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GTHA Strategic Goods Movement Network

Final Report

Prepared for:

Metrolinx

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Solutions for growing economies

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Acknowledgements / Confidentiality

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Executive Summary

Overview

Metrolinx is responsible for creating and maintaining a Regional Transportation Plan (RTP) for the Greater Toronto and Hamilton Area (GTHA). This responsibility is embodied in the *Metrolinx Act, 2006*. The RTP is part of an approach by the provincial government to prepare the GTHA for growth and sustainability. A formal review and update of the RTP is now underway, and its completion is expected in 2018.

The original RTP, entitled "The Big Move," built upon nine "Big Moves," or strategies. The eighth of these called for the development of a comprehensive strategy to improve goods movement within the GTHA and with adjacent regions. Metrolinx subsequently developed this strategy as part of the 2011 GTHA Urban Freight Study. The Study's Action Plan in turn called for the development of a GTHA-wide Strategic Goods Movement Network (SGMN). The SGMN supports and informs the updated RTP by ensuring the compatibility of the goods movement road and rail networks and intermodal terminal connections with the existing and planned rapid transit and commuter rail networks.

Purpose of a Strategic Goods Movement Network

This report develops a core road and rail SGMN for the GTHA. A SGMN can be characterized as a strategic, connected, and continuous network of multimodal corridors that *facilitates* the movement of freight. It features a hierarchy of facilities among all jurisdictions. It promotes reliability through redundancy; that is, alternative routes or modes are available through seamless connections. The SGMN connects all major intermodal terminals (rail, marine ports and airports) and major goods-generating activity centres with each other and with the major road and rail networks. The term 'core' reflects the SGMN's GTHA-wide perspective, as opposed to being a compilation of existing upper-tier SGMNs and roads that permit trucks.

The final GTHA-wide SGMN presented in this report comprises a map of the core road and rail networks, as well as a proposed implementation plan and monitoring program, a process to resolve future network conflicts, possible future data collection and research and a possible extended consultation – all of which are documented in this report. The role of the GTHA-wide SGMN could be enhanced through incorporating future policies, actions and other initiatives that may result from future discussions among Metrolinx, the Ontario Ministry of Transportation (MTO) and other agencies.

It should also be noted that the SGMN is based on the GTHA's existing road and rail networks, accounting for in large part for observed flows that are generated by major existing freight generators and intermodal terminals. While the SGMN accounts for designated future employment lands and planned rapid transit infrastructure, it does not identify or propose

any new road or rail links. The GTHA-wide SGMN will inform the MTO's *Greater Golden Horseshoe (GGH) Multimodal Plan*, which is developing a future multimodal passenger and goods network to 2051 for the broader GGH region. The GTHA-wide SGMN is intended to be updated periodically, to account for changes in conditions and new network improvements.

The SGMN builds on existing municipal SGMNs, providing a basis for adoption by upper-tier municipalities in their own jurisdictions, in order to promote a consistently defined network across the GTHA and to inform the setting of priorities for road improvements. The SGMN, and any related future policies, will in no way supersede existing municipal SGMNs or other uses of the designated corridors by the responsible jurisdiction. The SGMN is intended to support, inform and complement other municipal transportation, land use, environmental, economic and other plans and aspirations, and to provide a reference for future urban corridor design, Complete Streets schemes and the like. As such, the SGMN should be updated regularly as conditions and needs change, as elaborated in the proposed SGMN implementation plan (Section 8.2).

Benefits of the SGMN

Defining a GTHA-wide SGMN has many benefits, because it allows goods movement to be better integrated into the individual planning, prioritization and budgeting processes of all levels of government. This GTHA-wide approach recognizes that the movement of goods is independent of jurisdictions and boundaries, and that an efficient, multimodal network makes the best use of system capacity while reducing shipping costs and promoting economic competitiveness and quality of life. Moreover, while continued growth in truck traffic is a positive indicator of economic activity, there can also be impacts on congestion, greenhouse gas (GHG) emissions and air quality: a systematically-defined, GTHA-wide understanding and characterization of key goods movement corridors would aid in addressing these and other issues, and allow an improved understanding of the potential contributions of all goods movement modes to reducing congestion, GHG emissions and air pollutants to build on the many emissions-reduction measures that the goods movement industry already is taking.

The SGMN uniquely provides an integrated GTHA-wide perspective that shows how all key regional freight generators and intermodal terminals are connected. It thus provides the broad framework necessary for addressing issues that are not restricted to specific jurisdictions, from reducing GHGs and air pollutants and managing growth at the urban boundary, to reducing congestion and optimizing the use of the entire multimodal network, and providing policymakers with an improved understanding of which corridors to protect from encroachment.

The contribution of goods movement to economic wellbeing and quality of life is often not fully recognized in the perception of the public and in the prioritization of public policies.

Identifying a regional SGMN helps to ensure that the needs of goods movement industries are recognized within the context of planning the broader transportation network.

Approach

The project was developed in two broad phases. Phase I developed initial, high-level, RTP-compatible SGMN concepts, drawing upon an analysis of flows among the GTHA's major freight clusters and accounting for the existing upper-tier SGMNs. Phase II refined the SGMN concepts into a single core road and rail SGMN. Metrolinx has presented the core road SGMN for public comment in its September 2017 Draft RTP. The core road and rail SGMN informed Metrolinx's evaluation of its RTP rapid transit alternatives. The core network also provided the basis for identifying outstanding network conflicts for subsequent resolution - for example, as rapid transit plans on some SGMN segments are further refined in the future. Phase II proposed an implementation and monitoring plan, as well as a plan for subsequent broader stakeholder consultation with the private sector and recommendations for further research and data collection.

Final Core Road and Rail SGMN

The core road and rail SGMN derives from the Phase I network concepts. These concepts were based upon a data-driven definition of a network that connects key freight-generating clusters, overlaid with existing regional and municipal SGMNs. Note that the cluster geographies correspond to those associated with the data, and should not necessarily be construed as reflecting land uses that have been designated in municipal Official Plans. The core network now refines the concepts to develop a single consistent, GTHA-wide network that connects the freight-generating clusters and addresses several gaps in the initial compilation.

The derivation of the core SGMN takes into account three rounds of comments that were provided by Steering Committee members and by members of the study Review Group regarding the concepts; an initial circulation of a draft SGMN in June 2017; and a final circulation of the draft SGMN in August-September 2017. The Steering Committee comprised Metrolinx, MTO's Systems Analysis and Forecasting Office and Peel Region. The Review Group comprised the GTHA's other five upper-tier municipalities (Durham Region, Halton Region, York Region, City of Hamilton and the City of Toronto), other MTO offices, Transport Canada, Highway 407 ETR, Canadian National Railways and Canadian Pacific Railway, the Greater Toronto Airports Authority and Hamilton International Airport, the Hamilton Port Authority, the Port of Oshawa and Ports Toronto, and the Ontario Trucking Association. The City of Mississauga also provided comments.

Figure ES-1 presents the final road SGMN. Figure ES-2 presents the final rail SGMN.

Note that Metrolinx has included the final road SGMN in its September 2017 Draft Regional Transportation Plan (RTP), which has been made available for public comment. Comments on

the Draft RTP are not due until late 2017, so any subsequent comments on the SGMN must be addressed separately.

Figure ES-1. Regional Core Road SGMN

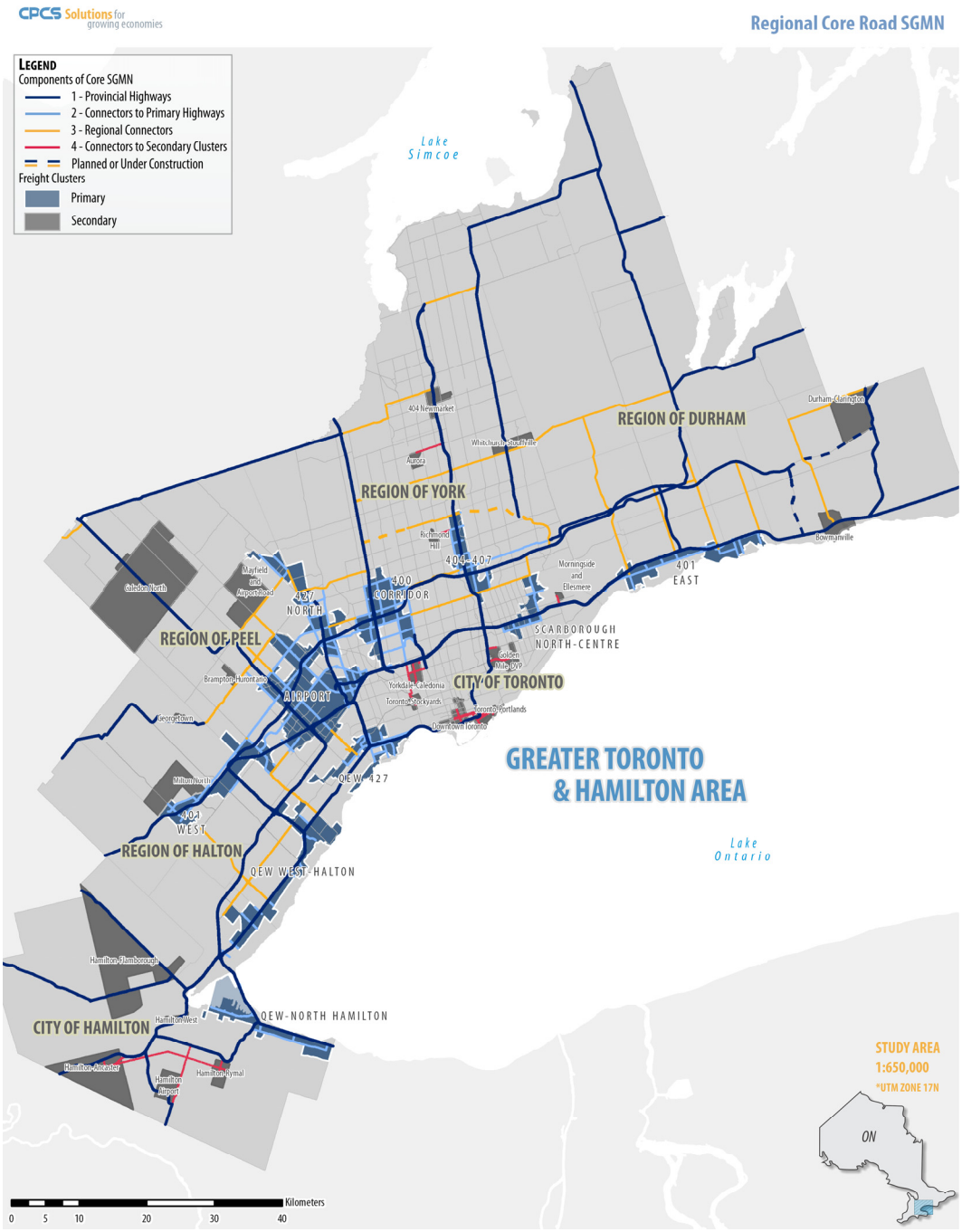
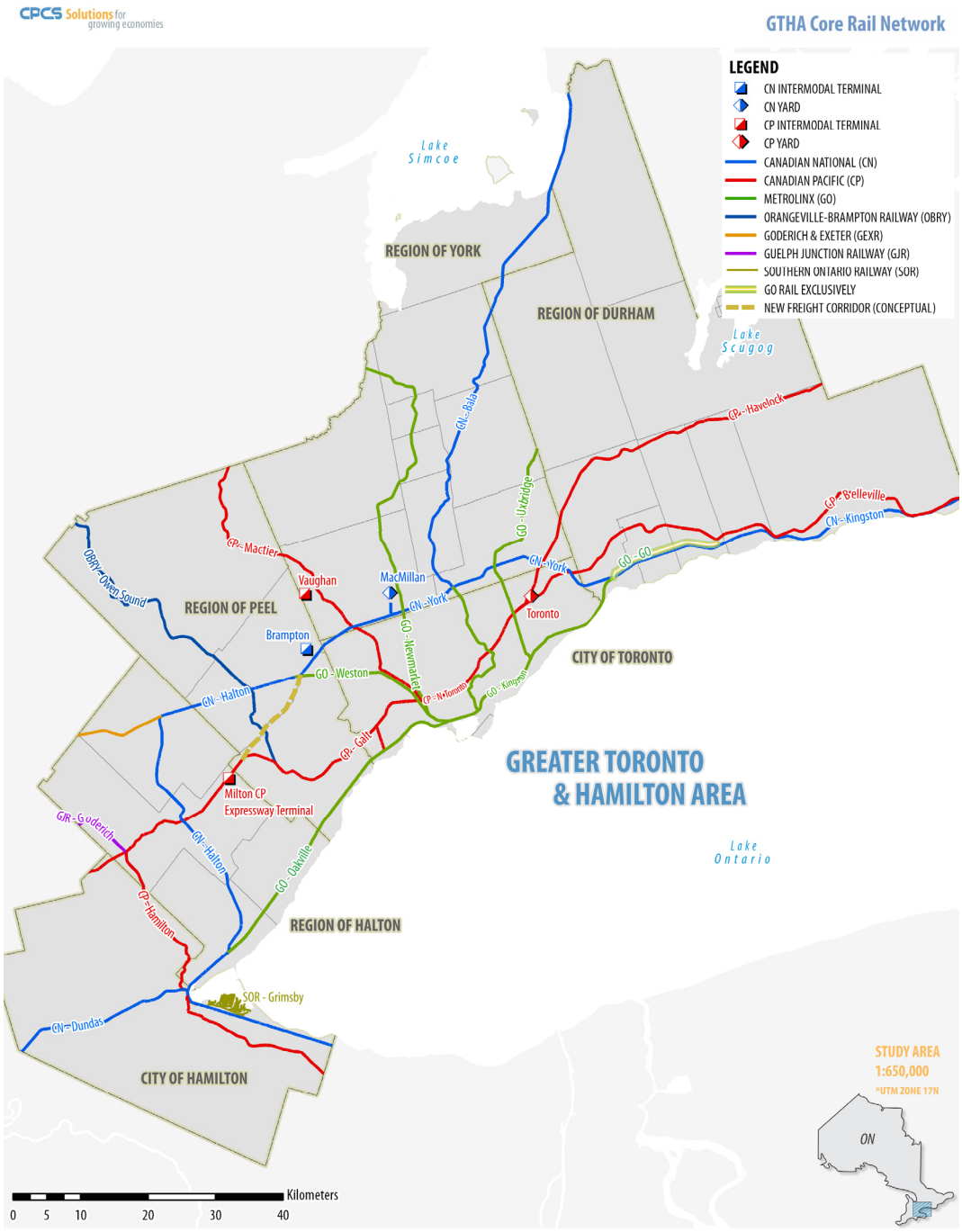


Figure ES-2. Regional Core Rail SGMN



Resolution of Outstanding Conflicts

Conflicts can arise in the designation of a network such as the SGMN – for example, on corridors that are shared with rapid transit. However, because the core road and rail SGMNs were developed in consultation with the Review Group, most potential issues and conflicts have been anticipated and provisionally addressed provisionally. The multi-faceted and iterative one-on-one consultation with individual agencies proved effective in identifying and accommodating Review Group comments.

As a result, only a few potential conflicts remain. These comprise eight SGMN corridors on which rapid transit is planned or is under construction, and three SGMN road sections in the City of Toronto that have load restrictions. In the case of the eight rapid transit corridors, potential conflicts should be addressed as corridor design progresses. In the case of the three segments with load restrictions, the extent to which any of these constitutes an actual constraint on the movement of goods is unclear, and might best be addressed if the City of Toronto identifies this as a constraint, or if the City proposes to rehabilitate any of the bridges in question.

In addition, it should be noted that Halton Region and the City of Toronto propose to review the need for possible additional SGMN segments, or possible changes to the core road SGMN, as part of future studies – notably, the planned update to the Halton Region Transportation Master Plan and a planned freight strategy for the City of Toronto.

Accordingly, this report proposes approaches to addressing these conflicts, if and as specific needs arise. The approaches are necessarily generic, drawing from best practices elsewhere, and serve as guidelines for future analyses and for the further development and refinement of the core road-based SGMN.

The approaches can be described at three levels or steps. The approaches are progressively more focused on individual corridors and on actual implementation. These are:

- At the master planning or strategic planning level, providing a municipality-wide, network-level perspective. The object is to coordinate the SGMN with transit and other major corridor improvements at a broad, strategic level.
- At the corridor and sub-area planning level, focusing on smaller numbers of corridors. The object is to integrate goods movement needs as corridor and area plans become more specific.
- At the level of planning and design for individual corridors. The object is to ensure that truck circulation and parking are considered explicitly in road and intersection design, especially as Complete Streets and other shared corridor guidelines are implemented on individual roads.

Proposed Implementation Plan

A plan was developed to implement the SGMN. The plan was based on a review of other recent practices. It recognizes that the implementation of the SGMN requires a cooperative approach among the relevant jurisdictions, and proposes potential participants for each component of the plan. However, the plan also recognizes that individual upper-tier municipalities ultimately are responsible for implementing the SGMN for roads that are under their jurisdiction, and that they will do so in a manner consistent with their own policies and plans.

The proposed implementation plan has fifteen actions, which are listed below:

1. Give the SGMN status by encouraging the Councils of the upper-tier municipalities to adopt it, or by encouraging upper-tier municipalities to incorporate the SGMN into their own plans and policies.

2. Encourage the Province and upper-tier municipalities to align and prioritize their individual operational, management and capital network improvements to support those elements of the SGMN that are under their individual jurisdictions. Coordinating initiatives across municipal boundaries also is encouraged.

3. Implement operational, management and capital network improvements that support the SGMN.

4. Prepare inventory of existing barriers such as load restrictions, turning radii, height requirements and inadequate pavement structures.

5. Establish a SGMN committee to coordinate and advance the implementation of SGMN initiatives.

6. Establish signage, route guidance and maps for the SGMN, covering the GTHA and possibly areas beyond.

7. Review and remove any existing upper-tier municipal by-law restrictions from the designated SGMN, where feasible.

8. Design and promote common approaches to set priorities for each implementation action, incorporating benefit-cost analysis.

9. Develop and promote consistent guidelines and best practices for evaluating zoning and land use plans along the SGMN corridors, to ensure that goods movement needs are accommodated while maintaining compliance with individual agencies' land use and transportation policies and aspirations.

10. Develop and promote common approaches and best practices for evaluating transportation proposals along the designated SGMN corridors and for assessing right-

of-way protection requirements, to ensure that goods movement needs are accommodated while maintaining compliance with individual agencies' policies.

11. Encourage upper-tier municipalities to develop their own secondary SGMNs in conjunction with lower-tier municipalities, in order to ensure first/last kilometre connectivity.
12. Develop and promote Complete Streets guidelines and best practices that account for goods movement.
13. Review existing funding sources to ascertain their potential application to SGMN corridor improvements.
14. Consider creating P3 structures to implement at least some types of improvements.
15. Implement a GTHA-wide performance-monitoring program, and use this program for public information, to inform planning and investment decisions, and to help determine when a SGMN update is warranted.

Proposed Monitoring Program

A plan was developed to monitor the performance of the SGMN and to measure its progress. The proposed monitoring plan has fourteen performance measures. These are listed below:

1. Truck volumes on SGMN corridors.
2. Value of goods carried on SGMN corridors, or average value of goods carried per truck.
3. Average truck travel times (along one or more corridors or on the entire SGMN).
4. Average truck travel speeds (along one or more corridors or on the entire SGMN).
5. Travel time reliability (along one or more corridors or on the entire SGMN).
6. Travel time delays (magnitude and duration) and costs of delays (monetary, fuel, GHG, air pollutants), along one or more corridors or on the entire SGMN.
7. Percent of the SGMN that has an acceptable pavement condition.
8. Percent of the SGMN that does not have restricted clearances or permanent or seasonal load restrictions.
9. Value of annual investments in SGMN network improvements.
10. Number of collisions involving trucks on the SGMN, per truck trip (volumes).

11. Number of fatal and serious injury collisions involving trucks on the SGMN, per truck trip (volumes).

12. Delays to freight trains and GO trains in the GTHA.

13. Delays incurred at at-grade crossings, for all road traffic and separately for trucks, as measured in vehicle-hours travelled.

14. Percent on-time delivery (proportion of total trips that are made within a certain threshold, as measured by shippers).

Except for measure 13, which requires input from the Class I and short line freight railways, and measure 14, which requires data from the goods movement industry, all measures would be developed from data that are developed or have been purchased by MTO or the upper-tier municipalities, as elaborated in Section 8.3. Incorporating some of these measures into a monitoring program may require additional data collection on an on-going basis.

How the SGMN Can Be Used (Applications)

The SGMN has a number of potential uses, which vary by stakeholder. The potential applications and benefits are described in Table ES-1. The table categorizes perspectives from four stakeholder groups, namely, the goods movement industry, infrastructure owners, other corridor users, and residents and landowners.

The table shows that there are many potential benefits. Key points to note:

- The goods movement industry benefits through the identification of a seamless, multimodal priority network across the GTHA, providing guidance on routes and alternatives. The SGMN also signals to industry that improvements will take place to further enhance the efficiency of goods movement in the GTHA.

- Infrastructure owners benefit in several ways: The SGMN can serve as a road map for locating upgrades and improvements that will benefit the movement of both goods and people. The SGMN informs planning, right-of-way protection and investment decisions and priorities, as well as zoning and land use planning decisions. The SGMN enhances the integration of goods movement with Complete Streets schemes and other corridor improvements. The SGMN can serve as a tangible focus or starting point for a broader goods movement data collection initiative and for research in goods movement – for example, by serving as priority locations for new data collection or to evaluate new traffic control technologies. Finally, the SGMN informs political decision-makers at all levels of government about the economic and other benefits of maintaining an efficient goods movement network in the GTHA.

- Other users benefit through the knowledge of how goods movement uses shared infrastructure, which informs their own mode and route choices.
- Residents and landowners benefit through an improved understanding of how the SGMN impacts traffic levels in their neighbourhoods as well as its potential impacts on mitigating congestion, energy consumption, GHG emissions and air pollution. The data collection program envisioned as the fifteenth element of the implementation plan could be used to inform the public, political decision-makers and analysts. It also could inform them as to the types and timing of potential improvements.

Table ES-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
Goods movement industry – the users of the SGMN	• **Designates a seamless, multimodal priority goods movement network that covers the entire GTHA**. • Provides **positive guidance on routing**. • Indicates those routes that, in the short term, could serve as **alternatives to congested routes**. • Conveys to private sector goods movement stakeholders that they are **being listened to and that goods movement is important** to municipal land use planning, road asset management and investment priorities. • Provides the basis for potentially **attracting private partners** to help implement and possibly help fund improvements that have broad benefits, potentially including fleet owners, courier companies, railway companies, industries that are adjacent or linked to an SGMN segment and so on. • Can influence the **locational choices** of prospective businesses that want to ensure they have adequate access for commercial vehicles.
Infrastructure owners (Province, upper-tier municipalities): Investment priorities and funding decisions	• Informs **prioritization of capital expenditures**. • Informs the **prioritization of operating expenditures**: e.g. priority maintenance and snow clearing, priority incident management and policing. • Provides a '**road map**' for implementing other goods movement actions. • Identifies possible **priorities for initiatives where multiple jurisdictions must collaborate**. • Informs **corridor right-of-way protection decisions and investments** for future roads and for intersection improvements. • Identifies candidate corridors that should be included in **emergency detour plans**, especially as alternatives to the 400-series highways. • Identifies existing corridors that should serve to **connect to planned or proposed 400-series highways**, or which would **serve as interim SGMN routes** pending the construction of these or municipal roads. • Informs municipalities, the Province, GO Rail and local transit authorities **where potential conflicts might arise on SGMN road and rail corridors** where rapid transit or other system upgrades (such as RER) are planned. • Provides an **overarching framework within which individual municipalities could**

Table ES-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
	develop their own secondary SGMNs. Municipal **truck route networks** also fall within and should be made consistent with this **SGMN hierarchy**, to promote consistency across the GTHA. • Could **inform funding decisions**, where multiple levels of government and even private landowners could collaborate to implement improvements. • Could **inform decisions on congestion pricing and other road charges**, by indicating where the corridors that would be most impacted by pricing decisions and, on the other hand, by indicating where non-tolled corridors should be provided (if tolling is the option).
Infrastructure owners (Province, upper-tier municipalities): Design, operational and technological improvements	• Promotes the **implementation of minimum design, geometrical, loading and clearance standards** to support heavy trucks when road and intersection improvements are made. These include pavement / sub-base load capacity, intersection turning radii, intersection truck turning storage and channelization, load-bearing capacity of structures, vertical and horizontal clearances for standard vehicles and for over-dimension vehicles (including for signal heads and wires), and so on. This means that any upgrades to the designated routes must be brought to these standards, so as to make the road ready for heavy trucks year round – i.e., eliminating seasonal load restrictions in the process. • Identifies **corridors where Complete Streets, traffic calming and transportation demand management measures should be carefully thought through**, so as to provide safe and smooth operations for other corridor users while maintaining the necessary throughput and accessibility for goods movement. • Informs where **heavy truck operations** along the designated corridors should be reviewed. For example, signal timings and progressions along designated corridors should be reviewed so that they are optimized for smooth truck flows. • Shows where **ITS and other new transportation optimization systems** should be put in place, if they are to maximize the benefit to truck movement. • Indicates corridors that could show promise for **demonstration projects**, such as truck-only lanes, especially across jurisdictions. • Provides a framework to **inform future plans for emerging technologies**, such as automated vehicles and truck platooning, as well as current and growing operational practices such as the growing use of long-combination vehicles (LCVs). Municipal LCV networks can be fitted into the SGMN, given that the 400-series highways are included in the SGMN and the SGMN connects key generators.
Infrastructure owners (Province, upper-tier municipalities): Land use and environmental planning decisions	• Indicates the **corridors where freight-supportive land use planning would be most effective**. • Indicates **which connectors must be protected** to maintain goods movement access to major goods generators, even as adjacent lands are converted to other uses. • Provides municipalities with a **quantitative basis for identifying major goods-generating lands** through the use of the 'freight cluster' definitions and analysis on which the SGMN was based. This quantitative approach **complements existing approaches** that are based on employment, Official Plan land use designations, industrial land strategies and the like. • Promotes **increased use of multimodal air, rail and marine terminals and ports** through the designation of and, ultimately, improvements to the road and rail

Table ES-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
	accesses to these terminals and ports. • Supports **planning around key intermodal hubs**, namely the international airports, intermodal rail terminals and the marine ports, which are connected to the SGMN and which are already major GTHA employment nodes currently or are expected to be in the future. • Supports **planning around mobility hubs** as they develop, especially in suburban areas, by indicating the potential SGMN routes to which mobility hubs should be connected hence identifying potential additions to the SGMN. • Informs **planning decisions on emerging topics**, such as the need for truck parking as mandatory use of electronic logging devices for hours of service is introduced. • Indicates corridors where **air quality improvements** related to goods movement and where **fuel reduction / GHG reduction measures** could build on industry initiatives and have the greatest potential.
Infrastructure owners (Province, upper-tier municipalities): Data and performance monitoring	• Indicates corridors where the RTP Key **Performance Indicators and other performance measures** would be most effective, in order to show how proposed network improvements benefit goods movement. • Indicates corridors where **data collection efforts** could be focused – truck travel time surveys, turning movement counts, classification counts and so on – with a view to coordinating data collection across the entire GTHA using common definitions, classifications and so on. • Inform **potential research needs**, such as new apps and other electronic technologies that could further improve truck travel times and reliability, inform driver/dispatcher route choices and so on.
Other users of the same infrastructure	• Provides information on the **likely location of high levels of goods movement activity**, so as to promote safe travel for all corridor users – for example, potential areas to avoid for pedestrians, cyclists and motorists who are uncomfortable around goods movement vehicles.
Residents and land owners	• Provides **clear indication of location of intensified goods movement activity**: e.g. possible input into land development decisions and residential purchase / leasing decisions.

Policies and Further Actions

Potential policies or guidelines regarding the adoption, take-up and implementation of the SGMN will be the subject of further discussions between Metrolinx and MTO, based upon but distinct from the outcomes of this study. As with other region-wide transportation initiatives, collaboration among Metrolinx, MTO, other Provincial agencies, upper-tier municipalities, infrastructure owners and, as appropriate, lower-tier municipalities will be needed. A potential complementary or follow-up activity could be a workshop among these organizations to discuss how the implementation plan and monitoring program could be actualized.

In the meantime, Metrolinx presented the core road SGMN plan in its September 2017 Draft RTP, which is now being reviewed for public comment. Among the actions that Metrolinx has proposed in its Draft RTP are two that relate specifically to the SGMN:

- Metrolinx will "advance collaboration between the public and private sector to support implementation of the Regional Strategic Goods Movement Network to link goods-generating activity centres, intermodal terminals and regional gateways." (Priority Action 3.10, Draft RTP, p. 80)
- Metrolinx will "study goods movement priority features for new and existing freight corridors, including but not limited to intelligent lane utilization and truck-only lanes." (Priority Action 3.10, Draft RTP, p. 80)

The proposed collaborative, cooperative approach recognizes that any future SGMN policies and actions will in no way supersede existing municipal SGMNs or other uses of the designated corridors by the responsible jurisdiction. The SGMN is intended to complement these uses in order to ensure that goods movement needs are explicitly considered when the responsible jurisdictions propose improvements or new infrastructure.

Recommendations

This SGMN report concludes with several recommendations for Metrolinx's consideration. These were:

- A plan for further consultation.
- Future data collection.
- Additional research and best practice guides.

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1 Introduction

Key Chapter Takeaway

This report develops a detailed core road/highway and rail Strategic Goods Movement Network (SGMN) for the GTHA. The core SGMN was developed in consultation with facility owners. However, some potential conflicts could warrant resolution in the future, if and as they arise: these comprise some shared corridors where rapid transit is under construction or is planned plus a small number of bridges on the SGMN in the City of Toronto that have load restrictions. The report proposes approaches for addressing these conflicts in the future. The report also proposes an implementation plan, as well as a plan to monitor performance and progress of the implementation. The report describes how the SGMN can be applied to transportation plans and priorities, and to inform industry, residents and other users.

1.1 Background

Metrolinx is responsible for creating and maintaining a Regional Transportation Plan (RTP) for the Greater Toronto and Hamilton Area (GTHA). This responsibility is embodied in the *Metrolinx Act, 2006*. The RTP is part of an approach by the provincial government to prepare the GTHA for growth and sustainability. A formal review and update of the RTP is now underway, and its completion is expected in 2018.

The original RTP, entitled "The Big Move," was approved by the Metrolinx Board in 2008. It built upon nine "Big Moves," or strategies. The eighth of these addressed goods movement. It called for the development of a comprehensive strategy to improve goods movement within the GTHA and with adjacent regions. Metrolinx subsequently developed this strategy as part of the 2011 GTHA Urban Freight Study, along with a 17-part Action Plan. The Action Plan in turn called for the development of a GTHA-wide Strategic Goods Movement Network (SGMN).

1.2 Objectives

The objective of this project is to prepare a high level SGMN for the GTHA. A strategic goods movement network can be characterized as a strategic, connected, and continuous network of multimodal corridors that *facilitates* the movement of freight. The network features a hierarchy of facilities among all upper-tier and higher jurisdictions. It promotes reliability through redundancy; that is, alternative routes or modes are available through seamless

connections. The SGMN seeks to connect all major intermodal terminals (rail, marine ports and airports) and major goods-generating activity centres with each other and with the major road and rail networks.

The SGMN has two primary objectives to support the development of the updated RTP:

- Support and inform the updated RTP by ensuring the compatibility of the goods movement road and rail networks and intermodal terminal connections with the existing and planned rapid transit and commuter rail networks.
- Provide input to Metrolinx's modelling of proposed multimodal transportation networks for the updated RTP.

The SGMN is also intended to:

- Build on existing municipal SGMNs, providing a basis for adoption by upper-tier municipalities in their own jurisdictions, in order to promote a consistently-defined network across the GTHA and to inform the setting of priorities for road improvements.
- Support, inform and complement land use planning, environmental planning, and economic development and competitiveness goals at all levels of government, by ensuring that goods movement needs can be included and addressed in these plans and aspirations.
- Provide a basis for potential future partnerships among public- and private-sector interests to implement needed goods movement improvements and for coordinated funding to support goods movement in the GTHA, and to inform future project prioritization.
- Provide a reference for future urban corridor design and operations, especially to ensure that goods movement is incorporated appropriately into Complete Streets guidelines and into the designation, planning, design and implementation of Complete Streets.
- Provide a basis for subsequent consultation with industry and other stakeholders.
- Allow for the potential introduction of goods movement actions that Metrolinx has proposed in its Draft RTP, issued in September 2017 for public comment, and others that were discussed in the 2016 RTP *Urban Goods Movement Backgrounder*.
- Ensure an appropriate balance to move passengers and goods on the road and rail infrastructure and connections with intermodal terminals. In particular, Metrolinx has indicated the need to protect and grow commuter rail services on CN- and CP-owned rail freight corridors, and to prioritize commuter rail services on its own corridors.

The SGMN directly supports Metrolinx's analysis of its proposed RTP initiatives, while also informing municipal governments and other agencies in their own analyses of goods movement needs. Note that the SGMN is meant entirely to be informative, complementary and supportive of the initiatives of these governments and other agencies. Chapter 9 elaborates the potential applications and benefits of the SGMN to owners of the road and rail infrastructure, by helping them account for goods movement needs in the setting of planning and investment priorities for upgrading and maintaining their infrastructure.

Finally, note that the approach and method used to develop the SGMN are based upon a scope that the consultants prepared for Metrolinx in December 2015. The approach has since been updated and refined.[1]

1.3 Relationship with the GGH Multimodal Plan

The Ontario Ministry of Transportation (MTO) is currently developing a multimodal transportation plan for the Greater Golden Horseshoe. A key objective of the *GGH Multimodal Plan* is to identify a goods movement network to meet demands for 2051 and beyond. The network is focused on roads and highways, but also will account for current and possible future intermodal rail terminals, airports and marine ports.

The SGMN informs the *GGH Multimodal Plan*. However, the two initiatives are distinct in three key ways:

- The SGMN covers only the GTHA, whereas the *Multimodal Plan* covers the entire GGH.
- The SGMN is concerned with the current road/highway and rail networks. It does not identify the need for any additional links, today or in the future. The SGMN can be updated as conditions and needs warrant, but will always focus on the existing network. The identification of any new links is part of the *GGH Multimodal Plan*'s mandate, and is a key objective of the *Plan*.
- The SGMN is based entirely on current truck and rail movements and volumes. It does not make any forecasts. In contrast, the *GGH Multimodal Plan* deploys forecasts for each mode, relying on MTO's new GGH Model v4 and its Province-wide Passenger and Freight Forecasting Model (PPFM).

Thus, although the SGMN was initiated for its own purposes, in many ways it serves as a lead-in to and a sub-set of the definition of a long-term multimodal goods movement network for the GGH.

1.4 Importance of a GTHA-wide SGMN

As is detailed in Section 2.5.1, four upper-tier municipalities have developed their own SGMNs: Durham, Peel and York Regions and the City of Hamilton. While these upper-tier SGMNs address goods movement within their own jurisdictions, a GTHA-wide SGMN recognizes that the movement of goods is independent of jurisdictions and boundaries, and that an efficient, multimodal network makes the best use of system capacity while reducing shipping costs and promoting economic competitiveness and quality of life across the entire

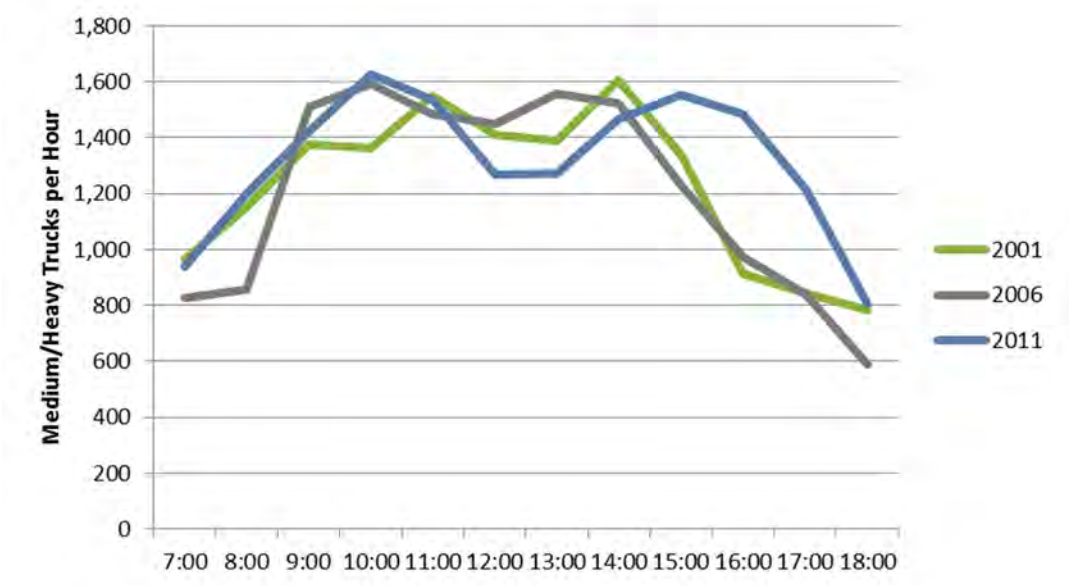
[1] *Scope for High Level Strategic Goods Movement Network for the GTHA*, prepared for Metrolinx, December 2015.

region. The GTHA-wide SGMN allows goods movement to be better integrated into the individual planning, prioritization and budgeting processes of all levels of government.

