METROLINX

Final Report

Transit Needs and Opportunities

Background Paper for the Regional Transportation Plan Review

IBI

Prepared for Metrolinx
by IBI Group

Table of Contents

Executive Summary **1**
Transit in the Greater Toronto and Hamilton Area: a decade of progress 1
Future growth presents both challenges and opportunities for transit 1
Moving towards a region connected by rapid transit 2
Identifying needs and gaps 2
Matching needs to opportunities 3

1 Introduction **5**
1.1 An Opportune Time to Review Transit in the GTHA 5
1.2 Regional Transportation Plan Review Process 5
1.3 Regional Transportation Plan Goals and Objectives 6
1.4 Organization of Report 8

2 Background **9**
2.1 Transit Service in the GTHA 11
2.2 Transit Network Hierarchy 13
2.3 Municipal Transit Service Planning Strategies 19
2.4 Transit Use in the GTHA 21
2.5 Urban Density and Transit 22
2.6 Cost Effectiveness and Transit Productivity 25

3 Future Outlook **29**
3.1 Growth Trends 29
3.2 Committed Transit Improvements 33
3.3 Role of Regional Express Rail (RER) 36
3.4 Travel Trends in the GTHA 39

4 Assessment of Needs **45**
4.1 Connectivity 46
4.1.1 Transit Network Coverage 46
4.1.2 Accessibility by Transit 50
4.2 Transit Capacity Needs 54
4.3 Travel Time Competitiveness 57

Table of Contents (continued)

4.4 Transit Travel Time Benefits from Committed Improvements 60
4.5 Social Equity 63

5 Transit Opportunities and Key Strategies 67
5.1 Matching Needs to Opportunities 67
5.1.1 Creating a more connected transit network 67
5.1.2 Enhancing transit capacity to address existing and future needs 68
5.1.3 Improving travel time competitiveness of transit 69
5.1.4 Targeting transit improvements to address social equity 70
5.1.5 Influencing travel behaviour 71
5.2 Key Strategies 71
5.2.1 Strategy 1: Expanding the Frequent Transit Network 72
5.2.2 Strategy 2: First-mile last-mile solutions 74
5.2.3 Strategy 3: Demand-Responsive Transit Services 74
5.2.4 Strategy 4: Improving and extending regional transit services 75
5.2.5 Strategy 5: Expanding the rapid transit network 76
5.2.6 Strategy 6: Expanding Express Services 77
5.2.7 Strategy 7: Transportation Systems Management (TSM) 78
5.2.8 Strategy 8: Fare Integration 79
5.2.9 Strategy 9: Road User Pricing 80
5.2.10 Strategy 10: Parking Pricing 80
5.2.11 Strategy 11: Transit pricing 80
5.2.12 Strategy 12: Transit-Supportive Policies and Initiatives 80
5.3 Summary and Potential Focus Areas for the 2017 RTP 81

Table of Contents (continued)

List of Appendices

Appendix A – Summary of Transportation and Land Use Statistics by Regional Municipality....82
Appendix B – Summary of Key Indicators for Areas in Need of Transit Improvements.....84
Appendix C –Transit Coverage Statistics for the GTHA.....86
Appendix D – Images Illustrating Urban Density.....89
Appendix E – Ward Boundaries in the GTHA.....92

List of Exhibits

Exhibit 2.1: Map of GTHA showing municipal boundaries, urban densities in the urbanized area[1], as well as existing regional rail and rapid transit lines in 2011..... 10
Exhibit 2.2: Table showing number of routes, service area, and recent service enhancements of each transit service provider in the GTHA 11
Exhibit 2.3: Map showing transit agency boundaries in the GTHA..... 12
Exhibit 2.4: Table showing classification structure of transit routes in the GTHA 13
Exhibit 2.5: Map of regional and rapid transit routes in the GTHA as of 2011 15
Exhibit 2.6: Map of express transit routes in the GTHA as of 2014..... 16
Exhibit 2.7: Map of frequent local transit routes in the GTHA as of 2014..... 17
Exhibit 2.8: Map of non-frequent local transit routes in the GTHA as of 2014 18
Exhibit 2.9: Indexed annual transit ridership and population growth in Toronto and the rest of the GTHA, 2004 – 2014 21
Exhibit 2.10: Trips made in the 6:30 a.m. to 9:30 a.m. peak period in the GTHA, 2001 and 2011 22
Exhibit 2.11: Urban densities that are most conducive to various transit service levels ... 23
Exhibit 2.12: 2011 population and jobs in Toronto, the GTHA excluding Toronto, and the GTHA, grouped by urban density 23
Exhibit 2.13: Morning peak period transit mode share in each GTHA ward versus average urban density..... 25
Exhibit 2.14: Changes in service area population and revenue vehicle kilometres, 2004-2014 26

Table of Contents (continued)

Exhibit 2.15: Increase in transit ridership, operating costs and operating revenues for agencies in the GTHA, 2004-2014 26

Exhibit 2.16: Transit productivity of municipal transit agencies in the GTHA, 2004-2014 . 27

Exhibit 2.17: Operating cost per revenue passenger in 2008 and 2014 27

Exhibit 2.18: Relationship between urban density in urbanized areas of the GTHA and transit operating cost 28

Exhibit 3.1: Growth in population and employment across the GTHA, 2001-2041 30

Exhibit 3.2: Average urban densities in upper and single tier municipalities in the GTHA, 2011 and 2031 30

Exhibit 3.3: Map of GTHA showing transit supportive areas in 2031 and 2011 31

Exhibit 3.4: 2011 and 2031 population and jobs in Toronto, the GTHA excluding Toronto, and the GTHA, grouped by urban density 32

Exhibit 3.5: List of planned and funded rapid transit improvements to be completed by 2031 in the GTHA 33

Exhibit 3.6: Map showing the committed rapid transit network in the GTHA 35

Exhibit 3.8: Transit mode shares of all trips starting or ending in each zone in the GTHA, 2011 AM Peak Period (TTS Actual) 41

Exhibit 3.9: Mode shares and trip volumes in the GTHA, 2031 43

Exhibit 3.10: Transit mode share of all trips to and from zones in the GTHA, 2031 AM Peak Period (Modelled) 44

Exhibit 4.1: Share of people and jobs within 800 m of rapid transit stations in the GTHA, 2011 and 2031 47

Exhibit 4.2: Map showing rapid transit coverage in the GTHA in 2031 with the committed transit improvements 48

Exhibit 4.3: Share of people and jobs within 400 m of a frequent transit route in the morning peak period in the GTHA, 2011 49

Exhibit 4.4: Average number of jobs accessible by transit within 45 minutes and within 90 minutes, as well as the percentage of all GTHA jobs accessible 50

Exhibit 4.5: Map showing number of jobs accessible per resident by transit within 45 minutes in the a.m. peak period, and population dot-density, 2011 51

Exhibit 4.6: Map showing number of potential workers accessible per job by transit within 45 minutes in the p.m. peak period, and job dot-density, 2011 53

Exhibit 4.7: Transit ridership on municipal transit routes where demand will exceed 1,000 in the AM Peak Period in 2031 55

Exhibit 4.8: Transit capacity observed in North America by service type 56

Table of Contents (continued)

Exhibit 4.9: Average travel times by car and transit in the a.m. peak period in 2031 with and without current committed projects 58

Exhibit 4.10: Map of ratios of transit travel time to auto travel time, along with population dot-density, 2031 a.m. peak period..... 59

Exhibit 4.11: Transit travel time saved with introduction of the committed transit projects, 2031 a.m. peak period 62

Exhibit 4.12: Transit and auto travel characteristics for sample trips from low-income areas 63

Exhibit 4.13: Map of GTHA highlighting areas in the lowest quartile of equivalent income that also lack good access to transit..... 65

Exhibit 5.1: Summary of key opportunities along with the needs that they will address ... 71

Exhibit 5.2: Areas of opportunity to expand the grid of frequent transit routes, anchored by GO RER 73

Exhibit C1: Share of people and jobs in GTHA served by transit by transit service category, 2011 87

Exhibit C2: Share of people and jobs in Toronto served by transit by transit service category, 2011 87

Exhibit C3: Share of people and jobs in the 905 served by transit by transit service category, 2011 87

Exhibit C4: Share of people and jobs in the GTHA that will be within 800 m of a rapid transit station in 2031..... 88

Exhibit C5: Share of people and jobs in Toronto that will be within 800 m of a rapid transit station in 2031..... 88

Exhibit C6: Share of people and jobs in the 905 that will be within 800 m of a rapid transit station in 2031..... 88

Exhibit E1: Map showing municipal wards in Toronto 93

Exhibit E2: Map showing municipal wards in Peel Region, Halton Region, and Hamilton 94

Exhibit E3: Map showing municipal wards in York Region..... 95

Exhibit E4: Map showing municipal wards in Durham Region 96

Executive Summary

A review of the first Regional Transportation Plan (RTP) for the Greater Hamilton and Toronto Area (GTHA), *The Big Move*, is underway. The review of the RTP provides an opportunity to take stock of and build on the foundation of Big Move projects. It supports working together as a region toward the completion of an updated RTP in 2017.

Transit in the Greater Toronto and Hamilton Area: a decade of progress

The last decade has seen many positive changes for transit. All service providers have experienced steady growth in ridership, particularly GO Transit and municipal transit operators outside of the City of Toronto where population and employment growth is highest. Across the GTHA, ridership growth has outpaced population growth, meaning more people are turning to transit on a regular basis. Between 2004 and 2014, the Toronto Transit Commission (TTC) saw a 28% increase in transit ridership compared to a 13% increase in the City of Toronto's population. For municipal service providers outside of Toronto, ridership increased by 50% compared to a 20% increase in service area population. During the same period, GO Transit ridership grew by 44%.

A large part of the increases in ridership are a direct result of investments in transit service. Municipal transit agencies in the GTHA increased revenue vehicle kilometres (a standard measure of service) by 67% between 2004 and 2014. GO Transit more than tripled the amount of service during this period, including significant increases in off-peak service.

Despite these positive trends in ridership, there remain challenges. Investments in service come at a cost and over the last decade operating costs have been increasing much faster than ridership and revenue. This is particularly the case for municipal service providers outside of Toronto, where service has expanded to lower density areas that are less efficient to serve. In 2014, the average gross operating cost per passenger on the TTC was $2.88 compared to an average cost of $5.30 for municipal transit agencies in the rest of the GTHA.

Future growth presents both challenges and opportunities for transit

The GTHA's population is expected to grow from 7.2 million people in 2015 to 10.1 million people in 2041, outpacing the consumption of greenfield land and resulting in an increased population density that is more evenly distributed across the region. Approximately 80% of the GTHA's projected population growth will occur outside the City of Toronto. This represents a major challenge since transit currently accommodates a relatively low proportion of trips (6%) in these areas. Travel within municipalities outside Toronto is both the largest and fastest growing travel market, and by 2041, almost twice as many people will work outside Toronto as within the City. Overall, travel patterns in the future will be more complex with transit needing to connect many more origins and destinations than today.

However, this growth is also making some of these communities more supportive of alternative transportation options. Policies for more compact development, intensification and mixed use established by the *Growth Plan for the Greater Golden Horseshoe* are taking effect. This continued intensification will improve the cost effectiveness of transit. By 2031, approximately 58% of residents and 54% of jobs across the GTHA will be in areas with densities above 50 persons+jobs per hectare, a level which is conducive to the efficient operation of transit at attractive service levels. Notwithstanding this, a large portion of the GTHA's population and

employment will still be in areas that are challenging for transit, pointing to the need to find more cost effective ways to service these areas.

Moving towards a region connected by rapid transit

In 2008, *The Big Move* recommended a dramatic expansion of major transit infrastructure across the region in response to the need to "catch up with growth" and develop a more connected transit network. As of today, Metrolinx and municipal transit partners have committed to investing in 350 km of rapid transit across the GTHA, including over 200 km of frequent, electrified regional rail service.

With these improvements, 1.8 million residents and 1.4 million jobs will be within 800 m of rapid transit service in 2031—equivalent to about 21% of all GTHA residents and 33% of jobs. Additional rapid transit projects in the planning stage that currently lack funding commitments could conceivably be funded and completed by 2031, which would push these figures higher. This is a significant expansion over 2011 rapid transit coverage of 9% of people and 19% of jobs. An expanded rapid transit network improves access to jobs, improves the speed and reliability of transit, and helps to address capacity constraints on the existing system.

Dramatically expanded GO rail service is a cornerstone of the future rapid transit network. The GO Regional Express Rail (RER) program represents a fundamental transformation of the GO rail system from commuter rail to all-day regional transit service. The GO RER program includes the introduction of electrified service running every 15 minutes or better throughout the day in both directions over the core segments of the GO network, with all-day, two-way service at lower frequencies extending beyond these segments to cover much of the remaining network. Peak-period peak-direction services will also be increased along all seven GO corridors, and the rail network will be extended to introduce peak services to such GTHA communities as Stoney Creek and Bowmanville. New GO stations on both new line extensions and at strategic infill locations will expand access to the regional rail system. Working in combination with other rapid transit corridors, GO RER is a catalyst for increases in local transit service with the potential shape both land use and transportation patterns. GO RER fills a gap in the higher order transit network and enables municipal service providers to better integrate local transit and higher order modes.

Identifying needs and gaps

Committed transit improvements represent a major investment, but they are only just enough to keep pace with population growth. Forecasts show that with committed transit improvements in place, transit mode shares will hold steady at 18% through to 2031. While this is represents large increases in absolute transit use and a significant achievement given the patterns of growth, the implication is that growth in auto trips will continue to outpace growth in transit trips when measured in absolute terms.

Recognizing this challenge, one of the primary objectives of the transit needs and opportunities study is to examine areas where transit can do better. This requires a bottom-up approach to examine the factors that could attract new riders while also investing in those who are already using transit today, providing them with greater access, frequency, reliability, speed, affordability, comfort and convenience.

The report focuses on four main indicators to identify areas of need and areas for potential improvement. These include:

- **Connectivity:** How easy is it to get to transit and how well does transit connect people and jobs?

- **Capacity:** Where is the transit system not providing sufficient capacity and in turn affecting reliability and comfort?
- **Travel time competitiveness:** How well does travel by transit compare to travel by car and what areas are not benefitting from committed rapid transit improvements?
- **Social Equity**: How can transit be improved to benefit areas with lower incomes and higher social needs?

The report adopts a quantitative approach using data and maps to illustrate how each area of the GTHA performs against these indicators.

Matching needs to opportunities

The analysis of the core transit indicators across the GTHA revealed that a variety of strategies are needed to address existing and future needs. In many cases, needs can be addressed by enhancements to local transit service, or by combining enhanced local service with other options. In other cases, such as higher growth areas or existing areas with low transit accessibility, more transformative changes will be required.

Based on the assessment of needs, and considering the growth challenges in the GTHA, seven core strategies for the transit network are recommended:

- **Expanding the frequent transit network**: A Frequent Transit Network (FTN) is generally understood to be composed of those corridors where people can expect convenient, reliable, easy-to-use services that are frequent enough (typically every 10 minutes or less) that they do not need to refer to a schedule. Many areas of the GTHA could support an expanded FTN which would improve the connectivity of the transit system.
- **Improve first-mile and last-mile connections:** Successful public transit systems need to offer safe and accessible connections to transit stops and stations for both pedestrians and cyclists. First-mile/last-mile challenges can also be addressed by emerging technologies including ridesharing, demand-responsive transit and, in the foreseeable future, autonomous vehicles. Essentially all parts of the GTHA's transit system can benefit from improved first-mile/last-mile connections.
- **Demand-responsive transit:** The advent and widespread adoption of smartphone technology and its various applications has stimulated the advancement of several new technology-enabled transportation modes and services. Advancements in this technology have enabled ridesharing and demand-responsive services to be dynamic and user-friendly while optimizing scheduling and service logistics. These technologies offer the potential augment or replace traditional transit services in lower demand areas or where more frequent and flexible connections to major hubs are desired.
- **Improving and extending regional transit services:** Regional transit routes are currently comprised of GO rail lines and GO bus routes. The implementation of GO Regional Express Rail (RER) will greatly enhance options for regional travel by facilitating two-way travel along most corridors and providing much needed additional capacity for peak direction trips. Further improvements to regional services will help to reduce travel times for longer distance transit trips and improve transit access to key employment areas. An expanded network of **express bus services** would be a key component of an improved regional transit network.
- **Transportation Systems Management**: TSM measures focus on operational and policy changes for smoother and safer traffic movements by private vehicles, public

transit, cyclists and pedestrians, while also improving the utilization (occupancy) of vehicles and their throughput volumes where possible. Opportunities to enhance the effectiveness of TSM have been increased in recent years by significant technological developments (e.g. smart, real-time data collection, traveller information, and traffic control). TSM has the potential to address many areas of need especially travel time competitiveness and capacity.

- **Expanding the rapid transit network:** The 2008 RTP placed a strong emphasis on building a comprehensive rapid transit network (Big Move Strategy #1). This strategy is now being realized with the construction of several new rapid transit lines. Additional rapid transit projects may be justified in some areas where they are able to deliver improved connectivity, capacity and travel times.
- **Fare integration**: Improved fare integration is a key priority for Metrolinx. Improvements to the fare system—including potential changes to the structure, fare products, concessions and payment system—can simplify the passenger experience, improves the value of services a user experiences and promote regional integration by supporting a common fare medium and structure across the GTHA.

Consistent with the 2008 RTP these transit network strategies must be supported by other strategies to influence travel demand and maximize investments in the transit network including road use pricing, parking pricing, transit pricing and transit-supportive policies and initiatives. While this analysis of regional transit needs and opportunities will inform the updated RTP, it is only one part of a larger RTP development process that will consider many other factors, including provincial plans, policies, strategies, guidelines and priorities, municipal official plans and transportation master plans, and other stakeholder input.

1 Introduction

1.1 An Opportune Time to Review Transit in the GTHA

The Greater Toronto and Hamilton Area's first Regional Transportation Plan, *The Big Move*, was approved by Metrolinx in 2008. It contained a vision statement for a more coordinated, efficient and sustainable transportation system articulated by ten core strategies.

The Big Move covers all modes including transit, roads, active transportation, and goods movement; with transit as a central focus. Strategy # 1: "Build a Comprehensive Regional Rapid Transit Network" has been the most discussed aspect of the plan and the outcome of this strategy and priority action # 1.1 under it: - "A fast, frequent and expanded regional rapid transit network" - are now being realized.

The 2008 RTP was developed at a time when studies were showing that severe traffic congestion was having significant impacts on the economy and that incremental improvements to the transportation system would not suffice. It also came after a period of relatively constrained capital investments in rapid transit. Many rapid transit projects were in the early planning stages, or identified on regional official plans, but few were advancing. Thus, planning and advancing rapid transit projects was a key focus of the plan.

Fast forward eight years to 2016, and it is evident that *The Big Move* has had an impact. Over 350 km of new rapid transit is in operation, under construction, or with committed funding. This includes 200 km of frequent, electric regional rail service, which was first established as a concept through *The Big Move* and is planned to be implemented through the GO Regional Express Rail (RER) program within the next ten years. Complementary to these advancing rapid transit projects are ongoing improvements to enhance regional transit connections, including GO bus improvements, a new connection to Pearson Airport in the form of UP Express and various improvements to address last-mile connections.

Looking ahead, a key question remains: Are the strategies and actions identified in *The Big Move* enough? With the Greater Toronto and Hamilton Area (GTHA) growing by 48% between 2016 and 2041 (approximately 110,000 persons per year), there is clearly a need to make sure transit is on the right track. This requires having an understanding of how the current network functions and the degree to which committed transit networks will address needs, especially in light of the transformative plan for GO RER. It also requires an understanding of how travel markets are changing in response to development growth, demographics and societal preferences.

One of the most significant changes since 2008 is the advancement of technologies that will enable new travel options that complement, replace, or compete with conventional transit options. Options such as dynamic transit shuttles, peer-to-peer ridesharing and connected vehicles are no longer just concepts and have the potential to reshape transportation.

1.2 Regional Transportation Plan Review Process

The GTHA evolves constantly, and its transportation plan needs to keep up. The Province of Ontario requires Metrolinx to review *The Big Move* by 2016, in coordination with the Province's review of its *Growth Plan* and other plans for the Greater Golden Horseshoe.

As input to this review, Metrolinx initiated the development of a series of nine background papers covering a range of topics including transit (this paper), active transportation, transportation demand management (TDM), new mobility and freight. These working papers then fed into an overall discussion paper summarizing Metrolinx's review of *The Big Move* and its implementation.

Engagement with municipal stakeholders was also a key element of the process and nine full day workshops were held in every regional municipality across the Greater Golden Horseshoe. These workshops provided a platform to let stakeholders know about the RTP review process, but also served as a critical avenue for these stakeholders to present their issues, success stories, and key concerns to the Metrolinx study team.

An updated RTP will be developed out of the background papers and through a stakeholder engagement process. Preparation of the RTP will consider related provincial plans, policies, strategies, guidelines and priorities, as well as municipal transportation master plans and official plans. The final step will be to create an Implementation Plan in partnership with GTHA municipalities.

1.3 Regional Transportation Plan Goals and Objectives

As part of the lead up to the release of the new RTP, Metrolinx has started preparation of updated goals and objectives to define how transportation is expected to support and enhance the lives of residents and the prosperity of the region's economy. At the highest level, a draft vision has been crafted, supported by six goals as described below.

Draft Vision Statement of the Regional Transportation Plan

In 2041, the Region's integrated transportation system will allow people to get around easily and will contribute to a high quality-of-life, a sustainable and protected environment, and a prosperous and competitive economy. It will:

- Offer a variety of options for getting around reliably, comfortably, conveniently and safely, contributing to a **high quality-of-life**;
- Make it easy to choose modes of travel that reduce our environmental footprint and contribute to a thriving, **sustainable and protected environment**; and
- Connect people to jobs, move goods and deliver services efficiently throughout the region, supporting a **strong, prosperous and competitive economy**."

The goals, lettered A through F, are associated with 19 measurable objectives that are intended to assess progress in achieving the overall vision of the plan.

Goal A - Connectivity, Convenience and Integration

OBJECTIVES

1. People have appropriate, realistic options to move easily and reliably from place to place.
2. People have the information they need to optimize their travel decisions.
3. Transit services and fares are seamlessly integrated.
4. All transportation modes are coordinated.

Goal B - Equity and Accessibility

OBJECTIVES

5. Transit offers affordable access to jobs, services and major destinations, and is competitive for most trips.

6. Transit fleets and transportation infrastructure, services and technology are accessible to users of all ages and abilities.

Goal C – Health, Comfort and Safety

OBJECTIVES

7. Walking and cycling are attractive and realistic choices for most trips.
8. Transit offers an attractive, high-quality user experience.
9. People feel safe and secure when travelling, with continuous progress toward eliminating injuries and deaths from transportation.
10. Goods are moved safely and securely

Goal D - A Well-Planned Region

OBJECTIVES

11. The transportation system supports compact and efficient development.
12. Integrated transportation and land use planning reduces the need for travel and encourages walking, cycling and taking transit.
13. Transit infrastructure and services have the capacity to meet demand.

Goal E – An Exemplary Environmental Footprint

OBJECTIVES

14. The transportation system is adaptive and resilient to the stresses of a changing climate, uses resources efficiently, and fits within the ecosystem's capacity.
15. The transportation system contributes to the achievement of provincial targets for greenhouse gas emission reductions.

Goal F - Prosperity and Competitiveness

OBJECTIVES

16. Travel times are predictable and reasonable.
17. The transportation system offers value to users and governments by providing economical, reliable and environmentally sustainable movement of people and goods.
18. Governments promote innovation in the transportation sector.
19. Sustainable, coordinated funding supports transportation operations, maintenance and expansion.

The overarching message of these goals is that the GTHA transportation system should operate like, a single, integrated network that is welcoming to all travelers, provides value for money, and encourages high transit use across demographics and geographies. Transit should be competitive with the car for most trips and the network should support broader *Growth Plan*

objectives such as complete communities and curtailing urban expansion. The assessment of transit needs presented in this report are based on these overarching principles and highlight key areas where service improvements are warranted.

1.4 Organization of the Report

Following this introduction, the report contains four chapters:

- Chapter 2 provides an overview of recent trends in urbanization and transit use in the GTHA, including key trends in overall transit system performance and financial indicators.
- Chapter 3 presents the future outlooks for the region, highlighting expected trends in urbanization and intensification, as well as plans for expansion of the region's rapid transit network.
- Chapter 4 provides a more in-depth examination of the transit needs in the GTHA, including assessments of the impact of committed transit network, focusing on key indicators of transit needs including connectivity, social equity, and travel time competitiveness.
- Chapter 5 outlines a series of opportunities and potential strategies to address existing and future needs, and respond to emerging trends.

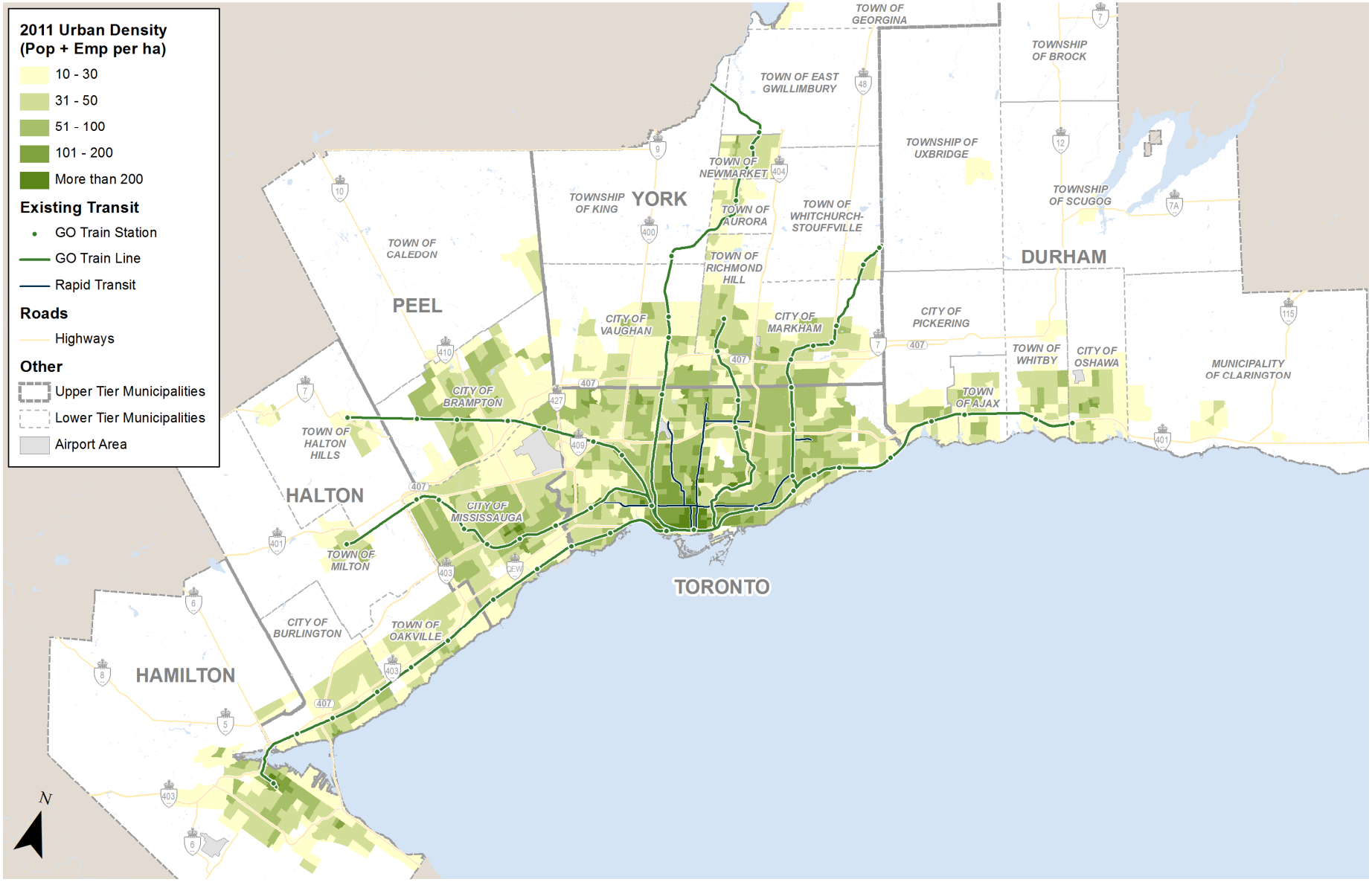
2 Background

The Greater Toronto and Hamilton Area (GTHA) is Canada's most expansive urban region, spanning over 130 km from Durham Region in the east to Hamilton in the west, and covering an area of almost 8,300 km^2. It is also by far its most populous: in 2011, the region's population stood at over 6.8 million, with about 3.5 million jobs. Section 1 of the *Metrolinx Act, 2006* defines the "regional transportation area" as the six subdivisions that comprise the GTHA: two single-tier municipalities (Toronto and Hamilton) and four upper-tier municipalities (Durham, York, Peel and Halton). These four upper-tier municipalities, in turn, are composed of 24 lower-tier municipalities, for a total of 30 municipalities across the region. A map of the regional transportation area and its constituent municipalities is shown in Exhibit 2.1.

Municipal transit agencies in the region provide service across nearly the entire urbanized area and 90% of the region's residents and jobs are within walking distance of some form of transit in the 6:30 a.m. to 9:30 a.m. peak period. As the region's urban boundary has expanded over time, agencies have also expanded their service areas. At the same time, the agencies have also increased service levels within the already established urban areas and most have adopted explicit service planning principles based on the goals of expanding and improving service.

However, these service enhancements have come at a cost. Municipal agencies, primarily those operating outside Toronto, have seen increases in operating costs outpace increases in fare revenues. This chapter provides an overview of the transit service provided in the GTHA, a brief outline of the service planning strategies of the agencies, and a discussion of recent trends in transit ridership and cost effectiveness.

Exhibit 2.1: Map of GTHA showing municipal boundaries, urban densities in the urbanized area[1], as well as existing regional rail and rapid transit lines in 2011



Source: IBI Group with information from Statistics Canada 2011 Census and National Household Survey
Notes: [1]Urbanized areas have urban densities (population plus jobs per hectare) greater than 10.

2.1 Transit Service in the GTHA

Eleven transit service providers operate across the region, providing services ranging from conventional local bus through heavy commuter rail

The GTHA is currently served by a network of 11 transit service providers that together run about 600 transit routes as shown in Exhibit 2.2. Nine service providers, shown in Exhibit 2.3, are municipal entities and primarily serve travel within the corresponding municipality. The remaining two service providers, GO Transit and UP Express, are under the direct authority of Metrolinx and are focused on regional travel.

