed?

Providing improved connectivity across the region is a key enabler for high quality of life, economic prosperity, and sustainability. The current regional network will not accommodate these social outcomes in the long term – Figure 2.2 outlines the impact of not addressing this problem.

**Figure 2.2:** What happens if the problem is not addressed?



#### **The transportation network will not manage the level of growth and quality of life will decrease**

- As the region's population increases by nearly 42%, existing transit and highways will see increased congestion leading to lower reliability and travel speeds
- As a result people will spend more time travelling and have fewer mobility choices



#### **The transportation network will become a barrier to further economic and regional development in the GTHA**

- Increased congestion will make it harder for people and businesses to access economic activities
- This will impact the attractiveness of the GTHA for businesses in which to work, invest, and innovate
- Population and employment growth will be constrained, especially in the downtown core, which may eventually deter investment and regional development



#### **The transportation network will be more resource and pollution intensive**

- Increased population will lead to increasing demands for mobility, which in turn will mean more fuel and energy used every day
- If trips are made on vehicles with lower energy efficiency, the transportation system will produce more pollution that impacts human health and the environment

**Figure 2.3:** Transportation Markets in the GO Service Area

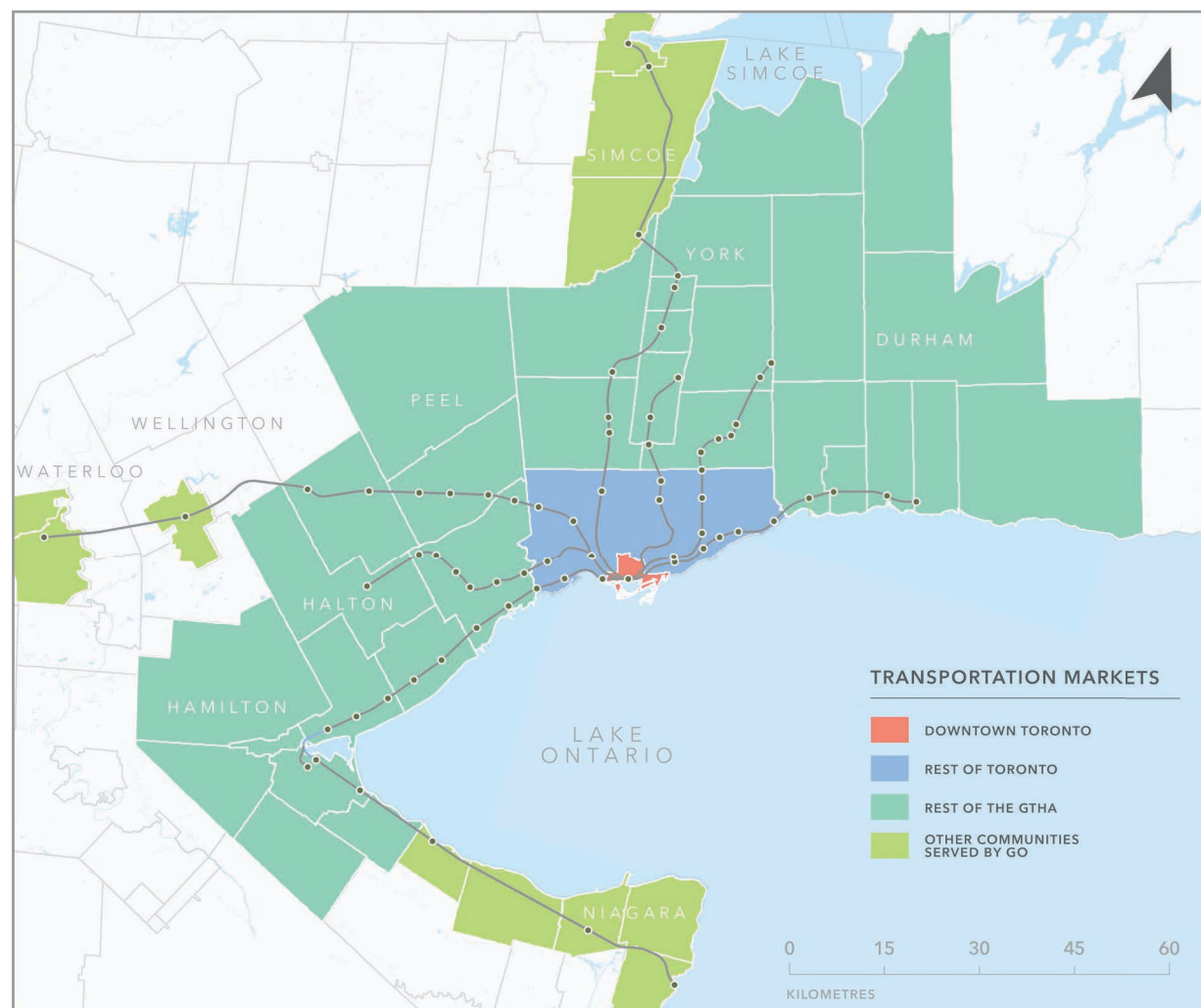
### Problem Deep Dive – Understanding the Need for Investment

This subsection provides a summary of key issues that shape or drive this problem:

- The GTHA and the GO Service Area<sup>3</sup> will see significant population and employment growth in the next twenty years.
- The transportation network is already congested and will be unable to provide quality mobility choices to the region's travellers because of increased population and employment will lead to travel demand that will exceed the network's capacity and coverage.

This analysis divides population, employment, and travel into markets as illustrated in Figure 2.3:

- Downtown Toronto
- Rest of Toronto
- Rest of the GTHA
- Other Communities Served by GO Transit



*Note - this FBC and its problem statement are focused on a specific set of transportation issues related to accommodating population and employment growth in the GTHA with high quality fast, reliable, and frequent services. The 2041 Regional Transportation Plan and the supporting background papers created during its development provide an in-depth review of a broader range of key issues that shape transportation in the GTHA.*

<sup>3</sup> The GO Service Area refers to all communities that have access to GO Transit services.

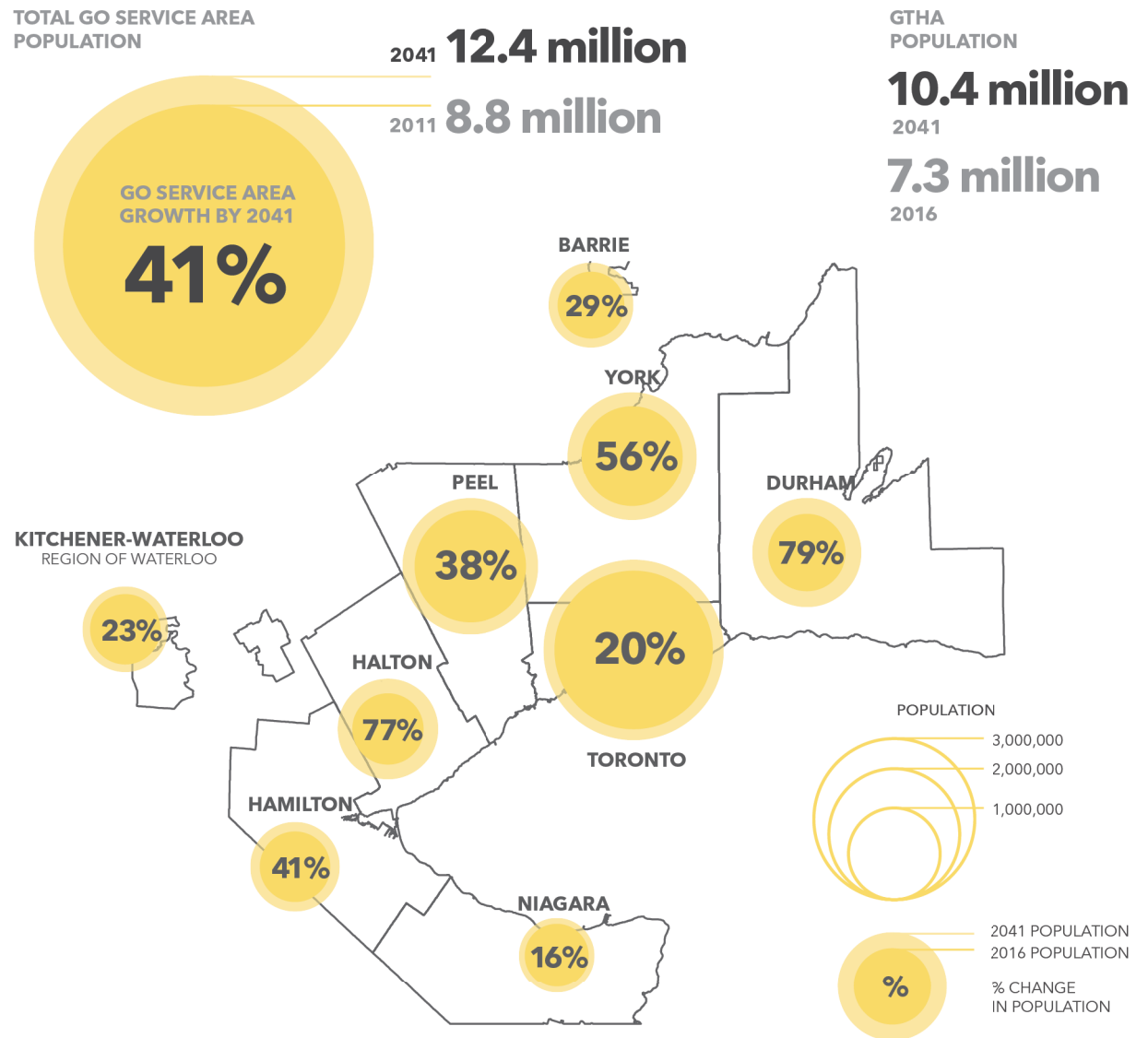


## The GTHA is Expected to See Significant Growth in the Coming Decades

### Population Growth

The GTHA is home to over seven million people and is rapidly growing. Each year, 110,000 new residents move to the region and current forecasts indicate the region's population will exceed ten million by 2041 (a growth of 41% from 2016), making it one of North America's largest and fastest growing city-regions. The GTHA extends over 100km from Hamilton to Oshawa and is a provincial and national centre of cultural, educational, and economic activity. Because the GTHA is a major centre, travellers are also drawn in from as far as Barrie, Niagara, and Kitchener, which are currently served by GO Transit services. This expanded area is referred to as the "GO Service Area" in this FBC, and is home to nearly 8 million people today may be as large as 12.4 million people by 2041. This growth is illustrated in Figure 2.4

**Figure 2.4:** Forecasted Population Growth by 2041 in the Greater Toronto and Hamilton Area



Source: Ministry of Finance Population Forecasts for Ontario.

**Figure 2.5:** Employment Growth in the Greater Toronto and Hamilton Area from 2011 to 2041

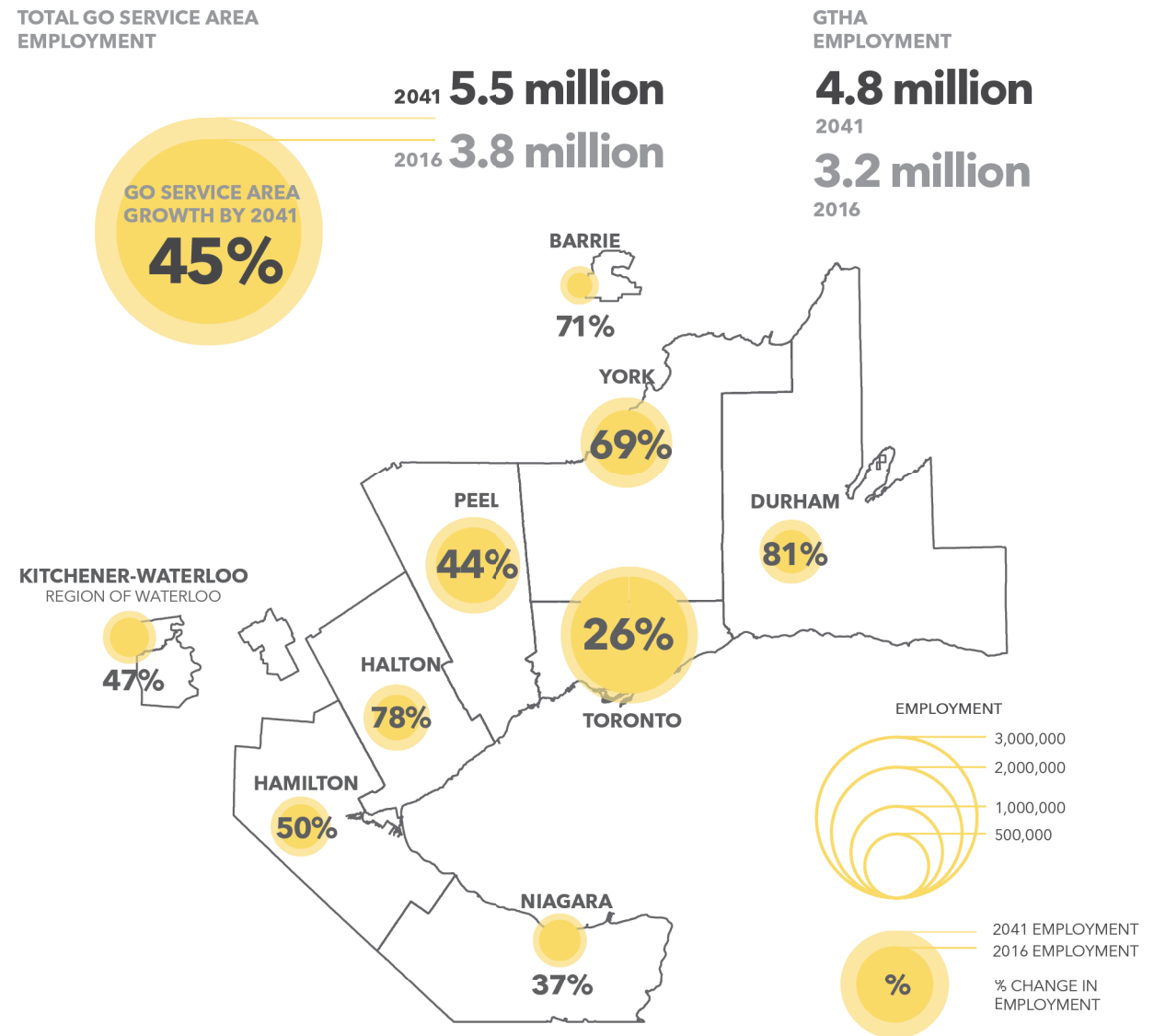
### Employment Growth and Economic Development

The economy of the GTHA is crucial to both Ontario and Canada. As the GTHA's economy continues to evolve, ensuring the transportation network can support diverse and innovative industries will be a key contributor to regional prosperity. Figure 2.5 illustrates employment growth forecasts for the GTHA.

The number of jobs in the GTHA is expected to grow by 45% between 2011 and 2041, from 3.3 million to 4.8 million (an increase of 45% or 1.5 million). The majority of employment growth will occur in the Rest of the GTHA, where job growth will exceed one million by 2041. This represents nearly 73% of all forecast employment growth in the region. Of this growth, 36% will occur within 2 km of a GO Rail station, which highlights how GO Rail can play a crucial role in connecting emerging employment centres across the region.

Employment in the Rest of Toronto will increase by 195,000, which represents 13% of GTHA wide growth. This increase will be distributed across Toronto, however nearly 42% of it will be within 2 km of a GO Rail station.

While employment growth will be distributed across the region. 40% of all jobs are expected to be located in Downtown Toronto by 2041. Today many jobs in Downtown Toronto are filled by commuters from across the GTHA. This is expected to continue into the future, which will put further demands on an already congested transportation network.



Source: Employment Forecasts in the Greater Golden Horseshoe Model v4

## Impact of Population and Employment Growth on the Transportation Network

### Travel Behaviour Today

Travel behaviour in the GTHA has been analyzed using Transportation Tomorrow Survey data (2016). Over the course of an average day, nearly three quarters of trips within the GTHA are undertaken by auto, followed by 14% on transit, 12% on other modes including walking/cycling and 1% on GO Rail. Travel can further be broken down by travel market and time of travel, as illustrated in Figure 2.6. These markets include:

- **Trips to Downtown Toronto from the Rest of the GTHA** – representing 4% of the peak demand and 2% of all-day demand.
- **Trips to the Rest of Toronto to/from the Rest of the GTHA** – representing 8% of peak demand and 6% of all-day demand.
- **Trips inside Toronto** – representing 34% of peak demand and 34% of all-day demand.
- **Trips within and between communities in the Rest of the GTHA** – representing 48% of peak demand and 50% of all-day demand.

Time periods in this analysis include:

- Peak Period Trips (typically 6:00-9:00 am in the morning and 3:00-7:00 pm in the evening).
- Off-peak trips (early morning, midday, and evenings).

**Figure 2.6:** GTHA Travel Market Analysis

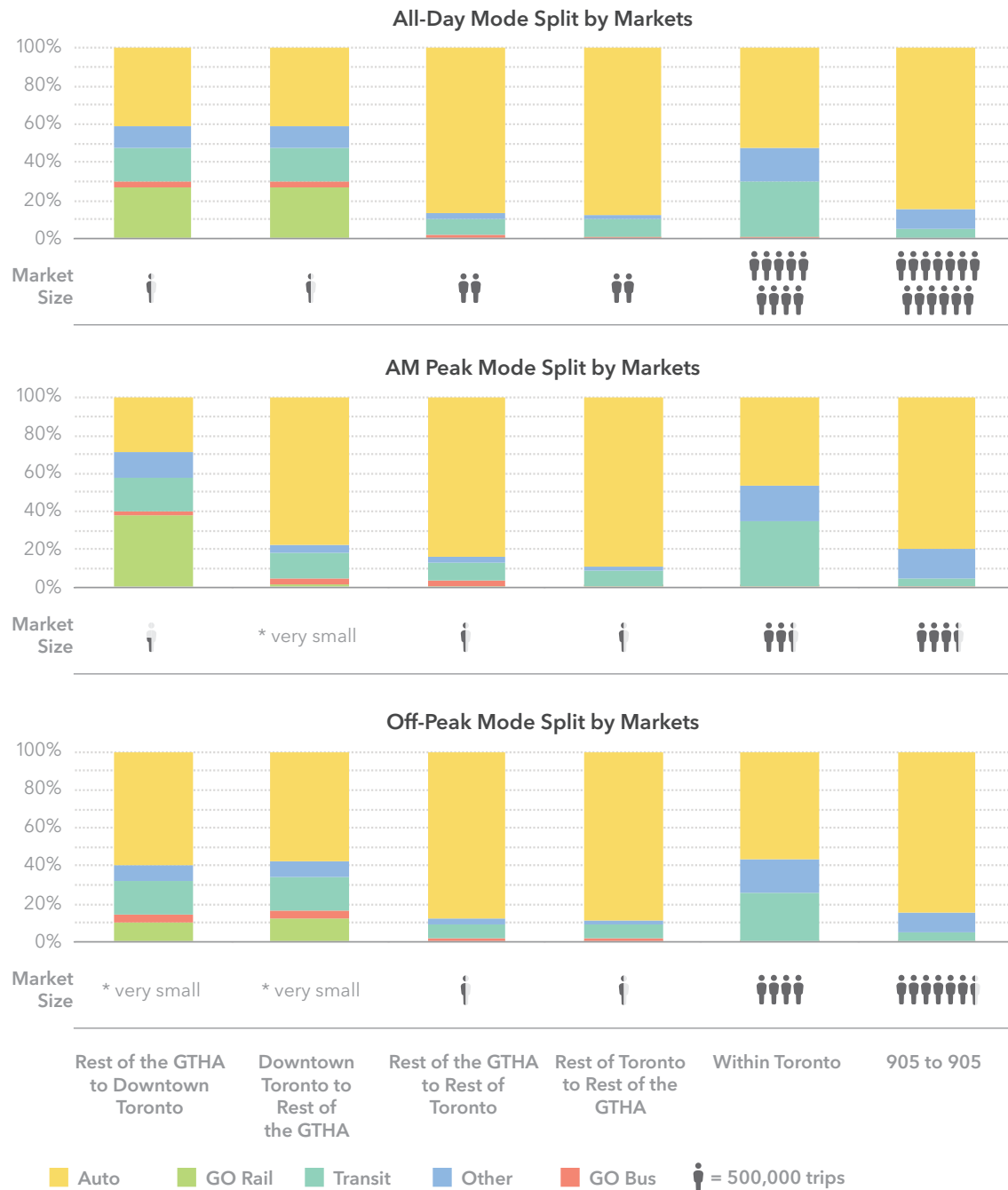


Figure 2.6 illustrates that:

- GO Rail is the dominant mode of travel in the peak period between Downtown Toronto and the Rest of the GTHA. Each day over 40% of commuters use GO Rail to access Downtown Toronto. Over 60% of all trips to Downtown Toronto are made on municipal transit and GO Transit. In this market, the auto mode share increases in the off peak and GO Rail's mode share decreases because highways are less congested (allowing faster travel times) and GO Rail's has lower frequency service or no service on some lines.
- Peak travel within Toronto is split between auto and transit, with GO Rail playing a minor role – this is due to the limited frequencies and two-way service in the city, which positions auto and transit as preferred travel options.
- The other travel markets are auto dominated – largely because transit options are unavailable or do not compete due to higher travel times or lower frequencies.

### ***The Impact of Growth on Travel Demand***

Increased population and employment puts pressure on the transportation network, contributing to increased congestion. Travel demand will increase by nearly 50% across the GTHA (see Figure 2.7). Presently, daily trips in Toronto are about 75% as many as daily trips outside of Toronto (3.1 million compared to 4.1 million). However, in the future, there will nearly be twice as many daily trips outside of Toronto compared to trips in Toronto.

**Figure 2.7:** Total peak period travel demand by travel market, 2011 and 2041

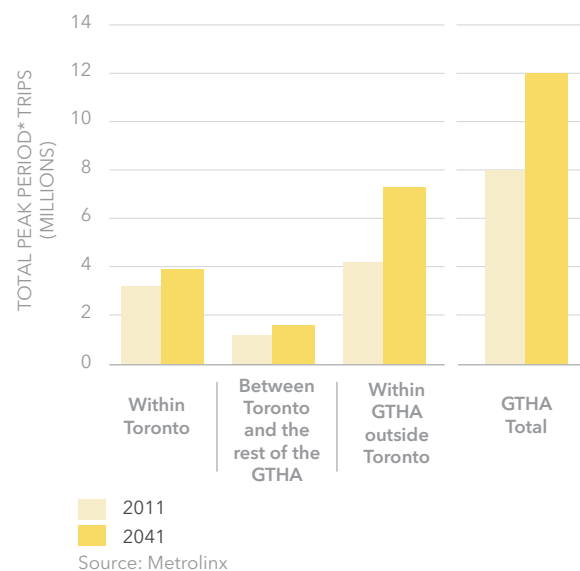


Figure 2.7 suggests that demand will continue to increase in the GTHA alongside population and employment growth, with significant increases in demand between cities across the GTHA. A significant amount of this demand growth will be outside of Toronto – where most travel is already conducted on the automobile (as noted in Figure 2.5). These “regional trips” (medium to longer distance trips that cross boundaries) reflect the changing economic and demographic landscape of the region and emphasize the need for regional transportation alternatives beyond the existing congested network.

### ***Can the GTHA Transportation Network Accommodate this Growth?***

The regional transportation network in the GTHA includes multiple transportation modes (described at a high level in Table 2.1). Much of the GTHA's transportation infrastructure used for medium to longer distance travel (10+ km) and regional travel was built half a century ago and is now operating at capacity. This infrastructure includes: the 400 series highways, the Gardiner Expressway, the Don Valley Parkway, the TTC subway network, and the GO Rail network, which initially began as a pilot in 1967. Today the highways, such as Highway 401, and subways are congested, not just in peak hours but increasingly throughout the day.

**Table 2.1:** High Level Review of Existing GTHA Transportation Network Modes for Medium and Long Distance Travel

Description	Key Considerations
<p><b>GO Rail and GO Bus</b></p> <ul style="list-style-type: none"> <li>GO Rail spans the GTHA and beyond with over 400 km of service routes and makes use of historic railways that shaped the growth of the region. As a result it covers a significant amount of the GTHA and connects to many municipalities across the region.</li> <li>The GO Bus network provides connectivity between communities not served by a direct rail connection and has seen gradual expansion and offers some off-peak and counter peak services..</li> </ul>	<ul style="list-style-type: none"> <li>The GO rail network primarily serves the Downtown Toronto commuter market, with trains bringing commuters to the downtown on weekday mornings and then them to the suburbs in the evenings. Off-peak rail service is provided on the Lakeshore corridors and was expanded to a half-hourly frequency in 2013.</li> <li>The majority of service is in peak periods and is peak directional due to availability of infrastructure.</li> <li>Currently GO Rail demand reaches and can exceed 80% of capacity in the peak – additional trains can be provided to meet demand; however, Union Station’s passenger capacity is a limitation of providing more peak train service.</li> <li>Further expansion is required to improve speed, service availability, and quality of service such that rail can compete with the automobile and integrate with the broader regional transportation network.</li> <li>Many passengers may choose GO Rail due to congested highways and high cost of parking or lack of parking availability in the Downtown core</li> <li>Require first and last mile connections for most trips</li> </ul>
<p><b>Automobile</b></p> <ul style="list-style-type: none"> <li>Automobiles can access all of the region using the region’s hierarchical road network. The 400 series highways provide long distance travel options while arterial roads within cities serve medium distance trips.</li> </ul>	<ul style="list-style-type: none"> <li>The auto network is congested in the peak period, which leads to increased travel times (an average 30% increase across the region).</li> <li>There are only six lanes into Downtown Toronto on the Gardiner Express Way and Don Valley Parkway – this means there is no capacity to accommodate new demand.</li> <li>While some highways could be expanded, the two key highways that serve Downtown Toronto cannot readily be expanded further (add more lanes) without significant property impacts.</li> <li>For example, much of the Gardiner Expressway runs adjacent to new residential and commercial developments.</li> </ul>
<p><b>Rapid Transit</b></p> <ul style="list-style-type: none"> <li>The region’s rapid transit systems include subways and Bus Rapid Transit (BRT) systems operated largely to serve medium-long distance trips within one service area.</li> <li>These services provide frequent two-way all-day service and primarily operate in their own right of way to provide reliable and high-speed travel.</li> <li>The Toronto York Spadina Subway Extension (TYSSE) to TTC Line 1 opened in 2017. This extensions expands Line 1 into York Region, making it the GTHA’s first cross boundary subway service.</li> </ul>	<ul style="list-style-type: none"> <li>High capacity rapid transit is an effective mode to serve medium-long distance trips, but is not a viable tool to provide regional travel (regional transportation requires wider stop spacing to provide competitive travel times with automobiles and other modes while rapid transit relies on medium stop spacing to attract demand with improved accessibility).</li> <li>The TTC Subway system is crowded and at capacity during the peak period – improved signalling and other investments to expand capacity are under development.</li> <li>Investment is being made to create new rapid transit. Many projects link population and employment centres outside of Downtown Toronto. Projects include Light Rail Transit (LRT) systems in Toronto, Mississauga, and Hamilton, with Bus Rapid Transit (BRT) development under consideration in Durham, York, Peel, and Halton.</li> </ul>
<p><b>Local Services</b></p> <ul style="list-style-type: none"> <li>The GTHA is served by multiple local transit services including buses and street cars.</li> <li>These services provide travel options for short-medium distance trips and connect to rapid or regional transit.</li> <li>These services have the shortest stop spacing and typically operate in mixed traffic.</li> </ul>	<ul style="list-style-type: none"> <li>Service plans and fleet strategies can be adapted to provide new service relatively quickly compared to rapid or regional transit, which may require more intense capital development programs.</li> </ul>

In the peak period and increasingly in the off-peak, this high level of auto demand leads to congestion, which in turn leads to increased travel times. Travel times across the region increase by an average of 30% when congested, with some highways experiencing as much as a 50%-120% increase in travel time.<sup>4</sup> With increased congestion and crowding comes negative impacts to travellers and the region:

- Decreased speeds for travellers using the automobile network is making it harder for people to get to the destinations they want to reach.
- Decreased reliability, which requires customers to plan further ahead or adapt their schedule to the transport.
- Crowding on transit reduces user experience and travel time reliability as customers may need to wait for multiple transit services to pass before space is available on a bus, train, or streetcar.

- The transportation network may contribute to housing affordability issues as parts of the GTHA with lower housing costs will remain less connected to major employment centres.
- Reduced accessibility to Downtown Toronto and other major employment centres will decrease the attractiveness of Toronto to invest or live and will also impede the region from realizing potential growth.
- Increased congestion will also impede investment and productivity and was estimated by Metrolinx to reduce regional productivity by \$15 billion per year by 2031.

These issues already exist today and are expected to increase as the GTHA's transportation network becomes overburdened as the region grows. If the network cannot meet demand, then crowding may diminish growth prospects, quality of life, and economic productivity.

### Planned Transportation Investments

Without additional expansion, the GTHA's transportation network will not provide the level or quality of mobility required for a growing region, which has led to significant investment in new transit infrastructure over the last decade, with more investment planned. The planned network described in the 2041 RTP includes a set of rapid transit projects that are in delivery across the GTHA:

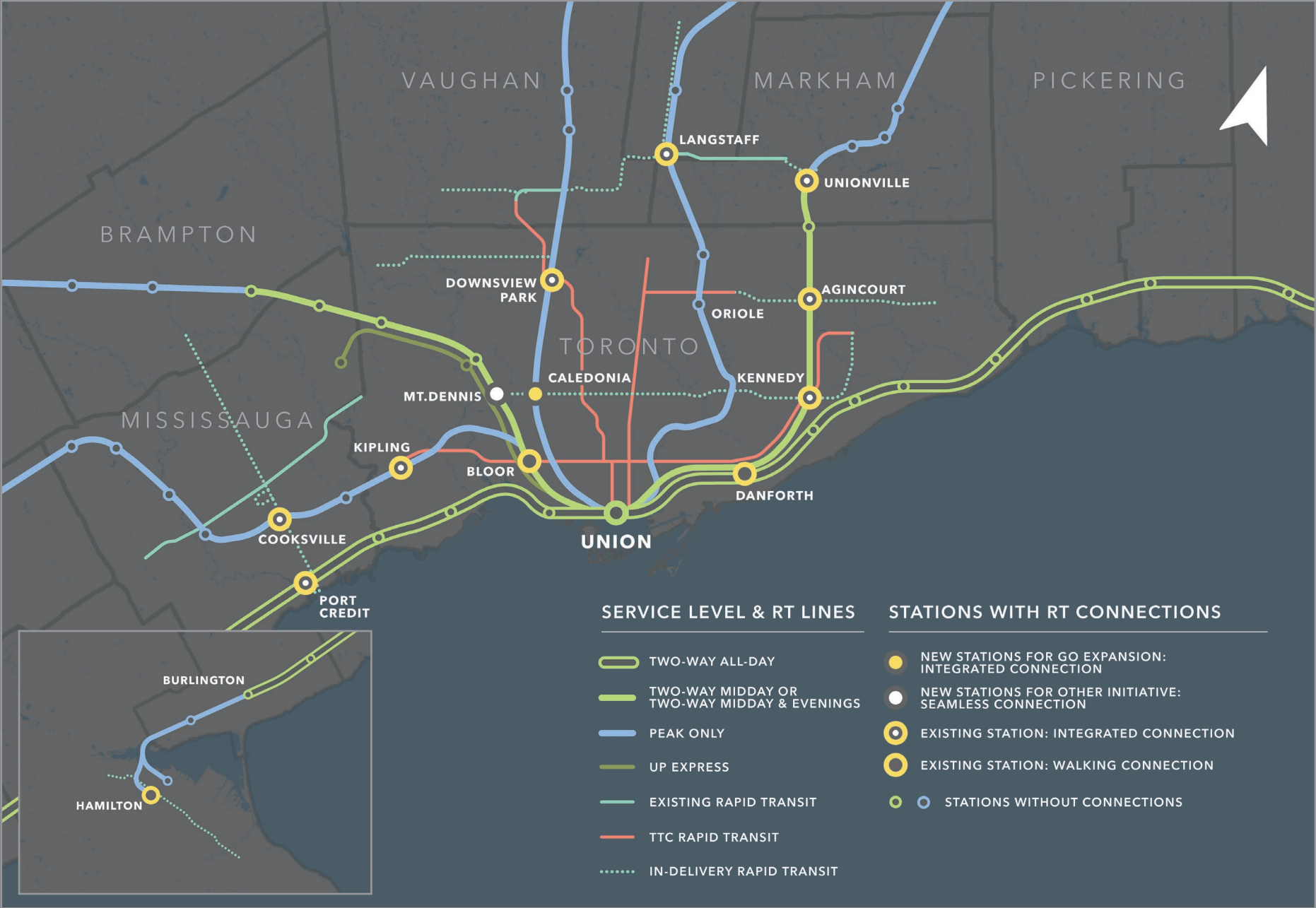
- **Eglinton Crosstown LRT** (Toronto)
- **Finch West LRT** (Toronto)
- **Hurontario LRT** (Mississauga)
- **Mississauga Transitway** (Mississauga)
- **Hamilton LRT** (Hamilton)
- **vivaNext Rapidways** (York Region)

These projects will provide fast, frequent, two-way all-day services and will primarily serve intra-municipal trips - however, together they do not provide region wide connectivity between major urban growth centres or employment centres. Additionally, many of these projects also connect to GO Rail to allow travellers to access more of the region entirely on transit. Figure 2.8 illustrates how these projects connect with GO Rail. Some projects connect to GO Rail stations without two-way all-day service which may limit the potential benefits of offering integrated stations, which highlights the need to fill the regional gap for two-way all-day service that connects growth areas across the region.

<sup>4</sup> 2016 TomTom Historic Traffic Congestion Statistic ([https://www.tomtom.com/en\\_gb/trafficindex/city/toronto](https://www.tomtom.com/en_gb/trafficindex/city/toronto))



**Figure 2.8:** Rapid Transit and GO Rail Interconnectivity









## 2.3 The Opportunity: Invest in Rail to Accommodate Growth

This problems statement can be addressed by investing in new regional travel options that:

- Demonstrate value for money through the Business Case process.
- Connect people from where they are to where they want to go safely and conveniently with competitive travel times compared to other modes.
- Are expandable to meet increasing travel demand as the region's population and employment grow.

The problem statement is driven by three core markets that will see significant demand increases due to population growth:

- Demand from the rest of the GTHA to Toronto;
- Travel between communities outside of Toronto; and
- Medium distance travel within communities.

Today, these markets are served by three modes:

- **Highways** that experience worsening traffic congestion.
- **Rapid Transit** that is crowded during the peak period and increasingly throughout the day.
- **Rail services** provides coverage across the region and experiences high demand, but requires investment to be a competitive choice for some markets.

Table 2.2 compares the effects of expanding the road, rapid transit, and rail networks to accommodate population and employment growth in the GTHA based on the problem statement. This table illustrates that:

- Highway expansion is unlikely to be an affordable solution to reducing congestion because Downtown Toronto has limited room to expand the Gardiner Expressway or Don Valley Parkway. This means Toronto will continue to be a bottleneck and source of congestion, even if highway expansion is provided elsewhere.
- Rapid Transit investment is underway to provide new connectivity, however it is unlikely to be an affordable solution to accommodate increased long distance demand.

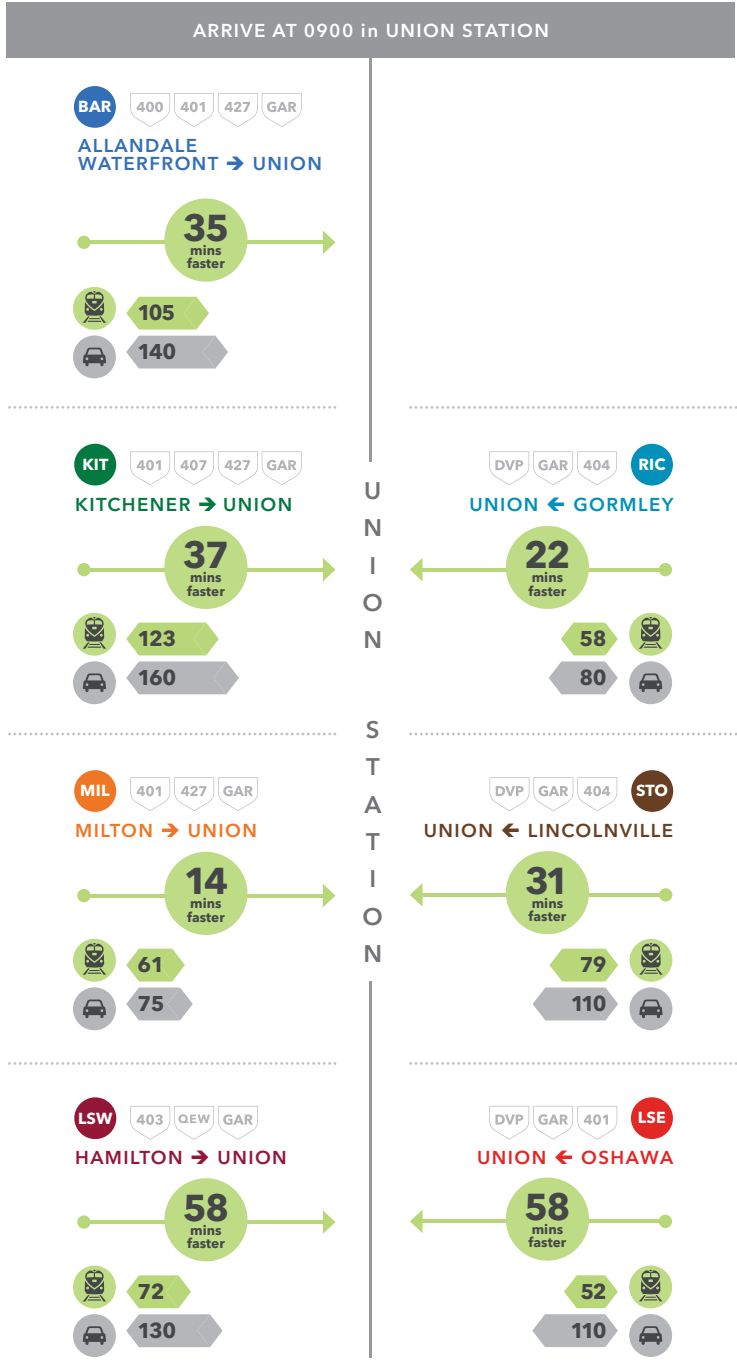
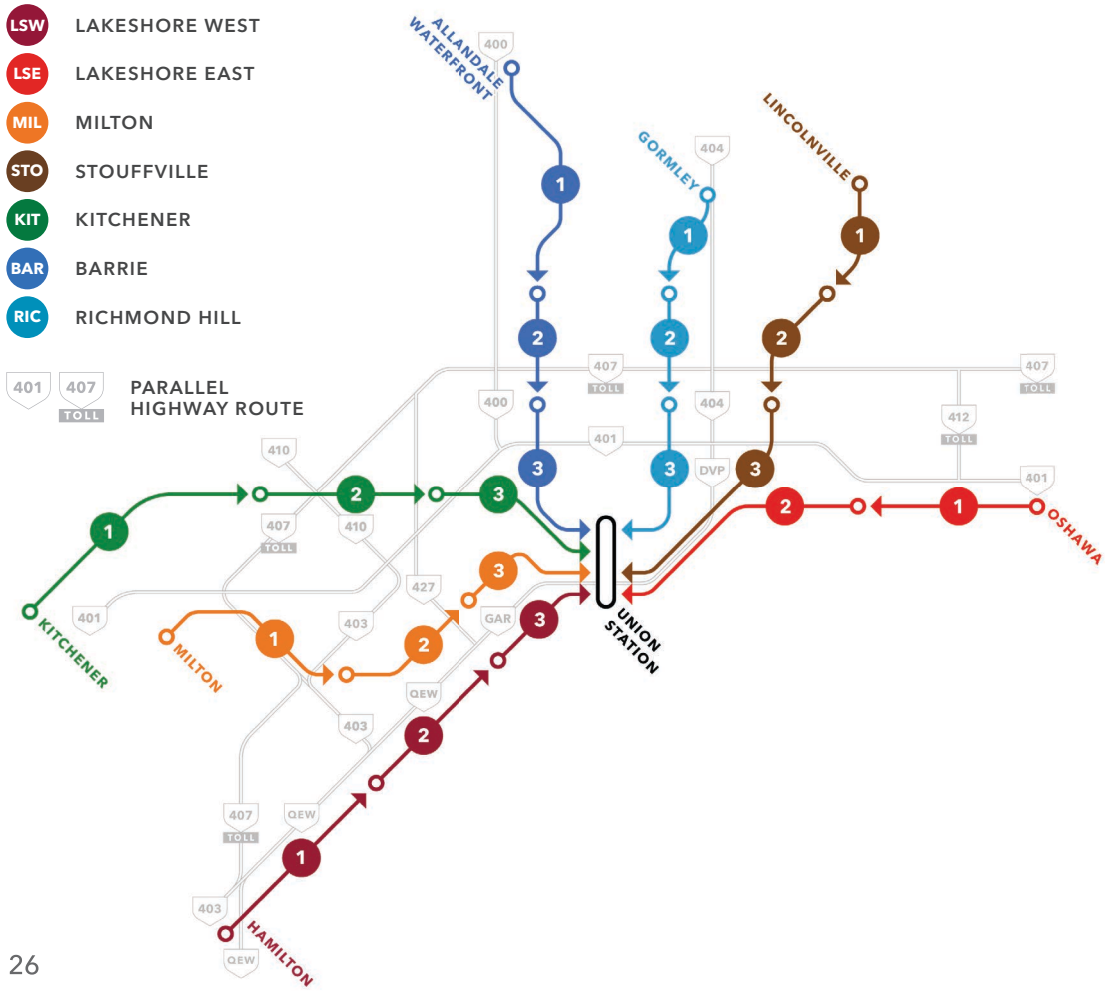
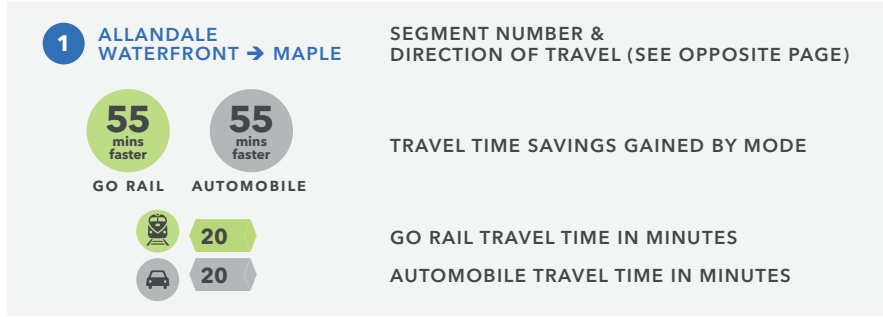
Based on this review, a rail based solution is proposed to address the problem statement. Rail is an effective solution based on the following factors:

- **Coverage** - GO Rail already operates on over 400 km of railways across the GTHA and beyond. GO Rail already runs through many downtown cores and Urban Growth Centres, which means there is limited need to build expensive tunnels or elevated structures that a Rapid Transit solution would require.
- **Deliverability** - GO Rail already owns significant portions of its network, which can expedite the delivery of expanded transit service across the region.