A simple example illustrates how the movement of goods has changed in the GTHA, and why a GTHA-wide perspective is needed. Figure 1-1 and Figure 1-2 show medium and heavy truck volumes at two points along Highway 401, taken from cordon counts over 10 years.

The figures show that volumes have increased significantly in the GTHA core, on Highway 401 at the Mississauga – Toronto boundary, as well as in the suburbs, as exemplified by the Toronto-Durham boundary counts. It can be seen the volumes are growing *upwards* in total numbers, *outwards* from the core to the suburbs (and counts at other suburban locations also are similarly growing) and *across the day*, as demonstrated by the all-day peak at both locations and the increase in trucks in the 3 p.m. – 5 p.m. hours.[2] While this growth and dispersion in truck activity are positive indicators of economic activity, there can also be impacts on congestion, greenhouse gas (GHG) emissions, air quality and, potentially, safety as the mix of trucks and passenger vehicles changes. A systematically-defined, GTHA-wide understanding and characterization of key goods movement corridors would aid in addressing these and other issues, and allow an improved understanding of the potential contributions of all goods movement modes to reducing congestion, GHG emissions and air pollutants to build on the many emissions-reduction measures that the goods movement industry already is taking.

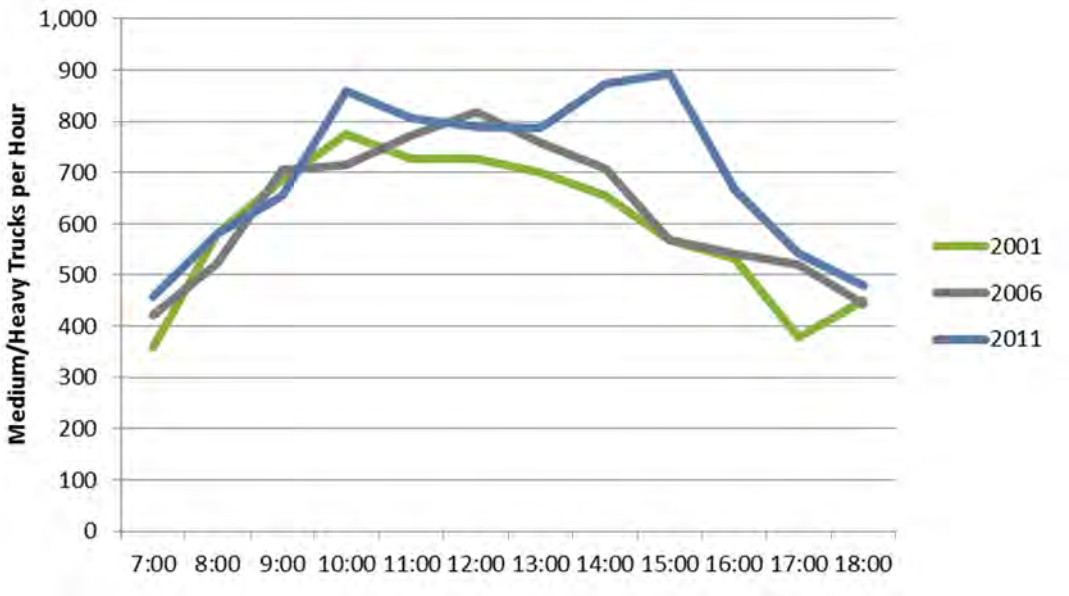
Figure 1-1. Growth in Truck Volumes on Highway 401 Westbound (Mississauga-Toronto Border)



Source: CCDRS medium and heavy truck counts, tabulated to support the *Regional Transportation Plan Legislated Review Backgrounder: Urban Goods Movement*, prepared by DKCI and CPCS for Metrolinx, 2016. Note that these counts cover only part of the day (7:00 am to 6:00 pm), were conducted only on a single day, and refer only to a single direction of travel.

[2] With high congestion levels throughout the day, truck activity is increasingly "encroaching" on peak periods, leading to increased conflicts

Figure 1-2. Growth in Truck Volumes on Highway 401 Westbound (Durham-Toronto Border)



Source: CCDRS medium and heavy truck counts, tabulated to support the *Regional Transportation Plan Legislated Review Backgrounder: Urban Goods Movement*, prepared by DKCI and CPCS for Metrolinx, 2016. Note that these counts cover only part of the day (7:00 am to 6:00 pm), were conducted only on a single day, and refer only to a single direction of travel.

Table 1-1 summarizes several GTHA-specific issues whose resolution would be aided with a GTHA-wide SGMN.[3] The table also highlights opportunities for deploying the SGMN to help address these issues as part of a broader effort, informing, complementing and supporting existing initiatives by Metrolinx and others, such as planned rapid transit and commuter rail improvements.

The SGMN uniquely provides an integrated GTHA-wide perspective that shows how all key regional freight generators and intermodal terminals are connected, thereby providing the broad framework that is necessary for addressing issues that are not restricted to specific jurisdictions, from reducing GHGs and air pollutants and managing growth at the urban boundary, to reducing congestion and optimizing the use of the entire multimodal network, and to helping policymakers provide an improved understanding of which corridors to protect from encroachment.

The contribution of goods movement to economic wellbeing and quality of life is often not fully recognized in the perception of the public and in the prioritization of public policies. Identifying a regional SGMN helps to ensure that the needs of goods movement industries are recognized within the context of planning the broader transportation network.

[3] Based on *Scope for High Level Strategic Goods Movement Network for the GTHA*.

Table 1-1. GTHA-Wide SGMN – Issues and Potential Applications

Theme	Issue	Potential Applications of the SGMN
1. The GTHA is a complex economic activity centre with multiple jurisdictions for goods movement.	• Large, complex metropolitan area. • Multiple public and private jurisdictions in the goods movement infrastructure. • Ownership and shared use of existing rail corridors. • Location of ports.	• Shippers and carriers look for seamless intermodal connections (rail terminals, marine ports and airports) to move goods throughout the GTHA. • Use the SGMN to inform Metrolinx's Urban Freight Forum* to broaden the understanding of the complexities from all perspectives.
2. Transit initiatives provide opportunities to aid goods movement but there can also be potential conflicts.	• Planned rapid transit initiatives could free up road capacity. • Rapid transit has implications for goods movement along individual corridors. • Complete Streets concepts promote appropriate corridor use by all users, although in practice this can prove challenging for trucks. • The goods movement network should have an appropriate density.	• The rapid transit plans of Metrolinx and other GTHA agencies provide opportunities for relieving auto traffic and congestion, to the benefit of goods movement. • The designation of a GTHA-wide urban freight network provides an opportunity to explicitly integrate goods movement needs into the designation, planning, design and implementation of Complete Streets and other corridors, so as to minimize potential conflicts between trucks and bicycles. • To maintain access and connectivity for goods movement in corridors that are served by rapid transit, there may be a need to designate parallel roads or rail lines as alternatives. There might also be scope or provisions for freight corridor protection, depending on the local context.
3. Land use and environmental issues must be taken into account.	• Climate change and air quality. • Redevelopment pressures. • Evolving urban/rural interface. • New employment areas. • Major goods-generating clusters and intermodal terminals.	• Understanding where the key goods movement corridors and intermodal terminals are will inform air quality and climate change mitigation plans. • Working in tandem with such references as MTO's Freight Supportive Guidelines, the definition of the SGMN can help to proactively accommodate goods movement in land use planning in built-up areas, in new employment areas and at the urban/rural interface.
4. Some key data exist to inform the definition of the network, but there are gaps in the data.	• Partial information on goods movement. • Lack of detailed employment data.	• Implementation of Metrolinx's 2013 Plan for Urban Goods Movement Data in the GTHA would address many of the needs, and the SGMN could help to clarify the need and identify key locations for data collection. • A uniform region-wide employment survey would provide detailed and consistent employment data.
5. The GTHA's role in through traffic and in international trade must be considered.	• Significant amount of through traffic. • International trade component, noting also the unpredictability of international trade flows, regulations and so on.	• The SGMN identifies key 'through' corridors and how they relate to the internal network. • Underlines the importance of senior governments and infrastructure owners to participate in the development of the SGMN. • All levels of government can work together to better understand and address the needs of non-local freight moving to, from and through the GTHA, and its implications on the GTHA.

* The Metrolinx Urban Freight Forum (UFF) brings together members from all three levels of government, freight transportation and logistics organizations, private sector companies and academia in order to support the delivery of Metrolinx's 2011 *GTHA Urban Freight Study*.

1.5 Project Structure

The project was developed in two broad phases. Phase I developed initial, high-level, RTP-compatible SGMN concepts, drawing upon an extensive stakeholder consultation (see Section 1.7) and an analysis of flows among the GTHA's major freight clusters and accounting for the existing upper-tier SGMNs. The findings were reported in the June 2017 *Phase I Report*.

Phase II refined the SGMN concepts into a single core road and rail SGMN. Metrolinx has presented the core road SGMN for public comment in its September 2017 Draft RTP. The core road and rail SGMN informed Metrolinx's evaluation of its RTP rapid transit alternatives. It also provided the basis for identifying outstanding network conflicts for subsequent resolution – for example, as rapid transit plans on some SGMN segments are further refined in the future. Phase II proposed an implementation and monitoring plan, as well as a plan for subsequent broader stakeholder consultation with the private sector and recommendations for further research and data collection. The findings were reported in the December 2017 *Phase II Report*.

1.6 Report Organization

This report presents the project findings. It integrates the *Phase I* and *Phase II* reports. It contains nine chapters:

- Introduction (this chapter).
- Background and review of best practices (Chapter 2).
- Guidelines for developing the SGMN (Chapter 3).
- A vision for the SGMN and balancing priorities for its implementation (Chapter 4).
- Development of concepts for the road SGMN (Chapter 5).
- Derivation of the core road and rail SGMNs (Chapter 6).
- Approaches to resolving outstanding conflicts (Chapter 7).
- Implementation and monitoring plans (Chapter 8).
- Applications of the SGMN and recommended future steps (Chapter 9).

Four appendices complement the report. Appendix A lists selected codes and conversion factors that were used to categorize business types and to estimates their numbers of employees in relation to the development of the SGMN concepts in Chapter 5. Appendix B provides detailed maps of the SGMN. Appendix C describes implementation plans for other SGMNs in the GTHA and elsewhere. Appendix D describes performance monitoring plans for other SGMNS in the GTHA and elsewhere.

1.7 Stakeholder Engagement – Review Group

The development of the SGMN was guided by a Steering Committee that comprised representatives from Metrolinx's Regional Planning and Rail Network Planning groups, MTO's Systems Analysis and Forecasting Office, and Peel Region, which developed the prototype for a multi-jurisdictional SGMN in 2013.

The development of the SGMN was based on consultations with the Steering Committee and with key public-sector stakeholders, infrastructure owners and associations. These stakeholders, identified as the Review Group for the SGMN, are listed below.

- MTO's Provincial Planning Office and Commercial and Advanced Transportation Office.
- The GTHA's upper-tier municipalities - Durham Region, Halton Region, Peel Region, York Region, the City of Hamilton and the City of Toronto.
- Transport Canada.
- The Greater Toronto Airports Authority and Hamilton International Airport.
- The Hamilton Port Authority, the Port of Oshawa and Ports Toronto.
- Canadian National Railways and Canadian Pacific Railway.
- Highway 407 ETR.
- Ontario Trucking Association.

The consultation was conducted in three ways:

First, consultation interviews were held with these stakeholders at the outset of Phase I in order to assess issues and identify the guidelines and criteria that were most important to them. These interviews informed the development of the Phase I concepts, while more generally engaging the stakeholders for the subsequent reviews. The consultation was supported by a review of known examples of SGMNs in the GTHA and elsewhere. The review also enumerated the factors and guidelines that others had used to define their SGMNs. Details are provided in Section 3.1.

Second, with the development of the draft concepts for the high-level SGMN in place, the Review Group was asked to review the draft Phase I report in early 2017. The Review Group's comments were incorporated into the final Phase I report, and served as the basis for developing a core road SGMN and a core rail SGMN in Phase II.

Third, the Review Group was asked to review two drafts of the core road and rail SGMNs. The first review took place in June and July 2017. Based on the comments received, the core road and rail SGMNs were revised and circulated for a second review in August and September 2017. The core road and rail networks were then finalized. These final versions formed the basis of the Phase II report, which was then circulated to the Review Group for final

comments in December 2017. At Metrolinx's request, the Phase II report also was circulated to MTO's GTHA Transit Policy Office and to the City of Mississauga for review. At the same time, Metrolinx has also included the core road SGMN in its September 2017 Draft RTP, which is now available for public review. Comments related to the SGMN from all these sources have been incorporated into this report.

It is recognized that the successful implementation of the SGMN relies on the input from private industry stakeholders. This consultation would be conducted separately from the current project, using the project's outcomes as its basis. As noted, this report includes a plan for subsequent, broader consultation with private industry stakeholders (see Section 9.3.2).

1.8 Analytical Approach and Data Sources

The SGMN network has a basis in both **quantitative** and **spatial analysis**. The quantitative analytical basis identified key freight-generating activity clusters and connecting corridors, as a function of actual conditions and use. The spatial analysis superimposed the existing municipal SGMNs and Metrolinx's proposed RTP rapid transit improvements in order to identify candidate SGMN corridors visually. Together, the two bases were used to define concepts for the GTHA-wide SGMN. In other words, whereas many SGMNs historically relied primarily on spatial and visual analysis to identify the freight-generating activity clusters, the GTHA-wide SGMN uses actual truck activity, derived from the GPS traces, to define these clusters and the connecting corridors. A spatial and visual analysis was then used to add employment lands, as designated in municipal Official Plans, to this definition. Finally, Review Group comments were further refined the connecting corridors through selected additions, deletions, substitutions and modifications.

Using this analytical basis, an iterative process was used to develop concepts for the SGMN from which, following successive reviews with the Review Group members, final core road and rail SGMNs were developed.

The SGMN is based on heavy truck movements, which is appropriate to the region-wide coverage of this initiative as well as to the objectives of a strategic goods movement network. As a starting point, the quantitative analysis used American Transportation Research Institute (ATRI) and Commercial Vehicle Survey (CVS) GPS traces to define heavy truck movements to, from, within and through the GTHA. The MTO provided selected excerpts of the CVS data and, to maintain compliance with the conditions of its licensing of the ATRI data, the Ministry prepared certain tabulations from the raw ATRI data for the consultant's use. These tabulations were used to identify the key corridors that are used by trucks, as well as the major trip origins and destinations (i.e., the major freight-generating activity centres). The analysis then considered these key freight-generating locations against employment by type, as a means of validating the origins and destinations. These locations were then categorized into primary and secondary freight-generating clusters.

Note that both the ATRI and CVS data were used for the analysis, in order to benefit from the full richness of the available data. However, their coverage (in terms of the truck fleets whose movements they depict) is not known, and so it is inevitable that there are some gaps and overlaps. Moreover, although both sets of data generally reflect trips made by heavy trucks, the CVS data are mostly collected on Provincial highways, and so they tend to reflect inter-regional and inter-urban trips, whereas the ATRI geographical coverage is ubiquitous. It should also be noted that the CVS data are an expanded set of survey data (i.e., a sample of observed activity), whereas the ATRI data correspond to the entire set of observations (i.e., all observed activity).

Finally, it is recognized although the GPS data provide a commonly defined and systematic 24/7 depiction of truck movements on every road and highway within the GTHA, they tend to miss the activity of smaller vehicles and of smaller fleets that do not subscribe to the fleet tracking systems that are the sources of the GPS data. However, the available data sources for this other activity – typically, manual and automatic counts conducted over limited periods at discrete intervals – are neither uniformly defined and always up to date across the GTHA, nor are they always available for the same time periods and dates. Addressing these gaps in the future would require additional data collection, which is discussed further in Section 9.3.4.

Although the focus on heavy truck movement is appropriate for the development of a region-wide SGMN, as noted above, it is recognized that in some parts of the GTHA, especially in the denser urban cores such as downtown Toronto, small- and medium-sized truck movement can exceed heavy truck activity. However, the design and planning needs associated with the small and medium-sized trucks, while important, tend to be more localized, focusing on smaller geographies and on individual roads and streets. As a result, and given that the data describing these movements are sparse in any event, individual upper- or lower-tier municipalities could develop their own, localized strategic goods movement networks. Such 'secondary' SGMNs should be consistent with and fit within the hierarchy established by the existing upper-tier SGMNs and, more broadly, within the GTHA-wide SGMN.

To ensure the usability of the two data sets, the study team compared them and found them to be reasonably consistent, even with the inherent different bases noted above. As a result, it was determined that the two sets of data could be used for this analysis, with the important qualification that this analysis is concerned with establishing the spatial distribution of trips, and not the absolute volumes.

The GPS-based approach provides a robust, evidence-based definition of freight generators, based on actual truck activity. This approach has the advantages of providing a systematic, GTHA-wide treatment. It also defined some freight generators that would not have been identified by a review of Official Plan employment areas or by employment numbers by industrial sector (often used as a proxy to identify freight generators) alone. Overall, the analysis provides a systematic delineation of primary and secondary freight-generating clusters and identifies key corridors, which all can be updated over time as conditions change.

For rail, the primary data source is Transport Canada's Grade Crossing Inventory, as discussed in Section 6.3.

The concepts for the high-level SGMN described in this report take into account the existing SGMNs that some upper-tier municipalities have developed (Peel, York, Durham and Hamilton), as well as regional/major arterial road networks in the other municipalities (Halton Region and Toronto). It also accounts for Metrolinx's proposed RTP rapid transit network. The use of the municipal SGMNs ensured that these segments were included in the GTHA-wide SGMN, or were considered when Review Group members proposed modifications. The use of the RTP rapid transit network helped to identify road and rail segments where it would be desirable to seek alternatives for the SGMN; that is, to avoid conflicting uses where possible. At the same time, some potential conflicts with the planned RTP rapid transit network and with a small number of City of Toronto roads that have weight restrictions can only be resolved if and as new infrastructure improvements are implemented – i.e., they are not conflicts today but might be in the future. Chapter 7 proposes approaches to addressing these potential conflicts if and as they arise in the future.

Note that a third spatial comparison was proposed using land use maps, as a means to avoid residential neighbourhoods and other sensitive areas and to identify planned employment areas. However, land use maps were only available from a small number of municipalities, and some of these declined to provide the necessary GIS-compatible layers, as a matter of policy. As a result, the available land use maps were reviewed only visually. On the other hand, the cluster analysis provides a far more thorough and robust means of identifying the location of the primary and secondary freight-generating land uses.[4]

[4] Note the definition of 'freight clusters' that is used for the SGMN analysis is based primarily on the observed truck trip generating activity, accounting also for employment type and for the current and future land use proposed in municipal Official Plans. The clusters thus identified are consistent with the definitions used in MTO's *Freight-Supportive Guidelines* (see section 2.1.4.1). However, the *Guidelines*' definition focuses on grouping designated employment lands (sections 2.2.4 and 8.1), which might not always result in the same geographical definitions as would occur with the SGMN's basis in truck trip activity. For more information, see *Freight-Supportive Guidelines*, Ontario Ministry of Transportation, Toronto, 2015.

1.9 Acknowledgements

This report was prepared by CPCS and David Kriger Consultants Inc. on behalf of Metrolinx, which sponsored the SGMN project.

The project was guided by a Steering Committee that, as noted, comprised representatives from Metrolinx's Regional Planning and Rail Network Planning groups, MTO's Systems Analysis and Forecasting Office, and Peel Region. Eric Petersen, PhD, Senior Advisor, Regional Planning at Metrolinx, served as Project Manager. Dr. Petersen's direction, guidance and inputs are gratefully acknowledged, as are those of the Steering Committee members.

Appreciation is also extended to the members of the Review Group, whose members are listed in the preceding section.

The contents of this report do not necessarily reflect any official position on the part of the Steering Committee members or of the stakeholder agencies that were consulted in its preparation.

The consultant team also expresses its appreciation for the data and reports described herein, which were provided by the Steering Committee and various Review Group members for use in this project. A special note of thanks is extended to MTO's Systems Analysis and Forecasting Office for the provision of ATRI GPS truck trace data and data from MTO's Commercial Vehicle Survey.[5] These data and other reports are detailed below. However, the scope of the project precluded the detailed review of these data and reports for correctness and accuracy, and the consultant team used them as provided. In all cases, all data were supplied to the consultant team with the necessary confidentialities having been applied first, and within the requirements of any applicable licensing and usage terms.

[5] All ATRI data were provided within the scope permitted by MTO's licensing agreements with ATRI. All ATRI and CVS data were anonymized so as to maintain confidentiality.

2 Background and Review of Best Practices

Key Chapter Takeaway

Goods movement generates significant benefits for society that are often not well understood. As such, goods movement policy is often an afterthought. Some local governments and metropolitan planning agencies have designed SGMNs to maximize the benefits generated by goods movement and to minimize conflicts between goods movement and other priorities. This chapter summarizes some of those best practices.

2.1 Why Goods Movement is Important

Goods movement has a broad societal impact. To the general public, goods movement is often considered to be a nuisance more than anything else. In large part, the activity related to goods movement – trucks driven on highways, freight trains rolling through urban areas, port terminals loading cargo on vessels, etc. – appears to many people to have little or no direct bearing on their day-to-day lives.

Passenger transportation, on the other hand, is by definition a "final good." A final good is one that is "consumed" by someone to satisfy some immediate need. The benefits related to industries that provide final goods then are visible and obvious to most people.

Because goods movement and related industries for the most part are "upstream" to final goods, the related benefits are more abstract to the general public. However, those benefits are no less real than the benefits that stem from the production of final goods. Indeed, all the functions related to goods movement are ultimately inputs into the production process of some final good. Without goods movement, most of those final goods disappear. With poor or less efficient goods movement, the cost of final goods increases and the variety of final goods that are available decreases. It is for this reason that goods movement is important to everyone, not just the people who are directly employed in the industry.

Another relevant factor is that the benefits of goods movement are often geographically dispersed, while some of the associated costs (e.g. noise and local emissions) are often concentrated in smaller geographic areas (near intermodal facilities, key highways and rail corridors, for example). This contrast in the geographic distribution of benefits and costs adds

to the challenge of arriving at optimal decisions regarding the prioritization of goods movement policies and infrastructure.

This challenge, along with the fact that goods movement is often at least one step removed from the consumer, means that goods movement industries will often face an uphill battle with respect to public perception and public policy prioritization. Identifying a regional strategic goods movement network helps to ensure that the needs of goods movement industries are recognized within the context of planning the broader transportation network.

2.2 Three Perspectives: Competing and Complementary Needs for a SGMN

Three perspectives inform the derivation of a strategic goods movement network. These perspectives are both complementary and competing. The three perspectives are the public sector, whose policies determine its needs; the community of residents, whose neighbourhoods can be affected by truck and rail traffic; and the private sector, which generates and moves goods.

In order to promote the viability of a GTHA-wide strategic goods movement network, it is useful to understand what each perspective looks for in a network. This understanding will help to gain buy-in to the network, as part of this work and in any subsequent consultations. It also will help ensure that any future updates are practical and implementable.

Table 2-1 elaborates the needs according to each perspective. From the public sector perspective, the desire is to support a range of public policies, including those related to the use of the transportation system, the preservation of communities and sensitive areas, the promotion of economic growth, and the minimization of GHG emissions and air pollutants. Communities typically want to minimize neighbourhood intrusion by trucks, along with the associated noise, vibration and pollution. For the private sector, “time equals money,” and so there is a desire for a well-connected, well-defined, direct and reliable network that supports the smooth and cost-efficient movement of goods. While many of these desires are complementary, there may also be a need to balance needs – for example, if residential neighbourhoods lie between an industrial area and the major transportation system. The definition of the SGMN sets up the ability for individual agencies to conduct more detailed analyses, knowing how individual links fit into the SGMN hierarchy.

Note that a SGMN reflects current needs and is implemented on the transportation system as it exists today: as opposed, for example, to the construction of a bypass that can take several years to implement. However, the SGMN also should have the flexibility to account for planned future infrastructure and to be updated as conditions warrant.

Table 2-1. Public Sector, Community and Private Sector Needs for a Strategic Goods Movement Network

Public Sector	Community	Private Sector
Public policy reflects the aspirations codified in Official Plans and other policy statements. Key aspirations related to a truck route network are to promote: • **Economic development** so as to sustain and grow the GTHA's economy. This requires a seamless, connected and efficient multimodal goods movement network to serve local, regional, cross-border and international goods movement. • **Safety** through the shared use of corridors, in which vulnerable users, especially cyclists and pedestrians, are provided a safe space. This means ensuring a corridor design that minimizes conflicts with other vehicles, especially trucks, while at the same time providing trucks with the necessary access to adjacent properties for loading. • **Community cohesion** through the avoidance of truck routes through neighbourhoods and the minimization of noise and vibration from trucks. • **Minimization of GHGs and air pollutants** through the use of congestion-free routes for trucks (and other vehicles) and through the continued implementation of emission controls. • **Environmental protection** through the avoidance of routing trucks through environmentally sensitive areas.	Residents seek to maintain and improve the quality of life in their neighbourhoods. From the perspective of goods movement, this means: • **Avoidance of truck traffic** traversing residential neighbourhoods. • **Minimization of truck noise and vibration** in residential neighbourhoods and other sensitive areas such as schools and hospitals. • **Safe environment** for all road users, especially cyclists and pedestrians. • **Right-sizing** of trucks for neighbourhood deliveries – especially in light of the rapid increase in online shopping and the express deliveries that this generates.	Key needs for a SGMN and for a truck route network generally are: • **Viable network** to promote economic activity. • **Connectivity** among intermodal terminals and major goods-generating land uses, and with the major Regional and Provincial road and highway networks. • **Directness** in routes, avoiding circuity. • **Safe environment** for trucks and all road users. • **Redundancy** in the goods movement network; that is, the availability of alternate routes that are readily accessible in the case of bottlenecks or incidents. Some large retailers locate their distribution centres at or close to intermodal terminals so that they also can access both rail and truck corridors, depending on the distances involved. • **Reliability** - that is, predictability in travel times so that delivery schedules can be met, at least most of the time. • **Consistency** in signage and regulations. • **Seamless transition** between jurisdictions. For the private sector, boundaries are transparent. • For the private sector, **delays and uncertainty increase operating costs**. These are real costs, passed on to consumers and businesses alike. Ultimately, in the face of uncertainty and rising costs, it may no longer be viable for a business to remain in operation at its current location, meaning that it ceases operations or relocates. These are real and tangible impacts on a region's economic viability and quality of life.

Source: Based on Regional Goods Movement Strategy for Metro Vancouver (draft), TransLink, 2015 and Town of Oakville Goods Movement Study, March 2016.

2.3 What is a Strategic Goods Movement Network?

There are various definitions of a strategic goods movement network. In its simplest form, a SGMN is a system of corridors that is at the top of a hierarchy of truck and other goods movement routes. These corridors are well connected with each other and with major freight generators and attractors (e.g. distribution centres (DC) and intermodal terminals). These corridors are identified while respecting existing land use and planning policies, and also informing future land use and planning policies by ensuring that the corridors are protected for goods movement.

A SGMN is related to but is different from a preferred set of truck routes and truck restrictions on other routes. Truck routes and restrictions identify where trucks can and cannot go. They can have specific conditions concerning the time-of-day, temporary seasonal weight restrictions (noting that there are exceptions for some types of commodities), permanent restrictions on dimensions and weights, over-size / over-weight loads, which may require special permits, and the transportation of dangerous goods. Their definition can be permissive (where a truck can go) or restrictive (where it cannot go). However, they do not identify preferences for truck traffic within the designated routes and restrictions. Because these designations are within the mandates of individual municipalities, the routes and restrictions do not necessarily align with those of adjoining municipalities.

Some municipalities have developed or update their truck route networks and restrictions according to established guidelines, meaning that their networks are cohesive, well defined and well understood. Hamilton, the Region of Waterloo and Ottawa are good examples. However, other municipalities make decisions in response to residents' or political concerns, meaning that the network often ends up fragmented and lacks cohesion and consistency. Most important, the network might no longer have a logical through-route to allow for the efficient movement of goods passing entirely through a municipality. Moreover, truck routes and restrictions do not necessarily protect certain routes nor are they strategic, in that they are not necessarily developed with major freight generators and attractors, or with goods movement flows, in mind.

A SGMN explicitly identifies all of these things, and it should be emphasized that the SGMN is always intended to respect the existing truck routes and restrictions on intersecting and feeder roads. In this way, the SGMN sits at the top of a hierarchy of a definition of truck corridors. Moreover, the inclusion of rail corridors in the definition of the GTHA-wide SGMN ensures that rail-rail and road-rail intersections (crossings) are taken into account, as well as the key intermodal terminals (rail, marine ports and airports).

2.4 Goods Movement and Transportation Planning in the GTHA

2.4.1 Multimodal Networks and Jurisdictions

The GTHA is Canada's most populous metropolitan region, and therefore it also has the largest consumer market. The large consumer market means that companies within the goods movement industry naturally gravitate to the GTHA. Moreover, due to the benefits provided

by economies of scale and clustering, the GTHA serves as a goods movement hub for the country as a whole. This means that although the goods movement industry in the GTHA generates important benefits for the region, it also generates benefits for a much broader area across the country.

As it has grown as a goods movement hub, the GTHA has developed a truly multimodal network of infrastructure to support goods movement. Goods flow by air, marine, pipelines, rail, and road, and are interchanged between modes at major terminals including airports, marine ports, rail intermodal and transload facilities, and pipeline terminals. Figure 2-1 shows the geographical extent of the GTHA and its constituent municipalities. Figure 2-2 shows the existing road network, airports and marine ports in the GTHA.[6] Figure 2-3 shows the existing rail network with the existing rail intermodal terminals. The figure differentiates the rail network by ownership (the two Class I railways, Metrolinx and the five short-lines).

A number of public sector entities play a key role in goods movement, including:

- Metrolinx (the regional transportation agency for the GTHA).
- The Ontario Ministry of Transportation, which owns and maintains most major expressways (the 400-series highways) and secondary highways in the region. The single exception, the Highway 407 ETR, is operated by a private concessionaire. Highway 407 is also the only tolled highway in the GTHA, although MTO is examining the feasibility of high-occupancy tolled (HOT) lanes on several highways, and the City of Toronto proposed the implementation of tolls on the Gardiner Expressway and the Don Valley Parkway and is continuing to study the issue.
- The federal government, which regulates air, marine, pipeline, and rail transportation.
- Canada Port Authorities (Ports of Hamilton, Oshawa, and Toronto), which operate the GTHA's publicly owned ports as well as the Billy Bishop Toronto City Airport.
- The Greater Toronto Airports Authority (GTAA), which operates Pearson International Airport, and the Hamilton International Airport (HIA), which is owned by the City of Hamilton and is leased to TradePort International Corporation.
- Regional municipalities (Halton, Peel, York, Durham) and two single-tier municipalities (Hamilton and Toronto) along with 24 lower-tier or local municipalities (see Figure 2-1) which collectively own and maintain the local road network in the region.

2.4.2 Private Sector

Broadly, there are three types of industries that could be considered of relevance to urban goods movement: shippers, transportation and logistics providers, and service industries (e.g. emergency response, roadside service, building maintenance, etc.).

[6] The figure also shows the Highway 407 East Phase II extension and the Highway 427 extension, which are under construction and committed, respectively.

Transportation and logistics (T&L or carriers) providers and shippers are collectively referred to as the goods movement industry. Meanwhile, service industries generate additional truck trips (many of which are completed by light and medium trucks) and therefore are also potentially affected by the development of a SGMN.

Figure 2-1. Municipalities in the GTHA

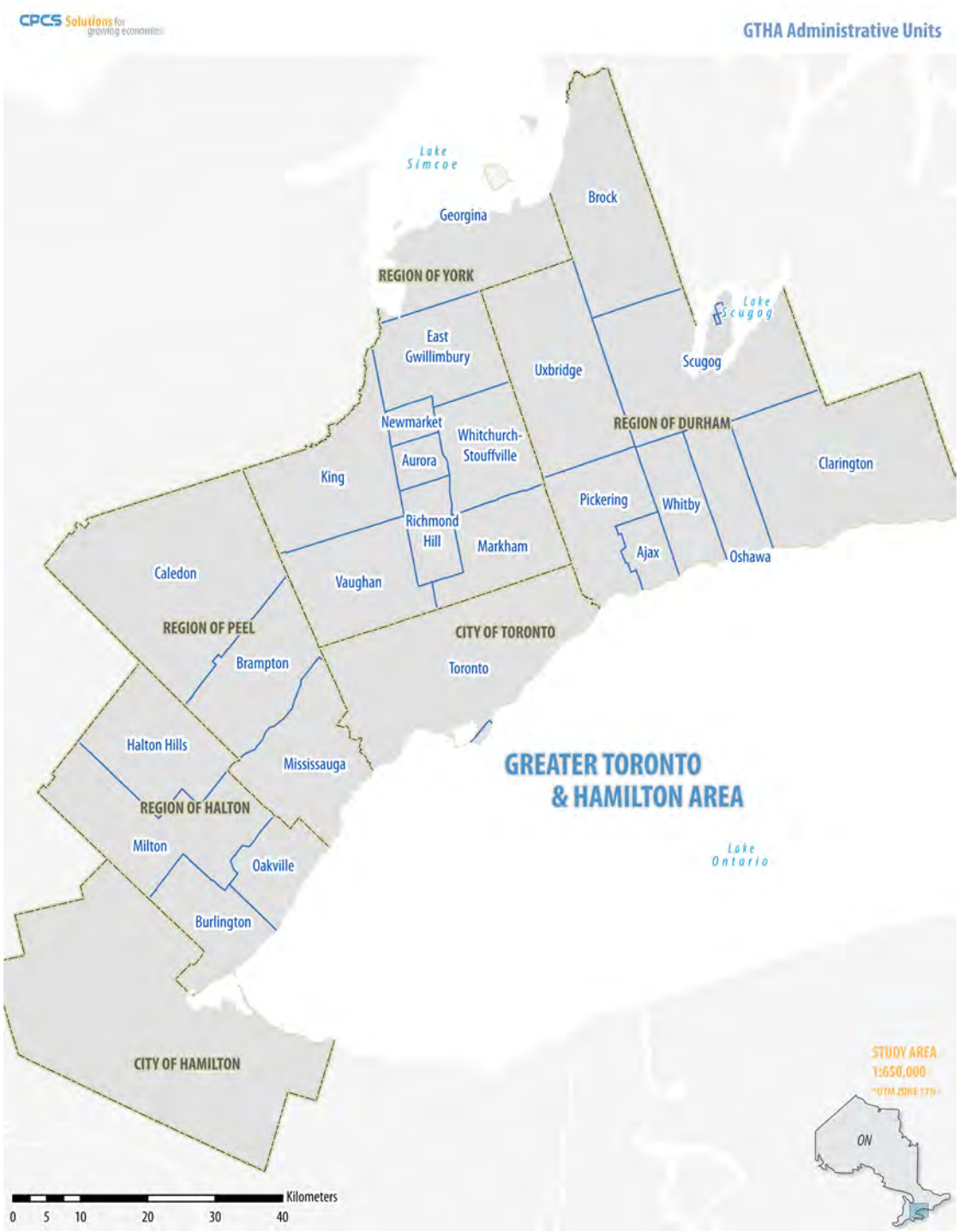


Figure 2-2. GTHA Road Network, Airports and Marine Ports

Source: CPCS analysis of data from MTO

Figure 2-3. GTHA Rail Network

Source: CPCS

2.4.3 Transportation Master Planning in the GTHA

The six upper-tier municipalities in the GTHA periodically develop and update their transportation master plans (TMP).[7] These TMPs usually reference goods movement to some degree or another, although only some speak specifically to a SGMN. The direction or guidance that they provide regarding goods movement will have implications for the development of a GTHA-wide SGMN.