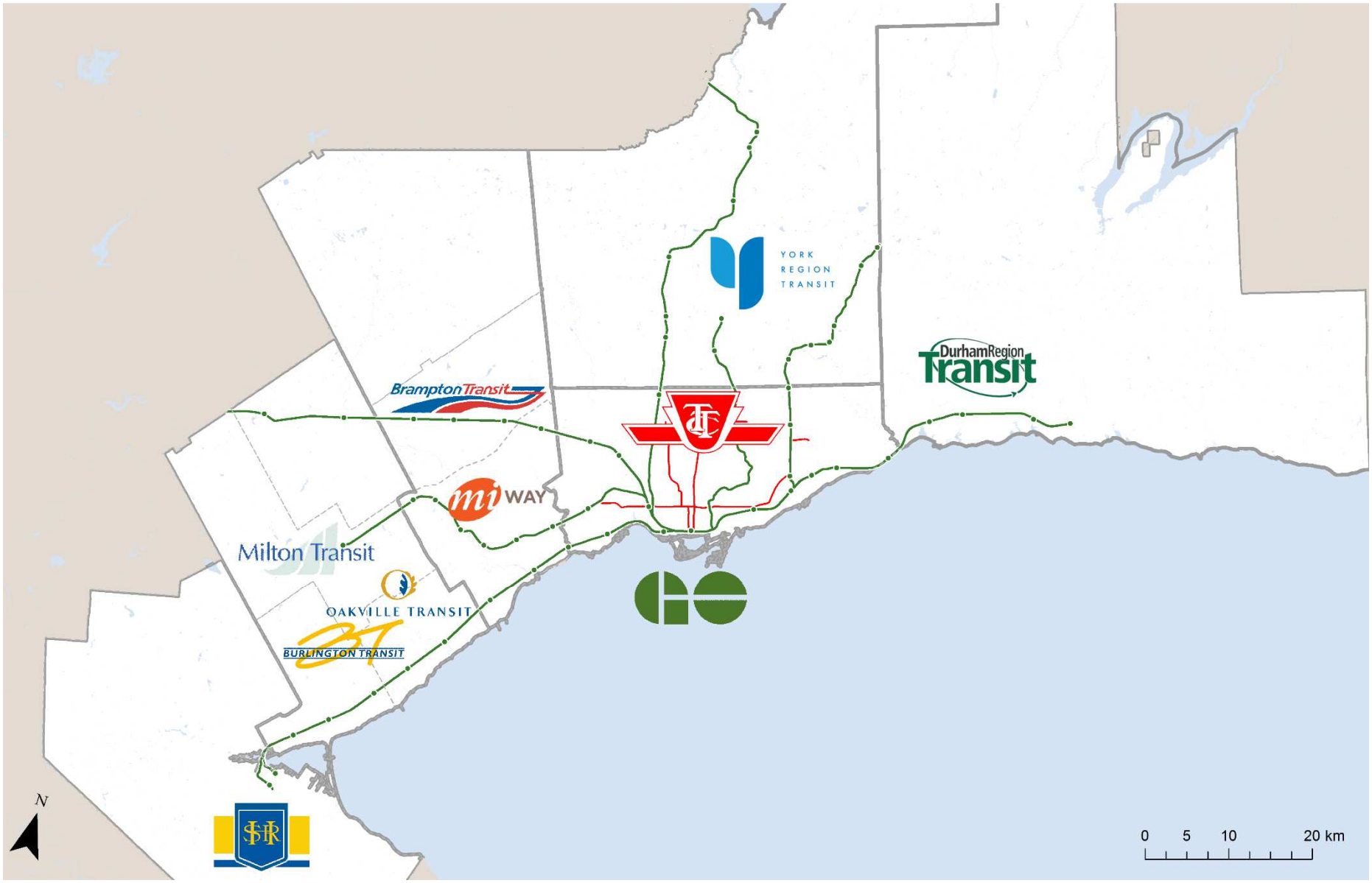
The TTC's subway network and GO Transit's seven regional rail lines form the backbone of the regional transit system. The GTHA's seven regional rail lines converge on downtown Toronto and the only rapid transit lines that existed in 2011—the TTC's subway network—are also focused on this area. 2011 travel patterns reflect this configuration: 54% of all 6:30 a.m. to 9:30 a.m. peak period transit trips in the region either started or ended in downtown Toronto (Planning District 1, or PD1) in 2011. By comparison, only 7% of all morning peak period auto trips in the region started or ended downtown.

Exhibit 2.2: Table showing number of routes, service area, and recent service enhancements of each transit service provider in the GTHA

Service Provider	# of Routes	Service Area (km^2)	Sample Recent Enhancements
Brampton Transit	45	267	• Züm service along Steeles Avenue West to Lisgar GO station ("BRT light")
Burlington Transit	24	98	• Technology and service enhancements
Durham Region Transit (DRT)	58	406	• DRT Pulse enhanced bus service along Highway 2
Hamilton Street Railway (HSR)	34	235	• Restructured routes and service levels
Milton Transit	8	36	• Dynamic transit shuttle pilot
MiWay	84	179	• Mississauga Transitway
Oakville Transit	43	104	• Home to Hub service, enabling customers to call ahead and book a ride to the nearest transit terminal
Toronto Transit Commission (TTC)	158	632	• New streetcar fleet • Capacity improvements to subway line 1, Yonge-University
York Region Transit (YRT)	128	1,776	• Viva BRT rapidways along Highway 7 and Davis Drive
GO Transit	52	*11,000	• New GO stations • Service frequency improvements
UP Express	1	n/a	• New airport rail link service

Notes: *The GO Transit service area extends beyond the GTHA into the Greater Golden Horseshoe.

Exhibit 2.3: Map showing transit agency boundaries in the GTHA



Note: GO Transit serves the entire GTHA

2.2 Transit Network Hierarchy

A hierarchy of transit services is emerging to serve increasingly complex regional trip patterns

As travel patterns have evolved in the region, the types of transit service provided have also become more varied to better cater to these needs. In general, the types of transit service provided in the GTHA can be distilled into five route classifications based on a mixture of operating characteristics including peak headways, average speed, and stop spacing as shown in Exhibit 2.4. Note that these classifications may differ from those used by municipal service providers.

Exhibit 2.4: Table showing classification structure of transit routes in the GTHA

Route category	Route subcategory	Description	Key market served	Example
Regional	Frequent All-Day	• GO Train and GO Bus routes that operate at headways of 15 minutes or better	Medium and long trips between key nodes.	Future RER-15 minute service
	All-day	• GO Train and GO Bus routes that operate throughout the day in both directions, typically at headways of 20-60 minutes.	Long trips between urban centres. Trips are typically 15 km or longer.	Existing Lakeshore East and West GO Train
	Commuter	• GO Train and GO Bus routes that operate only during peak periods, and typically only in the peak direction		Milton GO Train
	Airport Rail Link	• High average speed • Operates at headways intended to be competitive with other airport access/egress modes • Operates all day in both directions with service hours aligned to airport demand • Usually includes features intended to optimize use by air travellers	Trips to and from a major airport	UP Express
Rapid		• Average speed is higher than 25 km/hr • Operate at headways of 15 minutes or better • Stops are typically more than 1 km apart, but may be closer in dense areas • Operate all day (16 hours or more) in both directions • Usually operate in dedicated right-of-way, but may also use semi-exclusive rights-of-way	Medium length trips that range from 5-15 km long. Trips tend to be shorter in denser areas.	TTC Line 1 Yonge-University Subway
Express		• Average stop spacing is more than 500 m • Usually have closer stop spacing in “pickup” and “drop-off” zones, with a long non-stop segment between zones • Average speed is higher than 20 km/hr	Medium to long trips 10-15 km long, usually between residential areas and key	TTC 141 Downtown / Mt Pleasant Express, Brampton Transit

		• Municipal service providers have sometimes elected to charge a higher fare than is in place for the majority of services	employment nodes.	115 Airport Express
Local	Frequent	• Average stop spacing is less than 500 m • Average speed is 20 km/hr or less • Operate at headways of 10 minutes or better in peak periods	Short trips up to 5 km long, usually in dense urban areas.	TTC 60 Steeles West, MiWay 1 Dundas
	Non-frequent	• Average stop spacing is less than 500 m, and • Average speed is 20 km/hr or less	Short trips up to 5 km long, but may be longer where no alternatives exist.	TTC 55 Warren Park, YRT 18 Bur Oak

Note: Local knowledge and professional judgement was used to classify routes that do not strictly fall into any of these categories.

Each type of service works best for a particular travel market, as indicated in the Exhibit 2.4. For example, while a traveller could take a local bus route for a 15 km trip where equivalent rapid transit service was also available, the close stop spacing and potentially slow speeds due to traffic congestion would make this much more time consuming than using rapid transit.

Given the dispersed travel patterns across the GTHA where a combination of short, medium, and long trips are made to and from every municipality, an effective transit network would rely on a combination of these service types to connect key areas of the region. Exhibit 2.5 through Exhibit 2.8 present maps of the existing transit routes and highlight that outside the City of Toronto, few areas of the GTHA currently have a full hierarchy of transit services available.

Exhibit 2.5: Map of regional and rapid transit routes in the GTHA as of 2011

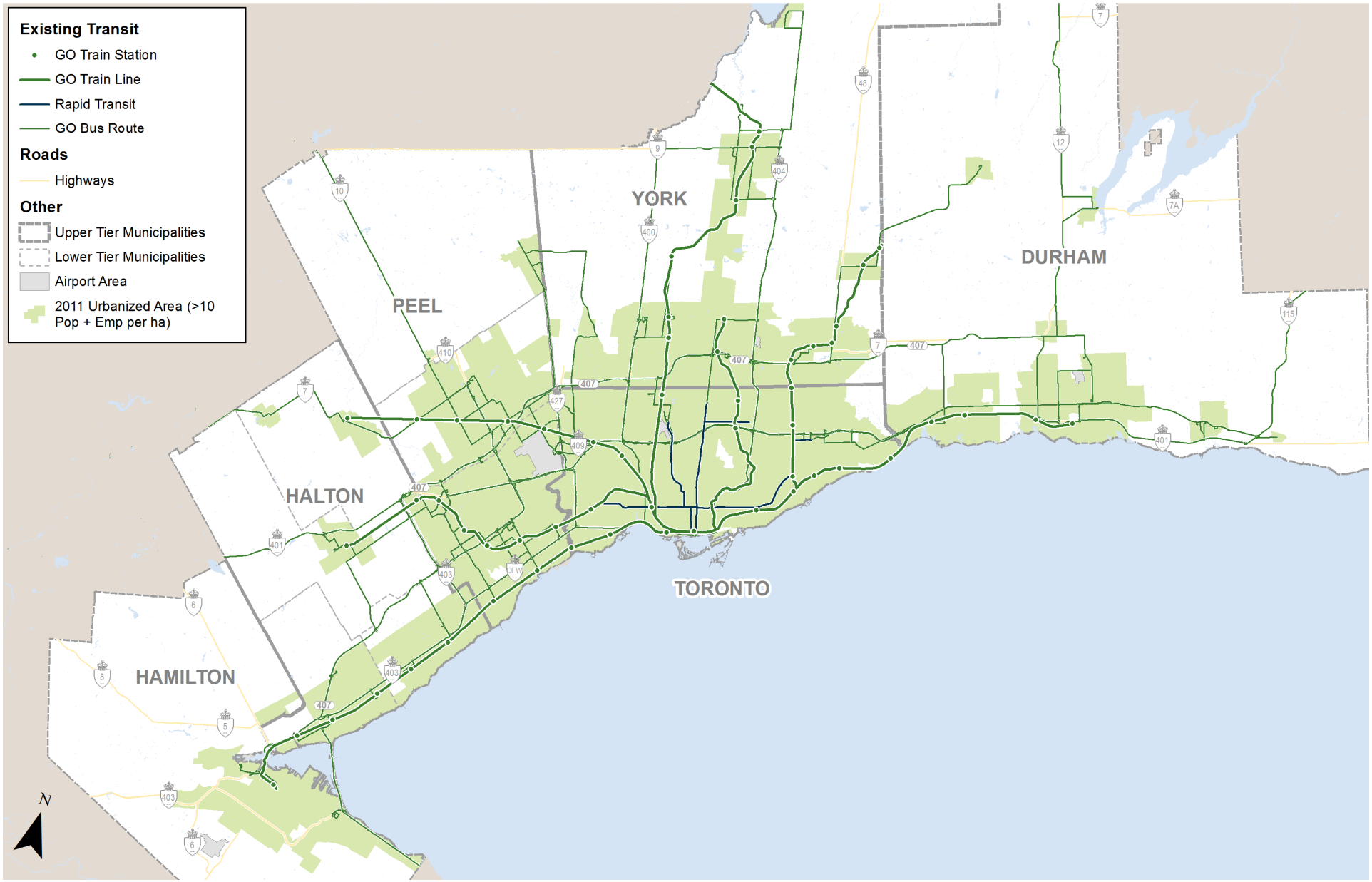
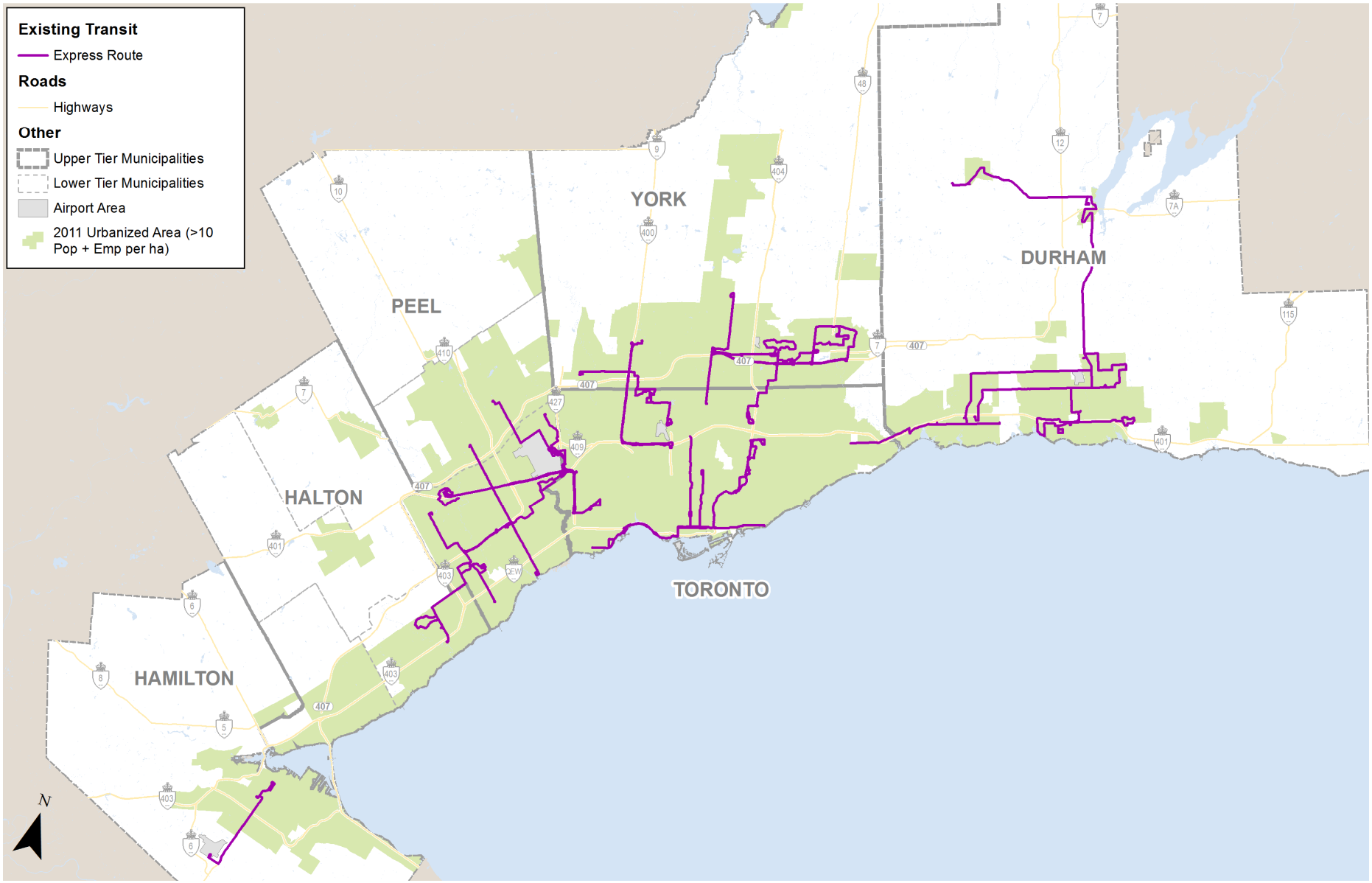
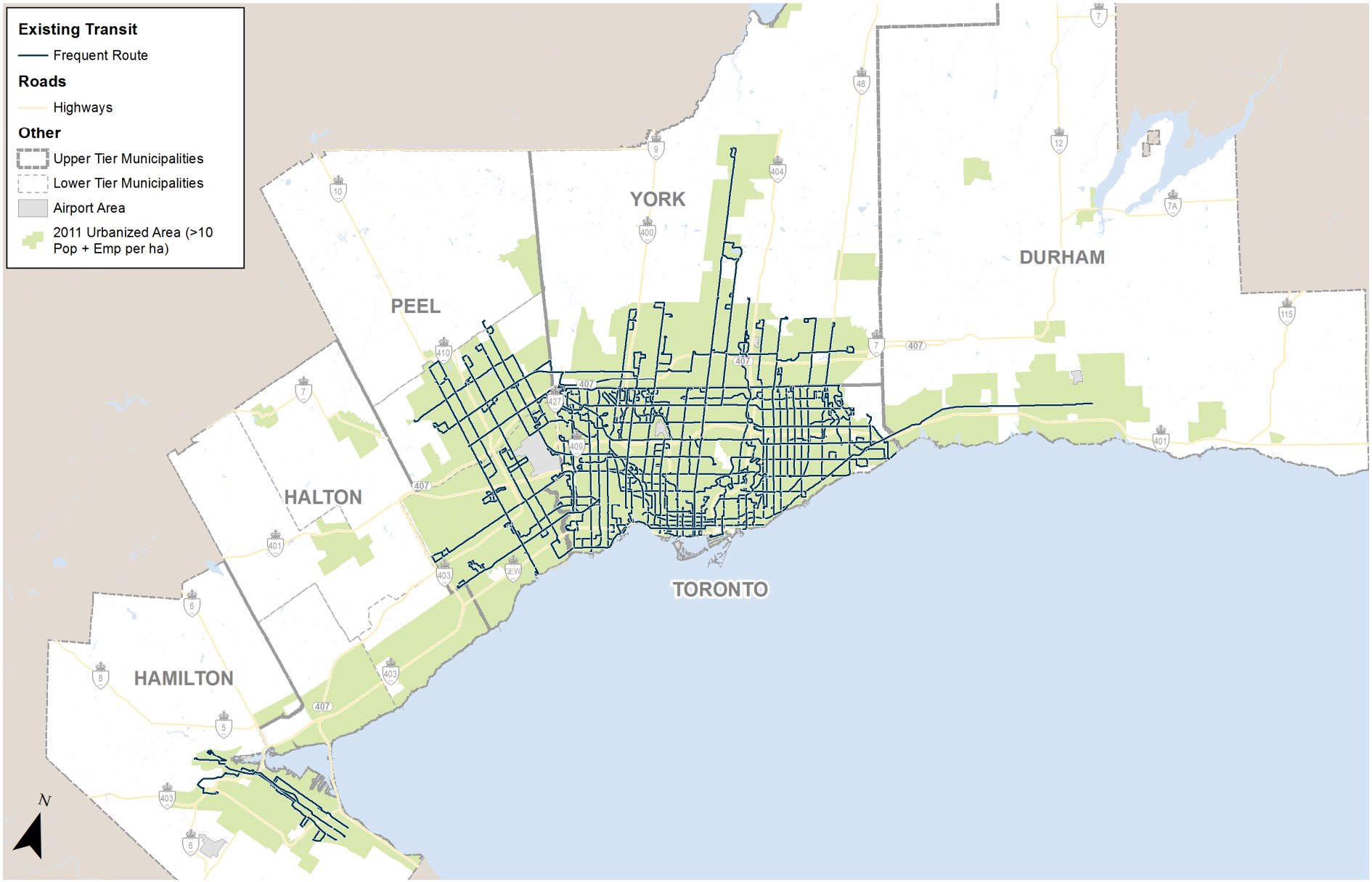


Exhibit 2.6: Map of express transit routes in the GTHA as of 2014



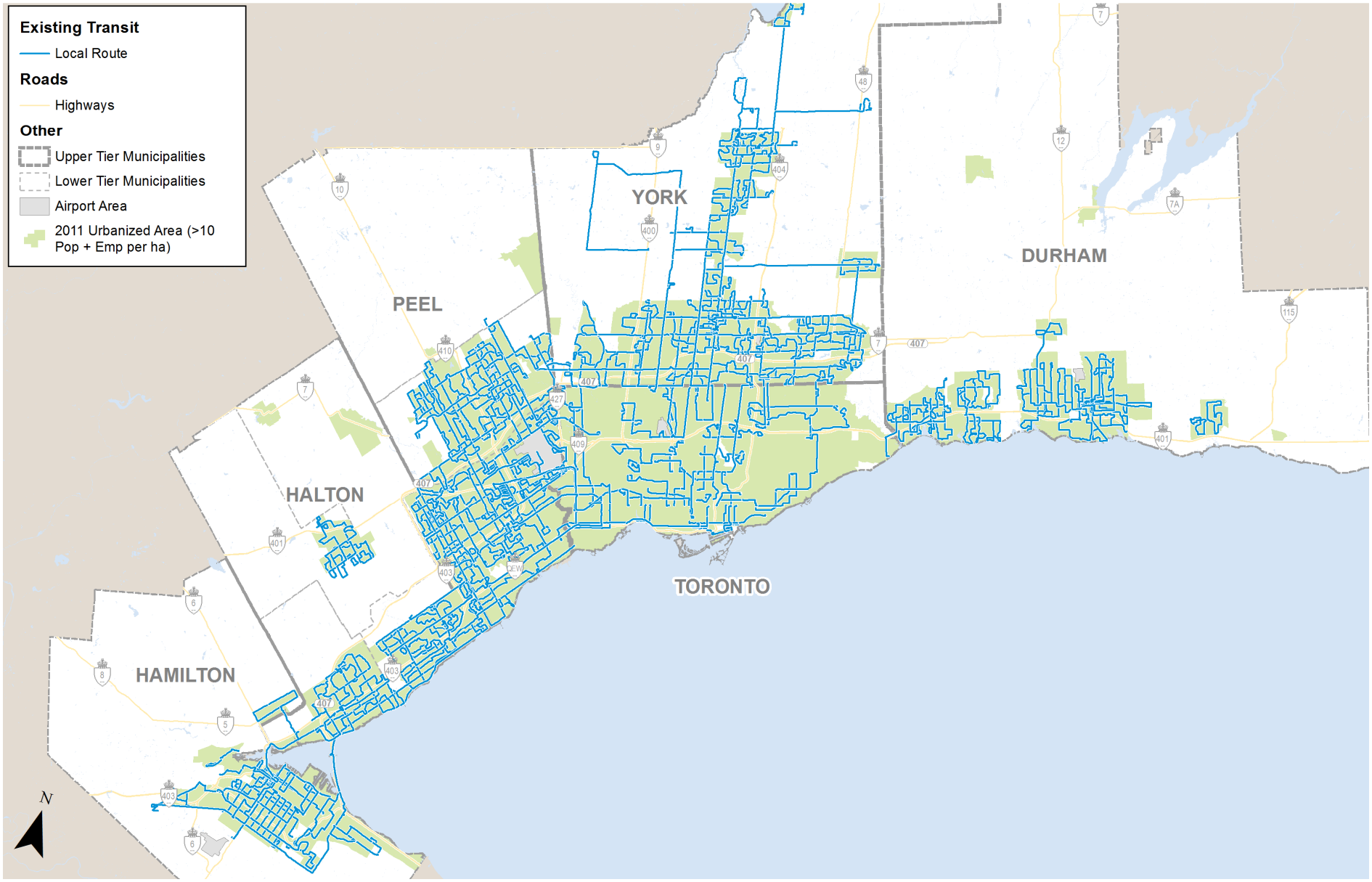
Source: Google Transit (2014)
Note: Additional TTC express routes were added in 2016.

Exhibit 2.7: Map of frequent local transit routes in the GTHA as of 2014



Source: Google Transit (2014)

Exhibit 2.8: Map of non-frequent local transit routes in the GTHA as of 2014



Source: Google Transit (2014)

2.3 Municipal Transit Service Planning Strategies

Service strategies are aligning with the RTP

Each transit service provider in the GTHA has their own transportation planning objectives and approaches, which are motivated by municipal government priorities, available resources, the context of the local transportation system, as well as regional and provincial plans. In general, municipalities and transit agencies across the region have transit network plans that are well-aligned with the goals of the RTP.

Based on a state of the practice review conducted as part of this study, the six goals most commonly mentioned in transit plans across the GTHA include:

- **Strengthened Network of Frequent and Rapid Services**: increase the frequency of service on key corridors and expand the corridors offering frequent and/or rapid services;
- **Improved Connections to Key Destinations**: improve service to and between major trip generators in the region;
- **Customer-Focused Planning and Delivery of Services:** improve customer-focused planning through better communication, improved service reliability, maintaining high quality facilities, and implementing clear and effective fare structures and payment methods;
- **Increased Integration between Service Providers and Modes:** planning for seamless connections between transit service providers both within and across municipal boundaries along with making walking and cycling to and from transit stations a feasible alternative for transit users;
- **Emphasis on Transit Equity and Access to Transit:** ensure that high quality transit service is available for all residents who want/need to make a trip in the region; and
- **Expanded Customer Information Through the use of Technologies:** use the most effective technology available to provide real time information to customers.

The agencies and municipalities are also developing common approaches to transit network planning with similar objectives. Key similarities include:

Strengthened Network of Frequent and Rapid Services

- All municipalities in the GTHA place a high focus on expanding service in their policy documents to encourage **ridership growth**. The most common approach to doing this is to plan a **strengthened network of frequent and rapid services** and to **improve connections to key destinations** both standard and higher order service.
- Several municipalities are planning to redesign their transit networks into a **grid network**, in many cases anchored on the downtown area of the respective municipality. In order for this to be effective service levels will have to be high enough to allow for easy transfers between routes.
- **Investing in higher order transit** is another common approach. In the case of Toronto it is a necessary approach to accommodate anticipated ridership growth. In 905 municipalities, rather than responding to network capacity issues, higher order transit is often a city building exercise with corresponding land use intensification plans designed to reduce automobile use and encourage transit use.

Increased Integration between Service Providers and Modes

- Most municipalities outside of Toronto place a high focus on **increasing service to GO Stations**, both in the near term and as GO service itself expands in the coming years with associated ridership growth.
- Most municipalities emphasize the importance of **inter-municipal connections**, but many plans do not outline specific approaches. For cities with a significant GO commuter base, improving inter-municipal connections is largely based on expanding service to GO stations with less emphasis on the transit agency itself providing the connections to bordering municipalities.
- Many municipalities and transit agencies are **encouraging multimodal travel**, usually in the form of active transportation, with associated policies encouraging compact mixed-use built form that is conducive to active transportation. Encouraging customers to combine active transportation with transit trips is increasingly an area of focus for GO Transit and the TTC, with Metrolinx wanting to significantly increase the percentage of customers that arrive at GO stations by a mode other than single occupancy cars. Multimodal strategies can help bridge the first and last mile of a transit trip and in the case of cycling expand the catchment area of transit service.

Some emerging directions for future transit planning are also being adopted across municipal transit agencies. While some agencies are more advanced in their adoption of these emerging directions, all are showing signs of evolving their planning principles to better incorporate the new approaches. These directions include:

Customer-Focused Planning and Delivery of Services

- Several agencies have started emphasizing the importance of **customer focused planning and service delivery**. The TTC has a customer charter and MiWay is likely to follow. An increased customer focus is often part of an effort to tailor services to individual needs by serving a greater variety of trip purposes and users beyond traditional peak-period commuters. Explicit customer engagement can complement incremental improvements to service frequency and network connectivity, especially in off-peak periods. Increased customer information and communication is also emerging as an important component of customer-focused planning.
- **Fare integration** remains an issue in the GTHA with little integration between the TTC and other service providers. The pending completion of PRESTO deployment as a common region-wide payment medium will alleviate some obstacles to travel across multiple service providers, but will not by itself lead to a truly integrated regional fare system. A separate process is being led by Metrolinx, in collaboration with municipal partners and with the involvement of the Ministry of Transportation, which involves the examination of options for revising the fare structure and making other related changes to achieve greater integration and other goals.

Emphasis on Social Equity and Access to Transit

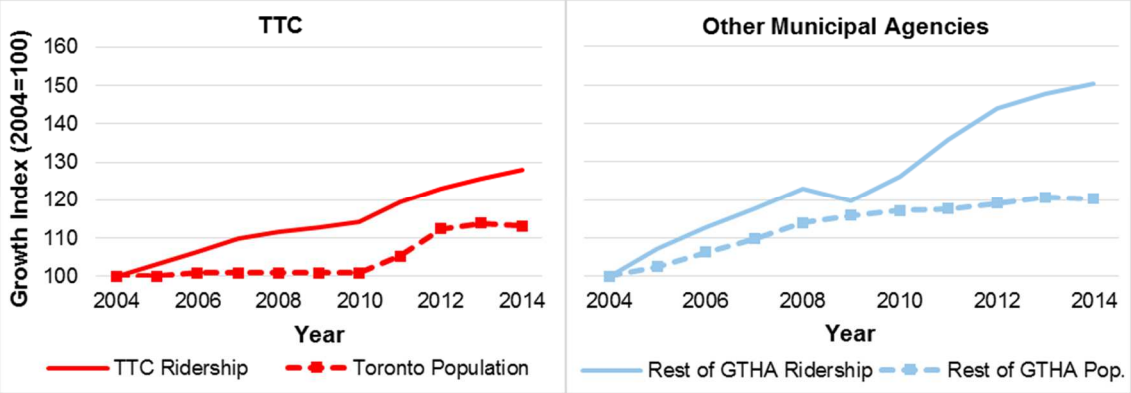
- Metrolinx has recently advanced the issue of **equitable access to transit** with the preparation of a *Backgrounder on Income and Transit Use*. The City of Toronto is also undertaking extensive work in the area of improving transit access to lower-income populations, building on the *Poverty Reduction Framework* adopted by the City in 2014. Other transit agencies and municipalities in the GTHA address equity to varying degrees with a focus on meeting and exceeding AODA requirements.