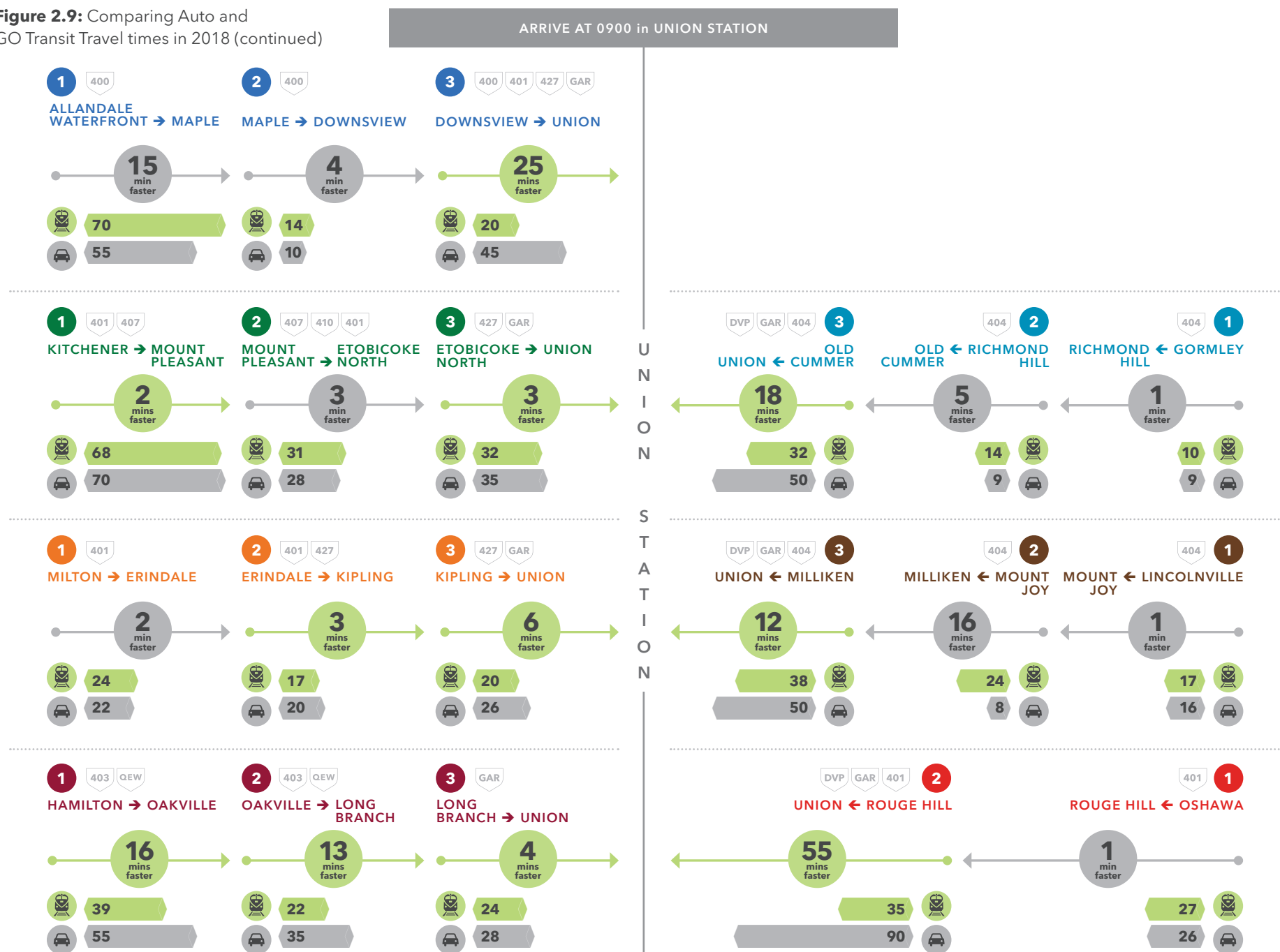
- **Expandable** - with infrastructure upgrades (including resolving pinch points at Union Station), GO Rail can add significant capacity to meet new demand. Every new train service added can provide capacity for over 2,000 passengers per hour per direction per train. This is neatly equivalent to adding one new freeway lane for every service dispatched.
- **Established Markets** - GO Rail services are already well used across the region. It is anticipated (and is tested in this FBC) that improved rail service will tap into further demand that is surpassed due to lack of capacity or lack of service (example: no two-way, all-day service).
- **Operating Subsidy** - GO Rail revenues currently cover a significant portion of operating and maintenance costs. Some peak hour services can generate enough revenue to cover all associated costs. Unlike highways which do not generate revenue to cover operating or maintenance, GO Rail could be financially sustainable in the long term.
- **Competition** - GO Rail's travel times on-corridor already compete with the automobile during the peak period for some trips- as illustrated in Figure 2.9 (note this figure compares corridor auto driving times based on Google Maps peak period estimates and station to station travel times on GO. It does not include time to access the highway network or access final destinations).

**Table 2.2:** Comparing How Different Modes Could Address the Problem Statement

Problem	Road Expansion	Rapid Transit Expansion	Rail Expansion
<b>Congested Network</b>	<ul style="list-style-type: none"> <li>Evidence suggests that building additional road capacity induces demand for trips by automobile, which eventually leads to congested highways and a return to the original problem.</li> <li>There is no space to provide more lanes into Downtown Toronto, which means even if highways are expanded elsewhere in the region, Toronto will remain a bottleneck unless demand to Toronto uses other modes.</li> </ul>	<ul style="list-style-type: none"> <li>The TTC subway system sees significant peak period crowding.</li> <li>Projects are underway to improve subway capacity, however providing new subways that can reduce congestion on other modes will be a costly (for example: Eglinton Crosstown will cost over \$5 billion to provide 19 km of new Rapid Transit).</li> </ul>	<ul style="list-style-type: none"> <li>Today GO Rail is not used for short trips or many trips in Toronto because two-way all-day service is not provided on most lines, fares are higher than other services, and frequencies are lower than other services - with improvements to these dimensions, GO Rail could be used by a wider range of passengers</li> <li>The existing rail network could accommodate significantly higher demand by providing two-way, all-day service, higher frequency services, and services in the off-peak.</li> <li>Expanding and improving the rail network provides longer-term relief from congestion, both on the transit network and through the benefit of mode-shift from automobile.</li> <li>Railways can transportation more people than road and approach similar capacities to Rapid Transit if required. For example, each GO Rail train could carry over 2,000 passengers, which is nearly twice the capacity of a TTC Subway Train or the same capacity as a new highway lane per hour.</li> </ul>
<b>Incomplete Network</b>	<ul style="list-style-type: none"> <li>Roads already cover much of the GTHA - however travel times slow on congested segments - such as the Gardiner Expressway into Downtown Toronto.</li> <li>Expanding Downtown Toronto Highways to increase speed is likely infeasible due to both high cost and property development patterns (the highway runs alongside major developments).</li> </ul>	<ul style="list-style-type: none"> <li>Rapid Transit projects are in delivery across the GTHA - however these projects are primarily focused on intra -municipal mobility and feature shorter stop distances which increase travel time for long distance travel.</li> </ul>	<ul style="list-style-type: none"> <li>Enhancing railway infrastructure and providing new stations enables passengers to access the transit network more quickly and easily thereby facilitating the trips they wish to make.</li> <li>Through upgrading existing railway lines and providing more services there is an opportunity to increase transportation capacity without the need to greatly expand the existing rail corridor.</li> </ul>



**Figure 2.9:** Comparing Auto and GO Transit Travel times in 2018 (continued)



## 2.4 The Solution: Transform GO Rail into a Rapid Rail System

### The Case for Change: Addressing the Problem Through Targeted Investment

The solution to the problem statement is to use targeted investment to transform GO Rail into a region-wide Rapid Rail network. Rapid Rail systems vary from other rail systems based on the following characteristics:

- Use of electric trains, with rapid acceleration and top speeds of 120 to 200 kilometres per hour. Almost all have level-loading or near-level loading, from platform to train. All have control systems that enable frequent services to operate safely. GO Rail is now the largest single diesel system in the world. Other cities have electrified their systems for operational efficiency and commercial productivity.
- Offer frequent all-day services, with trains every 10-15 minutes all-day from suburban areas to regional or sub regional hubs, and services every 15-30-60 minutes from communities up to 100 km away. Services can be more frequent in peak hours, or as required to carry demand.
- Offer a blend of express and all-stop services to meet the needs of a wide range of customers.
- Operate on surface corridors where available, but run in tunnels or on elevated structures where necessary.
- Alignments are almost always exclusive and not shared with road traffic, and level crossings are minimized.
- Have integrated ticketing and/or fares with other services to allow for seamless and convenient user experience.
- Function as part of region-wide networks with physical integration with other transit modes - such as subway, Bus Rapid Transit (BRT), or Light Rail Transit (BRT), and local bus services.

Rapid Rail is compared to other types of transit in Table 2.3 based on the type of trip each transit typically serves.

**Table 2.3:** The Role of Rapid Rail as Part of Regional Transportation Networks

<i>Trip type</i>	Longer trips across city regions of 3 to 20 million people	Medium-distance trips, within dense city centres	Short and medium distance trips, and feeder trips to subways and rail
<i>Typical mode used to serve trip type</i>	Rapid Rail	Subways or Metros	Light Rail/Streetcars/Tram
Examples	Paris RER; London Thameslink; Sydney Cityrail; Melbourne M-Train; Tokyo Rail Network; Zurich S-Bahn; Copenhagen S-tog	Toronto Subway; Montréal Metro; Hong Kong Mass Transit; Beijing subway; Delhi Metro; Paris Metro	St Clair, Spadina, Harbourfront Streetcars; Finch LRT; Kitchener Waterloo ION
	Tokyo Metro and Japanese Rail East; London Underground and Crossrail; Hong Kong Westrail and Eastrail	Ottawa Confederation LRT; Buffalo LRT; Boston Green Line; Vancouver Skytrain; Eglinton Crosstown (under construction); Montréal REM (under construction)	
Train length	160 to 350 metres	60 to 200 metres	15m to 60m
Train size	Single or double deck; 500 -2,000 seated passengers <i>double deck brings down the cost per seat</i>	Single deck; 100 to 1,000 passenger, many standing	Single deck; 100 to 500 passengers, many standing
Alignment	Mostly surface in existing rail corridors	Mostly tunnel or elevated	Mostly surface; sometimes in streets shared with traffic
Frequency	2 to 15 minutes	2 to 5 minutes	2 to 10 minutes
Top speed	110 to 160 km/h	80 to 100 km/h	60 to 100 km/h
Station spacing	2km to 8km	1km to 2.5km	300m to 3km
Capital cost per km	\$30m - \$100m	\$300m - \$1bn	\$50m - \$500m
Effective Capacity (passengers per hour per direction)	2,000 to 60,000 spanning the range of subway and light rail	10,000 – 40,000 usually deployed where a surface right of way is unavailable or cannot be built	2,000 – 10,000 viable in moderate density corridors where surface alignments are possible



**Figure 2.10:** Example Rapid Rail Systems**Experience from other City-Regions:  
What are the core elements of  
an Rapid Rail system?**

Worldwide, large city regions have invested in electrified Rapid Rail style systems to manage growth by providing fast, frequent, and reliable mobility options. Global examples of Rapid Rail style systems are shown in Figure 2.10. There are systems in more than 60 cities (shown in Figure 2.11) in Asia, Australasia, and Europe. These systems, together with local transit, enable trips across a large region that are competitive with travelling by other modes in speed, comfort, and convenience.

**SYDNEY, AUSTRALIA**

Sydney has frequent two-way all-day services extending over a large network. Nearer the city centre, trains run every 5-10 minutes, while further out, headways extend to 15 or 30 minutes.

**LONDON, ENGLAND**

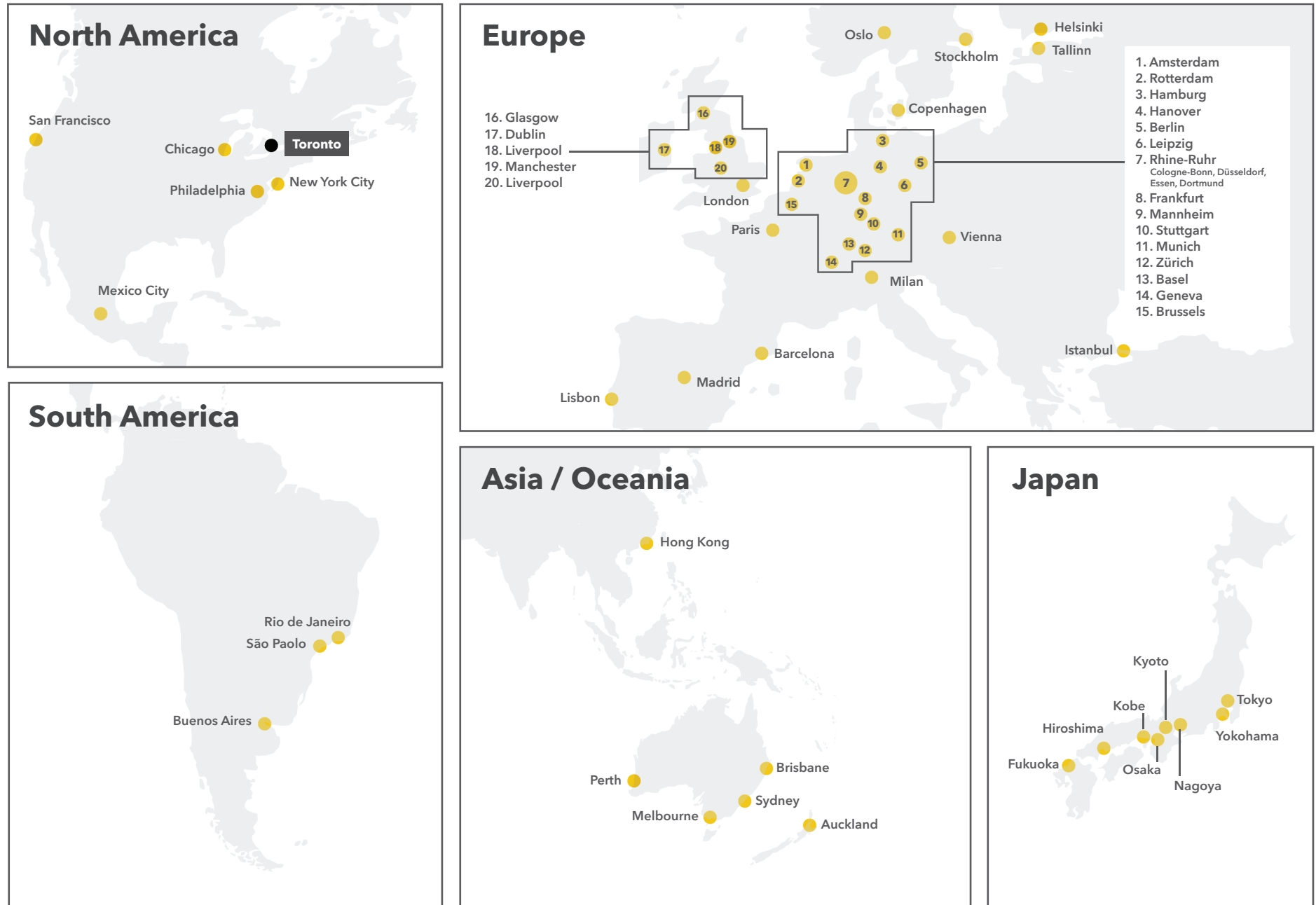
London has frequent electric railway services on 40 routes in a network that has developed progressively since the 1920s into a Rapid Rail style system.

**TOKYO, JAPAN**

The Tokyo rail network, provides high frequency services across the metropolitan region and into neighboring regions using fast electric trains.

**PARIS, FRANCE**

Paris' railway blends radial and cross city lines to provide high levels of accessibility across the city throughout the day.

**Figure 2.11:** Rapid Rail Systems Around the World

### GO Expansion - Regional Benefits and Evaluation Framework

Regional policies - including the 2041 RTP - were used to generate a benefits and evaluation framework for GO Expansion based on four strategic benefit categories as shown in Figure 2.12. These benefits describe the high-level value that GO Expansion can realize for the region and are further discussed and analyzed in Chapter 4 (the Strategic Case). Table 2.4 provides further detail on how GO Expansion contributes to specific regional plans and policies in the GTHA.

The GO Expansion program will realize these benefits by delivering six key changes to the GO Rail network:

- Expanding Union Station
- Making stations more accessible
- Providing Service in Both Directions
- Implementing More All-Day Service
- Providing Faster Travel Times
- Increasing Service Frequency to Every Fifteen Minutes or Better

**Figure 2.12:** Benefits of GO Expansion



#### Safe, Reliable, and Convenient Connections

GO Expansion will provide new capacity and a high quality of service that will serve part of the GTHA's growing transportation demands

- It will improve customer experience by providing more service (including two-way all-day service) alongside other customer focused initiatives
- It will serve new passengers who are attracted by faster and more frequent trains
- It will lead to a more resilient network by maintaining or exceeding current operating cost recovery
- It will provide capacity that meets and exceeds growth forecasts



#### High Quality of Life

GO Expansion will maintain and enhance quality of life as the GTHA grows

- It will improve travel across the region, and reduce congestion by connecting passengers to places they want to go with fast and convenient transit service
- It will lead to a safer transportation network that supports a healthy region
- It will support the development of complete communities, not just in Toronto but at every station on the system



#### Prosperous Economy

GO Expansion will support the development and prosperity of the GTHA

- It will connect people and businesses with a reliable and fast service - making it easier to connect, invest, and innovate in the GTHA
- It will improve connectivity between growing hubs in the region - enabling urban development
- It will generate jobs during the design, construction, and operation of the service



#### Protected Environment

GO Expansion will lead to an overall more sustainable transportation network

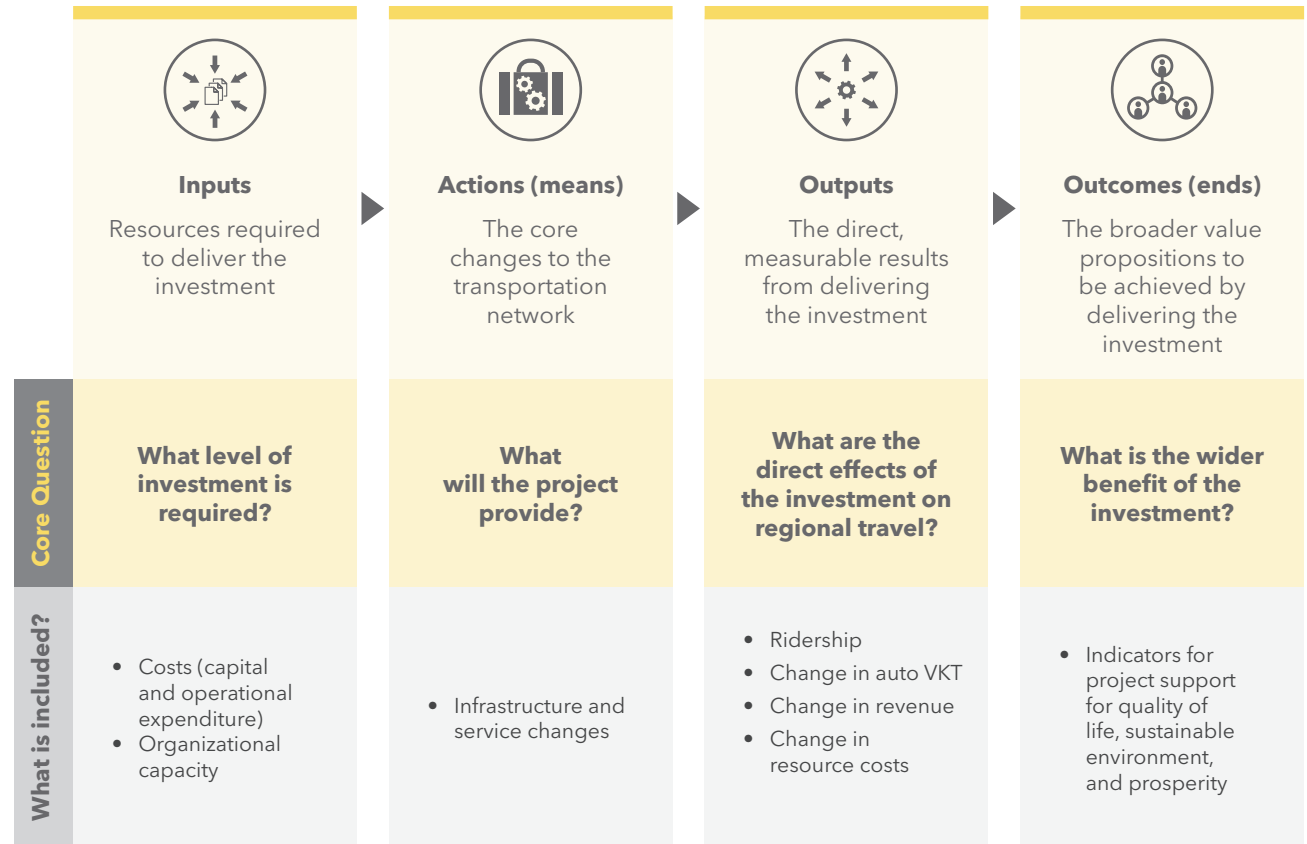
- It will increase the overall efficiency of GO Rail operations - meaning each trip taken will pollute less
- It will shift demand from the auto network - reducing the GTHA's carbon footprint and contributions to climate change

**Table 2.4:** Key Stakeholder Plans and Projects, Municipal Review

Municipal Review	Key Considerations
<b>Region of Durham</b>	<ul style="list-style-type: none"> <li>• Durham's long-term goals include creating healthy and complete, sustainable communities with a variety of mobility choices.</li> <li>• Supporting the planning, design and operation of an integrated transit service within the Region and with adjacent areas is a listed priority within the Durham Regional Official Plan (2017).</li> <li>• Ensuring the successful implementation of GO Expansion to compliment other Durham Region rapid transit corridors is a regional priority.</li> </ul>
<b>Regional Municipality of Halton</b>	<ul style="list-style-type: none"> <li>• The Halton Regional Official Plan's (2016) long-term goal is to develop a safe, convenient, accessible, affordable and efficient transportation system that supports healthy communities by promoting active transportation and public transit.</li> </ul>
<b>City of Hamilton</b>	<ul style="list-style-type: none"> <li>• The City of Hamilton Official Plan (2013) notes that the function of an integrated transportation network, and therefore an objective of the Plan, is to move people and goods safely, efficiently and effectively, and serve as an economic enabler.</li> <li>• The region aims to provide a balanced and integrated transportation network that facilitates all modes of transportation such as active transportation, transit, automobiles, goods movement vehicles, rail, air and marine.</li> <li>• The City's Transportation Master Plan (2007) calls for an expansion in transportation options that encourage active transportation, transit and enhance efficient inter-regional connections. It also notes the need for a more compact urban form, land use intensification and transit-supportive node and corridor development.</li> </ul>
<b>Regional Municipality of Peel</b>	<ul style="list-style-type: none"> <li>• The intent of the Region and its municipalities is to move towards the development of sustainable communities. Transit is considered to play a key role in this ambition, including helping to improve air quality and ensuring a healthy and active population. In the Official Plan (2012), the Region explicitly notes its support for the GO Rail improvements, relevant to Peel, that are articulated in Metrolinx's Regional Transportation Plan.</li> </ul>
<b>City of Toronto</b>	<ul style="list-style-type: none"> <li>• The City's Official Plan (2015) describes the need to create a city with a comprehensive and high-quality transit system that improves mobility for all; linking areas of housing, employment, and goods and services. The Plan includes a specific policy to support the increased use of existing rail corridors within the City for enhanced local and inter-regional passenger service.</li> </ul>
<b>Regional Municipality of York</b>	<ul style="list-style-type: none"> <li>• York Region's Official Plan (2016) uses a lens of sustainability to frame its plans to manage future growth. A key objective with respect to transportation is to provide a transit service that is convenient and accessible to all residents and workers of York Region. The establishment of two subway extensions (one, to Vaughan Metropolitan Centre, opened in December 2017. The other, an extension from Finch to Richmond Hill, is in design stages) and a series of rapid transit and transit priority corridors are the cornerstones of York Region's transit network.</li> <li>• In its Transportation Master Plan (2016), the Region notes the initiation of a Transit Optimization Program (TOP) in response to the introduction of the GO Rail Expansion program. Included in the program is aligning YRT/Viva's services to GO Transit's schedule, and improved access to GO Transit stations.</li> </ul>

The remainder of this FBC demonstrates how GO Expansion achieves these benefits and what is required to successfully deliver the program. This FBC makes use of a 'logic chain' to illustrate what is included in the investment program and how delivering GO Expansion will generate the proposed benefits. A benefits evaluation and management framework was used in this FBC to evaluate GO Expansion. Figure 2.13 outlines the generic evaluation framework while Figure 2.14 illustrates the evaluation framework for GO Expansion and a roadmap for the remainder of the FBC.

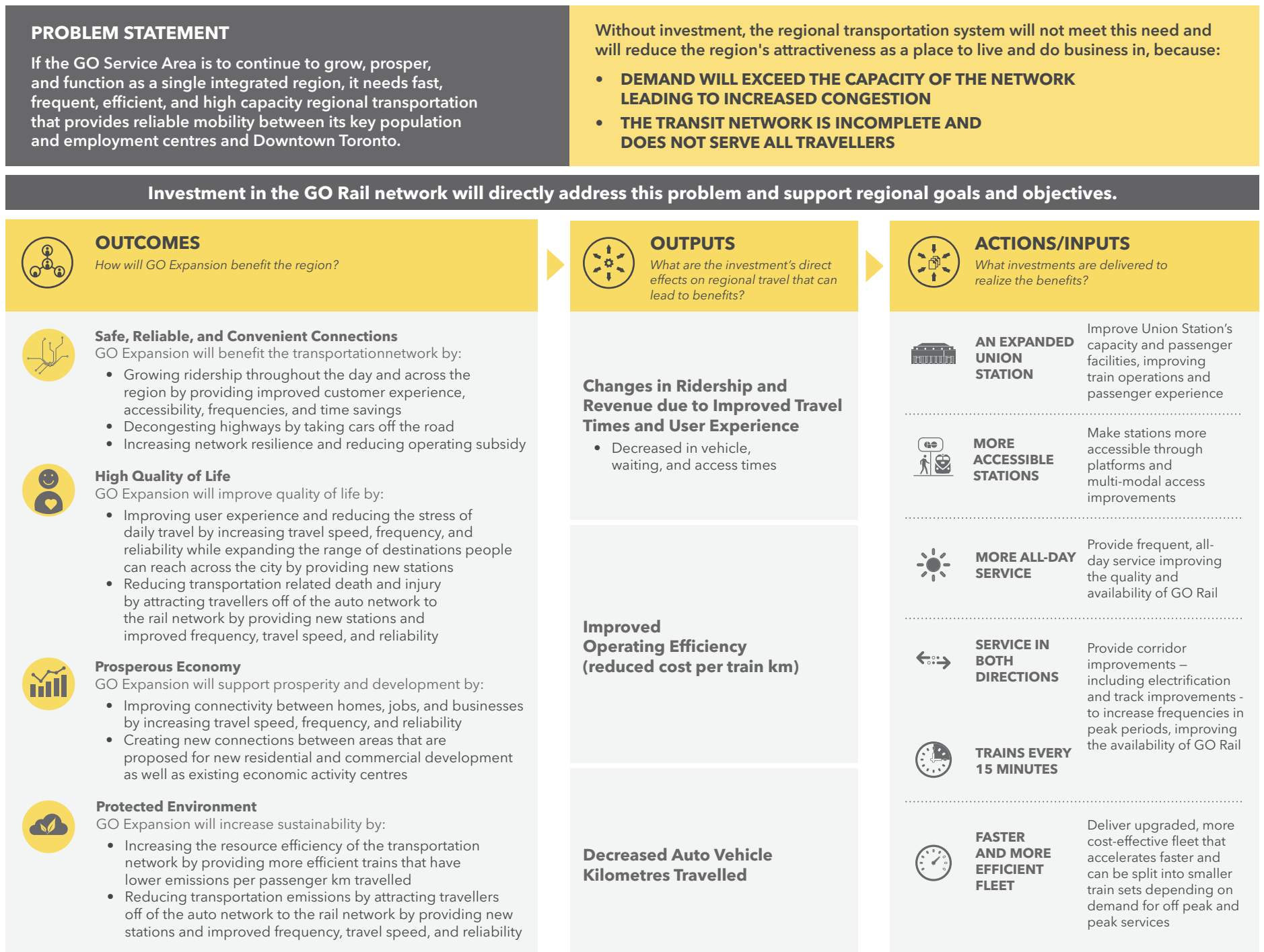
**Figure 2.13:** GO Expansion Evaluation Framework















**Figure 2.14:** GO Expansion Roadmap and Evaluation Approach



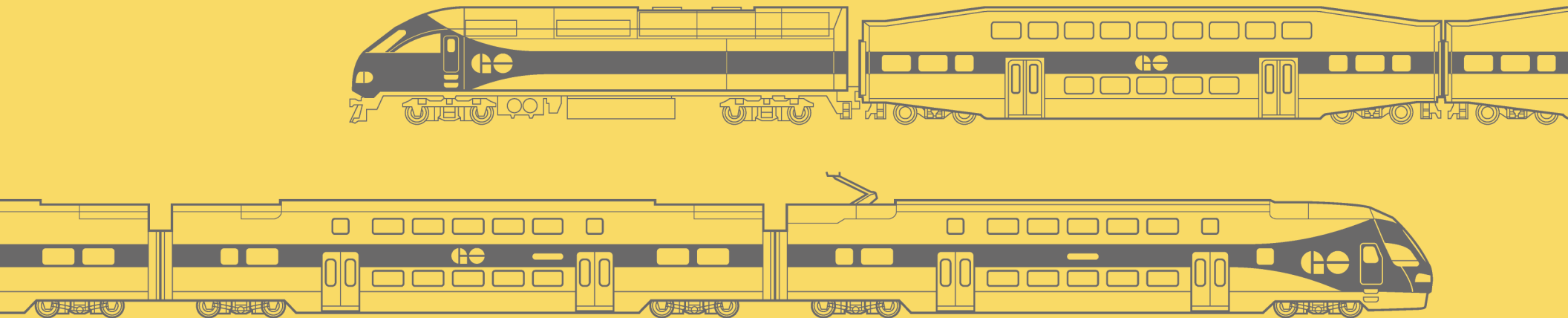
**Figure 2.14:** GO Expansion Roadmap and Evaluation Approach

 <b>Role/Case</b>	 <b>Inputs and Actions</b>	 <b>Outputs</b>	 <b>Outcomes</b>	<b>Transportation Benefits</b> Moving more people on a resilient and customer focused network.	<b>Quality of Life Benefits</b> Creating a connected and healthy region on a safe transportation network	<b>Prosperity Benefits</b> Supporting a more productive region by decreasing commute times and unlocking investment	<b>Protected Environment</b> Reducing the energy and resources used to provide mobility in the GTHA
 <b>Chapter 3: GO Expansion Program Definition</b>	Summary of proposed investment	Description of travel time and frequency performance objectives	<ul style="list-style-type: none"> <li>Outcomes and Benefits are not discussed in Chapter 3.</li> </ul>				
 <b>Chapter 4: Strategic Case</b>	Defining how actions change the network	<ul style="list-style-type: none"> <li>Change in automobile vehicle kilometers travelled</li> <li>Change in trips by mode</li> </ul>	<ul style="list-style-type: none"> <li>New ridership by time of day and geography - Increased network resilience</li> <li>Reduced operating subsidy and increased self-sufficiency - Improved customer experience</li> </ul>	<ul style="list-style-type: none"> <li>Estimated reduction in number of accidents resulting in injury or death</li> <li>Estimated reduction in health impacting emissions</li> <li>Estimated change in active travel</li> </ul>	<ul style="list-style-type: none"> <li>Estimated time saved due to decongestion on the highway network, and time saved due to improved travel time and service frequency on the rail network</li> </ul>	<ul style="list-style-type: none"> <li>Estimated reduction in fuel, emissions, and greenhouse gases for the transportation network as a whole and for GO Rail</li> </ul>	
 <b>Chapter 5: Economic Case</b>	Defining cost to deliver in economic terms	<ul style="list-style-type: none"> <li>Reduction in whole journey time leading to mode change and reductions in automobile VKT</li> </ul>	<ul style="list-style-type: none"> <li>Monetized journey time savings (including reliability and crowding)</li> <li>Monetized off peak congestion</li> <li>Monetized decongestion benefits</li> </ul>	<ul style="list-style-type: none"> <li>Monetized accident reductions</li> <li>Monetized criteria air contaminants reductions</li> <li>Monetized health improvements due to more active mode use</li> </ul>	<ul style="list-style-type: none"> <li>Wider Economic Impacts</li> </ul>	<ul style="list-style-type: none"> <li>Monetized resource and GHG savings</li> </ul>	
 <b>Chapter 6: Financial Case</b>	Defining costs and financial requirements to deliver	<ul style="list-style-type: none"> <li>Assessing forecasted change in revenue</li> </ul>	<ul style="list-style-type: none"> <li>Impact to required subsidy due to change in revenue and operating costs</li> </ul>	<ul style="list-style-type: none"> <li>Not discussed in Financial Case</li> </ul>			
 <b>Chapter 7: Deliverability and Operations Case</b>	Defining delivery requirements and risk management	<ul style="list-style-type: none"> <li>Assessing risks to provide service to meet forecasted outputs</li> </ul>	<ul style="list-style-type: none"> <li>The Deliverability and Operations Case discusses how GO Expansion will be delivered and key risks will be mitigated in order to realize the benefits specified in other cases.</li> </ul>				



# 3

## GO Expansion Program



## Overview

This chapter provides an overview of the GO Expansion program proposed to address the problem statement and realize the opportunities described in Chapter 3.

The technical program outlined in this chapter is of a Reference Concept Design (RCD) that illustrates how the GO Expansion program may be delivered to achieve a set of performance objectives - such as faster trains, higher frequencies, or cost efficiencies. The actual design for the GO Expansion Program will realize these objectives but its technical specifications may vary from the RCD based on the proposed procurement approach (detailed in Chapter 7: Deliverability and Operations Case) where private partners will design, build, finance, operate, and maintain GO Rail improvements. Further detail on RCDs are included within this chapter in section 3.3.

The program outlined in this chapter is evaluated in the four cases in chapters 4-7: Strategic Case, Economic Case, Financial Case, and the Deliverability and Operations Case.

## How is the chapter structured?

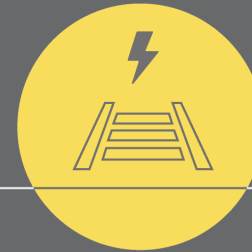
Section	Content
<b>3.1</b> GO Expansion Program Definition	A definition of the proposed GO Expansion program based on the outputs it will realize and the assumed design Metrolinx has developed to demonstrate the program's potential. This section also includes a description of the proposed changes to each GO Rail line included in the GO Expansion program.
<b>3.2</b> Reference Concept Design Process Assumptions	A description of the process and assumptions used to develop the Reference Concept Design for GO Expansion.
<b>3.3</b> Program Interdependencies	A summary of other projects, programs, or proposals that may impact GO Expansion or support the realization of its benefits.

## Chapter 3 Overview: GO Expansion by the numbers

**42** upgraded stations



**205** kilometres of new track  
**687** kilometres of electrified track



**6** new maintenance and storage facilities



Trains running up to  
**29% faster**  
with **60%** lower operating costs per kilometre



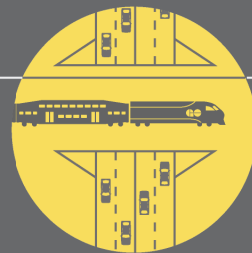
**14** bridges upgraded



**11** pedestrian and river grade separations

**2** rail/rail grade separations

**11** road/rail grade separations



Two-way, all-day service across **5** GO Rail lines



with over **6,000** services per week

## 3.1 Program Definition

### GO Expansion Program Overview

This subsection summarizes the proposed GO Expansion program including key elements of the RCD and the outputs the program seeks to deliver for the region.

The GO Expansion program will transform GO Rail from a commuter rail service to a Rapid Rail system that provides travellers with fast, frequent, two-way all-day services across the GO Service Area. Metrolinx has specified a range of performance objectives for the level of performance GO Expansion should realize – as defined in Table 3.1. These performance objectives are further defined in:

- Figure 3.1, 3.2, and 3.3 which illustrate the proposed service improvements GO Expansion will realize
- Figure 3.4, which shows end to end travel times to Union Station by line and Figures 3.5 and 3.6 which show how long it takes to reach Downtown Toronto assuming an average access time to the nearest GO Rail station.

The benefits that this program will realize and the requirements for their successful delivery are explored in the four evaluation chapters (4-7) included in this document, while subsequent Chapter 3 subsections provide greater detail on reference RCDs for each GO Rail line.

### Reference Concept Design Summary

Metrolinx has developed an RCD that illustrates how the GO Expansion program may be delivered and the scope of benefits the region could realize as a proof of concept. This reference concept design is used to:

- Demonstrate that a working approach to deliver GO Expansion is possible.
- Determine a budget and construction schedule to be approved by Treasury Board.

This RCD was developed based on over three years of engineering, economic, and modelling analysis to present a realistic and deliverable concept for GO Expansion.

Metrolinx and Infrastructure Ontario will use a Private Public Partnership (P3) model to deliver GO Expansion. This means a private sector partner will collaborate with Metrolinx to design, build, finance, and operate GO Rail as a Rapid Rail system. As a result, the exact specifications of the future GO Rail system will be determined through the GO Expansion procurement process where potential partners will submit proposals to realize the core objectives of GO Expansion defined in Table 3.1.

The key characteristics of the RCD are:

- **At least 15 minute all day, two-way service across the entire GO owned network with 7 minute service available where customer demand exists.**
- **Express services where feasible to cut travel times from more distant portions of the network.**
- **Electrified train service that allows for faster acceleration and speed at lower cost.**
- **Upgraded signaling system that will enable the rail network to support more service and improve safety.**
- **Upgraded and expanded fleet of vehicles to enable flexible response to changing demand and improved customer experience.**
- **Upgrades at existing stations, including expanded platforms, station buildings and amenities as required to meet the proposed service plan.**
- **Improve switches, and a more flexible track arrangement and more storage for the expanded fleet.**
- **Improved capacity at the network heart, Union Station in downtown Toronto, to support a minimum of 66 trains an hour with significant additional capacity for future growth.**

**Table 3.1:** GO Expansion Program Description, Objectives, and Reference Design Summary

GO Expansion Program Element	Description	Performance Objectives	Reference Concept Design Features
 <b>MORE ALL-DAY SERVICE</b>	Provide service throughout the day and on weekends, not just on weekday peak periods	<b>6,000 weekly services, including:</b> <ul style="list-style-type: none"> <li>• <b>Lakeshore West</b> - two-way all-day service between Union and Hamilton, fifteen minute service or better between Burlington and Union</li> </ul>	<ul style="list-style-type: none"> <li>• Expanded track and on-corridor works to accommodate more frequent service in both directions:</li> <li>• Eleven new rail/road and two rail/rail grade separations</li> <li>• 205 km of new track</li> <li>• Eleven new Pedestrian bridges</li> </ul>
 <b>SERVICE IN BOTH DIRECTIONS</b>	Provide two-way service on more of the GO Rail network	<ul style="list-style-type: none"> <li>• <b>Kitchener</b> - two-way all-day between Mount Pleasant and Union, fifteen minute service or better between Bramalea and Union</li> <li>• <b>Barrie</b> - two-way all-day between Allandale and Union, fifteen minute service or better between Aurora and Union</li> <li>• <b>Stouffville</b> - two-way all-day between Mount Joy and Union, fifteen minute service or better between Unionville and Union</li> <li>• <b>Lakeshore East</b> - two-way all-day with fifteen minute or better service between Oshawa and Union</li> </ul>	
 <b>TRAINS EVERY 15 MINUTES</b>	Increase frequencies to a train every fifteen minutes or better where possible on the GO Rail network		
 <b>FASTER AND MORE EFFICIENT TRAINS</b>	Make use of fleet that are more cost effective to operate and have faster acceleration and stopping	<ul style="list-style-type: none"> <li>• <b>Making use of trains that are up to 29% faster and up to 50% cheaper to operate per train kilometer</b></li> </ul>	<ul style="list-style-type: none"> <li>• Combination of Electric Multiple Units (EMUs) or Electric Hauled Locomotives</li> <li>• Over 680 km of GO Rail track is electrified</li> </ul>
 <b>MORE ACCESSIBLE STATIONS</b>	Provide improved stations, allowing for easier access to GO Rail	<ul style="list-style-type: none"> <li>• <b>Customers can board and alight faster, reducing trip times times by 2-5 minutes</b></li> </ul>	<ul style="list-style-type: none"> <li>• Level boarding included at 42 stations to decrease boarding, alighting, and platform clearance time, which will decrease train dwell times</li> </ul>
 <b>AN EXPANDED UNION STATION</b>	Improve Union Station's capacity and passenger facilities, improving train operations and passenger experience	<ul style="list-style-type: none"> <li>• <b>Ability to accommodate reference frequencies on each GO Rail Line</b></li> </ul>	<ul style="list-style-type: none"> <li>• Widened platform and improved vertical circulation (stairs, elevators)</li> </ul>

### What will vary between the Reference Concept Design and the GO Expansion Program Delivered by the Consortium?

Metrolinx has defined a set of outcomes and objectives that GO Expansion will realize. Each outcome requires improvements to GO Rail which have been scoped as minimum performance requirements that both the RCD and proposals submitted by potential partners must adhere to. These include specifications for:

- **Travel time improvements**
- **Train service frequencies**
- **Customer experience**
- **Safety**

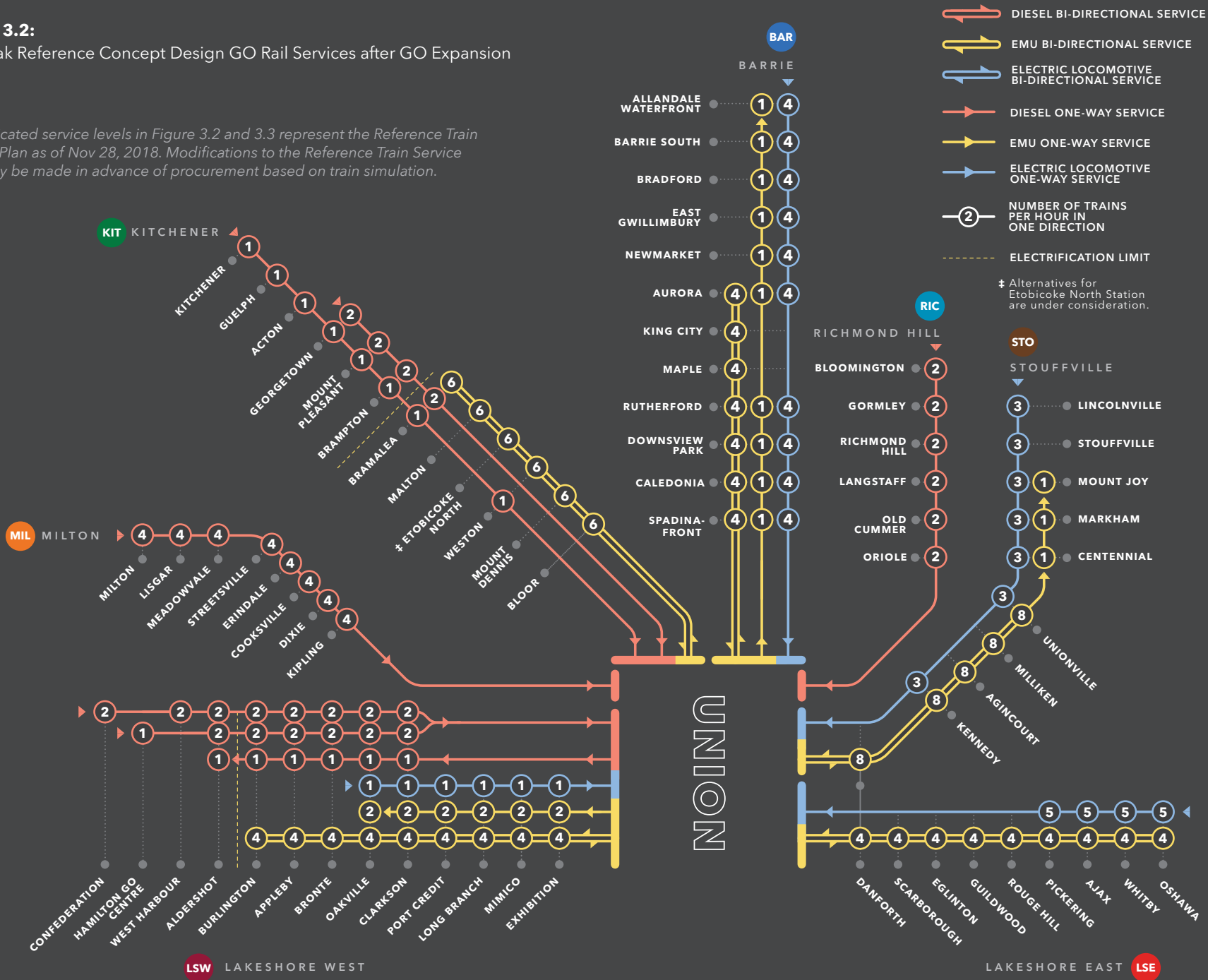
The RCD is just one of many potential infrastructure and service investment programs that could be deployed to reach these objectives. All proposals submitted to Metrolinx may vary in their design and delivery (example: different signalling approaches, different track designs) - however they all must deliver the benefits specified in this Business Case.