Table 2-2 summarizes the most recent TMPs that have been completed or are now being conducted by each upper-tier municipality, and their relevance for goods movement. The Regions of Peel, Durham and York and the City of Hamilton explicitly define their own strategic goods movement networks. All Halton Regional Roads permit trucks by definition, but Halton Region does not have a strategic goods movement network. The City of Toronto permits trucks on any road, subject to certain restrictions, but does not have a strategic goods movement network.

Also of note are two Provincial initiatives:

- The Ministry of Municipal Affairs and Housing's Growth Plan for the Greater Golden Horseshoe, 2017 provides linkages to intermodal facilities, efficient highway movement, and land use and transportation planning. Land uses adjacent to transportation facilities are meant to be compatible with uses (e.g., designate employment lands close to the transportation network). The Growth Plan encourages municipalities to designate land for manufacturing and to increase goods movement by rail.[8]

- MTO is currently preparing the Greater Golden Horseshoe (GGH) Multimodal Transportation Plan, which has an emphasis on multimodal, inter-regional passenger and goods transportation connections within and beyond the GTHA. The Multimodal Plan aims to improve the integration of land use and transportation planning throughout the GGH by providing clear overarching directions for major transportation investments, improved alignment of area-specific plans, and greater certainty for municipal and agency partners. Promoting inter-regional, inter-provincial and international connectivity for goods movement is key. The Plan will propose higher-order road and highway improvements to 2051, taking into account planned and proposed improvements in other freight modes and intermodal terminals. Completion of the Multimodal Plan is expected in 2019.

[7] Most lower-tier municipalities have developed TMPs of their own. However, these are not described here, given the focus of the SGMN on roads and facilities that are under the jurisdiction of upper-tier municipalities and senior governments.

[8] The Province recently completed a coordinated review of the Growth Plan for the Greater Golden Horseshoe, the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan and the Niagara Escarpment Plan. The four updated plans came into effect by July 1, 2017.

Table 2-2. Transportation Master Plans in the GTHA

Region, Title	Year	Reference to Goods Movement
Durham Region – Transportation Master Plan 2017	2017	A Strategic Goods Movement Network is included in the 2015 Durham Regional Official Plan (Schedule C, Map C4). By definition, all Regional Roads are open to truck traffic. However, according to staff, designation of a Regional Road in the SGMN indicates sections where the Region proposes to make active infrastructure improvements. Regional Council adopted an updated TMP in December 2017. The new TMP's Guiding Principles notes that the "region's transportation network will offer direct, continuous routes for … goods movement" and for other modes. Among the supporting Transportation Directions, the most relevant is Direction 6, which seeks to "improve goods movement to support economic development." The direction further notes that "providing efficient, continuous, and connected goods movement is integral to Durham Region's economic competitiveness and growth …" The TMP recommended four actions to support this direction and improve goods movement, including the addition of six corridors and routes to the existing SGMN. The additions include the main access road to the Port of Oshawa. These additions and related policy actions are described in Section 2.5.1.
Halton Region – Transportation Master Plan to 2031	2011	Goods movement is listed as one of the "opportunities" with the road network specifically identified as "captur(ing) the vast majority of goods movements." Initiatives listed through the TMP must consider the ability of the road network to support manufacturing, resource-related industry, and agriculture. The vision of the Region's TMP is to accommodate various travel choices to support a sustainable and multimodal network, by maximizing the use of transit and other alternatives to the single occupant vehicle. The five Guiding Principles included: • Balanced Needs – provide choice for the travel needs of residents • Healthy Communities – support a healthy and active lifestyle • Economic Vitality – transportation will be a major contributor to the Region's prosperity • Sustainability – balance economic, social and environmental goals • Well-Maintained Infrastructure – keep the Region's infrastructure in a good state of repair Effective and efficient movement of goods is an important element of the Regional transportation system, benefitting consumers and the economy, within Halton, GTHA and beyond. The TMP recommended that the Region continue to foster joint working relationships with Metrolinx and the GTHA municipalities. By definition, all Regional Roads are classified as major arterials and accommodate all truck traffic, although some seasonal restrictions apply. Halton's upcoming new TMP is expected to update the SGMN.

Table 2-2. Transportation Master Plans in the GTHA

Region, Title	Year	Reference to Goods Movement
City of Hamilton – Transportation Master Plan Review to 2031 and beyond	Nearing completion	A 30-year Transportation Master Plan was conducted in 2007. A review of the 2007 TMP is nearing completion. A strategic goods movement network was described in the 2007 TMP, and the City conducted a detailed truck route study in 2010. The current TMP Review identified several truck route connectivity issues: the western link between the Port of Hamilton and Highway 403, between the upper and lower city, and between the HIA and the new Rymal employment areas. However, these are to be examined in further detail after the TMP Review is complete.
Peel Region – Regional Transportation Master Plan (Long Range Transportation Plan Update) to 2031	2012	In its Problem and Opportunities statement, one of the points is to "maintain the Region's economic competitiveness by facilitating goods movement in Peel." "A key action to be undertaken by Peel is the identification of a potential strategic goods movement network." The subsequent study to identify this network is profiled in the next section. There are permanent and time-of-day restrictions on some Regional roads.
City of Toronto – Review of Official Plan transportation policies	2014	The City of Toronto does not have a truck route system or a SGMN: Any truck can operate on any road, except where restricted for oversized / overweight vehicles (unless there is a reason for the latter to be on these roads, i.e., to access its origin or destination). Through its "Feeling Congested?" initiative, the City updated its transportation policies as part of an Official Plan Amendment. The policies speak to goods movement, and although they do not specifically address truck routes or a SGMN, new policy 2.4(11)(g) notes the need for "policies for the improved management and more effective use of: 400-series highways; major roads that play a vital role in the City's freight distribution system; rail corridors; and, freight terminals." The City of Toronto is expected to launch an upcoming Goods Movement Strategy to address issues such as urban goods movement networks.
York Region – Transportation Master Plan to 2041	2016	Among the TMP's objectives is Objective 4: Maximize the Potential of Employment Areas. One of the major initiatives listed under this objective is to "designate a Strategic Goods Movement Network." Under the same objective, a notable action is to develop a Goods Movement Strategy to address strategies related to land-use, freight demand management and other innovations; a strategic network of truck routes; and a data collection program increasing the Region's understanding of freight needs and impacts. Among policy areas, a Goods Movement Network is explicitly listed as Policy Area 4. The recently approved TMP included a new SGMN, which is described in further depth in section 2.5.

Source: CPCS/DKCI review of specified TMPs, and interviews with and e-mails from the municipalities.

2.5 Best Practices in Defining SGMNs

This section reviews best practices either directly or indirectly related to a SGMN, with particular emphasis on the principles and processes taken to achieve the relevant policy objectives.

2.5.1 SGMNs in the GTHA

2.5.1.1 Region of Peel Strategic Goods Movement Network Study

In 2013, the Region of Peel completed its SGMN study.[9] The Peel study is particularly notable for this current study because it is the most recent and comprehensive of its kind within the GTHA. It also was the first SGMN in the Greater Toronto and Hamilton Area hence it serves as a prototype for other GTHA SGMNs, including this one. The Peel study identified several guiding principles before developing the SGMN for Peel Region.[10] These guiding principles are summarized in Table 2-3, along with their relevance for the GTHA SGMNS. Note that these principles were intended as guidelines as opposed to formal criteria. They served as 'rules' to guide the collaborative definition of the SGMN among the different jurisdictions whose roads and highways were candidates for inclusion in the SGMN.

Table 2-3. Guiding Principles for the Peel SGMN

Peel SGMN Guiding Principle	Relevance for GTHA SGMNS
Roads of all jurisdictions within Peel were regarded as being within scope for consideration in the SGMN. These roads comprised the Provincial 400-series highways, the Highway 407 ETR, Peel Regional Roads, and those roads owned and maintained by the three lower-tier municipalities (Mississauga, Brampton and Caledon). This ensured seamless connections, especially to the 400-series highways, whose interchanges are with both upper- and lower-tier municipal roads.	Highly applicable, as roads across the GTHA are owned and maintained by a mix of upper-tier and provincial governments. However, note that roads owned and maintained by lower-tier municipalities generally should not be included, unless they provide direct access to the 400-series highways, intermodal terminals, or other major goods movement generators, or unless there is no other alternative to accessing a generator or highway.
The Peel SGMN addressed only the road-based movement of goods – i.e., it is comprised only of roads and highways. Other freight modes (air, rail, marine and pipeline) were considered only insofar as they connect with the road network at airports, intermodal terminals, etc.	Applicable with one addition: The GTHA SGMNS also will consider rail freight corridors, especially with respect to how they interact with passenger transportation on shared and intersecting rail corridors, and at-grade road-rail crossings.

[9] Region of Peel, Strategic Goods Movement Network Study Technical Report, 2013.
[10] Region of Peel, Strategic Goods Movement Network Study Technical Report, 2013, pp 2.

Table 2-3. Guiding Principles for the Peel SGMN

Peel SGMN Guiding Principle	Relevance for GTHA SGMNS
Roads outside Peel were not considered, except insofar as they connect with Peel to help ensure that the network was effectively integrated.	Applicable with the modification that roads outside the GTHA should be considered only to the extent that they connect with the GTHA. Within the GTHA, SGMN-designated roads between upper-tier municipalities must connect.
The SGMN was concerned with the spatial definition of a network. Additional restrictions, such as by time of day or by season, should be considered separately, based upon this SGMN map.	Applicable, with some potential modification to consider in some additional detail seasonal restrictions, restrictions on oversize / overweight vehicles, and the treatment of Long Combination Vehicles (LCVs).[11]
The existing network of truck routes/truck restrictions was key to developing the SGMN. This means that the existing municipal truck routes and restrictions were retained on roads that are not part of the SGMN. However, this also means that the existing municipal truck routes and restrictions should be reviewed in order to ensure consistency with the SGMN, because the former now act as local connectors and feeders to the SGMN.	Applicable, with the modification that existing truck routes and restrictions among upper- and lower-tier municipalities in the GTHA must be recognized.
The SGMN study complemented and informed Peel's concurrent Road Characterization Study (RCS).	The GTHA SGMNS should take into consideration any current related efforts, such as the recently approved Durham and York region SGMNs that were updated as part of the respective TMPs.

The final Peel SGMN concept is shown in Figure 2-4. Note that the concept is based on existing roads and highways, but also considers key future infrastructure, which at the time included the proposed GTA West corridor.[12] The SGMN establishes a three-part hierarchy of roads, with the 400-series highways at the top of the hierarchy (because they are the highest-capacity facilities and are intended to carry inter-regional and long-haul trucks). The primary components of the SGMN are next in the hierarchy, connecting to the 400-series highways and using designated upper- and lower-tier municipal roads. Finally, connectors serve as secondary links with key generators, or to establish redundancy in the network.

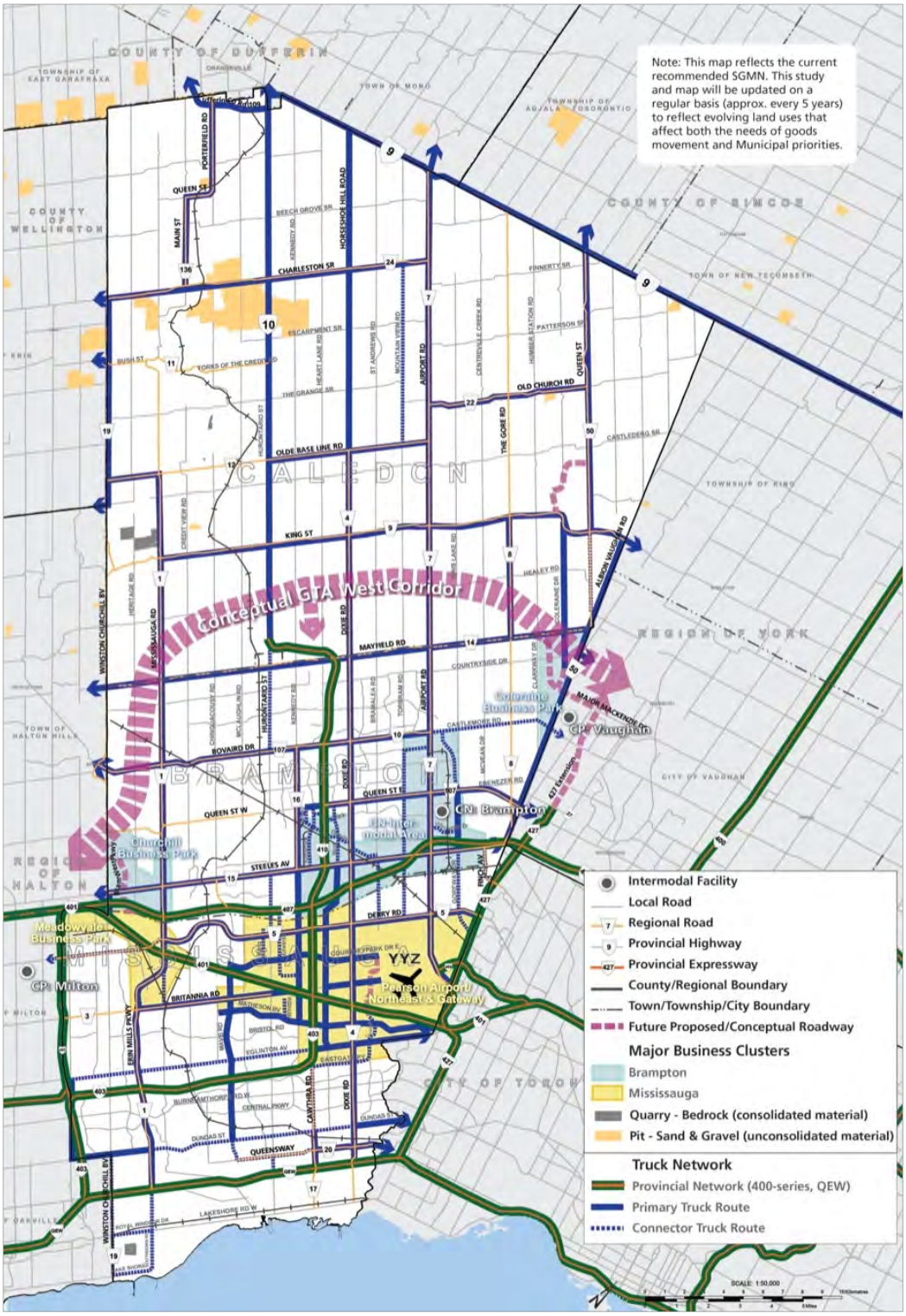
The principal study outputs were the map of the final SGMN concept, an implementation and monitoring plan, and a supporting Technical Report. Similar outputs are envisioned for the GTHA-wide SGMN. Peel Regional Council adopted the SGMN in May 2013. None of the three

[11] LCVs are operated under the Province's LCV Program, under permit. LCVs may operate only in regions and municipalities where the local road authority provides its consent.

[12] Please note that on February 9, 2018 the Ministry of Transportation announced that it would no longer be proceeding with the environmental assessment for the GTA West Highway Corridor, and that MTO and the Independent Electricity System Operator have initiated a separate Northwest GTA Corridor Identification Study in the area.

lower-tier municipalities has formally adopted the SGMN; however, they use it as a reference for their own analyses.

Figure 2-4. Final Peel SGMN



Source: *Peel Strategic Goods Movement Network Study*, Peel Region, Brampton, 2013.

2.5.1.2 York Region Goods Movement Strategy and SGMN

As noted in section 2.4.3, York Region has updated its TMP, which includes a new SGMN. Although the TMP recognizes that all Regional roads as part of the general goods movement network, the TMP further identifies a network highway, and primary and secondary arterial road goods movement corridors.

The SGMN identifies roads that are expected to benefit the most from freight-supportive design standards and land use planning. These roads see typical volumes in excess of 2,500 trucks per 8-hour period and a traffic mix that includes more than 10% medium and heavy trucks. To accommodate growing truck traffic they are generally future six-lane corridors with minimal overlap with rapid transit corridors and truck-only design elements in special cases.[13]

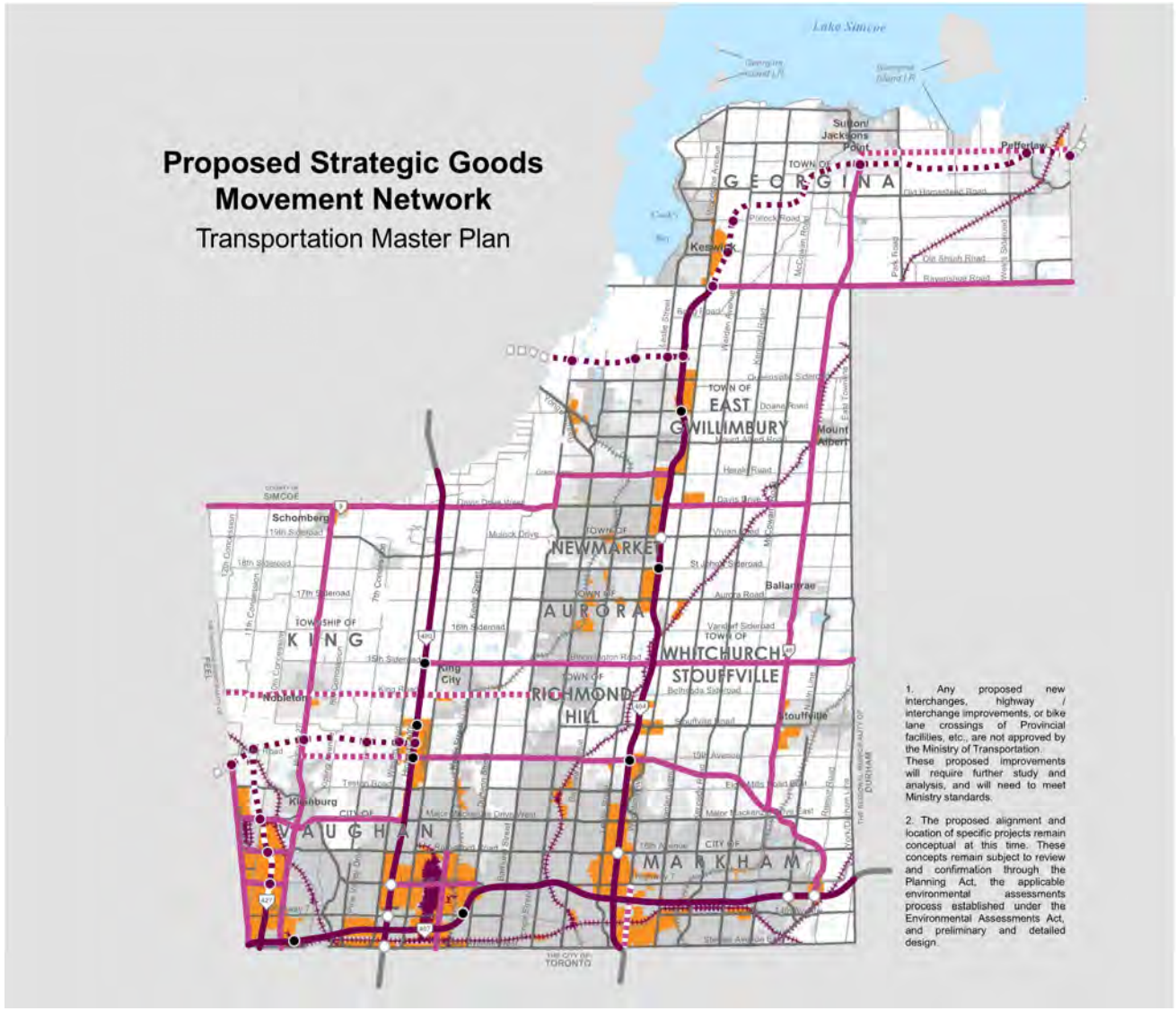
Among the policies related to the SGMN, the draft TMP has recommended that the Region:

- Protect the SGMN, especially near intermodal facilities where feasible
- Continue to recognize the importance of goods movement to the economic prosperity of the Region
- Work with freight stakeholders to permit off-peak delivery practices
- Ensure minimal structural, geometric and operational requirements for Regional roads to support goods movement
- Created an inventory of related deficiencies that can be remedied through stand-alone projects or in conjunction with other work
- Ensure that rights-of-way are protected to provide truck access to intermodal facilities and other freight hubs
- Project major goods movement facilities and corridors for the long term
- Build strategic partnerships across the GTHA by becoming a member of the Southern Ontario Gateway Council (SOGC)
- Request the participation of the Province of Ontario and Government of Canada in funding the construction of the Langstaff Road missing link
- Work with MTO to ensure continuous data collection as part of the CVS.

The Council-approved SGMN is shown in Figure 2-5. Like the Peel SGMN, this network also has a three-part hierarchy: Tier 1 includes existing and planned or potential future 400-series highways and Highway 407. Tier 1 also includes the railways. Tier 2 comprises the primary components, using existing primary Regional arterial roads: Note that some Regional arterial roads are designated as interim components of the SGMN, until such time as future 400-series highways are implemented. Tier 3 comprises secondary goods movement corridors.

[13] The Regional Municipality of York, Transportation Master Plan, 2016, pp. 121.

Figure 2-5. York Region SGMN



Source: *York Region Transportation Master Plan*, York Region, Newmarket, 2016.

2.5.1.3 Durham Region SGMN

Also noted in section 2.4.3, Durham Region recently updated its TMP, which includes an updated SGMN. Figure 2-6 shows the newly-adopted SGMN. This includes the Provincial highway system and certain Regional Roads that had been included in the previous SGMN, with the addition of six new corridors and connecting routes:[14]

- Bayly Street / Victoria Street / Bloor Street between Brock Road and Courtice Road.
- Courtice Road between Bloor Street and Highway 401.
- The southerly extension of routes on Brock Road, Lake Ridge Road and Thickson Road from Highway 401 to the Bayly / Victoria / Bloor corridor.
- Farewell Street between Bloor Street (effectively, Highway 401) and the Port of Oshawa, thereby designating access to the Port in the SGMN.
- Harmony Road from south of Winchester Road to Highway 407.
- Highway 7 from the York Durham Line to Highway 7/12 then continuing on Winchester Road to Thickson Road.[15]

The previous SGMN identified "a network of preferred haul routes that are planned to accommodate full-load commercial vehicles on a year-round basis and connect major generators of traffic." According to Durham Region staff, the need for these additional links was determined through a visual review of the existing SGMN map, looking at the routes that connect the key goods-generating locations.[16] The six new corridors and routes improve the continuity of the SGMN while also ensuring that key freight generators (notably the Port of Oshawa) and employment lands are connected. The updated TMP notes that

> "Implementation of the [SGMN] should focus on actions to ensure the routes are continuous, without truck bans or restrictions; service typical truck weights and dimensions; and are clearly marked. Road modifications will be required in certain locations to reduce impediments to truck travel, such as seasonal and permanent load restrictions, insufficient turning radii, and narrow lanes." Implementation of these works is subject to annual budgetary and financing review and approvals. The TMP finally notes the need for further consultation with area municipalities and affected stakeholders, including the trucking industry, to help establish implementation priorities.[17]

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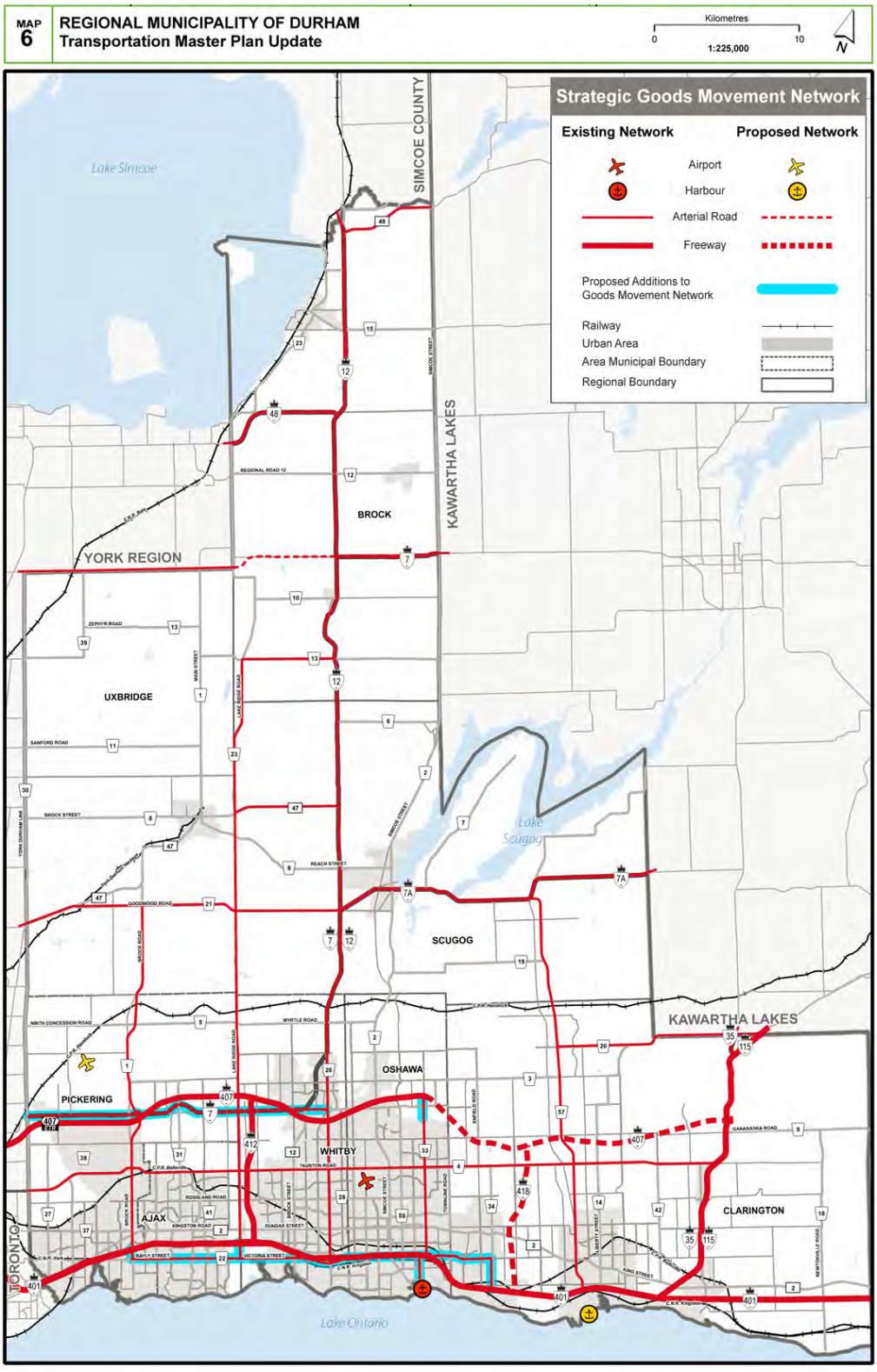
[14] Map 6, *Durham Transportation Master Plan November 2017*, approved by Durham Regional Council, December 13, 2017.
[15] The addition of this corridor in Durham's revised SGMN was partially based on Highway 7's inclusion in the draft core GTHA-wide SGMN, as depicted in the September 2017 Draft RTP.
[16] Consultant interview with Region of Durham staff, Whitby, November 30, 2016.
[17] Section 8.4, *Durham Transportation Master Plan November 2017*.

Figure 2-6. Durham Region SGMN



Source: *Durham Transportation Master Plan November 2017*, Durham Region, Whitby.

The updated TMP proposes several actions in order to support goods movement. Three actions (numbers 81, 82 and 83) refer specifically to the SGMN:

- Add the aforementioned routes to the SGMN.
- "Regularly review and update the Strategic Goods Movement Network in consultation with the area municipalities and key stakeholders.
- "Implement and promote the Strategic Goods Movement Network by identifying and planning for removal of barriers (e.g. load restrictions, turning radii, height requirements, pavement condition) as part of Regional road expansion and rehabilitation projects, signing preferred truck routes, disseminating information on the network, and avoiding by-law restrictions to truck movement on preferred routes."

Other proposed goods movement actions that could impact the SGMN are:

- Develop criteria to evaluate land use plans in order to minimize conflicts between truck traffic generated by employment areas and adjacent communities. (Action 84)
- Implement measures from Durham's *Traffic Management Guideline for Hamlets* to manage truck traffic impacts in small rural communities and hamlets. (85)
- Develop criteria for evaluating transportation initiatives from a goods movement perspective. (87)
- Review and update road design standards as needed to provide an acceptable and cost effective level of service for goods movement on Regional roads. (88)
- Protect rights of way to provide for safe and efficient truck connectivity to existing and future intermodal facilities, and improve connectivity between modes. (89)
- Design new or reconstructed Regional arterials linking employment areas with Highway 401 and Highway 407 to accommodate Long Combination Vehicles, where feasible. (90)
- Work with area municipalities to plan for efficient truck access to current and future intermodal hubs, including zoning and land use planning, as well as physical infrastructure such as turning lanes, turning radii, conditions of railway grade crossings and connectivity to the freeway system. (93)
- Work with all levels of government and the private sector to ensure that plans for goods movement address the entire route ("shelf to shelf") to maximize efficiency. (98)[18]

[18] Section 8.4, *Durham Transportation Master Plan November 2017*.

2.5.1.4 City of Hamilton

As noted in Section 2.4.3, Hamilton's 2007 TMP described a high-level SGMN. It comprised primary and secondary Provincial highways, the Lincoln Alexander and Red Hill Valley Parkways, and the 'major' rail network, as well as the Port of Hamilton and Hamilton International Airport. This SGMN was described as supporting inter-urban goods movement by truck, rail, water and air. Figure 2-7 depicts the 2007 SGMN. This SGMN is complemented by the City's truck route network, although City streets are not included in the SGMN. The 2007 TMP also recommended that the SGMN should be refined by identifying future infrastructure requirements and ensuring that it is compatible with the City's Official Plan growth policies.[19]

Figure 2-7. Current Hamilton SGMN (2007 TMP)

Source: *Figure 4.12, Hamilton Transportation Master Plan*, City of Hamilton, 2007.

The City prepared a detailed Truck Route Master Plan in 2010. Although not a SGMN study, the Master Plan noted the need to provide adequate road-to-road connections as well as links to intermodal terminals. It pointed out the importance of a hierarchy of truck routes, promoting arterial roads as the main corridors for heavy truck traffic and 'accepted' on collectors and local roads as needed. [20]

The current TMP Review identified several truck route connectivity issues: the western link between the Port of Hamilton and Highway 403, between the upper and lower city, and

[19] The City of Hamilton, *Hamilton Transportation Master Plan*, Hamilton, May 2007.
[20] The City of Hamilton, *City of Hamilton Truck Route Master Plan Study, Final Report*, Hamilton, April 2010.

between the HIA and the new Rymal employment areas. However, these are to be examined in further detail after the TMP Review is complete.

2.5.1.5 MTO Greater Golden Horseshoe Multimodal Transportation Plan

While not a SGMN per se, the GGH Multimodal Plan will propose long-range, higher-order road and highway network improvements that will serve passenger and freight demands to 2051 and beyond. As noted in Sections 1.3 and 2.4.3, the Multimodal Plan is taking into account inter-regional, inter-provincial and international demands and is promoting adequate road/highway connectivity among the GGH's intermodal terminals. By comparison, the GTHA-wide SGMN described in this report focuses on the existing network in the GTHA (but not the broader GGH) and, while ensuring flexibility to account for potential future updates as conditions warrant and as new infrastructure comes online, does not forecast demand or identify future network improvements. Overall, the GTHA-wide SGMN will inform the development of the long-range GGH Multimodal Plan, hence the two initiatives are complementary.

2.5.1.6 MTO Freight-Supportive Guidelines

MTO's guidelines, published in 2016,[21] are aimed at municipalities and provide a comprehensive set of strategies and direction in the area of land use and transportation planning, site design, road design an operations, and implementation strategies.

Although the guidance is more focused on planning, design, and implementation, it does offer some strategic direction on planning for a freight network. Important considerations listed by MTO under "2.3.1 Develop Strategic Truck Route Network" include:

- Maintain continuity and harmonization with adjacent municipalities.
- Establish multimodal connectivity and include routes/corridors that expedite freight movement.
- Identify different categories of truck routes (e.g. primary/major, secondary/alternate, routes with restrictions).
- Identify functional classification of roads.
- Identify locations of freight generators and receivers.
- Provide access to commercial and employment areas.
- As necessary, account for special freight needs such as accommodating long combination vehicles or exceptional load movements.

[21] Ontario Ministry of Transportation, Freight Supportive Guidelines, 2016, pp. 37-38

- Develop context-sensitive strategies, including considering freight considerations as part of Complete Streets.
- Be sensitive to land uses.
- Identify and determine ways to safely and efficiently manage conflicts between truck routes and transit/cycling routes.

Additionally, under 2.3.2 MTO recommends developing minimum standards, including as regards:

- Design elements (minimum lane widths, curve radii, intersection standards, intersection spacing, bridge design).
- Construction elements (surface materials, subsurface materials, signage, and traffic control standards).
- Maintenance elements (priority snow clearing, emergency road repairs, scheduling general maintenance to minimize delays and detours).
- Operational elements (signal timing).
- Communication elements (appropriate signage).
- Other special standards as necessary (e.g. routes frequently used for oversize loads).
- Ensuring that municipal road design standards for all road types accommodate the appropriate size of truck.

2.5.1.7 Ontario Trucking Association Local Truck Route Guide for Municipal Officials

The Ontario Trucking Association (OTA) provides guidance for municipal officials in designating a truck route network. It provides a number of suggested characteristics that should be used to define the network:[22]

- Existing truck routes.
- Adjacent land uses.
- Bridge locations.
- Roadway classification or type.
- Number of lanes.
- Constrained road status.
- Traffic analysis.

[22] Ontario Trucking Association, *Local Truck Routes: A Guide for Municipal Officials*, Toronto, December 2011.

In addition the OTA lists a number of special issues to consider:

- Anticipation, planning and incorporation of future development access needs.
- Development of off-peak deliveries program in key commercial areas.
- Identifying the businesses served by trucks.
- Location of current trucking companies within the municipality.
- Incorporation into and/or modification of major thoroughfare plan.
- Consideration of the traffic impacts to surrounding roads if truck traffic is restricted to a single road.
- Development of freight-supportive land use guidelines.
- Development of the plan as part of regional approach to moving goods.

2.5.1.8 Town of Oakville Goods Movement Study

This study developed a goods movement strategy for the Town of Oakville, in order to meet the needs of the town's automotive sector and economic bases while maintaining the community's residential quality of life. The study included a review of the Town's heavy truck route network. While not a strategic goods movement network, the review is cited here because it serves as a recent examination of the guidelines that were used by other GTHA, Canadian and US municipalities to define their truck routes, and a synopsis of the most common guidelines is relevant here. Seven factors or guidelines were found to be most important:[23]

- Road classification and function, which are used to screen ineligible roads (e.g., local streets) from further consideration. Note that in all cases, ineligible roads can be used for 'bona fide' first- and last-kilometre deliveries where no designated truck route alternative exists.
- Continuity, as defined in terms of providing alternate routes and links to the higher-order road and highway network (in Oakville's case, to the Regional and Provincial networks), links with intermodal terminals and truck generators, and links with external networks (i.e., with the networks of neighbouring communities).
- Connectivity, which also speaks to linkages with intermodal terminals and truck generators. (As can be seen, there is some overlap between 'continuity' and 'connectivity.' The implication is that both are important.)
- Adequacy of capacity (number of lanes or lane widths), geometries (turning radii at intersections) and grades (avoidance of long sections of roads having steep grades).
- Avoid conflicts with other users where possible, especially pedestrians and cyclists.

[23] DKCI, *Goods Movement Study Final Report*, Town of Oakville, Oakville, March 2016.

- Minimizing intrusion in residential neighbourhoods and in sensitive areas such as environmentally sensitive areas.
- Adjacent land uses, whereby it is desirable to avoid roads that have residential frontages and roads that serve schools and parks. Some municipalities seek to avoid routes that are adjacent to historical buildings, where possible.

2.5.2 SGMNs and Related Practices Elsewhere

Other regions outside of the GTHA have developed SGMNs and related practices. This section reviews some of these key relevant studies.

2.5.2.1 South Carolina

The 2008 South Carolina state-wide strategic corridor plan defined a regional urban freight network (analogous to a strategic goods movement network) as:

> *A strategic system of corridors [that forms] the backbone of the state's transportation system… This system provides a connected, continuous network that serves both the travelling public and facilitates the movement of freight. This strategic system provides the needed connectivity that will allow South Carolina to maintain and enhance its economic vitality.*[24]

The key points within this definition are connectivity, continuity and backbone. Connectivity implies the need to identify key freight generators and attractors. Continuity emphasizes the need for a fluid network with some level of redundancy. Finally, backbone implies a hierarchy, with the urban freight network being at the top of the hierarchy of a broader network.