2.4 Transit Use in the GTHA

Transit ridership growth is outpacing population growth, but auto trips still dominate

Transit ridership throughout the GTHA has shown strong growth between 2004 and 2014. Exhibit 2.9 shows that municipal transit agencies outside the City of Toronto saw a 50% increase in ridership (equivalent to 40 million additional riders) in this period, and carried 118 million passengers in 2014. This far outpaces the 20% growth in service area population in the GTHA municipalities outside Toronto during the same period. Ridership growth has also outpaced population growth in Toronto where the TTC carried 535 million riders in 2014, up 28% (or 117 million riders) since 2004. The TTC's service area population increased by just 13% during this period. GO Transit (not shown in the exhibit) also saw a notable increase in ridership, carrying 65 million passengers in 2014 (up 44% or 20 million riders).

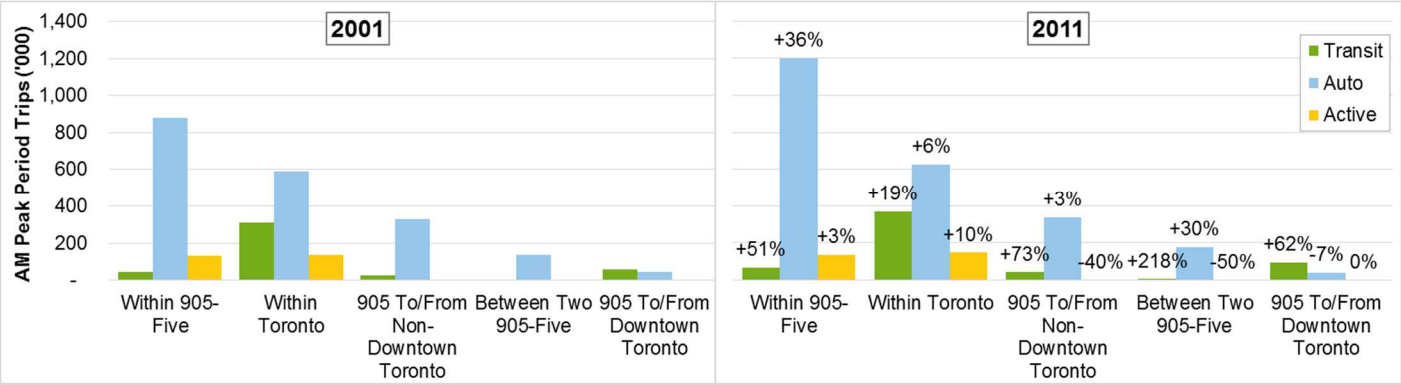
Exhibit 2.9: Indexed annual transit ridership and population growth in Toronto and the rest of the GTHA, 2004 – 2014



Source: 2004-2014 Canadian Urban Transit Association (CUTA) Statistics
Note: Population statistics refer to the service area population.

Despite these positive trends in transit ridership, it is important to note that growth in auto trips is far outpacing growth in transit trips when measured in absolute terms. This has implications for traffic congestion, which is already severe in some corridors, as well as greenhouse gas emissions throughout the region. The average number of transit trips made in the 6:30 a.m. – 9:30 a.m. peak period in the GTHA grew by 32% between 2001 and 2011 representing an increase of 141,000 trips. Even though there was only a 20% growth in auto trips in the morning peak period, this represents 405,000 trips—almost 3 times as many new auto trips as new transit trips. As Exhibit 2.10 illustrates, the majority of growth in auto trips occurred outside of Toronto where transit currently represents about 5% of all trips.

Exhibit 2.10: Trips made in the 6:30 a.m. to 9:30 a.m. peak period in the GTHA, 2001 and 2011



Source: 2001 and 2011 Transportation Tomorrow Survey

Notes:

- Within 905 Five – Trips that start in one of Hamilton, Halton, Peel, York or Durham and end in the the same regional or single-tier municipality
- Within Toronto – Trips that start and end within the City of Toronto
- 905 To/From Non-downtown Toronto – Trips that start in Hamilton, Halton, Peel, York or Durham and end anywhere in the City of Toronto outside downtown (PD1), and vice versa
- Between Two 905 Five – Trips that start in Hamilton, Halton, Peel, York or Durham and end in a different one of those five municipalities
- 905 To/From Downtown Toronto – Trips that start in Hamilton, Halton, Peel, York or Durham and end in downtown Toronto (PD1), and vice versa

2.5 Urban Density and Transit

High quality transit becomes cost-effective at urban densities greater than 50 people and jobs per hectare but much of the GTHA has yet to reach that threshold

There is a strong link between urban density (population + employment per hectare), transit supply, and transit use. Higher densities along transit corridors tend to result in higher ridership since transit agencies are able to serve more people per kilometre travelled. In turn, higher quality services (e.g. higher frequencies and/or faster services) become more cost-effective as ridership increases, and better service makes transit more attractive for other potential riders.

The Ministry of Transportation's *Transit Supportive Guidelines* (2012), which are highlighted in Exhibit 2.11, suggest that basic conventional local transit becomes increasingly cost-effective at urban densities above 50 people and jobs per hectare. In some areas below this threshold, more flexible dynamic, demand-responsive service (e.g. flexible-route services that make use of emerging technologies) may provide a more suitable alternative to conventional transit.

Exhibit 2.11: Urban densities that are most conducive to various transit service levels

Land Use Type	Urban Density (People + Jobs per ha)	Transit Service Type(s) that these densities are most conducive to
Central Business District	More than 200	- Rapid Transit (Subway/LRT at headways under 5 mins)
High Density Urban	100-200	- Very Frequent Transit (bus every 5 mins in mixed traffic) - Rapid Transit (LRT/BRT in dedicated right-of-way) at higher densities
Low Density Urban	50-100	- Local Transit (bus every 30 mins) - Frequent Transit (bus every 10 mins) at higher densities
High Density Suburban	30-50	- Local Transit (every 30 mins) in key corridors - Demand-Responsive Transit at lower densities connecting to hubs
Low Density Suburban	10-30	- Demand-Responsive Transit connecting to hubs

Source: IBI Group adapted from MTO's Transit-Supportive Guidelines (2012)

Illustrations of typical urban forms at these density levels are shown in Appendix D.

Exhibit 2.12 highlights that 47% of residents and 52% of jobs in the GTHA are located in areas where urban densities are less than 50 people and jobs per hectare. In the portion of the GTHA outside Toronto, these statistics climb to 64% and 74% respectively, which highlights a challenge that municipal transit agencies outside Toronto face in providing high quality service. Most agencies have service standards that require service be provided to virtually all residents living in urbanized areas[1]. However, the relatively low densities of newly urbanized areas and slow pace of intensification in some existing areas means that in some cases agencies provide conventional bus services in areas where density is not yet conducive to regular transit service.

Exhibit 2.12: 2011 population and jobs in Toronto, the GTHA excluding Toronto, and the GTHA, grouped by urban density

Density (Pop + Emp per ha)	Toronto		GTHA Excluding Toronto		GTHA	
	People	Jobs	People	Jobs	People	Jobs
Over 200	328,000 (12%)	532,000 (35%)	37,000 (1%)	29,000 (2%)	365,000 (5%)	561,000 (17%)
100-200	525,000 (19%)	205,000 (14%)	110,000 (3%)	63,000 (3%)	635,000 (10%)	268,000 (8%)
50-100	1,243,000 (46%)	392,000 (26%)	1,249,000 (32%)	385,000 (21%)	2,492,000 (38%)	777,000 (23%)
30-50	495,000 (18%)	277,000 (18%)	1,636,000 (42%)	640,000 (35%)	2,131,000 (32%)	917,000 (27%)
10-30	119,000 (4%)	103,000 (7%)	904,000 (23%)	727,000 (39%)	1,023,000 (15%)	830,000 (25%)
Total	**2,710,000**	**1,509,000**	**3,935,000**	**1,844,000**	**6,646,000**	**3,354,000**

Source: IBI Group with information from Statistics Canada 2011 Census and National Household Survey

Agencies outside Toronto have generally been proactive in improving the service levels (transit ridership and service levels are discussed in more detail in Section 2.6), even without the densities conducive to a strong grid of high quality transit service. In several cases, however, Exhibit 2.13 shows that transit mode shares in many municipal wards outside Toronto are still notably lower than the mode shares in wards within Toronto that have a similar urban density. It is clear from Exhibit 2.7 that Toronto residents have access to higher quality transit than residents outside Toronto—virtually all of Toronto's urban area is within 400 m of frequent service and almost all routes connect to the City's rapid transit system—so mode shares would be expected to be higher in Toronto.

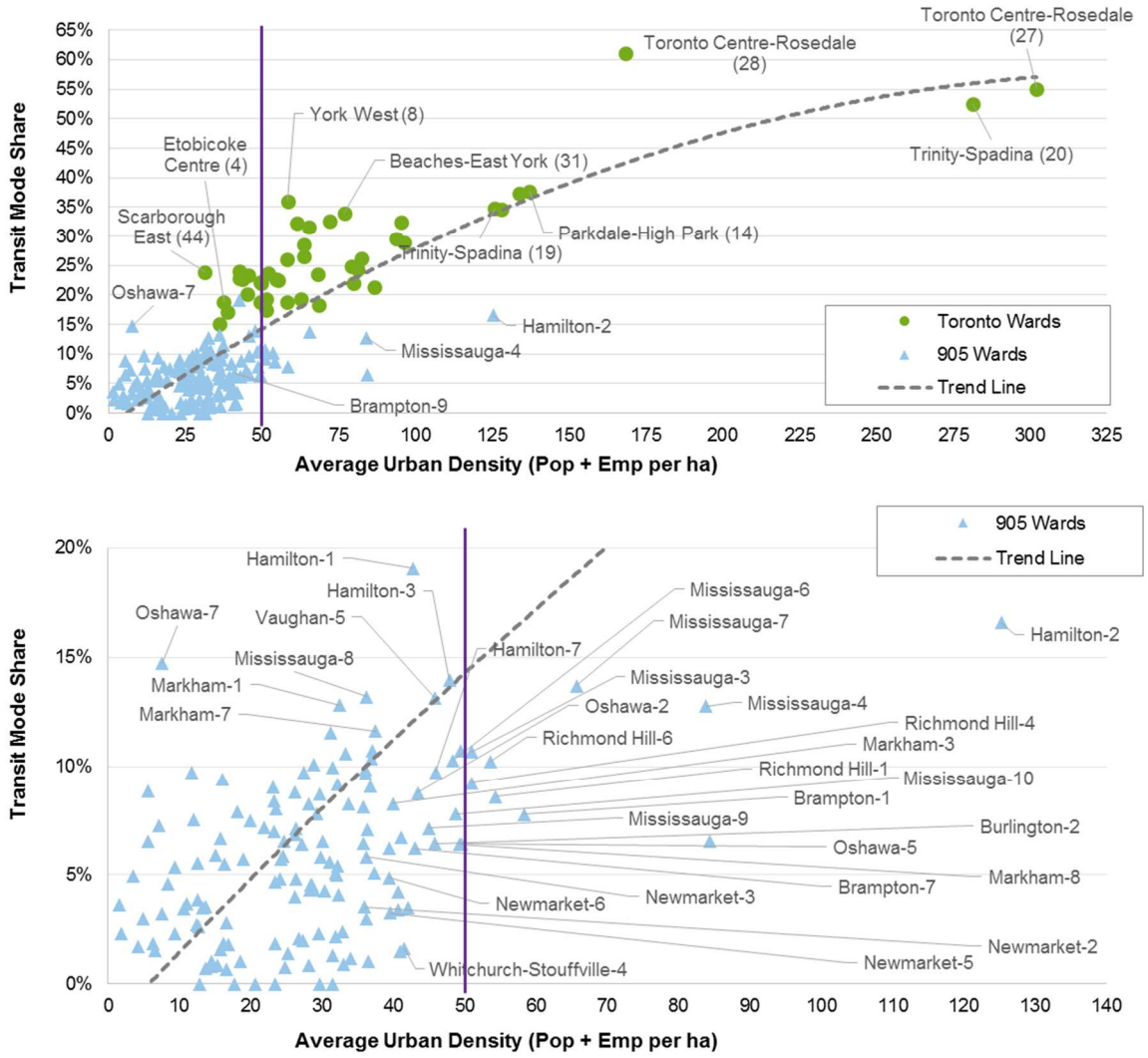
[1] York Region Transit's route coverage objective, for example, is to provide service to 90% of the urban area and Durham Region Transit has a similar objective. In both cases, service is deemed to be "provided" if the maximum walking distance to a stop is 400 – 1,000m (5 to 12 minute walk).

Beyond the impact of service levels, the relatively low transit mode shares outside Toronto can also be explained in part by how existing land uses and built forms in many areas are not fully transit supportive. Wide, busy arterial roads with wide intersection spacing, streets with transit stops but gaps in sidewalks, and buildings set back from the street are common in many suburban areas of the region, all of which make transit less attractive to travellers. In addition, the lower level of mixed use development in these areas means that activities are generally more dispersed and easier to reach by car than by transit or active modes.

Further, areas in municipalities outside of Toronto that have similar densities as areas within Toronto may be more isolated and limited in their geographic extent, which could also contribute to lower mode shares. This may be further exacerbated by the lack of a strong transit "network effect" that can be created where there are contiguous areas of sufficiently high density.

While agencies may try to increase ridership by improving frequencies, adding new routes, or extending existing services into new areas, potential passengers may find the built form to be a larger factor in their mode choice decision than the level of transit service.

Exhibit 2.13: Morning peak period transit mode share in each GTHA ward versus average urban density



Source: IBI Group based on 2011 Transportation Tomorrow Survey, Statistics Canada 2011 Census and National Household Survey

Notes:

- Urban density is measured as the total population and employment divided by the area of the ward. The area considered excludes any lands within the Greenbelt and lands covered by water.
- Transit mode shares are based on all trips that either start or end in the respective ward.
- Maps of municipal wards in the GTHA can be found in Appendix E.

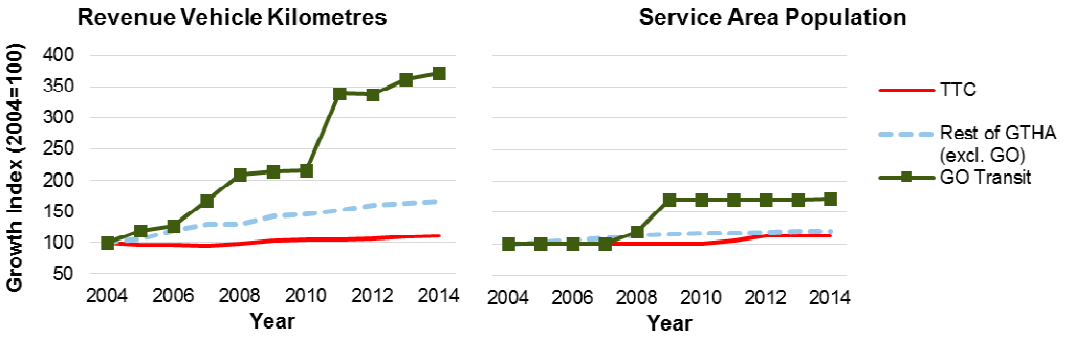
2.6 Cost Effectiveness and Transit Productivity

Transit investment is outpacing development as agencies increase service levels and expand service into new low density areas

Exhibit 2.14 illustrates that municipal transit agencies in the GTHA, on average, have increased revenue vehicle kilometres by 67% between 2004 and 2014, surpassing the 20% increase in the service area population during that time period. The agencies are not only working to keep up with population growth, but actively striving to improve service. GO Transit has seen the greatest

expansion of service in the region, more than tripling the amount of service provided between 2004 and 2014 with GO Train line extensions, higher peak period frequencies, and 30-minute off-peak service on the Lakeshore lines. The 2009 introduction of new bus services to communities outside the GTHA, including Niagara Region, Waterloo Region and Peterborough, created a notable increase in the GO Transit service area population.

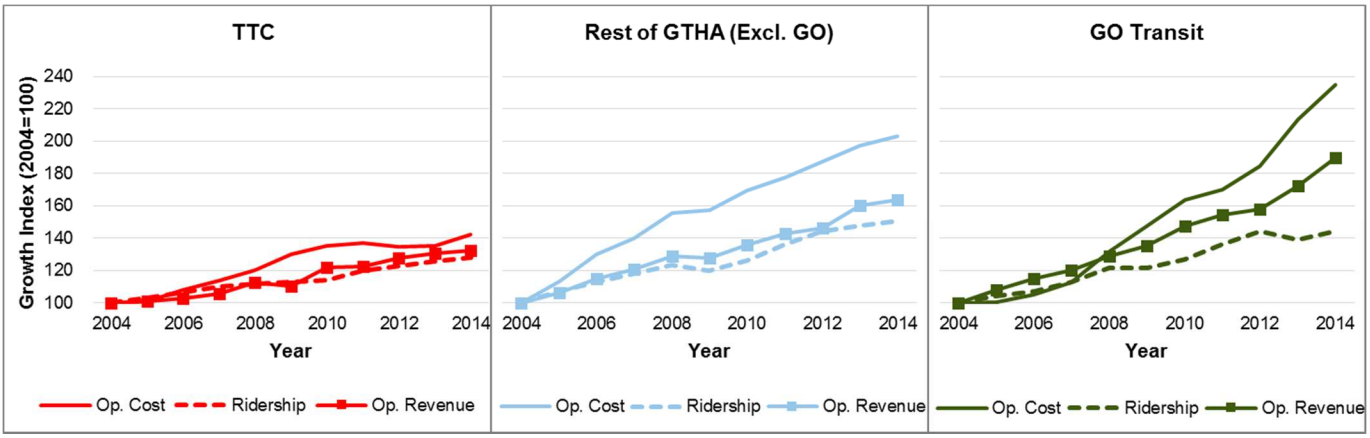
Exhibit 2.14: Changes in service area population and revenue vehicle kilometres, 2004-2014



Source: 2004-2014 CUTA Statistics

These increases in service have come with increased gross operating costs[2]. While Exhibit 2.15 shows that fare revenues for the municipal agencies outside Toronto increased by about 63% between 2004 and 2014, operating costs have approximately doubled in the same period. The fare-by-distance fare structure of GO Transit (versus flat fares charged by municipal agencies) helps to explain why GO's operating revenue has been better able to keep pace with operating costs.

Exhibit 2.15: Increase in transit ridership, operating costs and operating revenues for agencies in the GTHA, 2004-2014



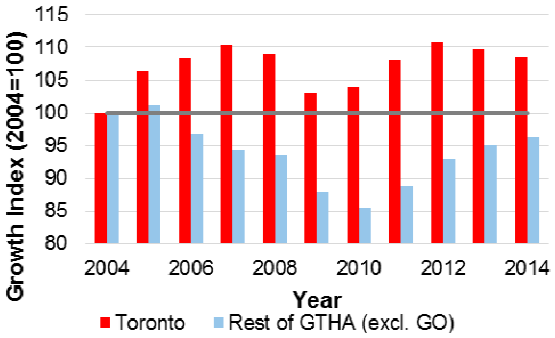
Source: 2004-2014 CUTA Statistics
Note: Operating costs reported to CUTA for GO Transit include expenses for other Metrolinx programs and services (e.g. Presto, UP Express, and other non-operating units).

The increasing ridership has had a positive impact on transit productivity[3] in recent years even as service levels continue to rise. Exhibit 2.16 shows that all municipal agencies have improved

[2] Costs and revenues are reported in constant 2014 dollars unless otherwise noted.
[3] Transit productivity is the ratio of transit ridership to revenue service hours and captures how much the service provided is utilized by residents.

productivity since the lows of 2010. The exhibit also indicates, however, that agencies outside Toronto are yet to recover to the levels seen in 2004.

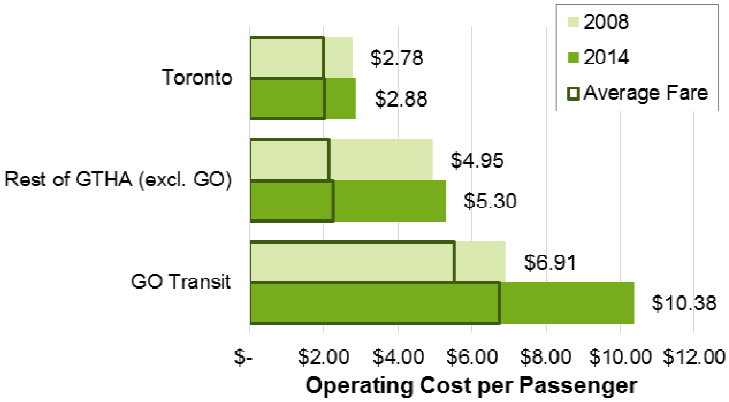
Exhibit 2.16: Transit productivity of municipal transit agencies in the GTHA, 2004-2014



Source: 2004-2014 CUTA Statistics

Despite this improvement in productivity since 2010, the gap between operating costs and revenue is still a concern. Exhibit 2.17 shows that while the TTC spent $2.88 per passenger in 2014 (up 3.6% since *The Big Move* was published in 2008), the other eight municipal service providers spent $5.30 on average (up 7.2%). Given that the average transit fare for these eight service providers was just $2.26, this declining cost effectiveness is a concern for transit agencies.

Exhibit 2.17: Operating cost per revenue passenger in 2008 and 2014



Source: 2008 and 2014 CUTA Statistics
Notes:

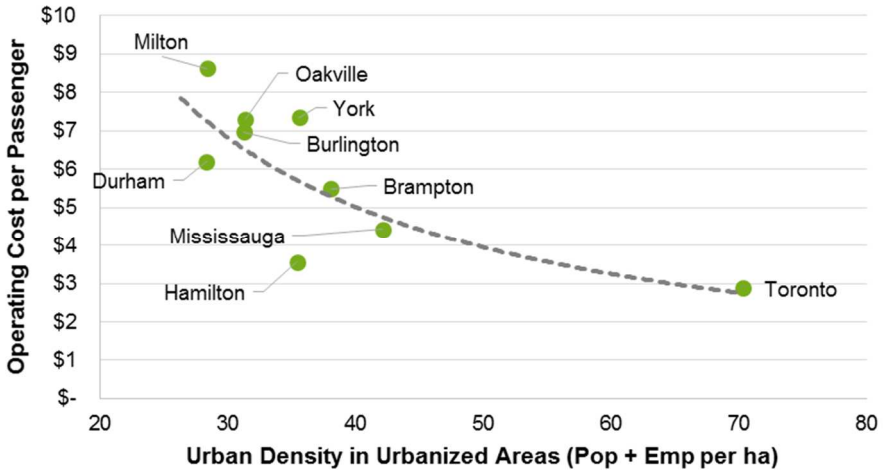
- Costs are in constant 2014 dollars.
- Operating costs reported to CUTA for GO Transit include expenses for other Metrolinx programs and services (e.g. Presto, UP Express, and other non-operating units).

Future intensification and mixed use developments will improve cost effectiveness, but more flexible services in the some outer region areas may be a better use of resources in the interim

As discussed in Section 2.5, meeting the objective of providing transit service throughout the urbanized areas of the GTHA has led agencies to expand conventional bus service into areas with relatively low urban densities. Exhibit 2.18 highlights that this strategy has important cost

implications since there is a strong correlation between lower urban density and higher operating costs per passenger.

Exhibit 2.18: Relationship between urban density in urbanized areas of the GTHA and transit operating cost



Sources: CUTA Statistics (2014); Statistics Canada 2011 Census and National Household Survey
Note:

- Urbanized areas refer to those parts of the municipality with average densities of 10 or more people and jobs per hectare.
- Many low-density neighbourhoods in the City of Hamilton are not served by HSR but are included in the calculation of average urban density. This explains why the average urban density appears low while HSR's operating cost per passenger is also low.

As the region develops and the objectives of compact development, intensification, and mixed use established by the *Growth Plan for the Greater Golden Horseshoe* take hold, agencies outside Toronto can expect to see improved cost effectiveness. For example, Mississauga's average urban density is expected to reach 49 persons+jobs per ha by 2031[4] and York Region is forecast to surpass 40 persons+jobs per ha. In the meantime, however, flexible demand-responsive transit solutions that use emerging technologies could provide important suburban connections while these communities intensify, as discussed further in Chapter 5.

[4] Based on forecasts from the *Growth Plan for the Greater Golden Horseshoe*.

3 Future Outlook

The *Growth Plan for the Greater Golden Horseshoe (Growth Plan)* forecasts that by 2031, the population of the GTHA will surpass 9 million—an increase of 2.2 million over 2011 . Ensuring that the region's transportation system keeps pace with this significant population growth is therefore paramount to the continued development of the nation's largest metropolis. The *Growth Plan* also requires that municipalities pursue more compact development that limits the expansion of the urban boundary and encourages intensification of existing built up areas.

In this context, traffic congestion and increased emissions from auto use could become more significant problems. Providing more travel choices to residents will be crucial to ensuring that access to destinations and activities is maintained or improved while decreasing potential environmental impacts.

This chapter discusses how the region is forecast to grow in the coming decades and highlights how travel patterns are expected to evolve as the committed transit improvements become operational.

3.1 Growth Trends

80% of the population growth to 2041 will occur in the regions outside Toronto.

Exhibit 3.1 shows that in the decade to 2011, the GTHA added just over 1 million residents and about half as many jobs, equivalent to about 1.7% growth per annum. Two upper-tier municipalities—Peel and York—together accounted for 61% of the population growth and 57% of employment growth. The older urbanized areas of Toronto and Hamilton together added just 270,000 people and 146,000 jobs in the same period as growth gravitated toward newly urbanizing parts of the region.

The exhibit also shows that this strong growth rate outside Toronto is expected to continue through 2041. By then, almost twice as many people will work in parts of the GTHA outside Toronto as within the City.

Exhibit 3.1: Growth in population and employment across the GTHA, 2001-2041

Municipality	Year						
	2001	2011	2021	2031	2041	2001-2011 Growth	2011-2041 Growth
Population ('000)							
Toronto	2,584	2,725	2,975	3,193	3,404	141 (0.53% p.a.)	679 (0.74% p.a.)
Peel	1,032	1,350	1,559	1,766	1,972	318 (2.72% p.a.)	622 (1.27% p.a.)
York	763	1,072	1,330	1,585	1,790	309 (3.46% p.a.)	718 (1.72% p.a.)
Durham	528	631	770	970	1,191	103 (1.8% p.a.)	560 (2.14% p.a.)
Hamilton	510	540	601	683	778	30 (0.57% p.a.)	238 (1.22% p.a.)
Halton	391	520	645	816	1,011	129 (2.89% p.a.)	491 (2.24% p.a.)
GTHA Total	**5,808**	**6,838**	**7,880**	**9,013**	**10,146**	**1,030 (1.65% p.a.)**	**3,308 (1.32% p.a.)**
Employment ('000)							
Toronto	1,435	1,516	1,618	1,659	1,716	81 (0.55% p.a.)	200 (0.41% p.a.)
Peel	534	682	801	875	966	148 (2.48% p.a.)	284 (1.17% p.a.)
York	385	539	687	788	902	154 (3.42% p.a.)	363 (1.73% p.a.)
Durham	188	240	300	357	428	52 (2.47% p.a.)	188 (1.95% p.a.)
Hamilton	205	234	274	306	352	29 (1.33% p.a.)	118 (1.37% p.a.)
Halton	189	254	331	391	467	65 (3% p.a.)	213 (2.05% p.a.)
GTHA Total	**2,936**	**3,465**	**4,011**	**4,376**	**4,831**	**529 (1.67% p.a.)**	**1,366 (1.11% p.a.)**

Source: Statistics Canada 2001 and 2011 Census, 2011 National Household Survey; Growth Plan for the Greater Golden Horseshoe

Transit-supportive densities are emerging in traditionally auto-oriented areas of the region

Exhibit 3.2 highlights that the projected growth to 2031 will increase the average urban density in the GTHA by 9% from just over 44 people and jobs per hectare in 2011 to about 48 in 2031. This reflects the expected concentration of growth within existing built-up areas and denser land use in greenfield areas, both of which are prescribed by the *Growth Plan.* Exhibit 3.3 illustrates the key implication of this for transit agencies—many areas that have densities less than 50 and are not fully transit supportive today (see Section 2.5) will become more transit supportive by 2031.

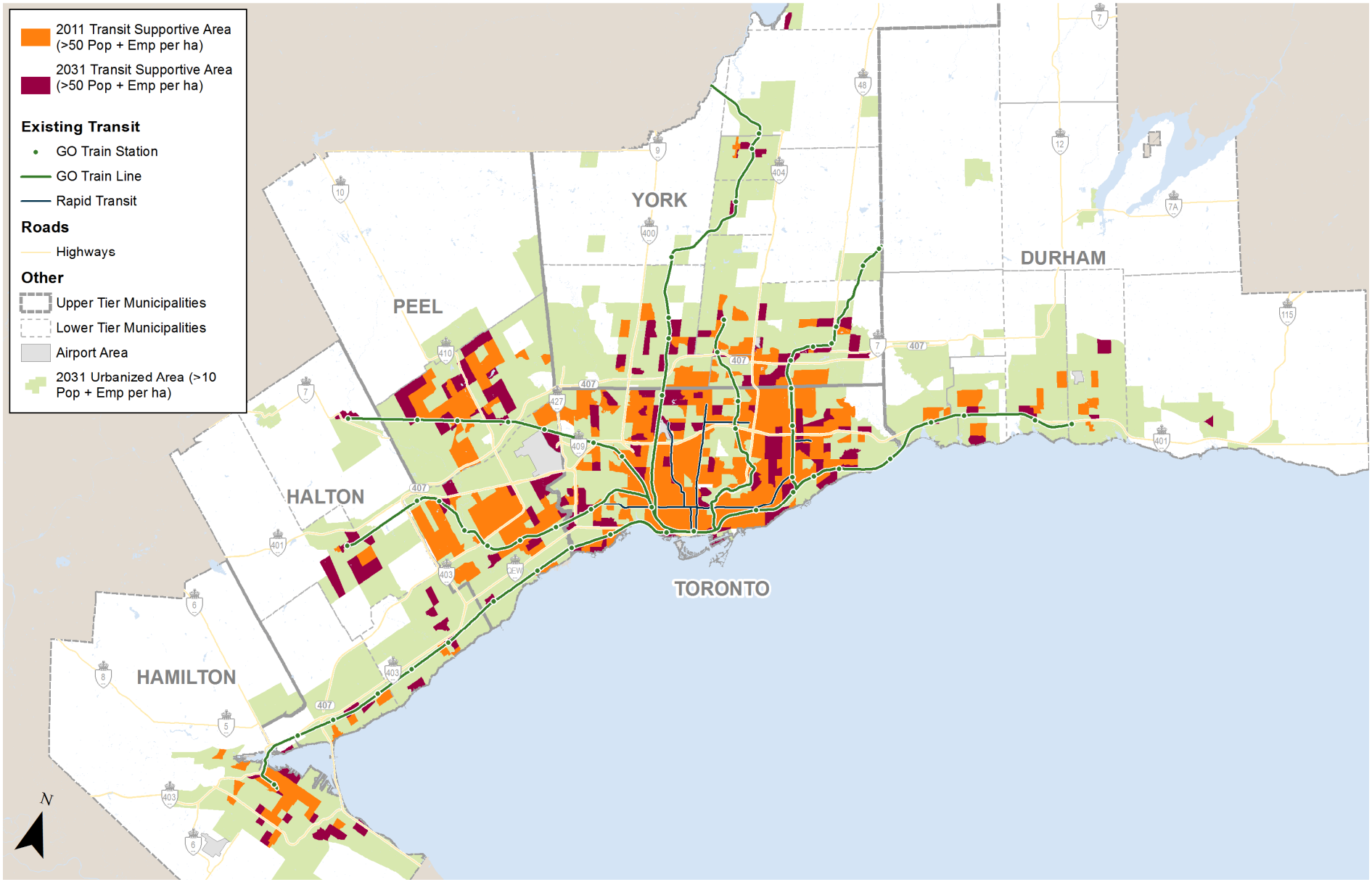
Exhibit 3.2: Average urban densities in upper and single tier municipalities in the GTHA, 2011 and 2031

Municipality	Urban Density (Pop + Emp per ha)		
	2011	2031	Change
Toronto	70	80	10 (14%)
Peel	39	44	5 (13%)
York	36	41	5 (15%)
Durham	28	32	4 (13%)
Hamilton	35	41	6 (17%)
Halton	30	35	4 (14%)
GTHA Average	**44**	**48**	**4 (9%)**

Source: IBI Group based on Statistics Canada 2011 Census and 2011 National Household Survey; MTO Greater Golden Horseshoe Model

Note: Urban density is measured as the total population and employment divided by land area, excluding lands within the Greenbelt and lands covered by water. Average density is only calculated for urbanized areas: those with densities above 10 people and jobs per ha.