**Figure 3.1:**  
Overview of GO Rail  
Services After GO  
Expansion



**Figure 3.2:**  
AM Peak Reference Concept Design GO Rail Services after GO Expansion

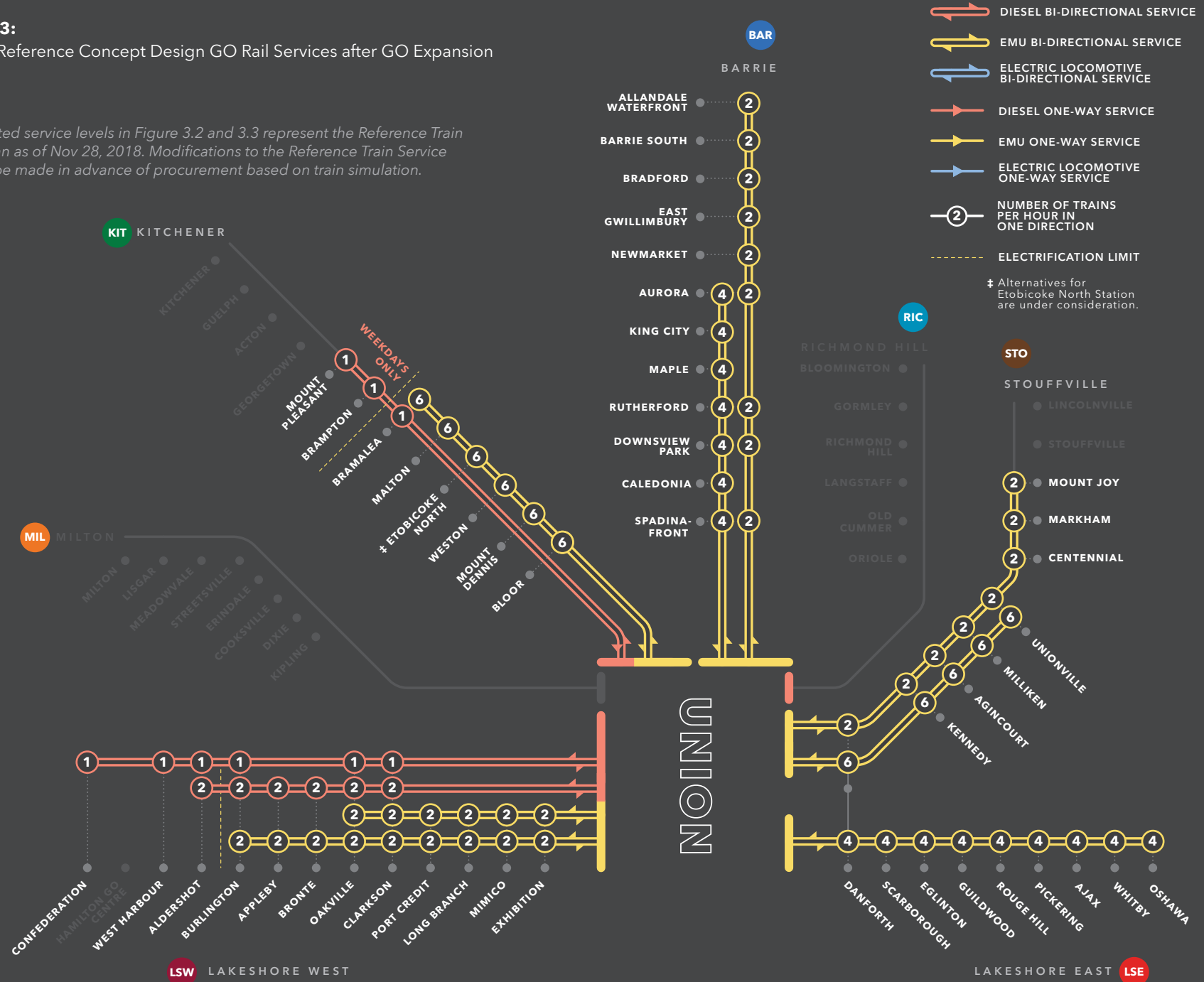
The indicated service levels in Figure 3.2 and 3.3 represent the Reference Train Service Plan as of Nov 28, 2018. Modifications to the Reference Train Service Plan may be made in advance of procurement based on train simulation.



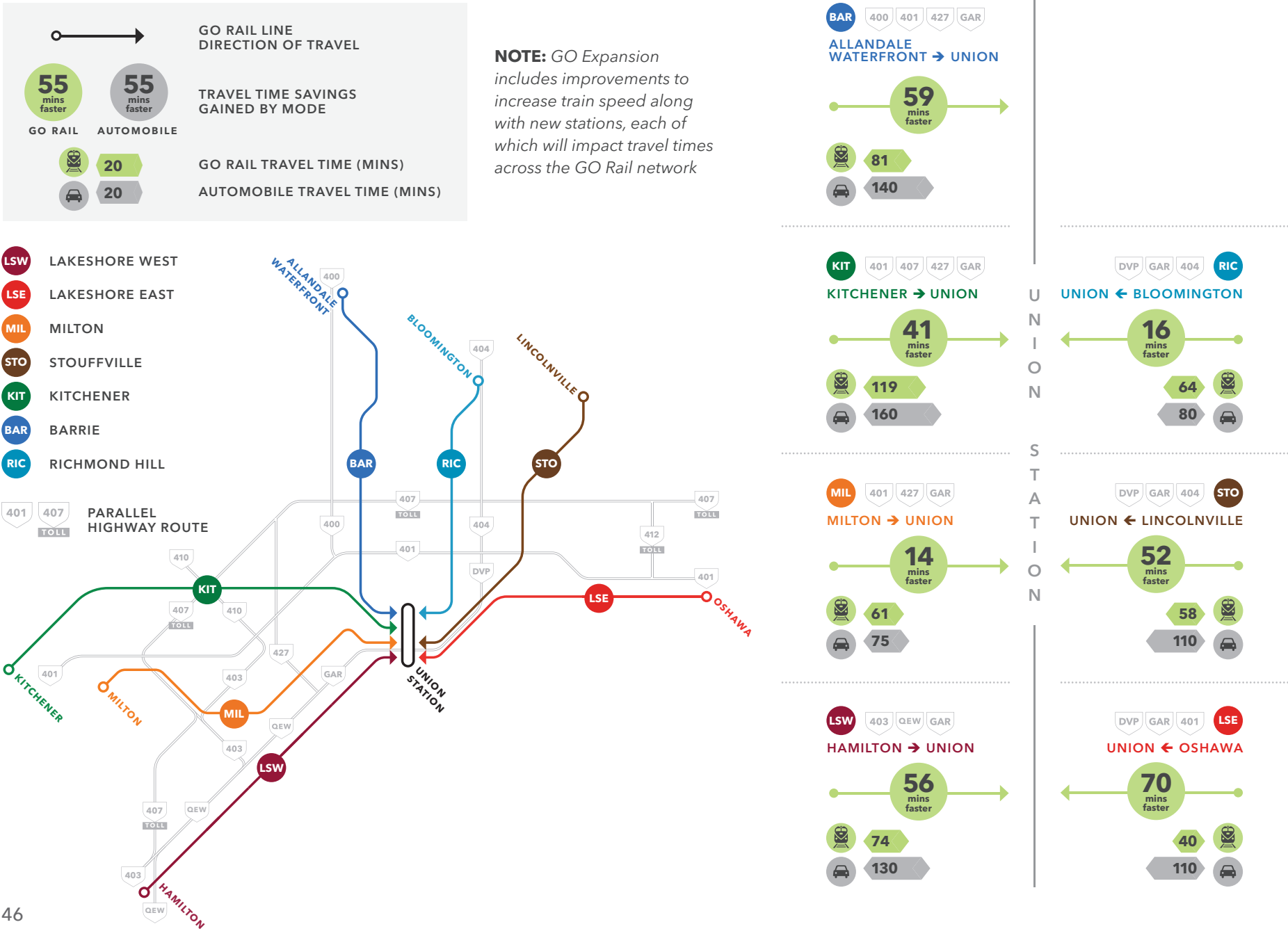


**Figure 3.3:**  
Off-Peak Reference Concept Design GO Rail Services after GO Expansion

The indicated service levels in Figure 3.2 and 3.3 represent the Reference Train Service Plan as of Nov 28, 2018. Modifications to the Reference Train Service Plan may be made in advance of procurement based on train simulation.



**Figure 3.4:** Reference Concept Design GO Expansion Travel Time Improvements



LSW

LAKESHORE WEST

LSE

LAKESHORE EAST

MIL

MILTON

STO

STOUFFVILLE

KIT

KITCHENER

BAR

BARRIE

RIC

RICHMOND HILL

401

407

TOLL

PARALLEL HIGHWAY ROUTE

400

404

407

410

412

427

403

QEW

ALLAN DALE WATERFRONT

BLOOMINGTON

LINCOLNVILLE

UNION STATION

KITCHENER

MILTON

MIL

LSW

HAMILTON

ARRIVE AT 0900 in UNION STATION

BAR

400

401

427

GAR

ALLAN DALE WATERFRONT → UNION

59 mins faster

81

140

KIT

401

407

427

GAR

KITCHENER → UNION

41 mins faster

119

160

MIL

401

427

GAR

MILTON → UNION

14 mins faster

61

75

LSW

403

QEW

GAR

HAMILTON → UNION

56 mins faster

74

130

DVP

GAR

404

RIC

UNION ← BLOOMINGTON

16 mins faster

64

80

DVP

GAR

404

STO

UNION ← LINCOLNVILLE

52 mins faster

58

110

DVP

GAR

401

LSE

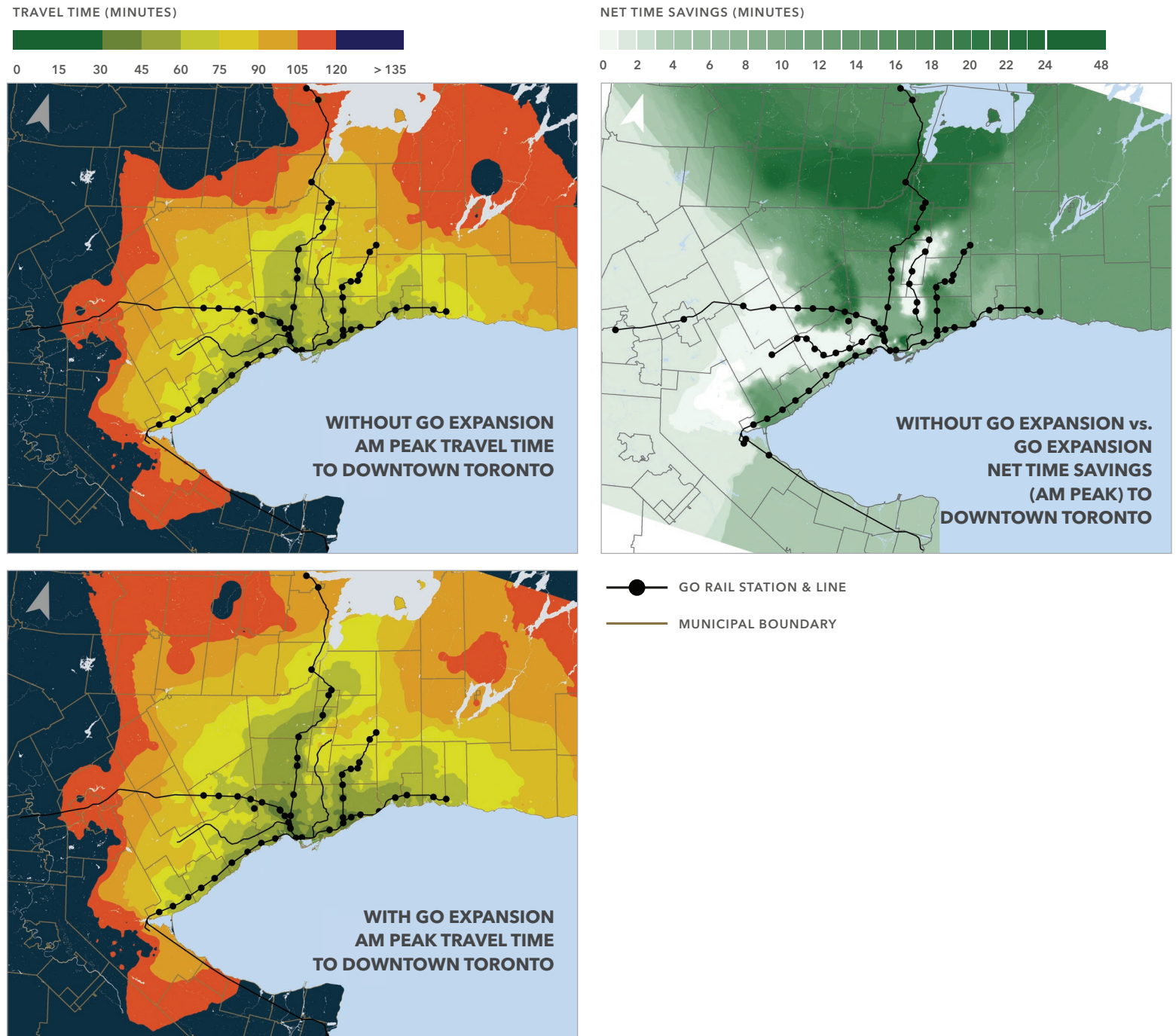
UNION ← OSHAWA

70 mins faster

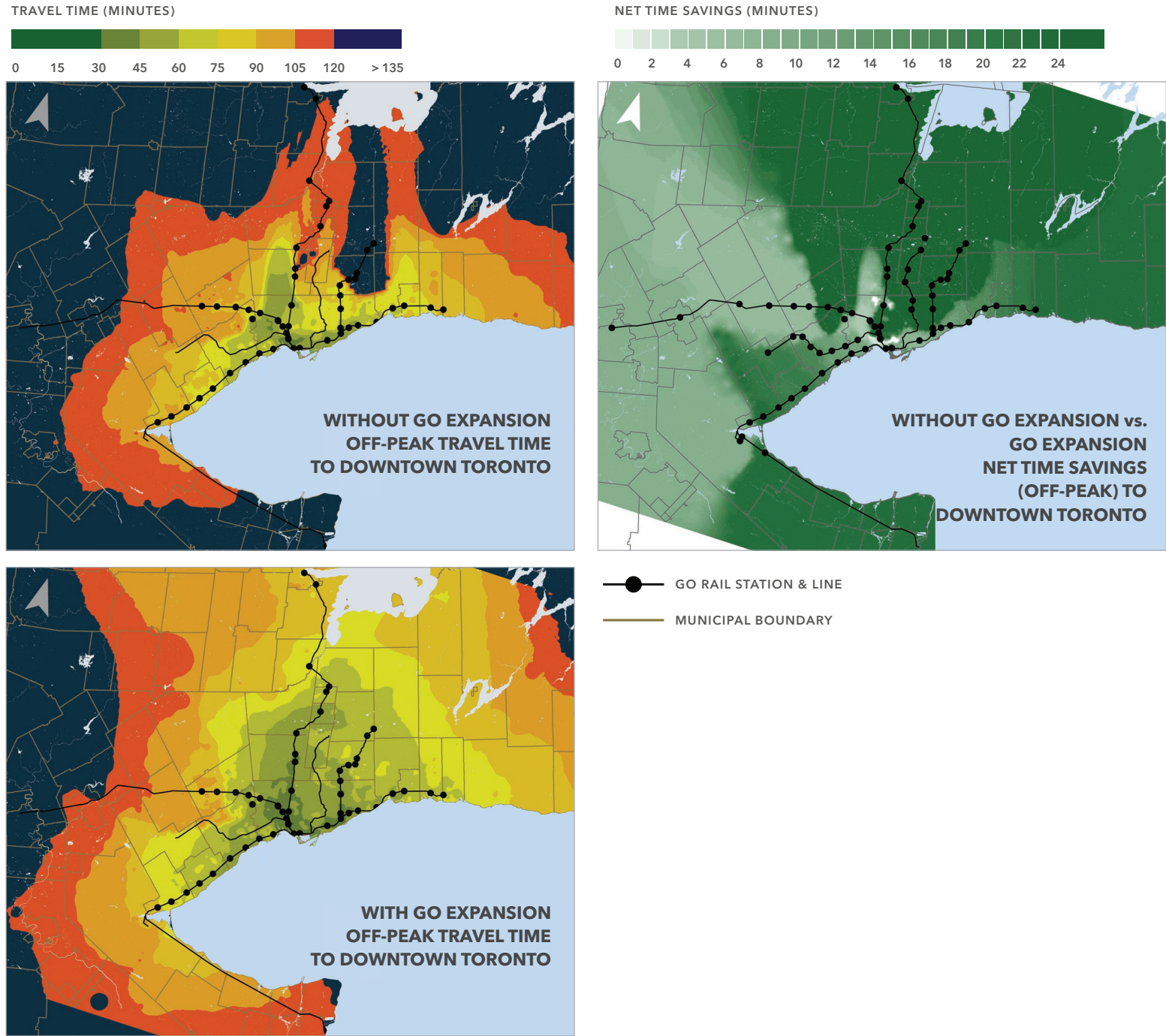
40

110

**Figure 3.5:** Comparison of Travel Times on GO Rail to Downtown Toronto Before and After GO Expansion in the AM Peak



**Figure 3.6:** Comparison of Travel Times on GO Rail to Downtown Toronto Before and After GO Expansion in the Off Peak





## GO Rail Line Improvements





## LSW Lakeshore West

### Lakeshore West Today

Lakeshore West is GO Rail's most heavily used corridor, with 48,000 peak passengers and 16,000 mid-day, contra-peak, and all-day passengers. Large parts of the corridor have been urbanized since the 1950s but intensification continues especially around Oakville and Aldershot stations.






The Lakeshore West Line currently offers two-way all-day service between Union Station and Aldershot with trains arriving every 15-20 minutes in the peak period and every 30 minutes throughout the rest of the day and on evenings and weekends. Additionally, there are trains to Union Station from Hamilton in the morning and trains from Union Station to Hamilton in the evening.

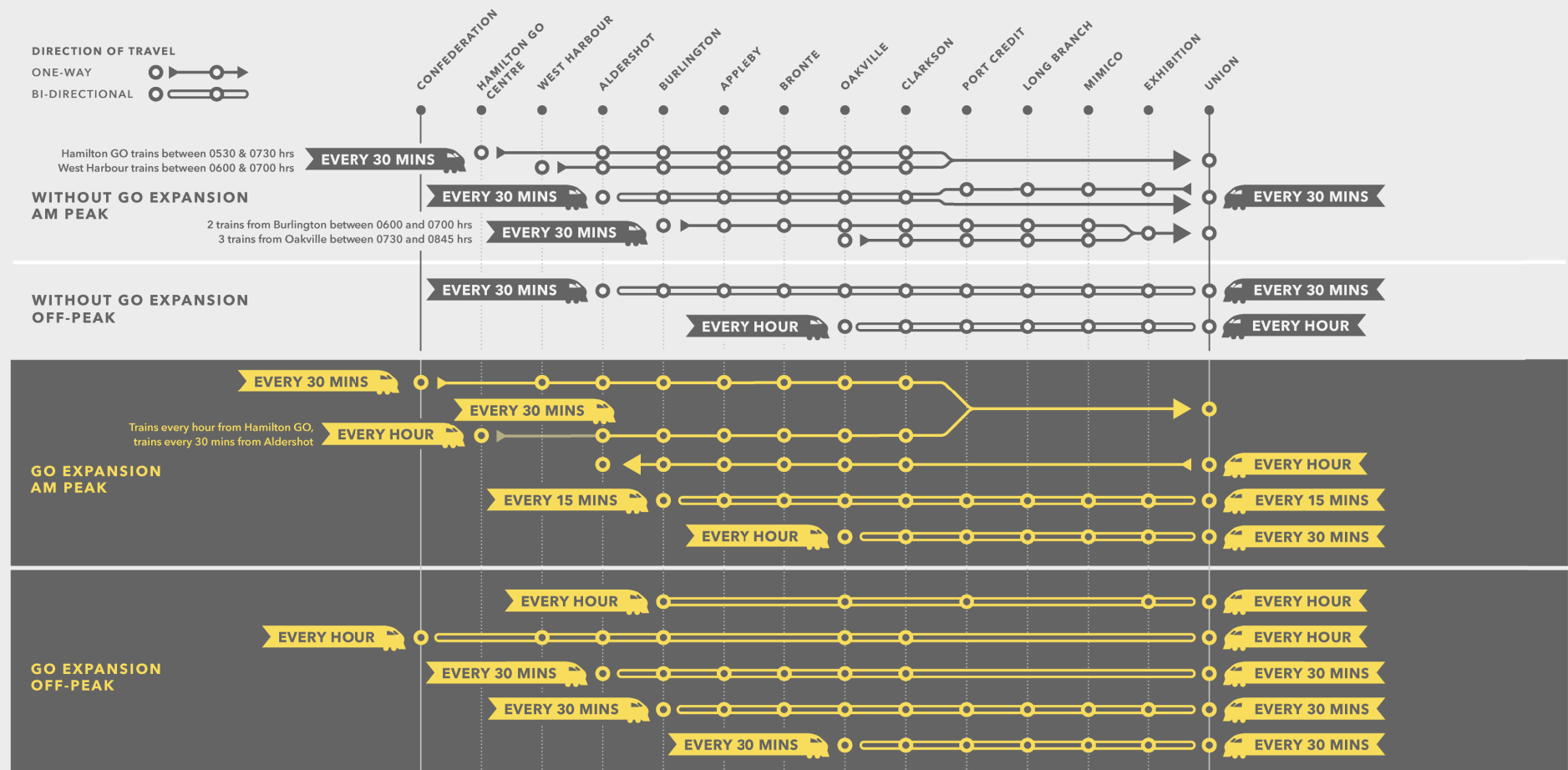
### Investment Summary

As part of GO Expansion, Lakeshore West will receive significant investment which is summarized in Table 3.2. The travel time and frequency improvements included in this program are illustrated in Figure 3.7.



**Table 3.2:** GO Expansion Improvements to the Lakeshore West Line

Program Element	Performance Objectives	Next Steps
 <b>MORE ACCESSIBLE STATIONS</b>	<ul style="list-style-type: none"> <li>Customers can board and alight faster, reducing trip times by 2-5 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Improvements at: Exhibition, Mimico, Long Branch, Clarkson, Oakville, Bronte, Appleby, Burlington</li> </ul>
 <b>MORE ALL-DAY SERVICE</b>	<ul style="list-style-type: none"> <li>282 weekday services</li> <li>Detailed service plan shown in Figure 3.5</li> <li>Two-way all-day service between Union and Hamilton, fifteen minute service or better between Burlington and Union</li> </ul>	<ul style="list-style-type: none"> <li>20.4 km of new track, two new road/rail separations</li> <li>All-day EMU service comprises 2 tph stopping at all stations to/from Burlington, and 2 tph stopping at all stations to/from Oakville.</li> <li>All-day Aldershot trains stop at Burlington, Bronte, Appleby, Oakville and Clarkson offering a combined service from these stations, half of which are express from Oakville</li> <li>Oakville and Clarkson have 6 tph, comprising 2 express and 4 all stations. Port Credit and all stations to Union have 4 tph all day</li> </ul>
 <b>SERVICE IN BOTH DIRECTIONS</b>		
 <b>TRAINS EVERY 15 MINUTES</b>		
 <b>FASTER AND MORE EFFICIENT TRAINS</b>	<ul style="list-style-type: none"> <li>Up to 8% faster for electric locomotive services</li> <li>Up to 29% faster for EMU service</li> </ul>	<ul style="list-style-type: none"> <li>Electrification from Union Station to Burlington Station (205 km of electrified track)</li> <li>Use of electric rolling stock (locomotives and EMUs)</li> </ul>

**Figure 3.7:** Lakeshore West Reference Concept Design Frequency and Speed Improvements




## KIT Kitchener

### Kitchener Today

Today the Kitchener Line is a well utilized passenger rail service with 22,000 peak passengers and 4,000 mid-day and off-peak passengers. The corridor serves urban centres and communities West of Toronto with direct connectivity to Guelph and Kitchener-Waterloo.






The Kitchener Line provides a four-train peak service between Kitchener Station and Toronto in the AM Peak and Toronto and Kitchener Station in the PM peak. An additional two trains per peak period run between Bramalea and Union Station in the AM peak and Union Station and Bramalea in the PM Peak. There is a two-way service every 60 minutes between Union Station and Mount Pleasant

### Investment Summary

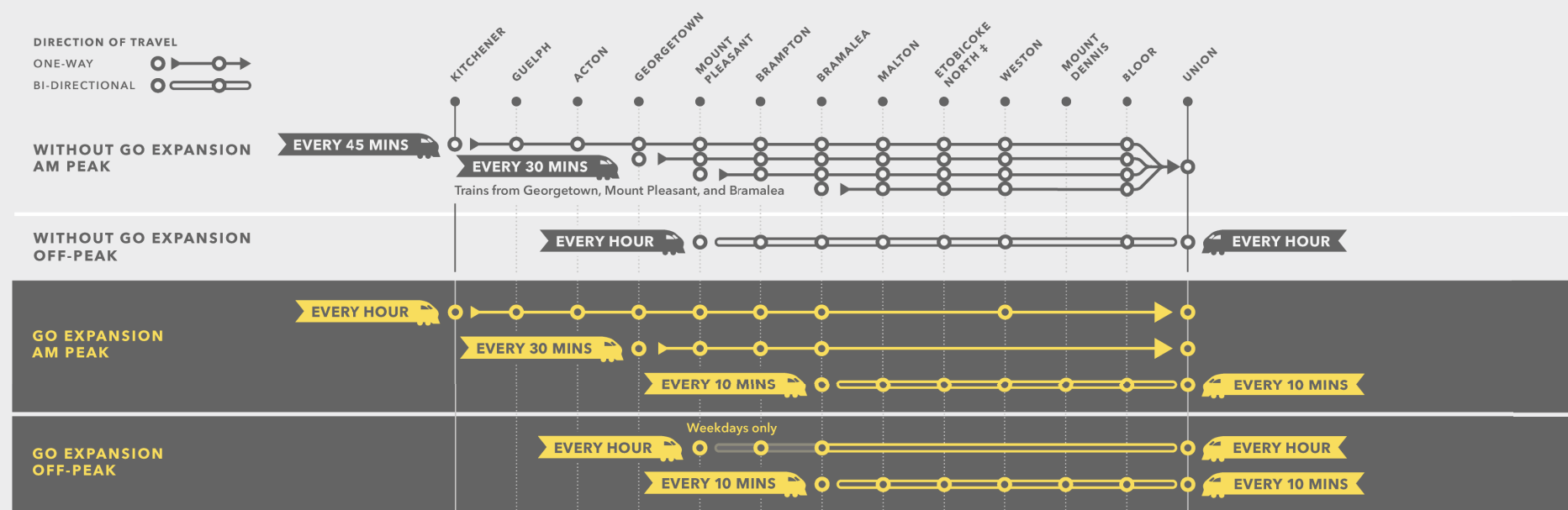
As part of GO Expansion, Kitchener will see significant upgrades between Bramalea and Union Station, with additional improvements on the remainder of the corridor. Table 3.3 summarizes the reference concept design and performance objectives for Kitchener. The travel time and frequency improvements included in this program are illustrated in Figure 3.8.



**Table 3.3:** GO Expansion Expansion Improvements to the Kitchener Line

Program Element	Performance Objectives	Next Steps
 <b>MORE ACCESSIBLE STATIONS</b>	<ul style="list-style-type: none"> <li>Customers can board and alight faster, reducing trip times by 2-5 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Improvements at: Bramalea, Brampton, Georgetown, Bloor, Weston, Malton</li> </ul>
 <b>MORE ALL-DAY SERVICE</b>	<ul style="list-style-type: none"> <li>340 weekday services (increase of 159)</li> <li>Detailed service plan shown in Figure 3.6</li> </ul>	<ul style="list-style-type: none"> <li>38 km of new track, nine upgraded bridges, two new road/rail grade separations, one new layover</li> <li>Peak service from Kitchener to Union (1 tph, reverse in PM peak) with an additional 2 tph from Georgetown to Union (reverse in PM peak)</li> </ul>
 <b>SERVICE IN BOTH DIRECTIONS</b>	<ul style="list-style-type: none"> <li>Two-way all-day service between Union and Bramalea, additional off-peak two-way service between Union and Mount Pleasant</li> </ul>	<ul style="list-style-type: none"> <li>Off-peak Diesel locomotive service between Mount Pleasant and Union (1 tph)</li> <li>All-day EMU service between Bramalea and Union (6 tph)</li> </ul>
 <b>TRAINS EVERY 15 MINUTES</b>		
 <b>FASTER AND MORE EFFICIENT TRAINS</b>	<ul style="list-style-type: none"> <li>Up to 29% faster for EMU services</li> </ul>	<ul style="list-style-type: none"> <li>Electrification from Union Station to Bramalea station (92 km of electric track)</li> <li>Use of electric rolling stock (EMUs)</li> </ul>

**Figure 3.8:** Kitchener Reference Concept Design Frequency and Speed Improvements





## BAR Barrie

### Barrie Today

Today the Barrie Line is a well utilized passenger rail service with 20,000 peak passengers. The Barrie Line provides seven peak period trains in the morning connecting Barrie to Union Station, and seven trains in the afternoon connecting Union Station to Barrie. Throughout the day, there are hourly two-way trains between Union Station and Aurora.

In 2018 expanded services were launched on the Barrie Line - including two-way, all-day hourly services on the weekend.

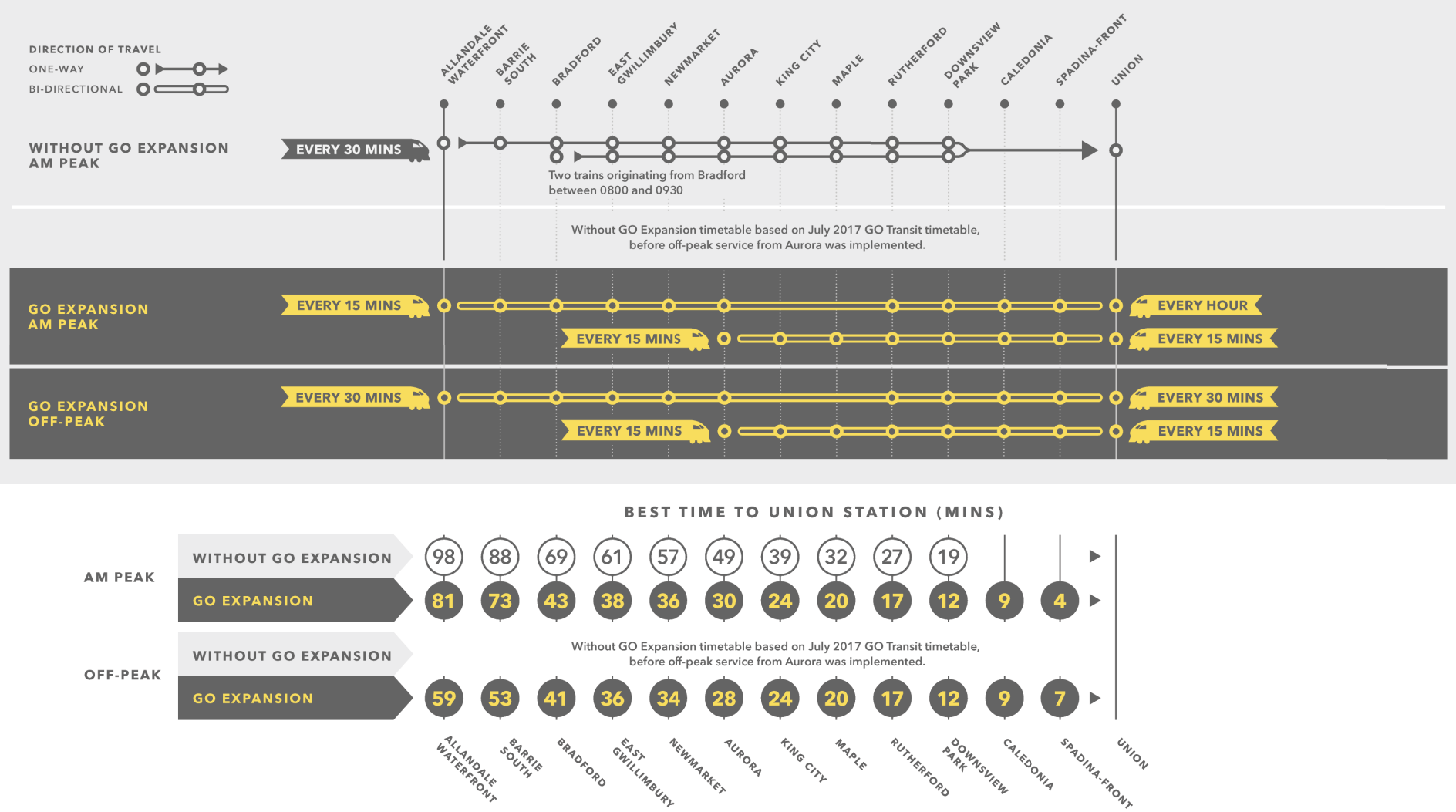
### Investment Summary

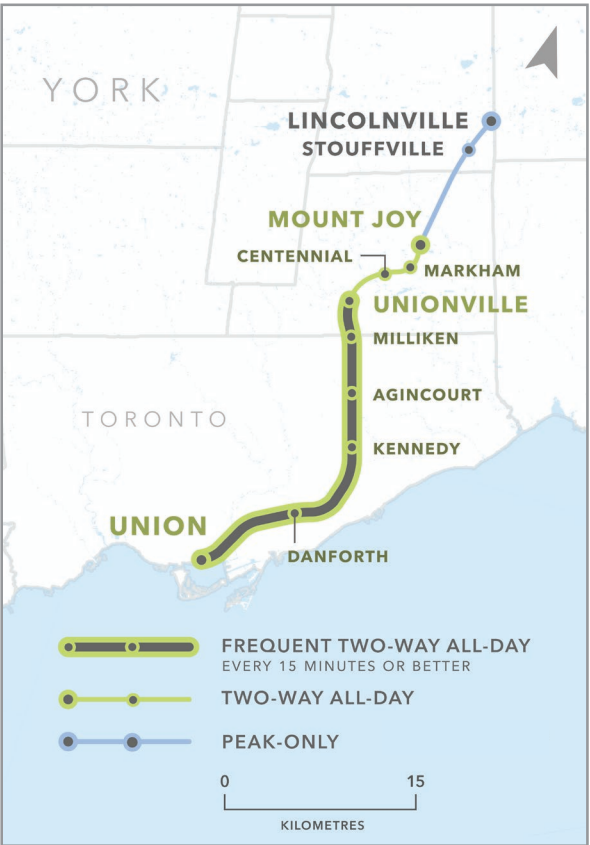
GO Expansion will allow for significant investment along the length of the corridor as defined in Table 3.4 and Figure 3.9.

**Table 3.4:** GO Expansion Expansion Improvements to the Barrie Line

Program Element	Performance Objectives	Next Steps
<b>MORE ACCESSIBLE STATIONS</b>	<ul style="list-style-type: none"> <li>Customers can board and alight faster, reducing trip times by 2-5 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Improvements at: Downsview Park, Rutherford, Maple, King City, Aurora, Newmarket, East Gwillimbury, Bradford, Barrie South, Allandale Waterfront</li> </ul>
<b>MORE ALL-DAY SERVICE</b>	<ul style="list-style-type: none"> <li>226 weekday services</li> <li>Detailed service plan shown in Figure 3.7</li> <li>A train every 15 minutes two-way, all-day between Union Station and Aurora</li> </ul>	<ul style="list-style-type: none"> <li>68.2 km of new track, one bridge upgrade, one upgraded road/rail separation, one new pedestrian bridge, one new layover</li> <li>Peak service from Barrie to Union (4 tph, running express from Aurora to Rutherford, reverse in PM peak) using electric locomotives, 1 tph from Union to Allandale Waterfront using EMUs (reverse in PM peak), and 4 tph between Aurora and Union using EMUs.</li> </ul>
<b>SERVICE IN BOTH DIRECTIONS</b>	<ul style="list-style-type: none"> <li>A train every 30 minutes in the peak and every 60 minutes throughout the day, evenings, and weekends between Barrie (Allandale) and Union Station</li> </ul>	<ul style="list-style-type: none"> <li>Off-peak service between Allandale Waterfront and Union (2 tph) and Aurora and Union (4 tph) using EMUs.</li> </ul>
<b>TRAINS EVERY 15 MINUTES</b>		
<b>FASTER AND MORE EFFICIENT TRAINS</b>	<ul style="list-style-type: none"> <li>Up to 8% faster for electric locomotive services</li> <li>Up to 29% faster for EMU service</li> </ul>	<ul style="list-style-type: none"> <li>Electrification from Union Station to Allandale Waterfront (174 km of electrified track)</li> <li>Use of electric rolling stock (EMUs and locomotives)</li> </ul>

**Figure 3.9:** Barrie Reference Concept Design Frequency and Speed Improvements





## STO Stouffville

### Stouffville Today

Today the Stouffville Line has 17,000 peak passengers. The Stouffville Line currently provides a train every 30 minutes in the peak direction- Lincolnville to Union Station in the morning and Union Station to Lincolnville in the afternoon. During the day there are hourly trains in both directions between Unionville and Union Station.

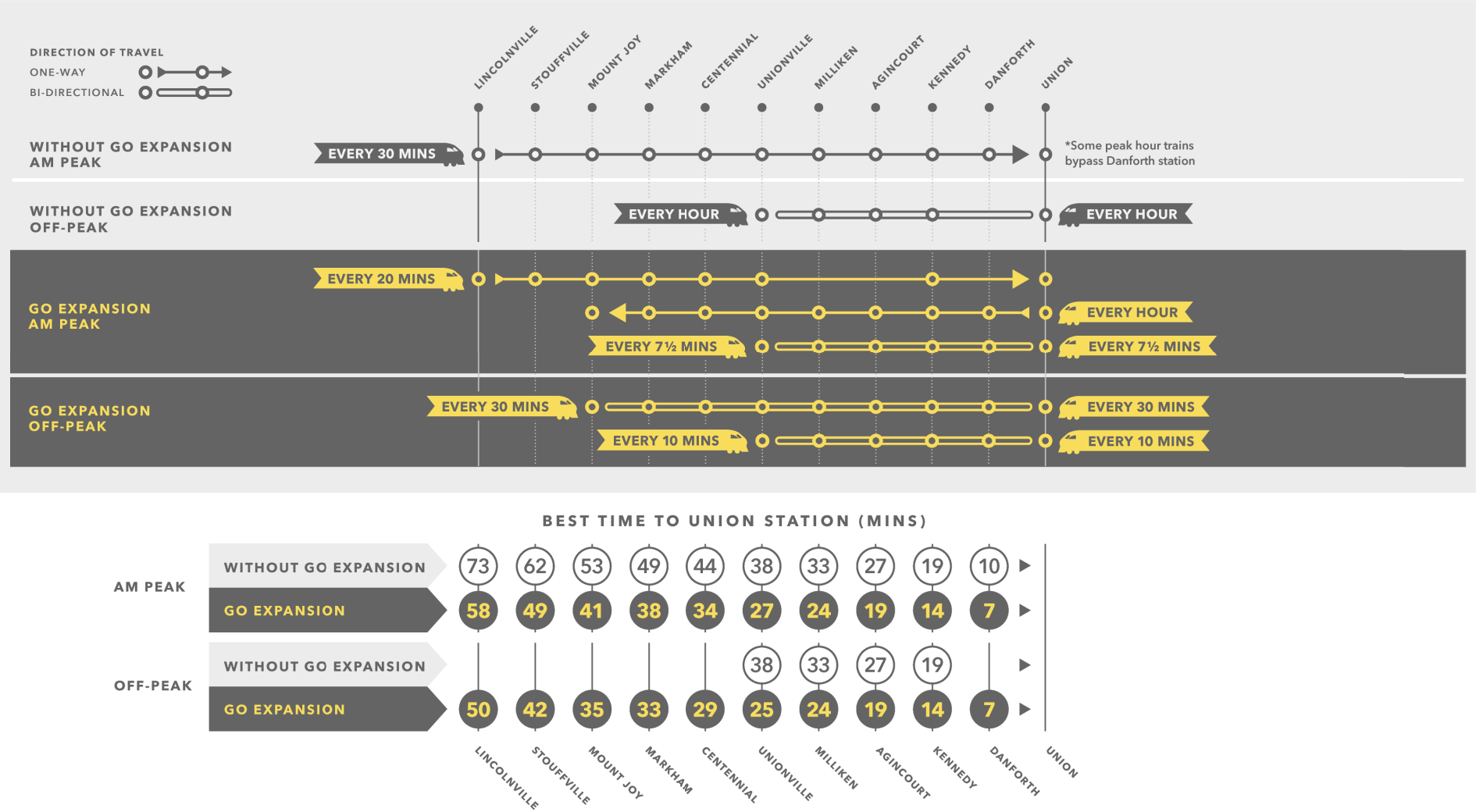
### Investment Summary

GO Expansion will allow for significant investment along the length of the corridor as defined in Table 3.5 and Figure 3.10.