2.5.2.2 Australia

In 2016, Austroads (an organization of Australasian state and territorial road and infrastructure departments) published an urban freight policy framework study that was designed to enhance the safety, efficiency and productivity of urban goods movement, while minimizing adverse environmental impacts. The study explicitly considered the following potential impacts when reviewing potential priority objectives: productivity, safety and efficiency. Although the scope of the study was broader than defining a strategic goods movement network, it did identify related policy priority areas through consultations with federal, state and local government organizations, and with the private sector.

In particular, as one of its high priority objectives, the study highlighted the need to prevent incompatible adjoining land uses, in part through the use of protecting specific routes for

[24] South Carolina Department of Transportation, South Carolina Strategic Corridor System Plan, 2008, pp. 1.

access to major freight generators and attractors. The study made recommendations through passive, intermediate and active interventions. With respect to the above priority objective the study recommended:

- As **passive interventions**, the development of maps showing key freight and industrial areas and adjoining land uses, with identification of actual and desired buffer zones, as well as guidance on desirable and other traffic volumes.
- As **intermediate interventions**, supply chain mapping to identify key routes utilized for freight and related pinch points, and appointment of dedicated freight personnel in government agencies.
- As **active interventions**, changing local Government Acts and state legislation to require considerations of these provisions, and freight strategies requiring local governments to develop local strategies to project local freight networks.[25]

Also of note is the country's the National Heavy Vehicle Regulator (NHVR) Journey Planning online tool. The NHVR is an "interactive online mapping service," which displays maps of urban and inter-urban routes that have been approved for use by heavy trucks. It is designed to help carriers determine when special permits are needed for over-dimensioned loads.[26]

2.5.2.3 Maspeth, New York

Maspeth, a community in Queens, was faced with growing conflict between heavy truck traffic and general traffic along the main corridor that runs through the community. To address these concerns, the New York City DOT commissioned a study of truck activity within the area, which ultimately recommended a defined (alternative) truck route. Although the implementation of a truck route is a different (but related) effort than defining a SGMN, the process and outcome of this study is useful to note in that it would have had to deal with similar issues and concerns (though at a more defined and constrained area).

In order to arrive at its conclusions, the study worked closely with local stakeholders, identified and addressed issues that could arise due to shifting truck routes. The study also made use of new and existing data regarding truck volumes, origins and destinations. Finally, after implementation ongoing data collection and analysis was initiated in order to monitor travel time impacts, and the New York DOT also worked closely with local police to ensure that new truck route rules were enforced.

Through this process the study recommended a new truck route. However, the study acknowledged that geometric constraints at a certain intersection to accommodate the

[25] Manders, Herford and Mitchell, Urban Freight: Development of a Policy Framework to Support Safety, Efficiency and Productivity, 2016, pp. 99.
[26] See https://www.nhvr.gov.au/road-access/journey-planner.

defined truck route would pose a challenge. As a result, the New York City DOT only approved the new truck route after the constraints posed at this intersection were eliminated.[27]

2.5.2.4 Los Angeles County, California

To identify goods movement system needs and direct funding to projects with the greatest expected benefit, Los Angeles County developed a Strategic Goods Movement Arterial Plan in 2015.[28] The purpose of the plan is to:

- Identify truck arterial system needs and gaps in connectivity,
- Prioritize project funding,
- Minimize conflicts between trucks and pedestrians/cyclists,
- Establish a database of arterial truck data can be used for planning purposes as well as by industry,
- Assist the trucking industry in identifying designated truck routes, and
- Support the development of the Federal Primary Freight Network.

To identify roadways to be included in the plan, screening criteria were applied in two phases. The first phase identified roadways that would meet the minimum qualifications using the following geospatial data:

- More than two lanes in each direction
- FHWA or Caltrans arterial classification
- Previously designated as significant arterial
- Defined local truck route
- Defined state truck route
- More than 20,000 vehicles per day
- More than 750 heavy duty trucks per day
- Arterial segments with more than three truck-related collisions 2008-2011
- Industrial land use

The second phase included stakeholder review and application of refinement criteria to make the arterial plan as continuous as possible. These refined criteria considered:

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[27] Holguín-Veras et al., NCFRP Report 33: Improving Freight System Performance in Metropolitan Areas: A Planning Guide, 2015, pp. 161 – 167.
[28] Iteris, Los Angeles Country Strategic Goods Movement Arterial Plan Final Report, 2015.

- Freeway access
- Traffic operations and ITS
- Multi-jurisdictional connectivity and continuity
- Use as a freeway alternative
- Goods movement activity centres
- Warehousing, distribution and logistics centres
- Gap closures
- Bicycle and pedestrian facilities
- Transit routes[29]

2.5.3 Considerations for Strategic Rail and Strategic Road/Rail Networks

2.5.3.1 Overview

The GTHA Strategic Goods Movement Network is not limited to roads or highways alone. For practical purposes air, marine, and pipeline modes can be considered in terms of their ports and terminals; that is, in terms of the road access to these facilities. However, rail also must be included in its own right, especially given Metrolinx's plans to expand regional rail service using, in part, the existing freight rail network. The examples below describe criteria and guidelines that are relevant to strategic rail networks and, in Australia, to strategic road and rail networks.

2.5.3.2 UK Strategic Freight Network

There is little guidance regarding the development of strategic rail networks. However, the UK Department for Transport (DfT) provides one useful approach. The DfT has embarked on the development of a Strategic Freight Network (SFN).[30] The SFN defines a national rail network that would serve the growing demands of moving both passengers and freight. Although the perspective is inter-urban rail, the UK example is relevant to the GTHA in that it seeks to minimize growing conflicts between passenger and freight movements on the rail network – an issue that is of special concern as the GTHA moves towards regional electrified rail. The DfT envisioned that the SFN would "complement, and be integrated with, the existing rail network." An enhanced core trunk network capable of accommodating more and longer

[29] Iteris, p. 6 – 7.

[30] *Network Rail, Strategic Business Plan update, Supporting Document, Strategic Freight Network*, UK Department for Transport, London, April 2008. Note that this section is synopsized from the December 2015 scoping document for the GTHA-wide SGMN, and is included here for the information of a broader audience.

freight trains, with higher load capacities, would be the basis of the SFN. Although the government defined the overall strategy, it expected that the private sector operators of the rail system would be responsible for the SFN's actual development and implementation.

The core trunk route network would be expected to:

- Have sufficient capacity for growth, possibly with fewer high-capacity lines.
- Have limited conflicts between passenger and freight traffic, for example by providing routing alternatives (diversions) and rail-over-rail grade separations.
- Minimize through freight movements via London where an alternate route is available.
- Provide for longer trains.
- Provide for appropriate axle loads.
- Include defined diversionary routes for each core route, with the objective of ensuring availability whenever operators wish to use the network.

This "future proofed" SFN was to be reviewed periodically, in order to ensure that the long-term network will be appropriate and sufficient to meet evolving needs. The core and diversionary routes were defined according to forecasts of rail freight flows. These notably included domestic freight, such as coal trains, and containers arriving at the country's marine ports. These demands were assessed against the existing rail network, which was categorized to identify lines that also support high-speed passenger trains and commuter rail service. With a view to minimizing conflicts and meeting the aforementioned expectations, alternate existing and potential future corridors were identified. Potential improvements were defined and costs were estimated. The improvements were then scored according to three main criteria: ability to reduce road (truck) traffic through an increased rail capacity; improvement in the traffic mix (i.e., reducing conflicts with passenger trains); and improvement in route mileage (a measure of the ability to reduce train-miles). The scores were then assessed against the cost of the improvement.

For the GTHA-wide SGMN, the second criterion – reductions in conflicts with passenger trains – is clearly the most important and practical consideration. Estimating current and future freight demand, the number of trains, modal diversion between truck and rail and changes in route kilometres are beyond the spatial scale of this analysis and beyond its scope as well. Nonetheless, some of the core network expectations cited above are relevant to the GTHA-wide SGMN, especially allowing for future growth (the first criterion, above), minimizing conflicts by ensuring that routing alternatives and rail-over-rail grade separations are available (the second criterion) and defining usable and practical alternate routes (the sixth criterion).

2.5.3.3 Australia Key Freight Route Maps

Australia's Key Freight Route Maps is a compilation of key road, highway and rail routes that connect the "nationally significant places for freight" in Australia. This initiative, developed by

the state/territorial and federal governments in consultation with industry, does not have a formal link to the Australian Government's Infrastructure Investment Programme. Instead, the Key Freight Route Maps are intended to "develop a more comprehensive understanding of the national land freight system," and to "inform decisions by governments [at all levels] and industry on commercial, regulatory and policy initiatives." The guiding principles used to identify the key freight routes are:

- Connect existing and potential nationally significant places for freight such as:
    - intermodal freight terminals;
    - industrial, mining and agricultural precincts;
    - significant freight destinations in regional centres; and
    - interstate freight.
- Carry:
    - high volumes of freight; and/or
    - high value commodities; and/or
    - a high frequency of heavy vehicles; and/or
    - specific commodities of high economic significance for the region.

Priority road and rail freight routes designated within a jurisdiction by legislation, policies, strategies and frameworks have also been included.

All routes contained in the maps were "nominated" by state and territorial governments. Within a state or territory, the Key Freight Routes were those considered by the relevant state or territory as the most important freight routes within its borders. 'Secondary, Cross Border Road Connections' are those that did not meet the same criteria or level of significance for the relevant jurisdiction but which were identified as providing critical linkages by a neighbouring jurisdiction.[31]

Although it is oriented towards inter-city goods movement, the Australian Key Freight Route Maps initiative is useful to the definition of the GTHA-wide SGMN in that it looks at road and rail together, and covers routes within and between multiple jurisdictions. The extent to which commodity flows were actually quantified for this initiative is not clear; in any event, it is not something that can be achieved in this project. The initiative does not have status, although it is developed, hence supported, by a council of federal and state/territorial Ministers of Transport, and it is clearly intended to inform future plans and actions by

[31] Frequently Asked Questions, Transport and Infrastructure Council, Canberra, Australia, October 15, 2015, http://transportinfrastructurecouncil.gov.au/publications/map_faqs.aspx.

individual authorities according to a system of commonly articulated designations. Note that the maps do include urban roads and highways, although these tend to be those that are under State jurisdiction. Note also that the maps included planned links.

2.5.3.4 Proximity to Railway Operations

As urban areas place greater emphasis on curbing urban sprawl, there is a growing trend towards infill development, including at sites in close proximity to railway operations, including rail freight corridors and intermodal yards. If this development is not carefully planned, new residents will be exposed to excessive noise, vibration and potentially safety risks. As a result of this exposure, the liveability of new neighbourhoods and/or the viability of the underlying freight activity may be affected.

To avoid these conflicts the Railway Association of Canada and the Federation of Canadian Municipalities published guidelines for new development in proximity to railway operations in 2013.[32] These guidelines provided are intended for use by municipalities, provincial governments, railways and developers, among others, when planning for new developments. The guidelines highlight the need to integrate transportation and land use planning.

The guidelines provide detailed implementation tools and recommendations designed to:

- Promote awareness of noise, vibration and safety issues, along with mitigation measures.
- Promote consistency in the application of related standards across the country.
- Establish an effective approvals process for new development to ensure that appropriate sound, vibration and safety mitigation is secured.
- Enhance the liveability of communities near railway operations.

Among the specific guidelines are specified distances for building setbacks, noise mitigation measures such as the installation of acoustic barriers of appropriate height and distance from noise sources, vibration control through building design (lining foundation walls, isolation of building columns and walls, etc.), and safety and security measures such as appropriate fencing and crash walls where necessary.

2.6 Summing Up

The review of best practices in the GTHA and elsewhere provides a context for the guidelines and rules that are used to develop the SGMN. The review documents the SGMNs that exist already in the GTHA, which establishes a basis for the region-wide SGMN. The review reinforces concepts that have been used to develop SGMNs elsewhere, such as network

[32] Dialog, J.E. Coulter Associates Limited, Guidelines for New Development in Proximity to Railway Operations, 2013.

hierarchy, connectivity, safety, redundancy, truck volumes, the need to connect major freight generators and intermodal terminals, the desire to minimize conflict with other uses and sensitivity to the adjoining land uses, among other considerations. The findings inform the consultation with key GTHA stakeholders, which is summarized in Section 3.1. Together, the review of best practices and the consultation define the guidelines and rules for developing the SGMN, which are elaborated in Section 3.2.

3 Guidelines for the SGMN

Key Chapter Takeaway

Prior to developing the SGMN, this chapter brings together the results of the stakeholder consultation with the findings of the previous chapter's literature review, in order to propose a set of 'rules' – guidelines – for developing the SGMN.

3.1 Consultations: What We Heard About Guidelines

In each consultation interview, the Review Group stakeholders were asked to identify the most important criteria and guidelines that should be used to define the GTHA-wide SGMN.[33] Respondents were provided a list of 15 responses from which to choose, and they also were given the opportunity to add their own responses (which some did).

The findings are presented below. For clarity, the responses from the government agencies (all levels of government) and from the terminal, port and airport owners and operators are shown separately, in Table 3-1 and Table 3-2 respectively. The two figures record the frequency of responses for each of the 16 responses, along with supporting comments. The separation of the two sets of responses provides the ability to understand the priorities according to the two perspectives and mandates. Table 3-3 combines the responses.

Respondents were asked to identify their 'Top 5' criteria / guidelines, although some cited additional criteria / factors as being important as well. The 'Top 5' criteria / guidelines that emerged from this consultation were:

- "Minimizing conflicts with other corridor users", often in the context of Complete Streets schemes, was the most frequently cited criterion / guideline for government agencies.
- For the terminal, port and airport respondents, "access to their facilities" was cited most frequently.
- Government agencies cited "connectivity with the 400-series highways" (mainly the highways: less so neighbouring municipalities) next most frequently among their responses.

[33] Section 1.7 describes the consultation process.

- Combined, these three criteria /guidelines represented the most frequently cited responses, at 11, 11 and 10 responses respectively.
- Next most frequent was "truck volumes" (8 citations), sometimes considering both current and forecasted volumes and also in the context of the underlying population growth.
- Finally, among the Top 5, "geometric design" was noted at 7 citations.
- Three respondents added the need to consider long-combination vehicles in the "other" category.

Of interest, "corridor jurisdiction, ownership and responsibility" was not cited by any respondent. This suggests that all respondents recognized the need for a cooperative, collaborative GTHA-wide need and approach to developing a SGMN. It also suggests support for the notion that the SGMN should be designated without considering ownership, and that the designation instead should be driven by industry needs, regional competitiveness, liveability and so on. However, at the same time, Metrolinx proposes that this criterion / guideline should be considered, especially with respect to rail corridors, where ownership of the rail corridors is a factor in the provision of commuter rail services. Metrolinx, CN and CP have collaborated in order to allow Metrolinx to provide commuter rail services on corridors that are owned by the two railways, while Metrolinx has purchased certain corridors outright where commuter rail volumes grew to a point where it was economical to do so.

The different priorities between the two groups of respondents reflect their respective mandates and interests, hence the differences are not unexpected. Perhaps more important is that many of the criteria represent common or overlapping interests.

Table 3-1. Criteria / Guidelines for a GTHA-Wide SGMN – Government Agencies

Criterion / guideline	Frequency	Comments
Truck volumes (absolute volume, % of total traffic, growth, …)	5	Select routes that already have lots of trucks on them (which also relates to performance). Don't need to use truck volumes as a hard threshold, just for guidance Want to design arterial roads to accommodate the "reality" of where trucks are actually travelling.
Road capacity	1	Capacity is not the defining factor – road function (classification) and performance are.
Performance (truck travel times, travel time reliability, accident rates, ….)	1	Important for trucking industry. Trucks will [always] use the shortest and fastest route, unless otherwise restricted.
Current road classification (e.g., arterial)	3	Classification / function drives a lot of other considerations, especially in an urban setting (less so in a rural setting)
Current truck route designation	3	Biggest issue currently is that have some [key] arterials designated as truck routes, but they run through residential neighbourhoods [and there are few alternatives]
Rail line capacity	2	Avoid at-grade crossings where possible. There are capacity constraints on some freight lines, where expanded commuter rail service is proposed. At least one of these proposed routes also runs through a rail yard. Ensure that planned commuter / passenger rail service expansions do not cut off freight rail access, especially in urban core.[34]
Zoning / land uses adjacent to road or rail line	1	Driven by land use: obliged to provide truck access if land is zoned industrial.

[34] While these viewpoints are acknowledged, Metrolinx notes that the movement of goods should not constrain Metrolinx's capacity to move passengers and commuters and to increase services on the rail network.

Table 3-1. Criteria / Guidelines for a GTHA-Wide SGMN – Government Agencies

Criterion / guideline	Frequency	Comments
Geometric design (lane width, intersection turning radii, turn lane storage, shoulders, ….)	5	Challenge to include a [rural] road in the SGMN if it does not have adequate shoulders. Must ensure that geometric design can accommodate truck improvements, such as trailer skirts (which are used to reduce fuel consumption). Roadway design for the movement of freight should consider the accommodation of currently regulated heavy vehicles, with consideration around oversized vehicles. For example, a roundabout located along a truck route can restrict the movement of certain types of vehicles, thus planning and design should accommodate the largest regulated vehicles in the Province. Note that the larger the vehicle, the more freight is carried per vehicle. The more freight carried, the less trucks are required to move the same amount of freight. Less trucks is less pollution in general, but also aids in the reduction of congestion in addition to a reduction in on-road [safety] exposure.
Structural adequacy (bridges, right of way, pavements, …)	2	Structural adequacy is important for the existing network, but can still designate half-load routes in the SGMN, because they can be upgraded in the future. What is important is that there are alternatives in the meantime. [Regional SGMN] considered structural adequacy but most roads are OK in this regard, so it was not an issue.
Access roads / rail lines to intermodal terminals, ports, airports, etc.	5	Account for planned or future facilities, such as Pickering Airport, 407 and other highway extensions. Must ensure that multi-user Complete Streets corridors can still accommodate truck access to terminals. Connectivity between modes should be a strong consideration of this study, especially when considering drayage and intermodal terminals, cross-docking, and local regions seemingly against the development of intermodal facilities. Connecting trucks to intermodal facilities, which would likely carry cargo the 'last mile', greatly reduces on-road truck travel (if rail has the capacity to move more freight through to these facilities). Freight Villages also could be included.

Table 3-1. Criteria / Guidelines for a GTHA-Wide SGMN – Government Agencies

Criterion / guideline	Frequency	Comments
Access roads / rail lines to major shippers / consignees	1	
Minimizing conflict with other corridor users (whether a road or a rail corridor)	8	Especially important on important truck corridors that also have or will have higher-order transit and are part of the cycling network. Hopefully, by placing priority on these SGMN sections, we can minimize conflicts among users. Want to minimize conflicts in Complete Streets schemes, especially in locations where increases in urban densification are planned. Can use SGMN to free up other parts of the network for other priorities such as transit and cycling. Some roads are the most efficient way to get to the 400-series highways, but they are not where trucks should be (given other uses). Where there is a high-volume truck corridor, should be thinking about a median-separated bicycle lane. SGMN could identify where there is a need for pushback, e.g. where there is a need to retain truck-friendly turning radii. Tied to minimizing SGMN designations in residential areas.
Minimizing routing through residential areas (whether a road or a rail corridor)	3	Must be consistent with "Liveable City" and other land use planning policies. Want to minimize truck and rail intrusion from noise.
Connectivity with 400-series highways / roads of constituent or neighbouring municipalities	7	Ensure that toll-free highways are available as options. Consistency / connectivity with goods movement networks and major generators (such as intermodal rail terminals, airports) in neighbouring regions. Don't want to restrict truck traffic if it is connecting to the 400-series highways: Want to minimize travel on local roads, so the ideal is to allow the shortest route to the highways.
Corridor / right of way jurisdiction, ownership or responsibility	--	

Table 3-1. Criteria / Guidelines for a GTHA-Wide SGMN – Government Agencies

Criterion / guideline	Frequency	Comments
Other: Long-Combination Vehicles	3	Would be useful to include potential LCV corridors (or make a general provision for including 400-series access roads that serve industrial areas, say 2 km from the highway), so that industry knows what to expect when planning LCV routes and also to enable cost-sharing with industry for the necessary improvements. Note that MTO is currently working toward evaluating all ramps and interchanges across the 400-series of highways toward LCV compliance. The LCV Program will be announcing substantial changes to the Primary LCV Network in the near future, which will include the addition of highways. All 400-series highways will in some form be included in the Ontario Primary LCV Network. Furthermore, MTO suggests evaluating to between 5 and 10 km from a highway interchange toward local industrial and commercial areas.

Table 3-2. Criteria / Guidelines for a GTHA-Wide SGMN – Intermodal Terminals, Airports, Ports

Criterion / guideline	Frequency	Comments
Truck volumes (absolute volume, % of total traffic, growth, …)	3	More than just truck traffic – must also look at population growth, auto volumes, freight volumes, etc. Must look at where the distribution centres are and how they link to the existing road infrastructure.
Road capacity	3	
Performance (truck travel times, travel time reliability, accident rates, ….)	2	Congestion on the 400-series highways. Important for time-sensitive freight, which requires fast and reliable travel times across all segments of the trip, including access to the facility.
Current road classification (e.g., arterial)	--	
Current truck route designation	1	Can appreciate need to avoid sensitive areas, but alternatives must be in place.
Rail line capacity	1	Core rail line capacity is not an issue – driven by other factors. The situation is a little different with rail lines that are within the urban areas.
Zoning / land uses adjacent to road or rail line	2	Must consider where development will take place and the adequacy of the network to handle that growth. Make sure industrial land uses around intermodal facilities is preserved.
Geometric design (lane width, intersection turning radii, turn lane storage, shoulders, ….)	2	Appropriate turning radii (for facility access) than even the shortest routing to the 400-series highways. Should consider these needs only after the SGMN is defined, not as a guideline to defining the SGMN. Some municipalities are building many roundabouts, but must make sure that they are not too tight for trucks.
Structural adequacy (bridges, right of way, pavements, …)	1	This is a secondary (less frequent) concern, but is an issue when moving dimensional (over-size / over-weight) equipment.

Table 3-2. Criteria / Guidelines for a GTHA-Wide SGMN – Intermodal Terminals, Airports, Ports

Criterion / guideline	Frequency	Comments
Access roads / rail lines to intermodal terminals, ports, airports, etc.	6	Need "robust" network (road and rail) to serve the facility, and must be able to accommodate additional needs as the surrounding land uses evolve. It's all about the fluidity of the entire supply chain. If we have trucks that are queuing to get into [our facility], then that is a lot of wasted capacity. Concerned about access being cut off as new residential development grows around facility.
Access roads / rail lines to major shippers / consignees	1	
Minimizing conflict with other corridor users (whether a road or a rail corridor)	3	
Minimizing routing through residential areas (whether a road or a rail corridor)	1	
Connectivity with 400-series highways / roads of constituent or neighbouring municipalities	3	
Corridor / right of way jurisdiction, ownership or responsibility	--	
Other: Long-Combination Vehicles	1	Off-ramps at some locations outside the GTHA cannot handle LCVs (meaning that the LCV route works at one end of the route but not the other).

Table 3-3. Criteria / Guidelines for a GTHA-Wide SGMN – Combined

Criterion / guideline	Government agencies	Terminals, ports, airports	All participants
Truck volumes (absolute volume, % of total traffic, growth, …)	5	3	8
Road capacity	1	3	4
Performance (truck travel times, travel time reliability, accident rates, ….)	1	2	3
Current road classification (e.g., arterial)	3	--	3
Current truck route designation	3	1	4
Rail line capacity	2	1	3
Zoning / land uses adjacent to road or rail line	1	2	3
Geometric design (lane width, intersection turning radii, turn lane storage, shoulders, ….)	5	2	7
Structural adequacy (bridges, right of way, pavements, …)	2	1	3
Access roads / rail lines to intermodal terminals, ports, airports, etc.	5	6	11
Access roads / rail lines to major shippers / consignees	1	1	2
Minimizing conflict with other corridor users (whether a road or a rail corridor)	8	3	11
Minimizing routing through residential areas (whether a road or a rail corridor)	3	1	4
Connectivity with 400-series highways / roads of constituent or neighbouring municipalities	7	3	10
Corridor / right of way jurisdiction, ownership or responsibility	--	--	--
Other: Long-Combination Vehicles	3	1	4

3.2 Implications for Guidelines: Rules for Defining the SGMN

Based on the consultations and on the review of the best practices we propose the following guidelines to be used for defining the SGMN:

- Include all eligible upper-tier municipal roads, all highways and all railways for consideration in the SGMN. (Note that the GTHA-wide SGMN does not include any roads that are under the jurisdictions of lower-tier municipalities.)
- Promote continuity, connectivity, consistency, directness and redundancy as underlying features of the SGMN.
- Ensure that existing and planned key goods-generating activity centres; existing and planned intermodal terminals, ports and airports; and existing and planned major or strategic employment areas are connected with each other and with the SGMN,

especially the 400-series highways and other expressways and, where appropriate, the railways.

- Ensure that these activity centres, terminals, etc. are connected, even if land use plans envision that specific sites are to be redeveloped for other uses in the future. Maintain access to these generators as long as they are in their present location and generate goods.

- Minimize intrusion through residential neighbourhoods and other sensitive areas, recognizing that to achieve this, it will be necessary to provide alternative routings.

- Develop a hierarchical SGMN that starts with the 400-series highways and other expressways (the 407 ETR and municipal freeways) at the top of the hierarchy, followed by primary connectors (mainly roads of upper-tier municipalities but also major lower-tier arterials) and then secondary connectors (to be considered when an effective link is otherwise lacking).

- Assume that all accesses to the 400-series highways and other expressways are included in the SGMN, unless a unique and special situation exists and that a nearby alternative is available.

- Account for existing municipal truck route definitions, with the understanding that these might be subsumed into the SGMN and that the remaining (non-SGMN) truck routes might have to be adjusted, to ensure that they are consistent with the SGMN.

- Minimize conflicts where other transit-, cyclist- or pedestrian-oriented corridor treatments exist or are envisioned. This can require special considerations on such corridors, or the provision of nearby alternate corridors for inclusion in the SGMN.

- Designate the corridor according to current needs, but also provide the flexibility to add and connect to the planned future roads and highways.

- Ensure that freight rail access to freight clusters is maintained, i.e., that the relevant freight-only and shared-use corridors are included in the SGMN. Account for road-rail and rail-rail at-grade crossings in the designation of the SGMN (i.e., do not restrict these intersecting corridors from inclusion in the SGMN, unless there is a nearby and convenient grade-separated crossing). The need for capacity improvements to serve goods and passenger movement should be planned collaboratively.

- Ensure that the SGMN and the associated policies continue to be relevant as future needs emerge, and can be modified as conditions warrant, by accounting for current and future truck traffic volumes and those of other road corridors, as well as current and planned land uses and current and projected population and employment. However, the truck traffic volumes, in particular, should be used as guides to identify the most important needs, as opposed to strictly defined, absolute numerical thresholds.

- Account for existing capacity, structural, geometric, and pavement deficiencies on candidate roads and at candidate intersections, but do not exclude them from consideration unless the candidate section's characteristics preclude any future rectification of the deficiency.

4A Vision for the SGMN and Balancing Priorities

Key Chapter Takeaway

Prior to developing the SGMN, it is useful to articulate a broad vision for where the SGMN specifically, and goods movement generally, fit in the GTHA. This chapter establishes a premise (that is, the 'givens') as the basis for the vision, and then proposes various approaches to implementing the SGMN that allow individual agencies to consider an appropriate 'balance' between accommodating passenger and goods movement in infrastructure investments and priorities.

4.1 A Vision for the SGMN: Premise

4.1.1 Premise

Before embarking on the actual development of the SGMN, it is useful, if possible, to first define a vision for the proposed SGMN. Our review of other jurisdictions found that they usually established policies and guidelines related to establishing a SGMN, but they did not necessarily establish a clear vision for goods movement and the SGMN. In our experience, the key challenge has been less the definition of a strategic goods movement network and more its actual implementation. In large part, this has to do with difficulties in establishing the importance of efficient goods movement in the eye of the public and of political decision-makers in transportation, land use and economic development investments and priorities. Addressing conflicts between goods movement and urban passenger movement also is a factor. Accordingly, we see the purpose of a vision statement here as less to describe the future state of the GTHA goods movement transportation system but more to establish where we see its importance among other transportation priorities.

Accordingly, as a prelude to the vision, we propose the following **premise** as a basis for the vision. This premise is adapted from a similar statement that was proposed in the SGMN

scoping document, and which in turn was drawn from the goals enumerated in a 2011 Ontario Trucking Association guide for developing municipal truck route systems:[35]

> The GTHA regional urban freight network is a safe, efficient, and well-connected system that integrates components of the road and rail networks and intermodal terminals. Using a series of common guidelines and criteria coupled with stakeholder consultation, the network enjoys broad acceptance by all GTHA governments and by private stakeholders. These common 'rules' allow the network to be updated from time to time, as needs change; and the GTHA-wide framework provides the basis for upper and lower tier municipalities to develop their own truck route systems in an integrated and consistent manner. The network features a hierarchy of components arranged according to their function as strategic, primary, or connecting links, and it includes components of all relevant jurisdictions. It promotes seamless transition between modes, and between external and internal traffic. Finally, the SGMN ensures an appropriate balance between the movement of passengers and the movement of goods on the available and planned road and rail infrastructure.

Note that the premise is a recap of what the SGMN looks like and how it is derived as a concept. It provides the planning context for the implementation of the SGMN, based on which needs such as sustainability, design, operations and safety can be incorporated, all while ensuring adherence to and consistency with applicable policies and standards. **These are givens.**

4.1.2 Vision: Where the SGMN Fits

A SGMN is designed with the purpose of minimizing conflicts with passenger transportation and with the general public more broadly. That said, some degree of conflict is unavoidable. How these conflicts are resolved and ultimately how they inform the alignment of a SGMN depends in part on the vision set out for identifying a SGMN and for goods movement in general. Accordingly, establishing a vision up front helps to establish an agreed-upon approach of how to resolve the inevitable conflicts that will arise when defining a SGMN, as well as future conflicts as the GTHA grows and changes. Chapter 7 proposes specific approaches for resolving these conflicts.

Section 2.1 established the importance of efficient goods movement to the wellbeing of a metropolitan region's residents and businesses. In the GTHA, a city's or broader metropolitan region's vision might be to be recognized as the national or international leader as a goods movement hub, with the development of a SGMN as part of its strategy to realize this vision. Or, the vision might be to maintain the region's status as an effective goods movement hub,

[35] *Local Truck Routes: A Guide for Municipal Officials*, Ontario Trucking Association, Toronto, December 2011.

while maximizing the local transportation network's resources for the purpose of facilitating passenger movement.

These two visions are different with respect to the priority that they place on goods movement over other investment priorities, especially in urban passenger transportation. Those differences then imply different guidelines regarding the implementation of a SGMN. A region that prioritizes goods movement may place greater weight upon minimizing goods movement costs with the SGMN at the expense of passenger movement. A region that envisions maintaining the goods movement status quo while enhancing passenger transportation will likely make different decisions on the particular alignment of a SGMN.

4.2 Balancing Priorities

The discussion below articulates the range between these priorities – that is, the **balance** between addressing goods movement needs, passenger movement needs and other priorities. It does so by expressing four 'views' of how this balance is expressed. **The point of this discussion is to articulate the need for ensuring that goods movement needs, especially on the sections that comprise the SGMN, are incorporated into the decision-making for urban transportation infrastructure. Recognizing the balance that a given municipality or government chooses for implementing its own infrastructure investments helps decision-makers understand clearly the implications of a given decision, and further underscores the role that the SGMN can have in achieving urban transportation, land use and economic development aspirations.**

Stated another way, there is a desire to ensure that goods movement does not constrain opportunities to introduce or improve rapid transit and commuter rail services, while at the same time avoiding extremes that relegate goods movement to the lowest priority, such as broadly banning truck traffic at certain times of day or in large areas. The alternate views also recognize the importance of the SGMN to the GTHA's economic development aspirations – in other words, the implementation of the SGMN has implications beyond those of capital and operational investments in the transportation network. Finally, the discussion of the possible views – that is, where the balance might land – informs possible future consultations with industry stakeholders, and helps them understand clearly how the SGMN benefits them and where it fits within governmental funding and investment priorities.

Municipal transportation master plans generally encompass a multimodal approach. However, it is within each individual authority's mandate to determine how and when to implement the SGMN within its jurisdiction. The intent of these alternate views, then, is to inform the authority's determination of the balance, by articulating the importance of an efficient goods movement network from both a planning and an economic perspective, and the implications of choosing one vision – that is, one level of the balance – over another.

4.2.1 The GTHA as a Leading Goods Movement Hub

This view first and foremost supports the GTHA as the leading goods movement hub in Canada, and a leading goods movement hub in North America. The GTHA's status as a goods movement hub generates economic prosperity for its residents by increasing access to goods, facilitating exports and generating employment through support activities. Further, it generates these benefits (particular good access and export facilitation) for cities and communities across the country.

In recognition of this important role that the goods movement industry plays for the region and country as a whole, a potential implementation approach is:

> *To enhance the status of the GTHA as a national and North American leader as a goods movement hub, in order to maximize the related benefits both for the region and the country as a whole.*

4.2.2 Balancing the Competitiveness of the Goods Movement Industry With Other Priorities through a Pareto Optimal Lense

Although the GTHA is an important goods movement hub, this view proposes that as the region grows there will be growing conflicts over resources between the goods movement industry and other priorities. These other priorities include local and intercity passenger transportation, residential land use, and recreational lands, among others. Ideally these conflicts can be resolved with mutually beneficial solutions. But the fact of the matter is that some conflicts will only be able to be resolved with parties benefiting to different degrees, or some parties benefiting and other parties bearing additional costs.

These conflicts could be resolved with the following potential approach to implementation:

> *To enhance the status of the GTHA as a national and North American leader as a goods movement hub, in order to maximize the related benefits both for the region, net of the related costs imposed upon the region.*

This approach implies that conflicts would be resolved through a "Pareto optimal"[36] fashion, taking into account regional benefits and costs. A variation on this approach could consider wider (e.g. national) benefits.

4.2.3 Maintaining the Competitiveness of the Goods Movement Industry

This view recognizes a challenge associated with arriving at Pareto optimal solutions is that the size of the benefits and costs are often uncertain. This uncertainty makes it difficult to

[36] Pareto optimality refers to an outcome where resources are allocated to individuals so that no individual can be made better off without making other individuals worse off. The concept's application here is that after resolving a conflict through a solution that maximizes ne benefits, some of those benefits will be redistributed to individuals that had initially been made worse off by the solution, so that they are at least no worse off than when they started.

conduct accurate benefit-cost analyses. There are further challenges with ensuring that the immediate losers from a certain policy or program are adequately compensated from the pool of net benefits that are generated by that policy or program.

As an alternative, the implementation approach can set a specific bar for goods movement in relation to some priority for other objectives, such as by ensuring that the goods movement industry is "no worse off" in the pursuit of other priorities:

> *To maintain the region's status as an effective goods movement hub, while maximizing the local transportation network's resources for the purpose of facilitating passenger movement.*

This approach can be modified to include other priorities, including maximizing residential and recreational land use.

4.2.4 Focusing on Enhancing Passenger Transportation and Other Priorities While Minimizing Negative Impacts on the Goods Movement Industry in the GTHA

Other variations of the previous proposed approach exist, including views that set a higher or lower bar for the goods movement industry. For example:

> *To maximize the local transportation network's resources for the purpose of facilitating passenger movement, while inflicting the least acceptable amount of harm on the movement of goods in the GTHA.*

4.2.5 Monitoring the Implementation

After choosing the implementation approach, to help implement the network, one or several tangible objectives can be defined in order to allow for some monitoring of the success of the eventual SGMN in helping to realize the chosen vision in the future.

With regard to maximizing the goods movement industry in the GTHA, specific goods movement efficiency indicators can be used to monitor implementation, for example:

- Maximize truck travel speeds – achieve an x% increase in average truck travel speeds region-wide
- Minimize variability in truck travel times (increase reliability)
- Minimize truck VKT and vehicle-hours travelled (VHT) by creating the most efficient routing for trucks

Depending on the preferred vision, the indicators can be modified, for example to maintain an average truck travel speed or to target a decrease up to a specific threshold.

4.2.6 Finding a Balance

The four views emphasize goods movement to varying extents, relative to other regional priorities such as competing demands for land and road space. In each of the cases the objective is to maximize regional wellbeing and prosperity, but the views differ in the relative

priority of goods movement relative to other priorities. This exercise illustrates that there may not be a "one size fits all" approach to framing the role of goods movement in the GTHA.