Exhibit 3.3: Map of GTHA showing transit supportive areas in 2031 and 2011



Sources: IBI Group based on Statistics Canada 2011 Census and 2011 National Household Survey; MTO Greater Golden Horseshoe Model

While Exhibit 3.3 showed that many already established urban areas in the region will intensify in the coming decades, Exhibit 3.4 indicates that in urban areas of the region 42% of the residents and 46% of jobs (equivalent to 3.8 million people and 1.9 million jobs) will be in neighbourhoods with average densities below 50 in the year 2031.

Exhibit 3.4: 2011 and 2031 population and jobs in Toronto, the GTHA excluding Toronto, and the GTHA, grouped by urban density

Density (Pop + Emp per ha)	Toronto		GTHA excluding Toronto		GTHA	
	People ('000)	Jobs ('000)	People ('000)	Jobs ('000)	People ('000)	Jobs ('000)
2011						
Over 200	328 (12%)	532 (35%)	37 (1%)	29 (2%)	365 (5%)	561 (17%)
100-200	525 (19%)	205 (14%)	110 (3%)	63 (3%)	635 (10%)	268 (8%)
50-100	1,243 (46%)	392 (26%)	1,249 (32%)	385 (21%)	2,492 (38%)	777 (23%)
30-50	495 (18%)	277 (18%)	1,636 (42%)	640 (35%)	2,131 (32%)	917 (27%)
10-30	119 (4%)	103 (7%)	904 (23%)	727 (39%)	1,023 (15%)	830 (25%)
Total	**2,710**	**1,509**	**3,935**	**1,844**	**6,646**	**3,354**
2031						
Over 200	433 (14%)	666 (40%)	234 (4%)	159 (6%)	667 (8%)	825 (19%)
100-200	796 (25%)	254 (15%)	216 (4%)	117 (4%)	1,012 (12%)	371 (9%)
50-100	1,444 (45%)	476 (29%)	1,917 (34%)	658 (25%)	3,361 (38%)	1,133 (27%)
30-50	403 (13%)	194 (12%)	2,168 (39%)	989 (38%)	2,572 (29%)	1,183 (28%)
10-30	112 (4%)	68 (4%)	1,067 (19%)	696 (27%)	1,179 (13%)	764 (18%)
Total	**3,188**	**1,657**	**5,603**	**2,619**	**8,791**	**4,276**
Change						
Over 200	105	134	197	130	302	264
100-200	271	49	106	54	377	103
50-100	201	84	668	273	869	356
30-50	-92	-83	532	349	441	266
10-30	-7	-35	163	-31	156	-66
Total	**478**	**148**	**1,668**	**775**	**2,145**	**922**

Source: IBI Group based on Statistics Canada 2011 Census and National Household Survey; MTO Greater Golden Horseshoe Model

This is an improvement over the 2011 statistics of 47% of people and 52% of jobs but in absolute terms the number of people living in areas below 50 people and jobs per hectare will still increase. Transit agencies will need to find cost effective ways to move even more people in areas that are not yet conducive to regular public transit. This presents some challenges:

- Municipal service providers other than the TTC will be pressed to expand coverage in green field areas even before these areas reach higher urban densities;
- Rapid growth of population and employment outside Toronto will increase demands for good suburb-to-suburb transit connections that are not well served today;
- Transit capacity issues in downtown Toronto are likely to worsen as population and employment increase.

3.2 Committed Transit Improvements

Metrolinx and its municipal transit partners are investing in 350 km of rapid transit across the GTHA, including almost 200 km of frequent, electrified regional rail

Since 2008, nine new rapid transit corridors identified as Top Priorities in *The Big Move* have either been completed, are under construction, or are in planning with a full capital funding commitment for their pending implementation. A tenth rapid transit project, the Scarborough subway extension, is also in planning.

A suite of work to expand and upgrade the regional rail network has also been undertaken or committed, including the successful launch of the Union Pearson Express in 2015. Through the GO Regional Express Rail program, infrastructure expansion and electrification will dramatically improve the quantity and quality of GO Train service. In addition, about 40 km of GO Train peak period line extensions within the GTHA will have entered service since 2011, or will enter service by 2031, bringing regional commuter rail service to new areas of Halton Hills, Richmond Hill and Hamilton.

Exhibit 3.5 shows a summary of these investments and Exhibit 3.6 shows the extent of the future rapid transit network.

Exhibit 3.5: List of planned and funded rapid transit improvements to be completed by 2031 in the GTHA

Project	Approximate Length (km)	Service Type	Status	Planned In-Service Date
Union Pearson Express	25	Regional, Airport Rail Link	Complete	2015
Viva Rapidway BRT – Yonge Street/Davis Drive	13	Rapid Transit	Partially Complete	- Davis Drive – 2015 - Yonge Street – 2018
Viva Rapidway BRT – Highway 7	26	Rapid Transit	Partially Complete	- Markham and Richmond Hill – 2014 - Vaughan Metropolitan Centre – 2016 - West Vaughan and Thornhill – 2020
Mississauga Transitway BRT	5	Rapid Transit	Partially Complete	Fully in service by 2018
Toronto-York Spadina Subway Extension	9	Rapid Transit	In Progress	2017
Eglinton Crosstown LRT	19	Rapid Transit	In Progress	2021
Finch West LRT	11	Rapid Transit	In Progress	2022
Hurontario LRT [1]	20	Rapid Transit	Committed	2022-2023
Hamilton LRT	13	Rapid Transit	Committed	2024
Sheppard East LRT	13	Rapid Transit	Committed	To be determined
Scarborough Subway Extension [2]	7	Rapid Transit	Committed	To be determined
GO RER 15-Minute-or-Better Service	192	Regional, Frequent All-Day	In Progress	Fully in service by 2024
GO RER 60-Minute All-Day, Two-Way Service	47[3]	Regional, All Day	Partially Complete	Fully in service by 2024

GO Train Line Extensions within the GTHA	39[4]	Regional, Commuter	Partially Complete	- Kitchener line extension beyond Georgetown – 2011 - Lakeshore West line extension to West Harbour – 2015 - Richmond Hill line extension to Gormley – 2016 - Richmond Hill line extension to Bloomington Rd. – 2020 - Lakeshore West line extension to Confederation – 2020 [5] - Lakeshore East Line extension to Bowmanville – 2023-2024 [5]

Notes:

[1] - The analysis in this report assumed that the entire LRT from Port Credit to downtown Brampton would be in service by 2031. However, a 2016 Brampton City Council vote has decided against the implementation of the portion of the line in Brampton on its previously proposed alignment. Work is on-going by Brampton to examine alternatives.

[2] – The funding for the Scarborough Rapid Transit project identified in *The Big Move* in 2008 has been reallocated to a replacement project, the extension of the Bloor Danforth subway

[3] – Does not include the 36 km of RER 60-Minute service north of York Region to Allandale station in Barrie.

[4] – Does not include the 45 km westward extension of the Kitchener (previously Georgetown) line across the GTHA boundary to Kitchener, which went into service in 2011. Only the section of the line between Georgetown and Acton stations is included here.

[5] – These extensions will operate over privately-owned railway corridors; timing is subject to final agreement with freight rail partners

With these improvements, 1.8 million people and 1.4 million jobs will be within 800 m of rapid transit service in 2031—equivalent to 21% of GTHA residents and 33% of jobs (see Exhibit 4.5). This is a significant expansion over 2011 rapid transit coverage of 9% of people and 19% of jobs.

For residents, access to jobs and other activities will be improved and employers will have access to a greater pool of potential workers. Moreover, implementing these projects will add transit capacity in many areas of the region, and will improve reliability and transit travel times by providing dedicated rights-of-way in corridors where buses compete with cars today. The role of RER in the transportation landscape of the GTHA will be further discussed in Section 3.3.

Priority Action 1.5 in *The Big Move* speaks to the implementation of public and private transit connections where appropriate between the GTHA and key destinations beyond its boundaries in a manner that supports the urban structure objectives of the *Growth Plan* and *Greenbelt Plan*. GO rail and bus services have crossed the GTHA's outer boundary for many decades, and since 2008 several GO rail and bus connections that cross this boundary have been established or augmented. These include the extension of GO's then-named Georgetown line west from Georgetown in late 2011 that brought commuter rail service to the communities of Kitchener-Waterloo and Guelph, and the extension of the Barrie line one stop further north to Allandale Waterfront station in 2013. Building on the existing seasonal weekend excursion train service, funding has been committed to extend peak-period peak-direction GO rail service into Niagara Region. The branch of the Lakeshore West line that will serve the planned Confederation station in eastern Hamilton will be extended to Grimsby for 2021 and to Niagara Falls for 2023, with timing subject to final agreement with freight rail partners. In addition, the Province has also committed to extend the Richmond Hill line to Bloomington Rd for 2020 and to extend the Lakeshore East line to Bowmanville for 2024.

Please note that except where noted to the contrary, GO services beyond the GTHA have not generally been reflected in the analysis in this report.

Exhibit 3.6: Map showing the committed rapid transit network in the GTHA

Source: Metrolinx

Note: The following committed projects are already in service as of 2016: Acton and West Harbour GO Stations, the Union-Pearson Express, the Mississauga Transitway, Viva Highway 7 BRT, and Viva Davis Dr BRT.

3.3 Role of Regional Express Rail (RER)

Dramatically expanded GO rail service is a cornerstone of the future rapid transit network. The GO RER program will transform the GO rail system from primarily a commuter-oriented option to an all-day regional transit service, with the total train trips operated per week growing from approximately 1,500 in 2014 to over 6,000 in 2024. The majority of service will be operated by electric trains that can accelerate faster and stay at top speed for longer, enabling potential travel time savings of up to 20 per cent.

Metrolinx first developed a recommended service concept for RER that was announced in April 2015 and outlined in the GO RER Initial Business Base (IBC) that included the following elements:

- Service running at 15-minute headways, or better, all day in both directions to/from Union –
  - Lakeshore East line;
  - Lakeshore West line to Aldershot station;
  - Kitchener line to Bramalea station;
  - Barrie line to Aurora station; and,
  - Stouffville line to Unionville station.
- Hourly service all day in both directions to/from Union –
  - Lakeshore West line between Aldershot and Hamilton Centre stations;
  - Barrie line between Aurora and Allandale Waterfront stations; and,
  - Stouffville line between Unionville and Mount Joy stations.
- New or enhanced peak period service in the peak direction to/from Union –
  - Lakeshore West line branch to West Harbour station;
  - Milton line;
  - Kitchener line between Bramalea and Kitchener stations; and
  - Richmond Hill line to an extended terminus at Bloomington Road station.

These headways represent minimum policy headways and, in many cases, the peak period headway will be better than the policy headway to accommodate the peak demand.

Following the completion of the IBC, funding commitments were announced by the provincial government that expanded the scope of GO rail expansion beyond the above to include additional investments as follows:

- The extension of the peak-period peak-direction service levels identified for West Harbour station in the IBC further outward to Confederation station in eastern Hamilton (announced May 2015);
- A Lakeshore West line extension beyond the GTHA to Niagara Falls (announced June 2016);
- A Lakeshore East line extension across central Oshawa to Bowmanville (announced June 2016); and
- An agreement in principle with CN to pursue a potential new freight corridor in the Brampton area that would allow CN to shift most of its freight traffic off the Kitchener line. If completed, this would enable further improvements to planned GO service

levels over and above what was included in the IBC, such as the extension of electrified, two-way all-day service over the entire corridor and of 15 minute-or-better service levels deeper into the City of Brampton.

Note that the analysis of transit needs that is discussed in Chapter 4 does not include the impacts of the infrastructure improvements announced in 2016.

The GO RER program will result in incremental improvements to service each and every year over its decade-long rollout. Some of the service improvements have already gone into service—as of 2016, for example, hourly mid-day service on the Kitchener line to Mount Pleasant is already operational.

Certain performance characteristics of this expanded GO Train service, particularly 15-minute-or-better headways and electrification, bring the possibility of this service functioning in a manner more closely resembling rapid transit than traditional commuter rail corridors. The creation of infill stations to the existing GO rail network are a potential complementary intiative that can further optimize the GO RER program.

Three new infill GO stations, each designed to serve as a convenient passenger interchange, will be constructed in conjunction with new intersecting rapid transit lines:

- Barrie line at Downsview Park (interchange with Toronto-York Spadina Subway Extension);
- Barrie line at Caledonia (interchange with Eglinton Crosstown LRT); and
- Kitchener line at Mount Dennis (interchange with Eglinton Crosstown LRT).

Following a comprehensive analysis, in June 2016 Metrolinx recommended that a further ten infill GO stations in the GTHA (as well as two additional infill stations beyond the GTHA) be included in the GO RER program subject to formal confirmation of funding, a variety of site-specific conditions and detailed technical analysis of corridor service plans.

The total number of GO stations will also be increased by some of the line extensions outlined above: seven new stations in the GTHA, plus three outside the GTHA in Niagara Region.

Note that the analysis of transit needs that is discussed in Chapter 4 does not include the impacts of the ten most recently-recommended GTHA infill stations, or the four out of the seven new GTHA stations that are associated with the Bowmanville extension.

RER is a catalyst for increased regional transit availability, with the potential to transform mobility across the GTHA

RER-type services are particularly effective in large, growing regions and can serve as a catalyst to help achieve transportation-land use and regional transit/mobility objectives. World-wide examples of RER-type services include the Paris RER, San Francisco BART, Munich S-Bahn and Frankfurt S-Bahn, among others.

The impact of RER will be long-term and many of the land use and transformative mobility impacts will continue to emerge beyond the 2031 horizon year of this study. In the medium term, however, RER will provide a critical foundation for improved transit service across all regional municipalities in the GTHA. The all-day, two-way service will better serve the non-work trip market, as well as the counter-peak direction trips that originate in Toronto with destinations outside the city. Today, about 8% of these 154,000 counter-peak trips in the morning peak period are by transit but with RER and the committed projects the transit mode share in this counter-peak market is expected to reach 12% by 2031. This is a significant gain in a travel market that is expected to grow by 71% and surpass 263,000 trips in 2031. Policy changes such

as fare and service integration, alongside operational improvements like an expanded frequent service grid could drive the transit mode share even higher.

RER fills a gap in the GTHA's higher order transit network and enables municipal service providers to better integrate local transit with higher order modes

In addition to the direct impact of committed and funded RER enhancements, the expansion of high capacity rapid transit in the GTHA will also allow transit agencies to better cater to longer-distance travel within and between municipalities. While these additional potential benefits may require more planning and funding commitments from transit agencies and governments in the region, they are an important part of the role of RER.

To date, municipal transit agencies have been working with Metrolinx to better integrate local transit and GO Train service at the stations to provide faster transit for long trips while curbing parking demands at GO Train stations. This has been challenging for several reasons, including:

- Low urban densities in areas served by the GO Train make running local bus service at higher frequencies difficult to sustain;
- Peak-only GO Train service with, at times, wide headways make service integration with local buses challenging; and
- Lack of comprehensive fare integration across all service providers can result in total fares for trips combining GO with other service providers that are perceived not to offer appropriate value, and make trip planning confusing for some travellers.

Recent transit planning in the GTHA has focused on extending the TTC subway lines further into suburban areas to overcome these challenges. Beyond the considerable cost implications, the relatively short station spacing of 2 km or less and speeds of 30-40 km/h place practical limits on the length of trips that subways can effectively serve. Trips from the suburbs outside Toronto to downtown become very time-consuming.

The moderate station spacing and consistently frequent, all-day, two-way service of RER fills the gap between the very high service levels and high capital costs of subways and the lower service levels but fast travel times offered by commuter rail. Municipal service providers benefit from direct access to strong higher order trunk lines to which they can funnel passengers—very similar to the way TTC's suburban bus routes connect to the subway today.

Strong RER trunk lines in the regional municipalities would help to anchor frequent networks, allowing agencies to improve service without drastically decreasing cost-effectiveness

Assessing the impact of the integration of TTC subway with TTC bus and streetcar service provides a good local example of the potential role of RER in the regions outside Toronto. Specifically, consider Scarborough and Etobicoke in Toronto, where urban densities average about 50 people and jobs per hectare—comparable to the more urbanized parts of the municipalities outside Toronto. In these areas, the TTC provides frequent transit service to 88% of the population even though the average density is only just above the threshold where basic transit is thought of as cost effective (see Exhibit 2.11).

These high service levels are sustainable because over 60% of transit trips in Toronto use the subway/RT network and a frequent grid of service is used to funnel riders to the stations. The remainder of TTC trips that do not use the subway benefit from the frequent grid in place to serve the subway. This helps to explain why the transit mode share averages 15% in the morning peak period for trips in Scarborough and Etobicoke that do not use the subway. Outside Toronto, the morning peak period transit mode share is just 5%. RER and the committed transit

improvements in *The Big Move* can emulate the high quality trunk service offered by the subway in Toronto and support an expanded grid of frequent services.

Even before the longer term land use, travel flow, and mobility changes that RER will encourage in the GTHA have taken hold, RER will be able to make a significant impact on how people travel throughout the region.

3.4 Travel Trends in the GTHA

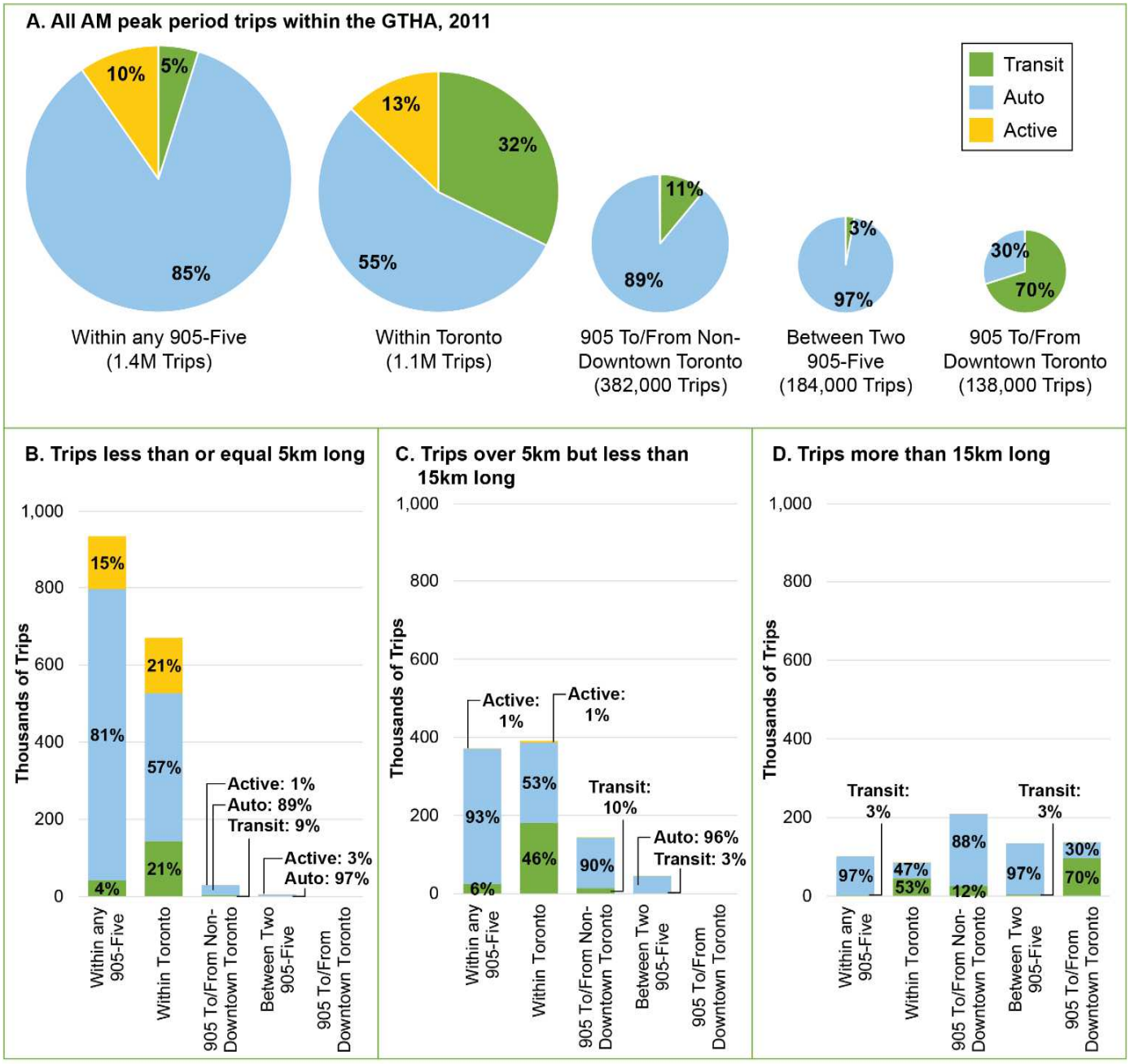
Transit dominates for trips to downtown Toronto, but outside Toronto transit averages just 5% mode share

As alluded to in earlier chapters, GO Transit has been very successful in providing a competitive transit alternative for trips between the "905 Five"—the municipalities outside the City of Toronto—and downtown Toronto. The 70% transit mode share in the 6:30 a.m. to 9:30 a.m. peak period in this market is partly due to the high quality of service offered by the GO Train, but is also a result of the dense concentration of jobs, high cost and low availability of parking, and limited road supply in downtown Toronto, which are strong disincentives to driving.

However, as shown in Exhibit 3.7, the "Within one of 905 Five" travel market, with about 1.4 million morning peak period trips, is ten times as large as the market for trips to/from downtown Toronto. With only a 5% transit mode share—a statistic that has been relatively stable since 2001—it is clear that the car is currently a very attractive mode for the majority of trips in this travel market. The exhibit also shows that transit is relatively unattractive for all lengths of trips both within and between the 905-Five.

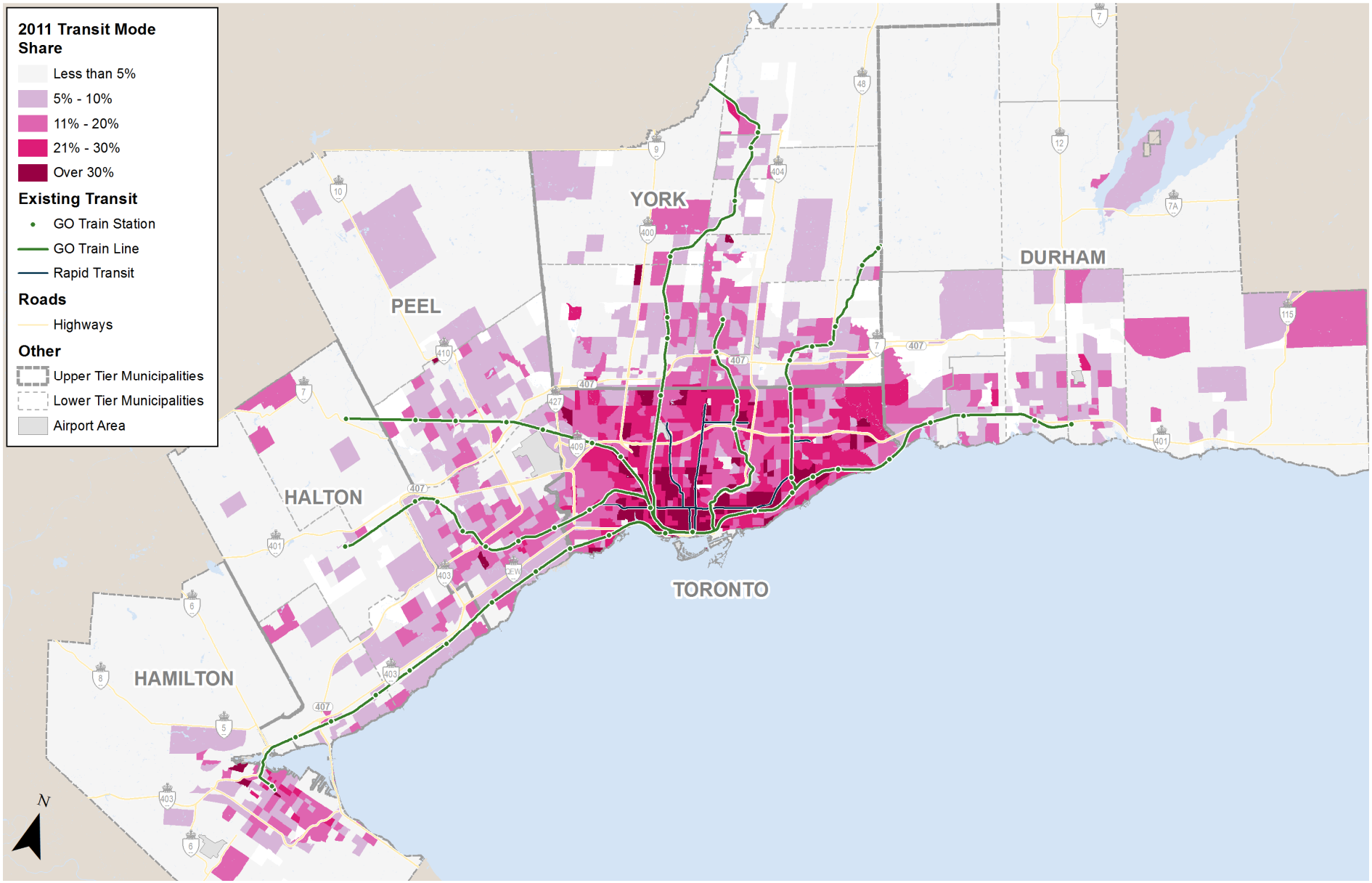
By comparison, transit is relatively attractive in Toronto, with a mode share of about 32% in the morning peak period. Transit mode shares are on the order of 50% for trips over 5 km long, although that falls to about 20% for shorter trips where active modes are more competitive. Exhibit 3.8 shows how transit mode shares vary across the GTHA today, reinforcing the difference between Toronto and the municipalities outside Toronto.

Exhibit 3.7: Mode shares and trip volumes for short, medium, and long trips in the 6:30-9:30 a.m. peak period in 2011



Source: 2011 Transportation Tomorrow Survey

Exhibit 3.8: Transit mode shares of all trips starting or ending in each zone in the GTHA, 2011 AM Peak Period (TTS Actual)



Source: 2011 Transportation Tomorrow Survey

Transit mode share will keep up with regional growth, holding steady at 18% through 2031, but cars will continue be the dominant mode

Forecasts show that by 2031, there will be close to 4.5 million trips made in the morning peak period—an increase of 1.2 million trips compared to 2011. Even with the committed transit improvements in place by that time, Exhibit 3.9 shows that transit mode shares in the region will remain stable at 18%. The planned investments are just enough to keep up with growth in the region. The 3.1 million auto trips projected to be made in the morning peak period will continue to dwarf all other modes, despite the strong growth in transit trips.

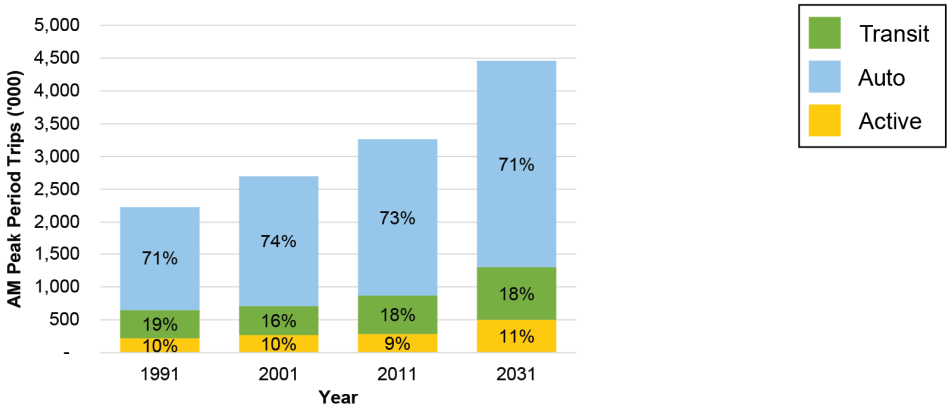
As expected given the strong population and employment growth outside Toronto, the "Within one of 905-Five" market is projected to be by far the largest travel market by 2031 at 2.1 million trips. This represents 47% of all morning peak period trips in 2031, up from 43% in 2011. Comparing Exhibit 3.7 to Exhibit 3.9 shows that the transit mode share is virtually unchanged at 6% in the 20 year period to 2031. Transit gains some market share in the "Between Two 905 Five" and "905 To/From Non-downtown Toronto" markets but these are small gains in the greater context of travel in the GTHA.

While the overall mode share is projected to remain stable, many urbanized areas where mode shares are relatively low today are forecast to improve by 2031. Exhibit 3.10 shows, for example, that downtown Brampton, Bramalea, south Vaughan, and Markham Centre will generally see transit mode shares improve compared to the 2011 conditions shown in Exhibit 3.8. However, Exhibit 3.4 shows that there will also be significant growth in population and employment in lower density suburban areas where conditions for transit are not as favourable (for example as compared to many of the older parts of Toronto). The combination of increasing transit use in established urban areas and growing populations in lower density suburbs helps to explain why overall transit mode share in the "Within one of 905-Five" market will remain relatively stable.