**Table 3.5:** GO Expansion Expansion Improvements to the Stouffville Line

Program Element	Performance Objectives	Next Steps
<b>MORE ACCESSIBLE STATIONS</b>	<ul style="list-style-type: none"> <li>Customers can board and alight faster, reducing trip times by 2-5 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Improvements at: Kennedy, Agincourt, Milliken, Unionville, Centennial, Markham, Mt. Joy, Stouffville, Lincolnville</li> </ul>
<b>MORE ALL-DAY SERVICE</b>	<ul style="list-style-type: none"> <li>302 weekday services</li> <li>Detailed service plan shown in Figure 3.8</li> <li>A train every 15 minutes between Unionville and Union Station two way all-day and on weekends</li> <li>Peak one way trains every twenty minutes from Lincolnville to Union Station in the AM Peak and Union</li> </ul>	<ul style="list-style-type: none"> <li>20 km of new track, one upgraded bridge, one new layover, two road/rail separation upgrades</li> <li>Peak service between Unionville and Union Station (8 tph), service from Union to Lincolnville (1 tph, reverse in PM peak) provided by EMUs, and electric locomotive service from Lincolnville to Union (3 tph, reverse in PM peak).</li> <li>Off-peak service between Mount Joy and Union (2 tph) and Unionville and Union (6 tph) provided by EMUs</li> </ul>
<b>SERVICE IN BOTH DIRECTIONS</b>		
<b>TRAINS EVERY 15 MINUTES</b>		
<b>FASTER AND MORE EFFICIENT TRAINS</b>	<ul style="list-style-type: none"> <li>Up to 8% faster for electric locomotive services</li> <li>Up to 29% faster for EMU service</li> </ul>	<ul style="list-style-type: none"> <li>Electrification from Union Station to Lincolnville (204 km of electrified track)</li> <li>Use of electric rolling stock (EMUs and locomotives)</li> </ul>

**Figure 3.10:** Stouffville Reference Concept Design Frequency and Speed Improvements





## LSE Lakeshore East

### Lakeshore East Today






Today the Lakeshore East Line has over 40,000 peak passengers and over 13,000 off-peak and counter-peak passengers making it the second busiest GO Rail lines. The Lakeshore East Line currently offers two-way, all-day service between Union Station and Oshawa with trains arriving every 15-20 minutes in the peak period and every 30 minutes throughout the rest of the day and on evenings and weekends.

### Investment Summary

GO Expansion will allow for significant investment along the length of the corridor, including complete electrification and a consistent service pattern all day, as defined in Table 3.6 and Figure 3.11.

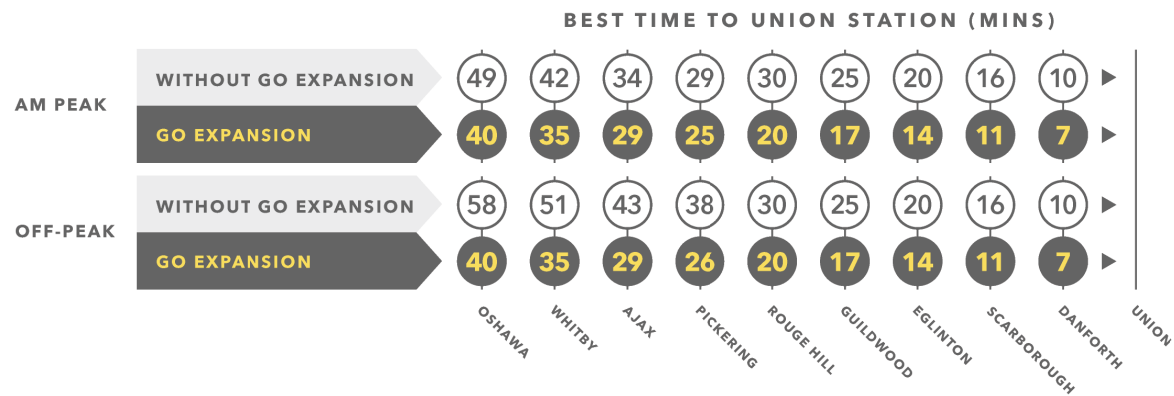
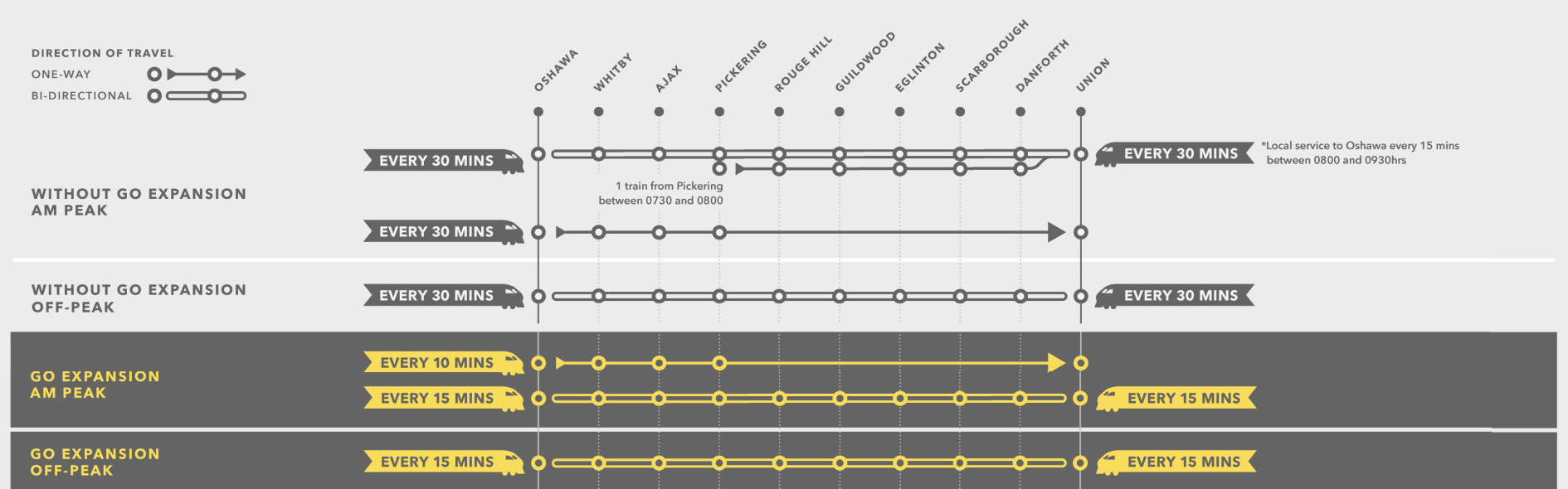


**Table 3.6:** GO Expansion Expansion Improvements to the Lakeshore East Line

Program Element	Performance Objectives	Next Steps
 <b>MORE ACCESSIBLE STATIONS</b>	<ul style="list-style-type: none"> <li>Customers can board and alight faster, reducing trip times by 2-5 minutes</li> </ul>	<ul style="list-style-type: none"> <li>Improvements at: Danforth, Scarborough, Eglinton, Guildwood, Rouge Hill, Pickering, Ajax, Whitby, Oshawa</li> </ul>
 <b>MORE ALL-DAY SERVICE</b>	<ul style="list-style-type: none"> <li>179 weekday services</li> <li>Detailed service plan shown in Figure 3.9</li> <li>Provide 15 minute peak service at all stops and 10 minute express peak service to Union Station, Pickering, Ajax, Whitby, and Oshawa</li> </ul>	<ul style="list-style-type: none"> <li>35 km of new track, three bridge upgrades, one new layover, one new pedestrian bridge</li> <li>All-day service between Oshawa and Union (4 tph) provided by EMUs with an additional peak only service from Oshawa to Union running express from Pickering (5 tph, reverse in PM peak) using Electric Locomotives</li> </ul>
 <b>SERVICE IN BOTH DIRECTIONS</b>		
 <b>TRAINS EVERY 15 MINUTES</b>		
 <b>FASTER AND MORE EFFICIENT TRAINS</b>	<ul style="list-style-type: none"> <li>Up to 8% faster for electric locomotive services</li> <li>Up to 29% faster for EMU service</li> </ul>	<ul style="list-style-type: none"> <li>Electrification from Union Station to Oshawa (92 km of electrified track)</li> <li>Use of electric rolling stock (EMUs and diesel locomotives)</li> </ul>



**Figure 3.11:** Lakeshore East Reference Concept Design Frequency and Speed Improvements



## MIL Milton

Currently GO Rail operates peak service to Union Station in the morning and to Milton to the evening. Improvements to Milton are not included in this FBC. However, Metrolinx continues to explore how to operate two-way all-day service on this corridor with CP Rail.



## RIC Richmond Hill

The 2015 GO RER Initial Business Case found a relatively weak case for frequent all-day services on the corridor, and identified issues that should be addressed before deciding on a development strategy for the corridor.

Technical challenges include:

- Flooding in the lower Don River, which affects most of the corridor from Richmond Street to the Millwood Bridge
- Slow journey times due to indirect alignment and low track speeds
- CN Rail ownership of the corridor north of Old Cummer, and conflicts with intensive freight services at the Doncaster Diamond rail junction and on the corridor north to Bloomington

- Lack of practical opportunities on the alignment for interchange with TTC other transit. The corridor passes under Line 2 Subway, the Millwood Bridge with intensive bus services, and the Eglinton Crosstown LRT, but the vertical separation makes it difficult and expensive to provide interchanges. Note that Oriole station is being relocated, and an effective interchange will be provided with Line 4 Subway.

Challenges affecting demand and benefits include:

- Proposed parallel transit improvements including Line 1 Subway extension to Richmond Hill, and the Downtown Relief Line to York Mills Road
- Competition from frequent 8 tph all-day service now planned for the Stouffville corridor
- Low population density and limited development potential along most of the corridor



## 3.2 Reference Concept Design Process Assumptions

This section defines the process and assumptions used to develop the RCD. These assumptions were set out based on significant analysis and design conducted by Metrolinx from 2015-2018. This section includes:

- **Reference Concept Design**
- **Design Background**
- **Design Objectives**
- **Business as Usual Definition**
- **Design Assumptions**

### Design Background

The transformation of GO Rail into a Rapid Rail Network, with frequent all-day services, has been the subject of study and design since commuter services were first piloted. Since 2010, Metrolinx has studied how electrification and other technologies could enable GO Rail to operate faster and more frequent all day services, playing a greater role in addressing regional transportation needs while improving financial performance. Studies included:

- **GO 2020 Plan (2008)**
- **The Big Move (2008 Regional Transportation Plan for the GTHA)**
- **GO Electrification Study (2010)**
- **Regional Express Rail Initial Business Case (2014-2015)**
- **2041 Regional Transportation Plan (2018)**

These studies demonstrated how expanding and improving the GO Rail service could realize significant potential benefits to travellers and the region as a whole.

### Initial Business Case for Regional Express Rail

The potential benefits of improved rail led to the 2015 Initial Business Case for Regional Express Rail<sup>5</sup>, which evaluated five alternative technical strategies, with hourly and quarter-hourly services all-day services using diesel locomotives, electric locomotives and Electric Multiple Unites (EMUs).

The IBC suggested that electrified two-way all-day service offered the greatest benefits relative to costs. Moreover, the IBC showed that the lower operating costs of electric trains and the higher revenues that generated by increased ridership could enable GO Rail to reduce its operating subsidy. On the basis of the IBC, Metrolinx proceeded with further analysis of "Scenario 5" (which included electrification and frequent two-way all-day service on the Lakeshore West, Kitchener, Barrie, Stouffville, and Lakeshore East corridors within Metrolinx's stage gate process).

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<sup>5</sup> Initial Business Case for Regional Express Rail, Metrolinx, 2015 ([http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/GO\\_RER\\_Initial\\_Business\\_Case\\_EN.pdf](http://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/GO_RER_Initial_Business_Case_EN.pdf))

### ***What's New in the FBC Reference Concept Design?***

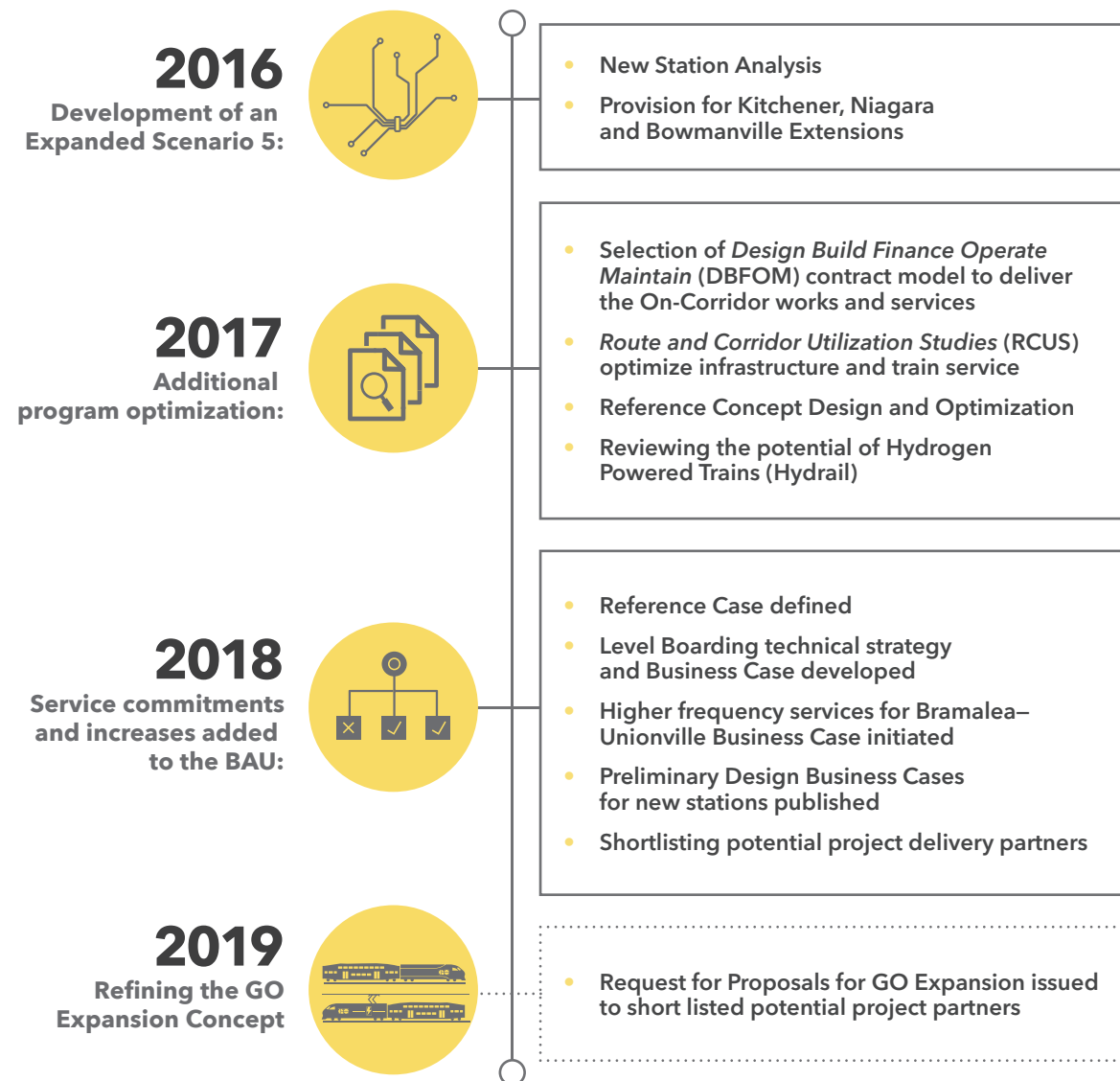
Since 2015, Metrolinx has developed detailed plans for implementation of Scenario 5 (shown in Figure 3.12), culminating in a RCD that is the basis for advancing GO Expansion through the final steps of the stage-gate process towards procurement. This has led to refined cost estimates based on a refined infrastructure and service specification compared to the IBC, which was based on preliminary analysis. The core service specification in the RCD is informed by Scenario 5 with higher frequency trains and express services on some corridors.

Metrolinx has also made provision for several additional stations to provide better connections to local transit and to support planned development. In parallel to developing the FBC and RCD, Metrolinx is exploring the development of extensions to Kitchener-Waterloo, Niagara, and Bowmanville, while also developing a program to add new stations to the GO Rail network. Provision is being made to include all of these within the GO Rail network as they proceed through the stage-gate process.

### **Design Objectives**

A set of objectives were set out to guide the design of a refined concept for Scenario 5 from the IBC. The core principles used to develop reference designs and services for GO Expansion were:

- **Build on Best Practice** – developed by drawing from exceptional rail systems around the world
- **Affordable** – deliverable within available budget and funding programs while keeping fares at a level comparable to historic trends
- **Efficient** – with revenues reducing operating subsidy requirements and potentially contributing to capital costs
- **Competitive** – with service frequencies and travel times that are attractive not just for peak trips to downtown Toronto but also for many trips across the region, midday, and weekends
- **Fully integrated** – connected with other transit across the region
- **Sustainable** – using efficient trains and supporting urban development that is attractive to people and businesses with a smaller carbon footprint
- **Expandable** – with potential to increase capacity to meet the needs of the region into the next century
- **Deliverable** – the program can be built without severe disruption to operation of existing GO Transit rail services

**Figure 3.12:** GO Expansion Design Timeline**Business as Usual Definition**

Business as Usual (BAU) refers to the future state of the GTHA's transportation network without GO Expansion. The BAU is the comparator against which the incremental costs and benefits of the GO Expansion Program are measured to understand the overall value of and case for GO Expansion. Generally, the BAU scenario has been defined to include investments and service enhancements that:

- Were planned or committed prior to or independently of GO Expansion.
- Would be required to meet underlying demand growth, following the commuter rail service structure that GO Rail has used for the past half century.
- Would be required as provision for other committed or proposed projects, such as the Eglinton Crosstown LRT, Hurontario LRT, or Hamilton LRT.
- Would be required, if GO Expansion was not implemented, to maintain acceptable levels of comfort, safety, and reliability on the GO Rail system (capacity increases are assumed to be required when demand in the 3-hour AM peak, from stations 20 minutes or further from Union, exceeds 100% of seats offered).

Key assumptions for what is included in the BAU scenario are described in Table 3.7.

**Table 3.7:** BAU Assumptions used in this FBC

Assumption Type	Core Assumptions
Committed prior to or independent of GO Expansion	<ul style="list-style-type: none"> <li>Achieving full disabled access in accordance to the Accessibility for Ontarians with Disabilities Act, 2005 (AODA) at stations</li> <li>Other station enhancements to meet Metrolinx design standards</li> <li>Peak services extended from and to new stations at West Harbour, Gormley and Confederation</li> <li>Hourly mid-day services to Mt Pleasant, Aurora and Unionville, and associated infrastructure (mostly signalling and track)</li> </ul>
Other GO Rail projects in the BAU are required to meet underlying demand growth	<ul style="list-style-type: none"> <li>Expansion of stations and station car parks</li> <li>Fleet expansion and associated train storage and maintenance facilities</li> <li>Some additional noise walls</li> </ul>
Provisions for other committed or proposed projects	<ul style="list-style-type: none"> <li>New stations at Mount Dennis and Caledonia, and a rebuilt station at Kennedy, as part of the Eglinton Crosstown LRT (TTC Line 5)</li> <li>Rebuilding of the 401 tunnel, which is required to protect for future development of High Speed Rail and higher frequency services beyond Bramalea that are not included in the current GO Expansion scope</li> </ul>
Investments to maintain safety, reliability and comfort	<ul style="list-style-type: none"> <li>Completion of the Union Station concourse reconstruction</li> <li>Completion of the Union Station Rail Corridor (USRC) re-signalling project</li> <li>The Union Station Expansion Project, to provide 3 new south platforms</li> <li>Reconstruction and reconfiguration of the Union Station platforms to provide greater capacity, comfort and safety</li> <li>Provision of a signal enforcement system, also referred to as Enhanced Train Control</li> <li>Upgrading to level crossings, and replacement of some level crossings with road rail grade separations</li> <li>Other works required to maintain GO facilities in a "State of Good Repair"</li> </ul>
Other network assumptions included in the Greater Golden Horseshoe Model (GGHM) used to estimate demand growth in the BAU scenario	<ul style="list-style-type: none"> <li>Completion of the Eglinton and Finch LRTs</li> <li>Construction of the Scarborough Subway extension to McCowan, replacing the Scarborough RT</li> </ul>

### Design Assumptions

A set of working assumptions were used to develop, model, and test the RCD for the FBC. These assumptions are based on:

- Operating and capital delivery experience in the GTHA.
- Historic GO Rail project delivery and performance.
- International best practice.

These assumptions are central to determining the overall feasibility of GO Expansion as well as estimating its potential costs and benefits. This sub section provides background on these assumptions and their influence on the GO Expansion RCD development process. Assumptions include:

- Customer Experience
- Train Service
- Train Performance
- Phasing
- Union Station Planning
- Track and On-Corridor
- Other Rail Operations
- Station Accessibility
- Modelling



### Customer Experience

This FBC assumes an optimized Customer Value Proposition, to ensure the GO Rail system is accessible and attractive to a wide array of potential passengers, based on the following assumptions:

- Faster journey times and two-way, all-day service on select lines.
- Passenger seating standards, are similar to existing conditions.
- The service plan should provide seated capacity in the 3-hour AM peak to match forecast demand for all longer journeys, defined as journeys to Union, originating beyond the city of Toronto and that 50% of the seated capacity shall be provided in the peak hour. Note this does not mean all passengers will have a seat, but all passengers have the possibility of a seat if they are willing to alter their journey times within the AM peak period.
- The service plan provides seated capacity through all off-peak hours and in the contra peak, equal to at least 20% of the AM peak hour capacity, or 10% of the 3-hour AM peak capacity.
- Further fare integration between the Toronto Transit Commission (TTC) and GO Rail.

Metrolinx's Design Excellence Team ensures the Customer Value Proposition and Customer Experience elements are implemented across the network in the areas of architecture, site and landscape, universal accessibility, sustainable, interior and industrial design which includes integrated art and harmonized wayfinding. Primarily qualitative, these influences can have an impact on ridership by improving the customer experience. As the qualitative impacts are quantified these may bring additional factors to current assumptions.

### Train Service

Determining the optimum service pattern on a regional rail system such as GO is an iterative process (as shown in Figure 3.13), taking account of passenger demand, track capacity, and fleet capability and costs. The general service aspirations for GO Expansion have been developed based on international experience, local markets, and the infrastructure that can be provided at reasonable cost. Specifically, some examples are:

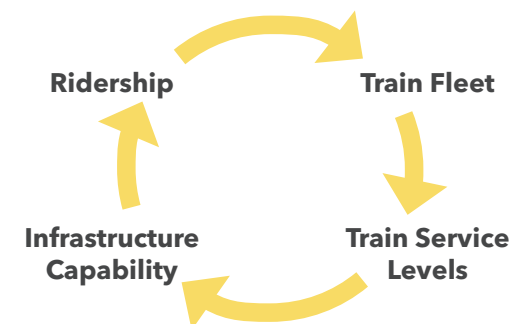
- Peak services on all corridors should be increased as required to carry underlying demand, consistent with the seating policy.
- All-day services on inner sections of GO-owned corridors that run through urbanized areas with more people and jobs should be every 15 minutes, all-day, or better.
- Services to urban centres outside the GTHA will be more frequent than today with hourly or half hourly service depending on capability of infrastructure and the potential for two-way demand.

There are some specific exceptions to these assumptions:

- All-day services beyond Burlington and Bramalea, and over the Milton corridor, are constrained by CN Rail and CP Rail freight. The Reference Design does not include any service increases on these lines, except for peak direction services in the peak hours. Future Business Case analysis could be used to justify further double tracking.
- All-day services beyond Aurora and Unionville are constrained by the capacity of corridors that will remain mostly single track.
- Due to the constrained corridor and limited development that is planned, double tracking is not contemplated beyond Unionville.

Where possible, consideration is given to operating express or limited-stop services from outer stations, to offer even faster journey times (express services are noted in Section 3.1).

**Figure 3.13:** GO Expansion Service and Infrastructure Design Process



### Train Performance

Trip times in the FBC are based on existing published journey times, with proportional adjustments for different types of trains as discussed in Table 3.3. The expected trip time savings range from 7% to 29% depending on train type and service, as shown in Table 3.8. These run times are based on train simulation and include allowances for dwell times and regulation.

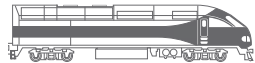

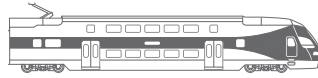
### Phasing

This FBC is prepared on the working assumption, used for modelling and analysis, that all corridors are upgraded simultaneously with all new services commencing between 2027-2028. However, in practice, delivery may be phased between 2025-2030. Metrolinx and their delivery partner will establish a specific schedule during the procurement process. Metrolinx is currently reviewing the introduction of increased services with existing fleet in advance of program completion.

### Union Station

Union Station is the heart of the GO network, and about 90% of GO's 210,000 weekday trips start or finish there. Union Station was built in the early twentieth century for use by long distance passenger trains that would typically spend an hour or more in the station. GO has incrementally modified the station into its current form, which is more suited for a commuter railway. GO operates about 40 trains through the station in the AM peak hour and is expanding and redeveloping passenger concourses with improved access to the PATH underground pedestrian network and the subway network.

**Table 3.8:** Train Types and Train Performance Used in the Reference Concept Design

Train Type	Description	Illustration	Speed improvements relative to 1 Diesel loco with 12 bi-levels		
			Train Configuration	Stopping	Express
Diesel locomotive hauled trains	The existing GO Rail train fleet uses diesel locomotive hauled trains, which will see continued use in the reference concept for some services (including Milton and Richmond)		1 Diesel loco and 6 bi-levels	13.0%	11.0%
			1 Diesel loco and 12 bi-levels	0.0%	0.0%
Electric Locomotive	Electric locomotives will be used on electrified lines and offer improved acceleration and stopping compared to diesel locomotives.		2 Diesel locos and 12 bi-levels	13.0%	11.0%
			1 Electric loco and 12 bi-levels	8.0%	7.0%
Electric Multiple Unit (EMU)	EMUs do not have a locomotive - rather a combination of self propelled carriages and carriages without motors are connected in a train. This train type has the fastest acceleration and stopping.		Bi-level EMU	29.0%	25.8%

Without changes to its operating practices and physical configuration, Union Station will be unable to accommodate increased demand into the future.

This FBC assumes further improvements to enable Union Station to accommodate Rapid Rail style services. As part of GO Expansion, the track layout is assumed to be modified, with higher speed ladders, and with fewer tracks. Wider platforms will have additional vertical circulation, allowing 10 trains to load, per hour. The RCD explicitly assumes:

- Ten tracks with wide platforms for twelve car trains.
- Additional escalators, elevators, and stairs to platforms.
- Provision for additional passenger bridges on the east and west end of the platforms.
- Two bay platforms, west-facing, for four-car UP Express and GO trains.
- Four bay platforms, east facing, for eight-car VIA trains and GO trains.

With these improvements, capacity will be about 100 trains per hour, more than twice the current level. This will be sufficient for projected traffic volumes to about 2050.

Metrolinx expects to give the delivery partner considerable freedom to optimize the track layout at Union Station, and develop a phasing plan to implement it.

### ***Track and On-Corridor Assumptions***

Metrolinx has developed a set of assumptions for the RCD's improvements to tracks and on-corridor features:

- **Expanded track** - the RCD allows for additional tracks to corridors where track capacity impedes speed or frequency. It is assumed that existing track and permanent way (culverts and drains, embankments, bridges, retaining walls, sub-grade and ballast) are well maintained and suitable for more intensive operation without significant upgrading. Although the frequency of train services will increase, the maximum axle loads will remain the same or less.
- **Electrification** - the RCD assumes a 25 kV AC overhead system designed by Metrolinx. Electrification is expected to allow for more cost efficient faster trains with increased acceleration and stopping capabilities. Improved acceleration and stopping in turn improves travel times and can attract more ridership. Metrolinx has also completed the statutory approvals process, including environmental assessments as required for systemwide electrification, and has negotiated connection agreements with Hydro One.
- **Signalling** - the RCD assumes costs to install a new signalling system throughout the GO Rail network including some form of Enhanced Train Control, which will provide automatic signal enforcement and work zone protection.

### ***Other Rail Operations***

The GO Rail network shares track with other operators for specific segments. The RCD assumes that both freight and VIA Rail will continue to operate:

- **Freight** - The rail network was originally built to principally carry freight. CN Rail continues to serve customers using track in the GTHA and has rights to do so under the sale and purchase agreements with Metrolinx. In addition, the Kitchener corridor between Bramalea (Halwest Junction) and Georgetown (Silver Junction) continues to be owned by CN Rail. The Milton corridor is owned by CP Rail and functions as part of their Toronto-Chicago mainline. Metrolinx is currently in discussions with CN Rail and CP Rail as to how their needs can continue to be met while allowing development of frequent all-day passenger services.
- **VIA Rail** - GO Rail tracks are also used by VIA Rail. VIA operates 15 trains per day each way over the Lakeshore East corridor, five trains each way over the Lakeshore West to London via Brantford and to Niagara, and two trains each way over the Kitchener corridor to London. VIA also operates the Toronto to Vancouver train, mostly serving tourists and operating twice each week. The FBC assumes a similar level of VIA service into the future.

### **Station Accessibility**

The RCD assumes that station accessibility will be improved in two ways:

- **Improved multi-modal access to stations** - today, many customers access GO Rail using park and ride facilities. Metrolinx is currently developing strategies and approaches to support continued station accessibility - including expanded multi-modal access via walking, biking, ride-sharing, or local transit agencies. The RCD assumes that all forecasted ridership is able to access the station either through park and ride or other modes.
- **Upgraded platforms to speed up boarding and alighting from trains** - GO currently operates a "low platform" system, with a raised "mini-platform" provided for wheelchair and stroller access to a single set of doors into the "accessibility" car. This is a practical, low cost way to comply with accessibility requirements while avoiding conflicts with express trains, VIA Rail, and freight trains that also run over the network. Many rail systems have introduced level boarding which allows customers to board trains without steps. Metrolinx has developed a technical strategy to raise platforms to provide faster boarding and alighting.

### **Modelling**

In order to support the optimization of the GO Expansion program and creation of this Full Business Case document, Metrolinx has developed a sophisticated modelling platform that provides ridership, economic, and financial outputs (e.g., off-peak ridership, time-savings benefits, benefit-cost ratios, revenue) for the GO Rail network. The model also provides a robust process for testing scenarios and sensitivities to inputs (e.g., fleet performance, maintenance costs, service concepts) to fully explore characteristics of the program and to mitigate potential risks to performance.

The model is a direct-demand model. Future ridership is forecasted by applying GO-station-level annual background growth rates to existing boarding count data by station. The model then uses elasticities to grow this ridership based on the generalized journey time savings that are provided by the GO Expansion services.

The background growth rates that drive the forecasts are based on travel demand forecasts from a separate model: the Greater Golden Horseshoe Model (GGHM). The GGHM is a macro-level, regional demand model that provides both traffic and transit forecasts for the 2031 horizon year, based on regional transportation network and land use growth assumptions. The GGHM has been successfully used as part of past regional and rapid transit corridor forecasting exercises, including the original RER Initial Business Case, the recent new stations preliminary design business cases (PDBC's), and the 2041 Regional Transportation Plan.

The economic and financial outputs generated by the model are consistent with Metrolinx's Business Case Guidance. This guidance provides a robust approach for assessing the benefits, costs, and impacts of a range of potential transportation investments. Metrolinx has published this guidance on our website at

[https://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/benefits\\_case\\_analyses.asp](https://www.metrolinx.com/en/regionalplanning/projectevaluation/benefitscases/benefits_case_analyses.asp)

## 3.3

### **Program Interdependencies and Parallel Projects**

GO Expansion is being considered alongside a range of other projects and programs. These “additional considerations” may impact the delivery, costs, and benefits of GO Expansion are summarized in Table 3.9. Each case in the FBC discusses how these interdependencies may influence or impact GO Expansion’s performance.

**Table 3.9:** Interdependencies with Other Projects

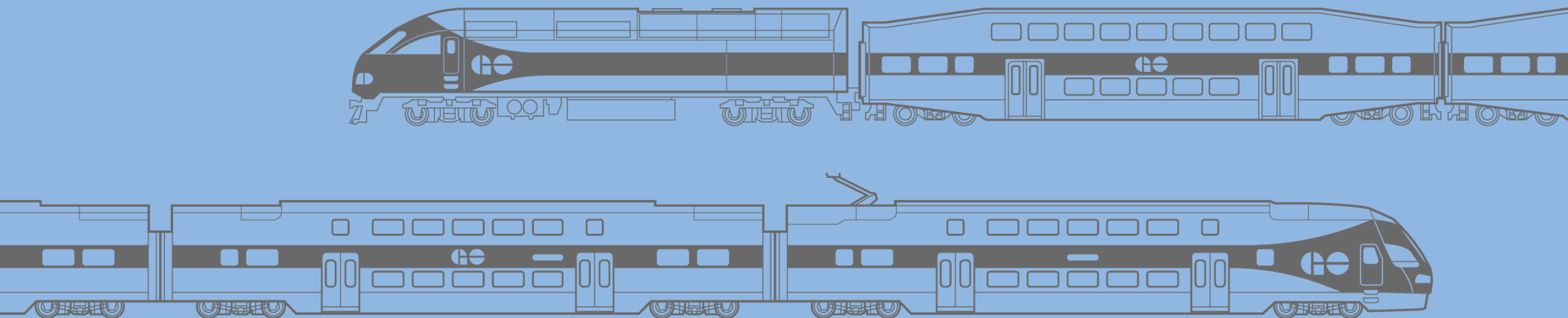
Key Considerations	Background	Impact on GO Expansion FBC	Next Steps
<b>GO Rail Extensions</b>	GO Rail extensions will expand the GO Rail network further to serve new communities such as Kitchener, Bowmanville, or Niagara. These extensions are currently under active development - including design, Business Case analysis, and discussions with freight rail operators and communities along the corridors.	<b>Not Included in FBC</b>	Continue to assess impact on GO Expansion during the development of rail extension Business Cases.
<b>Self Serve Strategy</b>	Transforming GO's service model to enable customers to make ticketing, fare, and service choices without direct interaction with GO Rail staff. This enables a more seamless experience, while changing front line staffing requirements for GO Rail stations.	<b>Included in both the BAU and GO Expansion</b>	Continue to develop the self-serve Business Cases.
<b>Station Access Strategy</b>	Developing a strategy to improve access to GO Stations by all modes of travel. Improved accessibility will reduce the effort required to access GO Rail and increase ridership. Station access improvements will also reduce the need to expand parking as more travellers will use transit or active modes.	<b>Included in both the BAU and GO Expansion</b>	Continue to implement the strategy.
<b>Transit Oriented Development</b>	The increased train service being implemented as part of the GO Expansion program will make living and working near GO stations more attractive. Metrolinx owns large parcels of land along the seven rail corridors in which GO operates and much of this once affordable and underutilized land will now be the focus of mixed use redevelopment. As part of the GO Expansion program, Metrolinx will identify Transit Oriented Development (TOD) opportunities across the network with the aim of capturing the uplift in land value, driving new ridership, and improving station access and customer experience. TOD will further align to the transit-supportive policies of the Growth Plan for the Greater Golden Horseshoe and Metrolinx's own Regional Transportation Plan, which identify dense mixed use environments around higher order transit as key measures to reduce traffic congestion, greenhouse gas emissions, and journey times.	<b>Not included in modelling analysis</b>	Continue to pursue TOD opportunities alongside GO Expansion.
<b>High Speed Rail</b>	The Government of Ontario is developing plans for a High Speed Rail (HSR) between Toronto and Windsor. GO Expansion will consider passive provision for future HSR developments and explore synergies between the two projects.	<b>Not included in modelling analysis</b>	Continue to review how the projects impact each other and identify potential synergies.
<b>High Frequency Rail</b>	VIA Rail is currently exploring how to increase service frequencies on the Windsor to Quebec City corridor, with a focus on train service between Toronto and Montreal. This project is currently under active development and consideration and would make use of the Union Station Rail Corridor and Union Station.	<b>Not included in modelling analysis</b>	Continue to review how the projects impact each other.
<b>Hydrail</b>	Hydrail has been proposed as an alternative to conventional electrification - allowing the performance parameters of electric trains without the need to develop electrification infrastructure. An initial feasibility study for Hydrail has been completed, with further work underway.	<b>Not included in modelling analysis</b>	Further analysis on the role of Hydrail within GO Expansion is underway.
<b>New Stations</b>	Metrolinx is exploring the addition of new stations to the GO Rail network. Separate Business Cases for the new station program will be prepared in parallel to this FBC for GO Expansion.	<b>Included as a separate modelling test</b>	Review benefits and costs of potential new stations through Metrolinx's Business Case process.





# 4

## Strategic Case



# Overview

The Strategic Case describes how GO Expansion will benefit the GTHA based on the strategic framework described in Chapter 2. The strategic value of the GO Expansion program is based on four key benefits:

- **Transportation Benefits** – improvements to rail, including new services at times of the day that are currently not served, allowing more people to make use of the system. As speed is improved, existing and new passengers will benefit and demand will also increase at existing stations.
- **Quality of Life** – faster trains and more service throughout the day contribute to people being able to use transit to get from where they are to where they want to go. As the region becomes more accessible, people will have wider access to a range of activities, institutions, and services through transit.
- **Economic Prosperity** – reliable transportation is essential for a thriving economy. Increased service, expanded accessibility, and faster trains mean reduced commute times and improved connectivity between urban growth centres and regional cores, which can support further investment and urban development. In addition, direct investment in rail delivery is a driver of job creation, including new skilled labourers.
- **Protected Environment** – more efficient trains will reduce the environmental impact of each train trip, while faster more frequent services will attract new passengers and reduce the number of auto trips in the region – further reducing pollution and emissions.

The strategic benefits have been identified across these categories through analytic modelling, design review, and policy analysis. The findings for GO Expansion are consistent with those realized by other significant investments in Rapid Rail or commuter rail systems internationally. The analysis included in subsequent sections of the Strategic Case provides estimates and discussion of the specific benefits across these categories that GO Expansion can realize for the GTHA.

## How is the chapter structured?

Section	Content
4.1 Transportation Benefits	A review of how the proposed investment in Chapter 3 changes transportation in the region with respect to travel times, accessibility, and ridership.
4.2 Quality of Life Benefits	A review of how GO Expansion will improve quality of life in the region by increasing overall accessibility and reducing the health impacts of regional transportation.
4.3 Economic Prosperity and Development Benefits	A review of how GO Expansion augments regional prosperity by connecting people to jobs, employment hubs, and growth areas with faster and more frequent services.
4.4 Protected Environment Benefits	A review of how GO Expansion will lead to a more sustainable regional transportation system.
4.5 Conclusions	A summary of the Strategic Case for GO Expansion.

# Strategic Case Summary

## Ten Reasons the GTHA will benefit from GO Expansion



## 4.1 Transportation Benefits



As discussed in Chapter 3, the GO Expansion program will channel over \$20 billion to deliver a transformational package of infrastructure and service improvements that will lead to a faster and more frequent rail service. The key transportation benefits realized by the project are:

**1**

**Ridership increases from faster, integrated, and connected rail services**

**2**

**A resilient and reliable network with capacity for now and the future**

**3**

**A self sustaining railway**

**4**

**A railway that meets customer needs**

## Benefit

1

## Ridership increases from faster, integrated, and connected rail services

With investment, total annual ridership on the GO Rail network will exceed **200 million by 2055.**

Today, GO Rail corridors spread across the GTHA, providing good coverage and connections to most of the region. However, not all corridors offer two-way service or all-day and weekend service, which has limited the system from reaching its true ridership potential..

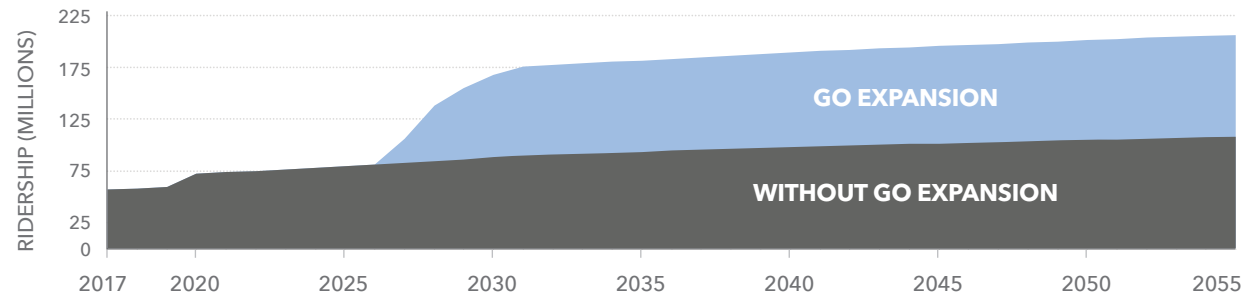
### What are GO Expansion's ridership impacts?

GO Expansion will transform GO Rail to provide two-way, all-day service across the network at faster speeds, which will enable ridership to increase by 60% by 2031 as shown in Table 4.1.

Total annual ridership on the GO Rail network will exceed 200 million by 2055 compared to 125 million without GO Expansion (shown in Figure 4.1). This change in ridership reflects over 295,000 new daily passengers (compared to ridership without GO Expansion), which will make GO Rail one of the busiest passenger railways in North America (as shown in Figure 4.2) with over 630 thousand daily trips.

This ridership growth will also include new customers who make use of new two-way all-day service in combination with bus, walking, or cycling trips with GO Rail to access more of the region.