Whether explicitly or implicitly, municipalities are assessing these trade-offs in making decisions on goods movement and other related policies and programs. The "right" approach may depend on the setting – for example, the optimal approach in downtown Toronto might be different from the optimal approach in a suburban industrial area. In any case, framing the trade-offs clearly and setting quantitative performance indicators and targets can help improve visibility into these trade-offs and thereby support the implementation of the SGMN (see Section 8.2) and public policy more generally.

5 Development of Concepts for the Road SGMN

Key Chapter Takeaway

This chapter develops concepts for the high-level, RTP-compatible road SGMN. The network is based on three components: First, key GTHA freight generators ('clusters') and freight corridors are identified, based on an analysis of various data sets, including CVS, GPS and employment data. Next, the various SGMNs, regional road networks or major arterial road networks that have been identified by regional municipalities in the GTHA are taken into account. Finally, the major RTP projects that are currently under construction or in procurement, and how the alignment of those projects interact with existing SGMNs or major arterial roads, are considered. These components are then combined and overlaid to develop concepts for the high-level, RTP-compatible SGMN. Some gaps and conflicts are evident in the concepts – notably, the need to ensure that an appropriate and consistent density of roads has been defined across all parts of the GTHA, and consider in detail potential conflicts with the proposed rapid transit network.

The rail SGMN has fewer conceptual alternatives, and so its derivation is discussed in the next chapter.

5.1 Data Sources

There are a variety of data sources, both direct and indirect, related to freight flows in the GTHA. For our analysis, we primarily relied upon data from the following sources:

- Commercial Vehicle Survey (CVS) data collected by MTO.
- Truck GPS data from the American Transportation Research Institute (ATRI).
- Canadian Business Patterns data obtained from the City of Toronto's website.

These data sources are described below.

5.1.1 CVS Data

The CVS data used in this study are from the 2012 survey collected by the MTO. The survey entails interviewing truck drivers at strategic roadside locations in the GTHA and elsewhere in the province. The roadside locations in the GTHA are shown in Figure 5-1, although it should be noted that other locations outside of the GTHA also contributed to the study team's knowledge of trips to and from the GTHA as well.

Figure 5-1. CVS Survey Data Collection Sites

Source: MTO

The primary advantages of this dataset are:

- Detail in terms of origin and destination location (which are coded by postal code), origin and destination facilities (e.g. manufacturing facility, warehouse), and whether the truck is loaded or empty.
- The dataset represents an unbiased sample of trucks (at least for the specific point locations where conducted), managing to capture both private and commercial fleets, and everything from tractor-trailers to specialized trucks.
- Because the locations are selected strategically (notably along 400-series highways), the survey likely captures a large percentage of trucks heading into and out of the GTHA, thus functioning much like a cordon count.

The primary limitation of CVS data is its geographic coverage. Because of the time and cost of conducting the survey, the data are only available for a few dozen locations in the GTHA, mostly along highways or near key transportation facilities such as intermodal hubs. Thus, the CVS data may accurately represent long-distance trucking trips but understate local trips, such as deliveries from GTHA distribution centres to GTHA stores.

Further, several CVS sites were added in Peel to augment the data collection efforts specifically in that region. As a result, the CVS results might overstate the volume of trips in Peel, despite efforts to address these and other issues when the sample was expanded to represent the universe of truck trips.

Finally, it is noted that the CVS represents 2012 trip patterns and characteristics, some of which might now be out of date. However, for the purposes of this analysis, they can be considered as representative and usable for the development of the SGMN.[37]

The study team obtained from MTO a data file containing truck trip ends by origin and destination zone (i.e. a count of all truck trips originating or destining in each zone). In addition, MTO provided an origin-destination (OD) file also indicating the type of facility at both ends, and loaded/empty/other status. OD pairs with fewer than 5 trips were suppressed (the suppression only affects the OD pairs, not the trip end counts). Note that the OD data for each GTHA zone include trips that start or end outside the GTHA, including cross-border trips, although the specific origin or destination outside the GTHA is not identified.

5.1.2 GPS Data

The American Transportation Research Institute collects GPS data from its partner fleets, which collectively represent a very large sample of trucks on the road. ATRI collects “pings” or “traces” on regular intervals which include attributes such as travel speed, and can be mapped

[37] The CVS has been conducted approximately every 5-6 years over the past several decades. The next CVS is planned for 2018.

to road segments. The data can also be used to identify trip ends, by analyzing where and how long trucks stop.

The primary advantages of the ATRI data are:

- Geographic coverage, as the GPS pings are highly accurate and can be mapped to individual road segments, including directional segments. This allows for excellent coverage of not only highways, but also arterial roads and below.
- The data cover a range of industries and sectors, including more of the intraregional trips that may be missed by the CVS.
- The data also have the advantage of being relatively current, being from October 2015.

The main disadvantage of GPS data is that they do not contain any detail with respect to commodities carried, loaded/empty status, or facility types. The dataset likely underrepresents certain types of vehicles, such as specialized vehicles, but pinpointing data gaps is not obvious. Additionally, because the data represent a sample, not the entirety, of trucks on the road, volumes derived from GPS data must be inflated or "scaled up" if they are to be compared with actual truck volumes.

Similar to the CVS data, MTO provided the study team with a trip end file by GGH zone,[38] as well as an origin-destination file. The data are for the month of October 2015. All OD pairs with fewer than 5 trips were suppressed. Trip origins and destinations were generally equal or close to equal for all zones (there is no differentiation between loaded and empty trips). Note that the OD data for each (GGH) zone include trips that start or end outside the GTHA, including cross-border trips; however the specific origin or destination outside the GTHA is not identified.

In addition, MTO also provided a geospatial file to the study team containing a directional road network for the GTHA, as well as data indicating the number of pings and average speed of pings, by hour, mapped to each road segment, for the month of October 2015. The study team converted these data to estimates of weekday 24-hour volumes by road segment, using a formula that takes into account the length of segments and average speeds, consistent with the approach the study team has taken with ATRI data in other metropolitan areas across North America.

The GPS data can also in principle be used to analyze the specific routing of individual trips. However, the study team did not have access to the raw, trip-level data and so this component was not part of the project.

[38] Refers to the traffic zone system that is used by MTO's GGH (Greater Golden Horseshoe) travel demand forecasting model (i.e., as opposed to the GGH itself).

5.1.3 Canadian Business Patterns Data

For validation purposes, the study team used a publically available business establishment database available from the City of Toronto to map freight-related employment by Toronto-area census tract. The data are from December 2015, and are compiled from the Business Register, a business repository maintained by Statistics Canada.[39] The data obtained from this tool are for the Toronto Census Metropolitan Area (CMA), which represents a subset of the GTHA (notably not including the Oshawa and Hamilton CMAs).

The dataset contains the number of business establishments by 6-digit NAICS (industry) code, by employment category (e.g. 1-4, 5-9 employees), for each census tract in the CMA. The study team aggregated the 6-digit NAICS codes to six economic sectors, reflecting different types of freight-related land uses. From these data, the study team generated an estimate of total employment NAICS code in each census tract. The NAICS codes and employment factors are found in Appendix A.

The primary value of the business establishment database is that it identifies clusters by industry code. However, on its own business establishment data is not a superior dataset to either of the others, because employment is not necessarily a strong indicator of trucking activity. As well, there is the risk of NAICS codes being misleadingly identified (for example distribution centres are sometimes assigned to retail trade), and of employment being assigned to company headquarters rather than to the true location of their workplace.

The study team compared the employment data to truck activity data on a census tract level (using a concordance between census tracts and GGH zones) to generate a high-level estimate of the relationship between freight-related employment and truck freight activity.

5.1.4 Summary of Data Sources

Based on the study team's analysis of the data, the CVS and GPS data appear to support each other very well. The CVS dataset estimates a higher number of truck trips for zones with quarries or intermodal facilities, while the GPS dataset estimates a higher number of truck trips for zones with high distribution centre or commercial activity. Thus the two sources in combination appear to be quite valuable in filling in important gaps in coverage. There may be some types of truck trips that are underrepresented by both data sources (including possibly smaller trucks such as couriers or service vehicles), though it is not clear to what extent this is the case.

[39] City of Toronto Data Centre, Canadian Business Patterns Census Tract Aggregation Tool (December 2015). Note that census tracts are largely defined on the basis of population in order to maintain reasonably consistent populations, and so they can vary in size. Statistics Canada defines census tracts as "small and relatively stable" areas that usually have populations between 2,500 and 8,000 persons. (http://www12.statcan.gc.ca/census-recensement/2011/ref/dict/geo013-eng.cfm)

5.2 Analytical Method

5.2.1 Purpose

In order to assess the degree to which a corridor provides connectivity to freight-related land uses, it is important to first develop a system for categorically defining the land uses.

This section describes how freight "clusters" were defined across the GTHA. The freight clusters represent areas of high concentration for freight-related businesses. First, freight-related employment was used to develop a picture of the geospatial pattern of freight activities in the region. Next, the study team analyzed truck trip ends (i.e. where truck trips originate or destine), in combination with aerial imagery, to quantitatively define concentrations of freight land uses.

The definition of freight clusters is highly dependent on truck data, as trucks generally represent the mode of transportation utilized for 'last kilometre' freight flows, even in situations where the dominant mode for a particular shipment is another mode, such as intermodal (rail) or air. It is noted that the method employed also successfully captures the most significant ports, airports, and rail terminals within the top freight clusters. Thus, although truck-focused in their definition, the freight clusters can also be considered fundamentally multimodal in nature.

5.2.2 Geographic Aggregation

The primary geographic level of aggregation used for mapping and analysis is the GGH Model Traffic Zone. For context, the average size of a zone in the City of Toronto is 100.5 ha (roughly 1 km x 1 km), or 445.5 ha (roughly 2 km x 2 km) in the remainder of the GTHA outside Toronto. These zones tend to be smaller than census tracts and provide improved geographic granularity in industrial and commercial areas (since census tracts are designed for equivalency of population and not employment).

5.2.3 Freight-Related Employment

As noted, employment data were used to develop a high-level estimate of the relationship between employment and truck trip generations. To do so, we distinguished between six sectors based on NAICS codes, and classified these as freight-related or not (see Table 5-1).

This classification was based on a bounded linear regression (cutting out census tracts with extremely high or low trip generation) at the census tract level, the results of which are shown in Table 5-2. We estimated the relationship between freight-related employment and truck trip activity (both generation and attraction), specifically the number of weekly truck trips generated per employee.

Table 5-1. Freight-Related Sectors and NAICS Composition

Sector	Freight-Related	NAICS
Construction and Raw Materials	Freight-Related	11-21 and 23
Manufacturing	Freight-Related	31-33
Wholesale Trade	Freight-Related	41
Retail and Food Service	Freight-Related	44-45 and 72
Transportation and Logistics	Freight-Related	48-49 (except 485,487), and 562
Professional Services	Other	51-62 (except 562)
Other Services	Other	22, 485, 487, 71, 81, 91

Table 5-2. Truck Trip Generation Associated with Freight-Related Employment

Sector	Weekly Truck Trips per Employee (GPS Data)	Weekly Truck Trips per Employee (CVS Data)
Construction and Raw Materials	-0.5	1.4
Manufacturing	0.7	0.7
Wholesale Trade	0.5	0.0*
Retail and Food Service	0.0*	0.2*
Transportation and Warehousing	3.0	4.8
Professional Services	-0.1	-0.2
Other Services	0.0*	-0.3*

Source: Study team analysis of employment and truck trip data. *not statistically significant at 5%

Based on this classification, professional services and other services do not appear to have any meaningful impact on truck trip activity and were not considered freight-related sectors. This does not necessarily imply that there are no freight impacts of employment in these sectors (for example, professional services often would generate demand for courier and shredding services, and other services generate trips by maintenance, service, and laundry vehicles, to name a few examples). However, no meaningful positive relationship could be established for the data available. Our conclusion is that whatever truck trips are generated are significantly lower than for other sectors.

Retail and food services employment seems to contribute minimally and not necessarily significantly to freight activity. The lack of a significant relationship could be affected by the overall large number of jobs in this sector and their geographic dispersion. Because particularly large retail clusters are still likely to generate significant truck activity and because the coefficient is positive, we included this sector as a freight-generating sector.

The CVS and GPS data sources generally show similar results. The most significant difference is for construction and raw materials. This difference is not unexpected and likely reflects a significant underestimation of construction-related activity in the GPS datasets (a phenomenon that is also described elsewhere in this report). Overall, the combination of the two data sources produced results that were consistent with the study team's a priori

expectations, with the most notable expectation being that Transportation and Warehousing employment shows the strongest relationship with truck trip generation.

5.2.4 Cluster Identification

The zonal CVS and GPS data were used in concert with one another to identify clusters of freight activity in the GTHA. The combination of these data sources was found to yield results consistent with the study team's knowledge of the GTHA, qualitative analysis performed using Google Earth imagery, and previous studies of freight clusters in the GTHA (notably recent studies by MITL[40] and Transport Canada[41]). As an additional validation step, the clusters were checked against freight-related employment by census tract and found to align well.

Cluster identification was performed using a data-centric approach. The data metrics used to screen and identify clusters were trip ends (i.e. number of truck trips originating or destining in a zone[42]) and trip density (number of trips per hectare). Both the CVS and GPS datasets were analyzed using these metrics, as these two sources tend to complement each other well.

The GPS dataset consists of actual raw counts, whereas the CVS dataset reflects estimated actual volumes (scaled up from the sample). The GPS dataset is also more recent; thus the two sources are not directly comparable. Overall, the total trip count is higher in the case of the CVS data (because it is scaled up).

In general, our primary focus is understanding the geographic *distribution* of trips in the GTHA, i.e. the percentage of region-wide trips associated with particular clusters. The relative number of trips associated with a cluster (relative to the GTHA as a whole) is a more meaningful metric than the absolute number of trips, for the purposes of comparing the two data sources (the maps provided later in this section are on the basis of GTHA shares rather than absolute volumes).

However, since the total number of trips in both data sources (~900,000 per week in the CVS and ~600,000 in the GPS) is generally of a similar order of magnitude, we used the more straightforward and relatable absolute values for the initial steps of defining clusters. Although in theory this gives less weight to the GPS data (which is based on a sample), this is offset by the fact that the GPS data are more volatile for individual clusters (depending on what fleets are equipped with the proper GPS receivers, the GPS data may capture all of the trucks going to a facility or none of them). Thus, among smaller clusters that are near the threshold for consideration, it is likely that the GPS data will far undercount the number of

[40] McMaster Institute for Technology and Logistics, "Truck Freight Generators & Attractors in the Province of Ontario." March 2014.

[41] Transport Canada, "Assessment of Access to Intermodal Terminals and Distribution/Transload Facilities in the Province of Ontario: Identification of Clusters and Facilities." *Ontario-Quebec Continental Gateway.* 2009.

[42] It should be noted that this approach counts each trip twice: once at the point of origin and once at the point of destination. The advantage of this approach is that at the micro-scale (e.g. for a freight cluster), each arriving and departing truck is perceived as a separate trip on the roads. Proper caution should be exercised interpreting the data at a regional level.

trips (but the cluster is picked up instead by the CVS data), or alternatively the GPS data gives a reasonable estimate of the total trips entering and exiting the cluster.

5.2.4.1 Screening to Identify Candidate Zones

Initially, a two-step screening procedure was employed to identify candidate zones for the clusters. The zones passing these screenings were termed cluster centres and cluster peripheries:

1. Cluster centres were defined as individual traffic zones with more than 1,000 weekly trips (by either the CVS or GPS method)

2. Cluster peripheries were defined as traffic zones with a trip density exceeding 5 weekly trips per hectare (by either the CVS or GPS method), or traffic zones that received two or more points according to the following scoring system:

Metric	Scoring
Weekly trips (CVS)	1 if exceeds 250 trips
Weekly trips (GPS)	1 if exceeds 250 trips
Weekly trip density (CVS)	1 if exceeds 5 trips/ha
Weekly trip density (GPS)	1 if exceeds 5 trips/ha

The purpose of the two classifications is that the cluster periphery zones are used to "build out" the clusters from the cluster centres. The major principles are that:

- Cluster centres are obvious freight generators or attractors in their own right, regardless of the characteristics of nearby zones

- Cluster peripheries are significant but not extremely high freight generators/attractors, and thus may or may not be regionally important depending on the characteristics of nearby zones. For example, an individual shopping mall or manufacturing facility may be locally significant, but not regionally significant if surrounded by residential neighbourhoods. However, if surrounded by other freight-generating uses it is appropriate to define it as part of a wider freight cluster.

The GGH zones vary considerably in terms of size; thus the use of trip density as a metric ensures the inclusion of smaller zones that nonetheless have a high concentration of truck trips. For example, many of the zones in downtown Toronto are quite small geographically but have a fairly high truck trip density, due to the high level of commercial activity (including retail establishments), density of employment and population, and ongoing residential and commercial construction.

In total, 315 zones were defined as cluster centres, while an additional 351 zones qualified as cluster peripheries.

5.2.4.2 Cluster Definition

Next, freight clusters were constructed based on visual analysis of the zones surpassing the two sets of thresholds. The main principles applied are:

- Two qualifying zones adjacent to one another are generally combined into the same cluster
- Clusters generally tend to follow major transportation arteries and this feature weighs heavily in cluster definition
- In some cases, there were visual gaps (i.e. non-qualifying zones) within or between clusters. In evaluating whether to "fill in" these gaps, Google Earth analysis of land uses was performed. Largely residential zones were typically not added, whereas commercial, semi-developed or undeveloped zones generally were. The significance of the gap was also considered: for example, a gap separating a cluster from a single marginally qualifying zone was typically not filled in, whereas a gap separating a major generator from a cluster generally was filled in (for example, linking the zone containing the Ontario Food Terminal to the 427-QEW cluster)
- Finally, a certain amount of judgment was applied in evaluating whether to flag and exclude zones. For example, some zones had a high trip-generation rate in the GPS data due to the presence of truck parking areas along highways (i.e. On Route plazas) – these were removed as freight clusters. As another example, some zones appeared to have unexpectedly high truck generation rates (especially in the CVS data) due to significant land development activity, which is for the most part temporary and not indicative of expected ongoing freight generation
- Combinations of "periphery" zones were included as freight clusters if the total combined trips per week exceeded 1,000 (whether or not this threshold was exceeded for any individual zone within the cluster)

5.2.4.3 Qualifying Clusters

This process yielded a total of ten primary freight clusters and a further 22 secondary freight clusters, which are listed and detailed in Section 5.4.

Primary clusters were defined as those with a number of weekly trips exceeding 10,000 (average of CVS and GPS data). Although this specific cut-off is somewhat arbitrary, the main idea is to distinguish large, sprawling, multifaceted clusters from those that are smaller and less diverse (and perhaps dominated by one or a few large generators).

As referenced, the minimum threshold for inclusion as a cluster was 1,000 weekly trips (by either CVS or GPS). At the margin, North York Centre was removed as a freight cluster because it surpassed the 1,000-trip threshold in the CVS data, but 55% of these trips were related to construction and most likely corresponded with recent extensive high-rise development along the Yonge Street corridor – an indicator that large freight volumes should not be anticipated on an ongoing basis. On the other hand, Hamilton Airport was added as a secondary freight

cluster although trip volumes fell just short of the threshold (917 trips according to the CVS), as the study team had reason to believe truck trip generation is underestimated at this location. The trip generation may be underestimated due to the fact that the airport is the largest mover of air express cargo in Canada (operated by CargoJet).

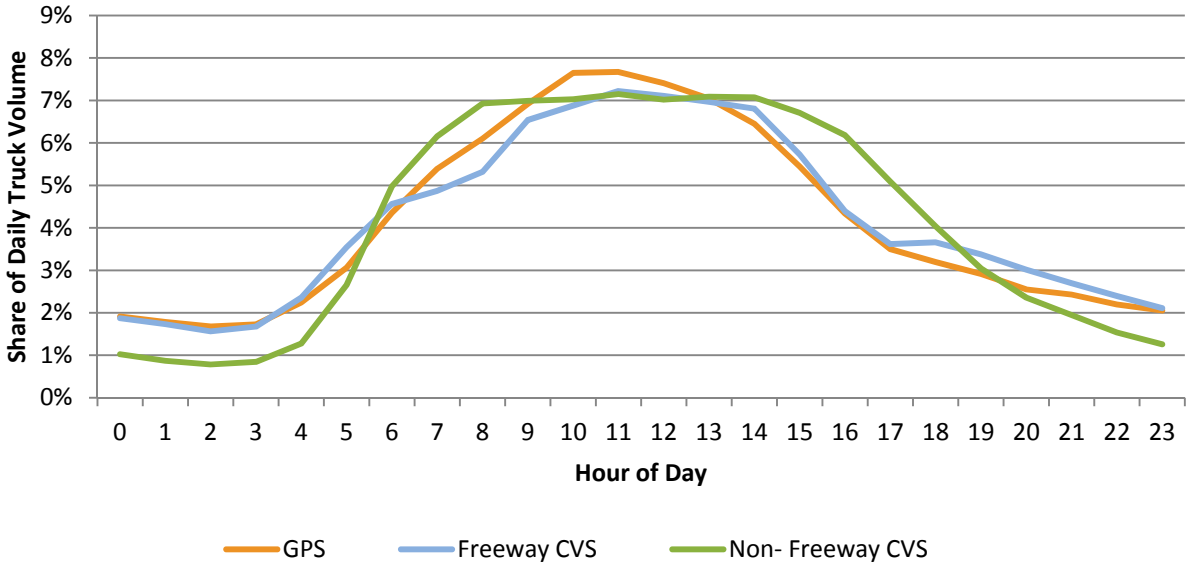
5.2.5 Truck Volumes and Delay

5.2.5.1 Truck Volume

Truck volumes were deduced from the GPS data. The study team obtained a shapefile with GPS truck pings mapped to a bidirectional road network. The volume for each road segment was calculated in hourly bins by taking into account the number of pings, ping frequency, travel speed, and length of segment. The volumes were then conflated to a centreline road network by summing volumes of adjacent road segments angled at 45 degrees or less relative to one another. The result of this step is weekday hourly estimates of relative truck volume by road. These volumes are considered "relative" because they reflect only the trucks in the GPS sample, not necessarily all trucks on the road. Thus, the data can indicate that Road "A" has twice as many trucks as Road "B," but not necessarily that either road has "X" number of trucks per day.

Figure 5-2 shows the weekday hourly distribution of truck activity in the GTHA, based on both the GPS and CVS data. The CVS data are further distinguished between freeway and non-freeway trips.

Figure 5-2. Distribution of Weekday Truck Traffic in GTHA, Hourly



Source: MTO analysis of GPS and CVS data

As noted in section 1.4, the hourly distribution of truck traffic in the GTHA has changed over time, with a larger portion of that traffic occurring during peak hours. According to the GPS

data, the peak hour for truck volumes on GTHA roads is between 10 AM and noon, at approximately 16% of all truck-hours. According to the CVS data, freeway trips peak slightly later, while non-freeway trips maintain a consistent peak from approximately 8 AM to 3 PM. (Note this does not necessarily mean that the above shares of all trucks, or all truck trips, are on the road at these hours, as truck trips are of variable duration. It also does not imply anything about hours of operation, as this metric does not account for trucks that are in service but stopped – e.g. loading/unloading).

Notably, the hourly distribution of truck traffic ramps up in the morning and continues to be higher midday. This distribution is unlike the typical hourly distribution of all traffic, where there are two distinct peaks (one in the morning and one in late afternoon/early evening) to coincide with commute patterns.

5.2.5.2 Truck Delay

The study team also made use of speed data available from the GPS dataset to generate an estimate of delay on road segments. Specifically, for each segment, the average point speed was available for each hour of each day in the month of October 2015 (assuming at least one truck ping in that span). The study team aggregated this to a monthly weekday average for each hour of the day (i.e. 24 data points for each segment).

For any individual segment, truck delay is computed according to the formula:

$$Truck\ Delay\ = Truck\ Volume\ \times \left(\frac{Segment\ Distance}{Truck\ Speed} - \frac{Segment\ Distance}{Truck\ Target\ Speed}\right)$$

where:

- Truck volume is computed for each segment and hour, by dividing the number of pings by the likelihood of a truck ping occurring on the segment (which is a function of speed and the length of the segment).
- Segment distance is in kilometres.
- Truck speed, in kilometres per hour, is the average travel speed for all trucks on the segment for the given hour (across a month's worth of weekday observations).
- Truck target speed is taken as 90% of the truck free-flow speed (FFS) for the given segment, generally equal to the overnight speed. Specifically, the FFS is taken as the 95th percentile average truck speed across all 24 hours of the day (i.e. the second highest hourly speed). The use of a target speed equaling 90% of free-flow speed is consistent with the approach used in major industry studies on truck delay[43] and reflects that free-flow speed is generally not attainable under heavy-volume conditions.

[43] American Transportation Research Institute, "Cost of Congestion to the Trucking Industry." April 2016.

Delay, computed in the manner described above, provides an indication of the total extra time spent by trucks in traffic, above and beyond the time it would take under more-or-less smooth traffic flow conditions. Since volumes are available on a "relative" rather than absolute basis, delay by necessity is similarly provided on a relative basis.

5.3 Freight Generation in the GTHA

5.3.1 Trip Ends in the GTHA

Figure 5-3 shows the number of trip ends by GGH zone for the GTHA, according to CVS data. A "trip end" is a trip originating or destining in a given zone.

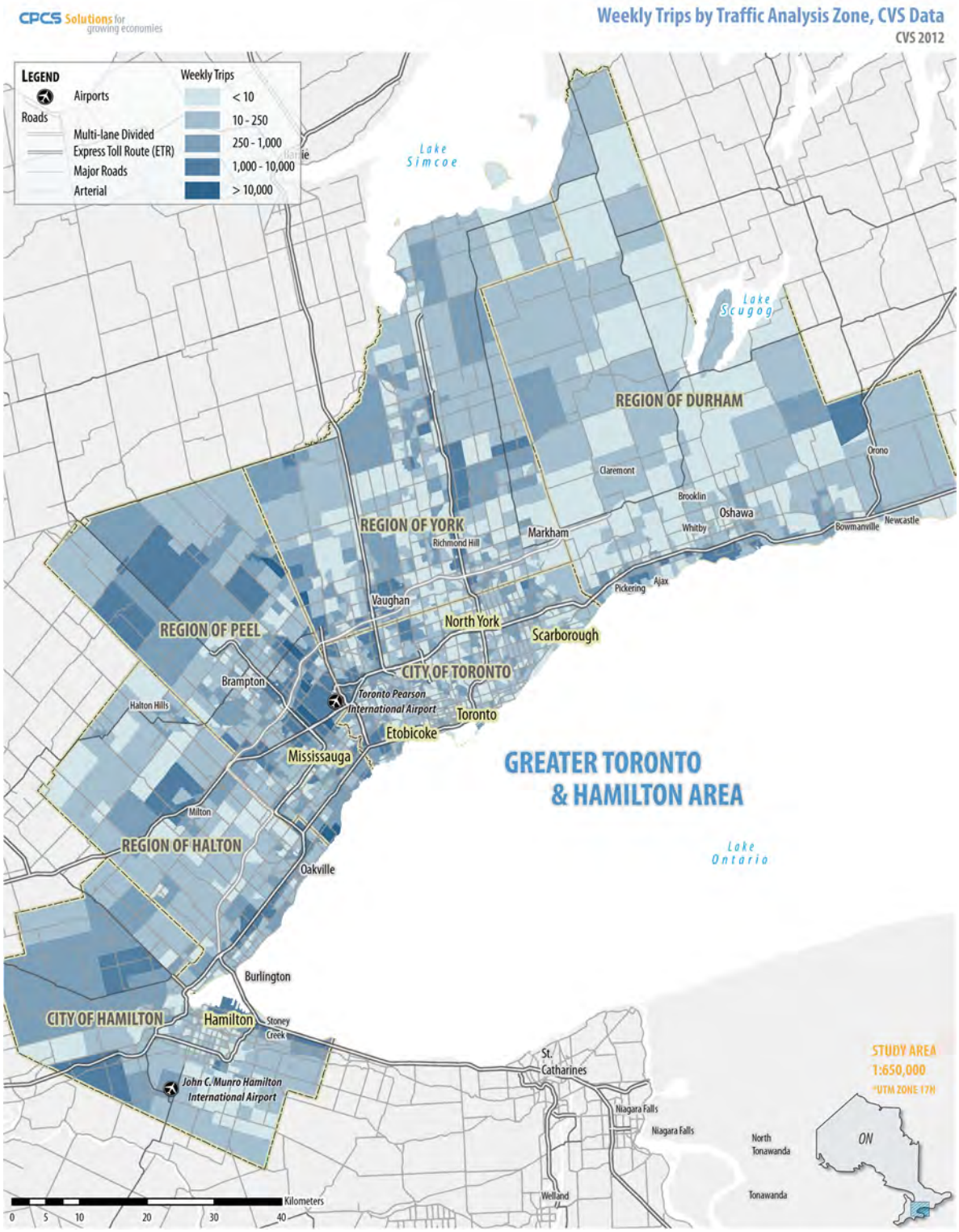
Figure 5-4 shows trip ends according to GPS data. As seen, there are considerable differences between the CVS and GPS data sources for certain zones, although the overall patterns are similar between the two sources. One explanation for the differences seen in Peel (in the zones in and around Pearson Airport, for example) is the oversample of CVS sites in Peel (as shown by the distribution of CVS sites in Figure 5-1.

5.3.2 Trip Density in the GTHA

Figure 5-5 shows the density of trip ends by GGH zone for the GTHA, according to CVS data. Trip density is simply the number of trip ends divided by the area of the zone. Because the zones vary in size, trip density is a better way to show the intensity of trips in the region.

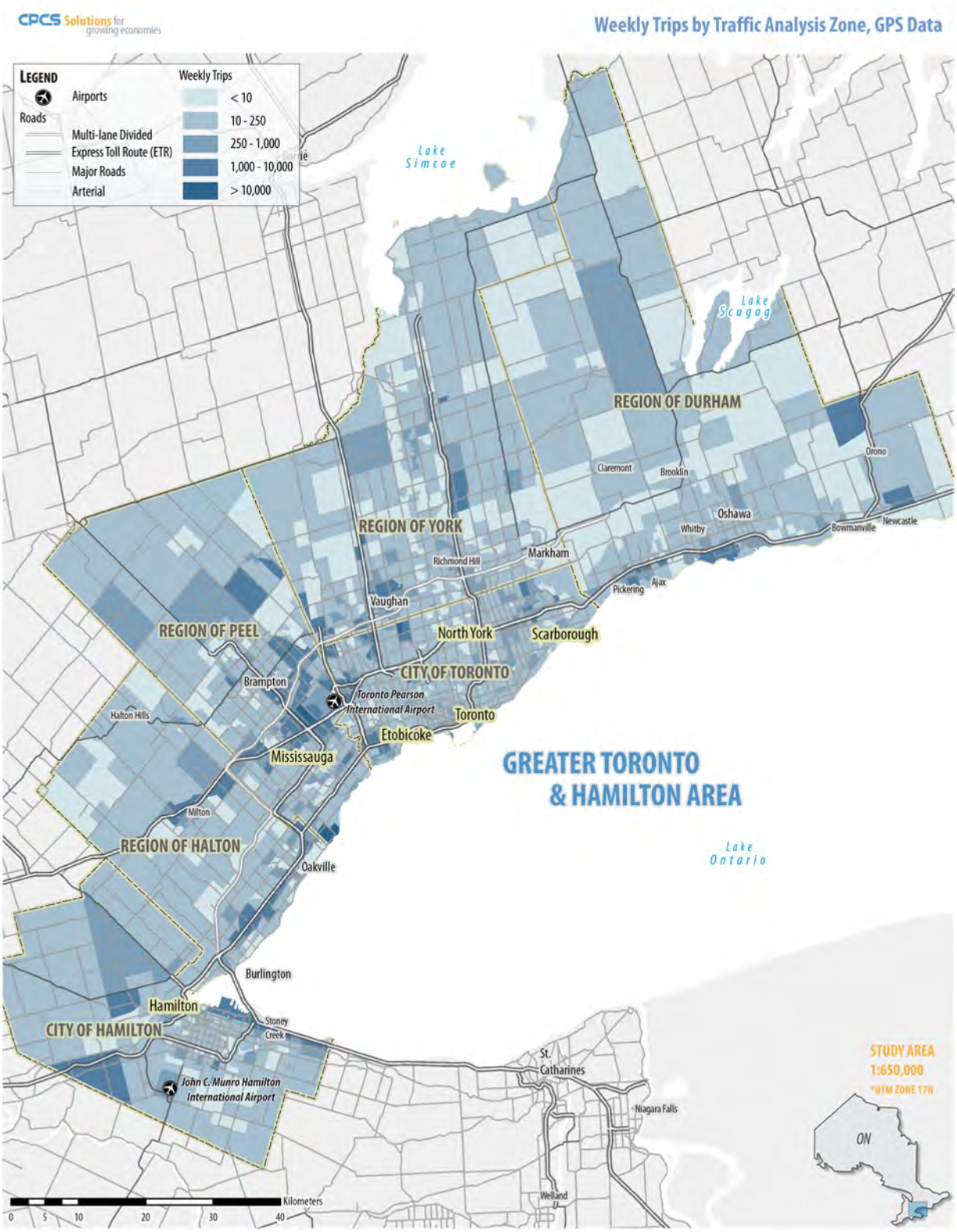
Figure 5-6 shows trip density according to GPS data. The most notable difference is Downtown Toronto, which has a much more apparent freight density according to GPS as opposed to CVS data.