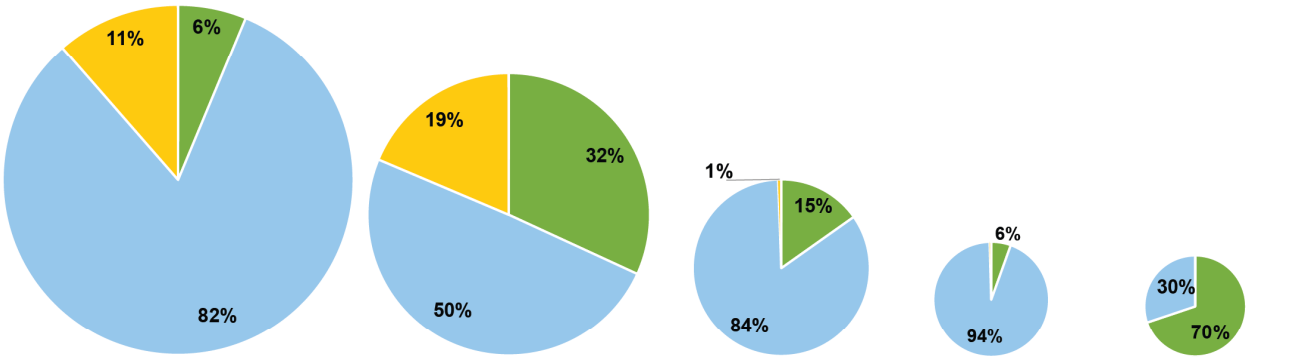
It should be noted that Exhibit 3.8 represents current modal shares from TTS whereas Exhibit 3.10 is based on modelled results, which explains some of the differences in zones will small population.

Exhibit 3.9: Mode shares and trip volumes in the GTHA, 2031

A. Growth in number of trips within the GTHA by mode, 1991-2031, AM Peak Period



B. 2031 Trips by travel market and mode, AM Peak Period

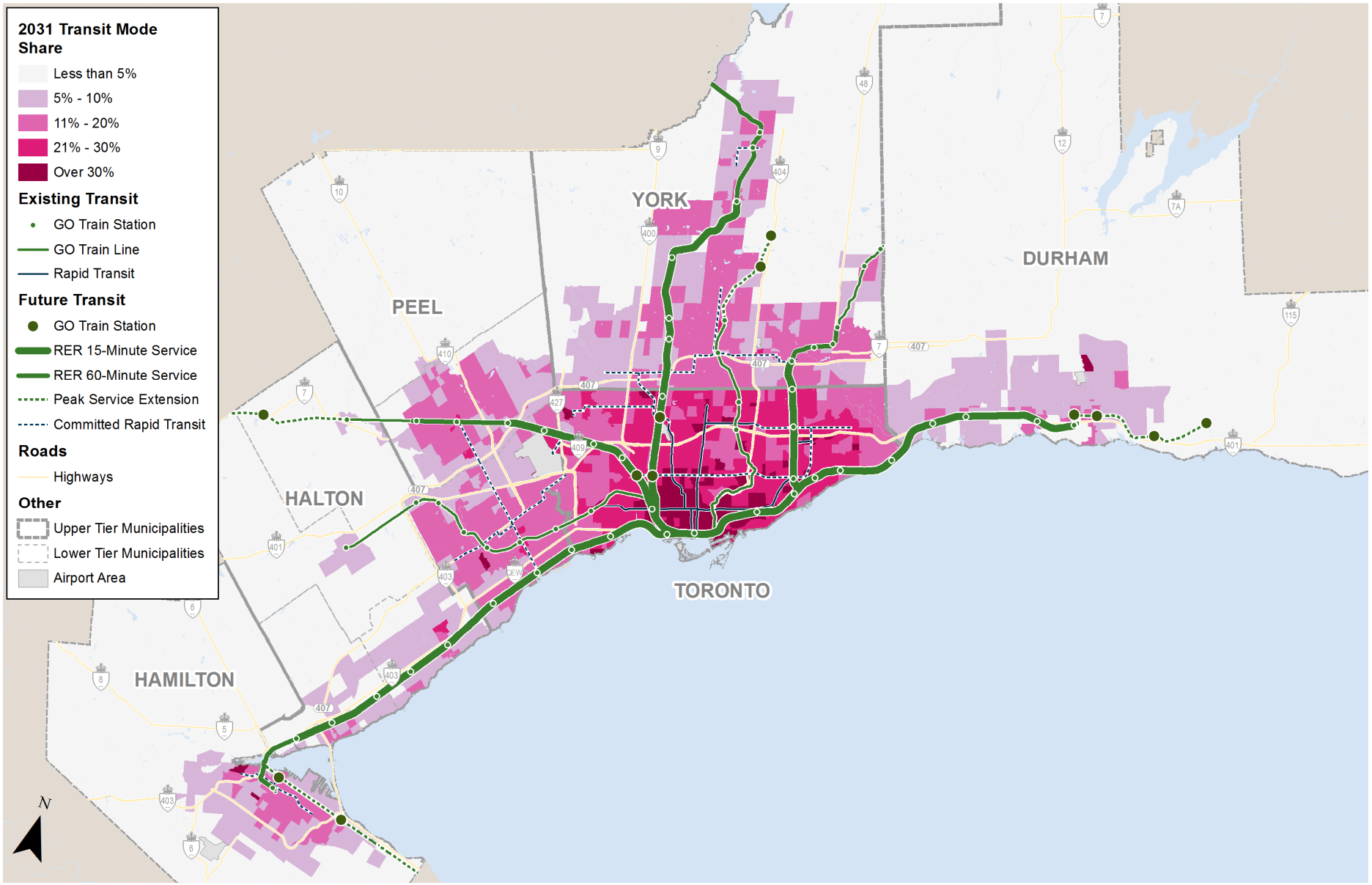


C. Origin-Destination Matrix of 2031 Trips, AM Peak Period

	Destination									
Origin	Downtown	Non-Downtown	All Toronto	Durham	York	Peel	Halton	Hamilton	Regions	GTHA
Downtown	108,900	67,600	**176,500**	1,300	8,400	13,300	1,100	400	**24,500**	**201,100**
Non-Downtown	230,200	959,700	**1,189,900**	19,800	130,800	74,300	11,100	3,000	**239,000**	**1,429,000**
All Toronto	**339,100**	**1,027,300**	**1,366,500**	**21,100**	**139,200**	**87,600**	**12,300**	**3,400**	**263,600**	**1,630,000**
Durham	19,700	**44,100**	**63,800**	325,500	19,400	2,800	200	100	**348,000**	**411,800**
York	65,800	151,800	**217,600**	9,300	529,000	27,800	1,600	300	**568,000**	**785,600**
Peel	50,400	91,500	**141,900**	1,300	35,300	696,400	44,100	5,700	**782,900**	**924,800**
Halton	17,600	15,500	**33,100**	200	3,600	64,200	287,700	22,700	**378,500**	**411,600**
Hamilton	2,700	1,900	**4,600**	0	400	3,800	24,000	269,600	**297,800**	**302,400**
Regions	**156,200**	**304,800**	**461,100**	**336,400**	**587,700**	**795,000**	**357,700**	**298,400**	**2,375,200**	**2,836,200**
GTHA	**495,400**	**1,332,100**	**1,827,500**	**357,500**	**726,900**	**882,600**	**369,900**	**301,800**	**2,638,800**	**4,466,300**

Source: 1991-2011 Transportation Tomorrow Surveys; MTO Greater Golden Horseshoe Model

Exhibit 3.10: Transit mode share of all trips to and from zones in the GTHA, 2031 AM Peak Period (Modelled)



Source: MTO Greater Golden Horseshoe Model

4 Assessment of Needs

Chapters 2 and 3 provided context for how transit operates in the GTHA today, and how it is likely to evolve in the coming decades. Some current and developing issues with transit supply and transit use have started to emerge and form the basis for identifying geographic areas in need of transit improvements. This chapter presents a more detailed assessment of those needs based on the following five broad indicators:

- **Connectivity** – How well the transit network links people to their destinations;
- **Capacity** – The extent to which the existing transit network meets the demands;
- **Travel Time Competitiveness** – Comparison of travel by transit and by auto, focusing on the time penalty of choosing transit;
- **Travel Time Benefits from Committed Improvements** – Identification of areas that are not likely to benefit from the committed transit improvements; and
- **Social Equity** – How well the transit network serves low income communities.

4.1 Connectivity

4.1.1 Transit Network Coverage

The committed transit improvements will put 1.8 million residents and 1.4 million jobs within walking distance of rapid transit.

Transit Network Coverage measures the share of residents and jobs that are within 400-800 m of transit service. The 400 m buffer (about a 5 minute walk) is used for local transit. For rapid transit, 800 m is used since people are generally willing to walk a longer distance to access higher quality transit.

At the most basic level, transit service is most useful to residents if it is provided within walking distance of their origins and destinations. While agencies have done well to ensure that 90% of the people and jobs in the GTHA were within walking distance of some form of transit, rapid transit has been much less accessible. Exhibit 4.1 shows that in 2011 only 9% of residents and 19% of jobs in urbanized areas were within walking distance of a TTC Subway or SRT station (these were the only rapid transit stations in 2011).

As discussed in the previous chapter, the frequent, all-day two-way level of service made possible by the GO RER program enables the regional rail network to meet customer needs in a manner increasingly similar to rapid transit. For the purposes of this connectivity analysis, the 15-minute-or-better portions of the regional rail network have been grouped with rapid transit and referred to under the latter term.

Exhibit 4.1 also shows that the committed transit network will greatly enhance rapid transit coverage throughout the GTHA. By 2031, 1.8 million residents and 1.4 million jobs in the urbanized area will be within walking distance of rapid transit—an increase of more than 10 percentage points over 2011 figures[5]. As Exhibit 4.2 shows, the committed rapid transit improvements (including RER) will bring fast, frequent, high capacity service to all upper-tier municipalities.

While this is a notable improvement, most residents will still live in areas that are not directly served by rapid transit. In the majority of cases, rapid transit is not feasible—the environmental impact may be too high, the expected demand may be unsustainably low, or the capital costs would be too high to justify the projects. One way that transit agencies typically extend the catchment area of a rapid transit network is to connect it to a grid of frequent routes. The higher frequencies shorten average wait times and make transit more time-competitive with the car, which is important for potential riders who have a choice between transit and auto modes.

[5] This coverage is higher if the catchment areas of park and ride facilities at subway and GO stations are included. These catchment areas extend well beyond the 800 m walking distance used in this analysis.

Exhibit 4.1: Share of people and jobs within 800 m of rapid transit stations in the GTHA, 2011 and 2031

Density (Pop + Emp per ha)	Population	Jobs	Residents within 800 m	Share of Population	Jobs within 800 m	Share of Jobs
2011						
Over 200	365,000	561,000	225,000	62%	469,000	84%
100-200	635,000	268,000	179,000	28%	93,000	35%
50-100	2,492,000	777,000	171,000	7%	66,000	8%
30-50	2,131,000	917,000	34,000	2%	19,000	2%
10-30	1,023,000	830,000	6,000	1%	4,000	0%
Total	**6,646,000**	**3,353,000**	**615,000**	**9%**	**651,000**	**19%**
2031						
Over 200	667,000	825,000	439,000	66%	702,000	85%
100-200	1,012,000	371,000	489,000	48%	218,000	59%
50-100	3,361,000	1,133,000	675,000	20%	316,000	28%
30-50	2,572,000	1,183,000	207,000	8%	110,000	9%
10-30	1,179,000	764,000	37,000	3%	54,000	7%
Total	**8,791,000**	**4,276,000**	**1,847,000**	**21%**	**1,400,000**	**33%**

Sources: IBI Group based on Statistics Canada 2011 Census and National Household Survey, Google Transit (2014), and MTO Greater Golden Horseshoe Model
Note: "Rapid transit" includes the GO RER 15-minute-or-better network

Exhibit 4.2: Map showing rapid transit coverage in the GTHA in 2031 with the committed transit improvements

Source: IBI Group adapted from Metrolinx committed transit network map

Just over half of residents are within walking distance of frequent transit today. Increasing coverage would bring high quality transit to areas that are too far from rapid transit lines.

Exhibit 4.3 shows that half of residents and 60% of jobs in the urbanized area of the GTHA are within walking distance of at least one frequent transit route in the 6:30 am to 9:30 am peak period. However, the exhibit also highlights that these figures differ significantly when considering Toronto and the municipalities outside of Toronto separately. While about 86% of Toronto residents are served by frequent transit, only a quarter of the residents outside Toronto have access to this level of service.

Exhibit 4.3: Share of people and jobs within 400 m of a frequent transit route in the morning peak period in the GTHA, 2011

Density (Pop + Emp per ha)	Population	Jobs	Residents within 400 m	Share of Population	Jobs within 400 m	Share of Jobs
Toronto						
Over 200	328,000	532,000	313,000	95%	525,000	99%
100-200	525,000	205,000	490,000	93%	193,000	94%
50-100	1,243,000	392,000	1,080,000	87%	338,000	86%
30-50	495,000	277,000	378,000	76%	235,000	85%
10-30	119,000	103,000	83,000	70%	79,000	77%
Total	**2,710,000**	**1,509,000**	**2,344,000**	**86%**	**1,370,000**	**91%**
GTHA excluding Toronto						
Over 200	37,000	29,000	26,000	70%	25,000	86%
100-200	110,000	63,000	84,000	76%	47,000	75%
50-100	1,249,000	385,000	458,000	37%	194,000	50%
30-50	1,636,000	640,000	339,000	21%	196,000	31%
10-30	904,000	727,000	87,000	10%	191,000	26%
Total	**3,936,000**	**1,844,000**	**994,000**	**25%**	**653,000**	**35%**
GTHA						
Over 200	365,000	561,000	339,000	93%	550,000	98%
100-200	635,000	268,000	574,000	90%	240,000	90%
50-100	2,492,000	777,000	1,538,000	62%	532,000	68%
30-50	2,131,000	917,000	717,000	34%	431,000	47%
10-30	1,023,000	830,000	169,000	17%	270,000	33%
Total	**6,646,000**	**3,353,000**	**3,337,000**	**50%**	**2,023,000**	**60%**

Sources: IBI Group based on Statistics Canada 2011 Census and National Household Survey and Google Transit (2014)

Note: Transit coverage statistics for rapid, frequent, and local transit for each density category across the GTHA can be found in Appendix C.

Exhibit 2.7 shows that a frequent grid is emerging in Brampton and in some parts of Mississauga, but the frequent network is generally sparse outside Toronto. An expanded grid of frequent services in the regions outside Toronto, along with strong integration with future rapid transit stations is needed in order for municipal transit agencies to take full advantage of the rapid transit network. Potential opportunities to expand the frequent network are further discussed in Chapter 5.

4.1.2 Accessibility by Transit

Local transit coverage is good, but better first and last mile transit solutions could improve transit connectivity to key employment areas

Access to Jobs measures the number of jobs accessible by transit from a given area within a given travel time in the a.m. peak period divided by the number of residents in the area. Transit travel time includes time spent on board the vehicle, as well as walking, waiting, and transfer times.

Access to jobs by transit varies widely across the GTHA. Exhibit 4.4 shows the number of jobs in the GTHA that are accessible to the average person by transit within 45 minutes and within 90 minutes. In the exhibit, accessibility is measured for the average resident of downtown Toronto, the average resident of anywhere in Toronto, and the average GTHA resident. An average resident of the GTHA can access just over 111,000 jobs (about 4% of all jobs in the region) within a 45 minute transit trip in the 6:30 a.m. to 9:30 a.m. peak period. However, a person living in downtown Toronto can access almost 600,000 jobs (about 19% of all jobs in the GTHA) on average within the same travel time. Within a 90 minute transit trip, the average GTHA resident can access over 720,000 jobs—about 23% of all jobs in the region.

A study conducted by the Brookings Institute[6] looked at accessibility to transit and employment in 100 metropolitan areas in the US, including the number of jobs accessible within 90 minutes by transit to the average resident of each area. Results showed that Chicago and Philadelphia-area residents have access to 24% of all jobs in their respective regions—comparable to the GTHA. Other metropolitan areas performed better, such as Boston (30%), San Francisco (35%) and New York (37%).

Exhibit 4.4: Average number of jobs accessible by transit within 45 minutes and within 90 minutes, as well as the percentage of all GTHA jobs accessible

	45 Minutes		90 Minutes	
Place of Residence	Number of Jobs Accessible	Fraction of All GTHA Jobs	Number of Jobs Accessible	Fraction of All GTHA Jobs
Downtown Toronto	585,000	19%	1,358,000	43%
All of Toronto	217,000	7%	1,221,000	39%
GTHA Average	111,000	4%	722,000	23%

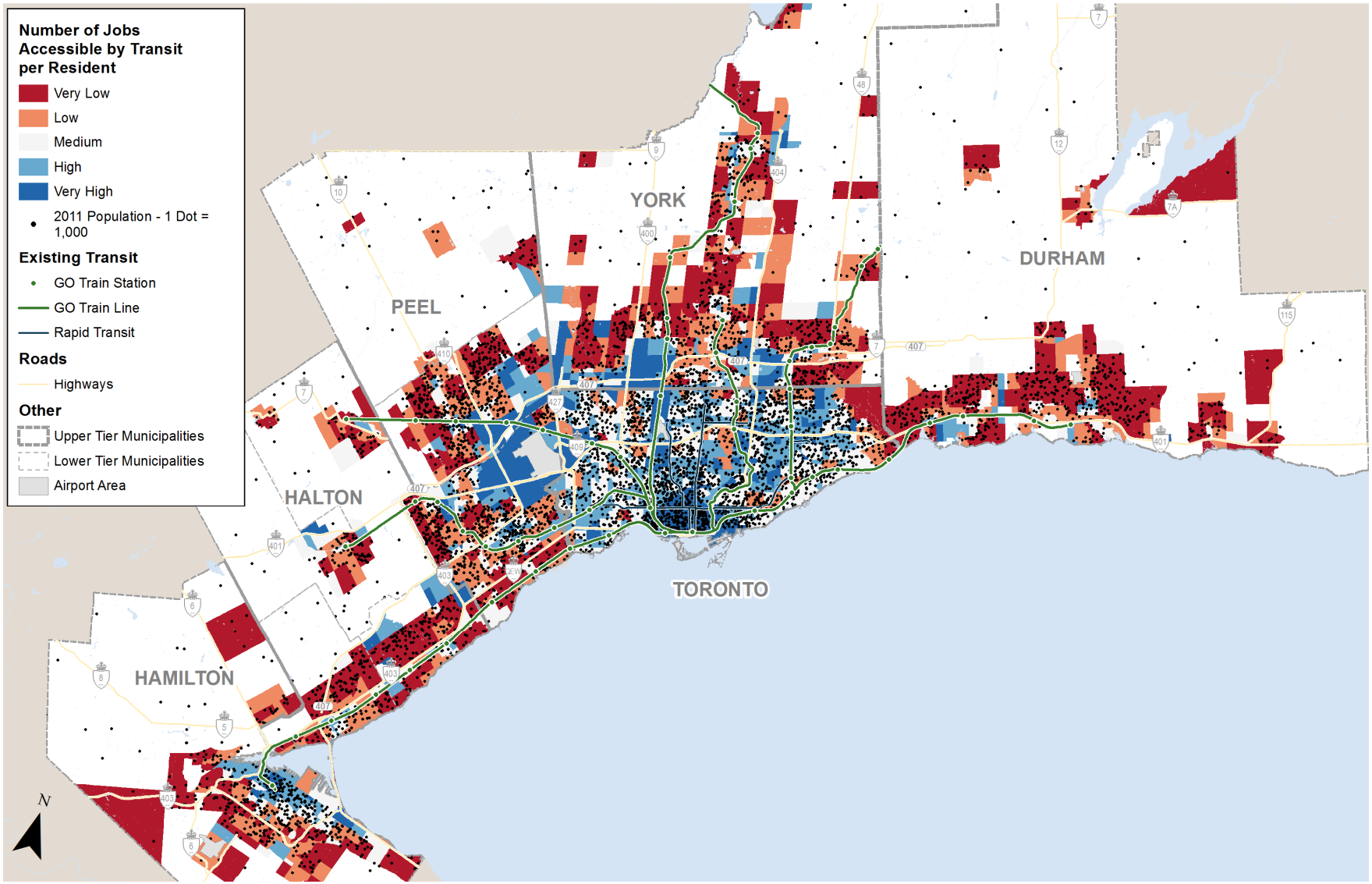
Source: Metrolinx/Arup Accessibility Tool; Statistics Canada 2011 Census and National Household Survey

The number of jobs accessible to the average resident by transit in 45 minutes, along with population dot-density, is mapped in Exhibit 4.5. In the exhibit, low job accessibility and high population in a given area suggest that the existing transit service may not be providing adequate levels of connectivity for many residents in those neighbourhoods.

In Toronto and Hamilton, the population tends to be concentrated in areas that also have high employment—downtown Toronto, downtown Hamilton, and North York for example. This high level of mixed use development puts jobs closer to residents and transit can more easily connect the two. Many of the jobs in other regions, however, are concentrated in larger employment areas near 400 series highway. Examples include large employment areas along Highway 400 in Vaughan, around Highway 404 at Highway 7 in Markham, and around Pearson Airport in Mississauga. Exhibit 4.5 shows that there are currently few residents in these areas, reflecting not only their industrial land uses, but also the fact that key highway intersections are much more attractive to employers that want to locate in auto-oriented business parks than to residential development.

[6] Tomer, A., Kneebone, E., Puentes, R., and Berube, A. Missed Opportunity: Transit and Jobs in Metropolitan America. Metropolitan Policy Program at Brookings. 2011

Exhibit 4.5: Map showing number of jobs accessible per resident by transit within 45 minutes in the a.m. peak period, and population dot-density, 2011



Source: Metrolinx/Arup Accessibility Tool; Statistics Canada 2011 Census and National Household Survey
***Notes:** Data for Durham Region only shows accessibility by GO Transit. Durham Region Transit route data was not available at the time of writing.
Accessibility categories correspond to quintiles of the observed range of number of jobs accessible per person across the GTHA. For example, "Very Low" means that the number of jobs accessible per resident is in the lowest 20% of the range observed across the GTHA.

Many of the employment nodes with low accessibility shown in Exhibit 4.5 are challenging to serve with conventional transit because travel flows tend to be strongly biased in the peak direction and developments in the business parks tend to be auto-oriented.

While transit service exists in these major employment nodes—all of these areas have at least basic local coverage—access could be improved by implementing more flexible first and last mile solutions to connect people directly to their places of work. More detailed study of local conditions would be required to assess specific opportunities for improvements.

Key areas in need of transit improvements based on the Access to Jobs indicator:

- **Peel Region:** Meadowvale, East Brampton, Central Mississauga
- **York Region:** Markham-Richmond Hill, North Richmond Hill, South West Vaughan, North and South Markham
- **Halton Region:** South Burlington, North Oakville, South Milton
- **Hamilton:** East Hamilton

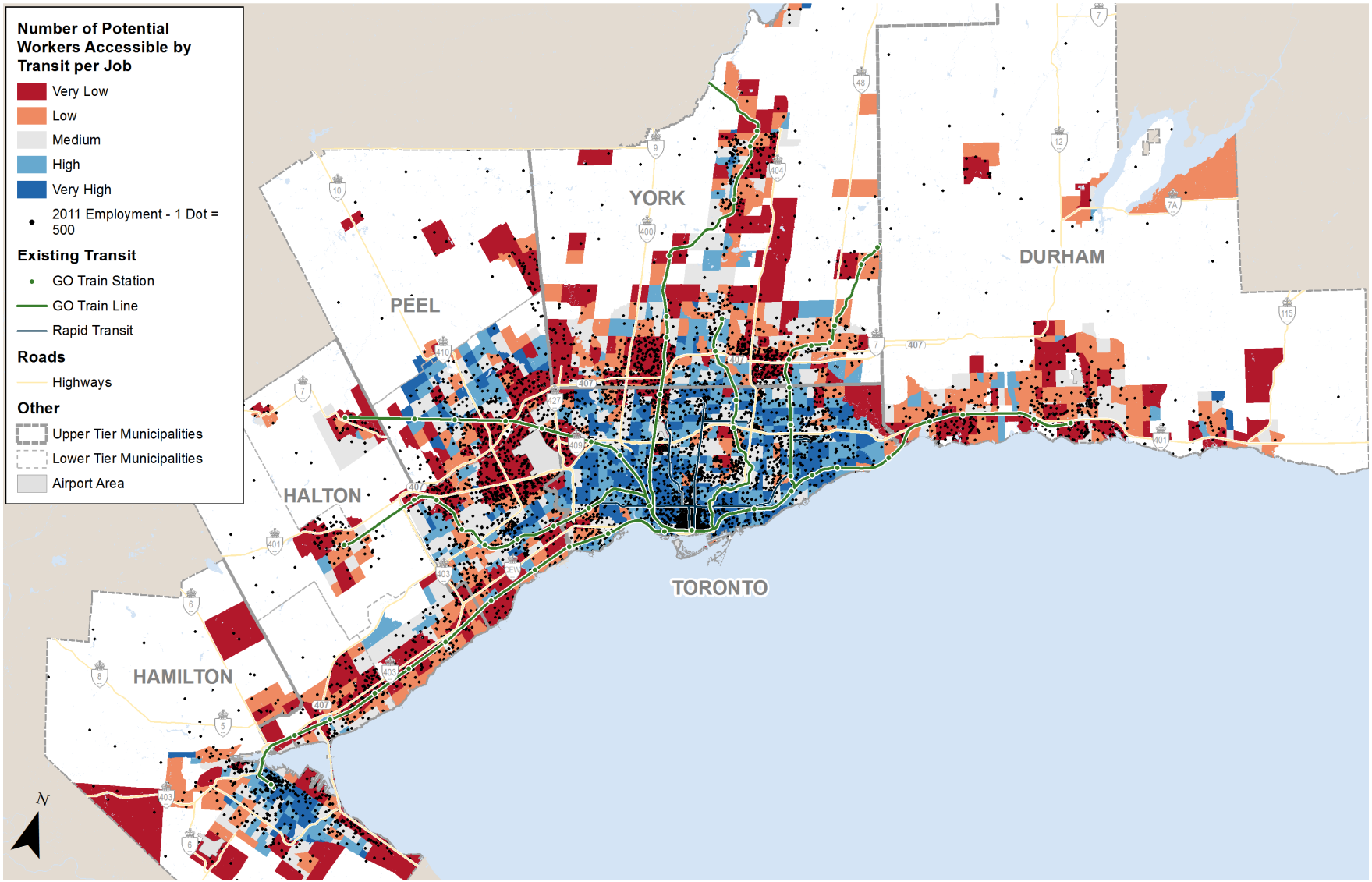
Notes:

- Areas identified as high level examples only. A more detailed assessment is needed to determine particular neighbourhoods and corridors that warrant improvements.
- Areas identified here are based on trip origins.

The *Access to Potential Workers* indicator is similar to the *Access to Jobs* indicator discussed previously. However, rather than measuring the number of jobs accessible per resident, it measures the number of potential workers accessible to each job—effectively a measure of accessibility from an employer's perspective[7]. Exhibit 4.6 shows a map of access to potential workers and job dot-density across the GTHA. In the exhibit, low access to workers and a concentration of jobs in a given area suggest that the existing transit service may not be providing adequate levels of connectivity for many employers in those neighbourhoods.

[7] Measuring access to potential workers is based on identifying job locations, determining how far one can travel in 45 minutes using all transit services available, then calculating how many residents live within that catchment area. It is measured in the 3:30 p.m. to 6:30 p.m. peak period rather than the morning peak period to ensure that peak-only transit routes that start in employment areas would be included in the calculations.

Exhibit 4.6: Map showing number of potential workers accessible per job by transit within 45 minutes in the p.m. peak period, and job dot-density, 2011



Source: Metrolinx/Arup Accessibility Tool; Statistics Canada 2011 Census and National Household Survey
***Notes:** Data for Durham Region only shows accessibility by GO Transit. Durham Region Transit route data was not available at the time of writing.
Accessibility categories correspond to quintiles of the observed range of number of potential workers accessible per job. For example, "Very Low" means that the number of potential workers accessible per job is in the lowest 20% of the range observed across the GTHA.

Exhibit 4.6 reinforces what was previously observed with the *Access to Jobs* indicator: potential workers may find it difficult to access the key employment nodes around Pearson Airport and near highway intersections by transit. These large employment areas therefore make up the primary areas in need of transit improvements as revealed by this indicator.

Key areas in need of transit improvements based on Access to Potential Workers indicator

- **Peel Region:** Pearson Airport Area, Meadowvale, South-East Brampton
- **York Region:** South East Vaughan, South Markham
- **Halton Region:** North Milton, South Burlington

Notes:

- Areas identified as high level examples only. A more detailed assessment is needed to determine particular neighbourhoods and corridors that warrant improvements.
- Areas identified here are based on trip destinations (employment locations).

4.2 Transit Capacity Needs

Transit ridership in several corridors across the GTHA are approaching the capacity of conventional bus service. A range of priority measures can help alleviate crowding.

Serving morning peak hour transit demand of about 500 persons (equivalent to about 1,000 people through the 6:30 a.m. to 9:30 a.m. peak period) typically requires 10 buses in the peak hour, equivalent to a six-minute headway[8]. MTO's *Transit Supportive Guidelines* suggest that this is about the average capacity offered by buses operating in mixed traffic in North America. As demand increases beyond this level, service reliability suffers as bus bunching becomes very likely and crowding tends to be a concern[9].

Exhibit 4.7 shows the transit corridors in the GTHA that are forecast to exceed 1,000 passengers in the morning peak period with the committed transit improvements in place.

[8] Based on a bus capacity of 50 passengers.
[9] *Transit Capacity and Quality of Service Manual (3rd Ed), Chapter 5* highlights that exclusive rights of way or higher order service become feasible at average headways of 5 minutes or less since increasing bus frequency is not likely to improve service in mixed traffic.

Exhibit 4.7: Transit ridership on municipal transit routes where demand will exceed 1,000 in the AM Peak Period in 2031

Source: MTO Greater Golden Horseshoe Model

Notes: i) For clarity, GO ridership and service levels on the future GO rail network are not shown.

ii) Caution should be observed in interpreting this exhibit as only committed rapid transit routes were included. Adding rapid transit in other corridors would increase ridership in those corridors.