**Figure 4.1:** GO Rail Annual Ridership With and Without GO Expansion

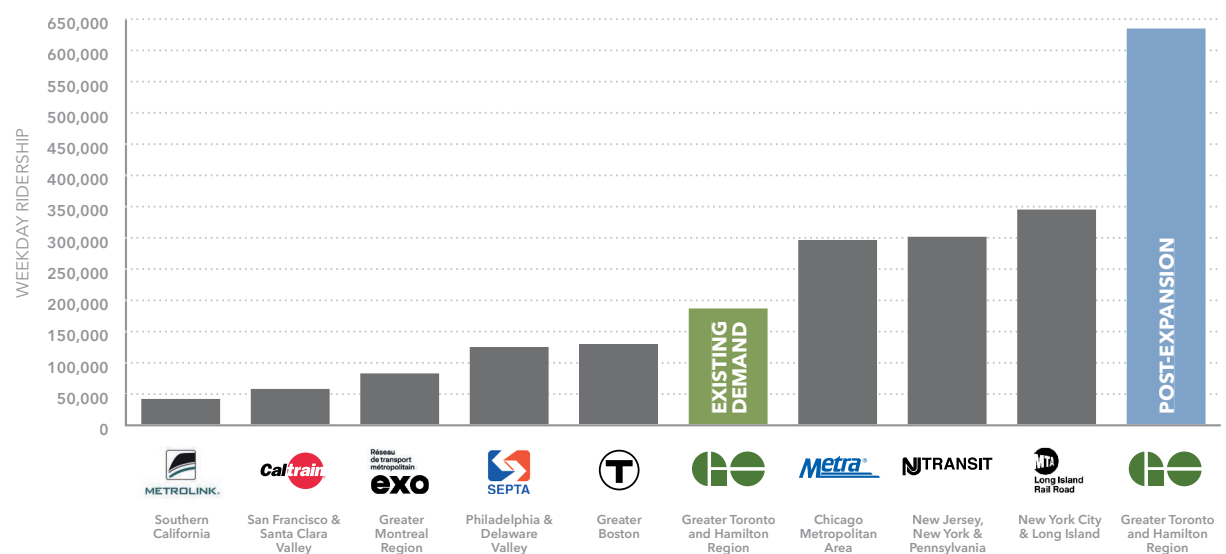


**Table 4.1:** Rail Ridership Growth with GO Expansion

Annual Ridership (millions)	2017 Peak Ridership	2017 Off-Peak, Contra-Peak, and Weekend Ridership	2017 Total Ridership	2031 Peak Ridership	2031 Off-Peak, Contra-Peak, and Weekend Ridership	2031 Total Ridership	Ridership Percent Change 2017-2031
Lakeshore West	11.6	6.1	17.7	22.5	15.3	37.8	113%
Lakeshore East	9	4.7	13.7	23.9	14.7	38.6	181%
Milton	7	-	7	9.3	-	9.3	33%
Kitchener	5.2	2.9	8	19.5	25.1	44.6	395%
Barrie	4.5	0.1	4.6	14	14.1	28.1	505%
Richmond Hill	2.5	-	2.5	3.8	-	3.8	54%
Stouffville	3.2	0.7	3.9	10.1	6.3	16.5	323%
<b>GO Rail Network</b>	<b>42.9</b>	<b>14.5</b>	<b>57.4</b>	<b>103.2</b>	<b>75.5</b>	<b>178.7</b>	<b>211%</b>



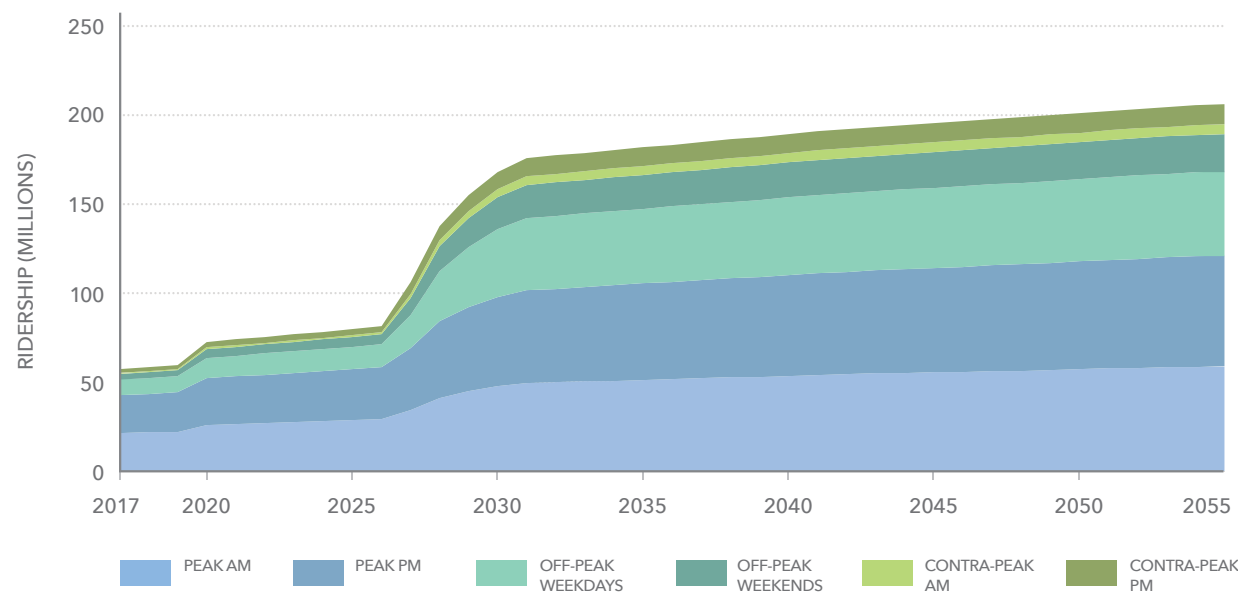
**Figure 4.2:** GO Rail Ridership Compared to Other North American Passenger Railways



Note: Post expansion number reflects year 2031

Figure 4.3 illustrates how this demand is distributed by time of travel - after GO Expansion comes online, off-peak demand is forecast to be comparable to peak demand. This highlights the potential market that the current commuter rail focused services do not serve. Figures 4.4 and 4.5 shows where this ridership is distributed in the network in the peak and off-peak. Growth is most significant on lines that upgrade to two-way all-day service, such as Stouffville, where passengers benefit from new travel opportunities that the current service structure does not provide.

**Figure 4.3:** GO Rail Ridership After GO Expansion by Time of Day



Note: These graphics assume all services come online in 2027-2028.

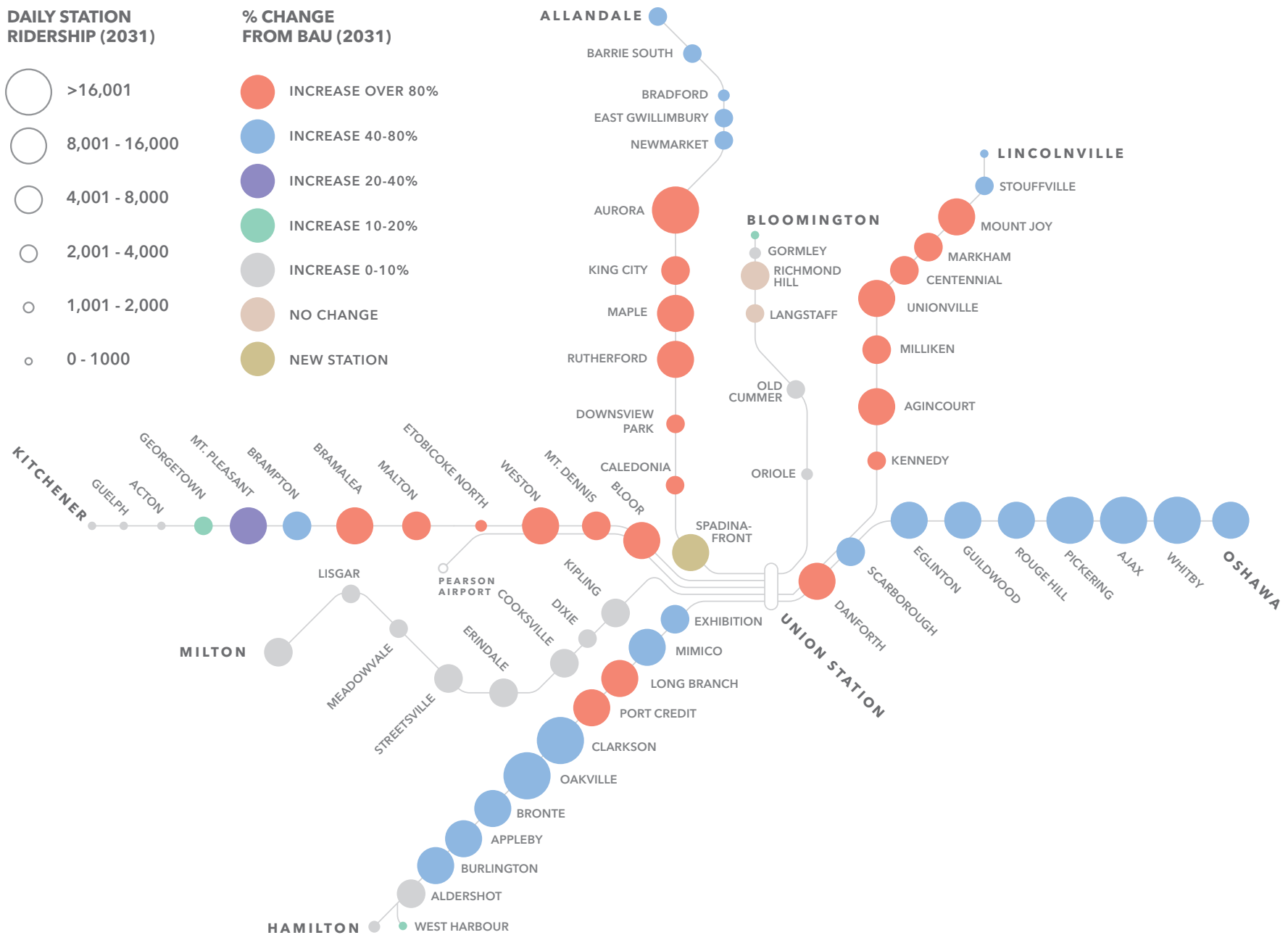
### Realizing Ridership Gains

Forecasts illustrate how GO Expansion has the potential to significantly increase ridership. This ridership can be realized by ensuring GO Rail operates at the speeds and frequencies specified in this FBC; however other factors are essential to realizing this benefit. Ridership is also dependent on:

- Ensuring station access for a range of modes, including walking, cycling, and local transit
- Providing a competitive customer experience that evolves over time with customer needs
- Managing development near stations
- Ensuring services are punctual and reliable
- Developing the 2041 RTP's Frequent Rapid Transit Network alongside GO Expansion to provide additional connections and integrated services



**Figure 4.4:** GO Rail Ridership Change in Peak Period Ridership After GO Expansion is Implemented, 2031  
(reflective of ridership after program is fully implemented)





**Figure 4.5:** GO Rail Ridership Change in Off-Peak Ridership After GO Expansion is Implemented, 2055  
(reflective of ridership after program is fully implemented)



## Benefit



## A resilient and reliable network with capacity for now and the future

The current GO Rail network provides high quality peak service but has limited off-peak service. In addition, Union Station is becoming a bottleneck on the network and has crowded platforms (impacting passenger mobility) and a congested rail corridor.

The GO Expansion program evaluated in this Business Case was designed to deliver a system with the capacity to meet the needs of the GTHA for the foreseeable future, through to 2055, but with capability to support growth even into the next century as the GTHA continues to grow. While the majority of capital investment will occur in the 2020s, this investment will allow GO Rail to more reliably accommodate significant increases in transportation demand as the region continues to grow.

### *How does GO Expansion enable resiliency and future network capacity?*

Transforming GO Rail into a Rapid Rail system with two-way all-day fast and frequent service allows GO Rail to serve as an alternative for other transit modes - including rapid transit and highways - to access more of the region. This means passengers have more choice. If other services become congested or suffer disruptions, today GO Rail may not be an alternative. In the future, GO Rail will give customers additional options to travel across the region. Additionally, GO Expansion allows GO Rail the flexibility to add more capacity to meet growth beyond 2055.

Each train added can carry as many passengers as a new lane of highway or nearly two subway trains. Two key constraints will be addressed to enable GO Rail to expand its capacity as needed into the future:

- **Union Station** is being rebuilt with 10 wide platforms, each long enough for a 12 car bi-level train and sufficient vertical circulation to accommodate future demand. Two platforms may be required for use by Intercity Long Distance Rail. Assuming 16 tph at each of the 8 platforms for GO use, and 1,800 passengers per train, the station could handle 230,000 passengers per hour, or over 500,000 through the peak period, about 5 times the current traffic. New stations at Spadina, Exhibition, and East Harbour can provide relief to Union Station, where the capacity of sidewalks and the PATH system may prove to be more of a constraint than the GO tracks and platforms after GO Expansion is delivered.
- **Track and Signalling** constraints on the network will also be addressed with a solution to be determined by OnCorr to meet the requirements specified by Metrolinx: typically 6 to 12 trains per hour, per track, will be required initially, rising to 16 trains on the Lakeshore East by 2055. However, many regional rail systems operate 24 trains per track, per hour; some achieve even more, though segregation with other operations such as VIA Rail or freight is likely to be required. With two inbound tracks from the Lakeshore West and Kitchener, and one from each of the other five corridors, there will be nine tracks with potential capacity for 216 train arrivals. Changes will be required to track, power, signalling and storage, but the potential capacity within the existing corridors is significant and can be utilized to meet growing demands into the future.

GO Expansion will provide

**enough capacity to serve growing demand past 2055.**

## Benefit

### 3

## A self sustaining railway

Today, some GO Rail services may collect enough fares to cover all their operating costs. For example, a train with 2,000 passengers is likely to be subsidy neutral. However, the network as a whole requires operating subsidy.

Increased revenues generated by new passengers and lower operating costs from electric trains mean that after 2031 GO Expansion will enable GO Rail to operate without operating subsidy. By 2055, revenue is forecast to exceed 130% of operating costs.

### *How does GO Expansion reduce subsidy requirements?*

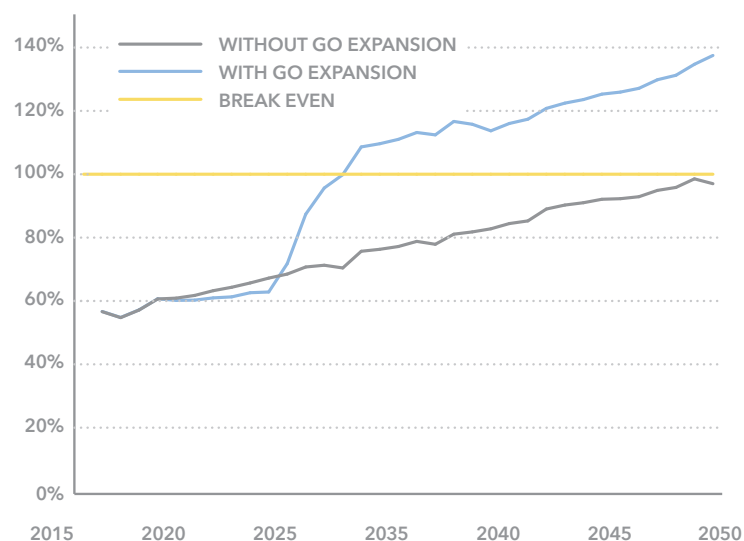
The operating costs and resources to provide a single train service (example: an 8-car train) are broadly the same no matter how many passengers are carried. While some costs will vary with demand, most costs are fixed and related to the propulsion, staffing, and wear and tear. This means that if more customers make use of the train, the costs of providing the trip are divided among more travellers.

As the number of travellers increases, the cost of each trip will decrease and the overall efficiency of the train service will increase. GO Expansion will increase ridership throughout the day and use high efficiency electric trains on select routes, which have significantly lower operating costs per train km. This will lead to complete cost recovery by 2031 (shown in Figure 4.6). The railway will become self sustaining, releasing previous GO Rail subsidy for other uses.

By 2031,

## GO Rail revenues are forecasted to cover all operating costs with fare box revenue.

**Figure 4.6:** Comparison of Operating Costs and Revenue for GO Rail in the BAU and with GO Expansion



## Benefit

## 4

**A railway that meets customer needs**

For many travellers, travel in the GTHA can be slow, stressful, and take away valuable time that could be spent on other pursuits. GO Expansion will provide significant upgrades to travel time and frequency/timetables that will ensure the user experience is aligned with customer needs and expectations.

As part of the 2041 Regional Transportation Plan, Metrolinx undertook extensive research to better understand travel behaviour and attitudes towards transportation in the GTHA. Six key regional personas were created to provide a lens through which the strategies of the 2041 RTP could be assessed.<sup>6</sup> The six key regional personas were developed under the context of GO Transit's current rail service structure. While the current GO Rail service provides a considerable level of service for regular commuters and some occasional users, the level of service does not meet the needs of travellers with different behaviours, motivations, and backgrounds. For example, current off-peak service requires a traveller to plan far ahead within a restrictive time frame, which may be impractical for someone who values freedom on how they spend their time. While travel personas in the region are diverse, all converge on similar pain points and desires such as convenience, safety, and reliability.

<sup>6</sup> Personas are drawn from Appendix 2D of the "2041 Regional Transportation Plan for The Greater Toronto and Hamilton Area", by Metrolinx, March 2018

***How does GO Expansion realize improved customer experience?***

GO Expansion will transform GO Rail into a Rapid Rail system that will benefit customers by delivering two key customer pivot points:

- **Pivoting from Service in the Morning and Afternoon Peak Periods to Service All Day** - GO Expansion will provide trains in both directions throughout the day, meaning customers who may travel during the midday or need a later train home can now use GO Rail for more trips. Integration with existing and planned rapid transit will further increase how GO Rail can be used to access the region.
- **Pivoting from limited trip schedules that require customers to plan ahead to Service every 15 minutes that lets customers turn up and GO** - GO Expansion will provide frequent train services (every 15 minutes or better on some lines), which will allow customers to 'turn up and GO', with less time spent planning ahead or waiting for the train. Evidence from other cities with Rapid Rail systems indicates this can be very attractive in shifting trips away from cars to rail.

Table 4.2 describes how the general benefits of GO Expansion apply to the six personas in the 2041 RTP.

GO Expansion will augment customer experience

**by transforming GO Rail from a commuter system into a Rapid Rail system with 6,000 weekly services**

allowing travellers to go where they want, when they want.

**Table 4.2:** Customer Service Improvements for GO Rail based on the 2041 Regional Transportation Plan Personas

Persona	Where are they likely to live and work?	Pain Points (difficulties with travel in the region)	Desires (what they want out of travel)	GO Expansion will...
<b>Time and Balance Seekers</b>	Live and work in suburbs or downtown	<ul style="list-style-type: none"> <li>Thinks driving is expensive, but uses it because it gives more time with family and friends</li> </ul>	<ul style="list-style-type: none"> <li>Freedom, convenience, enjoyable experience</li> <li>More time for themselves, family and friends</li> </ul>	<ul style="list-style-type: none"> <li>Increase the competitiveness of GO Rail compared to automobile because it provides two-way, all-day, fast, and frequent service.</li> <li>This will position GO Rail as a potential travel option for travellers who seek to save time travelling.</li> </ul>
<b>Traditional Suburban Travellers</b>	Live in suburbs and likely to work in suburbs	<ul style="list-style-type: none"> <li>GO Rail is inconvenient</li> <li>Driving is stressful and slow but more convenient than alternatives</li> </ul>	<ul style="list-style-type: none"> <li>Control and predictability of one's travel time</li> <li>Easier travel by car</li> </ul>	<ul style="list-style-type: none"> <li>More frequent service may make GO Expansion more convenient for Suburban travellers</li> <li>Shifting demand from automobile to GO Rail will give an easier, less congested commute to traditional suburban travellers who continue to drive</li> </ul>
<b>Frustrated Solution Seekers</b>	Live in suburbs and work downtown	<ul style="list-style-type: none"> <li>GO Rail is stressful and slow</li> <li>Transit is crowded</li> </ul>	<ul style="list-style-type: none"> <li>Wants to be on time</li> <li>Seamless, integrated, fits their schedule</li> <li>Allows them to be productive while on the move</li> </ul>	<ul style="list-style-type: none"> <li>Provide a frequent, fast, and reliable travel option that can connect with other transit services</li> </ul>
<b>Connected Optimizing Urbanites</b>	Live and work in Toronto	<ul style="list-style-type: none"> <li>GO Trains are expensive and inconvenient - prefers ride sharing or TNCs</li> </ul>	<ul style="list-style-type: none"> <li>An integrated 24/7, and optimized transit system with new technology</li> </ul>	<ul style="list-style-type: none"> <li>Expanded all-day service makes GO more convenient</li> <li>Assumed customer value proposition seeks to improve user experience</li> </ul>
<b>Satisfied Mature Urbanites</b>	Live and work in Toronto	<ul style="list-style-type: none"> <li>Sometimes transit can be crowded</li> </ul>	<ul style="list-style-type: none"> <li>Continuous improvements in usability, and options</li> <li>Safe travel</li> </ul>	<ul style="list-style-type: none"> <li>Expanding the number of destinations they can reach with new service</li> <li>Providing more service and higher frequencies which may reduce crowding on GO Rail and other services (such as TTC subway)</li> </ul>
<b>Aspiring Young Travellers</b>	Live and work in Toronto	<ul style="list-style-type: none"> <li>Pricing, crowding, and cleanliness</li> </ul>	<ul style="list-style-type: none"> <li>Integrated, fast, reliable, predictable, and punctual services</li> </ul>	<ul style="list-style-type: none"> <li>Two-way, all-day service with 15 minute frequencies makes GO Rail a strong travel choice for trips within Toronto as well as for trips to connect to friends, family, employment, or education opportunities outside of Toronto</li> </ul>



## 4.2 Quality of Life Benefits



GO Expansion will maintain and enhance quality of life as the GTHA grows to over 10 million people by 2041. As the population grows, so too will transportation demand and without new regional transportation options, increased congestion will affect quality of life. Ensuring that the region's network provides high quality connections is a key element of providing this growing population with a high quality of life – especially by ensuring the network has safe, fast, convenient, frequent, and reliable high capacity transportation choices.

GO Expansion will transform regional transportation, allowing the GTHA to reach its population growth targets while maintaining a high quality of life. It will do so by realizing two benefits:

**5**

**Connecting communities across the region**

**6**

**A safer and healthier transportation network for a growing region**

## Benefit

## 5

Connecting communities  
across the region

Without GO Expansion, GO Rail continues to operate as a commuter network - while it serves a significant number of commuting trips each day, trips outside the peak or in the contra-peak direction may not be served.

#### How will GO Expansion increase connectivity?

GO Expansion will add two-way, all-day service to three lines (Kitchener, Stouffville, Barrie) and increase frequencies on Lakeshore East and West to position GO Rail as a mode of choice for a range of trips. Specifically, after GO Expansion is delivered:

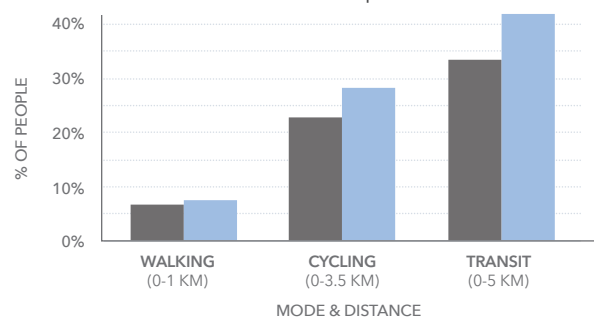
- 42% of the region (5.3 million people by 2041) will live within 5 km of a GO Rail station with two-way, all-day service - this is a net increase of 5.4% (as shown in Figure 4.7). In addition, over 50% of lower income people in the region will live within 5 km of a station with two-way, all-day service.
- 34% of the region will be able to reach Downtown Toronto in 45 minutes (including average transit or driving time to Rail GO Stations), a net increase of over 20% (as shown in Figure 4.8).
- A total of over 4,000 recreational, cultural, educational, and social service facilities will be within 5 km (or transit access distance) of a GO station with two-way, all-day service, allowing travellers to access more of the region with transit.
- Increased accessibility and decreased travel times will support the development of complete communities near GO stations.

GO Expansion can be accessed by

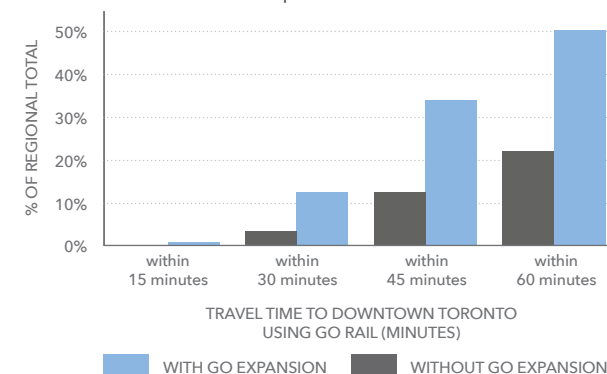
## 41% of the region's homes

when using transit.

**Figure 4.7:** Population Living Within a Set Distance from a GO Rail Station with Two-Way, All-Day Service Before and After GO Expansion



**Figure 4.8:** Amount of the GTHA's Population That Can Access Downtown Toronto by Travel Time Before and After GO Expansion



**Benefit****A safer and healthier transportation network for a growing region**

GO Expansion can support health and safety goals for the region by encouraging more people to take active modes (walking or cycling) a part of their trip and by also reducing accidents by decreasing the number of automobile trips on the GTHA's highway network.

***How will GO Expansion lead to a safer and healthier region?***

As the ridership on GO Rail increases, the number of trips on the GTHA's road network will decrease. This will lead to over 7,000 fewer car collisions resulting in death or injury by 2055. The GO Expansion program will ensure all upgrades to GO Rail ensure customer safety. This means whether people travel by car or by transit, the overall transportation system in the GTHA will be safer after GO Expansion is delivered.

GO Expansion will also increase active trips to access GO Rail, like walking or cycling, by up to 75% (or over 15 million new walking and cycling trips a year) by 2031. Trips involving active modes tend to support improved health due to exercise.

GO Expansion will lead to

**7,000 fewer accidents**

resulting in death or injury over its lifecycle and support a healthier region by generating over 15 million new walking and cycling trips for station access a year.



## **4.3 Economic Prosperity and Development Benefits**



The GTHA is anticipated to see a 45% growth in employment by 2041, with over 4.8 million jobs in the region. Ensuring that communities and activity centres across the region are well connected with a fast, frequent, and reliable transportation network is a key component to realizing this growth target – both by attracting investment and talent to the region and also by ensuring people can access employment opportunities across the region. GO Expansion will support the GTHA's ability to support this employment growth and increase prosperity by:

**7**

**Reducing the time commuters spend travelling**

**8**

**Improving connectivity between Urban Growth Centres**

**9**

**Creating new jobs across the GTHA during the Delivery and Operations of GO Expansion**



## Benefit

**Reducing the time commuters spend travelling**

Existing GO Rail services provide highly reliable and fast connections to Downtown Toronto with a focus on peak trips to downtown and evening peak trips to return home. While Downtown Toronto will continue to play an important role as the key employment centre in the region, significant employment growth is expected to continue over the next 35 years in other areas across the GTHA. Providing reliable commute options where employment is expected to be is essential to ensure the GTHA remains a competitive place to work, invest, and do business. Additionally, work patterns are changing – many industries have flexible working arrangements or hours that are unlikely to fit into a traditional AM Peak train in and PM Peak train out operating pattern.

***How will GO Expansion improve commuter travel times?***

The addition of two-way, all-day service allows the GO Rail network to accommodate a wider range of start/end times for work, and accommodate commuters who make plans after work.

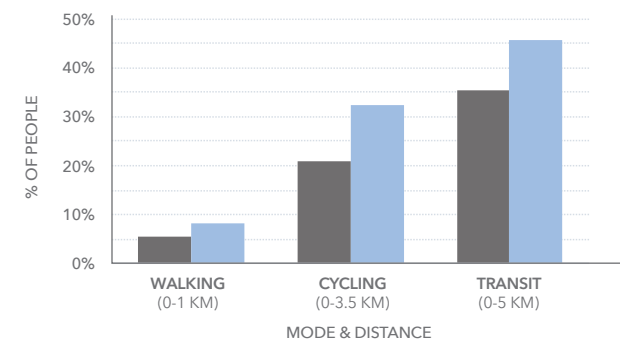
In addition, as two-way service is introduced, more people will be able to commute in the contra-peak direction. The key benefits from these improvements are:

- Commuters on GO Rail will save on average up to 10 minutes per trip due to faster trains and more frequent service.
- As more commuters choose GO Rail, there will be a decrease in peak-period congestion. GO Expansion is forecast to save people commuting by automobile 6.5 million hours in 2030, and 200 million hours by 2055.
- Under GO Expansion 45% of all jobs within the GTHA will be within 5 km of a GO Rail station with two-way, all-day service (as shown in Figure 4.9).
- With GO Expansion over 42% of all jobs in the GTHA can be reached within 45 minutes of travel time (including time to access the GO Rail station) from downtown Toronto (as shown in Figure 4.10).

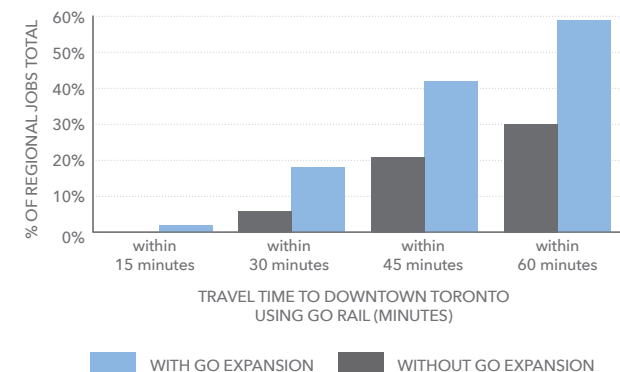
After GO Expansion, commuter trips will be

**10 minutes shorter on average & 33% of all jobs will be accessible by GO Rail.**

**Figure 4.9:** Employment within a set distance of a GO Rail station with Two-Way All-Day Service



**Figure 4.10:** Amount of the GTHA's Jobs That Are Within Travel Times of Downtown Toronto Before and After GO Expansion





## Benefit



## Improving connectivity among Urban Growth Centres

The time it takes to travel between destinations is a key determinant of their attractiveness for investment, living, or working. GO Rail provides long distance mobility between key areas across the region, with rail corridors and stations adjacent to segments of the region that will play an important role in economic development (as shown in Figure 4.11), including:

- Existing Employment Hubs – areas that concentrate employment.
- Future Employment Hubs – areas that are planned as focal points for new employment growth over the next 25 years.
- Urban Growth Centres – areas prioritized for densification and mixed-use growth.
- Increased connectivity between major employment centres and urban growth centres can encourage further investment, innovation, and business development.

This “shrinking” effect refers to an economic process called “agglomeration”, where decreasing the time it takes to access economic centres catalyzes further productivity, including:

- Increased interaction and collaboration between firms or other institutions that are located across the GTHA.
- Expanded labour catchment for a range of industries that require strong talent, which can encourage new investment and business development opportunities.

### *How does GO Rail increase connectivity between employment and urban growth centres?*

With GO Expansion the addition of two-way, all-day service on select GO Rail lines, with improved rolling stock and infrastructure to allow greater speeds, greatly reduces the time it takes to travel across the region – including time spent on train and waiting for the train to arrive. This will effectively ‘shrink’ the region – allowing people to access major employment and development areas more quickly – thereby supporting planned employment growth and economic development.

Figures 4.11-15 illustrate how GO Rail stations, Urban Growth Centres, and present and future employment hubs will be drawn together based on travel time after GO Expansion is delivered. On average, the time it takes to move from an Urban Growth Centre to Downtown Toronto decreases by 15 minutes with GO Expansion. These figures make use of generalized journey time to show how far Urban Growth Centres and Employment Hubs are from Downtown Toronto based on the perceived travel time (including accessing GO Rail, waiting for a train, and time spend in vehicle) in the BAU and GO Expansion scenarios.

GO Expansion will bring Urban Growth Centres closer together by

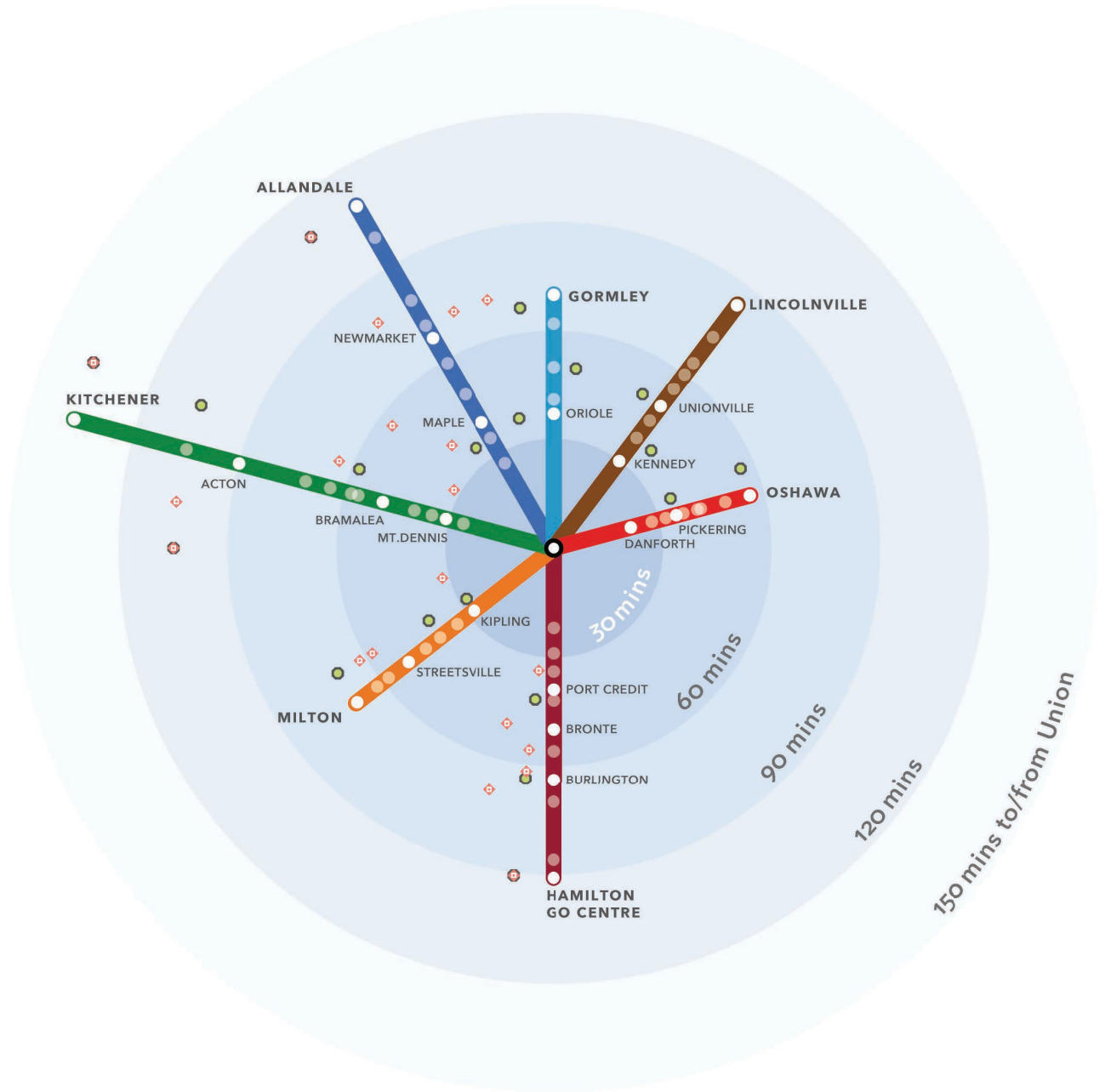
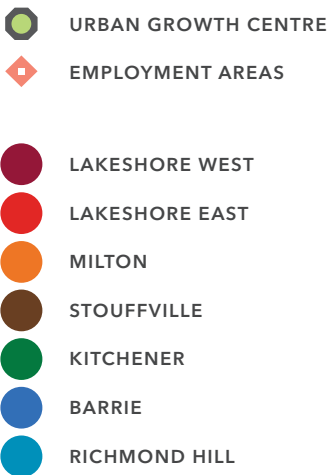
**up to 25 minutes in the off-peak & 10 minutes in the peak,**

**which will support investment, development, and growth.**

GO Expansion will increase the economic connectivity and prosperity of the region



**Figure 4.12:**  
GO Rail Journey Time  
Between Downtown  
Toronto and Urban  
Growth Centres and  
Employment Hubs in  
the Peak Period without  
GO Expansion

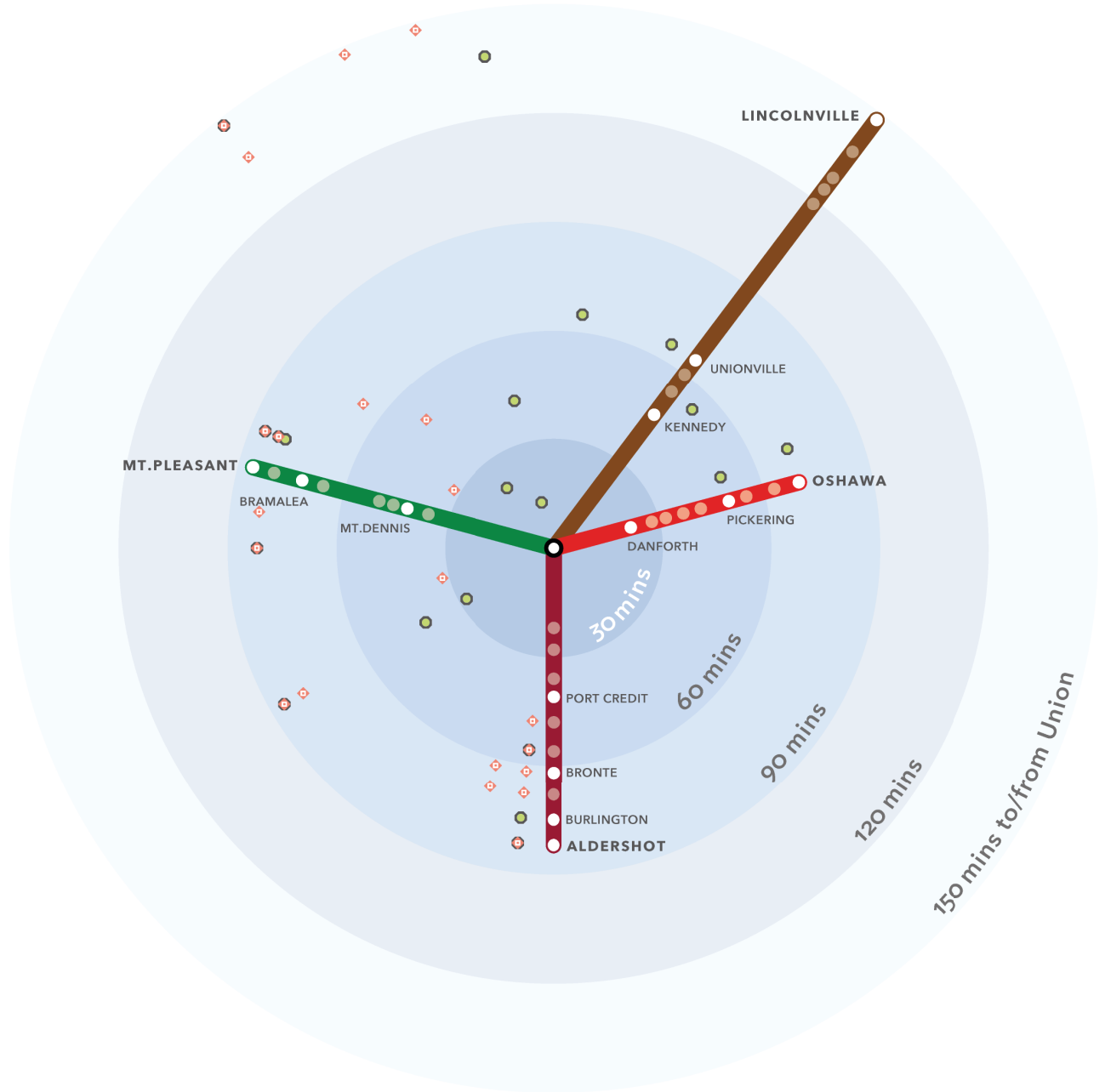
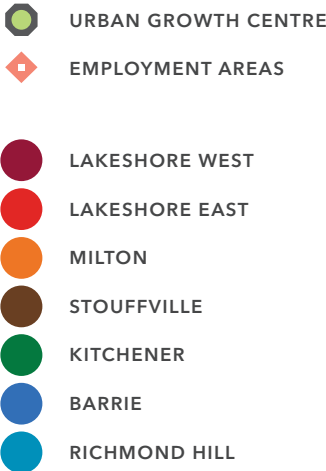


**Figure 4.13:**

GO Rail Journey Time  
Between Downtown  
Toronto and Urban  
Growth Centres and  
Employment Hubs in  
the Peak Period with  
GO Expansion



**Figure 4.14:**  
GO Rail Journey Time  
Between Downtown  
Toronto and Urban  
Growth Centres and  
Employment Hubs in the  
Off-Peak Period without  
GO Expansion

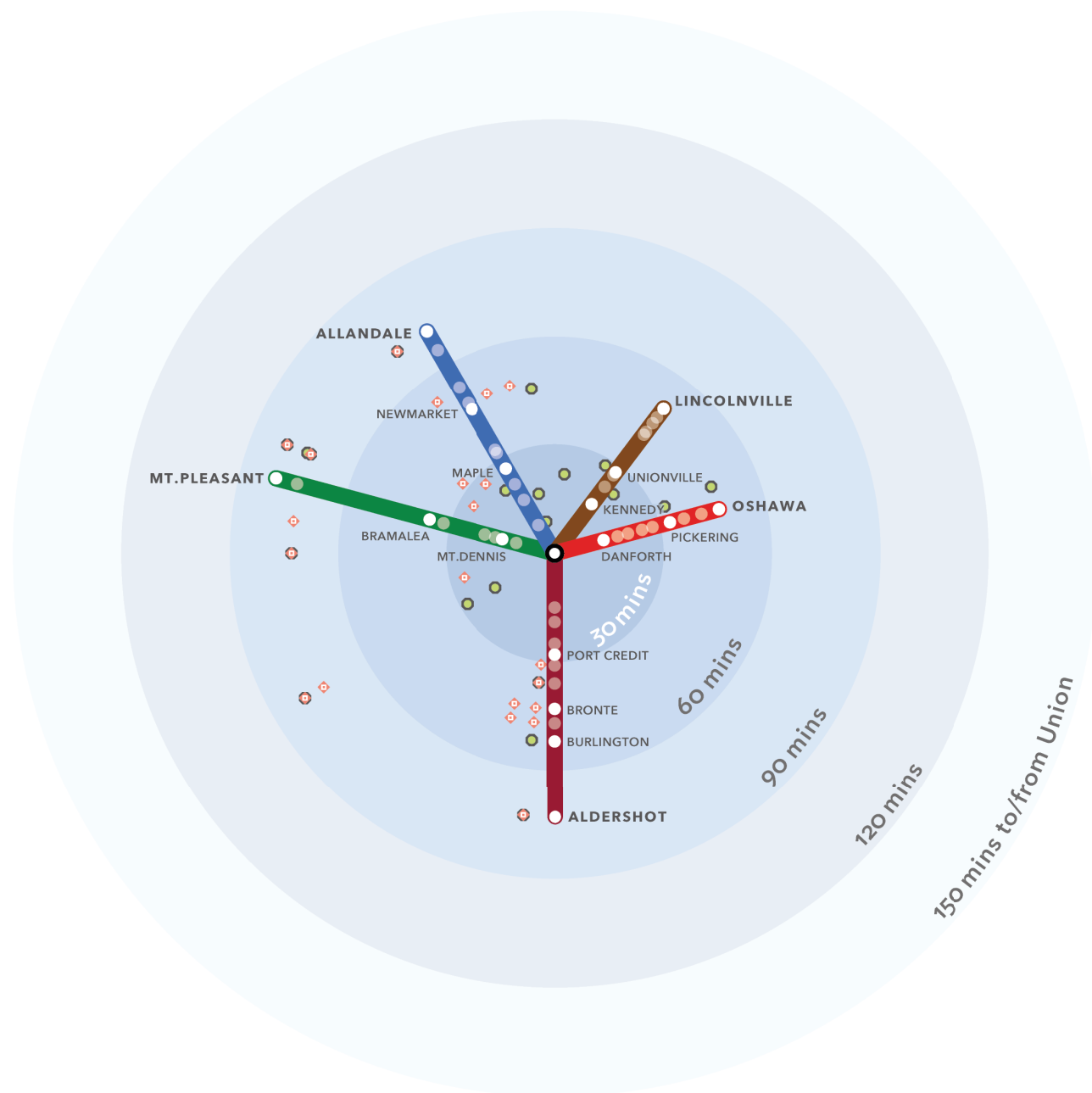


**Figure 4.15:**

GO Rail Journey Time Between Downtown Toronto and Urban Growth Centres and Employment Hubs in the Off-Peak Period with GO Expansion

International experience suggests that urban development and economic productivity can be increased when urban centres with labour (example: making it possible to commute further or to different parts of the GTHA for skilled workers) or industrial synergies (example: connecting an area with significant R&D based industries to a financial services hub) are connected with improved reliable services. For example, with GO Expansion both Aldershot and Oshawa stations will be less than 60 minutes to the downtown core.

This change in travel time further connects the economies and urban development patterns of the region, which can trigger increased investment and more rapid development - both of which support overall regional prosperity.