Figure 5-3. Weekday Trip Ends by Traffic Zone, CVS Data



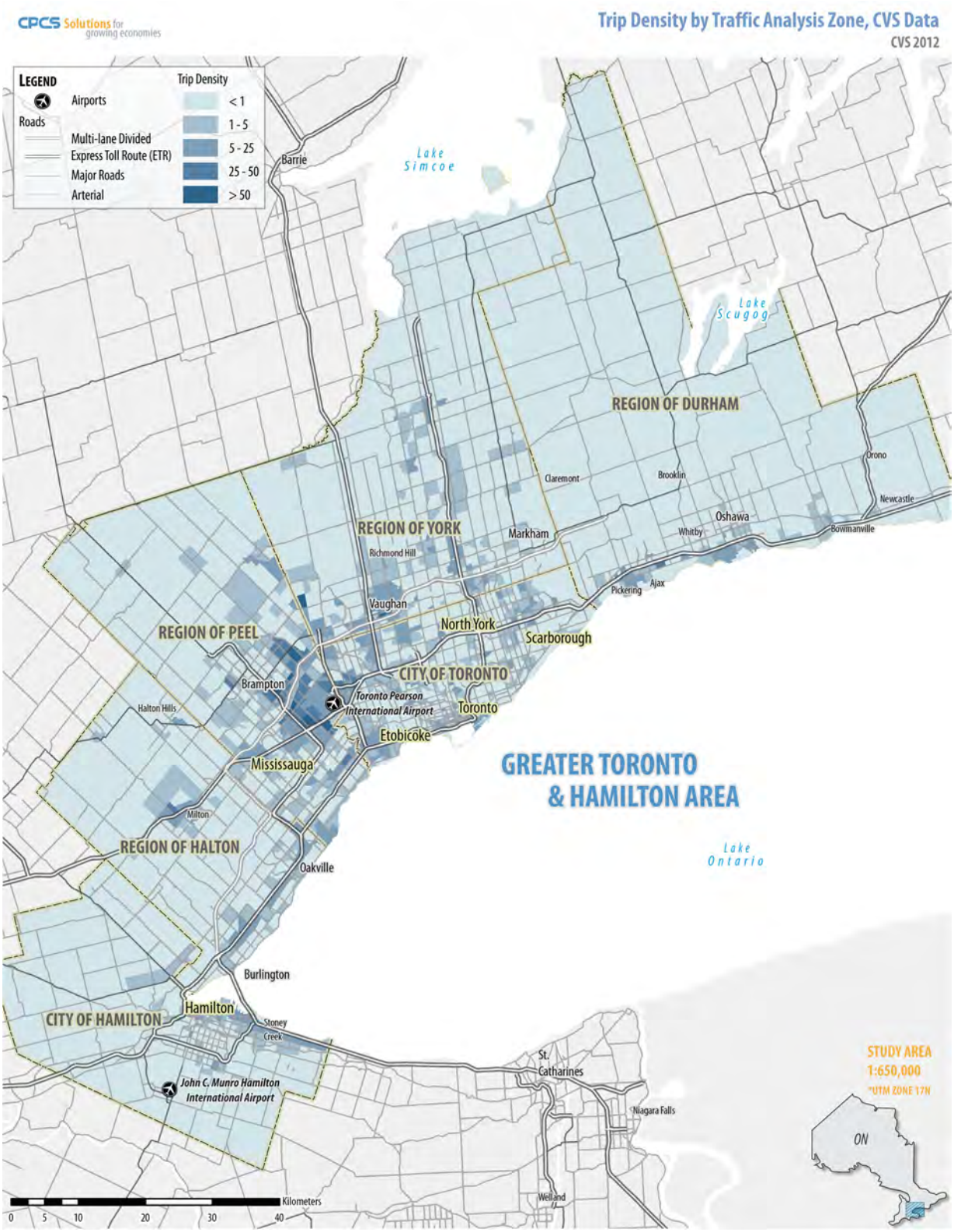
Source: Study team analysis of CVS data

Figure 5-4. Weekday Trip Ends by Traffic Zone, GPS Sample Data



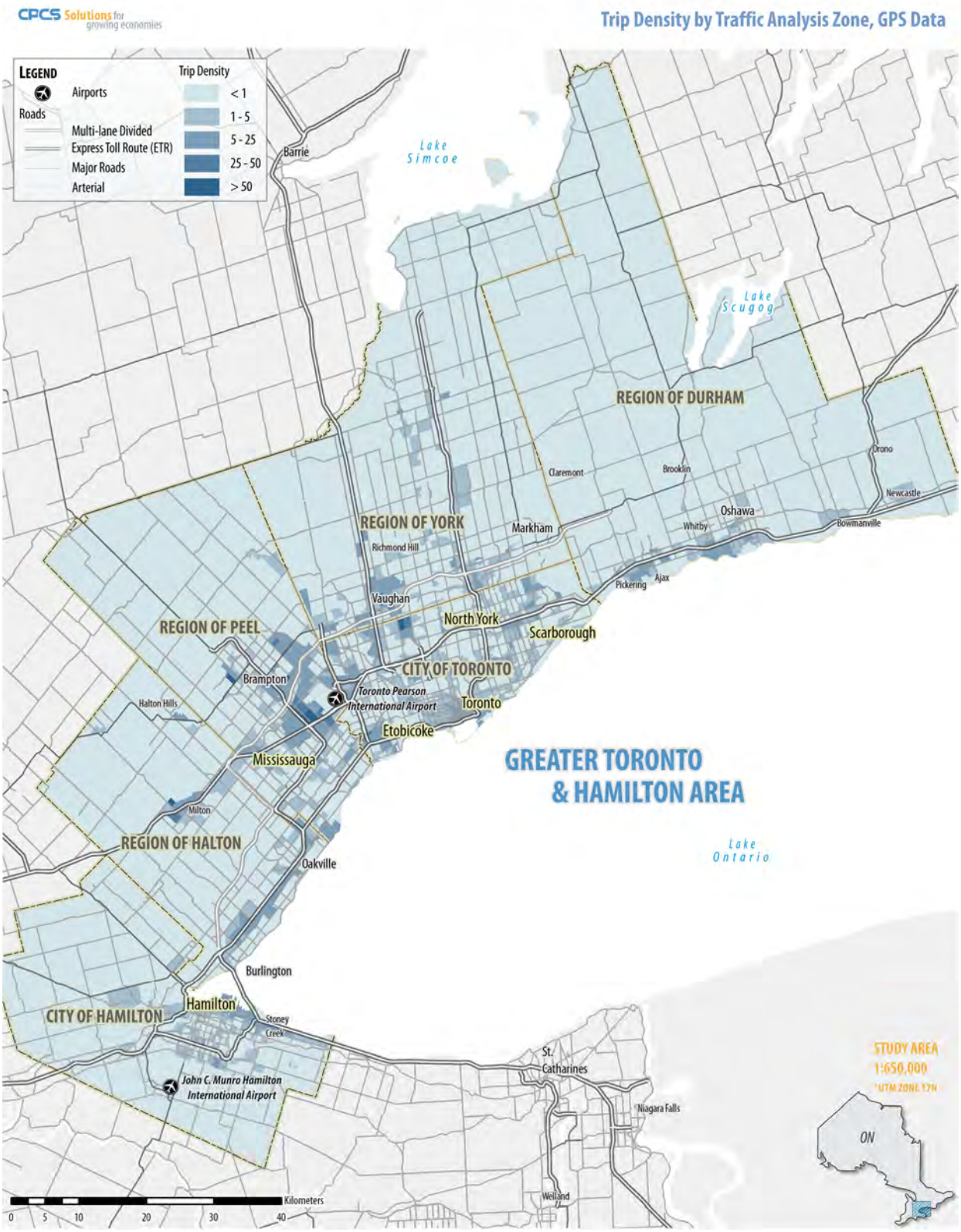
Source: Study team analysis of CVS data

Figure 5-5. Weekday Trip Density (Trips/Area in ha) by Traffic Zone, CVS Sample Data



Source: Study team analysis of GPS data

Figure 5-6. Weekday Trip Density (Trips/Area in ha) by Traffic Zone, GPS Sample Data



Source: Study team analysis of CVS data

5.3.3 Freight-Related Employment in the Toronto CMA

Figure 5-7 shows the density of freight-related land uses in the Toronto CMA, by census tract.[44] Notably, the freight-related employment density is particularly high around Pearson Airport in Mississauga and into Brampton, as well as in Vaughan. Both of these areas are found to be significant clusters according to the CVS and GPS data shown above.

5.3.4 Distribution Centres and Manufacturing Centres in the GTHA

Figure 5-8 illustrates the distribution of large distribution and manufacturing facilities in the GTHA, specifically buildings exceeding a square footage of 400,000 square feet. The data were compiled by the study team based on its knowledge and expertise, with the aid of Google Earth. The most significant manufacturing facilities in the GTHA, in terms of square footage, are the auto assembly plants, specifically GM in Oshawa, Ford in Oakville, and Chrysler in Brampton. Other assembly plants, such as Honda in Alliston, are close to but outside the GTHA and thus are not included. Another significant manufacturing centre is that of the steel plants in Hamilton.

The top GTHA distribution hubs are in the GTHA West area, specifically Mississauga (Airport area and Meadowvale), Brampton, Vaughan (400 and 427 corridors), Bolton and Milton.

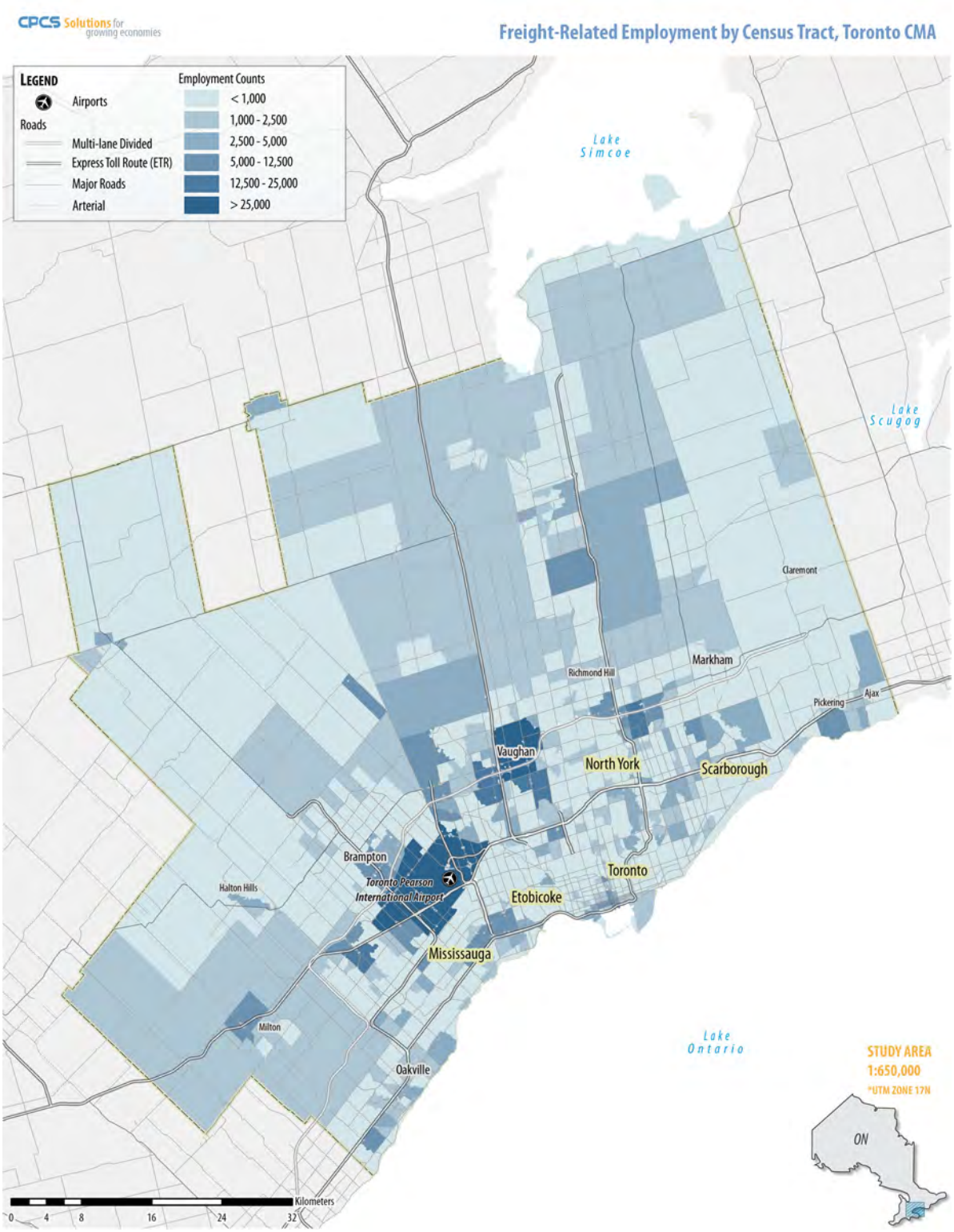
The difference in the general locations of manufacturing facilities and distribution centres can be explained in part by the differences in locations of their customers. Manufacturing facilities are primarily export oriented. For some facilities, by being located closer to the periphery of the urban area they are able to achieve an ideal balance between being able to draw upon the local labour force while avoiding (to some extent) local area congestion when exporting products by road. Other manufacturing facilities are located close to ports, airport or intermodal yards to take advantage of marine, air or rail transportation for the purpose of getting their products to customers in Canada and internationally.

DCs, on the other hand, usually serve a regional or national market. While it is advantageous for DCs to be located near the periphery of the urban area for the purpose of serving domestic customers outside of the urban area, this must be balanced against the fact that a large number of their customers (e.g. retail stores) are located within the immediate urban area. This especially true of smaller DCs that serve a regional, rather than national, market. As evident by the map, DCs have gravitated towards Peel, which gives them a good balance in access to local and external customers, as well as intermodal terminals and the airport.

Note that Figure 5-8 draws attention to where the *largest* facilities are located. In many cases, these are newly established outlying areas. Some clusters, prominent in the previous maps, are less noticeable on this map as they consist of many smaller facilities (notably older areas such as Scarborough and Etobicoke). Note also that the analysis considers only existing facilities.

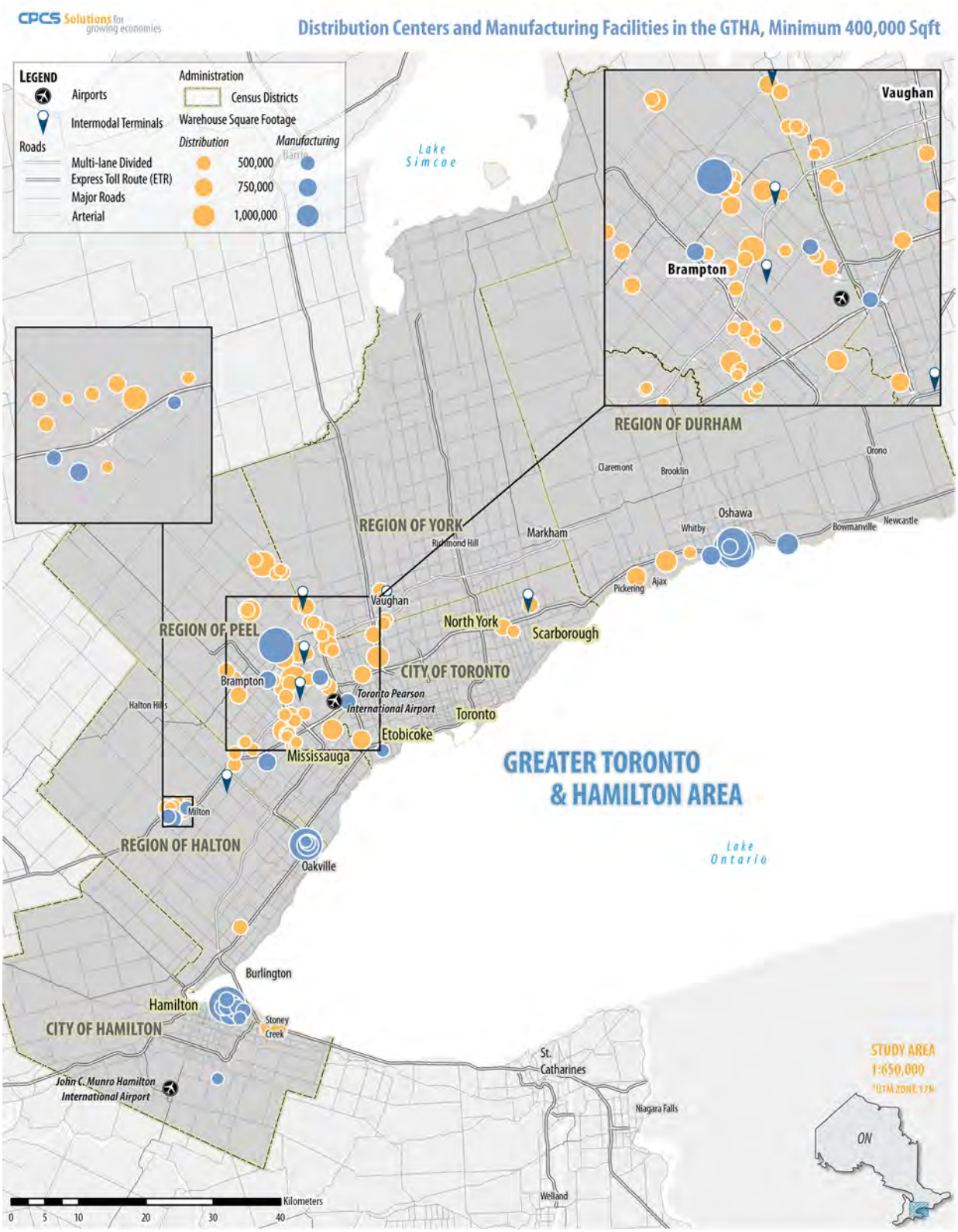
[44] The reader is reminded that census tracts vary in size according to population.

Figure 5-7. Freight-Related Employment by Census Tract in the Toronto CMA



Source: Study team analysis of Census employment data

Figure 5-8. Large Distribution and Manufacturing Centre Locations in the GTHA



Source: Study team analysis

5.4 Freight Clusters in the GTHA

5.4.1 Overview of Primary and Secondary Freight Clusters

Based on the analysis of CVS, GPS and employment data, ten primary and 22 secondary freight clusters were identified in the GTHA. Figure 5-9 shows the locations of the clusters. The clusters are listed and detailed in Table 5-3. Note that the geographies correspond to those according to which the data were supplied, and should not necessarily be construed as representing municipal Official Plan designations of employment lands.

The study team reviewed previous freight cluster analyses carried out in the GTHA and Ontario. A 2014 study by MITL[45] of freight clusters in Ontario listed ten significant clusters in the GTHA along with nine elsewhere in the province. The areas covered by the MITL clusters (identified by locational description but not by detailed maps) appear to overlap almost entirely with the clusters identified in this study, although the exact delineations of the clusters differ. This is because the MITL study primarily used CVS and TCOD[46] data but not the more recent, detailed GPS data available for this study. In addition, this study is more focused on geographic continuity of freight-related land uses as opposed to municipal boundaries.

The clusters also broadly align with those identified in a study by Transport Canada,[47] which identified 15 primary industrial clusters within the confines of the GTHA. The definition of clusters in that study was somewhat more restrictive geographically (for example it lists three separate clusters along the QEW between Highway 407 in Burlington and Highway 403 in western Mississauga, instead of the single "QEW West – Halton" cluster as defined in this study). The Transport Canada (TC) study did not identify any primary clusters that this study missed, whereas the TC study did not identify Scarborough North-Centre or 404-407 as being primary clusters. This may be because of the methodological differences in geographical aggregation as mentioned, or possibly because the TC study was based primarily on interviews with large freight generators, which may lead to an underrepresentation of areas with many, smaller freight generators.

Note that the clusters were defined according to the method and criteria that were described in Section 5.2.4. Thus, while the clusters might not follow property ownership, local geographical conventions or definitions used in other planning studies, they are defined consistently according to the data. As well, while it is possible to break out a single primary cluster (which, by definition, combine several different kinds of freight-related establishments

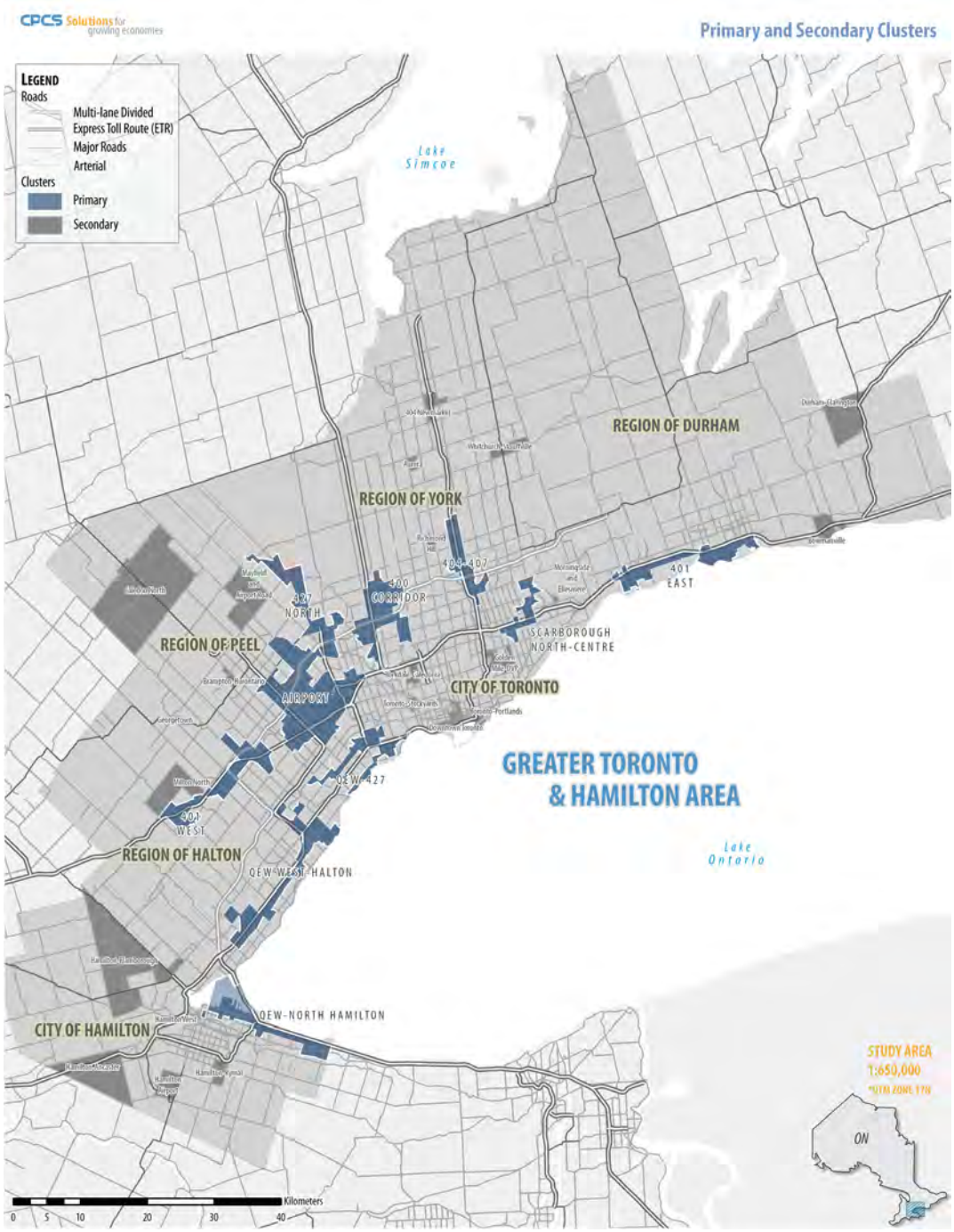
[45] McMaster Institute for Technology and Logistics, "Truck Freight Generators & Attractors in the Province of Ontario." March 2014.

[46] Trucking Commodity Origin and Destination Survey, a Statistics Canada survey that measures the annual commodity movements and outputs of trucking companies that have at least $1.3 million in annual revenue. Note that these are not 'true' trip O-D data, although they can complement other sources such as the CVS. For details, see http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=2741.

[47] Transport Canada, "Assessment of Access to Intermodal Terminals and Distribution/Transload Facilities in the Province of Ontario: Identification of Clusters and Facilities." *Ontario-Quebec Continental Gateway.* 2009.

together) into two or more secondary clusters (which, by definition, are centered on a single or small number of specific establishments), doing so would minimize the importance of the cluster's overall freight-generating activity. For example, several primary clusters comprise an intermodal terminal plus the surrounding ancillary freight-generating establishments – thereby highlighting the importance of the intermodal terminal as a hub.

Figure 5-9. Location of Freight Clusters in the GTHA



Source: Study team analysis

Table 5-3. Descriptive Overview of Freight Clusters

Cluster	Type	Municipalities	Highways	Notable Facilities
Airport	Primary	Mississauga, Brampton, Etobicoke	401, 427, 409, 403, 410, 407	Pearson Airport, CN Brampton Intermodal Terminal, Toronto Interport Sufferance Warehouse, Canada Post Gateway Postal Facility, Chrysler plant, Walmart DCs, Canadian Tire DCs, TJX/ Winners, Coca-Cola, PepsiCo, Maritime Ontario, Manitoulin Transport, Molson-Coors, YRC, Kraft, Nestle
400 Corridor	Primary	Vaughan, North York	400, 401, 407	CN MacMillan Yard, Toys R Us, UPS, Home Depot, LG Electronics, fuel terminals
427 North	Primary	Bolton, Vaughan, Etobicoke	427, 407	CP Vaughan Intermodal Terminal, Sears, Home Depot RDC (new), Canadian Tire DC (new), HBC, Mars, Conair Consumer Products, FedEx Distribution Centre (new)
QEW West	Primary	Burlington, Oakville, Mississauga	QEW, 403, 407	Suncor Energy Terminal, Petro Canada Terminal, Ford plant, CRH cement plant, UPS
QEW-427	Primary	Mississauga, Etobicoke	QEW, 427, 403	Ontario Food Terminal, Metro, Campbell Company of Canada
401 West	Primary	Milton, Mississauga, Brampton	401, 407	CP Expressway, Lowe's, Whirlpool, Sobey's, Amazon, IKEA, Walmart, Chrysler parts, Modatek Systems, Karmax Heavy Stamping
QEW-North Hamilton	Primary	Hamilton	QEW, 403	Port of Hamilton, ArcelorMittal Dofasco, Stelco
401 East	Primary	Oshawa, Whitby, Ajax, Pickering	401	GM plant, Loblaws, Sobeys, LCBO, Gerdau Steel
404-407	Primary	Markham, Richmond Hill	404, 407	Philips Canada, Honda Canada DC, Toronto Buttonville Airport (scheduled to be closed)
Scarborough North-Centre	Primary	Scarborough	401, 407	CP Toronto Yard, Owens Corning, Cinram, HBC, Atlantic Packaging
Brampton-Hurontario	Secondary	Brampton	410	Day & Ross, Kelloggs
Downtown Toronto	Secondary	Toronto	DVP, Gardiner	various commercial
Caledon North	Secondary	Caledon	Hwy 10	Lafarge, James Dick Construction
404 Newmarket	Secondary	Newmarket, E. Gwillimbury	404	various
Hamilton-Flamborough	Secondary	Hamilton	Hwys 5, 6	Lafarge, Dufferin Aggregates

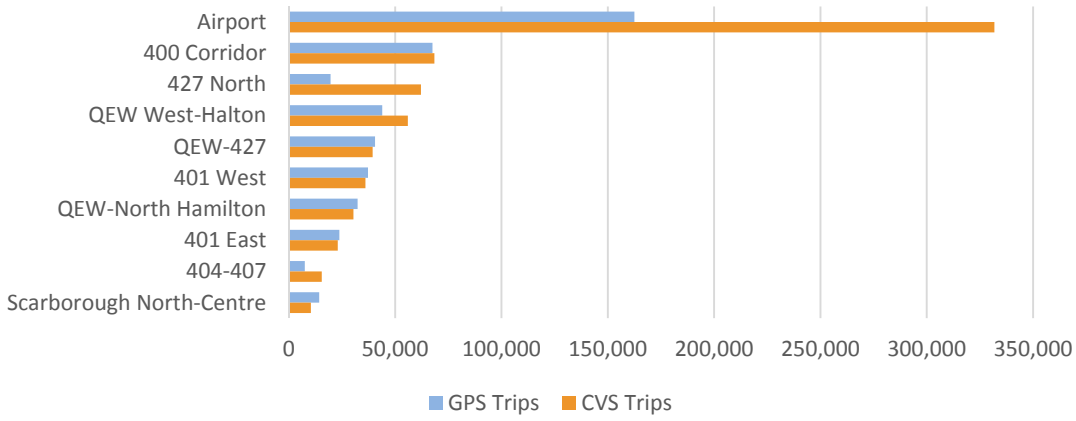
Table 5-3. Descriptive Overview of Freight Clusters

Cluster	Type	Municipalities	Highways	Notable Facilities
Toronto-Portlands	Secondary	Toronto	DVP, Gardiner	Port of Toronto, Bulk Salt Storage, Concrete Campus, Redpath Sugar
Milton North	Secondary	Milton	401	Dufferin Aggregates
Mayfield and Airport Road	Secondary	Caledon		PepsiCo
Golden Mile-DVP	Secondary	Toronto	DVP	Agropur Natrel
Yorkdale-Caledonia	Secondary	Toronto	Allen Rd, 401	Yorkdale Shopping Centre
Richmond Hill	Secondary	Richmond Hill	404	Apotex
Toronto-Stockyards	Secondary	Toronto		various meatpacking and retail
Georgetown	Secondary	Halton Hills		Saputo Dairy
Hamilton-Rymal	Secondary	Hamilton	LMA Pkwy	Maple Leaf Hamilton, Canada Bread Company
Hamilton-Ancaster	Secondary	Hamilton	403	various
Aurora	Secondary	Aurora	404	Transcontinental Printing
Clarington North	Secondary	Clarington	Hwy 115	Lafarge
Bowmanville	Secondary	Bowmanville	401	St Mary's Cement
Whitchurch-Stouffville	Secondary	Whitchurch-Stouffville		Lafarge
Morningside and Ellesmere	Secondary	Scarborough	401	various manufacturing, commercial
Hamilton West	Secondary	Hamilton	403	CP Aberdeen Yard
Hamilton Airport	Secondary	Hamilton	Hwy 6	Hamilton Airport

5.4.1.1 Weekday Trips by Freight Cluster

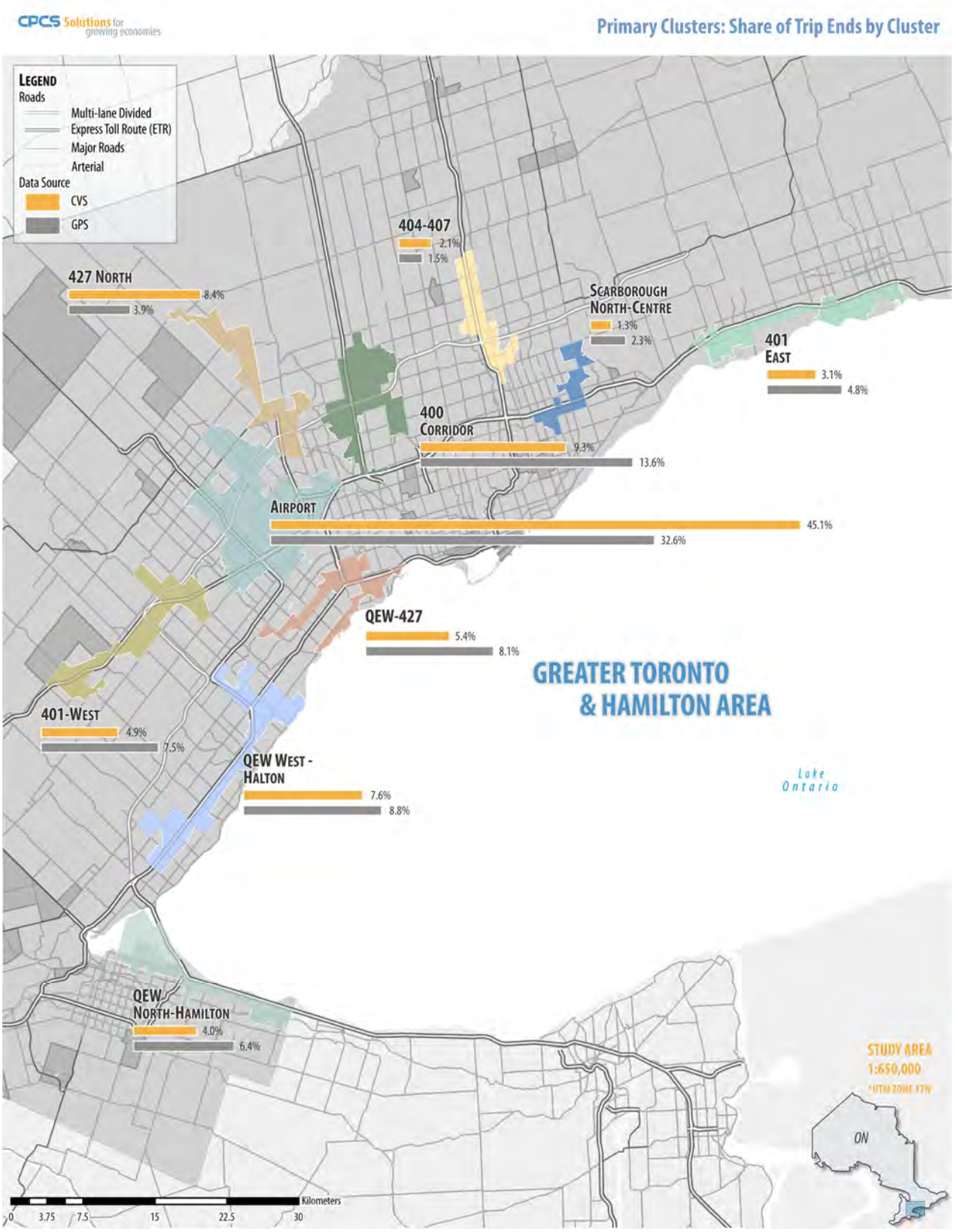
Figure 5-10 shows the number of weekday trips for primary freight clusters. In many cases, the CVS and GPS approaches estimate a broadly similar number of trips, despite their significant differences in method, coverage and timing. It is noted, however, that expansion factors are assigned to the CVS data in order to estimate the "universe" of weekday truck trips. The GPS data, on the other hand, are not assigned such a factor. Overall, the CVS data show a total of 923,674 trip ends per week in the GTHA, whereas the GPS data show a total of 637,812 trips. The relative closeness of these values is suggestive of the fact that the GPS sample is very significant and much larger than the CVS sample. As mentioned, because of this fact the lack of expansion of the GPS dataset is not considered to be a significant problem for this analysis. Alternatively, to control for this issue, Figure 5-11 shows the *share* of trips associated with each cluster, according to the two datasets.

Figure 5-10. Weekday Trips by Primary Cluster, GPS vs. CVS Sources



Source: Study team analysis of GPS and CVS data

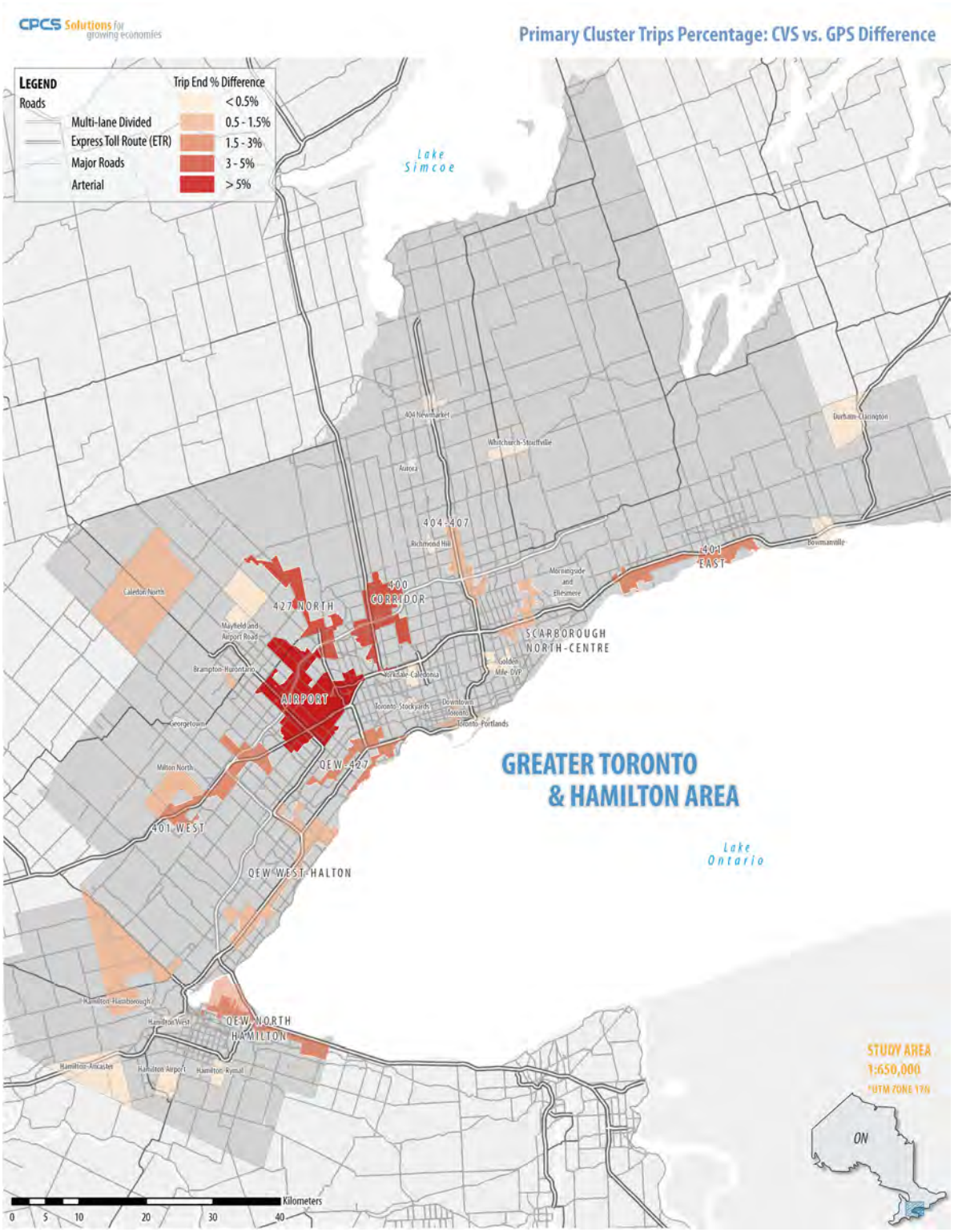
Figure 5-11. Percentage of All-Cluster Trips by Cluster, GPS v. CVS Sources



Source: Study team analysis of GPS and CVS data

The same information is shown in Figure 5-12, with a darker shade indicating a larger discrepancy between the two data sources.