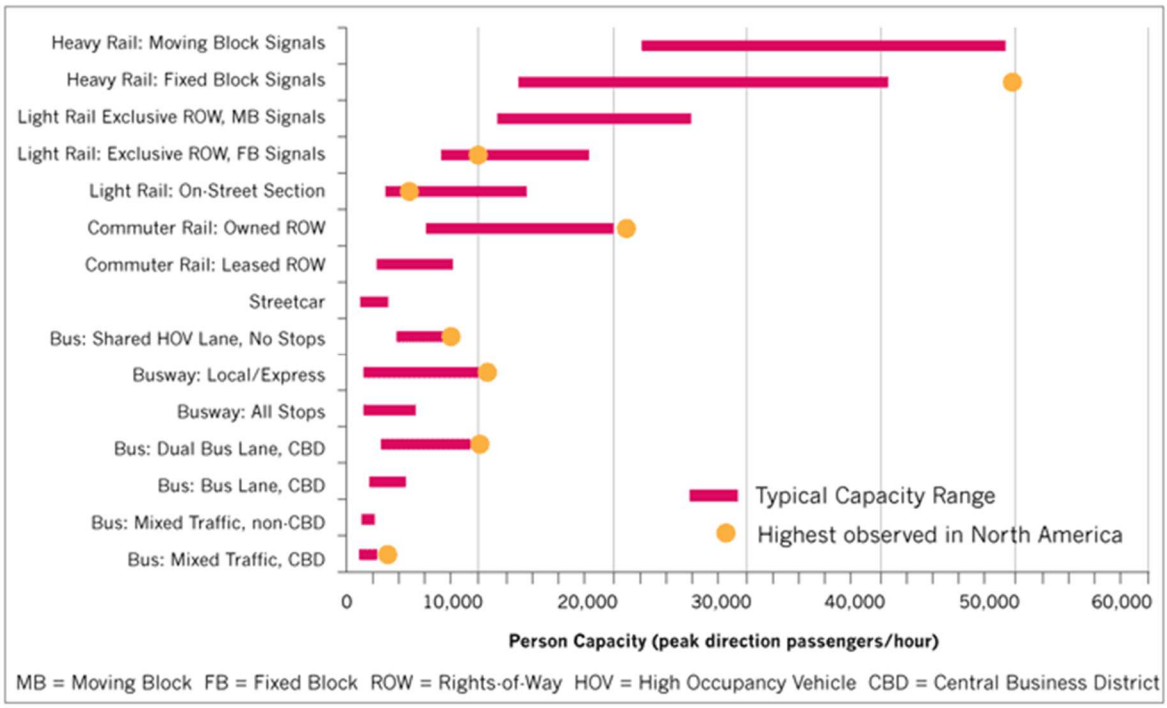
Several of the corridors highlighted in the exhibit align with the committed transit network presented in Exhibit 3.6 such as Hamilton LRT, Hurontario LRT, Sheppard LRT, Finch West LRT, and the Highway 7 and Yonge Street rapidway extensions. However, the exhibit also shows that several other corridors will also begin to reach the limits of conventional bus service, including:

- Queen Street in Brampton,
- Dundas St in Mississauga,
- Highway 2 in Durham Region

Also evident from the ridership projections is the dominance of the Toronto subway system which is reaching or exceeding capacity in many parts today as discussed below.

Efforts are underway to improve service in Brampton (*Züm* service currently operates on Queen, Main, Steeles and Bovaird) as well as Durham Region (*Pulse* operates on Highway 2). These examples both use a combination of transit priority measures such as shared HOV lanes, bus-only lanes and signal priority. Exhibit 4.8 shows that these types of measures have been shown to improve capacity. These are some examples of relatively low-cost measures that can be implemented before considering upgrading to more costly dedicated rapid transit in these corridors. Chapter 5 further discusses opportunities to address transit capacity issues.

Exhibit 4.8: Transit capacity observed in North America by service type



Source: Ministry of Transportation for Ontario – *Transit-Supportive Guidelines* (2012)

Subway demand in Toronto will exceed capacity in the near future. Policy actions to shift demand to RER, along with capital investments, could provide relief.

Capacity constraints on the Yonge-University Subway (Line 1) and Bloor-Danforth Subway (Line 2) are well documented. The Metrolinx Yonge Relief Network Study (June 2015) concluded that

the Yonge Subway, south of Bloor is currently operating at least +11% over its capacity of 28,000 passengers per hour per direction (pphpd).

Even with the committed transit improvements in place, strong demand from the north and east will continue to funnel onto the subway and exacerbate existing capacity issues on the system.

There is a clear need for alternatives to the subway if transit mode shares are to be maintained or improved in the future. While additional capital investment beyond the committed projects may be part of the solution, policy initiatives such as fare and service integration—in concert with committed capacity improvements to the GO network—would also incentivize some travellers to choose GO for their trips to downtown and relieve some demand from the subway. Chapter 5 further discusses policy-driven opportunities to alleviate crowding on some key transit routes.

4.3 Travel Time Competitiveness

The committed improvements will make transit more time competitive across the GTHA, with York seeing the strongest gains, but transit will still be time-consuming in Halton and Durham

Transit-Auto Travel Time Ratio compares the time taken to make a trip by transit (including time spent walking, waiting, transferring, and riding on the transit vehicle) to the time spent travelling between the same origin and destination by car.

The time taken to make a trip by transit compared to by car is a significant component of the mode choice decision that many travellers make[10]. Exhibit 4.9 shows the overall average travel times for trips made by transit and by auto, by municipality of origin or destination[11], in 2031, assuming that:

1. Only existing rapid transit projects are in place, and
2. The committed rapid transit network is implemented.

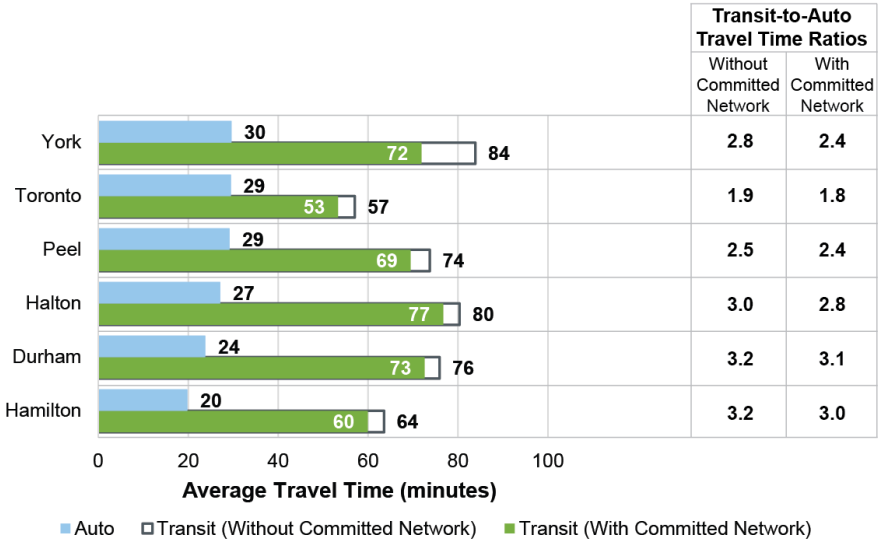
The exhibit shows that under the first scenario, the highest travel time ratios can be projected to be in Durham Region and Hamilton, where an average trip by transit will take about 3.2 times longer than an average trip by car in 2031. By comparison, an average transit trip in Toronto would take 1.9 times longer than an average trip by car. Travel time ratios alone distort the fact that both travel times by car and transit in Hamilton will be among the shortest in the GTHA.

The exhibit also highlights that York Region will benefit the most from the committed transit projects, with the average transit-auto travel time ratio falling from 2.8 to 2.4 as transit travel times fall by 12 minutes (14%). The implementation of frequent service on two GO lines, the Toronto-York Spadina subway extension, and Viva Rapidway service on Yonge St and Highway 7 all contribute to the travel time benefits that York residents will see. Travel time ratios in Halton and Durham will remain high.

[10] *TCRP 88 – A Guidebook for Developing a Transit Performance Measurement System* and the *Transit Capacity and Quality of Service Manual 3rd Ed.* (TCQSM) both highlight that assessing transit travel time is important to any system of measuring the quality of transit service.

[11] Average transit travel times in this analysis include trips to the municipality in the morning peak period. For many municipalities outside Toronto where transit service levels in the counter-peak direction are low, the average transit travel time is higher than would be the case if only peak-direction travel was measured.

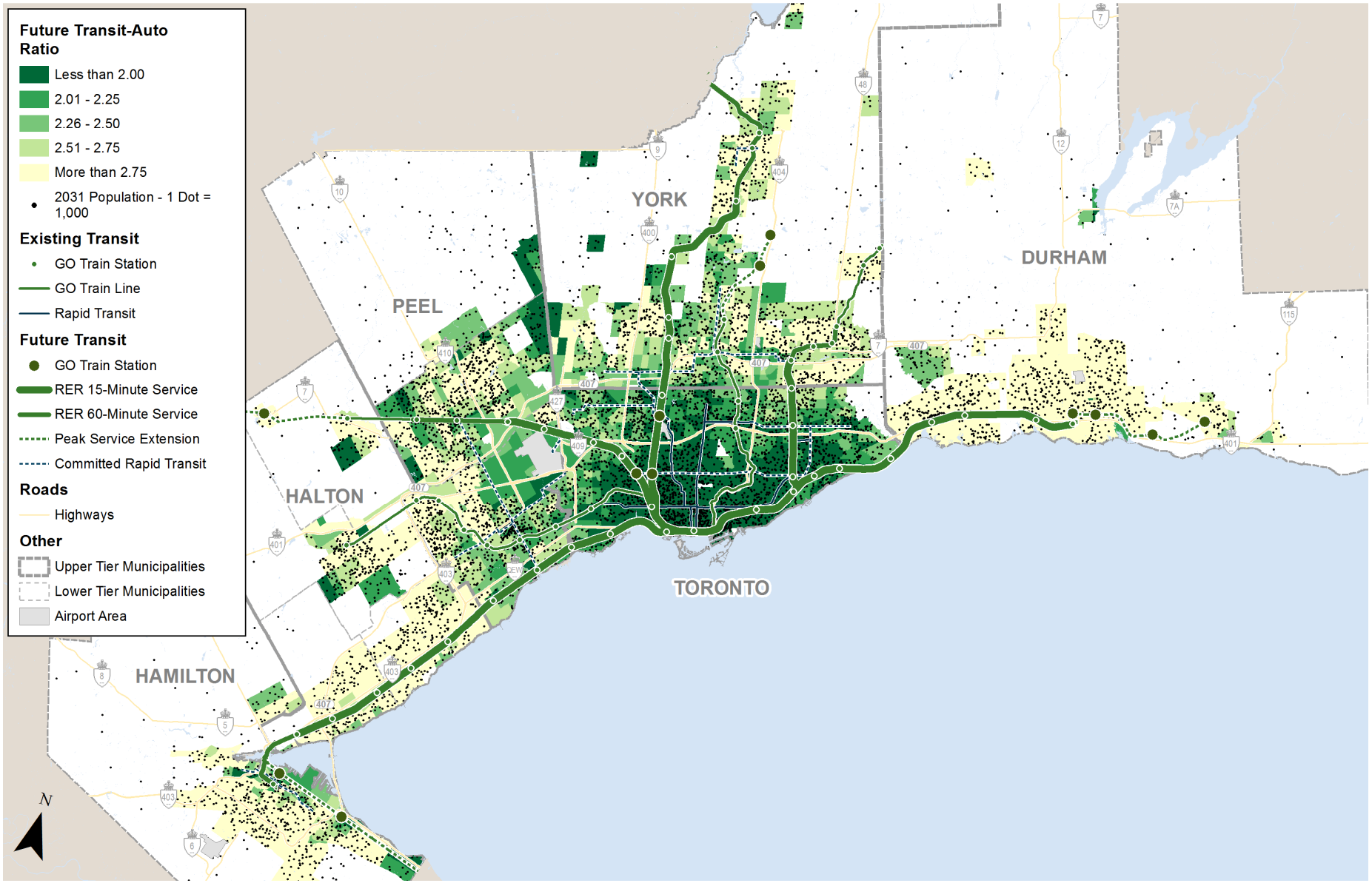
Exhibit 4.9: Average travel times by car and transit in the a.m. peak period in 2031 with and without current committed projects



Source: MTO Greater Golden Horseshoe Model
Note: Travel times are based on all trips entering or leaving each Region, including internal trips. Transit times include access and egress times, as well as transfer times between routes.

Exhibit 4.10 maps the distribution of transit-auto travel time ratios in the morning peak period across the GTHA in 2031, assuming that the committed transit network is implemented. Heavily populated areas with high transit-auto travel time ratios are potentially in need of transit improvements. Even with the committed improvements, transit travel in places like central Brampton, Meadowvale, north Markham, and parts of Durham and Hamilton will still be 3 times as long (or more) as by car.

Exhibit 4.10: Map of ratios of transit travel time to auto travel time, along with population dot-density, 2031 a.m. peak period



Source: MTO Greater Golden Horseshoe Model
Notes: Based on the average travel time of all trips entering or leaving each area where the trip can be completed by either transit or by auto.

All areas of the GTHA cannot be expected to have competitive transit travel times. Low density, auto-oriented neighbourhoods that are challenging to serve by transit would not see large improvements in travel time ratios with the committed rapid transit improvements. In some cases, making transit more time-competitive in these areas would be lower priority than some of the other transit needs highlighted in this study. More detailed assessments of local conditions would be needed to prioritize neighbourhoods where transit could be more time-competitive.

Key areas in need of transit improvements based on the Transit-Auto Travel Time Ratio indicator

- **Durham Region:** North Whitby-Oshawa, South Pickering-Ajax, Central Clarington
- **Peel Region:** Meadowvale, Central Brampton, West Mississauga
- **York Region:** Markham-Richmond Hill, Central Vaughan, North and South, Markham, East Newmarket
- **Halton Region:** South Burlington, Oakville, East Milton
- **Hamilton:** Central Hamilton

Notes: Areas identified as high level examples only. A more detailed assessment is needed to determine particular neighbourhoods and corridors that warrant improvements.

4.4 Transit Travel Time Benefits from Committed Improvements

The committed transit projects will improve travel times by 7% across the region, with some areas saving over 10 minutes on an average transit trip.

Exhibit 4.9 highlighted that some parts of the GTHA will benefit more from the committed transit improvements than other areas. Although all six subdivisions of the GTHA will see some benefit, the committed transit network will not deliver transit travel time savings to every neighbourhood in the region. Exhibit 4.11 shows a map of transit travel time savings with the committed network for all trips to or from various parts of the GTHA in the 6:30 a.m. to 9:30 a.m. peak period in 2031. The savings shown represent the difference between average transit travel times[12] with the committed transit projects implemented and average transit travel times if those projects were not implemented, instead leaving the existing transit services in place.

The exhibit also shows the 2031 population dot-density to highlight heavily populated areas that will not see much reduction in transit travel times. Comparing Exhibit 4.11 with Exhibit 4.10 helps to identify areas that are heavily populated, have relatively high transit travel time ratios, and will not see significant travel time savings with the committed transit improvements.

With this in mind, areas that show relatively little transit travel time savings according to Exhibit 4.11 but already have competitive transit travel times according to Exhibit 4.10, such as the neighbourhoods closest to downtown Toronto, may not be high priority areas for additional major transit investment intended to shorten journeys. (They may, however, be priorities for investment for other reasons such as improving capacity, reliability, or access.) In contrast, south Brampton west of Hurontario appears as a potential area in need of improvement in both exhibits, so there may be a greater need for investment to improve transit travel times in that neighbourhood.

In the south Brampton example, as with several other parts of the GTHA outside Toronto, the committed rapid transit improvements do not directly serve the area. Without an expanded grid of frequent service (Exhibit 2.7 shows that the frequent grid does not extend into south west

[12] Average travel time is weighted by the number of trips taken on transit to or from an area, and include access time, egress time, and transfer time.

Brampton), it is difficult to extend the potential travel time savings brought by the committed projects into these areas. Section 4.1.1 presented a more thorough discussion of the role of frequent transit within the rapid transit network.

Within Toronto, parts of south Etobicoke and north Scarborough have some of the least competitive transit travel times in the City as well as relatively low travel time savings. Exhibit 4.11 may underestimate the travel time savings these areas by not adequately capturing the travel time saved by residents who may choose GO instead of the TTC for trips within Toronto following implementation of the GO RER program, additional stations and potential fare and service integration measures. However, the uncertainty regarding the future of fare and service integration between GO Transit and the TTC makes it challenging to estimate at this time how many people will choose GO in the future and therefore benefit from faster transit travel times.

It is also important to note that in addition to travel time benefits, a major benefit of committed improvements is improved reliability. While difficult to quantify, it can be expected that reliability improvements will be realized through greater separation of vehicles from traffic (partial or fully-dedicated runningways), increased capacity and reduced potential for full vehicles by-passing waiting passengers.

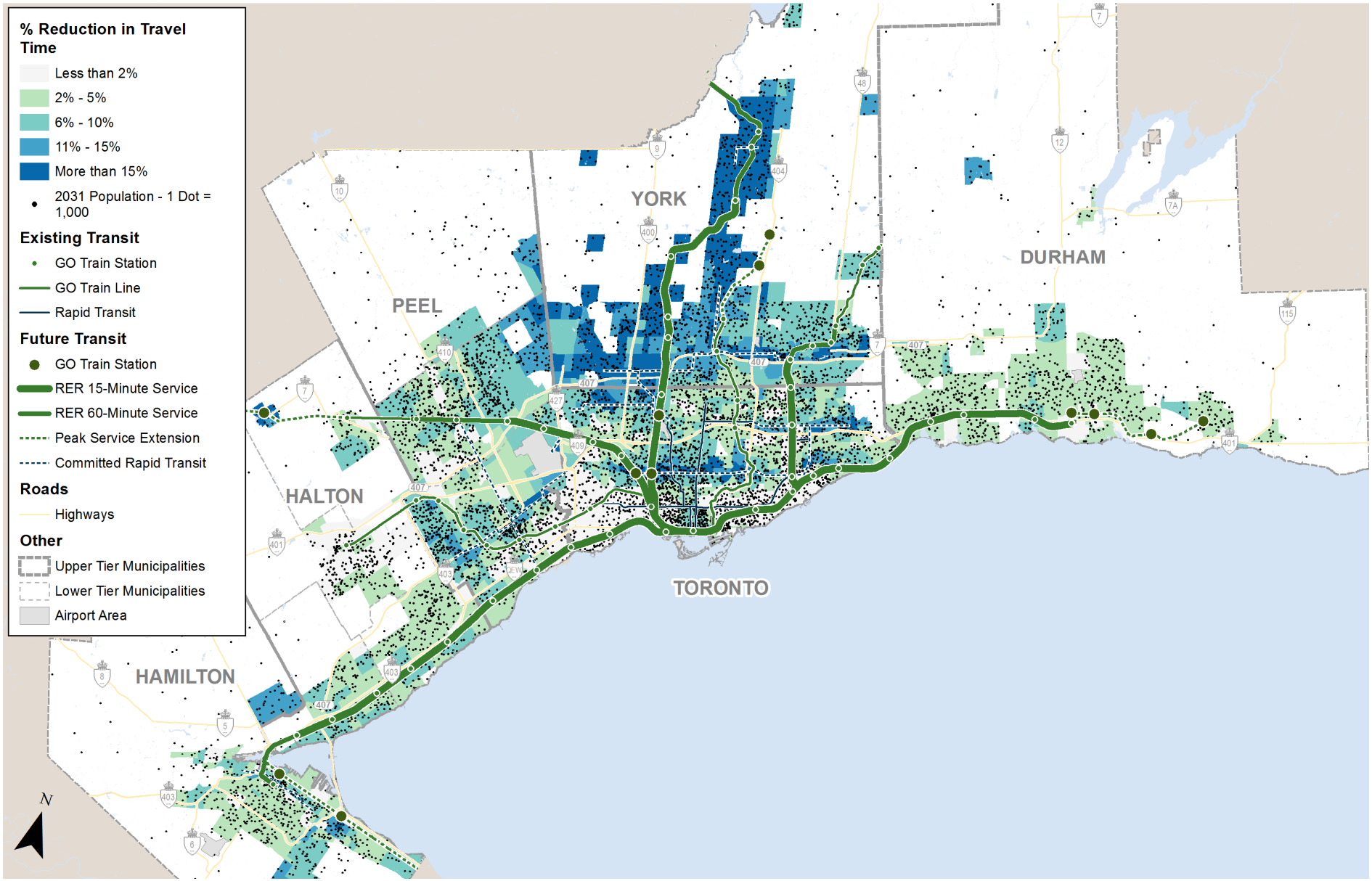
Key areas in need of transit improvements based on the Travel Time Savings indicator

- **Toronto:** North Scarborough, South Etobicoke
- **Peel Region:** East Mississauga, South Brampton
- **Halton Region:** South Burlington, North Oakville, South Milton

Notes: Areas identified as high level examples only. A more detailed assessment is needed to determine particular neighbourhoods and corridors that warrant improvements.

In some parts of the region where traffic congestion is high and few separated transit facilities exist, the transit-to-auto travel time ratio may be low even though both transit and auto travel times are relatively high. In downtown Toronto, for example, improving transit reliability and travel times would benefit many residents who do not have access to a car. Improving transit performance would also provide a more attractive alternative to the car for those residents who have access to a vehicle but face high auto travel times due to traffic congestion.

Exhibit 4.11: Transit travel time saved with introduction of the committed transit projects, 2031 a.m. peak period



Source: MTO Greater Golden Horseshoe Model

4.5 Social Equity

Lower-income residents face both cost and travel time penalties when travelling by transit

For many residents of the GTHA, travelling by transit is not only more costly than travelling by car for some trips, but can also be much more time consuming. This disparity between transit and auto cost and travel time is particularly important for low income[13] households of the region. Some of these families are forced to invest thousands of dollars in purchasing a vehicle—funds that could be invested elsewhere if better transit connections were available.

Exhibit 4.12 highlights the time and cost of some typical trips made from low-income areas in the region. As expected, many trips within and between the regions are more costly and more time-consuming by transit than by car.

Exhibit 4.12: Transit and auto travel characteristics for sample trips from low-income areas

Area of Social Need (Origin)	Destination	Transit Time (mins)	Auto Time (mins)	Transit-Auto Time Ratio	Transit Cost	Auto Cost	Transit-Auto Cost Ratio
South Brampton	Airport Corporate Centre	68	22	**3.1**	$ 19.90	$ 8.27	**2.41**
Downtown Hamilton	Burlington (QEW at Appleby)	91	31	**2.9**	$ 24.90	$ 11.35	**2.19**
Agincourt	Highway 404 at Highway 7	48	23	**2.1**	$ 18.30	$ 8.41	**2.18**
Dundas at Spadina	Vaughan Mills	77	40	**1.9**	$ 25.55	$ 14.75	**1.73**
Pickering Centre	Scarborough Centre	36	21	**1.7**	$ 15.14	$ 7.75	**1.95**
Central Etobicoke	Downtown Toronto	53	37	**1.4**	$ 16.15	$ 31.46	**0.51**
Central Brampton	Downtown Toronto	87	73	**1.2**	$ 29.88	$ 44.77	**0.67**

Notes:

- Times and routes are obtained from Google Transit for trips ending at 8:30am on a typical weekday.
- Total transit trip cost is the sum of transit fare (including co-fares and free transfers where applicable) and the value of time (taken to be $15 per hour).
- Auto trip cost assumes a vehicle cost of $0.16 per km (CAA average for a mid-size sedan), plus a value of time of $15 per hour, plus a parking fee of $20 for trips ending in Downtown Toronto.

Part of the disparity in costs is due to the absence of full fare and service integration between transit agencies, particularly at the connections to the TTC. Those making trips into Toronto from neighbouring municipalities either walk across the city boundary and pay a single TTC fare—increasing their commute time—or pay a second, undiscounted fare. Lower-income households rely more on transit for their mobility, are more sensitive to the fare they pay for their transit trips than higher-income households, and, as a result, may be more impacted by having to pay a second undiscounted fare.

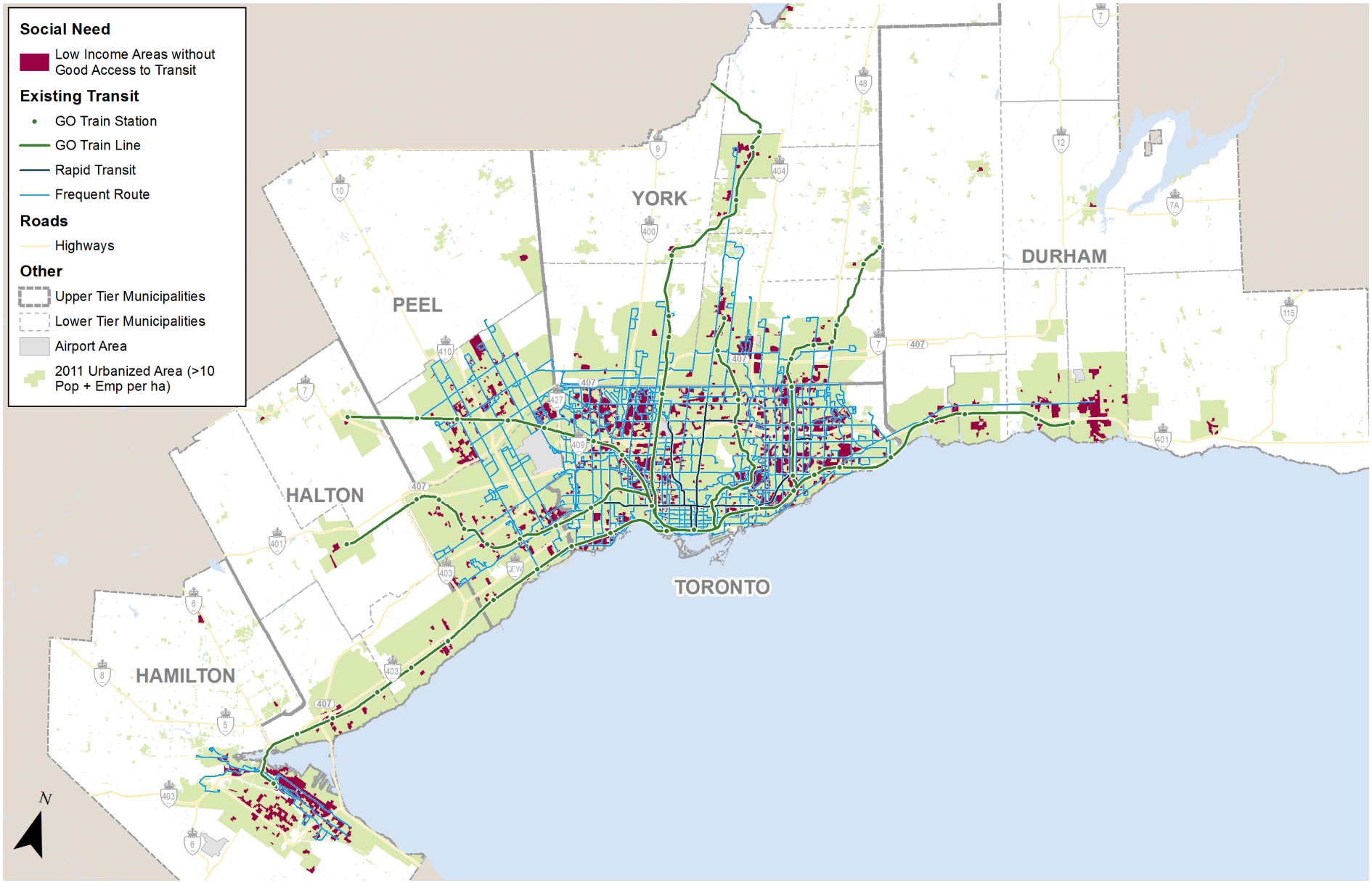
[13] Income in this context refers to Equivalent Income, which is a measure of household income relative to household size. It is the ratio of median household income to the square root of average household size, measured at the dissemination area level. Low-income areas in this report refers to areas with average equivalent income in the lowest quartile of incomes observed across the GTHA.

Exhibit 4.13 shows areas where incomes are low and access to transit is poor[14]. Outside Toronto, the sparsity of frequent transit discussed in Section 4.1.1 helps to explain the poorer scores for access to transit in these areas. Within Toronto in suburban areas, the areas of need are largely related to the urban form. Wider spacing of arterials where frequent services operate and physical barriers (e.g. ravines, rail corridors, and freeways, which have fewer crossings in the suburbs than in downtown) both increase the walking distance to transit. Some potential opportunities to address all these challenges will be discussed in Chapter 5.

Comparing Exhibit 4.13 with Exhibit 4.11 shows that some parts of North Etobicoke and Scarborough where incomes are lower and transit access is poor will see improved transit travel times in the future. These improvements are critical in these areas in order to provide a useful alternative to the car for residents who cannot afford to use a car for all of their travel needs. However, comparing the two exhibits also shows that several low income neighbourhoods with poor transit access are not forecast to see significant transit travel time improvements. These are potential areas for further assessment to identify the most suitable transit improvements to be pursued.

[14] Access to transit is a metric that quantifies, for each part of the GTHA, an equivalent level of transit service based on the walk time to the nearest transit stop(s) and the frequency of service available at those stops.

Exhibit 4.13: Map of GTHA highlighting areas in the lowest quartile of equivalent income that also lack good access to transit



Source: IBI Group based on Metrolinx/Arup Accessibility Tool and Metrolinx *Social Equity and Transit Background Paper (2015)*

Key areas in need of transit improvements based on the Access to Transit in Low Income Areas indicator

- **Durham Region:** South Oshawa, South Whitby, South Ajax
- **Peel Region:** South East Mississauga, Malton, South Brampton, North Brampton
- **York Region:** South Markham, South Richmond Hill
- **Hamilton:** Central Hamilton, Hamilton Mountain
- **Toronto:** North Etobicoke, Central Etobicoke, North Scarborough, Central Scarborough

Notes:

- Areas identified as high level examples only. A more detailed assessment is needed to determine particular neighbourhoods and corridors that warrant improvements.
- Areas identified here are based on trip origins.

5 Transit Opportunities and Key Strategies

This chapter presents a summary of the key needs and challenges identified through the examination of existing trends and future outlooks in the previous chapters. Potential strategies that could address these needs are then identified and discussed.

Strategies highlighted in ***bold italics*** and numbered are considered key strategies from a regional transportation planning perspective and are discussed further in Section 5.2.

5.1 Matching Needs to Opportunities

5.1.1 Creating a more connected transit network

An effective transit network is dependent on many factors including speed, reliability, comfort and convenience. However, without adequate connectivity, a transit system cannot fully meet the needs of its users. Essentially, connectivity represents the ease with which transit users can get from their point of origin to point of destination. Connectivity is a function of walking distances and routes to/from transit, number of transfers and degree to which different transit services are integrated.