## Benefit



### **Creating new jobs across the GTHA during the Delivery and Operations of GO Expansion**

In addition to changing the way people travel and commute, GO Expansion will also support economic growth by creating jobs through direct investment in infrastructure and operations.

#### **How will GO Expansion create new jobs?**

Transportation and infrastructure investments are typically strong job creators. Successful project delivery and operations requires a range of skills and job types and varying experiences, which allow infrastructure projects to support skill and labour pool development. Additionally, major infrastructure projects can attract investment from out of province or internationally to develop plants and offices, both of which also create jobs.

Key jobs for GO Expansion include:

- Tradespeople to construct and maintain infrastructure.
- Engineers, architects, and planners to plan and design to infrastructure.
- Professional services to set up procurement and program management

Implementation of GO Expansion will support approximately

**8,300 jobs per year in construction and supply-chain industries.**

This is equal to nearly

**100,000 job-years of employment**

**over 12 years of project and program delivery.**

## 4.4 Protected Environment Benefits



The GTHA's transportation network is a major source of greenhouse gas (GHG) emissions and is one of the region's major contributors to climate change. Additionally, the region's transportation system is resource intensive – every day the region requires significant resources – such as fuel, materials, and electricity to operate. GO Expansion realizes a key sustainability benefit – moving more people with less pollution and energy spent.

# 10

## Moving more people with less energy and pollution



## Benefit

## 10

## Moving more people with less energy and pollution

Transportation requires significant energy to operate and generates significant emissions that impact public health, including Criteria Air Contaminants (CACs), as well as Green House Gases (GHG) emissions. The majority of which come from autos and trucks. As a result, significant shifts in demand from the road network can reduce the region's contribution to climate change and lead to cleaner air.

#### How will GO Expansion reduce energy use and emissions?

GO Expansion will shift over 145,000 cars off the road each day leading to significant GHG reductions. By 2055, this will amount to 7.3 megatonnes of CO<sub>2</sub>e (a combination of multiple GHGs into one unit of measurement).

After GO Expansion, GO Rail will make use of electric trains, which will reduce average GHG emissions per trip from 1.85 kg per trip without GO Expansion to an average of 0.5 kg per trip (as shown in Figure 4.16). Using electric trains will result in a net reduction in GO Rail emissions of 6.2 megatonnes of CO<sub>2</sub>e over the investment lifecycle. While GO Rail will continue to emit GHGs, GO Expansion is a carbon negative investment, which means the net reduction in emissions is greater than any new emissions generated.

The combined total reduction of transportation GHG emissions (including reduced auto and rail emissions) due to this investment will be nearly 13.5 megatonnes CO<sub>2</sub>e of GHGs, which is equal to nearly one year of transportation related emissions across the GTHA.<sup>7</sup>

A reduction in transportation emissions will also generate other benefits including improved health for people throughout the GTHA and in particular near pollution 'hot spots'. A healthier population has become an increasing priority elsewhere in the world, including in Paris and in London, where low emission transportation policies aim to improve people's health.<sup>8</sup>

<sup>7</sup> From "Greenhouse Gas Emissions Inventory for the Greater Toronto and Hamilton Area", by The Toronto Atmospheric Fund, December 2017, available online: [http://taf.ca/wp-content/uploads/2017/12/TAF\\_2015\\_GTHA\\_Emissions\\_Inventory\\_2017-12-06.pdf](http://taf.ca/wp-content/uploads/2017/12/TAF_2015_GTHA_Emissions_Inventory_2017-12-06.pdf)

<sup>8</sup> From London Mayor's Transportation Strategy (2018, available online: <https://www.london.gov.uk/what-we-do/transportation/our-vision-transportation/mayors-transportation-strategy-2018>)

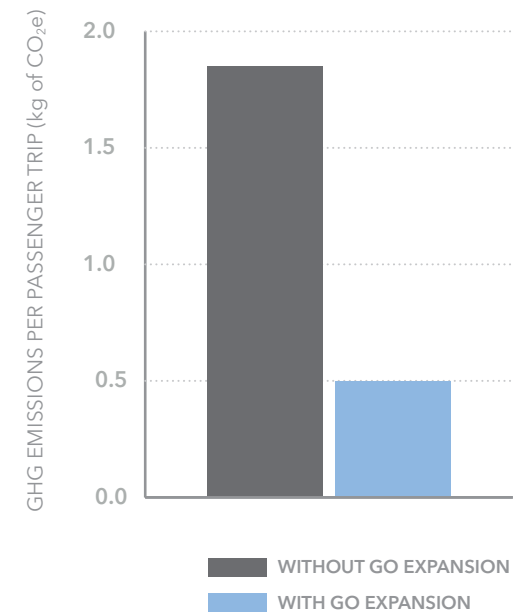
GO Expansion will reduce GHG emissions by

**13.5 megatonnes of CO<sub>2</sub>e**

over its lifecycle.

**Figure 4.16:**

Average GHG Emissions Per Passenger Trip on GO Rail





## 4.5 Strategic Case Conclusions

### Summary

GO Expansion will transform how people travel across the region – allowing customers to use the transit network in new ways that improve their journey travel time and experience. In addition, it will have a significant contribution to regional and provincial policy by directly improving quality of life, economic prosperity, and regional sustainability. The impact of GO Expansion across the four dimensions of strategic performance is summarized in Figure 4.17, while Table 4.3 describes what these benefits mean to the region.

Based on these substantial benefits, GO Expansion will directly address the problem statement:

- It will provide new transportation choices that can accommodate significant population growth and help tackle congestion
- It will provide the foundations of a region wide Frequent Rapid Transit Network (as described in the 2041 RTP)
- It will support the GTHA in maintaining a high quality of life, prosperous economy, and protected environment as its population grows by over 40%

**Figure 4.17:** Ten Reasons Communities in the GO Service Area Benefit From GO Expansion



#### TRANSPORTATION



#### QUALITY OF LIFE

- 1 Doubling rail ridership** - GO Expansion will nearly double GO Rail's ridership. By 2055, annual ridership will exceed 200 million (compared to 105 million without GO Expansion). This ridership gain includes nearly 60 million additional off-peak and counter peak trips, a net increase of 210%. This ridership increase reflects the latent demand for improved rail service in the region. Delivering GO Expansion alongside the delivery of rapid transit projects and improved station access will allow GO Rail to act as the foundation of a region wide transit network and realize these significant ridership increases. Ridership changes are shown in Figure E.4 and Table E.2.
- 2 Capacity for the future** - GO Expansion will allow GO Rail to add over 1,000 new rail services a day by upgrading rail corridors and Union Station. Once upgraded, GO Rail can increase capacity until the end of the century to meet increased demand as the region's population and employment continue to grow.
- 3 A self-sustaining railway** - GO Expansion will reduce the costs of operating trains and increase ridership, leading to a railway system that covers all operating costs with fare box revenue. With GO Expansion, GO Rail revenues will exceed 110% of operating costs over the next sixty years, with revenue equalling 150% of costs in 2055.
- 4 A railway that meets customer needs** - GO expansion will transform the customer experience for railway passengers. GO Rail will pivot from a peak only railway to a two-way all-day service with 15 minute or better frequencies that will let customers turn up and go for their service. This transition to a 'subway' style service will appeal to a range of customers and make GO Rail a competitive mode for many more trips than today's commuter focussed customer experience.
- 5 New regional connections** - After GO Expansion, 41% of the region's people will be able to access a GO Rail station with two-way all-day service by transit (compared to 34% without GO Expansion). In addition, over 4,000 cultural, educational, and social service facilities will be readily accessible with two-way all-day GO Rail service. This will allow people to choose transit to take them from where they are to where they want to go - greatly improving their quality of life.
- 6 A healthier region and safer transportation network** - GO Expansion will generate 15 million new walking and cycling trips to access GO Rail station a year. Active travel options tend to promote improved health. In addition, as more drivers choose GO Rail, there will be less traffic and an estimated 7,000 fewer accidents resulting in death or injury over the project lifecycle in the GTHA.



**ECONOMIC PROSPERITY**

**7 Reducing commute times -** GO Expansion will reduce commuter times by an average of 10 minutes per trip and as much as 20-30 minutes for other trips. After GO Expansion is delivered, 45% of all jobs in the region will be accessible by transit from a GO Rail station with two-way all-day service, compared to 35% in the off-peak. In addition, nearly 60% (a net increase of 30%) of all jobs in the GTHA will be accessible within a one hour trip on the GO Rail network from Union Station. This means people will have less stressful commutes and more productive time for work, supporting an overall more prosperous region.

**8 Catalyzing Urban Growth Centres -** GO Expansion will reduce travel times between Urban Growth Centres and downtown Toronto by 25 minutes in the off-peak and 10 minutes in the peak. This 'shrinking' effect has been seen to unlock investment and urban development in other city-regions. As more of the region's planned Urban Growth Centres are closer to downtown, they become more attractive places to do business, invest or live, which in turn could accelerate development. New developments could lead to a more productive region or address housing affordability by unlocking more of the region for denser and complete community style development.

**9 Creating new jobs across the region -** GO Expansion is a regional project that will generate trades and professional jobs during its design, construction, and operations. An estimated 8,300 annual job equivalents for the first twelve years of delivery will be created over the lifecycle of the program.

**PROTECTED ENVIRONMENT**

**10 Cleaner air and energy conservation -** GO Expansion will reduce Criteria Air Contaminants that impact human health and up to 13.5 megatonnes of Greenhouse Gases that contribute to climate change. After the project is delivered, nearly 145,000 car trips per day will shift to rail and with more efficient trains, rail Greenhouse Gas emissions will drop from 1.85 kg/trip to 0.5 kg/trip.



**Table 4.3:** Benefits of GO Expansion to Rail Passengers, Drivers, and the Region

Background	
Rail and Transit Passengers	<ul style="list-style-type: none"><li>• Faster service (average of 10 minutes saved per trip)</li><li>• Expanded choices – 42% of places to live and 46% of places to work are accessible with a fast, frequent, two-way all-day GO Rail service</li><li>• More of the region can be reached by GO Rail including 4,000 cultural, educational, social service, and recreational sites within transit access distance of a station with two-way all-day service</li><li>• Increased connectivity to the rapid transit network</li></ul>
Drivers	<ul style="list-style-type: none"><li>• Reduced congestion (over 145,000 cars off the road each day) on major highways leading to more reliable and quicker travel times</li></ul>
Region	<ul style="list-style-type: none"><li>• A more connected region can attract investment in urban development or businesses – GO Expansion will bring major urban growth centres closer together by reducing travel time by 10-25 minutes</li><li>• For the first twelve years of program delivery there will be 8,300 job equivalents created annually in construction and supply-chain industries</li><li>• Improved health due to cleaner air and a more active population</li><li>• A more resilient transportation network with reduced operating subsidy, expanded choice, and substantial additional capacity for the rest of the century</li><li>• Reduced traffic accidents and emissions</li></ul>

**Key Considerations for Future Program Planning**

GO Expansion’s strategic performance may be affected by other planned rail investments which are separately being considered in the GTHA as discussed in Table 4.4.

**Table 4.4:** Impact of other planned investments on the Strategic Case for GO Expansion

Key Considerations	Background	Impact on Strategic Performance
Rail Extensions	Rail extensions will expand the GO Rail network further to serve new communities such as Bowmanville or Niagara.	Rail extensions will increase the number of communities that can use GO Rail to travel across the region and will therefore potentially increase ridership and all strategic benefits associated with improved accessibility and reduced travel times.
Station Access Strategy	The station access strategy is assumed to be delivered within the BAU. Station access will support travellers to access GO Rail by non-auto modes, such as cycling, walking, car-pool, ride sharing, taxis, or local transit.	Station access supports passengers to more easily access GO Rail. Ridership realization is heavily influenced by the competitiveness of the whole GO Rail journey (including access and waiting times) compared to the automobile or other modes. Ensuring convenient and safe access to GO Rail is an essential element of realizing the ridership benefits in this Business Case.
Transit Oriented Development	Transit Oriented Development (TOD) will be focused around and adjacent to GO stations - potentially increasing the number of homes and businesses located within walking distance of the system. The land use assumptions in the model assume some growth around stations but do not reflect a complete TOD buildout, where grey and greenfield development intensify housing and commercial development near stations.	If TOD exceeds what has been assumed in this analysis, there will likely be increased demand for travel at GO stations. In addition, the successful delivery of GO expansion may support and trigger further TOD at stations across the network. While GO Expansion will support further TOD, a set of supporting policies and plans must also be considered to realize the full potential of TOD alongside the GO Expansion program.
High Speed Rail	High Speed Rail is under consideration between Toronto and Windsor and with proposals to serve Pearson Airport, Guelph, and Kitchener Waterloo. The delivery model in the Preliminary Business Case for High Speed Rail suggested that it would share tracks with GO Expansion.	High Speed Rail will serve a similar market as the Kitchener Line - this means some customers may make use of High Speed Rail instead of GO Rail, which could reduce GO Rail's ridership on this corridor. Therefore, GO Expansion may generate slightly fewer trips than currently forecast - this may be offset by High Speed Rail feeding passengers west of Kitchener to GO stations besides Union Station
Hydrail	Hydrail is a proposed model for delivering electric traction trains in the GTHA using trains that run on hydrogen fuel cells. Hydrail was analyzed in a feasibility report that explored the technical feasibility and potential economic and financial impacts of deploying Hydrail trains instead of overhead catenary system electric locomotives and EMUs.	Hydrail's impact on the Strategic Case is unknown at this time. It could have three impacts: <ul style="list-style-type: none"> <li>• Hydrail will mitigate the need to install overhead catenary systems</li> <li>• Hydrail may be supportive of the development of hydrogen oriented industries in Ontario, which could expand GO Expansion's economic prosperity benefits</li> <li>• Hydrail may also influence environmental impacts including emission reduction, depending on the amount of fleet that uses hydrogen fuel cells and the amount of emissions to produce them</li> </ul>

# 5

## Economic Case



## Overview

The Economic Case describes the benefits and costs of GO Expansion to the GTHA using social benefit cost analysis, which is concerned with the costs of a project and its impacts on users and society:

- **Costs** - the economic (or resource) costs invested by society to deliver, operate, and maintain the investment. This appraisal includes capital, operating and lifecycle costs.
- **Impacts** - changes to welfare for transportation users and society, and occurring as a result of the investment. This appraisal includes changes in time savings, auto operating costs, road safety, and GHG emissions.<sup>9</sup>

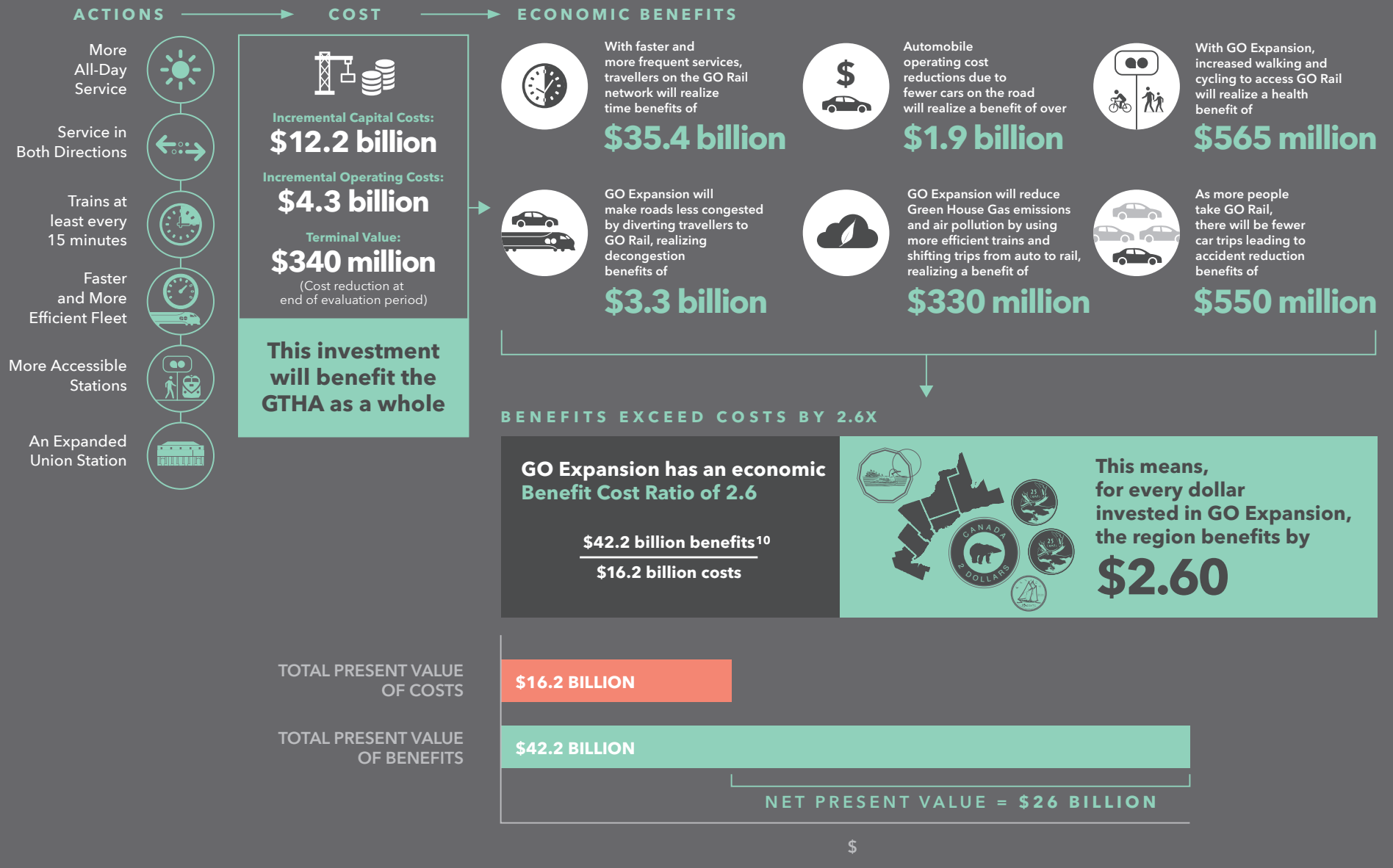
The Economic Case analysis allows decision makers, project planners, and the public to understand whether the use of resource for a new transportation project will deliver value to the region that exceeds the costs to deliver it. This chapter considers similar issues as the Strategic Case, but applies local and international best practice to monetize how GO Expansion will benefit travellers and improve quality of life, economic prosperity, and environmental sustainability for the region.

## How is the chapter structured?

Section	Content
5.1	<b>Economic Case Analysis</b> A description of all assumptions used to complete the Economic Case.
5.2	<b>Economic Narrative</b> A description of the relationship between costs and impacts for GO Expansion.
5.3	<b>Economic Costs to Deliver the GO Expansion Program</b> A description of the costs required to deliver the investment.
5.4	<b>User Impacts: GO Expansion Benefits Travellers Across the Region</b> A description of how GO Expansion affects travellers or 'transportation network users'.
5.5	<b>External Impacts: GO Expansion Leads to a More Sustainable and Healthier Region</b> A description of how GO Expansion affects society by reducing the social costs of travel.
5.6	<b>Wider Economic Impacts: GO Expansion Increases Regional Prosperity</b> A description of how GO Expansion will contribute to regional economic development, productivity, and economic efficiency.
5.7	<b>Economic Case Conclusion</b> An overview of the overall economic impact of GO Expansion including sensitivity tests and risk management approaches..

<sup>9</sup> Positive changes are referred to as benefits, while negative changes are referred to as disbenefits.

## Economic Case Summary



<sup>10</sup> Benefits indicated above do not add to \$42.2 due to rounding. Table 5.6 provides a detailed summary of benefits and costs.

## 5.1 Economic Case Analysis

### Understanding Benefit Cost Analysis

The Economic Case makes use of social benefit cost analysis to compare the benefits realized by GO Expansion to the costs required to deliver it. Benefit Cost Analysis (BCA) is commonly used when assessing the value of infrastructure projects to:

- Determine if the benefit of an investment outweigh its costs by determining a Benefit Cost Ratio (BCR) – investments with a BCR greater than one will generate benefits that exceed the costs to deliver and operate them.
- Evaluate the net economic benefit or cost to the region through a Net Present Value (NPV) calculation, which is equal to the benefits of an investment minus the costs to deliver and operate it – a positive NPV indicates that benefits exceed the costs to deliver and operate the investment.
- Understand benefit and cost drivers for the investment to ensure that benefits are realized throughout the delivery and operations of the investment.

A set of guiding assumptions and parameters noted in Table 5.1 are used throughout the BCA in this Economic Case. All analysis in the Economic Case is incremental to the Business as Usual (BAU) scenario – meaning that all costs and impacts only consider those directly related to the GO Expansion program. All analysis is presented in real terms in 2017\$ prices and assumes an economic discount rate of 3.5%<sup>11</sup>.

The discount rate is used to represent the fact that goods/benefits today are valued more than goods/benefits in the future.

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<sup>11</sup> Real values, used in the Economic Case, reflect the change in the value of goods and services in terms of purchasing power from the base year. Nominal values, used in the financial case, reflect the expected cost of a good or service in the year of expenditure. These values include both the general inflation rate as well as the increase for the good/service in real terms.



**Table 5.1:** Economic Case Inputs and Assumptions

	Full Business Case	Explanation
<b>Evaluation period</b>	2017 - 2086	60 years from assumed implementation of new services
<b>Discount Rate</b>	3.5% per year real	Ontario Ministry of Finance guidelines
<b>Terminal Value</b>	50% of fixed maintenance and 100% of capex 2066-2086	Assumption
<b>Value of Time per hour</b>	\$17.36 with 0.7% growth to 2055	Rate is based on 50% of average GTHA wage rates. VoT growth is assumed to follow 1% GDP growth forecast by Ontario Ministry of Finance, with elasticity of 0.75
<b>Generalized Journey Time Elasticity</b>	-1.0 Peak, -1.4 off-peak	Metrolinx analysis
<b>Network effect</b>	Ridership increase of 1% on each corridor for every other corridor with two-way, all-day service; 2% for frequent all-day services	Assumption
<b>Fares</b>	Fare integration with TTC from 2020, with existing GO riders within Toronto paying only TTC fares. Passenger charges (which may include parking charges) increase 1.0% real per year	Policy assumption
<b>Value of accident reduction</b>	\$0.10 per km declining at a rate of 5.3% per year	Metrolinx Business Case Guidance
<b>Road user time savings</b>	0.010 hours peak and 0.0013 off-peak per auto VKT diverted to transit	Metrolinx analysis based on GGHM runs
<b>Auto Operating Costs</b>	Marginal operating cost of \$0.09 per km	Metrolinx Business Case Guidance
<b>GHG reduction</b>	1 tonne carbon avoided per 4,000 car-km; \$42.10 per tonne social value	Metrolinx Business Case Guidance
<b>Active travel</b>	\$1.73/km cycled and \$3.84/km walked	Metrolinx Business Case Guidance

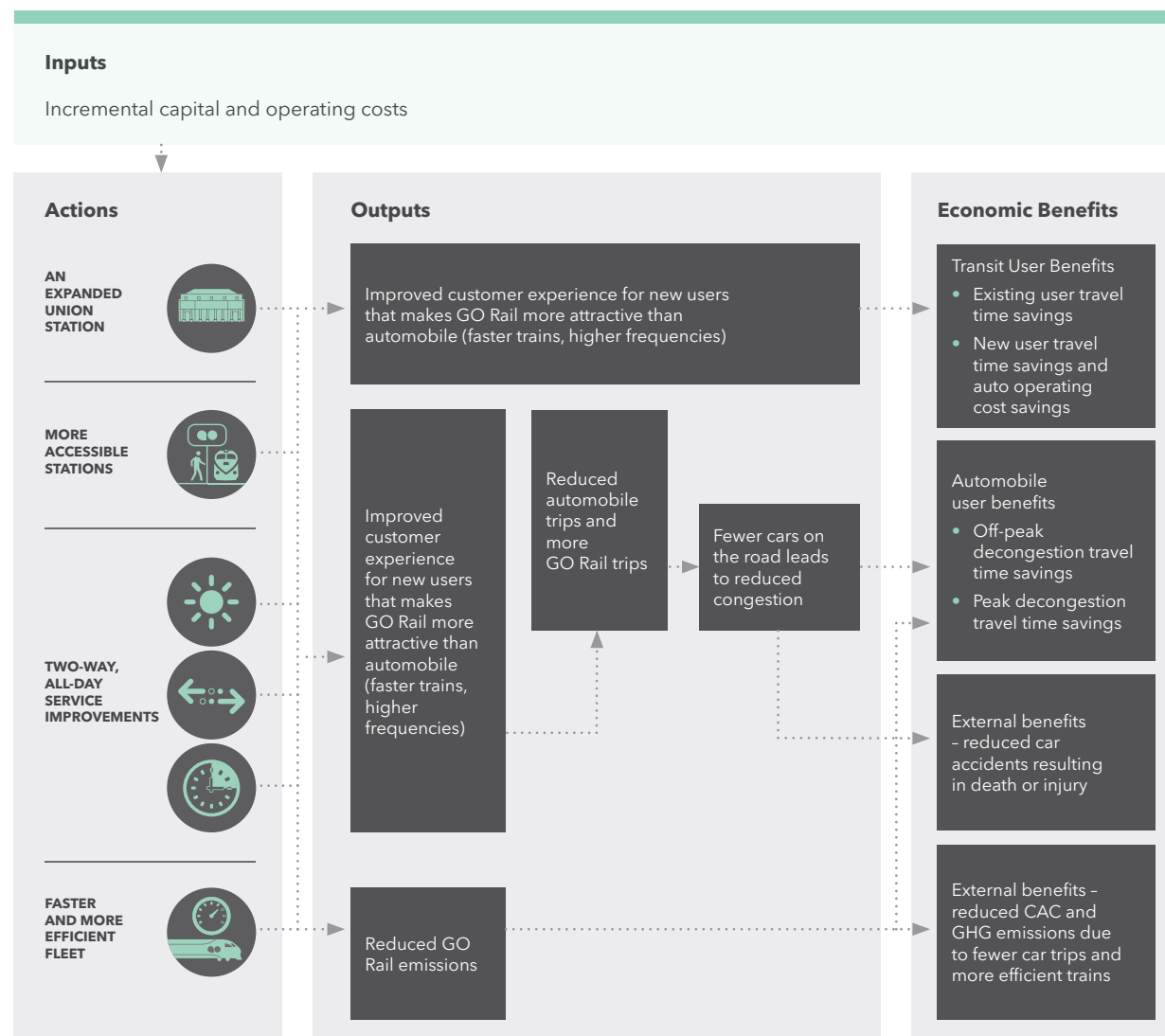
## 5.2 Economic Narrative

GO Expansion is a significant investment in the GTHA's transportation network - the analysis included in the Economic Case illustrates how its benefits exceed the costs to deliver it. Projects generate economic value by improving the region's welfare through three overall mechanisms

- Directly benefiting travellers by improving their journey experience and reducing their travel time and other travel cost factors
- Reducing the 'social cost' of transportation in the region as a whole by encouraging mode shift to modes that have reduced externalities - including fewer accidents resulting in death and injury and reduced environmental impacts
- Triggering Wider Economic Impacts (WEIs) by allowing firms and people easier access to economic and employment opportunities

The economic narrative for how GO Expansion realized these benefits is described in Figure 5.1

**Figure 5.1** Economic Case Narrative



## 5.3 Economic Costs to Deliver the GO Expansion Program

### Overview

This subsection of the Economic Case describes the costs or 'required investment' to deliver GO Expansion. Costs are divided into two categories:

- **Capital Costs** – fixed one-time costs incurred during the implementation of the investment and when elements of the investment are lifecycle expired, thereby requiring complete replacement (example: track replacement every 30 years). Capital costs include fleet, corridor, and station costs.
- **Operating and Maintenance Costs** – ongoing costs required to operate the investment and provide day to day maintenance, including all labour and materials.

Table 5.2 outlines the capital and operating costs for GO Expansion, at a network level and by corridor over the project lifecycle. These costs are incremental to the BAU scenario and have been discounted based on the approach defined in the Economic Case Analysis section.

*Note – unlike the Financial Case which deals with costs in nominal terms and focuses on their overall financial impact on Metrolinx, the Economic Case is focused on the resource costs of GO Expansion in real terms. The Economic Case is based on the 'opportunity cost' of allocating resources to GO Expansion while the Financial Case is focused on the required cash flow to deliver and operate the investment. Further information on the distinction between these two cases is provided in Metrolinx Business Case Guidance Volume 2.*

**Table 5.2:** GO Expansion Costs (incremental to BAU scenario)

Costs (Present Value, Million 2017 CAD \$)	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East	System- wide
<b>Capital</b>	<b>\$12,220</b>	<b>\$2,240</b>	<b>\$960</b>	<b>\$2,550</b>	<b>\$1,680</b>	<b>\$2,150</b>	<b>\$2,640</b>
Corridor	\$8,500	\$1,160	\$630	\$2,130	\$1,140	\$1,540	\$1,900
Fleet	\$3,720	\$1,080	\$330	\$420	\$540	\$610	\$740
<b>Operating &amp; Maintenance Costs</b>	<b>\$4,340</b>	<b>\$360</b>	<b>\$1,000</b>	<b>\$1,020</b>	<b>\$830</b>	<b>-\$100</b>	<b>\$1,230</b>
Operating	\$1,860	\$170	\$720	\$500	\$440	-\$130	\$160
Maintenance	\$2,480	\$190	\$280	\$520	\$390	\$30	\$1,070
<b>Terminal Value</b>	<b>-\$340</b>	<b>-\$80</b>	<b>-\$30</b>	<b>-\$50</b>	<b>-\$60</b>	<b>-\$50</b>	<b>-\$70</b>
<b>Total Present Value of Incremental Costs</b>	<b>\$16,220</b>	<b>\$2,520</b>	<b>\$1,930</b>	<b>\$3,520</b>	<b>\$2,450</b>	<b>\$2,000</b>	<b>\$3,800</b>

## 5.4 User Impacts: GO Expansion Benefits Travellers Across the Region

### Overview

User Impacts are a key area of analysis for transportation investments. They represent how GO Expansion will improve welfare for transportation network users or travellers. This includes both travellers who will make use of GO Expansion and those who will not but benefit from travellers moving from other modes to GO Rail.

### How does GO Rail Investment Benefit Travellers?

The user impacts considered in this Business Case were estimated using the GGHMV4 model – a transportation network model that makes use of the generalized cost<sup>12</sup> of the modes available for each trip to determine how travellers make use of the network. User benefits are considered through the lens of changes in costs, or ‘willingness to pay’ for a trip.

Travellers who reduce costs have more personal time with their friends or family and also have more productive time due to shorter commutes. As discussed in the economic narrative, GO Expansion will change the cost of travel with three overall impacts:

- **Existing GO Rail Passengers** – GO Expansion will reduce the generalized cost of travel below the status quo cost of travel, providing a direct welfare benefit to existing users.
- **New GO Rail Passengers** – GO Expansion will reduce the generalized cost of travel on GO Rail, which will attract new travellers (who used to use another mode). These new travellers will receive a benefit equal to the difference in what they were willing to pay and the new generalized cost of travel on GO Rail.
- **Auto Travellers** – GO Expansion will attract some travellers off the auto network, which will lead to decongestion. In turn, decongestion reduces the travel time and operating cost for travellers who remain on the auto network.
- For travellers that switch to GO Rail, the rule of a half is applied where new customers receive a benefit of half of the overall travel time difference between the BAU and GO Expansion scenario.<sup>13</sup> This travel time difference is then monetized using the VoT.
- Auto user benefits are estimated based on the amount of peak and off-peak demand that shifts to GO Rail. Each traveller that switches to GO Rail will reduce the amount of VKT on the auto network. A decongestion time saving of 0.010 hours/km in the peak and 0.0013 hours/km in the off-peak is used to estimate travel time savings for auto users. The hours saved by auto travellers are then monetized using a value of time.

### How are Traveller Benefits Estimated?

The benefits included in the Economic Case are based on a direct demand model that allocates future transportation demand to GO Rail based on its competitiveness with other modes. This model estimates traveller benefits based on traveller type:

- For existing GO Rail travellers, benefits are estimated by comparing the overall travel time for GO Rail in the BAU and under the GO Expansion scenario. The number of hours saved per trip are monetized using the Value of Time (VoT).

<sup>13</sup> The rule of a half is a standard approach used in user or traveller benefit estimation. Traveller benefits are based on the difference between the generalized travel time in the BAU and the GO Expansion scenarios. However, it is unknown at which overall travel time difference customers switch to GO Rail. For example: if the travel time difference from the BAU and GO Expansion Scenarios is 10 minutes, it is unknown whether customers would switch at a difference of seven, eight, or nine minutes. Economists assume that the demand curve (which represents the level of demand for a given travel time for GO Rail) is linear between the BAU and do-something scenarios (in this case, the GO Expansion scenario) and allocate half of the difference to new travellers.

<sup>12</sup> Generalized cost is the sum of the monetary (e.g. public transit fare) and non-monetary (i.e. time spent travelling – time is monetized using a Value of Time factor) costs of a journey.

### User Impact Summary

All user impacts included in this analysis are 'net impacts' across the corridor, including a summation of benefits and disbenefits. Table 5.3 summarizes user impacts due to GO Expansion projects, both at a network level and by corridor.

User benefits are significant over the lifecycle of the project – totalling over \$40 billion. Total transit user benefits reflect an average timesaving of over 10 minutes per trip due to increased frequency, reliability, and travel times.

These benefits are realized across each of the GO Rail lines that receive upgraded service and can be divided into two broad categories:

- **Lines with existing two-way, all-day service:** benefits on Lakeshore East and West are largely driven by providing new journey opportunities (example: being able to travel to or from Barrie line stations all-day) and increased frequencies along the existing two-way, all-day corridor.
- **Lines with peak only or limited two-way, all-day service:** benefits on Kitchener, Barrie, and Stouffville lines are driven by the addition of significantly more two-way, all-day service and 15 minute service on core segments of the lines.

The overall benefits for the second category – lines that currently have limited two-way, all-day service – reflect a greater transformation of rail service in terms of accessibility, speed, and frequency and are therefore significantly higher than the total benefits from corridors that currently have two-way all-day service. For example, the Barrie Corridor's over \$12.8 billion in benefits are derived from greatly improving service for existing passengers, but also enabling a wider range of new trips with high quality and frequent transit.

**Table 5.3:** User Impact Summary

Benefits (Present Value, Million 2017 CAD \$)	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East	System- wide
Transit User	\$35,430	\$5,720	\$5,020	\$11,720	\$3,700	\$6,690	\$2,580
Auto User	\$3,330	\$790	\$310	\$650	\$320	\$910	\$350
Auto Operating Cost Savings	\$1,940	\$420	\$180	\$460	\$170	\$500	\$210
<b>Total User Benefits</b>	<b>\$40,700</b>	<b>\$6,930</b>	<b>\$5,510</b>	<b>\$12,830</b>	<b>\$4,190</b>	<b>\$8,100</b>	<b>\$3,140</b>

## 5.5 External Impacts: GO Expansion Leads to a More Sustainable and Healthier Region

### Overview

Every trip taken can contribute to negative societal impacts – whether it be emissions that pollute the air or injuries that can occur from collisions. These impacts are called the ‘social cost of transportation’. Transportation investments are an opportunity to reduce these social costs by improving the economic efficiency of the transportation system – meaning less impact for the same amount of travel (measured in impact per passenger kilometre).

### How does GO Expansion Lead to a More Sustainable and Healthier Region?

This FBC includes four external impacts:

- **Improved Safety** – as travellers switch from automobile to GO Rail, they will take trips off the highway and roadway system, which will reduce the number of accidents causing death or injury in the GTHA.
- **Reduced Greenhouse Gas (GHG) Emissions** – transportation emissions include GHG emissions that contribute to climate change. As travellers switch from automobile to GO Rail, they will take trips off the highway and road systems, which will reduce the amount of GHG emissions and transportation's contribution to climate change.
- **Increased Physical Activity Leading to Healthier Travellers** – customers who used to drive and use GO Rail after GO Expansion is delivered may access stations by walking and cycling. Increased physical activity can improve traveller well-being and lead to a health benefit to the region. Induced GO Rail demand may also access the service by walking or cycling.
- **Reduced Criteria Air Contaminants (CACs)** – transportation emissions also include CACs, which impact human health. As more drivers switch to GO Rail after GO Expansion there will be reduced CAC emissions and other pollutants known to affect human health.

These four external impacts are realized in two-ways:

- **Improved efficiencies on GO Rail** – investment in GO Expansion changes many elements of the GO Rail system – including the trains and traction system. These changes can reduce the impact of a passenger km travelled on the GO Rail network.
- **Mode change** – if travellers move from a less efficient mode to GO Rail then there is an impact equivalent to the externalities per trip on GO Rail, minus the externalities on their previously used mode. These benefits are calculated based on the change in auto VKT.



### How are External Benefits calculated?

External benefits are calculated using the same direct demand model as GO Rail ridership and traveller benefits. These benefits are based on the diversion rate to GO Rail. As more customers switch from auto to GO Rail, the total amount of auto travel decreases. As shown in Table 5.4, reduced auto VKT leads to two external benefits:

- **Improved Safety** - reduced accidents leading to death or injury at a rate of \$0.10 per km declining at 5.3% per year (reflecting general improvements in road safety leading to fewer accidents per year).
- **Reduced Greenhouse Gas Emissions** - one tonne of GHGs avoided per 4,000 car-km valued at \$42.10 per tonne.
- **Increased Physical Activity** - as passengers switch from automobile to GO Rail, some may walk or cycle to the station - each cycling trip realizes a benefit of \$1.73 per km cycled and each walking trip generates a benefit of \$3.84 per km walked.
- **Reduced Criteria Air Contaminants** - health benefits due to reduced CACs are typically estimated at a rate of \$0.02 per km reduction in auto travel.

### External Impacts Summary

The overall external benefits of GO Expansion are shown in Table 5.4, which illustrates that GO Expansion will realize significant external benefits of over \$1.4 billion over its lifecycle. These benefits are driven in two-ways:

- Number of automobile trips that switch to GO Rail.
- Trip length for trips that used to use auto and now use GO Rail.

Because the social cost of each auto trip increases with distance travelled, the benefit per trip that changes to GO Rail is based on the distance of the auto trip avoided/no longer taken.

Each line realizes both health and environmental benefits. Health benefits are greater than environmental benefits because the social cost of a km of travel is higher in terms of health than it is for the GHGs.

**Table 5.4:** External Impact Summary

Benefits (Present Value, Million 2017 CAD \$)	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East	System- wide
Reduction in Accidents Resulting in Death or Injury	\$550	\$120	\$50	\$130	\$50	\$140	\$60
Increased Physical Activity	\$565	<i>Note: Health benefits due to increased activity were estimated for the system as a whole and not each line.</i>					\$565
GHG Emissions Reductions	\$220	\$50	\$20	\$50	\$20	\$60	\$20
Reduced Air Pollution	\$110	\$20	\$10	\$30	\$10	\$30	\$10
<b>Total Present Value of External Benefits</b>	<b>\$1,445</b>	<b>\$190</b>	<b>\$80</b>	<b>\$210</b>	<b>\$80</b>	<b>\$230</b>	<b>\$655</b>

## 5.6 Wider Economic Impacts: GO Expansion Increases Regional Prosperity

### Overview

Traditional benefit costs analysis (BCA) takes into account the improvement in welfare because of an investment in transit infrastructure. Primarily, this takes the form of reductions in the cost and time for transportation (travel time savings). Wider Economic Impacts (WEIs) are included in an expanded BCA. WEIs are usually categorized into several components, each addressing a series of potential benefits identified in regional economics literature and other Business Cases for transformational projects.

### How does GO Expansion Increase Regional Prosperity?

Research suggests that the primary benefits related to GO Expansion are associated with agglomeration based on the relationship between density of economic activity and productivity. Investment in GO Expansion will reduce travel times across the network, which in turn decreases the generalized cost of travel. This allows urban areas to become 'closer' (shorter travel time), which increases the effective density of employment and economic activity within the region.

The range of WEIs GO Expansion is expected to realize for the region are described in Table 5.5.

### Wider Economic Impacts Summary

Efforts are underway to develop a WEI model for the GTHA. For this document, an illustrative WEI value has been estimated based on international experience, which suggests WEIs from rail investment range from 5%-50% of user benefits. A conservative range of 5%-15% has been selected for this analysis, which notes WEIs may range from \$2 billion to \$6 billion in additional economic benefits.

While WEIs are not included in the conventional BCR and NPV in this FBC, they are expected to contribute positively to both economic indicators.

**Table 5.5:** Potential Wider Economic Impacts of GO Expansion

Type	Benefit
<b>Agglomeration - bringing firms closer together in terms of generalized journey time</b>	GO Expansion provides faster and more frequent service across the region and delivers new stations. This will reduce the time it takes to travel between the region's economic or employment centres, as discussed in Strategic Benefit 8. Agglomeration benefits are expected to occur as firms become closer together in terms of time - this allows firms to benefit from increased exchange of ideas in face to face meetings or business transactions.
<b>Expanded Commute Shed</b>	GO Expansion allows firms (employers) and workers (employees) easier access to one another. For example, GO Expansion significantly decreases commute times by rail, which expands the range of locations someone can live and still reach work in a reasonable time. In other regions, this expanding 'Commute shed' (the amount of people who can travel to work in a set time, as discussed in Strategic Benefit 7), has been shown to increase productivity as employer needs and desirable employment opportunities are better aligned through reduced travel times.

# 5.7 Economic Case Conclusion

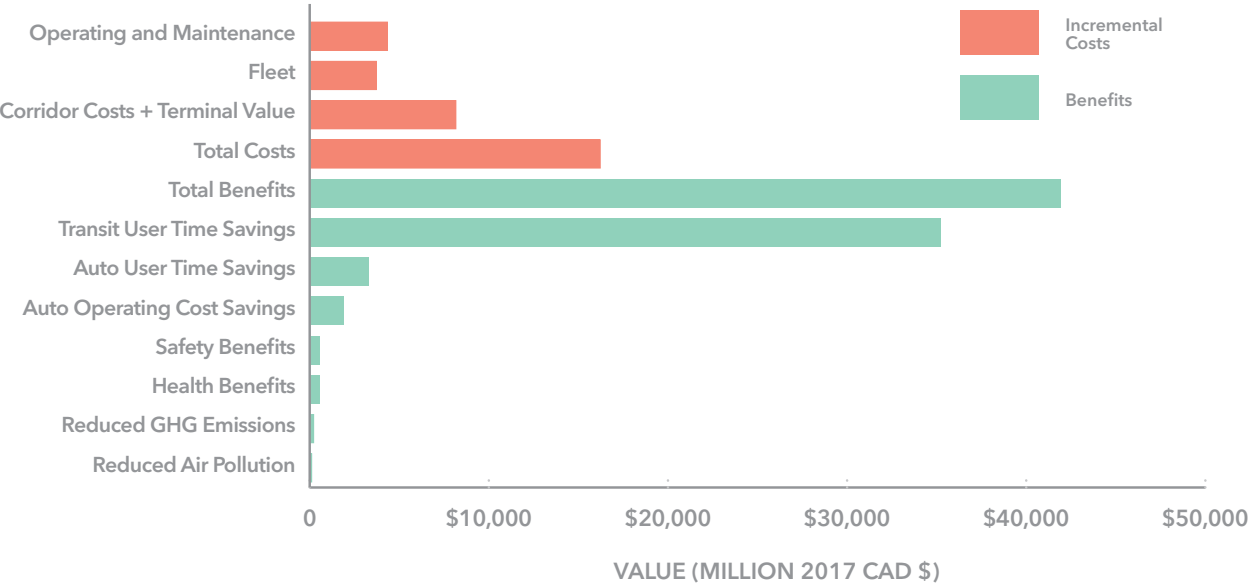
## Summary

The Economic Case compares costs and benefits to determine the overall economic viability of an investment. This analysis considers the magnitude of costs and benefits as well as:

- **Benefit Cost Ratio (BCR)** - the net benefits divided by the net costs, which is used to indicate how many benefits are realized per dollar spent.
- **Net Present Value (NPV)** - the net benefits minus net costs, which is used to indicate the overall magnitude of net benefits to the region.