Figure 5-12. Percentage-Point Difference in Trip Share, GPS v. CVS Sources



Source: Study team analysis of GPS and CVS data

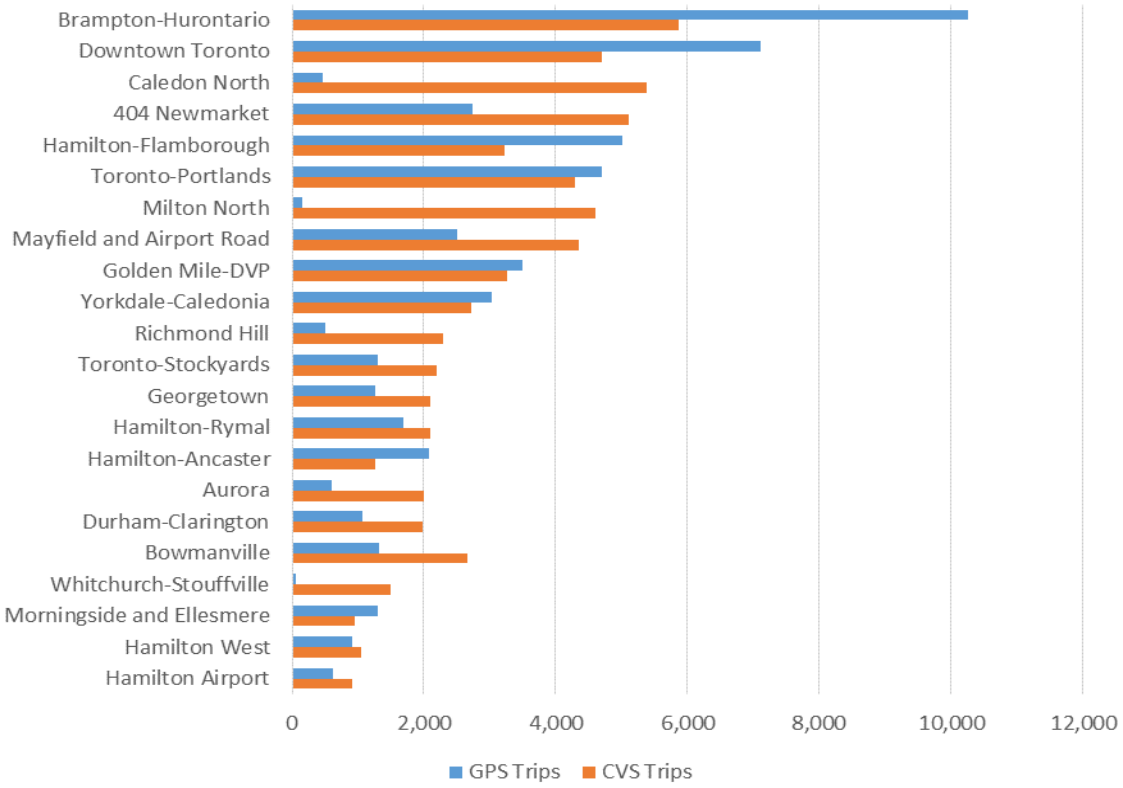
The most notable difference is for the Airport cluster, which is profiled in greater depth in Figure 5-14 and Figure 5-15. The discrepancy is partly attributable to the airport itself, but more significantly to CN's intermodal facilities (both Brampton and Mississauga), as well as associated facilities such as container transportation company terminals (all higher in the CVS data as expected). Similarly, the greater CVS truck trip volume for the 427 North cluster is driven largely by the CP Intermodal Terminal in Vaughan.

Figure 5-13 shows the number of weekday trips for secondary freight clusters. In this case, the larger GPS volume for Brampton-Hurontario is driven by the presence of a large less-than-truckload (LTL) facility in this cluster, for which its trips appears to be underrepresented in the CVS data. The timing of the CVS relative to the newer GPS data could also be a contributing factor, if the facility ramped up operations between those two periods.

Downtown Toronto also has higher GPS volumes compared to the CVS. This is likely due to the CVS underestimating local deliveries, although this is partly offset by the CVS's greater coverage of construction-related vehicles such as cement trucks (according to the CVS, 58% of trucks to/from Downtown Toronto are related to construction sites) and general expansion factors.

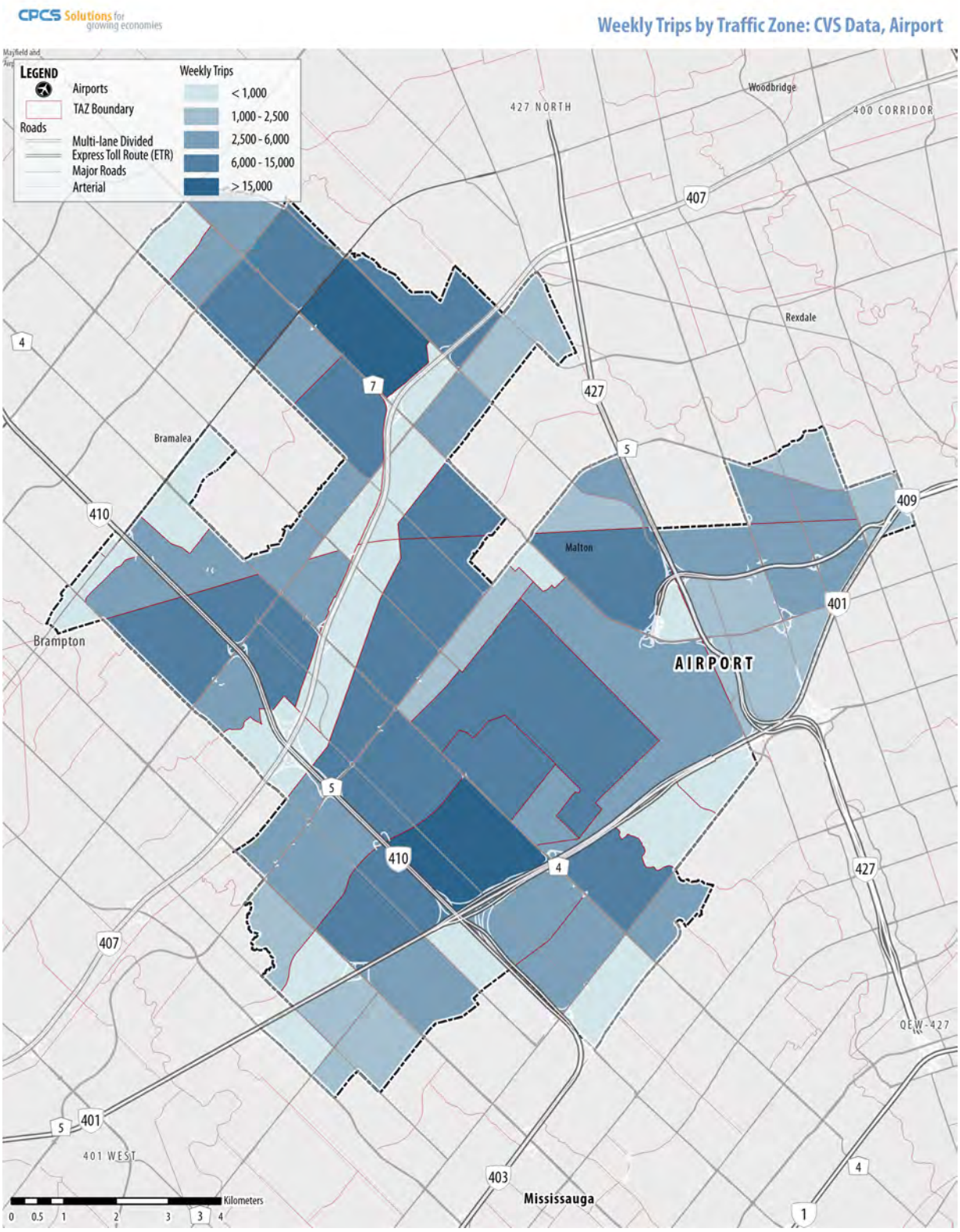
Several clusters have much higher estimates in the CVS data compared to GPS data (though keeping in mind that the total expanded number of trips in the CVS is approximately 50% higher than the total number of GPS trips). In most cases the relevant clusters are dominated by extraction sites such as quarries. This applies to the Caledon North, Milton North, Durham-Clarington and Whitchurch-Stouffville clusters.

Figure 5-13. Weekday Trips by Secondary Cluster, GPS vs. CVS Sources



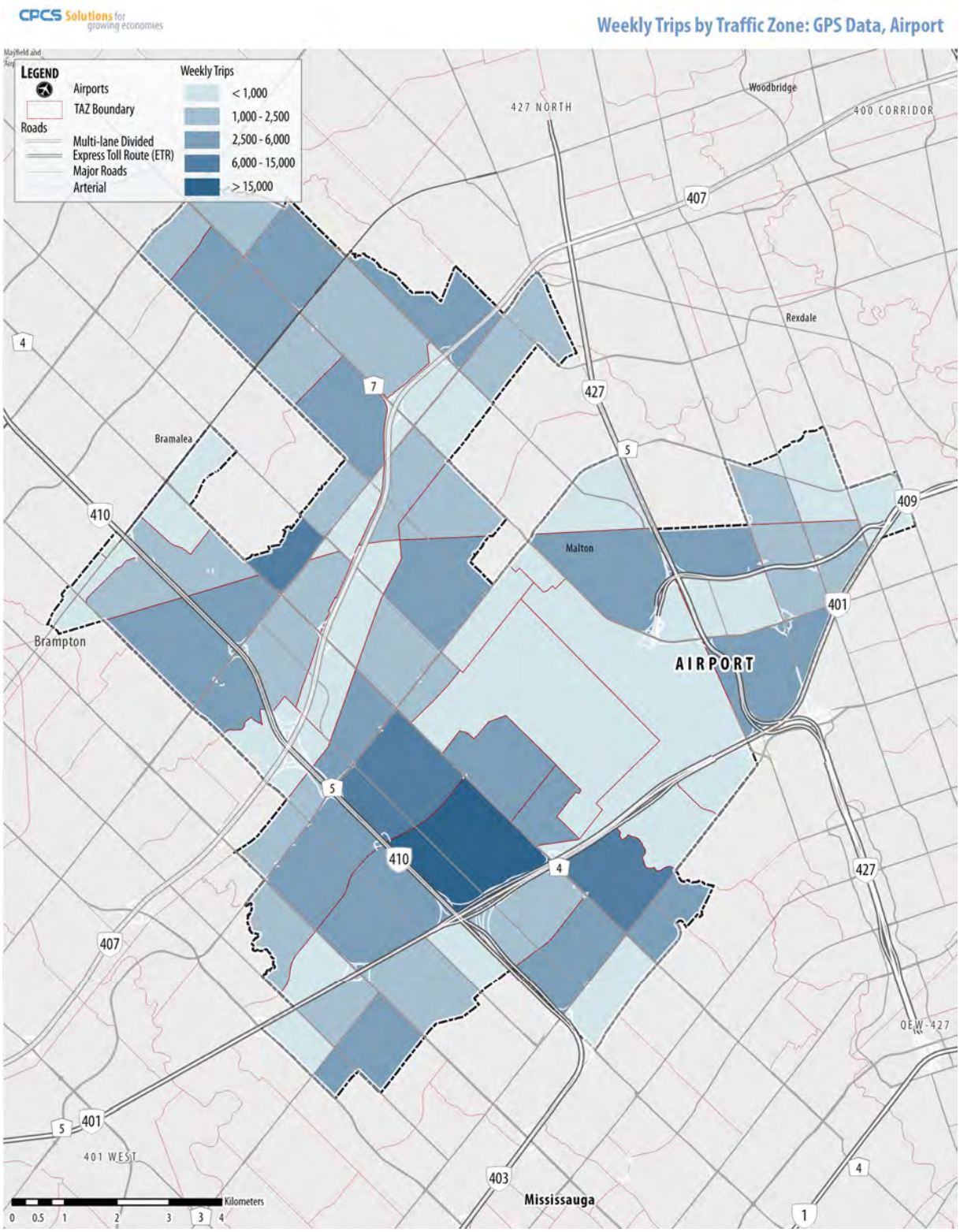
Source: Study team analysis of GPS and CVS data

Figure 5-14. Airport Cluster: Weekly Trips by Traffic Zone, CVS Data



Source: Study team analysis of CVS data

Figure 5-15. Airport Cluster: Weekly Trips by Traffic Zone, GPS Data



Source: Study team analysis of GPS data

5.4.2 Characteristics of Freight Clusters

5.4.2.1 Type of Facility

Figure 5-16 shows the distribution by type of facility for each of the clusters, according to the CVS. The left section shows the types of distribution facilities on the cluster end – that is, the type of facility to which the truck trips are destined, while the right section shows the types of facilities on the partner end (the types of facilities from which the truck trips originate). The partner site is wherever the truck trip originates (if coming to the designated cluster) or is destined to (if going from the designated cluster). For example, a truck trip from a manufacturing facility in the QEW West – Halton cluster to a distribution centre somewhere else (within or outside the GTHA) is reflected in the QEW West-Halton line as follows: a manufacturing facility on the cluster end, and a distribution facility on the partner end.

For example, the Caledon North cluster is dominated by manufacturing facilities, with 76% of trips involving a manufacturing facility within the cluster, including quarries. 42% of the trips involve a construction site on the other end of the trip.

As noted previously, the CVS data do not present a full overview of all truck trips (especially local trips within the region). This should be taken into account when assessing the figure. For example, the 58% of truck trips to/from Downtown Toronto involving construction sites is very likely an overestimate given that the CVS data are not capturing many local deliveries.

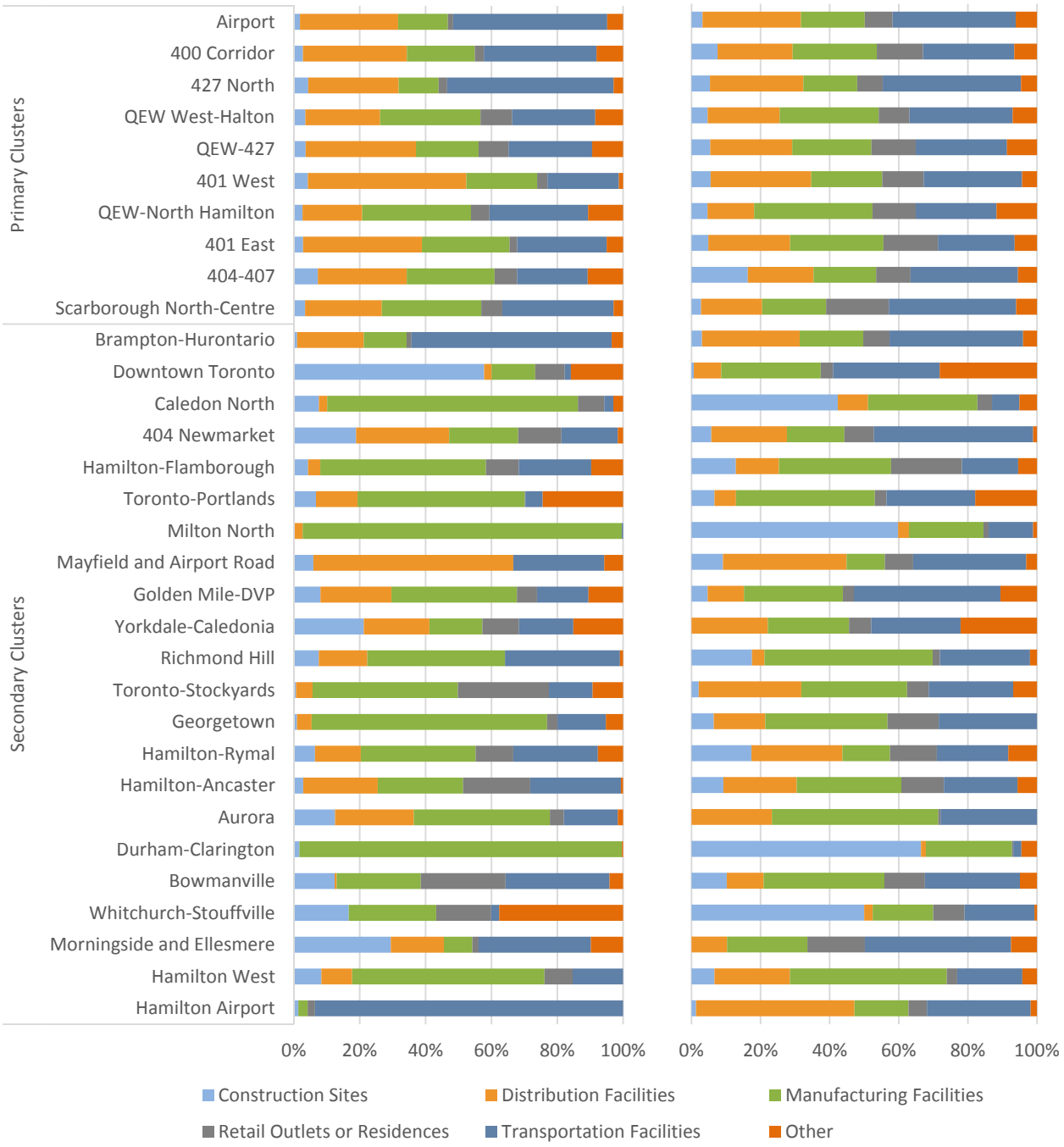
Among the primary freight clusters, the 401 West cluster has the highest percentage of distribution centre-related trips, at 48%. This is expected, as this region encompassing Milton, the south end of Brampton along Steeles Avenue and the Meadowvale area of northwest Mississauga is a fast-growing distribution hub, featuring DCs of such companies as Lowe's (including the DC formerly belonging to Target), Amazon, Walmart, Sobey's and Whirlpool, among others.

The clusters with the largest share of manufacturing-related trip ends are QEW-North Hamilton (33%), Scarborough North-Centre (30%), and QEW West (30%). The first of these is a historic steel-producing area featuring companies such as ArcelorMittal Dofasco, Hamilton's largest private sector employer.[48] Scarborough North-Centre has a large number of comparably smaller manufacturers, including Atlantic Packaging Products (with several locations) and Owens Corning's plant on McNicoll Avenue. QEW West notably features the Ford Motor plant in Oakville.

The two primary clusters with the highest share of transportation-related trip ends are 427 North and the Airport clusters, which feature the CP and CN intermodal yards, respectively.

[48] ArcelorMittal Dofasco website, accessed January 2017

Figure 5-16. Type of Facility within Destination Cluster (left chart) and for Originating Partner Site (right chart)



Source: Study team analysis of CVS data

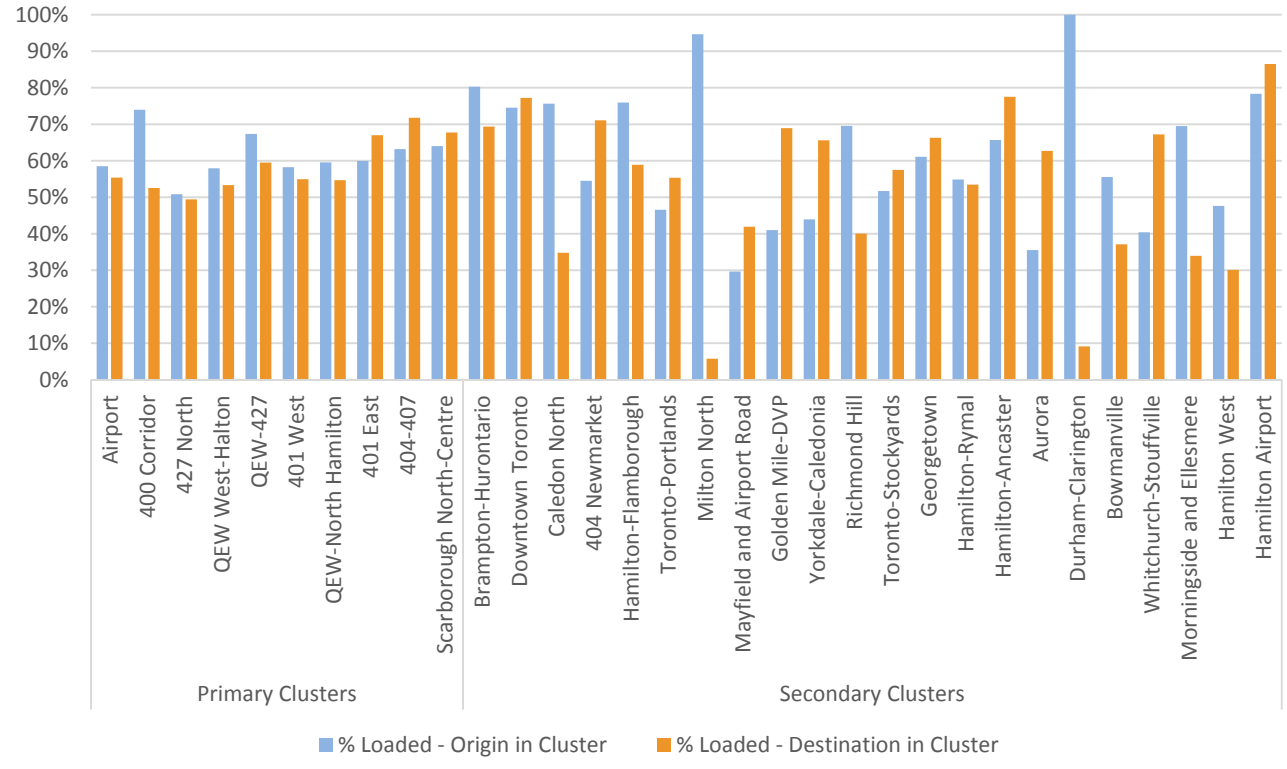
Note: Left chart represents the type of facility to which the truck trips are destined. Right chart represents the type of facility from which the truck trips originate.

5.4.2.2 Loaded/Unloaded

Figure 5-17 shows the breakdown in loaded versus empty trips, by cluster, based on CVS data. The blue columns show the percentage of all trips *starting within the cluster* that are loaded. The orange bars show the percentage of trips *destined to the cluster* that are loaded. As seen in the graph, the percentages are roughly equivalent for primary clusters, though significant differences are observed for certain secondary clusters, particularly ones oriented towards natural resources.

The average percentage over all clusters is 60% loaded for trips originating in the clusters, and 55% loaded for trips destined to the clusters. That the former is larger may be expected given that most of parts of the GTHA that are not within clusters are likely net recipients of loaded truck trips (for example deliveries to stores and residences). Also, the GTHA serves as a distribution hub for much of Eastern Canada, suggesting a greater proportion of loaded trips outward as opposed to inward. That said, it is peculiar that the share of trips that are loaded to and from the Downtown Toronto cluster is roughly in balance, given that we would expect that many trucks would be loading inbound and empty outbound. However, this may again have to do with the mix of traffic that is covered (and not covered) by the CVS.

Figure 5-17. Share of Loaded Trips by Primary and Secondary Cluster



Source: Study team analysis of CVS data

5.5 Truck Volumes, Speed and Delay in the GTHA

Figure 5-18 the relative weekday truck volumes on limited access highways in the GTHA, according to the GPS data. Figure 5-19 shows the same data but for all roads using a different scale, in order to highlight the differences between arterial roads. In both cases the volumes are "relative" in the sense that they based on the GPS sample (although this is quite large, as noted) and not scaled up to total volume levels.[49]

Figure 5-20 shows average (all-day) travel speeds for trucks in the GTHA, by corridor, while The speed listed is the weekday average speed experienced by trucks, computed from volume-weighted average hourly speeds by hour of day (thus accounting for the effects of congestion). In other words, this map shows the speed experienced by the average truck.

Figure 5-21 displays average truck delay for corridors in the GTHA. As with volume, delay is expressed on a relative (sliding scale) basis, since delay is a function both of truck speeds and relative truck volumes.

Corridors such as Highway 401 have a significant amount of delay, although the travel speeds on these corridors are still generally higher than surrounding arterial roads. Notably (and expectedly), the tolled Highway 407 has the highest travel speeds and minimal truck delay. However, this corridor does not rank among the highest in the region in truck volumes.

It should be noted that the GPS-based truck volumes shown in these and subsequent figures do not necessarily correspond to truck volumes that are observed from cordon counts, automatic traffic recorder counts and other counts. This is because not all heavy trucks are equipped with GPS units, hence their trips are not included in the GPS traces. As well, the other counts are conducted at varying and discrete times and locations, whereas the GPS data are continuous and pervasive. Overall, the GPS provide the benefits of temporal consistency across (and to, from and through) the entire GTHA, as well as large and robust volumes, which make them best suited for a comparison of roads across the entire region (include off-highway corridors).

[49] Both volume and delay are expressed on a sliding scale because these are "relative" values. The truck volumes in the dataset are assumed to be generally representative of all trucks on the road, although it is acknowledged that the GPS datasets may undercount certain types of vehicles and thus there may be regional imbalances. Using the relative data it is possible to say that a certain corridor has twice the truck volume of another corridor, or twice the amount of truck delay; however it is not possible to say that a corridor has "X" number of trucks or "X" hours of delay. Development of a suitable multiplier to scale up from relative to absolute volumes would be benefited by increased truck counts in the region, particularly off-highway such as on arterial roads.

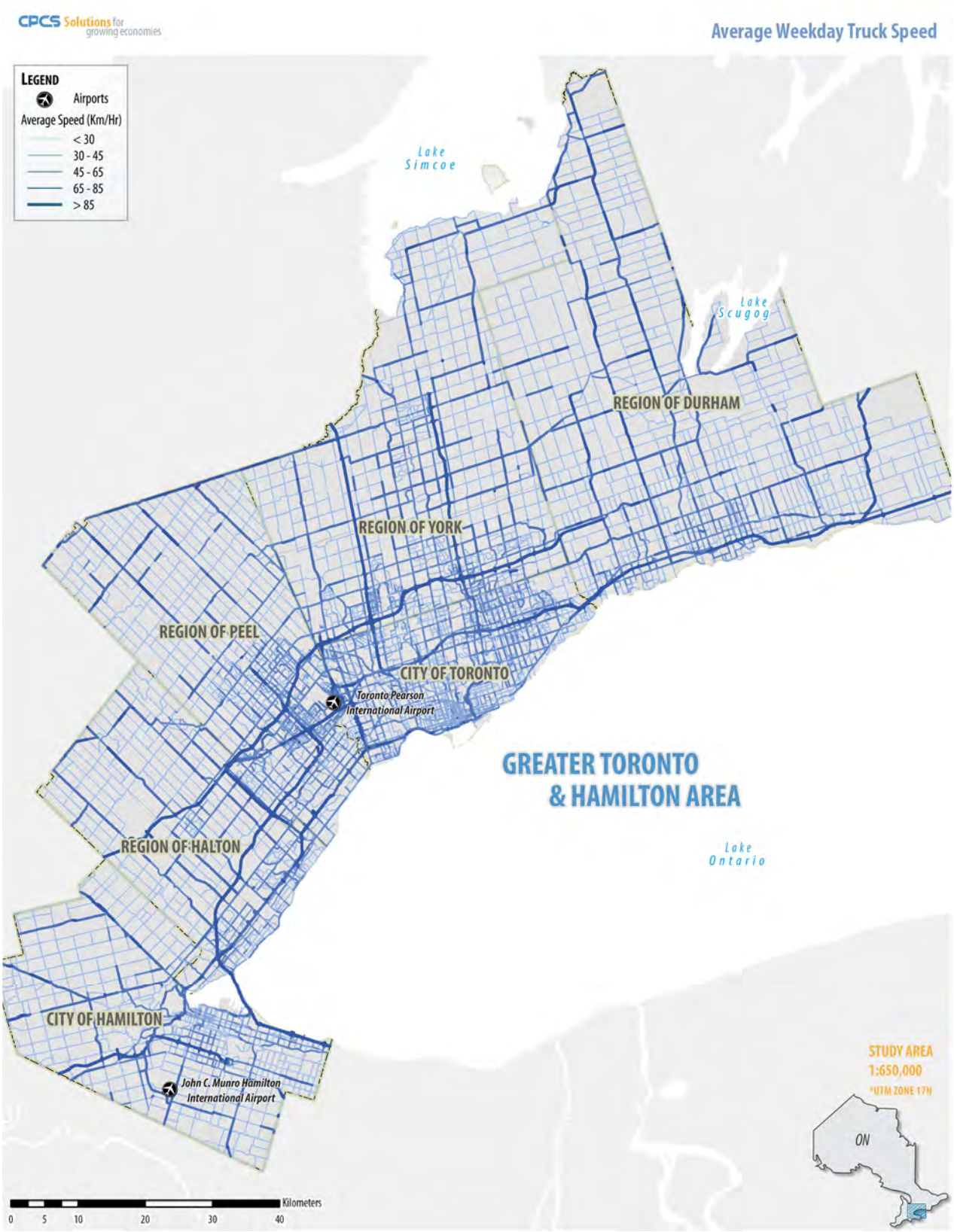
Figure 5-18. Relative Truck Volumes on Limited Access Highways in GTHA

Source: Study team analysis of GPS data

Figure 5-19. Relative Truck Volumes (Highway and Arterial) in the GTHA

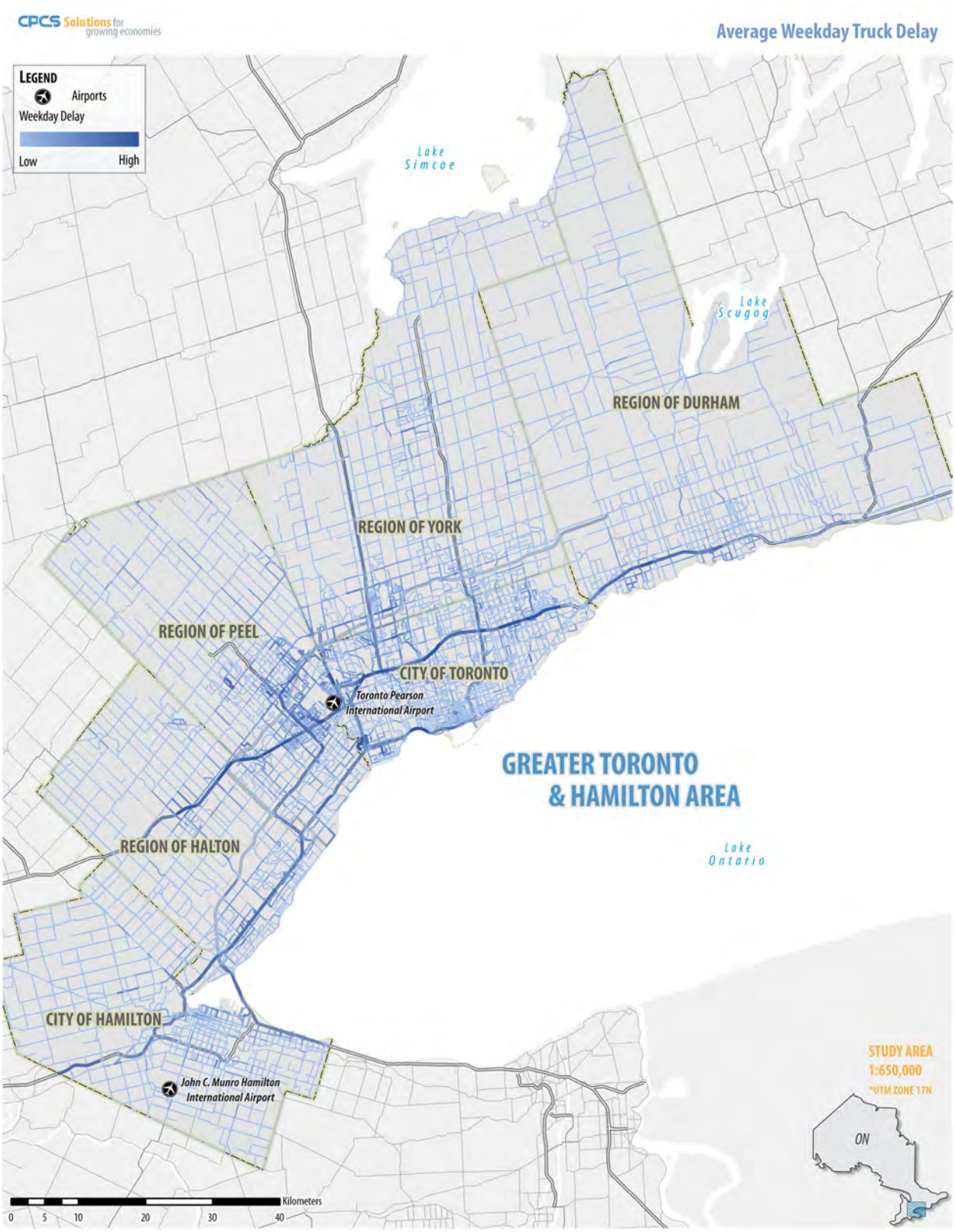
Source: Study team analysis of GPS data

Figure 5-20. Average Truck Travel Speeds in GTHA, by Corridor



Source: Study team analysis of GPS data

Figure 5-21. Average Daily Truck Delay (Hours per Day)



Source: Study team analysis of GPS data

5.6 SGMN Concepts

5.6.1 Compilation of Existing Upper-Tier Municipal Networks

As noted in Section 2.5.1, the upper-tier GTHA municipalities (the Regional Municipalities, Toronto and Hamilton) all have existing strategic goods movement networks or truck routes. These are shown graphically in Figure 5-22 to identify initial concepts for the high-level, GTHA-wide SGMN, noting the following:

- Peel Region developed a SGMN in 2013[50] as part of its Goods Movement Strategic Plan (both primary and connectors are shown). The rail network was not included.
- York Region updated its SGMN as part of its Transportation Master Plan in 2016, as shown on the map.[51] The SGMN is subdivided into a primary and secondary SGMN. The secondary SGMN is roughly analogous to the broader truck routes or regional road networks defined in other regions. The map includes both interim and anticipated goods movement corridors (based on future planned or proposed roads). Note that York Region's SGMN includes rail. However, for clarity, that network is not shown in Figure 5-22.
- Durham Region defined a SGMN in its 2015 Official Plan. This SGMN was revised as part of Durham Region's recently adopted (2017) Transportation Master Plan update.
- The City of Hamilton defined a SGMN in its 2007 Transportation Master Plan. Note that the City of Hamilton's SGMN includes rail. However, for clarity, that network is not shown in Figure 5-22.
- Halton Region has not defined a SGMN – their Regional Roads, which allow trucks except where specific load restrictions exist, are shown instead. As such, the Halton Region network on the map appears to be denser than the SGMNs shown for the other regions, as a SGMN is at the top of a hierarchy of routes.
- The City of Toronto has not defined a SGMN or a truck route network, given that trucks are generally allowed anywhere on the municipal road network except where specific restrictions exist. As a result, the City's arterial roads are shown instead in Figure 5-22. As in the Halton Region case, the network appears denser than the other networks on the map because it is not a SGMN.

Due to the varying definitions noted above, Figure 5-22 is not necessarily a compilation of upper-tier municipal SGMNs. Rather, we refer to the individual SGMNs and major arterial road

[50] Region of Peel, "Strategic Goods Movement Network Study: Technical Report," April 2013.
[51] York Region, 2016 Transportation Master Plan. November 2016.

networks[52] as goods movement networks more broadly, as the basis for developing concepts for a high-level, GTHA-wide SGMN.

5.6.2 Concepts

Following Figure 5-22, Figure 5-23 overlays the SGMNs with the freight clusters that have been identified. In this case, only the designated primary SGMNs (and connectors in the case of Peel) have been included, as well as regional roads in Halton Region. Only limited access highways (as opposed to major arterials) are shown in the City of Toronto.

Figure 5-24 provides relative truck volumes overlaid with the freight clusters that have been previously defined. This is followed by Figure 5-25, which shows the truck volumes overlaid with the regional SGMNs (or regional roads and major arterials in the case of Halton Region and Toronto, respectively). In both these cases, the truck volumes are relative and reflect the data shown in Figure 5-19.[53] The figures purposely show high truck volume corridors only for the off-highway network, since it is understood that most highways have relatively high truck volumes. The purpose of these maps is not to explicitly categorize roads as high or low volume, but rather to show, for general validation, the high degree of correlation between locations of high truck volume, locations of freight clusters, and existing regional SGMN corridors.

It is noted that for the most part, the freight clusters are well connected to the high-level SGMN, though there would be some gaps if the network in Toronto was limited to limited-access highways. Note that while these GPS-derived truck volumes appear mainly on the urbanized parts of the SGMN and in the vicinities of the freight clusters, it should be recalled that some activity, especially that of smaller or one-vehicle fleets, is not always captured by the commercial GPS data, hence is not shown on the two figures. For example, many aggregates haulers, which are important users of rural roads, are independent truckers who operate only their own vehicles and are less likely to subscribe to a commercial GPS tracking service. Nonetheless, the results are indicative, showing how the municipal SGMNs largely cover the freight clusters (in the respective upper-tier municipalities) and link them to each other and to the Provincial highway network.

Note that in Figure 5-25, future proposed or planned highways that were identified by the York and Durham SGMNs have been retained in these concepts. Chapter 6 uses the truck volumes and the relationships with the identified freight clusters to synthesize the high-level SGMN concepts into a single core GTHA-wide SGMN that sits at the top of the hierarchy of current regional SGMNs.