Analysis presented in the previous sections has highlighted a number of challenges with respect to connectivity:

- **Diversity of travel patterns**: As the GTHA grows and expands, travel patterns are becoming more complex and diverse. The share of trips within the upper-tier municipalities outside of Toronto is growing, as are trips between them. While Downtown Toronto remains the dominant employment destination in the GTHA, there are many other major hubs throughout the region that are not as well connected to the major transit networks and rapid transit corridors. In many cases (e.g. the Airport Corporate Centre and Highway 404 / Highway 7 Business Park) these nodes draw from a wide area for workers. Without an effective grid of regional transit services, connectivity between multiple origins and destinations will remain a challenge.
- **Land use densities and street patterns**: Approximately half of all of the GTHA's population and jobs are located in areas with land use densities that only support basic transit service levels. Many suburban areas built over the past few decades lack a fine-grained street grid network which is essential for transit connectivity. While planning policy encourages mixed use development, there are many areas of the GTHA that are dominated by large tracts of primarily residential uses which increase travel distances to employment areas and other activities.
- **Auto-centric design of major employment areas:** There are several nodes throughout the GTHA that have developed into large employment areas, including the Pearson Airport area in Mississauga, the intersection of Highway 404 and 407 in Markham, and the intersection of Highway 400 and Highway 7 in Vaughan. In many of these areas an auto-centric urban form currently exists, with building entrances separated from the street by large surface parking lots, few sidewalks, and little or no bicycle infrastructure. While major transit stops and stations are sometimes nearby, first/last mile pedestrian, bicycle, or transit connections between the stops/stations and the employment locations are often not in place.
- **An Incomplete Frequent Transit Network**: Within the City of Toronto, most major corridors operate with high levels of transit service (i.e. headways of 10 minutes or better in the peak). However, across the rest of the GTHA, the extent of the frequent transit network is limited (or lacks connectivity) despite the fact that many areas are

close to having the densities required to support a frequent transit network. Outside of Toronto, efforts are being made to increase the grid of frequent transit services, particularly in Mississauga, Brampton and York Region. For example, the YRT/Viva 2016-2020 Strategic Plan calls for the transition of existing services along key corridors to a Frequent Transit Network (FTN).

- **Access to rapid transit networks**: Rapid transit influences connectivity in many ways. Rapid transit supports frequent connecting services and feeder services that can penetrate into communities. Rapid transit also serves to shape land use over time by creating mixed use corridors, and in turn higher connectivity between people and jobs. As highlighted in Exhibit 4.5, approximately 9% of the GTHA's residents and 19% of jobs are currently within 800 m of rapid transit.
- **Service Integration**: Work carried out by Metrolinx as part of the ongoing fare and service integration strategy has highlighted challenges that result from the region's multiple service providers focusing on travel solely within their respective jurisdictions. It has identified the need to move to a more customer-focused system where the user sees the transit system as unified and not impacted by jurisdictional boundaries.

There are several key opportunities to improve connectivity of the transit network. Key strategies are highlighted in ***bold*** and discussed further in the next section.

- ***Expanding the frequent transit network***, where supported by land use densities and where these networks can be connected to major nodes and rapid transit;
- Extend routes that approach or cross boundaries between service providers;
- Improve coordination of services at key interagency transfer points such as GO stations and major transfer hubs;
- Increase the number of routes that provide connections to major destinations, aligning these routes with major travel flows;
- ***Improve first-mile and last mile connections*** to and from major transit corridors, transit hubs and rapid transit. This includes addressing safety, comfort and convenience for pedestrians and cyclists;
- Utilize emerging innovative transit solutions including ***demand-responsive transit*** to improve connectivity where conventional transit services may not be viable;
- Continue to extend and fill in the gaps in local transit services to improve coverage and connectivity; and,
- Improving local transit service levels and coverage to new growth areas.

5.1.2 Enhancing transit capacity to address existing and future needs

Many parts of the transit system in the GTHA are experiencing capacity challenges. The subway system in Toronto operates at or above design capacity during peak hours, as do many of TTC's surface transit routes. Capacity challenges also exist on key corridors outside of Toronto including Yonge Street in York Region, the Hurontario-Main Corridor in Mississauga/Brampton and parts of the King/Main corridor in Hamilton. Many local transit routes experience capacity challenges as they approach major subway stations, GO stations and major activity generators. Despite significant increases in service over the past decade, much of the GO rail system also continues to see high passenger loadings during peak periods as a result of growth in demand.

In some cases capacity challenges can be addressed by increasing service levels or adding new routes. However, many higher growth areas will require more significant improvements such as introducing higher-order transit where none currently exists.

Major initiatives to alleviate transit capacity constraints on existing busy bus corridors are underway. These include the Toronto-York Spadina Subway Extension into York Region, Eglinton Crosstown and the Highway 7 and Yonge Street rapidways in York Region. Other committed rapid transit projects including the Hurontario, Hamilton, Finch West and Sheppard East LRTs will further serve to increase the overall capacity of the transit network and provide circumferential connections to the radial rapid transit network. Investments in GO rail service, including RER, will help off-load other major corridors including the Toronto subway system.

While these investments will alleviate capacity constraints on many existing corridors, there is the potential that resulting increases in transit ridership could contribute to additional downstream capacity concerns where they feed trunk lines into downtown. Thus it will also become important to build additional redundancy into the network of rapid transit corridors feeding downtown Toronto.

Although these committed improvements represent very significant investments, they are not sufficient to address all needs to 2031. In addition to other planned rapid transit improvements, strategies to maximize the capacity of existing (and future) transit networks will be required. Such strategies are often referred to as ***Transportation Systems Management (TSM)***. As described further in the next section, TSM refers to a broad set of tools that increase the efficiency of the transportation system by using technology or low-cost improvements to minimize the effect of vehicle congestion by providing priority for transit vehicles and improving overall operations in road corridors. TSM would also include operational enhancements to grade separated rapid transit.

5.1.3 Improving travel time competitiveness of transit

A person's decision to take transit is highly influenced by the competitiveness of transit compared to other modes. The fact that 70% of morning peak period trips to downtown Toronto are made on transit is in part due to the fact that transit very competitive compared to travel by car, particularly when parking costs are factored in. Outside of trips to downtown Toronto, the relative differences between transit times and auto times are highly variable. Challenges arise when the time advantages of travelling by car over transit are significant enought that transit use is primarily limited to captive riders (those that do not have access to other modes).

Travel markets that are most subject to disparities in travel times include the following:

- Outbound trips from Toronto to the municipalities outside Toronto. For example, travelling from Victoria Park and Danforth to the Highway 404/Highway 7 employment area in Markham currently takes approximately 30 minutes to drive in peak conditions compared to 1.5 hours by transit.
- Trips between urban centres that are not connected by rapid transit or GO rail. For example, midtown Oakville to downtown Brampton or Pickering Centre to Markham Centre.
- Shorter trips within areas where transit frequencies are low enough that the wait time for transit can approach or exceed the time that the trip could be made by car.

The previous chapter highlighted that many areas of the GTHA will see improvements in transit travel times as a result of committed transit improvements. Travel markets that are aligned with the Regional Express Rail Network will see significant benefits, particularly outbound trips to employment areas connected to RER.

Key opportunities to improve the travel time competiveness of transit include:

- ***Improving and extending regional transit services***, including GO rail networks as well as regional bus services
- ***Expanding the frequent transit network***, using GO rail corridors with frequent service, committed rapid transit and Urban Growth Centres as anchors.
- Implementing ***Transportation Systems Management*** approaches such as HOV lanes and reserved transit lanes to provide priority for transit vehicles.
- ***Expanding the rapid transit network***
- Introducing new or expanded ***express bus services*** as precursors to rapid transit
- Improving feeder bus services to major transit hubs and providing priority for these services where they experience congestion
- Implementing innovative transit solutions to address the ***first-mile, last-mile*** component of transit trips.

5.1.4 Targeting transit improvements to address social equity

Improving equity in transportation is defined as addressing the transportation needs for those most vulnerable, that is, those who have the greatest need for transit due to a lack of alternative options.

The 2008 Big Move Regional Transportation Plan (RTP) highlighted the important link between social equity and transit. According to *The Big Move*, "Access to frequent, fast and affordable transit is therefore crucial for equity and social cohesion. The transportation system needs to improve the mobility options for people … connecting at-risk, vulnerable and disadvantaged communities to the jobs, social services and health care facilities which can improve people's lives."

Technical work done in advance of Metrolinx's *Social Equity & Transit: Background Paper* to inform the RTP for the Greater Toronto and Hamilton Area identifies a number of opportunities to improve the transit network characteristics that have the greatest impact on social equity. These fall under the categories of:

- Coverage and connectivity
- Rapid transit (whether by bus or rail)
- Frequency and span of service
- Walk distance
- Reliability
- Crowding and capacity
- Barrier-free access
- Affordability
- Walking and cycling networks.

From a transit network planning perspective, many of the opportunities identified to address overall transit needs will also help to address social equity. Key opportunities include ***expanding the frequent transit network***, ***improving first-mile and last mile connections*** and implementing ***Transportation System Management*** solutions to improve capacity (reducing crowding) and improving reliability.

Spatial data on areas of social need, as highlighted in the previous chapter, helps ensure that these network opportunities are priorities where they are needed most.

The previous chapter also served to highlight the challenges some residents face in terms of transit costs and travel times. These challenges are particularly acute for residents whose travel patterns are not aligned with the existing rapid transit network (and hence experience longer transit times) and/or where they have to cross fare boundaries incurring additional costs.

Accordingly, changes to fare structures and ***fare integration*** represent key opportunities to address social equity challenges as discussed further in the Section 5.2.8.

5.1.5 Influencing travel behaviour

As a rapidly growing Region, the GTHA faces a major transportation challenge. Overall, transit trips will grow faster than auto trips, but since auto trips will still account for 71% of all morning peak period trips in 2031, the absolute change in auto trips will significantly outweigh growth in transit trips. This result is not surprising given that approximately 78% of all population growth and 84% of employment growth to 2031 will occur in the regions outside Toronto where prevailing mode shares are lower. Growth in auto trips has significant implications in terms of congestion, greenhouse gas emissions, health impacts and overall economic, social and environmental outcomes.

To address the challenges with growth in auto trips, transit network solutions need to be complemented with strategies to reduce and manage travel demand. Transportation demand management (TDM) strategies use information, education, and incentives to influence the demand for travel. TDM is an important tool to help shift more trips from autos to transit and other sustainable modes. TDM is also applicable to transit where shifting the time or routing of travel can help address capacity shortfalls.

Metrolinx, through its Smart Commute program, has a number of programs aimed at influencing travel behaviour. Looking beyond these programs from a transit planning perspective, several strategies offer significant potential:

- ***Road pricing***, where there are effective transit alternatives available
- ***Parking pricing***, at both major destinations as well as transit stations/GO stations
- ***Transit pricing*** (e.g. peak/off-peak fares)
- Improving active transportation networks to transit

5.2 Key Strategies

In the previous section a number of potential strategies that have the potential to address existing and future transit needs were identified. Key strategies identified in ***bold italics*** are discussed further below, along with how they will address needs by area and/or travel market. Exhibit 5.1 shows a summary of these strategies and the needs they will address. It should be noted that these are not intended to be an exhaustive list of strategies, but rather key strategies that should be detailed further as part of the RTP Update.

Exhibit 5.1: Summary of key opportunities along with the needs that they will address

Key Strategy	Creating a more connected transit network	Enhancing transit capacity to address existing and future needs	Improving travel time competitiveness of transit	Targeting transit improvements to address social equity	Influencing travel behaviour
Strategy 1: Expanding the frequent transit network	•	•	•	•	

Key Strategy	Creating a more connected transit network	Enhancing transit capacity to address existing and future needs	Improving travel time competitiveness of transit	Targeting transit improvements to address social equity	Influencing travel behaviour
Strategy 2: Improve first-mile and last mile connections	●		●	●	●
Strategy 3: Demand-responsive transit	●		●		
Strategy 4: Improving and extending regional transit services	●	●	●		
Strategy 5: Transportation Systems Management	●		●	●	●
Strategy 6: Expanding the rapid transit network	●	●	●	●	●
Strategy 7: Express bus services		●	●		
Strategy 8: Fare integration	●			●	●
Strategy 9: Road use pricing					●
Strategy 10: Parking pricing					●
Strategy 11: Transit pricing					●
Strategy 12: Transit-supportive policies and initiatives				●	●

5.2.1 Strategy 1: Expanding the Frequent Transit Network

A Frequent Transit Network (FTN) is generally understood to be composed of those corridors where people can expect convenient, reliable, easy-to-use services that are frequent enough that they do not need to refer to a schedule.

As highlighted in Chapter 3, many areas of the GTHA outside Toronto have land use densities to support inclusion in the FTN, but lack strong trunk lines such as subways to connect to. While it is not feasible or cost effective to provide complete coverage of the GTHA with frequent transit, there are many areas where committed rapid transit projects or GO service improvements (or both) will provide the necessary anchor to connect to as shown on Exhibit 5.2.

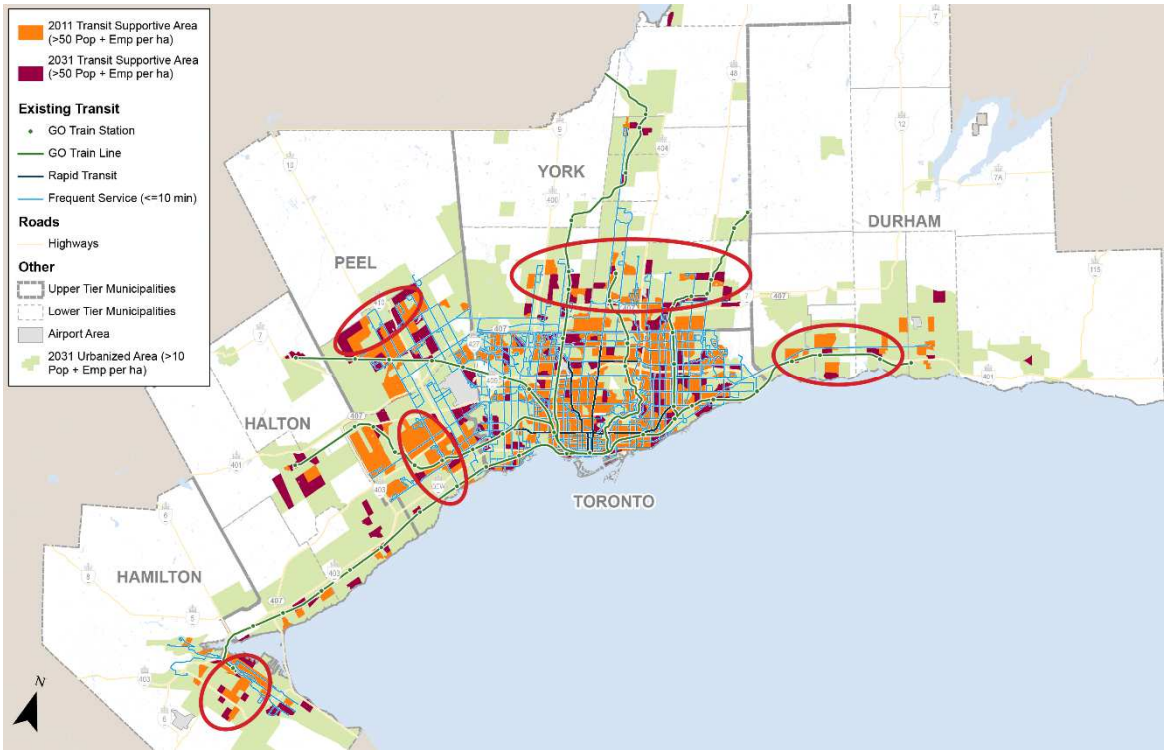
Exhibit 5.2 highlights sample areas of the GTHA that have land use densities that could support frequent transit over time, but currently lack a connected FTN. These areas are also close to one or more of the following: existing or planned rapid transit, Regional Express Rail, an Urban Growth Centre. There are also areas were the existing FTN could be extended to provide a

continuous grid. Each of these sample areas are discussed on the following page along with the key needs an expanded FTN could address.

Evolving to a more comprehensive FTN in the GTHA will need to go hand in hand with the emerging transit service hierarchy as described in Chapter 2. It may also require greater subsidy levels for certain routes in early years while ridership patterns are being established, which in turn may require low productivity routes to be rationalized.

Service reliability is an important aspect of the FTN. Implementing a very frequent service along a busy street without dedicated transit facilities can lead to bunching[15], which, from the customer's perspective, can increase the service headway. For example, customers waiting for a transit vehicle that is scheduled to arrive every five minutes could be waiting 15 minutes for service. Eventually, three vehicles arrive back-to-back so on average, the actual headway matches the schedule. However, from the customers' perspective, the route is not frequent because the headway that they experience is 15 minutes.

Exhibit 5.2: Areas of opportunity to expand the grid of frequent transit routes, anchored by GO RER



Hamilton Mountain: Large areas of the upper city of Hamilton could support an expanded FTN. Hamilton's Rapid Ready Plan identifies conceptual connections. An expanded FTN in these areas would improve travel times for transit from the upper mountain to the lower city as well as to major destinations such as Mohawk College. An expanded FTN would serve to improve transit for several identified areas of social need.

Central Mississauga: Many east-west and north-south trips in Central Mississauga are not aligned with GO rail lines. While the Hurontario LRT and Mississauga Transit provide strong spines, other trips may benefit from expanding the FTN. Mississauga's MiWay Five plan

[15] *Transit Capacity and Quality of Service Manual (3rd Ed), Chapter 5* highlights that at headways of 5 minutes or less, bus bunching becomes more likely and increasing service frequency is not likely to improve service in mixed traffic.

identifies this as a priority. An expanded FTN in this area would provide improved connectivity by extending the reach of the planned Hurontario LRT and Lakeshore RER corridor.

North Brampton: North Brampton is a rapidly growing area with transit-supportive densities, but is outside of the primary catchment area of planned rapid transit corridors and was highlighted as an area with poor accessibility. Implementation of an expanded FTN would serve to improve connections between residential areas and employment areas, and support investments in RER on the Kitchener corridor and rapid transit in the Hurontario-Main corridor.

Southern York Region: The wide 2 km spacing of arterial roads creates challenges for transit in southern York Region. Increasing service levels on the 2 km grid, in combination with existing and planned rapid transit will serve to increase the overall connectivity of the transit grid. The justification for an expanded FTN is greatly enhanced by the GO RER program which will provide anchor connections at Barrie and Stouffville line GO stations, in addition to Urban Growth Centres. YRT's Five Year Transit Strategy identifies an initial FTN.

Southern Durham Region: The Durham municipalities along the lakeshore include large tracts of primarily residential or primarily employment oriented uses. An expanded FTN would serve to improve connectivity between these areas and also support frequent service on GO's Lakeshore East line. DRT's Five Year Transit Strategy identifies an initial FTN (referred to as a High Frequency Network).

5.2.2 Strategy 2: First-mile last-mile solutions

Successful public transit systems need to offer safe and accessible connections to and from transit stops and stations for both pedestrians and cyclists. Key factors include the directness of walking and cycling routes, the use of wayfinding to ensure that routes are "legible" to users, the design of buildings and open spaces (both public and private) for aesthetics and personal security, and the provision of amenities such as trees, benches, lighting and bicycle parking.

First-mile last-mile challenges can also be addressed by emerging technologies including ridesharing, demand-responsive transit (see next section) and, in the foreseeable future, autonomous vehicles. Such solutions are enabled by smartphone technologies which connect transit riders to service providers.

Essentially all parts of the GTHA's transit system can benefit from improved first-mile last mile connections. Examples of how improvements could address some of the needs identified in the previous chapter include:

- Increased and improved active transportation connections to transit in areas of social need in North Etobicoke and Scarborough.
- Implementation of transit shuttle services and ridesharing services in areas such as the Highway 404 / Highway 7 Business Park, Vaughan Metropolitan Centre, Southeast Brampton and the Pearson Airport area, which were identified as areas with poor transit accessibility to workers within 45 minutes.
- Implementation of bike share programs around RER stations where there are nearby destinations that are accessible by bicycle.

5.2.3 Strategy 3: Demand-Responsive Transit Services

The advent and wide-spread adoption of smartphone technology and its various applications has stimulated the advancement of several new technology-enabled transportation modes and services. Advancements in this technology have enabled ridesharing and demand-responsive services to be dynamic and user-friendly while optimizing scheduling and service logistics.

Historically referred to as “dial-a-ride” services, demand-responsive services have several potential applications:

- Supplementing or replacing fixed route services in rural areas and low density communities where jobs and residents are widely dispersed
- Filling gaps in the fixed-route system
- Providing alternative transit access options to and from transit hubs and GO stations where the existing street patterns do not support a connected transit grid, or where land use does not support frequent transit
- Providing service outside of the hours of fixed routes, for example to major employers that have early or late night shifts
- Replacing fixed routes, which require high passenger subsidies, with savings redirected into frequent transit services on major corridors

Utilizing dynamic transit to connect lower density areas or major employment nodes to rapid transit and GO rail would also serve to improve the travel time competitiveness of transit.

Dynamic transit has significant potential to address some of the needs and challenges around transit accessibility highlighted in Chapter 4. Specifically, Exhibit 4.10 highlighted many areas on the fringe of the urbanized area with low accessibility to workers within 45 minutes. Examples include the area around Hamilton airport, eastern Hamilton/Stoney Creek, employment areas in south Burlington and Oakville, Milton, Georgetown, Caledon, employment areas in Vaughan, and employment areas along Highway 404 north. In some cases, dynamic transit could be a precursor to potential future fixed route transit (e.g. Caledon).

A yearlong pilot project in Milton called “GO Connect Service” served to demonstrate the potential for dynamic transit. New options for dynamic transit are also being advanced in York Region and Durham Region.

Implementing dynamic transit on a wide-spread basis is not without challenges. It will require a supportive regularly environment to clarify the role of private sector and in many cases could require a higher subsidy per trip than conventional services. Efforts to rebrand dynamic transit to distinguish it from historical dial-a-ride services, which were focused on captive markets such as seniors, will also be required.

5.2.4 Strategy 4: Improving and extending regional transit services

Regional transit routes are currently comprised of GO Rail lines and GO Bus routes. The implementation of the GO Regional Express Rail program will greatly enhance options for regional travel by facilitating convenient two-way travel along most of the GO network throughout the day, and by providing much needed additional capacity for peak direction trips.

The committed network also includes extensions to the current GO rail network:

- West Harbour to Confederation station in Hamilton, with later extension to Niagara Falls,
- Richmond Hill to Gormley and Bloomington Rd. in York Region, and
- Oshawa to Bowmanville in Durham Region.

Beyond the committed projects, the RTP identifies potential new regional rail services to Bolton, Locust Hill in east Markham and Seaton (Central Pickering). The RTP also identified the possibility of considering additional GO rail extensions beyond the GTHA to Cambridge and Peterborough, each of which has undergone further investigation since the RTP was published.

Improvements to the GO Bus network continue to be made in response to growth and changing travel patterns. For example, in September 2016 GO Transit will introduce new all-day GO Bus service between Brantford and Aldershot station in Burlington, peak period GO Bus service between Milton and downtown Cambridge, and upgrade the peak period GO Bus service between Kitchener and Bramalea to all-day service. A separate study is underway to develop a strategy for expanding future GO Bus services over the next five to ten years.

A key opportunity for the GO Bus network is to address travel markets that are not aligned with planned rapid transit improvements. The effectiveness of the GO Bus network could be greatly improved through the implementation of a connected network of HOV lanes, as demonstrated during the 2015 Pan Am Games, plus other priority measures such as queue jump lanes.

Extensions of the GO Rail network would address a number of needs identified in the previous chapter including:

- Transit travel time competiveness in parts of the region that do not benefit from the committed rapid transit projects or RER such as east Hamilton/Niagara Region and east Durham Region for example.
- Improving access to employment areas along the Highway 404 corridor in York, Halton and Durham where there are large employment areas that have low access by other transit modes. Increasing travel speeds of GO trains where RER is not planned, through tactical geometric improvements for example (Metrolinx is currently studying this in some corridors), would improve transit access. Benefits would be enhanced by implementing dynamic transit and first-mile last mile solutions that connect these employment areas to the new GO stations.

5.2.5 Strategy 5: Expanding the rapid transit network

The 2008 RTP placed a strong emphasis on building a comprehensive rapid transit network (Big Move Strategy #1). This strategy is now being realized with the construction of several new rapid transit lines. As highlighted previously in Chapter 3, if only committed projects were implemented, the number of residents who will be within 800 m of rapid transit will increase from 9% in 2011 to 21% in 2031 while the number of jobs will increase from 19% to 33%. While significant, further expansion is required to develop a more complete rapid transit network.

Following the 2008 RTP, Metrolinx has implemented rapid transit projects in phases aligned with government funding commitments, which it has allowed for their classification into “Quick Wins”, “First Wave” and “Next Wave” projects. The First Wave projects received government funding commitments between 2006 and 2010 and many have now been completed or are in the building phases of implementation. The Next Wave represents projects from the Top Priorities list of the 2008 RTP (as amended in 2013) that had not obtained committed funding as of the development of Metrolinx’s *Investment Strategy*. Some of these projects, including Hurontario LRT, Hamilton LRT and GO electrification and expansion have since been funded through the province’s *Moving Ontario Forward* commitments in 2014. The balance of Next Wave projects will be considered as candidates for rapid transit expansion and include the Relief Line in Toronto, Yonge North Subway Extension, Dundas Street BRT, Brampton Queen Street Rapid Transit and Durham-Scarborough BRT, Planning and project development work is underway.

The 25 year plan for the regional Rapid Transit Network in the 2008 RTP identifies additional rapid transit projects beyond the Next Wave. Through completed or on-going Transportation Master Plans, regions and municipalities have reviewed these projects and in some cases suggested additions or deletions.

The list of potential rapid transit network expansions is clearly extensive. Over the next decade, significant resources will be required to deliver on committed projects. Accordingly, further extensions and new rapid transit projects will need to be well justified.

While it is not the role of this study to identify or assign priorities to future rapid transit projects, it is informative to highlight how potential rapid transit projects could address some of the needs identified in the previous chapter. Examples include:

- Durham-Scarborough BRT (Highway 2 corridor): Rapid transit in the Highway 2 corridor would address several identified needs in Durham Region and surrounding areas. In particular, Durham has some of the highest travel times in the GTHA and implementing rapid transit would significantly improve the competiveness of transit for medium to longer distance trips throughout southern Durham. Having an alternative to GO Rail for longer distance east-west trips within Durham would benefit lower income households and better serve local trips. Rapid transit would also enhance the overall capacity of transit in the Highway 2 corridor, which was identified as a potential future issue.
- Yonge North Subway extension: The Yonge subway extension would address a number of needs including capacity limitations of the existing surface routes north of Finch Station. This project would also fill a missing gap in the rapid transit network providing improved connectivity for the immediate area and beyond. By facilitating more compact growth and intensification, this project would have the effect of bringing people and jobs closer together, further improving transit accessibility. $55 million in funding has been recently committed to advance the planning and design of this subway extension.
- Brampton Queen Street Rapid Transit: This proposed east-west rapid transit corridor (in combination with rapid transit on Highway 7) would connect Urban Growth Centers in Brampton and Vaughan. Brampton is one of the fastest growing municipalities in the GTHA and will require significant improvements to transit capacity. This project would also address a key need highlighted by the assessment which is a lack transit access to jobs within 45 minutes for residents of north Brampton and parts of Vaughan.
- Relief Line: A primary objective of The Relief Line is to address capacity shortages on the subway system and the Yonge/Bloor interchange in Toronto. Addressing this bottleneck will also facilitate other rapid transit projects in Toronto including projects that address areas of social need. $150 million in funding has been recently commited to advance planning and design of this line.
- Dundas Street BRT: Through Burlington, Oakville and parts of Mississauga, accessibility to jobs by transit is very poor. To a large extent this is a result of land use patterns which includes large employment areas and primarily single family residential neighbourhoods. Rapid transit along Dundas St. in Mississauga and Oakville could help to reduce the effective time separation between workers and jobs.

Recognizing the time to deliver rapid transit projects is long, some future rapid transit corridors could be implemented initially as quick start services. Such an approach was adopted by York Region for its Viva rapid transit network and is proposed for the VivaNext corridors on Jane/Major Mackenzie and Leslie/Don Mills. Durham's Pulse bus service is another example of how a corridor can evolve through incremental investment towards full rapid transit.

Additional strategies to maximize the effectiveness of rapid transit projects include stronger land use policies and incentives for intensification and the implementation of feeder transit services.

5.2.6 Strategy 6: Expanding Express Services

Express bus services operate with greater stop spacing and higher speeds and are generally used in corridors where there is a significant percentage of riders in the corridor traveling longer distances between residential areas and key employment nodes. Examples include

Mississauga's MiWay express routes and TTC's express route network, which recently expanded to include five new routes focused on corridors outside of the downtown. While GO Bus also operates express routes, many of these serve as regional connectors over very long distances rather than serving relatively shorter trips within municipalities or between adjacent municipalities.

Expanding the network of express routes, where justified based on demand, has the potential to improve transit travel times in areas where transit is uncompetitive compared to driving and where committed rapid transit projects do not address all travel markets.

At present, the express bus network is highly constrained by jurisdictional boundaries. Expanding the network of express services would allow transit users to select the right type of transit for their trip.

Moving forward there will be need to clarify roles and responsibilities for express services, and specifically the distinction between GO Bus services in highway corridors and potential express routes proposed by various municipalities that operate in the same corridors. The findings of the *Intercity Bus Modernization Study* currently being conducted by Ontario's Ministry of Transportation will also need to be considered in the context of regional bus travel in the GTHA.

5.2.7 Strategy 7: Transportation Systems Management (TSM)

Strategy #3 of the 2008 RTP, "Improve the Efficiency of the Road and Highway Network", lays out nine Priority Actions and four Supporting Policies to be implemented as part of the Regional Transportation Plan. These are aimed at improving the network's efficiency through a variety of tools – known collectively as Transportation System Management or TSM – that will improve its ability to carry people and goods smoothly and safely by all modes.

TSM measures focus on operational and policy changes for smoother and safer traffic movements by private vehicles, public transit, cyclists and pedestrians, while also improving the utilization (occupancy) of vehicles and their throughput volumes where possible. For transit, this includes a focus on using technology or low cost improvements to minimize the effects of vehicle congestion on transit vehicles. Opportunities to enhance the effectiveness of TSM have been increased in recent years by significant technological developments (e.g. smart, real-time data collection, traveller information, and traffic control and toll collection systems). TSM is a major focus in many US cities which have started to brand corridors where targeted TSM measures have been implemented as "smart corridors". Regional TSM programs in southern California, for example by the San Diego Association of Governments (SANDAG) and the Southern California Association of Governments (SCAG) are good examples of successful approaches.

Key TSM strategies that could greatly benefit transit and lower the cost of providing frequent transit services include:

- Reallocating road space (e.g. on-street parking removal)
- High Occupancy Vehicle (HOV) lanes/Transit-only lanes
- Intersection and signal improvements
- Bottleneck removal programs
- Data collection to monitor system performance
- Traveller information

TSM has the potential to address many of the needs identified in the previous chapter, particularly those related to travel time competiveness. TSM also goes hand in hand with the implementation of Frequent Transit Networks (FTN's) as described previously.