A summary of the Economic Case is provided in Table 5.6, Figure 5.2, and Figure 5.3

**Figure 5.2:** GO Expansion Economic Summary - Network

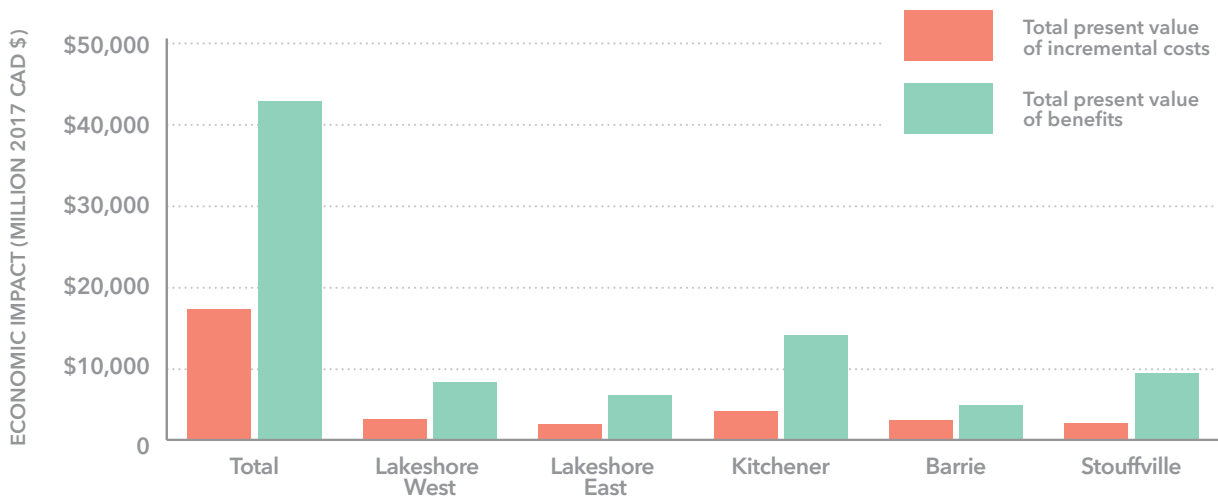


Net Present Value	
\$25,925	
Benefit Cost Ratio	
2.6	

**Table 5.6:** Economic Case Summary

Present Value of Economic Impact (Million 2017 CAD \$)	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East	System-Wide
<b>Total Incremental Costs</b>	<b>\$16,220</b>	<b>\$2,520</b>	<b>\$1,930</b>	<b>\$3,520</b>	<b>\$2,450</b>	<b>\$2,000</b>	<b>\$3,800</b>
<b>Capital</b>	<b>\$12,220</b>	<b>\$2,240</b>	<b>\$960</b>	<b>\$2,550</b>	<b>\$1,680</b>	<b>\$2,150</b>	<b>\$2,640</b>
Corridor	\$8,500	\$1,160	\$630	\$2,130	\$1,140	\$1,540	\$1,900
Fleet	\$3,720	\$1,080	\$330	\$420	\$540	\$610	\$740
<b>Operating &amp; Maintenance Costs</b>	<b>\$4,340</b>	<b>\$360</b>	<b>\$1,000</b>	<b>\$1,020</b>	<b>\$830</b>	<b>-\$100</b>	<b>\$1,230</b>
Operating	\$1,860	\$170	\$720	\$500	\$440	-\$130	\$160
Maintenance	\$2,480	\$190	\$280	\$520	\$390	\$30	\$1,070
<b>Terminal Value</b>	<b>-\$340</b>	<b>-\$80</b>	<b>-\$30</b>	<b>-\$50</b>	<b>-\$60</b>	<b>-\$50</b>	<b>-\$70</b>
<b>Total Benefits</b>	<b>\$42,145</b>	<b>\$7,120</b>	<b>\$5,590</b>	<b>\$13,040</b>	<b>\$4,270</b>	<b>\$8,330</b>	<b>\$3,795</b>
<b>Total User Benefits</b>	<b>\$40,700</b>	<b>\$6,930</b>	<b>\$5,510</b>	<b>\$12,830</b>	<b>\$4,190</b>	<b>\$8,100</b>	<b>\$3,140</b>
Transit User (reduced travel times and increased frequencies)	\$35,430	\$5,720	\$5,020	\$11,720	\$3,700	\$6,690	\$2,580
Auto Operating Cost Savings	\$1,940	\$420	\$180	\$460	\$170	\$500	\$210
Auto User (Decongestion)	\$3,330	\$790	\$310	\$650	\$320	\$910	\$350
<b>Total External Benefits</b>	<b>\$1,445</b>	<b>\$190</b>	<b>\$80</b>	<b>\$210</b>	<b>\$80</b>	<b>\$230</b>	<b>\$655</b>
Reduction in Accidents Resulting in Death or Injury	\$550	\$120	\$50	\$130	\$50	\$140	\$60
Increased Physical Activity	\$565						\$565
GHG Emission Reductions	\$220	\$50	\$20	\$50	\$20	\$60	\$20
Reduced Air Pollution	\$110	\$20	\$10	\$30	\$10	\$30	\$10
<b>Economic Case Factors</b>							
<b>Net Present Value</b>	<b>\$25,925</b>	<b>\$4,600</b>	<b>\$3,660</b>	<b>\$9,520</b>	<b>\$1,820</b>	<b>\$6,330</b>	<b>N/A</b>
<b>Benefit Cost Ratio</b>	<b>2.6</b>	<b>2.8</b>	<b>2.9</b>	<b>3.7</b>	<b>1.7</b>	<b>4.2</b>	<b>N/A</b>

**Figure 5.3:** GO Expansion Economic Summary – By Line



	Total	Lakeshore West	Kitchener	Barrie	Stouffville	Lakeshore East
Net Present Value (Million 2017\$)	\$25,925	\$4,600	\$3,660	\$9,520	\$1,820	\$6,330
Benefit Cost Ratio	2.6	2.8	2.9	3.7	1.7	4.2

*Note: System-wide costs and benefits not shown*

## Conclusions

Overall, the GO Expansion program's improved service offering is forecast to deliver high value for money for the GTHA – significantly improving welfare above and beyond the resources invested to deliver the program:

Passenger time savings worth

**\$35.4 billion**

Auto operating cost savings worth

**\$1.9 billion**

Road user benefits worth

**\$3.3 billion**

Safety, health, and environmental  
benefits worth

**\$1.5 billion**

GO Expansion's benefits exceed costs across the entire network and on a line by line basis. The program will realize nearly \$42.2 billion in benefits. The overall project will have a BCR of 2.6 – indicating that for every \$1.00 invested in GO Expansion, the region will see a welfare benefit valued at \$2.60. In addition, the NPV of the program is estimated to be \$26 billion – which is equal to a benefit of \$9,000 per household in the GTHA, indicating that the region will realize significant welfare benefits beyond the cost to deliver the program.

Each line included in the GO Expansion program will also have benefits that exceed the costs of delivery, which illustrates how investing in GO Rail will benefit the GTHA as a whole – including communities that can access the Barrie, Kitchener, and Stouffville lines that see significant service improvements.



### Benefit Dependencies and Risk

GO Expansion's strong economic performance is based on the significant benefits it can generate relative to the costs of investment. These benefits are connected to the six actions included in the GO Expansion program and are realized when existing customers on GO Rail have a faster trip with improved frequencies and auto travellers switch to GO Rail based on travel time improvements. Key considerations that shape Metrolinx's ability to realize these benefits are:

- Ensuring delivered service runs at a comparable speed and frequency to the proposed service concepts in this Business Case
- Aligning customer experience with customer expectations over the lifecycle of the rail service to attract and retain passengers
- Improving station access from current situation
- Developing Transportation Demand Management (TDM) and other marketing programs to minimize customer disruption during construction and encourage customers to make use of the improved rail services

Key benefit risks that should be considered as the project is advanced include:

- Demographic and economic factors such as lower regional growth, potentially affecting demand
- Changes in cost of travel on other modes, which may reduce the benefit per trip on GO Rail or make other modes more attractive than assumed in this Business Case

In addition to realizing benefits, the overall Economic Case for GO Expansion is also shaped by the level of costs relative to benefits realized. Key considerations to minimize cost risks include:

- Using contracting to manage potential cost overruns, particularly in finalizing the design and its construction
- Considering the impact of cost escalation on the program's delivery costs – including materials and contractor and concession staff
- Timing issues on costs or revenue/income flows which constrain progress
- Delay costs due to prolonged approvals process, construction hold-ups or other factors
- Robustness due to project changes such as scope alterations
- Impacts due to the procurement approach or contract management strategy

### Other Benefits and Benefits Not Considered

The FBC for GO Expansion includes a range of economic benefits that illustrate and estimate the benefits of the investment to the region. While efforts have been made to estimate the core benefits associated with major rail investments, there are two sets of additional benefits that have not been included in the core Economic Case:

- Benefits that have been estimated, but require further development and analysis before they are included as core benefits in Metrolinx Business Cases
- Benefits that have not been estimated due to limitations in modelling and analytic methodology, but are anticipated to have a positive impact on the case for GO Expansion

This Business Case can therefore be considered conservative as it does not directly estimate a range of additional benefits anticipated to arise from GO Expansion. These additional benefits are discussed in Table 5.7.

**Table 5.7:** Benefits Not Estimated and Monetized in the GO Expansion Full Business Case

Type	Benefit	Description
Traveller	Crowding Reduction on Local Transit and Subways	<ul style="list-style-type: none"> <li>GO Expansion will draw customers off subways, buses, and street cars</li> <li>This will lead to decongestion or crowding reductions on these services, which will benefit passengers who currently make use of the services</li> </ul>
	Travel Time Savings and Traveller Benefits Across the Complete Network	<ul style="list-style-type: none"> <li>Modelling tools used in this FBC did not directly estimate the travel time savings of travellers who make use of GO Rail to access other new modes – such as Hurontario LRT</li> <li>Because GO Rail provides direct high frequency connectivity to these modes, these travellers will also realize a travel time benefit</li> </ul>
	Automobile Traveller Savings Due to New Road-Rail Grade Separations	<ul style="list-style-type: none"> <li>GO Expansion includes new road-rail separations which will reduce the time drivers spend at crossing gates while GO Rail services pass</li> </ul>
	Freight Travel Time Savings	<ul style="list-style-type: none"> <li>GO Rail will decongest highways and roadways, which will also decrease travel time for goods movement</li> </ul>
External	Noise reductions due to decreased auto travel	<ul style="list-style-type: none"> <li>As more drivers switch to GO Rail after GO Expansion there will be a decrease in noise in select corridors</li> <li>This decrease in noise has not been estimated or monetized, but is typically a net benefit when compared to any increase in noise from higher rail frequencies</li> </ul>

### Sensitivity Tests

Sensitivity tests are used to determine how variations in project assumptions could impact overall project performance. A range of tests were conducted to explore:

- Which variables drive project performance?
- Is there a point where the project is unfeasible and has a BCR lower than 1?
- What is the lowest performance the project could realize?

### Sensitivity Test Analysis

Over 30 sensitivity tests were conducted (as shown in Table 5.8). These tests noted the following conclusions:

- GO Expansion performance is most heavily driven by realizing the costs estimated in this document – higher costs could reduce the BCR to as low as 2.29 (25% cost escalation).
- User benefits are most heavily driven by value of time – if value of time is lower than the assumed in the FBC the BCR could be reduced to 2.32.
- If overall benefits are significantly lower than estimated the BCR could be as low as 2.10 (25% reduction in benefits).
- In a scenario where benefits decrease by 25% and costs increase by 25%, the BCR would be 1.60, while a scenario where ridership is not realized could reduce the BCR to 1.0.
- Analysis suggests that benefits would have to drop by over 60% (costs remaining unchanged) or costs would have to escalate by over 160% (benefits remaining unchanged) for the project to have a BCR below 1.

Of these tests, ridership realization has the most significant impact on BCR and benefits. This highlights the importance of ensuring GO Expansion is delivered alongside robust marketing, Transportation Demand Management (TDM), and station access programming to attract and retain new customers.

This range of test results indicates the overall robustness of the Economic Case for GO Expansion – if the investment outlined in this document is delivered with similar specifications, it can be expected to realize significant benefits to the region. While GO Expansion has strong performance, effective benefits realization and risk management practices should be integrated into project delivery to ensure this performance is realized.



**Table 5.8:** Sensitivity Test Analysis

Test Type	What drives this test?	How could these issues be managed?	Sensitivity Test Conclusions	Max BCR	Min BCR
<b>Cost Increase</b> <ul style="list-style-type: none"> <li>Costs were increased by 5%, 10%, and 15% to understand how higher costs may impact project feasibility.</li> <li>Operating costs increase at 1% per year.</li> </ul>	<ul style="list-style-type: none"> <li>Higher costs could occur for a range of reasons: <ul style="list-style-type: none"> <li>Increases in labour or commodity prices</li> <li>Project and contract management inefficiencies</li> <li>Unanticipated physical or environmental risks</li> <li>Delays in delivery</li> <li>Changes in fuel or electricity costs</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Contractual mechanisms can be put in place to transfer risk to project delivery partners</li> <li>Costs used in this business case include risk estimates and escalation to account for uncertainty</li> </ul>	Even if costs increase significantly, GO Expansion's benefits significantly exceed costs and the project has a strong BCR.	2.45	2.29
<b>Decreased Benefits</b> <ul style="list-style-type: none"> <li>Benefits were decreased by 5%, 10%, and 25%</li> </ul>	<ul style="list-style-type: none"> <li>General impacts to benefits could be caused by many issues, including: <ul style="list-style-type: none"> <li>Operators not providing the scoped travel times and frequencies</li> <li>Fewer people choosing GO Rail</li> <li>Inability for travellers to access GO Stations (station access issues such as full parking)</li> <li>Fewer people walking or cycling to stations</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Specify minimum service standards in contracts and enforce based on output specifications</li> <li>Ensure GO Rail continues to evolve its customer experience to meet changing needs</li> <li>Explore opportunities for Transit Oriented Development</li> <li>Invest in expanded GO Station access programs</li> </ul>	Even with a 25% reduction in net benefits, GO Expansion's benefits exceed costs by over two times.	2.46	2.10
<ul style="list-style-type: none"> <li>Value of time growth was reduced to zero</li> <li>Value of time was reduced by 5%, 15%, and 25%</li> </ul>	<ul style="list-style-type: none"> <li>Value of time is highly correlated with economic activity – if economic prospects for Ontario decreased then value of time may decrease</li> </ul>	<ul style="list-style-type: none"> <li>If values of time were to decrease, Metrolinx could consider mechanisms to maintain benefit levels – such as increasing net travel time benefits</li> </ul>	Even with a value of time lower than assumed values, the case for GO Expansion is still robust.	2.50	2.13
<ul style="list-style-type: none"> <li>Auto operating costs were reduced by 5%, 15%, and 25%</li> </ul>	<ul style="list-style-type: none"> <li>Auto operating costs could decrease due to increased efficiencies or automation – both of which make automobiles more competitive with other modes (example: Mobility as a Service driverless vehicles)</li> <li>Costs could also decrease due to reduced parking or fuel costs</li> </ul>	<ul style="list-style-type: none"> <li>Develop partnerships with new mobility providers to use reductions in auto operating costs as a means to use new mobility as a feeder to GO Rail</li> <li>If parking or fuel prices drop, consider fare policies or other means to respond by improving the GO Rail customer value proposition</li> </ul>	Even with a reduction of automobile operating costs of 25%, the case for GO Expansion is still robust with benefits exceeding costs.	2.54	2.52

**Table 5.8:** Sensitivity Test Analysis (continued)

Test Type	What drives this test?	How could these issues be managed?	Sensitivity Test Conclusions	Max BCR	Min BCR
<b>Cost Increases and Benefit Reductions</b> <ul style="list-style-type: none"> <li>Costs were increased by 5%, 10%, and 25%, while benefits were reduced by 5%, 10%, and 25%</li> </ul>	<ul style="list-style-type: none"> <li>This test illustrates what happens when issues that increase costs or benefits happen at the same time</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation strategy varies depending on the range of issues that drive lower benefits or higher costs</li> </ul>	Even if GO Expansion was to be delivered with 25% higher costs and significantly lower benefits, its BCR still exceeds 1.0.	2.16	1.60
<b>Reduced Ridership Realization</b> <ul style="list-style-type: none"> <li>Peak ridership was reduced by 25% to 80% and off-peak ridership were reduced by 50%-100%</li> </ul>	<ul style="list-style-type: none"> <li>This test illustrates what happens if the ridership in the model cannot be realized – either because passengers choose other modes or because customers cannot access stations due to inadequate station access (example: no parking, not enough bus service, limited active travel connections)</li> </ul>	<ul style="list-style-type: none"> <li>Ensuring Metrolinx develops a robust station access strategy, including: direct access by local buses, integrated rapid transit and GO Rail stations, new active travel linkages (including pedestrian and bike access), sufficient parking, and long term integration of emergent mobility providers</li> <li>Ensuring potential customers understand the benefits of GO Expansion through marketing and Transportation Demand Management</li> </ul>	Even if GO Expansion realizes significantly lower ridership, it can still have a BCR of 1. This scenario is considered unlikely as efforts and programming (such as station access projects) are in place to realize potential ridership gains.	1.5	1.0



**Program Specification Tests**

Additional analysis has been conducted to determine how the addition of new stations could impact the economic performance of GO Expansion. This analysis is shown in Table 5.9.

Adding the new stations to the GO Rail network significantly increases ridership and net benefits, though with a small decrease in the overall benefit-cost ratio. The new stations will continue to be refined through separate business cases to optimize their performance within the overall GO Rail network.

**Key Considerations for Future Program Planning**

GO Expansion’s economic performance may be affected by the additional key considerations for rail planning in the GTHA as discussed in Table 5.10.

These potential dependencies have not been included in the modelling analysis as the programs included in this table are largely still under development. Economic impacts of these dependencies will be assessed in future programing and Business Case analysis.

**Table 5.9:** Impact of New Stations on Economic Performance

Indicator (All differences relative to the RCD presented in this FBC)	Addition of new stations
Benefit-cost ratio	Decrease by 0.08
Net present value	Increase by \$1.7 billion
Lifecycle farebox recovery	Decrease by 3% to 107%
Lifecycle project costs (capital and operating)	Increase by \$2.7 billion
2031 Annual Ridership	Increase by 6 million
Overall Impact	New stations will increase ridership and net present value of the program and will have a marginal negative impact on BCR.

**Table 5.10:** Impact of Key Considerations on the Economic Case for GO Expansion

Key Considerations	Description	Impact on Costs	Impact on Benefits
Rail Extensions	Rail extensions will expand GO Rail further to serve new communities such as Bowmanville or Niagara.	Operating costs may increase because GO Rail will operate over longer distances. Capital costs will also increase to provide required on and off corridor infrastructure to accommodate fast and frequent GO Rail service.	User benefits may increase if improved GO Rail service is offered along the corridor extensions
Station Access Strategy	The station access strategy is assumed to be delivered within the BAU. Station access will support travellers to access GO Rail by non-auto modes, such as cycling, walking, car-pool, ride sharing, taxis, or local transit.	This program is unlikely to significantly drive costs beyond what is noted in the BAU.	This program is a key enabler of benefits. Up to 40% of new GO Rail passengers will access the system with a non-auto mode. Ensuring station access is in place and that customers can make use of GO Rail without their car is a key determinant of customers making use of GO Expansion's speed, reliability, and frequency improvements.
Transit Oriented Development	Transit Oriented Development (TOD) will be focused around and adjacent to GO Rail stations – potentially increasing the number of homes and businesses located within walking distance of the system. The land use assumptions in the model assume some growth around stations but do not reflect a complete TOD buildout, where grey and greenfield development intensify housing and commercial development near stations.	Increased TOD may lead to increased operating and capital costs to accommodate demand with additional service.	If TOD exceeds what has been assumed in this analysis, there will likely be increased demand for travel at GO Rail stations. If more people live near and make use of GO Rail, GO Expansion benefits will increase as the program improves services over the BAU.
High Speed Rail	High Speed Rail is under consideration between Toronto and Windsor and with proposals to serve Pearson Airport, Guelph, and Kitchener Waterloo. The delivery model in the Preliminary Business Case for High Speed Rail suggested that it would share tracks with GO Expansion.	High Speed Rail may be co-delivered with GO Expansion and could make use of the Kitchener Corridor. However, all incremental costs required to deliver High Speed Rail will not be incurred by GO Expansion.	High Speed Rail will serve a similar market as the Kitchener Line – this means some customers may make use of High Speed Rail instead of GO Rail, which could reduce overall benefits of GO Expansion.
Hydrail <sup>12</sup>	Hydrail is a proposed model for delivering electric traction trains in the GTHA using trains that run on hydrogen fuel cells. Hydrail was analyzed in a feasibility report that explored the technical feasibility and potential economic and financial impacts of deploying Hydrail trains instead of overhead catenary system electric locomotives and EMUs.	The "Regional Express Rail Program Hydrail Feasibility Study Report" found that Hydrail could reduce capital costs for electrification but would carry new capital costs to provide systems to develop and distribute hydrogen fuel cells. However, at this time a Hydrail system of the size and scope of the GO Rail network has not been delivered in any other jurisdiction so further analysis is required to determine if Hydrail is cost neutral to the costs presented in this Business Case.	Preliminary analysis in the feasibility study suggests that Hydrail trains could achieve a similar level of performance as conventional diesel or electric trains assumed in GO Expansion – which suggests that Hydrail can achieve a similar level of benefits as the reference concept presented in this FBC.

<sup>12</sup> Regional Express Rail Program Hydrail Feasibility Study Report – online at:  
[http://www.metrolinx.com/en/news/announcements/hydrail-resources/CP\\_RailG-PGM-RPT-245\\_HydrailFeasibilityReport\\_R1.pdf](http://www.metrolinx.com/en/news/announcements/hydrail-resources/CP_RailG-PGM-RPT-245_HydrailFeasibilityReport_R1.pdf)

# 6

## Financial Case



## Overview

The Financial Case sets out the fiscal impact of the GO Expansion program on an annual and lifecycle basis. Unlike the Economic Case, which focuses on welfare benefits to society, the Financial Case is solely concerned with costs and revenues associated with the project and their impact on government accounts. However, like the Economic Case, the Financial Case is prepared in parallel to the Strategic Case objectives - the financial impact of GO Rail should be considered in the context of the benefits and value it realizes for the region.

**NOTE: The Financial Case and Economic Case both assess the costs of an investment, but do so for different purposes.**

The Financial Case is concerned with the net impact on Metrolinx and Provincial finances in nominal (inflation adjusted) terms in order to support investment and financial planning.

The Economic Case is concerned with the overall cost to society and is expressed in real terms (impact of inflation removed) to illustrate the opportunity cost of spending on GO Expansion.

For example, the Economic Case could be used to assess the question: is spending resources on GO Rail the best use of these resources?

While the Financial Case answers the question: how much money is required to deliver new GO Rail service? **As a result, the costs included in the two cases do not directly align.**

**Only the costs included in the Financial Case should be used for investment planning.**

## How is the chapter structured?

Section	Content
<b>6.1</b> Financial Case Analysis	A description of parameters and assumptions used to develop the Financial Case.
<b>6.2</b> Financial Impact to Metrolinx	A description and quantification of the outgoing costs and incoming revenues associated with GO Expansion.
<b>6.3</b> GO Expansion Funding Sources	A description and quantification of where the money will come from to pay for GO Expansion.
<b>6.4</b> Financial Case Conclusion	A description of the potential financial risks associated with GO Expansion, and associated mitigation options.

# Financial Case **Summary**



## 6.1 Financial Case Analysis

The Financial Case uses parameters and assumptions consistent with Metrolinx's Business Case Guidance as of April 2018 – as shown in Table 6.1. All analysis in the Financial Case is incremental to the Business as Usual (BAU – scenario without GO Expansion) scenario – meaning all costs and revenue impacts only consider those directly related to the GO Expansion program above and beyond existing spending.

**Table 6.1:** Financial Case Assumptions

Line Item Consideration	Description	Assumption(s)
Discount Rate	A rate used to convert future year financial figures into nominal values	5.5%/year
Inflation Rate	Inflation reflects how the value of money varies over time. Under conditions of inflation, 1 dollar today could not purchase what 1 dollar could purchase last year, nor 1 dollar in the future. The inflation rate adjusts financial considerations based on how costs and revenues change over time against overall prices.	2%/year
Capital, Operating and Maintenance Cost Escalation	Certain GO Expansion elements may increase in value above the rate of inflation. This increase is considered as a 'cost escalation.	1%/year until 2031
Evaluation Period	The evaluation period is the lifecycle of the project included in the financial appraisal	60 years of operation
Fares	The rate at which fares increase over time.	Assume growth in line with historic trends for fare growth.



## 6.2 Financial Impact to Metrolinx

### Background

The Financial Impact of GO Expansion is divided into two categories

- **Cost to deliver**
- **Revenue impacts**

These categories are presented based on incremental values – meaning the financial changes from the Business as Usual scenario in order to reflect the net impact of the investment. A set of output measures, or tests, are also provided to indicate the impact of GO Expansion such as cost per train km or passengers per \$ spent.

### Costs to Deliver the Investment

Costs are subdivided into two categories:

- **Capital Investment** – capital costs include any expenditure to deliver the investment's key infrastructure and systems. It is a summary of the fixed costs incurred throughout the project lifecycle, either during project delivery or to replace project components when they are lifecycle expired.
- **Operating and Maintenance Costs** – a summary of the costs required to operate and maintain the investment across day to day operations.

The total cost to deliver GO Expansion is shown in Table 6.2.

### Business as Usual Investment

The Business As Usual (BAU) scenario requires \$12 billion in capital investment to maintain current GO Rail services and will have \$27 billion in operating costs (up to 83% of which will be offset by revenues) through to 2086. These costs would only maintain the current capability of the rail network with some marginal improvements possible as existing trains are replaced (example: more fuel efficient trains may reduce operating costs). Importantly, it would not provide any substantive capacity increase during the peak, and does not include any resources required to introduce two-way, all-day services across the system. Therefore, the BAU scenario will limit the ability to meet the objectives set out in the Strategic Case, and will not realize any additional Economic Benefit beyond what the GO Rail system currently delivers to the region.

### GO Expansion Investment

GO Expansion incremental capital costs of \$12.2 billion and \$4.4 billion in operating costs through to 2086. This represents a 43% increase in costs compared to the BAU. With this increase, GO Expansion delivers a substantial expansion in the capacity of GO Rail services as well as introducing two-way, all-day services across the system, electrification, and other improvements. Capital expenditure is distributed across all lines, with Lakeshore West (\$2.6 billion), Lakeshore East (\$2 billion), and Barrie (\$3.6 billion) requiring the most significant capital investment to deliver improved frequencies and two-way all-day service.

**Table 6.2:** Costs to Deliver GO Expansion

<b>Without GO Expansion</b> (BAU Scenario - expenditure over the evaluation period without GO Expansion)							
<b>Costs (Million \$)</b>	<b>Total</b>	<b>Lakeshore West</b>	<b>Kitchener</b>	<b>Barrie</b>	<b>Stouffville</b>	<b>Lakeshore East</b>	<b>System- wide*</b>
Capital	\$12,000	\$1,500	\$1,000	\$900	\$700	\$1,000	\$6,900
Operating and Maintenance	\$27,000	\$3,100	\$1,000	\$1,200	\$800	\$2,500	\$18,400
<b>Total Costs</b>	<b>\$39,000</b>	<b>\$4,600</b>	<b>\$2,000</b>	<b>\$2,100</b>	<b>\$1,500</b>	<b>\$3,500</b>	<b>\$25,300</b>
<b>With GO Expansion</b> (expenditure to deliver electrified two-way all-day service)							
<b>Costs (Million \$)</b>	<b>Total</b>	<b>Lakeshore West</b>	<b>Kitchener</b>	<b>Barrie</b>	<b>Stouffville</b>	<b>Lakeshore East</b>	<b>System- wide*</b>
Capital	\$24,220	\$3,730	\$1,910	\$3,470	\$2,340	\$3,130	\$9,640
Operating and Maintenance	\$31,390	\$3,470	\$2,010	\$2,210	\$1,620	\$2,400	\$19,680
<b>Total Costs</b>	<b>\$55,610</b>	<b>\$7,200</b>	<b>\$3,920</b>	<b>\$5,680</b>	<b>\$3,960</b>	<b>\$5,530</b>	<b>\$29,320</b>
<b>Incremental</b> (GO Expansion Investment - Investment Required Without GO Expansion)							
<b>Costs (Million \$)</b>	<b>Total</b>	<b>Lakeshore West</b>	<b>Kitchener</b>	<b>Barrie</b>	<b>Stouffville</b>	<b>Lakeshore East</b>	<b>System- wide*</b>
Capital	\$12,220	\$2,230	\$910	\$2,570	\$1,640	\$2,130	\$2,740
Operating and Maintenance	\$4,390	\$370	\$1,010	\$1,010	\$820	-\$100	\$1,280
<b>Total Costs</b>	<b>\$16,610</b>	<b>\$2,600</b>	<b>\$1,920</b>	<b>\$3,580</b>	<b>\$2,460</b>	<b>\$2,030</b>	<b>\$4,020</b>

**Revenue**

Revenue impacts are quantified in Table 6.3 and have been derived from the transportation demand model used to estimate GO Rail ridership. Revenue impacts include revenue resulting from changes in fare paid and number of trips taken.

The incremental change in fare revenue is shown in Table 6.3.

As with costs, the scenario without GO Expansion is estimated to generate significant revenues (\$22.3 billion) through to 2086 (the end of the Business Case period). However, GO Expansion fare revenues increase to \$34.6 billion.

**Table 6.3:** GO Expansion Revenue Impacts

Revenue (Million CAD \$)	Total
Without GO Expansion Revenue	\$22,300
Revenue with GO Expansion	\$34,600
Net Incremental Revenue	\$12,300

## 6.3 GO Expansion Funding Sources

GO Transit operations are currently funded by a mix of revenues and provincial government funding. Capital costs are typically funded directly by the provincial government. GO Expansion's capital costs will be funded directly by the Province of Ontario through Metrolinx and Infrastructure Ontario and the Government of Canada. GO Expansion's revenues are expected to exceed operating costs over the lifecycle of the project, with 2031 being the first forecast year that revenue can exceed operating costs. After this point, operational funding may no longer be required for the core GO Rail network. Table 6.4 illustrates the funding sources used to deliver the capital and operating costs of GO Expansion.

After GO Expansion is delivered, it is anticipated that revenues will increase more substantially than costs, which will generate an operating surplus estimated at \$7.8 billion. As a result, GO Transit could be self-sufficient in operating and maintenance terms which while unique in North America, is not uncommon amongst other international cities such as London, Tokyo, Hong Kong and Singapore. The operating surplus can be used to partly fund the estimated capital costs required to deliver the improvements in service or be used for other transit initiatives.

This operating surplus represents 63% of the incremental capital investment needed to deliver GO Expansion which reduces the need for Ontario public funds to deliver infrastructure works as well as eliminating the need for annual operating subsidy. However, as it will take time for the increase in fare revenues to materialize, it is expected that the Province of Ontario will need to provide funding to deliver the GO Expansion capital investment program with re-payments generated in later years.

**Table 6.4:** Funding Sources

Funding Source	Funding Amount
New fare revenues	Incremental: \$12.3 billion Incremental Revenue - Operating Costs: \$7.8 billion (potential revenue surplus)
Province of Ontario	Incremental Capital: \$12.6 billion Incremental Operating: Not Required (revenue is anticipated to exceed operating costs, and potentially cover some capital costs)
Federal Government	\$1.9 billion Funding Commitment

## 6.4 Financial Case for GO Expansion

### Financial Case Summary

The total financial impact for GO Expansion is shown in Table 6.5.

GO Expansion delivers a range of financial and organizational benefits:

- Demand & revenue growth is substantial at over 50%.
- While operating and maintenance costs also increase, the change is relatively minor at 17%.
- Operating costs per passenger trip reduces from \$11.20 to \$6.87.
- Operating margin shifts from a recovery of only 88% of total operating and maintenance costs to an operating surplus of 110% over the evaluation period (revenues equal 130% of operating costs in 2055).
- The operating surplus can fund over 60% of the estimated incremental capital investment needed.

**Table 6.5:** Financial Case Summary

Financial Impact (Million CAD \$)	Without GO Expansion	GO Expansion	Incremental Financial Impact
<b>Total Costs</b>	<b>\$38,900</b>	<b>\$55,700</b>	<b>\$16,800</b>
Capital	\$12,000	\$24,300	\$12,300
Operating and Maintenance Costs	\$26,900	\$31,400	\$4,500
<b>Revenue</b>	<b>\$22,300</b>	<b>\$34,600</b>	<b>\$12,300</b>
<b>Net Financial Impact</b>	<b>-\$16,600</b>	<b>-\$21,100</b>	<b>-\$4,500</b>
<b>Revenue/Operating Costs</b>	<b>0.83</b>	<b>1.10</b>	<b>2.73</b>

## Financial Risks and Risk Management

The Financial Case for a project focuses on its affordability, funding availability, and sensitivity to changes and market shocks that may impact project viability. The key risks that could have a serious financial impact on GO Expansion are:

- Cost overruns, particularly in finalizing the design and its construction.
- Inflation, increasing payments to contractors, concessions or staff.
- Econometric factors such as lower regional growth, impacting on demand or other expected outputs.
- Stability of funding sources, particularly if the project relies on third party funding such as PPP investors.
- Timing issues on costs or revenue flows which constrain progress.
- Delay costs due to prolonged approvals process, construction hold-ups or other factors.
- Sensitivity to external factors such as new technology (example: automated or hydrogen vehicles).
- Robustness due to project changes such as scope alterations.
- Impacts due to the procurement approach or contract management strategy.
- Consistency with government guidance or rules such as balance sheet treatment.

Potential mitigation approaches for these risks include:

- Integrated risk register between public and private parties to ensure that risks are transparent and managed by the right owner(s).
- Collaboration between public and private bodies to jointly identify issues and develop solutions.
- Clear and timely decision making, particularly around change control.
- Systematic assurance processes to review and challenge progress against plans.
- Quantify risk assessment through a mixture of modelling and qualitative judgement.
- Prioritise activities where conflicts could increase risks.
- Incentivise innovation and other techniques to reduce costs or increase revenues.

In addition, it will be important to establish a funding package which is robust not only to these risks, but to any changes in cash flows due to delays in introducing GO Expansion services or increases in costs.



## Conclusions

GO Expansion has a robust Financial Case - the level of investment applied over the required BAU expenditure will significantly transform mobility in the GTHA, while also improving the long-term day-to-day financial performance of the railway. While the initial capital investment is substantial, it is largely offset by the increase in demand and fare revenues. The investment also allows GO Rail to become operationally self sufficient which will reduce the longer term public funding pressures for the Province of Ontario.

## Sensitivity Tests

Sensitivity tests were conducted to determine:

- How required incremental investment varies by potential cost escalation
- How changing revenue levels impact revenue/operating cost ratio
- How ridership realization will impact revenue/operating cost ratio

### *Incremental Investment*

A range of sensitivity tests were conducted that raise costs to deliver and operate GO Expansion by 5%, 10%, and 25%. These tests indicate that incremental investment can increase from \$4.5 billion to:

- \$7 billion (5% increase)
- \$12 billion (15%) increase
- \$18 billion (25%) increase

These sensitivity outputs reflect scenarios that are considered to be low risk due to two factors:

- Cost estimates used in this FBC already include significant design and engineering, along with risk/contingency.
- Metrolinx is pursuing a contract structure to transfer key risks to delivery partners.

## Revenue and Operating Costs

A key element of the financial case for GO Expansion is that revenue exceeds operating costs over the investment period. This means farebox revenue can be used to pay for all operating costs and some capital costs. Sensitivity testing was conducted to determine how changes in GO Rail operating costs and fare assumptions impact cost recovery.

The base assumption is that fares will increase following historic trends. If fares are frozen without opportunity for price increases then the revenue/operating cost ratio for this project will fall to 93%. This indicates the importance of developing a fare policy that allows for fares to grow with inflation and escalation in operating costs.

A second test escalated operating costs at a higher rate than inflation (1% above escalation used in the estimating process) to determine if fare revenues could match increased costs. This test indicates a lifecycle cost recovery of 97%, indicating how additional subsidy may be required if fares cannot keep pace with operating costs.

### ***Ridership Realization***

Ridership realization will significantly impact revenue and revenue/operating cost ratio. Peak ridership was reduced by 25-85% and off-peak ridership was reduced by 50%-100%. Across these scenarios, the maximum revenue/operating cost ratio was 81% and the minimum was 69%. These tests suggest ridership realization is essential to meet the performance specified in this Financial Case.

### ***Sensitivity Review***

These sensitivity tests indicate the following conclusions:

- Unanticipated cost escalation could have a significant impact on the Financial Case for GO Expansion – current cost control mechanisms will be used to manage potential for cost escalation and maintain the incremental investment requirements provided in this FBC.
- Fare revenues play a crucial role in ensuring GO Expansion reduces the need for operating subsidy. Fare policy should be explored to ensure GO fares continue to grow following historic trends, with flexibility to adapt if operating costs see a sudden escalation.
- If ridership cannot be realized, the Financial Case for GO Expansion is severely impacted. This highlights the crucial role Transportation Demand Management (TDM), marketing, and station access projects play in realizing the Financial Case for GO Expansion.

# 7

## Deliverability and Operations Case



# Overview

This section describes the proposed approach for delivering GO Expansion, setting out the division of roles and responsibilities, key challenges, risks and mitigation.

# How is the chapter structured?

Section	Content
<div>7.1</div> <div>Key Delivery Strategies</div>	Description of the key delivery strategies that will be used to implement GO Expansion.
<div>7.2</div> <div>Procurement</div>	Description of how GO Expansion is being procured, including the forms of contract to be used, the division between on-corridor and off-corridor works and services, and the division of responsibilities for ongoing operation and maintenance of the system.
<div>7.3</div> <div>Operations and Maintenance</div>	Description of the proposed approach to operate and maintain GO Rail during the GO Expansion program.
<div>7.4</div> <div>Risks Management</div>	Description of key risks and how they are being addressed, managed and mitigated

## 7.1 Key Delivery Strategies

### Overview

The chosen approach to project delivery mobilizes local and international experience in delivering similar projects, transferring risks and responsibilities, and aligning incentives; all the while retaining flexibility for Metrolinx to meet future needs. It builds on global experience from over half a century of similar projects and services being delivered around the world. The following key strategies have been adopted:

- Governance
- Integrated Project Team
- Use of an Integrated Design Build Finance Operate and Maintain (DBFOM)
- Project Optimization
- No Transfer of Revenue Risk
- Long Range Procurement Flexibility
- Consultation
- Project Readiness

### Governance

Key decisions are subject to approval by the Metrolinx Senior Management Team, the Metrolinx Investment Panel, the Metrolinx Board, and the Provincial Treasury Board. Metrolinx, the regional transportation agency, “owns” the project and its assets and has overall responsibility to deliver it efficiently and effectively, achieving the benefits set out in this Business Case within available funds.

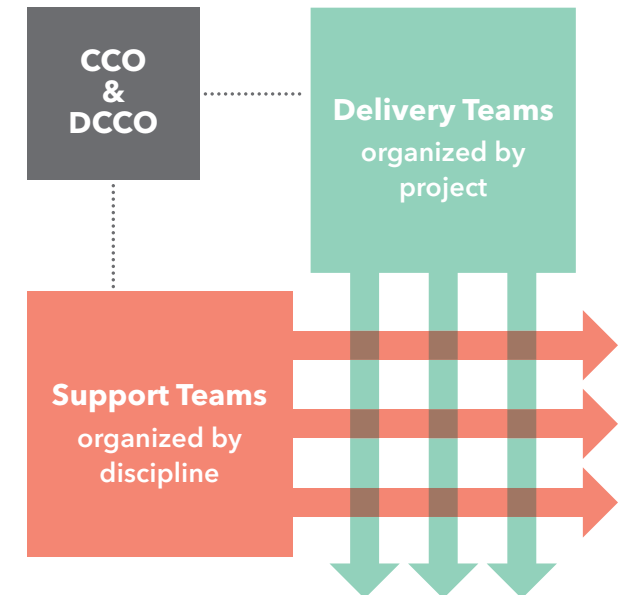
### Integrated Project Team

Metrolinx has formed an integrated project management team with Infrastructure Ontario and private consultant advisors. This enables the widest range of local and international expertise to be mobilized. Discrete teams are responsible for:

- **Project Management:** to monitor the performance and progress of the many discrete projects within the GO expansion program;
- **Project Control:** to ensure the adequate monitoring and oversight of the budget and schedule of projects within the GO Expansion program; and
- **Sponsorship:** to ensure the project is delivered so as to maximize the benefits identified in the business case within available funds.

Figure 7.1 shows the structure of the project delivery team and support teams involved in the project.

**Figure 7.1:** GO Expansion Project Delivery



**CCO:** Chief Capital Officer

**DCCO:** Deputy Chief Capital Officer

**Delivery Teams** are accountable for delivery of a particular project or portfolio of projects and managing cost, schedule, safety, quality, and risk.

**Support Teams** provide specialized disciplinary expertise across the program for tasks including property acquisition, design standards, and program wide financial control.

### **Delivery of the On-Corridor Works and Services in an Integrated Alternative Finance and Procurement Process (DBFOM)**

International experience shows that the risk of technical failures and cost and schedule overruns can be reduced by procuring railway systems and services in a single contract. This model transfers a substantial degree of risk onto private capital, with payment depending on effective performance. This approach serves to internalize integration risks and enable technical optimization. 'OnCorr ProjectCo', the On-Corridor delivery consortium, will be responsible for upgrading the system to deliver the benefits identified in this Business Case, while delivering punctual and reliable train services during implementation and for a further period of 30 years.

### **Enabling OnCorr Project Co to Optimize System Design and Service Plans**

Metrolinx is preparing an Output Specification that sets out its requirements for the On-Corridor works and services, and a Reference Concept Design, including plans for train services and infrastructure, and conceptual plans for maintenance and operation. These will be provided to bidders for the role of OnCorr Project Co. However, the Reference Concept Design will only show one possible "solution"; bidders will be encouraged to innovate and develop solutions that cost less, can be delivered sooner and with less disruption, and offer greater benefits to passengers. The contract will allow for further optimization during the contract term as traffic grows, new technology becomes available, and new solutions are identified.

### **No Transfer of Traffic or Revenue Risk**

International experience shows that transfer of revenue risk is rarely successful for urban and regional rail systems. Metrolinx will continue to "own the customer", meaning it will continue setting service requirements, setting and collecting fares, marketing the system, and ensuring integration with other transport. Metrolinx will determine the level of service to be operated but OnCorr Project Co will decide how to deliver them.

### **Flexibility for Future Service Requirements**

All aspects of the system are being designed to accommodate future needs. The contract with OnCorr Project Co will include provisions to increase capacity to meet anticipated traffic growth until 2055. Design of infrastructure works, such as Union Station, will also protect for reasonably foreseeable growth into the future.

### **Community Consultation**

Metrolinx is undertaking a full range of communication, consultation, and mitigation activities to minimize and manage the impacts on local communities both during construction and after implementation. EA and TPAP documents, which provide detailed information on anticipated impacts and proposed mitigation, are distributed to the public for feedback prior to provincial approval.

As shown in Table 7.1, these EAs have been prepared, or are being prepared, for many elements of the program. Depending on the final system design, some additional EAs, and further amendments to existing EAs, may be required prior to commencement of construction activities.

### **Readiness**

An integrated project schedule, work block planning and rail corridor access management system have been established to ensure that construction activities associated with the GO Expansion program can be delivered with minimal disruption to existing rail services. Additionally, a single capital cost estimate has been prepared including contingencies appropriate for the level of design development.

**Table 7.1:** GO Expansion Environmental Assessment

Corridor	Project	EA Status	Corridor	Project	EA Status
Barrie	Barrie Rail Corridor Expansion	Complete	Richmond Hill	Bloomington Station	Complete
	Wellington Road / Rail grade crossing separation	Ongoing		RH Train Storage facility on the Richmond Hill Sub for Barrie Trains	Not started
	Davenport Diamond Rail / Rail grade crossing separation	Complete	Stouffville	Steeles Grade Separation, Milliken, Agincourt & Unionville	Complete
	Caledonia GO Station	Complete		Lincolnville Rail Layover and GO Station Improvements	Complete
	Rutherford GO Station improvements/upgrades	Complete		Lincolnville Rail Layover and GO Station Improvements Addendum	Ongoing
Kitchener	Kitchener additional track	Upcoming EA		Scarborough Junction Rail/Rail Grade Separation + Danforth Road/Rail Grade Separation	Not initiated
	Heritage Rd Layover	Upcoming EA	USRC	Union Station Rail Corridor - East Enhancement	Notice of Completion
	Georgetown to Kitchener GO	Upcoming EA		6 SmartTrack Stations	Complete
Lakeshore East	Rail Corridor Expansion from Guildwood to Pickering GO Station	Complete	New Stations	6 GO Stations	Complete
	Rail Corridor Improvements from Don River to Scarborough GO and Danforth GO Station improvements	Complete		GO Rail Network Electrification	Complete
	Oshawa to Bowmanville GO Expansion	Addendum on hold	System-Wide	Electrification Addendum for major bridge modifications and maintenance facilities	Not Initiated
	Rouge Hill Station Pavilion	Addendum on hold			
	Third Track between Whitby Rail Maintenance Facility and Oshawa GO, & 4 platform tracks at Oshawa GO.	TBD			
Lakeshore West	Burloak Rd Grade Separation	Complete			
	Niagara Expansion - Grimsby GO Station	Complete			
	Confederation GO Station	Complete			
	Lewis Road Layover Facility-Phase II Expansion	Complete			
	Kerr St Road / Rail Grade Crossing Separation	Complete			
	Strachan	Complete			
	Niagara Expansion - St Catharines Station	Addendum			
	Niagara Expansion - Niagara Falls Station	Addendum			
	Niagara Expansion - Niagara Falls Layover	Addendum			
	Drury Lane Bridge	Addendum			
	Fourth Mainline Track between Willowbrook and Long Branch	Not initiated			



## 7.2 Procurement

### Overview

The procurement approach for the GO Expansion program has been developed to address the following objectives:

- To achieve effective transfer of design cost and schedule risk to those who are best able to manage them;
- To mobilize private sector and international expertise, where appropriate, to optimize design, delivery and operations;
- To retain control and flexibility to meet future needs; and
- To achieve competitive pricing.

Metrolinx is using a range of contractual models to deliver GO Expansion (illustrated in Figure 7.2). This includes a mix of conventional and Public-Private Partnerships (PPP).

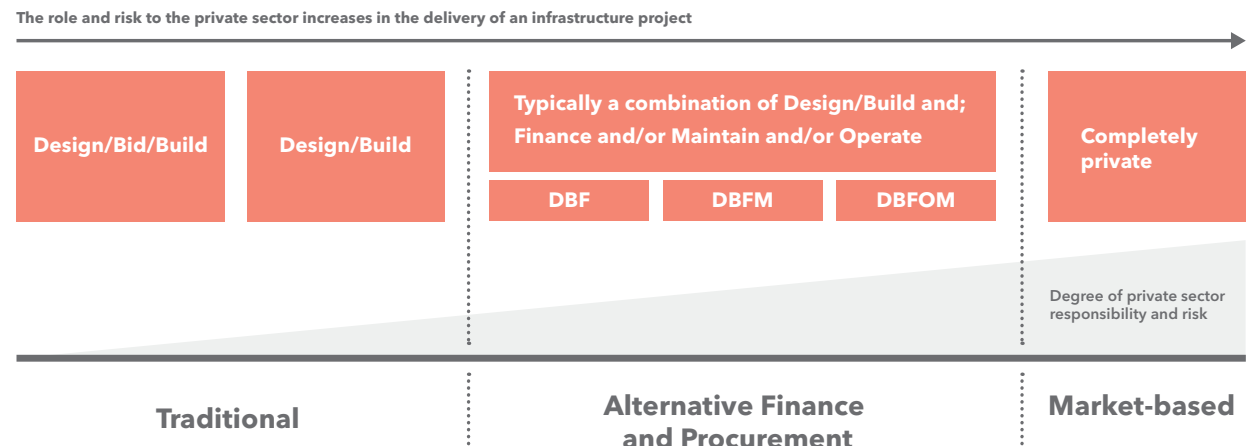
### Conventional Design-Bid- Build (DBB)

Conventional Design-Bid- Build (DBB) procurements are commonly used to deliver public infrastructure, where requirements are clearly defined, integration risks are low, and there are specific detailed requirements and therefore limited potential for design innovation. Private contractors that are selected through a competitive tender process responding to a prescriptive specification. A more permissive Design-Build (DB) model is widely used where the output requirement is clearly defined, for example a road-rail grade separation, but there may be opportunity for innovation in the detailed design

### Public-Private Partnerships (PPP)

PPP models include Design-Build-Finance (DBF), PPP models where contractors must finance work during construction with payment only on substantial completion. This motivates timely project completion. It also includes, Design-Build-Finance-Maintain (DBFM) model, that transfers responsibility for long term maintenance, and Design-Build-Finance-Operate-Maintain (DBFOM) model that also transfers responsibility for long term operations. PPP models can transfer delivery and whole-life performance risks to the contractor. To the extent these risks are transferred, specifications can be less prescriptive and more performance based. This incentivises contractors to optimize their design and delivery approach to maximize long term benefits and minimize life cycle costs.

**Figure 7.2:** Infrastructure Procurement Models



### ***Metrolinx Experience***

Metrolinx has 50+ years of experience in delivering GO rail infrastructure projects, using conventional DBB procurements and has a good record of delivering these works. More recently Metrolinx successfully procured larger and more complex GO rail infrastructure such as the Pearson Airport spur and the Whitby Rail Maintenance Facility using both DBF and DBFM procurements. Metrolinx is leveraging its experience to ensure that the appropriate procurement model is identified for each component of GO Expansion program.

### **Procurement Structure**

The procurement structure of the GO Expansion program has been organized around three overall programs which are described below:

- **Early works** - including both on-corridor and off-corridor civil works such as new track, station improvements, grade separations and utility relocations, that are either enabling infrastructure for future service increases, needed state of good repair improvements or components that can be delivered early, to reduce schedule risk for the program.
- **Off-Corridor**- including customer and safety-related improvements to existing stations and the introduction of new stations that are delivered in partnership with local municipalities and property developers.
- **On-Corridor** - including infrastructure and services required to deliver the train services including civil works, signalling, electrification, control, communications systems and fleet; and services needed to operate and maintain the GO rail service.

### **Early Works**

Early works projects are being delivered through a number of procurement models, including both conventional and PPP procurements. Approximately 40 smaller, more discrete projects are being delivered through conventional Design-Build (DB) and Design-Bid-Build (DBB) procurements. These include items such as vegetation removal to facilitate electrification, double tracking on the Barrie corridor, station redevelopment projects at Rouge Hill and Aldershot stations. In addition, there are 12 larger early works projects being delivered through Build-Finance (BF) and Design-Build-Finance (DBF) procurements. These include items such as additional rail tunnels under Hwy 401 along the Kitchener corridor, rail over rail grade separation at the davenport diamond on the Barrie corridor and track expansion along segments of the Lakeshore East and West corridors.

### **Off-Corridor**

Off-corridor works are being delivered with a mix of conventional and procurements. For existing stations a conventional (DBB) procurement and DBF procurement are each being used to deliver a range of existing station renovations and improvements that include state of good repair improvements, implementation of customer and safety initiatives and expansion of facilities to meet growth in customer demand. Conventional (DBB) procurements are also being used to deliver new stations such as Caledonia GO.

### **On-Corridor**

DBFOM procurement is being used to procure the on-corridor infrastructure, railway equipment and services needed to deliver the GO Expansion program. The contract with the OnCorr Project Co will be structured to ensure the primary integration risk to the program, namely managing a large scale construction project on a live operational network, is properly managed, and the best value for the tax payer can be achieved through innovative design to achieve the desired train service.

Metrolinx will specify the desired train service levels and each proponent team bidding in the procurement will have to develop an integrated solution including an operational plan, fleet strategy, and any additional fixed infrastructure required above and beyond those constructed as part of the enabling works. Project proponents will need to demonstrate that their solution enables all service levels throughout the 30 year contract term and will include infrastructure to be built as part of the Initial Works, and specifying any future construction required to achieve service levels later in the contract term. This long-term approach means that teams will need to consider trade-offs between capital expenditure, maintenance and operating cost to optimize the overall cost of the system.

They will need to consider issues such as ease of operation and maintenance as part of the initial project design. Project proponents will also be required to manage the maintenance of the equipment and infrastructure that they procure and install. This creates a significant incentive to ensure that the equipment and materials chosen are fit for purpose, properly installed, and fully operable and maintainable

### **Industry Capability to Deliver the On-Corridor Procurement**

Before choosing the DBFOM model for the On-Corridor procurement, Metrolinx and Infrastructure Ontario reviewed international experience and conducted market soundings to ensure there are both a capability and an appetite for such a large contract. The response to the market soundings was positive—there is now a global and maturing industry delivering large rail projects. While there is no single directly comparable project, there are many projects recently completed or underway that are similar in relevant scope and cost dimensions. For example:

- **Denver Eagle P3**, a 55km 2-line electrified commuter rail system delivered under a 30 year DBFOM contract. The system opened in 2016. A third line, built under a separate DBFM contract, is almost completed
- **Gautrain**, an 8km 2-line commuter rail system linking Johannesburg, Pretoria, and Oliver Tambo Airport, completed 2012 under a single DBFOM contract. The system is now being extended.
- **Sydney Metro Northwest**, a 36km line being delivered under a single DBFOM contract, under construction

It is expected that OnCorr Project Co will be formed by a consortia of local and international companies, bringing skills in rail systems, construction, railway operation, maintenance, and finance. A Request for Qualifications was issued in early 2018, and Commercial Confidential Meetings were conducted with interested parties to discuss issues including responsibility and risk transfer (utilities, contamination, possession planning, third party operators, legacy infrastructure), debt capacity, and contract flexibility. Metrolinx is now developing contract documents and expects to issue a Request for Proposals to a shortlist of bidding consortia in 2019, with contract award in early 2021.

Metrolinx and IO are considering the appropriate structure to finance the project, to ensure effective risk transfer through the project life while also enabling a wide range of companies to participate in the competition. Figure 7.4 shows a possible contract and financial structure.

## 7.3 Operations and Maintenance

### Overview

The procurement structure for the GO Rail expansion program includes an DBFOM On-Corridor procurement. All bidders for the On-Corridor contract know that they must consider and deliver the GO Expansion works for the full life cycle. Project proponents will need to demonstrate that their infrastructure and operational solution can deliver train service growth throughout the whole contract life of [30] years. This long-term approach means that the project proponents will need to consider issues such as ease of operation and maintenance as part of the initial project design, and creates a significant incentive to ensure that the equipment and materials chosen are fit for purpose, properly installed, and fully operable and maintainable.

The On-Corridor procurement process is deliberately seeking consortia with partners who have significant international experience with the operation and maintenance of highly used rail networks. Future GO Rail services will be much more intensive than current service levels and will require a rapid response to any operational issues. Maintenance on a highly used rail network must be carefully planned and will make use of techniques such as preventative maintenance and remote condition monitoring to ensure failing assets are detected and maintained prior to the point of failure. This requires expertise and experience that is not readily available in the current Metrolinx organization.

The GO Expansion project also entails expanding and upgrading existing rail infrastructure within a live network with ongoing operations—including GO Rail and other companies accessing the network such as VIA, Amtrak, CN, and CP. Hence, it is also important to procure a consortium that is familiar with modernizing an existing system during continued operations.

### Roles and Responsibilities

Given the importance of operations and maintenance activities, a clear definition of roles and responsibilities within the GO Rail expansion program is required. Table 7.2 sets out the high-level roles and responsibilities between Metrolinx and OnCorr Project Co that have already been shared and tested in market. These principles are used to develop Concept of Operations and Concept of Maintenance documents, which are working level documentation that set out the future detailed working arrangements between parties. These documents ensure that each party's accountabilities and responsibilities are fully understood prior to formalizing the Project Agreement.

As the project owner of the On-Corridor procurement, Metrolinx retains accountability for:

- The overall network and the delivery of the GO Expansion (including after OnCorr Project Co is appointed as well as after GO Rail expansion capital works is complete)
- Revenue risk
- Customer Experience
- Final decision of service increases and approval of contractor timetables (allowing flexibility for unanticipated fluctuations in demand)
- Relationship between GO Rail and other rail companies operating throughout the GTHA (i.e. VIA Rail, Amtrak, CN and CP)

**Table 7.2:** On-Corridor Procurement Roles and Responsibilities

Theme	Project Co Responsibility	Metrolinx Responsibility
Operations	<ul style="list-style-type: none"> <li>• Operation of train services, including train driving</li> <li>• Timetable planning, train control and dispatch for all operators across the GO Rail-owned network</li> <li>• Refurbishment, maintenance, servicing and cleaning of all trains, as well as specification and procurement of new trains</li> </ul>	<ul style="list-style-type: none"> <li>• Service specification, including allocation of paths for other operators</li> <li>• Operating GO Bus services, including bus replacement services</li> <li>• Fare retailing, revenue collection and enforcement</li> </ul>
Staffing	<ul style="list-style-type: none"> <li>• Train staff including Customer Service Ambassadors as required to operate doors and accessible ramps</li> </ul>	<ul style="list-style-type: none"> <li>• Train staff including Customer Service Ambassadors as required to operate doors and accessible ramps</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>• Design, build, finance, integration, maintenance, rehabilitation or renewal of assets within the railway corridor (civil infrastructure, tracks, electrification, signalling, trains, etc.)</li> </ul>	
Stations	<ul style="list-style-type: none"> <li>• Reconstruction of Union Station track and platforms</li> </ul>	<ul style="list-style-type: none"> <li>• Station construction, maintenance, and cleaning (except Union Station track and platforms)</li> <li>• Modification of platforms for level boarding</li> </ul>
Maintenance	<ul style="list-style-type: none"> <li>• Construction of new maintenance and train storage and/or layover facilities, if required</li> <li>• Work block (possessions) planning and management</li> </ul>	
Safety	<ul style="list-style-type: none"> <li>• Compliance with safety, security and emergency management policies as set by Metrolinx</li> </ul>	<ul style="list-style-type: none"> <li>• On station safety, security and emergency management</li> </ul>
Other		<ul style="list-style-type: none"> <li>• Customer communications and announcements</li> <li>• Wayfinding, advertising, branding and brand management</li> <li>• Major third-party relationships (e.g. railways, municipalities)</li> </ul>

## Operational Framework

Although OnCorr Project Co will have significant responsibilities, it is always Metrolinx that sets the requirements for Project Co to deliver a reliable service, including setting train capacity, minimum frequency of service and maximum journey times between stations. The details of meeting the specified requirements are then determined by the bidders. To meet Metrolinx's rail operations requirements, a successful bid for OnCorr Project Co will have to consider 3 key elements together to optimize their bidding solution:

- **Train Schedules:** the detailed network train schedule that delivers the service requirements for customers.
- **Fleet and crew resources:** in sufficient quantity to provide the train schedule, plus spares for resilience and maintenance.
- **Fixed Infrastructure:** the track layout, train control system and traction power system on which the fleet and crews operate to deliver the train schedule. This is designed and developed with the capability to deliver some operational resilience and to ensure that required performance and punctuality standards can be met.

Bidders will develop their own detailed schedule that delivers the Metrolinx requirements. The train schedule will accommodate all GO Rail services operated by OnCorr Project Co and need to accommodate the requirements of other passenger and freight operators with contracts allowing them to operate on Metrolinx-owned infrastructure.

Linked to the train schedule is the rail corridor access plan for maintenance and construction. This plan will also be developed to meet Metrolinx specifications. Examples of these specifications include requirements for an adjacent corridor to be kept open to allow a bus bridge across, and planning for closures to allow maintenance access for third parties – such as a municipalities or utility companies.

The fleet size will need to be sufficient to cover the train schedule at all times, including during any required periods of heavy maintenance. This is reflected in the ratio of spare vehicles Project Co will need to have routinely available. The desired electric fleet is expected to include EMUs, which can be operated flexibly and efficiently as short train sets in off-peak times and then combined into longer trains for on-peak hours. Maintenance of new electric fleets and EMUs is estimated to be less costly to perform. The current bi-level coaches are expected to remain in service, with electric locomotives providing some of the motive power to reduce dependency on diesel locomotives. The coaches and diesel locomotives currently in operation will continue to be used on the federally-regulated sections of the network not owned by Metrolinx and coaches will also continue to be used in the peak period on all parts of the GO Rail network.

Fleet maintenance plans will be developed using the current facilities in Etobicoke and Whitby and with potential to out-stable some of the fleet overnight at the ends of the rail corridors for light maintenance and cleaning. This may require upgraded fixed infrastructure to provide adequate tracks for storage, and facilities such as wayside power. Fleet operating crews will be a Project Co responsibility that will be required to meet Metrolinx and other standards. Crew resources will be aligned to the fleet plan and the train schedule. Service will operate throughout weekdays and on weekends across all corridors, with shift patterns for crews maintaining flexibility to meet service requirements.

OnCorr Project Co is accountable for the design, delivery of the new infrastructure required for GO Rail expansion and the maintenance of all On-Corridor fixed infrastructure. This will ensure that designs will take into account ease of maintenance as well as operational capability. Additionally OnCorr Project Co will ensure that all infrastructure, fleet and operations are delivered safely within the context of a Metrolinx Safety Management System.

## 7.4 Risk Management

### Overview

In determining the approach to project delivery for GO Expansion, Metrolinx reviewed the experience of other large and complex rail projects around the world, to develop an approach to effectively manage risks and uncertainties associated with delivering the program.

Metrolinx has implemented an industry standard risk management process for delivery of its capital works known as Integrated Risk Management, which aims to assist the delivery teams to meet risk management objectives via a structured, comprehensive process that focuses on mitigating threats to successful delivery and maximizing opportunities.

The risk management process also informs Metrolinx's contracting strategy with its contractors, with two key principles:

**Risks should be shared in an equitable fashion between the Contracting Authority and the Contracting Market delivering the work on behalf of Metrolinx.**

**Risks should be owned by the party best placed to manage / mitigate them.**

A key driver for choosing a DBFOM contract for the On-Corridor procurement was to manage the risks associated with integration of significant new infrastructure into an operating railway.

A summary of the major categories of risks and associated mitigation are identified below.

### System Performance Risk

New railways may not operate as planned or expected, because rolling stock, signalling, track layouts, and train crew do not perform as assumed.

Provision of a Reference Design to bidder will show one possible way to deliver Metrolinx's output specification, including Train Service Plans and Infrastructure Plans. The Reference Design will be provided "without warranty", ensuring responsibility rests clearly with the contractor. This means Metrolinx will take no responsibility if it does not deliver the required services.

### System Integration Risk

Lack of system integration can cause delays and overruns on large rail projects. For example, when signalling, electrification, tracks and trains are supplied under separate contracts, testing and commissioning is lengthy, and allocating responsibility is challenging. Mitigating system integration risk was a key reason for the decision to procure on-corridor works in a single contract. Payments to OnCorr will be dependent on it delivering punctual and reliable train services, with the speed and frequency that is agreed.

### Construction Disruption Risk

As GO Expansion is being delivered, there will be impacts on the delivery of current service that need to be managed. A Operational Performance Regime will encourage OnCorr to minimize impacts on existing GO riders during implementation.

OnCorr will be responsible for work block planning, both for its own works and for works by off-corridor contractors and third parties. OnCorr will be incentivized through the performance regime to minimize impacts on passenger services. Operating payments will be substantially reduced if OnCorr severely disrupts peak commuter services.

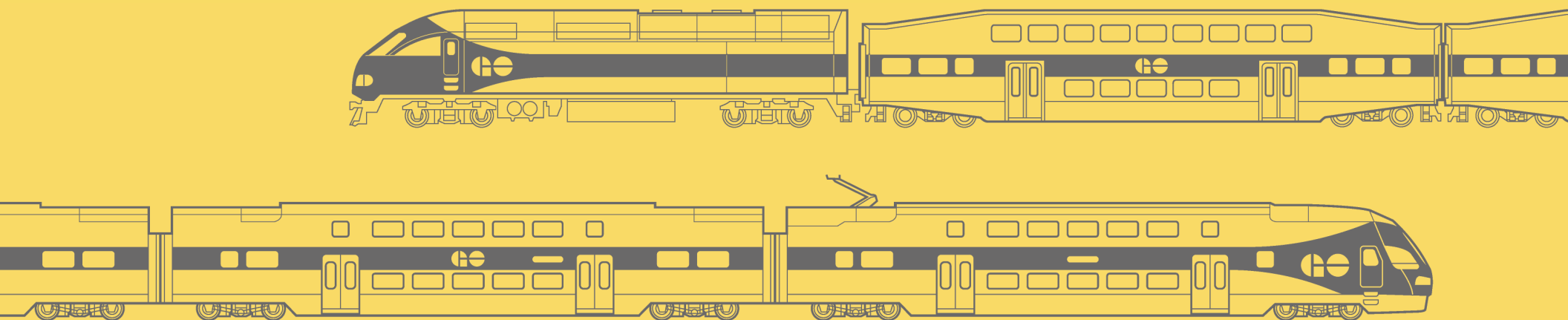
Construction works are planned in close proximity to local communities and may give rise to complaints regarding noise and vibration.

Works will comply with all noise and vibration related regulatory requirements and a construction noise regime will be developed and adhered to in order to manage adverse impact to communities (e.g. nighttime and weekend working).



# 8

## Conclusion





# Conclusion

## Business Case Conclusions

This FBC for GO Expansion builds upon over ten years of study, analysis, design, and investment planning to present a deliverable plan to transform GO Rail into a Rapid Rail system. This transformation is a critical investment that will allow the GTHA to grow by over 40% by 2041 while providing a high quality of life and remaining a competitive place to do business.

The four cases in this FBC together articulate a compelling case to invest in GO Expansion as described in Table 8.1. These four cases demonstrate that GO Expansion is a high value investment – not just for rail passengers, but for the travellers who do not use GO Rail and for the GO Service Region as a whole.

Across the four cases of the this FBC, GO Expansion has been shown to provide:





- **More time with family, for everyone** – travellers using GO Rail will get from where they are to where they want to go an average of 10 minutes faster, while drivers will benefit from decongested roads.
- **More money in pockets** – travellers who switch to GO Rail will save money (a total of \$1.9 billion over the next 60 years) by not paying for gas and parking.
- **More jobs and increased productivity** – investing in rail will create 8,300 new jobs per year in construction and supply-chain industries and make the GTHA a more competitive place to invest and do business.
- **Better business for Metrolinx** – more efficient trains will reduce operating costs and improved service will grow ridership (doubling to over 200 million trips/year by 2055) and revenue leading to a 110% cost recovery over the GO Expansion lifecycle.
- **Opportunities to partner with Private Sector to improve delivery and expand development** – private sector partnerships will minimize delivery risk and support job growth and industrial investment in the GTHA, while ensuring GO Rail service meets customer needs.

## How will the Benefits in this FBC be Realized?

The benefits included in this Business Case are the driving rationale for investment in GO Expansion. Metrolinx has developed a benefits realization program to ensure that as GO Expansion is delivered and enters operations that the region will realize these benefits. Metrolinx will realize these benefits by:

- Setting travel time and frequency requirements for each GO Rail line to ensure the delivered program produces similar travel time savings as defined in this FBC
- Evolving customer experience overtime to ensure GO Rail provided a competitive and traveler friendly experience
- Managing capital and operating cost risk through the P3 process to ensure costs are within the levels outlined within this FBC
- Delivering complementary programs and plans, including GO Station access and Transit Oriented Development initiatives, that will support ridership growth
- Developing additional private partnerships to encourage station development

**Table 8.1:** GO Expansion Business Case Summary

Case	Case Evidence	Conclusions
 <b>Strategic Case</b>	<p>GO Expansion will realize four types of benefits:</p> <ul style="list-style-type: none"> <li>• <b>Transportation Benefits</b> – faster journey times and higher frequencies will double annual ridership to over 200 million (daily trips exceeding 630 thousand, with less congestion for drivers due to 165,000 fewer car trips a day) while ensuring the network has reduced subsidy requirements and can accommodate demand growth past 2055.</li> <li>• <b>Quality of Life Benefits</b> – connecting nearly 30% of the GTHA's population with fast, frequent, and reliable services while also supporting a healthier region by adding 15 million walk and cycle trips to stations a year.</li> <li>• <b>Economic Prosperity</b> – reducing congestion and saving commuters up to 10 minutes a trip while also creating 8,300 annual job equivalents over twelve years in construction and supply-chain industries and decreasing journey times by up an average of 25 minutes between Urban Growth Centres in the off-peak.</li> <li>• <b>Protected Environment</b> – reducing emissions per rail trip by 70% and total Greenhouse Gas emissions by 13.5 megatonnes, while also reducing Criteria Air Contaminants and other pollutants that impact human health.</li> </ul>	<p>These strategic benefits illustrate how GO Expansion will directly address the problem statement:</p> <ul style="list-style-type: none"> <li>• It will provide new transportation choices that can accommodate significant population growth and help tackle congestion.</li> <li>• It will provide the foundations of a region wide Frequent Rapid Transit Network (as described in the 2041 RTP).</li> <li>• It will support the GTHA in maintaining a high quality of life, prosperous economy, and protected environment as its population grows by over 40%.</li> </ul> <p><b>Based on this evidence, the Strategic Case for GO Rail justifies it as an investment to achieve regional policy and realize the benefits of rapid growth.</b></p>
 <b>Economic Case</b>	<p>The Economic Case for GO Expansion assessed a range of benefits and costs:</p> <ul style="list-style-type: none"> <li>• <b>Incremental economic costs of \$16.2 billion</b> over the investment lifecycle</li> <li>• <b>Economic benefits of 42.2 billion</b>, including: <ul style="list-style-type: none"> <li>• Transit user benefits of \$35.4 billion</li> <li>• Road user benefits of \$3.3 billion</li> <li>• Auto Operating Cost savings of \$1.9 billion</li> <li>• Accident reduction and health improvement benefits of \$1.1 billion</li> <li>• Emission reduction benefits of \$330 million</li> </ul> </li> </ul>	<p>GO Expansion's benefits significantly exceed costs:</p> <ul style="list-style-type: none"> <li>• GO Expansion realizes \$42.1 billion in benefits by investing \$16.2 billion resulting in a BCR of 2.6 to 1 - this means for every \$1.00 invested in GO Expansion, the region will benefit by \$2.60.</li> <li>• This is an NPV of \$25.9 billion, meaning a benefit of nearly \$9,000 per household.</li> </ul> <p><b>Based on this evidence, the Economic Case justifies investment GO Expansion as means to realize economic benefits in Ontario.</b></p>
 <b>Financial Case</b>	<ul style="list-style-type: none"> <li>• Without GO Expansion, GO Rail will require a net investment (capital and operating costs minus revenues) of \$16.6 billion over the next 60 years.</li> <li>• GO Expansion requires a net investment of \$21 billion in the same time period, meaning the net incremental investment for GO expansion is \$4.5 billion.</li> <li>• In addition the incremental revenue generated by GO Expansion could allow GO Rail to run without subsidy beyond 2031 and achieve an revenue/operating ratio of 130% by 2055.</li> </ul>	<p>GO Expansion's incremental investment of \$4.5 billion will allow Metrolinx to transform GO Rail from a commuter system into a world class Rapid Rail system that doubles ridership, saves passengers 10 minutes per trip, and realizes significant benefits while reducing the need for operating subsidy.</p> <p><b>Based on this evidence, the Financial Case suggests that GO Expansion is a beneficial investment with a manageable level of required investment.</b></p>
 <b>Deliverability and Operations Case</b>	<p>Metrolinx has conducted extensive project development, environmental assessment, and operational planning projects to ensure GO Expansion is deliverable. In addition, an innovative P3 model will minimize risk and support delivery on time and budget.</p>	<p>GO Expansion has undergone significant development – from a technical design perspective as well as from a project governance and procurement practice that draws from international best practice.</p> <p><b>Based on this evidence, the Deliverability and Operations Case, is found to demonstrate GO Expansion is readily deliverable.</b></p>

**Recommendations**

Based on the performance across these four cases, Metrolinx will submit this FBC to the Minister of Transportation to inform decision making on future transportation investment.

**Next Steps**

Following Metrolinx's stage-gate process, the GO Expansion program will continue to progress through several next steps:

- The program is moving forward to the Province for decisions, informed by this Full Business Case.
- As of November 2018, Metrolinx is conducting a Request for Qualifications (RFQ) process to shortlist potential partner consortiums to deliver the GO Expansion program.
- Pending approval by the Province and the successful shortlisting of potential partners, Metrolinx will launch a Request for Proposal (RFP) for GO Expansion.
- Metrolinx will develop a benefits realization plan to ensure that the benefits described in this FBC are protected through the procurement process.
- If significant changes are made to the program during procurement, an updated Full Business Case will be produced.
- Once the program is in service, Metrolinx will produce a Post In-Service Business Case to review the actual costs and performance of the program.





### Acknowledgements

Metrolinx would like to thank several firms that provided significant support in producing the GO Expansion Full Business Case:

- **First Class Partnerships**
- **Steer**
- **EY**
- **Jacobs**

The business case also benefited from insights provided by Metrolinx's Capital Oversight Committee:

- **Sarah Clark**
- **Howard Permut**
- **Michael Lewis**
- **Ed Martin**
- **Howard Shearer**
- **Bryan Davies**

Finally, the GO Rail Expansion Full Business Case has been independently peer-reviewed. The focus of the peer review was to confirm that the evidence provided in the business case is robust and constitutes high quality transport appraisal to inform decision-making. The feedback received was considered during the development of the final version of this document. We would like to take this opportunity to thank Martin Gray and Associate Directors Samantha Hernandez and Martin Smith from Steel Associates Limited, and Richard Davies, a freelance specialist in rail strategy, bidding and economics for their contributions to this peer review.



# Glossary

<b>Active Transportation</b>	As defined in the Provincial Policy Statement (2014): human powered travel, including but not limited to walking, cycling, inline skating, and travel with the use of mobility aids, including motorized wheelchairs and other power-assisted devices moving at a comparable speed.		
<b>Business As Usual</b>	<i>A scenario used in Business Case analysis that reflects the future state of the region (including population, employment, and the transportation network) without the investment that is appraised in the Business Case. In this document, Business as Usual (BAU) refers to the future state of the region and GO Rail without GO Expansion.</i>	<b>First- and last-mile</b>	This describes the challenge of moving people between transit stations, mobility hubs, or fixed-route transit services and their home, workplace or other major destination. The concept applies broadly to making improvements in transit access for all people trying to reach transit regardless if they live within one mile of a transit station or mobility hub. Alternatives to driving and parking a car can be advanced with, for example, programs that support carpooling; well-maintained infrastructure that facilitates walking and cycling, prioritizes transit access; and initiatives that support new mobility, like on-demand shuttle services. It can also describe moving goods between major intermodal hubs, such as rail yards and airports, and their final destination, such as retail stores, restaurants or even customers' homes
<b>Benefit Cost Ratio</b>	An economic indicator that reflects the relationship between benefits and costs of an investment. A BCR greater than 1 indicates the projects benefits exceed costs.		
<b>Bus Rapid Transit</b>	Transit infrastructure and service with buses running in their own exclusive right-of-way, fully separated from traffic, typically with signal priority measures in place and longer spacing between stops than conventional bus routes (typically 500 metres to 1 kilometre) to maintain higher average speeds and ensure reliability of the service	<b>Full Business Case</b>	This Business Case aligns with the part four of Metrolinx's stage gate process (Design and Procurement Preparation). The Full Business Case advances an investment to procurement and funding by confirming its scope, benefits, costs, and delivery approach.
<b>Criteria Air Contaminants</b>	Pollutants that contribute to smog, acid rain, and human health impacts.	<b>Greater Golden Horseshoe Model</b>	A transportation demand model used for investment analysis and long range planning.
<b>DBFOM</b>	A procurement approach where a private partner (typically a consortium of companies) is responsible for designing, building, financing (partially or completed), operating, and maintaining an investment for a set contract period.	<b>Greater Toronto and Hamilton Area</b>	The combined area of Hamilton, Halton Region, Peel Region, York Region, Durham Region, and Toronto.
<b>Design Excellence</b>	A strategy to deliver seamless integrated transportation systems to the traveller. It is inclusive of architecture, urban design, landscape architecture, signage and wayfinding, and integration of public art. Design excellence encompasses all of the touch points at which the traveller interacts with the transportation system, including delivery of: universal access and accessibility, fare integration, safety and comfort, trip planning and integrated technology.	<b>Greenhouse Gases</b>	Emissions that contribute to climate change.
<b>Electric Multiple Units</b>	Electric trains where traction power is supplied by multiple train car, as opposed to locomotives at the front or back of the train.	<b>Hydrogen Powered Trains</b>	Trains that use hydrogen fuel cell powered engines for traction power. Also referred to as "Hydrail".
		<b>Initial Business Case</b>	The first Business Case prepared for a project in line with part two of Metrolinx's stage gate process (Feasibility and Options Analysis). This Business Case compares potential investments to identify if there is merit in further design and development.



<b>Light Rail Transit</b>	Transit infrastructure and services consisting of light rail vehicles running in an exclusive right-of-way, fully separated from traffic, typically with transit signal priority measures in place and longer spacing between stops than conventional transit routes (typically 500 metres to 1 kilometre) to maintain higher average speeds and ensure reliability of the service.	<b>Transit Oriented Development</b>	Developments that are planned and designed to integrate with transit in order to encourage increased ridership and compact mixed-use developments.
<b>Mode Share</b>	<i>The percentage of person-trips made by one mode of travel relative to the total number of trips made by all modes.</i>	<b>Urban Growth Centres</b>	<i>Existing or emerging downtown areas shown in Schedule 4 in the Growth Plan for the Greater Golden Horseshoe, 2017, and as further identified by the Minister (of Municipal Affairs) on April 2, 2008. They represent twenty-five downtown areas that are intended to be mixed-use, high-density, and transit-supportive focal points for residential and employment growth and intensification in a municipality.</i>
<b>Net Present Value</b>	The total economic value of a project. Determined by subtracting project costs from its total benefits. A positive Net Present Value indicates that the project's benefits exceed its costs.	<b>Vehicle-Kilometres Travelled</b>	A measure of roadway use, commonly used in estimating congestion, that reflects the distance that an individual drives, or, more typically, the cumulative distance driven by all vehicles in an urban region during a specified period of time. Vehicle kilometres travelled can reflect the link between land use and transportation. Land uses that are further away from each other result in longer trip lengths, more traffic on roadways and more vehicle kilometres travelled, for example
<b>Preliminary Design Business Cases</b>	This Business Case is aligned with step three of Metrolinx's stage gate process (Preliminary Design) and develops a more detailed design for one or more investment options discussed in an Initial Business Case. It is used to secure funding for a potential investment.	<b>Wider Economic Impacts</b>	Benefits from investing in transportation that lead to a more productive region. Typically these benefits include agglomeration (enabling increased innovation, collaboration, and productivity) and labour supply benefits (increased job access for employee and a larger labour pool for employers).
<b>Reference Concept Design</b>	The Reference Concept Design illustrates how an investment be delivered. This reference concept design is used to: <ul style="list-style-type: none"> <li>• Demonstrate that a working approach to deliver GO Expansion is possible.</li> <li>• Determine a budget and construction schedule to be approved by Treasury Board.</li> </ul>		
<b>Transportation Demand Management</b>	As in the Provincial Policy Statement (2014), a set of strategies that result in more efficient use of the transportation system by influencing travel behaviour by mode, time of day, frequency, trip length, regulation, route, or cost. Examples include: carpooling, vanpooling, and shuttle buses; parking management; site design and on-site facilities that support transit and walking; bicycle facilities and programs; pricing (road tolls and/or transit discounts); flexible working hours and telework; high occupancy vehicle lanes; park-and-ride; incentives for ridesharing, using transit, walking and cycling initiatives to discourage drive alone trips.		

## Appendix: Peer Review

### Overview of the GO Expansion Business Case Peer Review

#### Introduction

Metrolinx engaged two independent professionals to undertake a peer review of the GO Expansion Full Business Case:

- Richard Davies is a freelance specialist in rail strategy, bidding and economics. He recently supported the United Kingdom's Department for Transport's DfT Rail's Passenger Services team on franchise policy, including the design of the new West Coast Partnership for services on the new high speed railway that the UK is building, and was previously Chief Economist of the UK's Strategic Rail Authority.
- Martin Gray is the founder and Managing Director of Steel Associates Limited, a boutique management consultancy based in London. Supported by Associate Directors Samantha Hernandez and Martin Smith, their achievements include taking the lead on high-value projects within High Speed 2, Crossrail, Network Rail, Transport for London, Heathrow Express, Houses of Parliament and Paddington Station Commercial development.

The primary focus of the peer review was to determine whether the evidence and information provided in the GO Expansion Full Business Case is robust and constitutes high quality transport appraisal to inform decision-making. We would like to take this opportunity to thank Martin Gray and associates, and Richard Davies for their contributions.

#### Peer Review Process

The review comprised of three broad tasks:

- Review the content of an early draft of the GO Expansion Full Business Case.
- Develop a report outlining the outcome of the peer review including any suggested modifications and feedback, considering areas of input Metrolinx had identified.
- Provide any comments directly to the GO Expansion Full Business Case document that complement the reviewers report.

The peer reviewers were asked to critically assess the overall document including the Context Chapter, Proposed GO Expansion program Concept Chapter, Strategic Case, Economic Case, Financial Case, and the Deliverability and Operations Case.

Generally, the review focussed on whether the business case captured the foundational and essential elements required for the GO Expansion Program, ensuring there were no missing elements. It was also important to determine whether the GO Expansion Full Business Case is of the best standards for transportation appraisal for major infrastructure investments.

With the business case provided in draft, reviewers were advised that the document's visual design would be further optimized once final document inputs were available. The version of the business case provided did not include an executive summary, conclusion, table of contents, glossary, and table of figures/tables; all of which were developed upon final inputs. During the peer review process, the Metrolinx team and the peer reviewers held a series of discussions to discuss the results and findings of the peer review.

## Overall Comments

- Both reviewers agreed the business case is expansive in content, covers many areas expected in the Full Business Case and is akin to the five-case method used in the UK for project business cases (a requirement of the UK Treasury's Green Book Guidance).
- Both reviewers commended the use of infographics, which helps illustrate many of the key points of the program and help explain generally complex issues.
- Generally, the material was clear and much of the necessary content was included. However, reviewers suggested improving the narrative, that is, when details are provided 'in the story' and providing insight to the centrality of the project to the region/public.
- Both reviewers identified the Economic Case as being most robust while the Deliverability and Operations Case needed further development. Reviewers offered suggestions to appropriately strengthen content of the Deliverability and Operations Case.

## Some Key Findings and Recommendations

The following are excerpts from the final peer review reports. It is important to note, this reflects only a portion of their comments.

### *Richard Davies*

- "The case is well presented and does a good job in weaving together the many aspects of the scheme, including project planning, governance, service development and construction and setting in the context of the Toronto area's transportation priorities. The material is generally very clear, with many pertinent facts and insights in tables and call-out boxes which help illustrate many of the key features of the case. The use of infographics is excellent, and they help illustrate many of the key points of the scheme".
- "The document reflects the five-case method used in the UK for project business cases (a requirement of the UK Treasury's Green Book guidance)".
- **The Strategic Case:** "Some more insights about the centrality of the project to the economic development of the region, particularly Toronto itself, would be helpful. Without the scheme economic and employment growth would be constrained, potentially to a greater extent than brought out in the case so far".
- **The Economic Case:** "The forecast growth in off-peak demand is considerable, but needs to be set in context with the lack of significant off-peak GO Rail service at present" and "some monetary amounts are in NPV terms and others are not; this should be clarified in the text".
- **The Financial Case:** "More might be said on the basis of the capital cost estimates, i.e. on what basis they are being judged to be reasonable, what contingencies are being allowed for and the costs of disruption during scheme construction. If the approach to contingencies is through the use of a DBFOM approach, then some assurance (from early supplier engagement) that these risks can reasonably be absorbed might be provided".
- **The Deliverability and Operability Case:** "It would be good to set out as clearly as possible why the proposed DBFOM approach is likely to be the best compared with eg. direct programme management and operation" and "It's not really at a stage a typical FBC procurement case would be at in the UK context and the impression created in the document is that there is more work needed before final decisions are taken. Given the complexity of DBFOM contracts, this seems sensible".

***Martin Gray and associates from Steel Associates Limited***

- “The Review Document is expansive in content and covers many areas expected in a Full Business Case (FBC). Many of the infographics are well thought out and help the understanding of what can be complex issues”.
- “The basic structure of the FBC is good (as discussed in the General Observations section above). It aligns with the UK Government’s Green Book guidance for business cases which adopts a 5 case model, very similar to that used in this document. Whilst there is no reason for this FBC to follow the prescribed UK model, the structure is well proven and provides a robust framework for investment decisions”.
- The underlying readability of the document could be improved with restructuring, building narrative through the document. Noting, the context of each chapter needs to be explained in full, before proceeding into the details. The Peer Reviewer offered structural changes for each chapter.

- **The Strategic Case:** “although quite extensive, is largely inward looking. It would benefit from focussing on how the Program will deliver the wider strategic vision and development objectives for the Greater Toronto and Hamilton Areas, and the criticality of how the GO Expansion Program is fulfilling that objective”.
- **The Economic Case:** “would be more accessible to the layman if it followed a more evolving narrative that combines an explanation about the purpose and methodologies of the Economic Case, as well as documenting the key assumptions and findings of the analysis”.
- **The Financial Case:** “must address the real fiscal impact of the Program and must therefore be as comprehensive and robust as possible. In practice, it is better to seek to over deliver in this Case, demonstrating how key estimates have been validated against national and international benchmarks”.
- **The Deliverability and Operability Case** needs to develop elements such as: a Procurement Plan with “specific activities, owners and timescales against which progress and success can be measured”; “Evidence of active risk identification and management”; and, “activities that might be considered as part of the Management Case”.

**Conclusions**

The comprehensive reports of each peer reviewers were an essential part of the revisions made to the draft GO Expansion Full Business Case and informed the refinements made to the final published version of the document. Their recommendations were considered by staff and applied appropriately. Metrolinx will continue to use peer reviews as an important resource for business cases.