Examples of transit needs that could be addressed through TSM include:

- Implementing TSM on key arterials in Scarborough and North Etobicoke to improve transit travel times for areas of social need. In these areas TSM could also reduce the differential between travel time by transit and by car.
- South Mississauga where transit routes are delayed by congestion.
- Surface routes in City of Toronto which experience capacity constraints and where routes are delayed by congestion, but are not in the committed network for rapid transit.
- Corridors in South York Region that are parallel to existing or planned rapid transit where the travel time differential between transit and automobile discourages transit use.
- Travel time competiveness of existing or future transit routes on highway corridors. By implementing dedicated HOV lanes, significant reductions in travel times could be achieved, as was demonstrated during the 2015 Pan Am Games.

Realizing the full potential of TSM initiatives in the GTHA will require a major, collaborative program by Metrolinx, the MTO, all GTHA municipalities, transit properties, police forces and relevant private sector companies.

5.2.8 Strategy 8: Fare Integration

In order to address fare and service integration issues, Metrolinx initiated a comprehensive study in 2015 to develop principles for fare and service integration and to develop and evaluate potential alternative fare structures.

Expansion of the PRESTO smart card system (which is expected to be implemented on all TTC routes by the end of 2016) will serve to enable fare integration and will result in a system that is more seamless for the transit user.

Previous work by Metrolinx has served to highlight issues that are impacted by the current fragmented regional fare structure. This include, but are not limited to:

- Double fares for short cross-boundary trips (especially Toronto to/from York Region and Mississauga);
- Lack of fare integration between GO Transit and municipal transit systems, particularly the TTC;
- Closed door operations for external service providers operating in Toronto;

The implementation of RER also presents both opportunities and challenges around fare structures. In particular, RER will provide greater service levels for medium-longer distances trips within municipalities which, based on current GO fare policies, would cost more than the same trip made using the municipal transit system.

Regardless of the ultimate fare structure that is adopted, changes to the cost of transit by market will no doubt justify changes to transit route structures and service levels.

One area of need that potentially stands to be impacted by changes to the regional fare structure is social equity. Lower-income households rely more on transit for their mobility, are more sensitive to the fare they pay for their transit trips than higher-income households, and, as a result, fare policy choices may impact them more. Residents of lower-income areas also use the transit network differently than those from higher-income areas, and certain types of fare structure changes will have a greater potential to impact them than others, with both adverse and beneficial outcomes possible.

5.2.9 Strategy 9: Road User Pricing

Various forms of road user pricing have been discussed over the past two decades ranging from expanded highway tolling to comprehensive distance-based pricing for all vehicle trips.

By changing the relative cost between travel by transit vs. travel by car, road pricing could significantly increase transit modal shares. In turn, this would justify increases in transit service levels, thereby improving the overall connectivity and competitiveness of transit.

Investments in rapid transit and improved GO rail service levels will increase choices available to travellers, which must go hand in hand with any road pricing strategy.

5.2.10 Strategy 10: Parking Pricing

Workshops held with municipal stakeholders and transit service providers early in this study highlighted parking pricing (or lack thereof) as a key issue. In particular, free parking at GO stations is seen as undermining efforts by local service providers to improve feeder bus services to these stations. Metrolinx recommended the implementation of pay parking at transit stations to governments in its 2013 *Investment Strategy* but this recommendation has yet to be implemented.

Similarly, the abundance of free parking in employment areas outside of downtown areas encourages travel to these areas in single-occupant private vehicles and is a major disincentive to transit. The extensive provision of free parking also has a significant negative impact on built form.

Wider spread implementation of paid parking, through policy or regulatory mechanisms, would serve to level the playing field between transit and driving. As with road user pricing, this would support investments in transit service levels.

Reducing the amount of free parking at transit hubs would also improve environments for emerging transit services including dynamic transit.

5.2.11 Strategy 11: Transit pricing

Transit pricing strategies offer the potential to address challenges around transit network capacity. For example, differential pricing between peak period travel and off-peak travel could shift demand to times when the transit system has greater spare capacity. However, differential transit pricing is not without challenges. Another potential opportunity for transit pricing would be to implement changes to GO Train fares to allow more riders to take advantage of off-peak and reverse peak capacity.

Potential changes to the regional fare structure that may address some of these opportunities are being considered as part of Metrolinx's work on fare and service integration.

5.2.12 Strategy 12: Transit-Supportive Policies and Initiatives

The effectiveness of all of the above strategies can be enhanced through various supporting strategies which were identified in the 2008 RTP and are being further examined through parallel projects and studies. These strategies include, but are not limited to:

- Strengthened policies and incentives to intensify around emerging transit supportive areas (note that the Proposed Growth Plan for the Greater Golden Horseshoe, 2016 includes changes to intensification targets).
- Adopting complete street policies which place a higher emphasis on creating supportive environments for pedestrians, cyclists and transit.
- Planning for more Complete Communities.

- Continuing to plan land uses to support committed rapid transit and RER.

5.3 Summary and Potential Focus Areas for the 2017 RTP

This study has served to identify a number of needs and opportunities for transit in the GTHA. It is intended to lay the groundwork for the subsequent development of transit network recommendations for the Regional Transportation Review (RTP). Overall, there has been substantial progress made by all municipalities and transit service providers to improve the effectiveness of the transit system. However, many challenges remain with respect to improving the connectivity of the transit network, addressing rapidly growing areas, and overall positioning transit to become more competitive with travel by car.

Based on the analysis presented in this report, and other parallel studies, there are several key areas of focus for the 2017 RTP have been identified:

- Making the best possible use of the region's existing transit assets and maximizing return on investment in committed investments;
- Continuing to focus on the transformative effect that implementing Regional Express Rail will have in integrating transit across the region, but also people's decisions on where to live and work;
- Supporting transit network improvements with complementary strategies to improve first-mile, last-mile connections, improved facilities and incentives for active transportation, and supportive regulatory environments for emerging transit services;
- Continuing to evaluate opportunities to expand the rapid transit network, with a focus on projects that serve to complete gaps in the network, address existing and projected capacity deficiencies and facilitate transformations in land use; and,
- Advancing alternatives for road and parking pricing which serve to influence travel behavior and support greater investments in the transit system.

Appendix A

Summary of Transportation and Land Use Statistics by Regional Municipality

		Region					
		Durham[1]	Halton	Hamilton	Peel	Toronto	York
Population	**2011**	632,700	523,000	540,800	1,347,600	2,714,600	1,074,300
	2031	909,400	820,000	680,000	1,770,000	3,189,900	1,590,000
	% Change	44%	57%	26%	31%	18%	48%
Employment	**2011**	240,000	254,900	233,800	682,200	1,515,100	540,300
	2031	360,000	390,000	310,000	880,000	1,661,000	790,000
	% Change	50%	53%	33%	29%	10%	46%
Urban Density (Pop + Emp per ha)	**2011**	28	30	36	40	70	36
	2031	32	35	41	44	80	41
Transit Mode Share (AM Peak Period)	**2011**	8.9%	7.4%	9.9%	9.9%	30.6%	10.1%
	2031	8.8%	7.2%	9.5%	12.4%	30.8%	12.9%
	Percentage Point Change	-0.1	-0.2	-0.4	2.5	0.3	2.8
Auto Mode Share (AM Peak Period)	**2011**	84.0%	87.2%	81.5%	84.0%	60.5%	85.1%
	2031	84.2%	85.4%	80.2%	79.4%	56.9%	81.6%
	Percentage Point Change	0.2	-1.8	-1.3	-4.6	-3.7	-3.5
Active Mode Share (AM Peak Period)	**2011**	7.1%	5.4%	8.5%	6.1%	8.9%	4.9%
	2031	7.0%	7.4%	10.3%	8.1%	12.3%	5.6%
	Percentage Point Change	-0.1	2.0	1.8	2.0	3.4	0.7
Total Trips (AM Peak Period)	**2011**	302,800	306,500	235,000	786,000	1,666,500	663,300
	2031	443,900	493,800	334,500	1,111,000	2,091,100	983,500
	% Change	0.5	0.6	0.4	0.4	0.3	0.5
Self Containment (AM Peak Period)	**2011**	69.8%	54.0%	77.7%	62.5%	68.8%	53.3%
	2031	73.3%	58.3%	80.6%	62.7%	65.3%	53.8%
	Percentage Point Change	3.6	4.3	2.9	0.1	-3.4	0.5
2031 Average Auto Travel Time (mins, AM Peak Period)		23.8	27.1	19.8	29.2	29.4	29.6
2031 Average Transit Travel Time (mins, AM Peak Period)	**Without Committed Network**	75.9	80.4	63.5	73.7	57.1	83.9
	With Committed Network	72.6	76.7	59.9	69.5	53.3	71.8
	Travel Time Saved (%)	4%	5%	6%	6%	7%	14%
Transit-to-Auto Time Ratio, Without Committed Network (2031, AM Peak Period)		3.2	3.0	3.2	2.5	1.9	2.8
Transit-to-Auto Time Ratio, With Committed Network (2031, AM Peak Period)		3.1	2.8	3.0	2.4	1.8	2.4
Access to Jobs per Resident within 45 minutes (2011, AM Peak Period)			7,300	28,300	31,100	217,200	19,500
Access to Residents per Job within 45 minutes (2011, PM Peak Period)			20,300	81,100	68,600	392,500	50,800

Notes:

[1]Access to Jobs and Access to Residents data was not available for Durham Region at the time of writing

Mode shares are based on all trips to or from each Region, including trips that start or end outside the Region.

Appendix B

Summary of Key Indicators for Areas in Need of Transit Improvements

Key Area	2011 Average Transit Share	2031 Average Transit Share	2011-2031 Growth			Avg Travel Time Savings (%)	Avg Transit-Auto Ratio with Committed Network	Avg Jobs Accessible per Resident	Avg Resident Accessible per Job
			Population	Employment	Total Trips				
Toronto									
North Scarborough	20%	23%	5,500	2,400	22,600	4%	2.25	132,000	309,000
South Etobicoke	20%	21%	41,700	8,200	46,600	-1%	2.00	77,200	153,800
Durham									
North Whitby-Oshawa	7%	8%	66,100	41,000	74,300	4%	3.63		
South Pickering-Ajax	9%	8%	23,200	23,000	21,800	4%	3.34		
Central Clarington	3%	3%	24,100	4,600	21,100	4%	2.98		
York									
Markham-Richmond Hill	9%	9%	60,700	93,900	68,900	13%	2.49	23,700	34,300
North Richmond Hill	10%	13%	34,100	500	26,700	19%	2.45	9,700	57,600
Southwest Vaughan	5%	7%	12,000	39,400	35,600	17%	2.51	10,200	29,700
Southeast Vaughan	9%	13%	56,300	14,400	51,700	18%	2.20	18,600	35,900
North Markham	10%	12%	120,200	16,500	98,000	8%	2.72	5,000	39,500
South Markham	11%	10%	-15,300	21,400	3,800	9%	2.59	21,800	48,900
Central Vaughan	5%	8%	9,300	6,200	4,600	17%	2.59	11,000	39,100
East Newmarket	5%	8%	9,500	2,300	12,400	18%	3.18	13,300	25,800
Peel									
Pearson Airport	7%	11%	3,200	38,100	77,200	6%	2.15	52,700	41,500
Southeast Brampton	6%	9%	4,000	19,100	29,700	8%	2.48	24,200	46,900
Meadowvale	8%	12%	35,600	21,100	16,400	9%	2.94	17,500	67,300
East Brampton	7%	6%	54,500	24,100	62,300	7%	2.71	18,100	70,400
Central Mississauga	11%	13%	-300	-4,500	-8,400	5%	2.69	29,600	122,700
Central Brampton	7%	12%	53,000	24,300	67,200	5%	2.74	27,800	111,000
West Mississauga	14%	15%	9,800	-1,200	9,500	7%	2.53	22,700	77,200
Halton									
South Burlington	5%	7%	44,600	6,100	51,200	5%	3.10	12,500	25,000
North Oakville	9%	7%	144,600	87,400	142,400	4%	3.06	7,700	24,800
North Milton	3%	5%	18,400	31,400	39,300	2%	2.90	6,000	12,600
South Milton	5%	6%	187,800	34,800	153,800	2%	2.94	3,100	18,500
South Oakville	7%	8%	30,400	5,400	26,500	5%	2.88	12,100	31,000
East Milton	6%	6%	52,200	8,500	44,300	2%	2.97	3,200	15,900
Hamilton									
East Hamilton	9%	7%	3,500	20,000	21,700	6%	2.99	13,600	34,900
Central Hamilton	11%	10%	28,900	12,400	57,600	4%	3.13	30,900	87,100

Appendix C

Transit Coverage Statistics for the GTHA

Exhibit C1: Share of people and jobs in GTHA served by transit by transit service category, 2011

Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	Rapid Transit Coverage (800 m)				Frequent Coverage (400 m)				Local Coverage (400 m)				All Transit			
			People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	365	561	225	62%	469	84%	339	93%	550	98%	244	67%	450	80%	365	100%	561	100%
100-200	635	268	179	28%	93	35%	574	90%	240	90%	399	63%	197	74%	628	99%	267	100%
50-100	2,492	777	171	7%	66	8%	1,538	62%	532	68%	1,750	70%	548	71%	2,401	96%	746	96%
30-50	2,131	917	34	2%	19	2%	717	34%	431	47%	1,585	74%	652	71%	1,884	88%	836	91%
10-30	1,023	830	6	1%	4	0%	169	17%	270	33%	520	51%	510	61%	637	62%	619	75%
Total	**6,646**	**3,354**	**615**	**9%**	**651**	**19%**	**3,337**	**50%**	**2,023**	**60%**	**4,498**	**68%**	**2,357**	**70%**	**5,915**	**89%**	**3,029**	**90%**

Note: "All Transit" includes the Express category of transit

Exhibit C2: Share of people and jobs in Toronto served by transit by transit service category, 2011

Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	Rapid Transit Coverage (800 m)				Frequent Coverage (400 m)				Local Coverage (400 m)				All Transit			
			People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	328	532	225	69%	469	88%	313	95%	525	99%	207	63%	421	79%	328	100%	532	100%
100-200	525	205	179	34%	93	45%	490	93%	193	94%	296	56%	137	67%	519	99%	204	100%
50-100	1,243	392	171	14%	66	17%	1,080	87%	338	86%	619	50%	210	54%	1,208	97%	382	97%
30-50	495	277	34	7%	19	7%	378	76%	235	85%	224	45%	123	44%	447	90%	263	95%
10-30	119	103	6	5%	4	4%	83	70%	79	77%	43	36%	54	52%	98	82%	90	87%
Total	**2,710**	**1,509**	**615**	**23%**	**651**	**43%**	**2,344**	**86%**	**1,370**	**91%**	**1,389**	**51%**	**945**	**63%**	**2,600**	**96%**	**1,471**	**97%**

Exhibit C3: Share of people and jobs in the 905 served by transit by transit service category, 2011

Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	Rapid Transit Coverage (800 m)				Frequent Coverage (400 m)				Local Coverage (400 m)				All Transit			
			People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	37	29	-	0%	-	0%	26	70%	25	86%	37	100%	29	100%	37	100%	29	100%
100-200	110	63	-	0%	-	0%	84	76%	47	75%	103	94%	61	97%	108	98%	63	100%
50-100	1,249	385	-	0%	-	0%	458	37%	194	50%	1,131	91%	338	88%	1,193	96%	364	95%
30-50	1,636	640	-	0%	-	0%	339	21%	196	31%	1,361	83%	529	83%	1,437	88%	573	90%
10-30	904	727	-	0%	-	0%	87	10%	191	26%	477	53%	456	63%	539	60%	529	73%
Total	**3,935**	**1,844**	**-**	**0%**	**-**	**0%**	**994**	**25%**	**653**	**35%**	**3,109**	**79%**	**1,413**	**77%**	**3,314**	**84%**	**1,558**	**84%**

Exhibit C4: Share of people and jobs in the GTHA that will be within 800 m of a rapid transit station in 2031

Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	667	825	439	66%	702	85%
100-200	1,012	371	489	48%	218	59%
50-100	3,361	1,133	675	20%	316	28%
30-50	2,572	1,183	207	8%	110	9%
10-30	1,179	764	37	3%	54	7%
Total	**8,791**	**4,276**	**1,847**	**21%**	**1,400**	**33%**

Exhibit C5: Share of people and jobs in Toronto that will be within 800 m of a rapid transit station in 2031

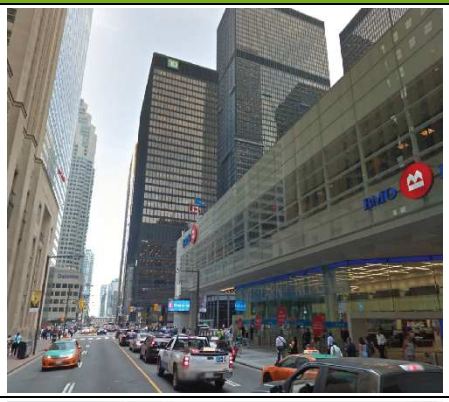
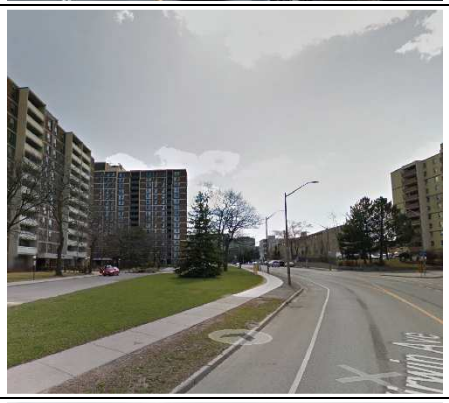
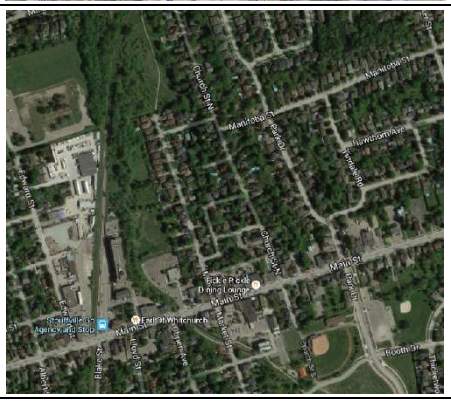
Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	433	666	268	62%	590	89%
100-200	796	254	397	50%	152	60%
50-100	1,444	476	442	31%	161	34%
30-50	403	194	70	17%	39	20%
10-30	112	68	9	8%	7	10%
Total	**3,188**	**1,657**	**1,186**	**37%**	**949**	**57%**

Exhibit C6: Share of people and jobs in the 905 that will be within 800 m of a rapid transit station in 2031

Density (Pop + Emp per ha)	Total People ('000)	Total Jobs ('000)	People ('000)	Share of Total	Jobs ('000)	Share of Total
Over 200	234	159	171	73%	112	70%
100-200	216	117	92	43%	65	56%
50-100	1,917	658	233	12%	155	24%
30-50	2,168	989	136	6%	71	7%
10-30	1,067	696	28	3%	47	7%
Total	**5,603**	**2,619**	**660**	**12%**	**450**	**17%**

Appendix D

Images Illustrating Urban Density

Urban Density	Example Urban Form	
	Aerial	Streetscape
More than 200 **Financial District, Toronto**		
100-200 **Cooksville, Mississauga**		
50-100 **Main and Locke Streets, Hamilton**		
30-50 **Whitchurch-Stouffville**		

Urban Density	Example Urban Form	
	Aerial	Streetscape
10-30 **Port Perry, Scugog Township**		

Appendix E

Ward Boundaries in the GTHA

Exhibit E1: Map showing municipal wards in Toronto

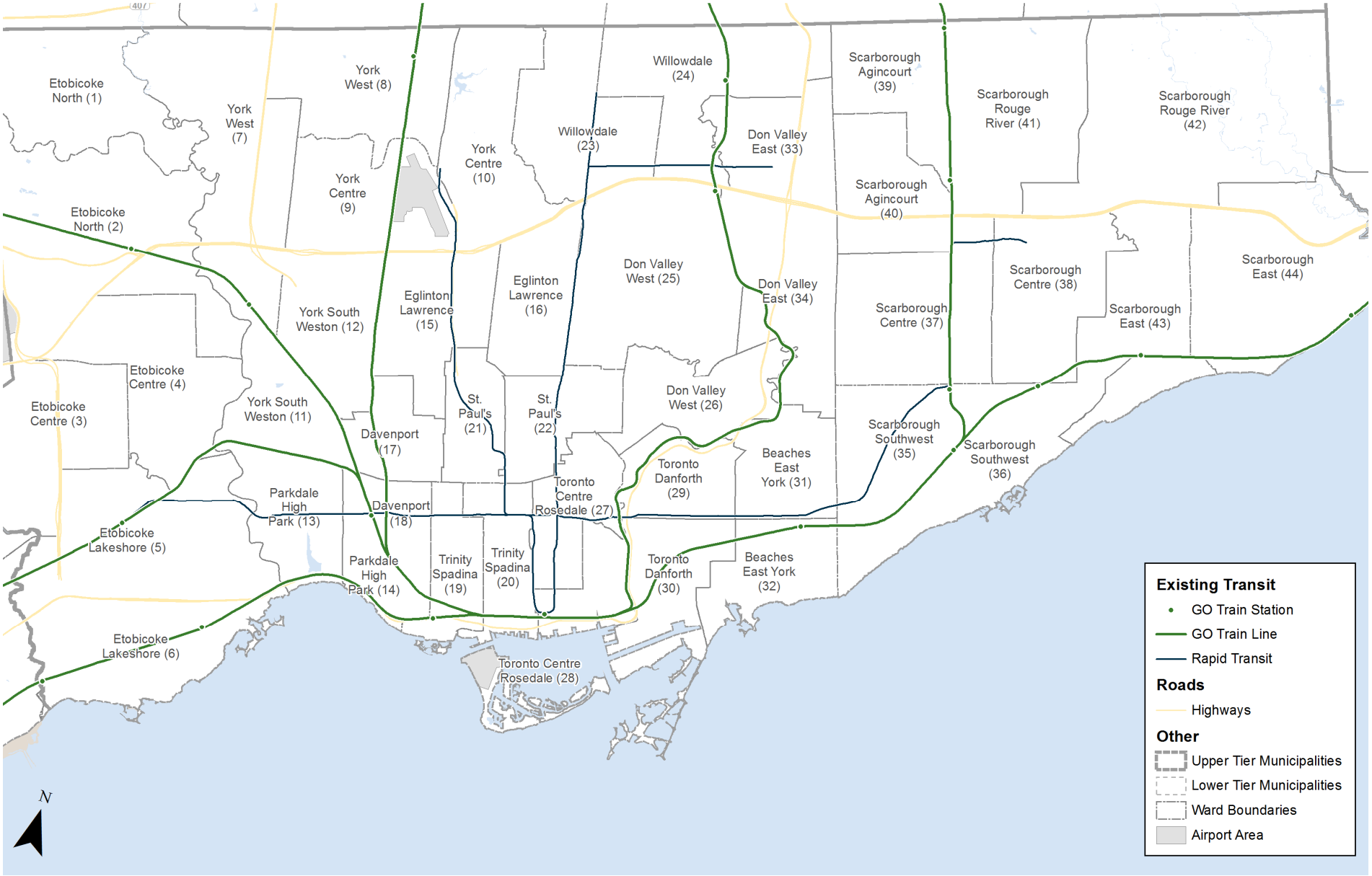


Exhibit E2: Map showing municipal wards in Peel Region, Halton Region, and Hamilton

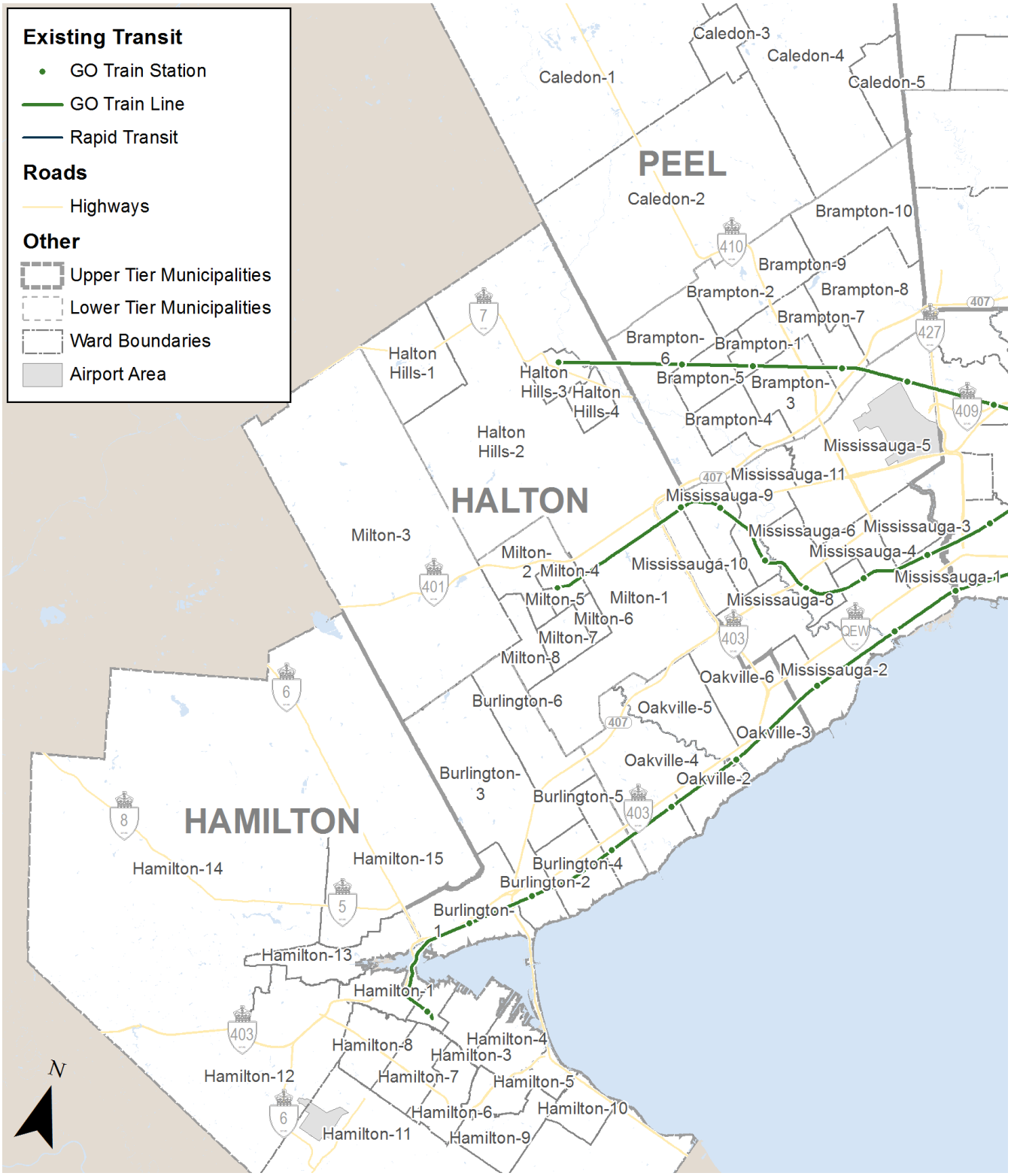


Exhibit E3: Map showing municipal wards in York Region

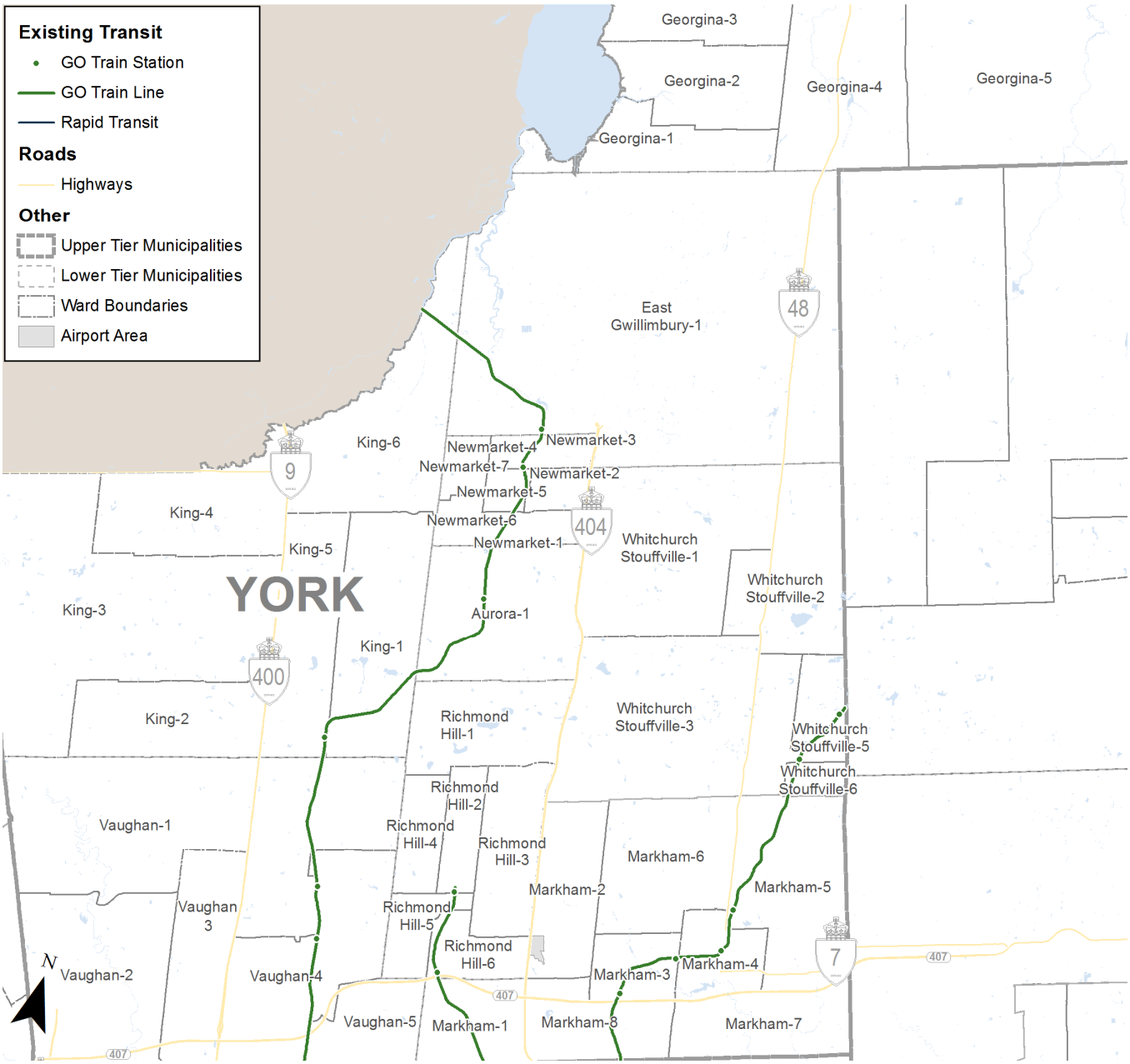


Exhibit E4: Map showing municipal wards in Durham Region