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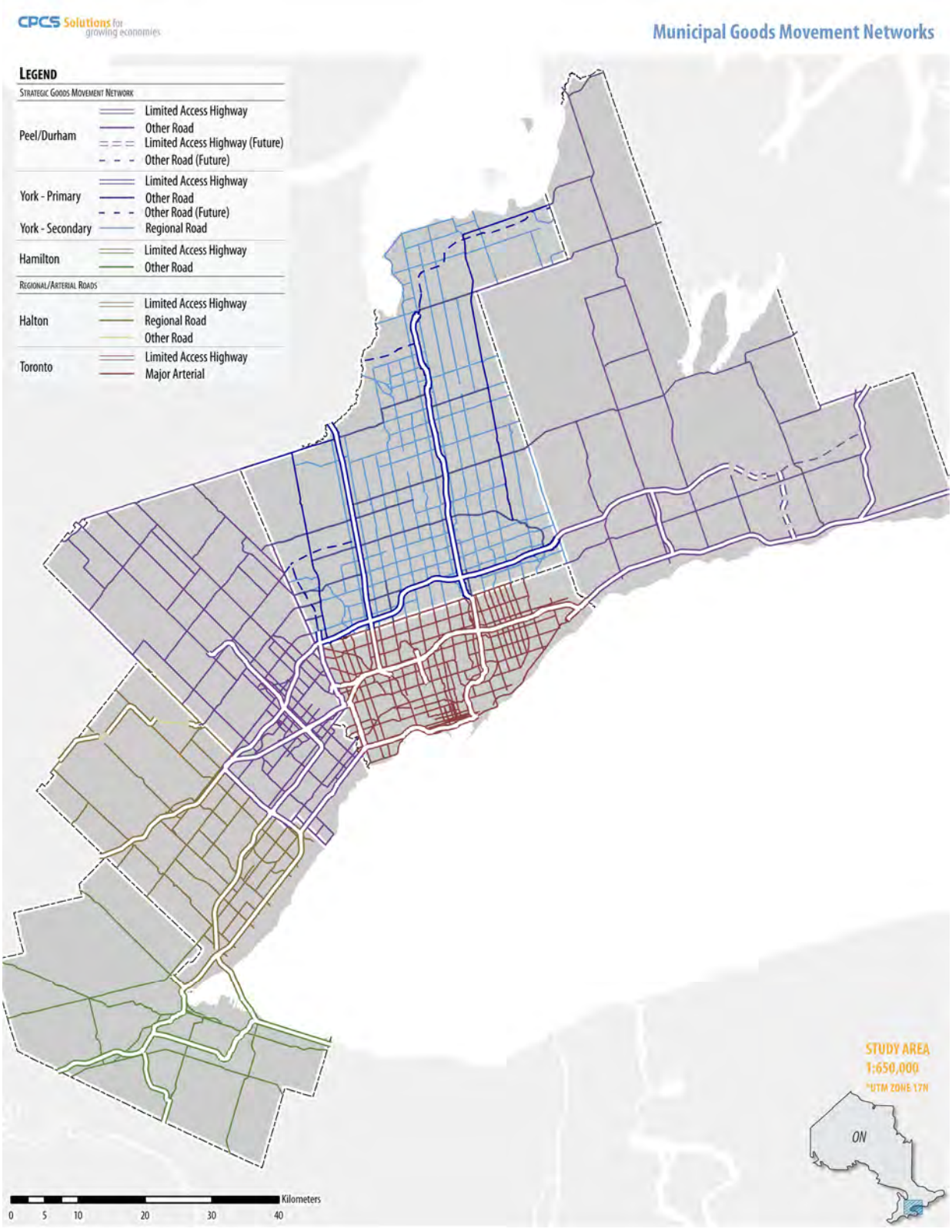
[52] Note that some major arterials in Toronto have time-of-day restrictions.

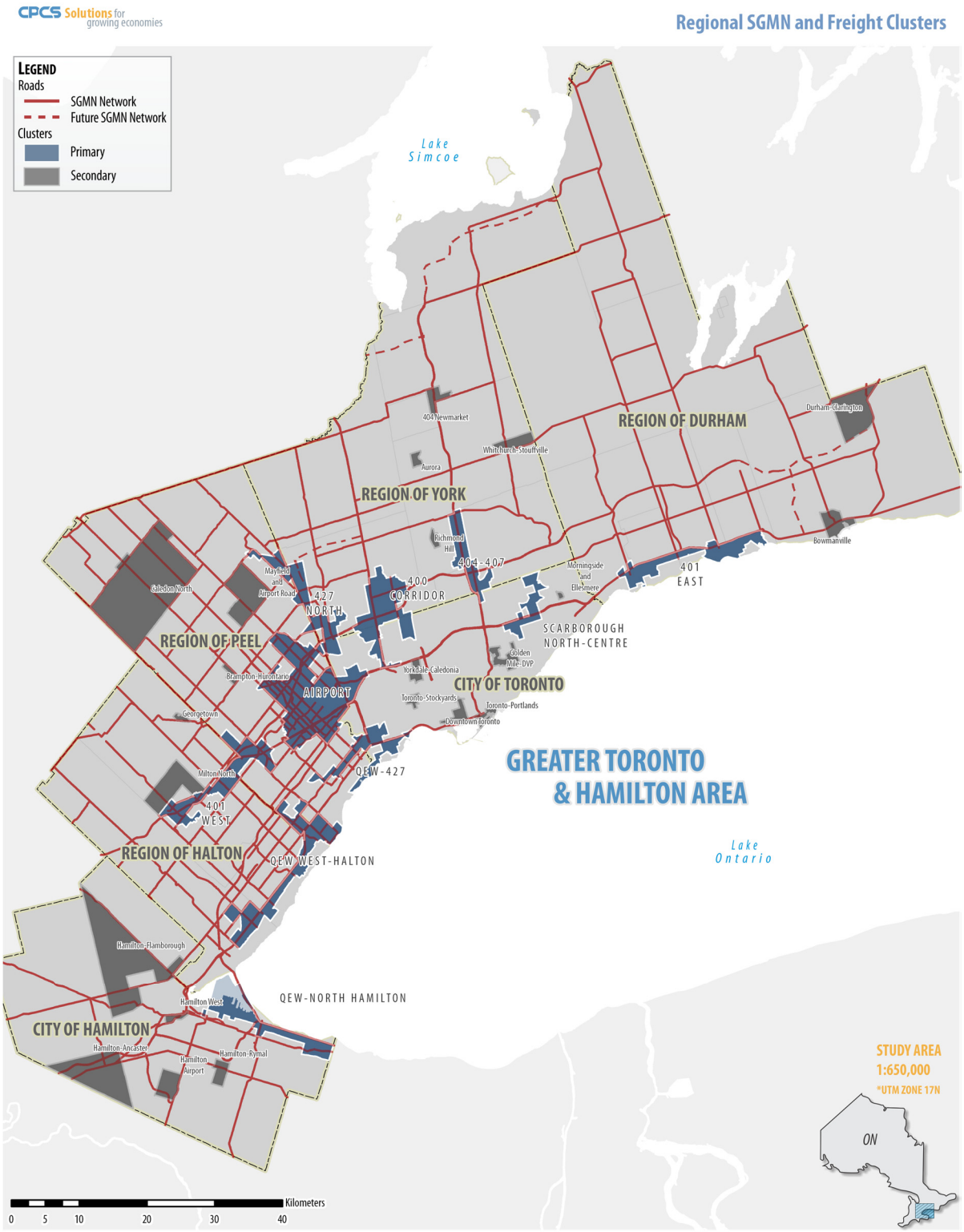
[53] The threshold for "high truck volume" corridors is set at the 80th percentile of road segments with at least 1 truck count recorded (including highways). These figures reflect the maximum volume of either direction for a given road, potentially leading to slight differences with Figure 5-19 near the threshold level of what constitutes a "high volume" corridor.

Figure 5-22. Existing Goods Movement Networks in the GTHA



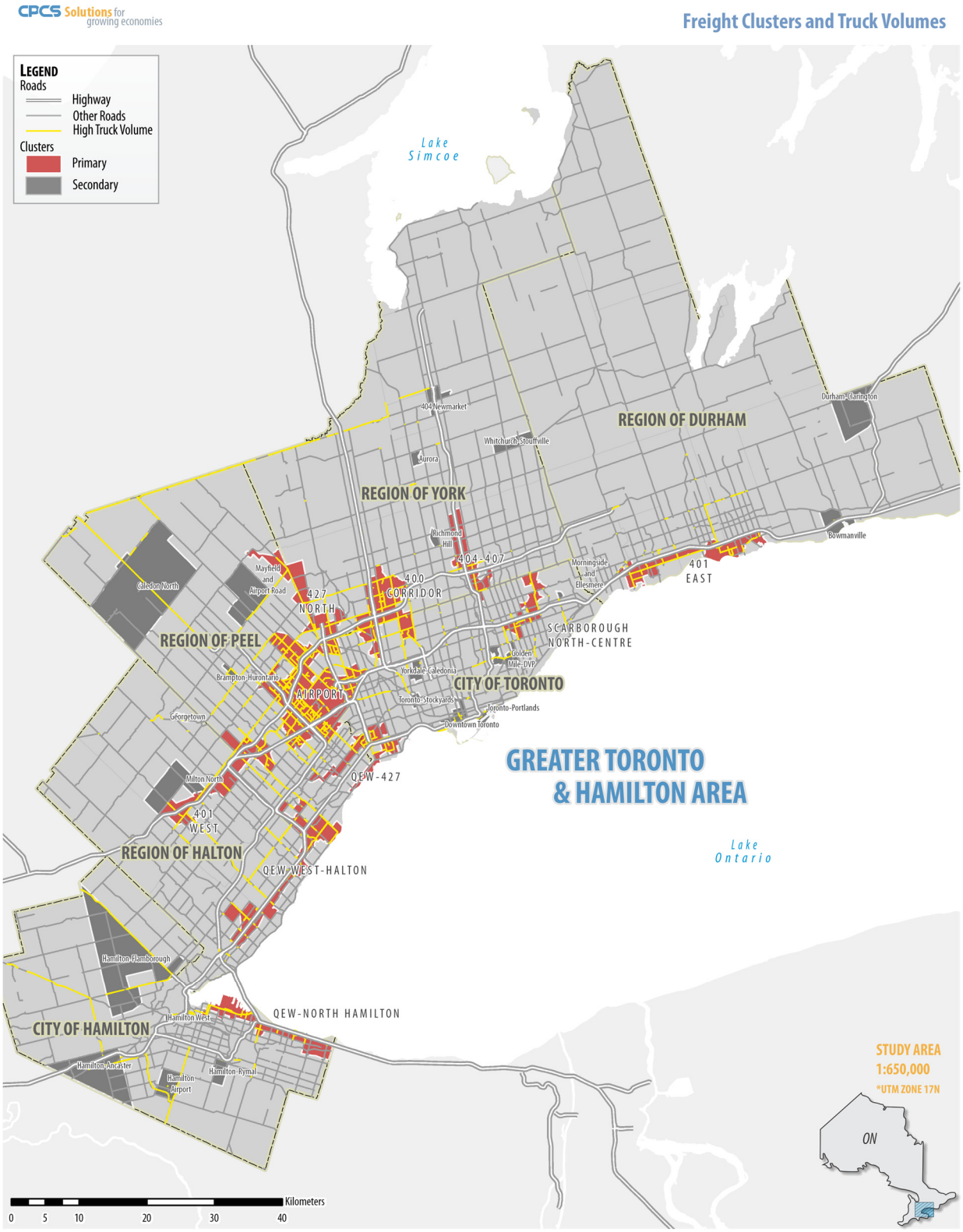
Source: Shapefiles provided to study team by Regions

Figure 5-23. Municipal Goods Movement Networks and Freight Clusters



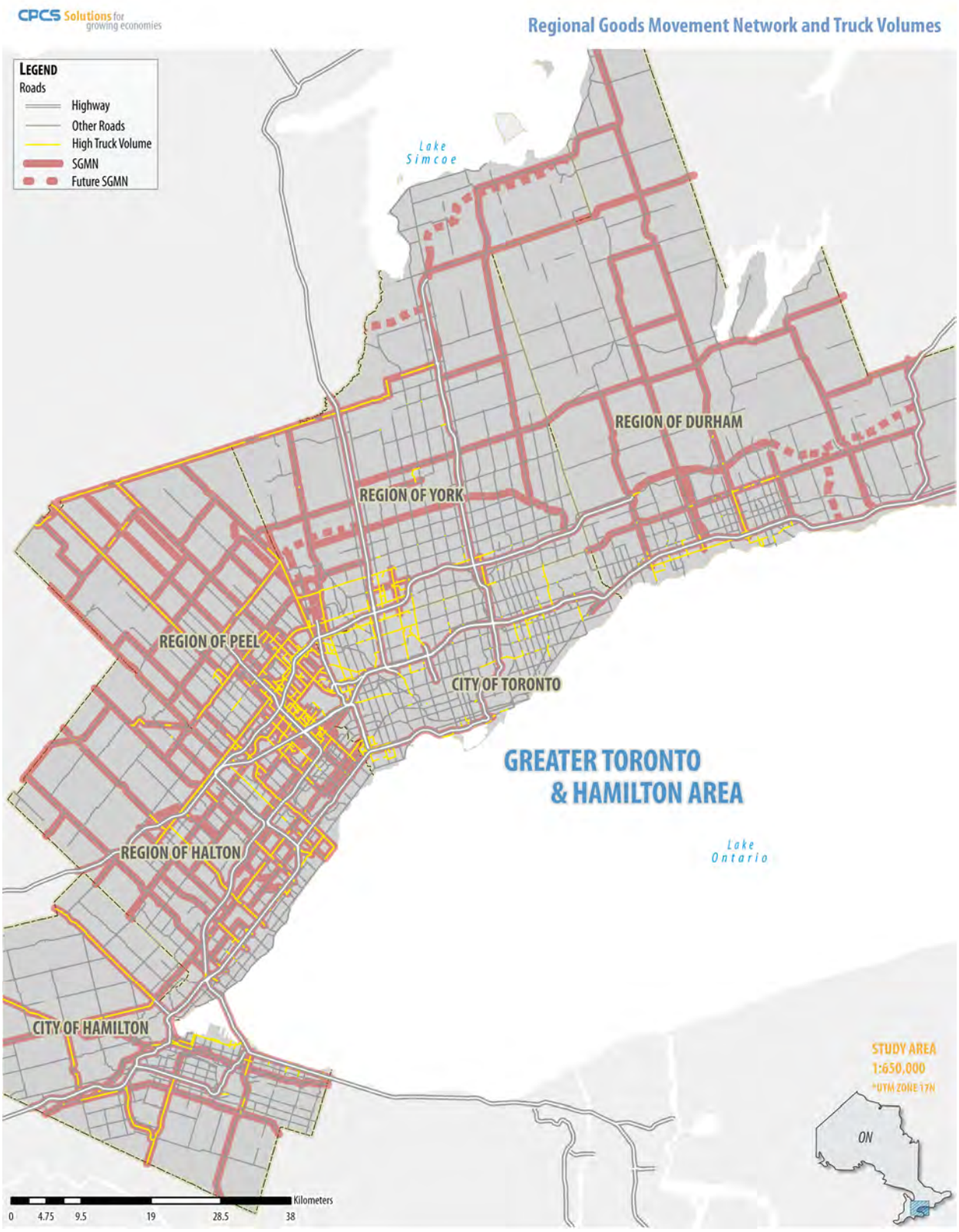
Source: Study team analysis and shapefiles provided to study team by Regions

Figure 5-24. Freight Clusters and Truck Volumes



Source: Study team analysis. Note: Yellow shades on map show off-highway corridors with truck volumes exceeding the 80th percentile of all roads (including highways).

Figure 5-25. Municipal Goods Movement Networks, With Truck Volumes



Source: Study team analysis. Note: Yellow shades on map show off-highway corridors with truck volumes exceeding the 80th percentile of all roads (including highways).

5.7 Metrolinx RTP Major Projects

Metrolinx is planning and implementing several major transit projects across the GTHA, including major light-rail transit (LRT), transit way/bus rapid transit (BRT) and subway extension projects, among others. An important factor in the development of the GTHA-wide SGMN is to avoid or minimize potential conflicts with proposed rapid transit initiatives. This section enumerates eight relevant initiatives whose alignments potentially coincide or intersect with existing SGMNs and regional roads, preparatory to the development of the core SGMN (Chapter 6) and to future resolutions of conflicts if and as they materialize (Chapter 7).

5.7.1 LRT Projects

5.7.1.1 Hamilton LRT

The Hamilton B-line LRT project is currently in the procurement phase, with a preferred proponent to be selected in 2018. Construction is anticipated to start in 2019, with completion targeted for 2024.[54] The LRT will span 14 kilometres, running through downtown Hamilton primarily along Main and King Streets (see Figure 5-26). Of note, these sections of King Street and Main Street are part of the Hamilton SGMN shown in Figure 5-22. As such, it may be necessary to identify an alternative to these sections for the purpose of identifying a region-wide SGMN, depending on the extent to which they can be designed to accommodate both trucks and the new LRT.

Figure 5-26. Hamilton B-line LRT Map

Source: City of Hamilton, https://www.hamilton.ca/city-initiatives/priority-projects/light-rail-transit-lrt.

[54] City of Hamilton, https://www.hamilton.ca/city-initiatives/priority-projects/light-rail-transit-lrt.

5.7.1.2 Hurontario LRT

The Hurontario LRT project is currently in the procurement phase, with a preferred proponent to be selected in 2018. Construction is targeted for completion in 2022.[55] The Hurontario LRT will span 20 kilometres over 22 stops from the Port Credit GO Station in Mississauga to the Gateway Terminal at Steeles Avenue West in Brampton (see Figure 5-27).

The current Peel SGMN designates parts of Hurontario as part of the network, specifically the portion south from the Queensway to the QEW, and north from Derry Road to Steeles Avenue, both of which overlap with the LRT alignment. Further, there are intersections with the SGMN at Courtneypark Drive, Britannia Road, Matheson Boulevard, Eglinton Avenue, Dundas Street, and the Queensway. These intersections would have to be reviewed for their ability to continue to be able to accommodate trucks during and after the construction of the LRT.

Figure 5-27. Hurontario LRT Map

Source: Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/hurontario-lrt.aspx

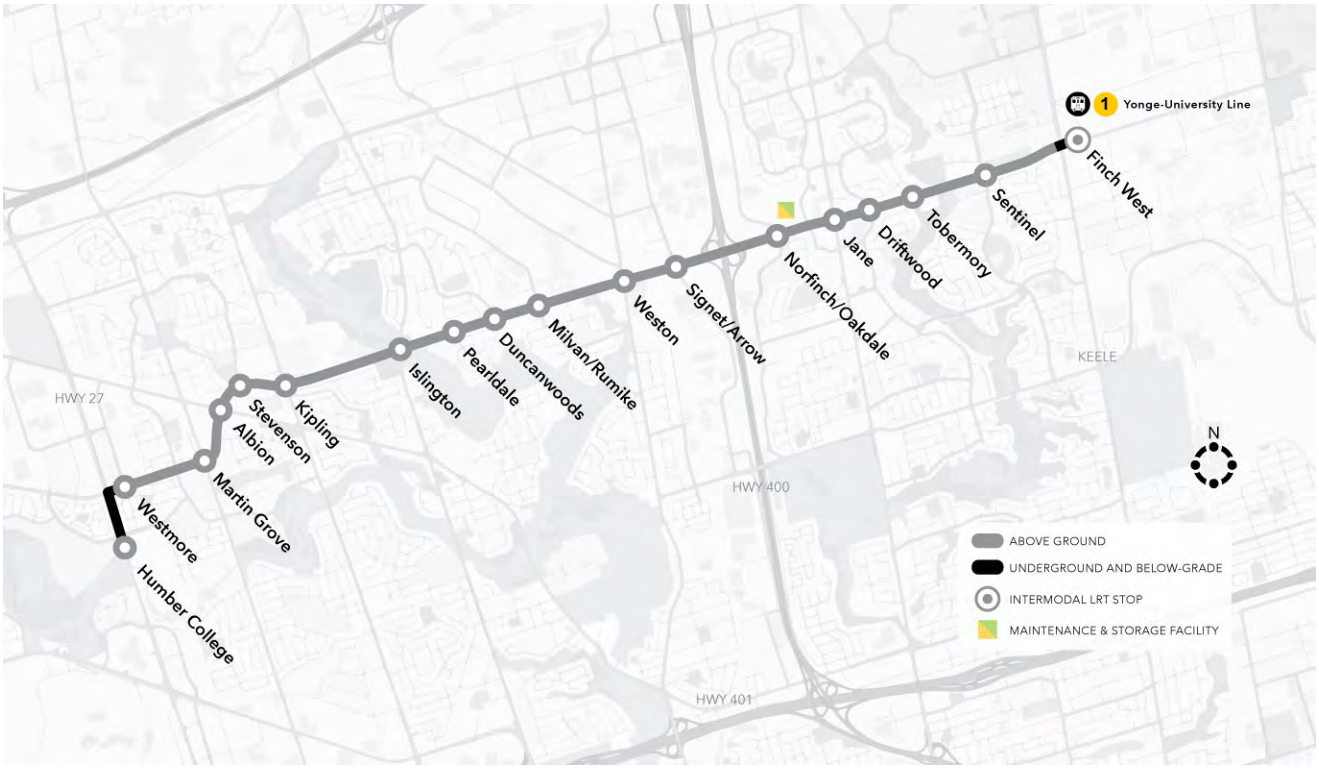
[55] Metrolinx, Hurontario Light Rail Transit.

5.7.1.3 Finch West LRT

The Finch West LRT project is currently in the procurement phase, with a preferred proponent to be selected in 2018. Construction is expected to begin in 2017, and project completion is expected for 2022.[56] The 11-kilometre LRT will connect Humber College in the west and TTC Line 1 in the east at the newly-opened Line 1 extension (see Figure 5-28).

The entire LRT alignment overlaps with a portion of the major arterial road network in Toronto as shown in Figure 5-22. The closest major arterial that runs parallel to Finch over the full length of the planned LRT alignment is Steeles Avenue.

Figure 5-28. Finch West LRT Map



Source: Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/finchwest-lrt.aspx.

5.7.1.4 Eglinton Crosstown LRT

The Eglinton Crosstown LRT is currently under construction, with completion targeted for 2021. The LRT will run 19 kilometres from Mount Dennis in the west to Kennedy Road in the east, where it connects to TTC Lines 1 and 3. The portion of the LRT from Mt. Dennis to Laird will be elevated or tunnelled (see Figure 5-29), with the rest running at grade.

[56] Metrolinx, The Finch West Light-Rail Transit Project.

The entire stretch of Eglinton that will be served by the LRT is part of the major arterial road network as shown in Figure 5-22, and several other major arterials intersect this portion of Eglinton.[57] Lawrence Avenue (to the north) and St. Clair Avenue (to the south) are the closest parallel major arterials. However, both of these links are discontinuous between Mt. Pleasant Road or Bayview Avenue and Don Mills Road.

Figure 5-29. Eglinton Crosstown LRT Map

Source: Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/crosstown.aspx.

5.7.1.5 Sheppard East LRT

The proposed Sheppard East LRT will run 13 kilometres from the Don Mills Sheppard subway terminus to Morningside Avenue. Most of the alignment is expected to be at grade.[58] The entire length of Sheppard Avenue along the at-grade portion of the LRT (and beyond) is part of the major arterial network shown in Figure 5-22, with several other major arterials intersecting. The closest natural alternative to Sheppard through this stretch is Highway 401.

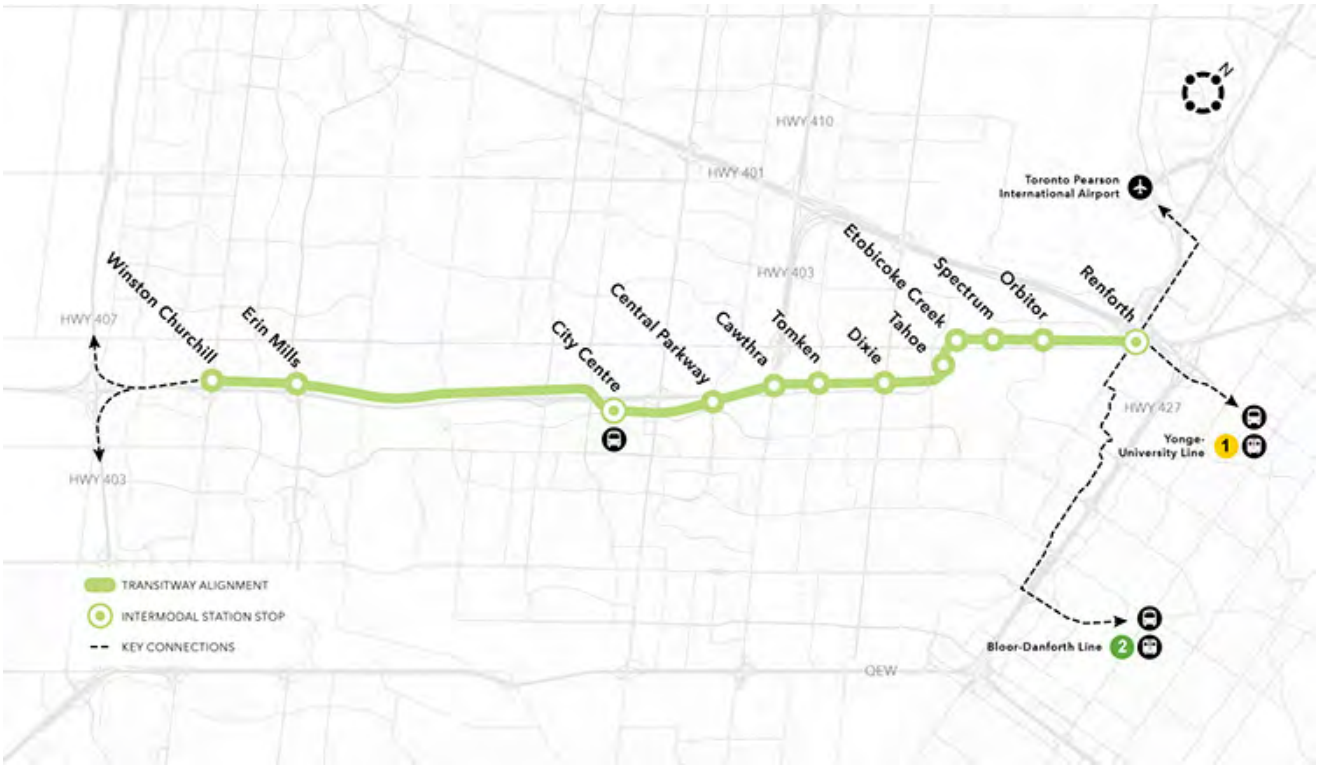
[57] Metrolix, http://www.metrolinx.com/en/greaterregion/projects/crosstown.aspx.
[58] Metrolinx, http://www.metrolinx.com/en/projectsandprograms/transitexpansionprojects/toronto_lrt.aspx.

5.7.2 Other Major RTP Projects of Note

5.7.2.1 Mississauga Transitway

The Mississauga Transitway is comprised of exclusive bus lanes - a mix of dedicated shoulder lanes and dedicated roads - that run largely parallel to Highway 403 across Mississauga. The Transitway is now complete, with the final stations opened in November 2017. As shown in Figure 5-30, it extends 18 kilometres between Winston Churchill Boulevard in the west and Renforth Drive in the east.[59] Because the Transitway operates on newly constructed dedicated lanes and roads, few implications are expected for the SGMN.

Figure 5-30. Mississauga Transitway Map



Source: Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/mississauga-transitway.aspx.

5.7.2.2 York Region vivaNext Rapidways

VivaNext Rapidways are exclusive bus lanes that for the most part run or will run in the centre median of existing roadways. In total, the Rapidways will extend 34 kilometres along Highway 7, Yonge Street and Davis Drive.[60] As shown in Figure 5-31, Rapidways are currently open on sections of Highway 7 (including a connection to the recently-opened Line 1 subway extension to Vaughan Metropolitan Centre) and Davis Drive. The remaining Rapidway sections along

[59] Metrolinx, http://www.metrolinx.com/en/greaterregion/projects/mississauga-transitway.aspx.
[60] Metrolinx, Major Projects by Region.

Highway 7 and Yonge Street are anticipated to be completed by 2021, with future Rapidways planned for the long term along various roads in York Region.

Figure 5-31. York Region vivaNext Rapidways

Source: York Region, http://www.vivanext.com/project_map.

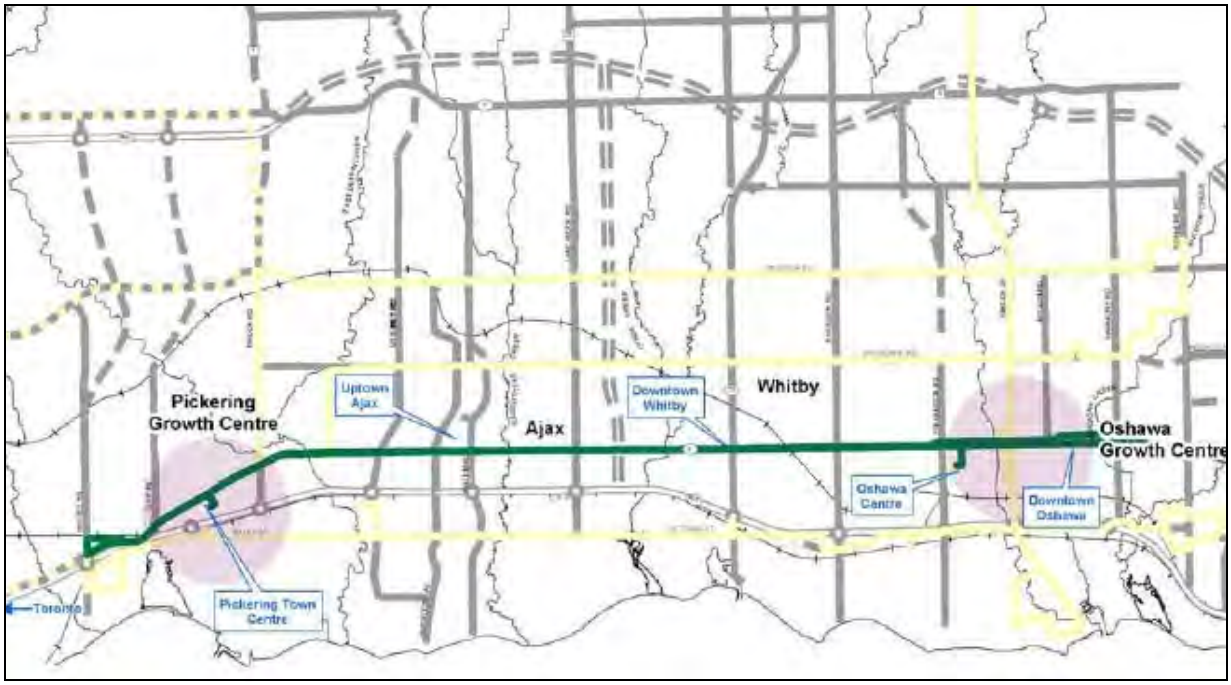
Highway 7 and Yonge Street are part of York Region's secondary SGMN, though not the primary SGMN. There are few intersections between these roads and York Region's primary SGMN. Keele Street, which is part of the primary SMGN intersects Highway 7, while east of

Highway 404, the stretch of Woodbine Avenue that terminates south of Highway 7 is part of the SGMN. Davis Drive is part of the primary SGMN, but the section of Davis Drive where the Rapidway runs is not part of the primary SGMN. Green Lane (north of Davis Drive) serves as the nearest east-west artery that is part of the primary SGMN where the Rapidway runs along Davis Drive.

5.7.2.3 Durham – Scarborough BRT

The Durham – Scarborough Bus Rapid Transit (BRT) initiative, shown in Figure 5-32, proposes a higher order rapid transit service along the Highway 2 corridor in Durham Region, linking Oshawa, Whitby, Ajax and Pickering, and along the Ellesmere Road corridor in Toronto, to connect with the TTC's rapid transit system at Scarborough Centre.[61]

Figure 5-32. Highway 2 Durham – Scarborough Bus Rapid Transit Corridor



Source: Durham – Scarborough Bus Rapid Transit Benefits Case, Metrolinx, June 2010

Phase 1 of the Durham- Scarborough BRT project has received $82.3 million from Metrolinx as part of the Quick Wins program. Phase 1 includes the introduction of DRT (Durham Rapid Transit) PULSE service, which consists of 26 low-floor buses operating at 7.5 minute peak hour frequency between the University of Toronto's Scarborough Campus and downtown Oshawa, construction of segments of curbside bus-only lanes (along with buffered cycling lanes)

[61] Durham – Scarborough Bus Rapid Transit Benefits Case, Metrolinx, June 2010.

through several major intersections along Highway 2 in Ajax and Pickering (approximately 4 km in length) to be completed by 2018 (some sections are already open), and ITS and transit-supportive road infrastructure.

In August 2016, the Province announced funding for an Environmental Assessment and detailed design study to support the implementation of Phase 2 of the BRT along the corridor. Brock Road, Lake Ridge Road and Highway 412 are key SGMN routes that run across the proposed Highway 2 BRT corridor.[62]

5.8 Summary

This chapter has developed initial concepts for a high-level, RTP-compatible Strategic Goods Movement Network for the GTHA. Taking into account the rules and guidelines, the SGMN integrates three components:

- Key freight generators ('clusters') and key goods movement corridors, as determined by an analysis of freight flows and employment data.
- Existing and planned SGMNs developed and proposed by the GTHA's upper-tier municipalities.
- Proposed rapid transit network improvements.

Some gaps and potential conflicts remain to be resolved in the derivation of the core road SGMN and in future SGMN updates, notably:

- An appropriate and reasonable density for the SGMN's road components across the entire GTHA. In particular, there may be a need to define a core GTHA-wide SGMN that sits on top of the hierarchy of existing regional SGMNs, taking into account relative truck volumes, locations of clusters and land use, among other factors. Secondary clusters, especially in the City of Toronto, also must be connected.
- The need to account more precisely potential conflicts with major transit investment plans, and to identify possible resolutions to these conflicts. An initial review identifies several potential conflicts – that is, SGMN road sections or intersections that intersect the proposed LRT projects:
    - Hamilton LRT: King Street and Main Street
    - Hurontario LRT: Steeles Avenue to Derry Road, Queensway to the Queen Elizabeth Way, and six intersections.

[62] Source: Information provided by Durham Region, e-mail of March 22, 2017.

- The Toronto LRTs are on major arterials, some of which offer the best long distance routes through the City of Toronto and thus would be natural candidates for inclusion in the SGMN. Of note, if Eglinton Avenue East between Bayview and Don Mills is excluded from the SGMN, there are no nearby parallel routes that could serve as a meaningful alternative to ensure the connectivity of the SGMN.
- Durham – Scarborough BRT: Brock Road, Lake Ridge Road and Highway 412 intersect the proposed Highway 2 BRT corridor.
- There are few conflicts between the primary York Region SGMN and the VivaNext Rapidways – mainly two intersections on Highway 7.

These gaps and potential conflicts are considered in subsequent chapters.

6 Derivation of Core SGMN

Key Chapter Takeaway

This chapter presents the final road/highway and rail SGMN. It explains the steps and factor that were used to develop the SGMN. It also notes how the SGMN relates to Metrolinx's draft Regional Transportation Plan.

6.1 Introduction

This chapter explains the derivation of the final or 'core' Strategic Goods Movement Network for the GTHA. These concepts were based upon a data-driven definition of a network that connects key freight-generating clusters, overlaid with existing regional and municipal SGMNs. The core road SGMN now refines the concepts to develop a single consistent, GTHA-wide network that connects the freight-generating clusters and addresses several gaps in the initial compilation. The term 'core' reflects the distillation of the various conceptual road networks into a single SGMN that addresses GTHA-wide needs. The chapter also develops a core rail SGMN.

The derivation of the core SGMN takes into account three rounds of comments that were provided by Steering Committee members and by members of the study Review Group regarding the concepts, an initial circulation of a draft SGMN in June 2017 and a final circulation of the draft SGMN in August-September 2017.

The final road and rail SGMN is presented here. Note that Metrolinx has included the final road SGMN in its September 2017 Draft Regional Transportation Plan, which has been made available for public comment. Comments on the Draft RTP are not due until late 2017, so any subsequent comments on the SGMN must be addressed separately.

The road and rail SGMNs are presented separately. The derivation of the core road SGMN is described in Section 6.2. The derivation of the core rail SGMN network is described in Section 6.3. GIS files of the two core networks have been provided separately to Metrolinx.

6.2 Core Road SGMN

6.2.1 Overview

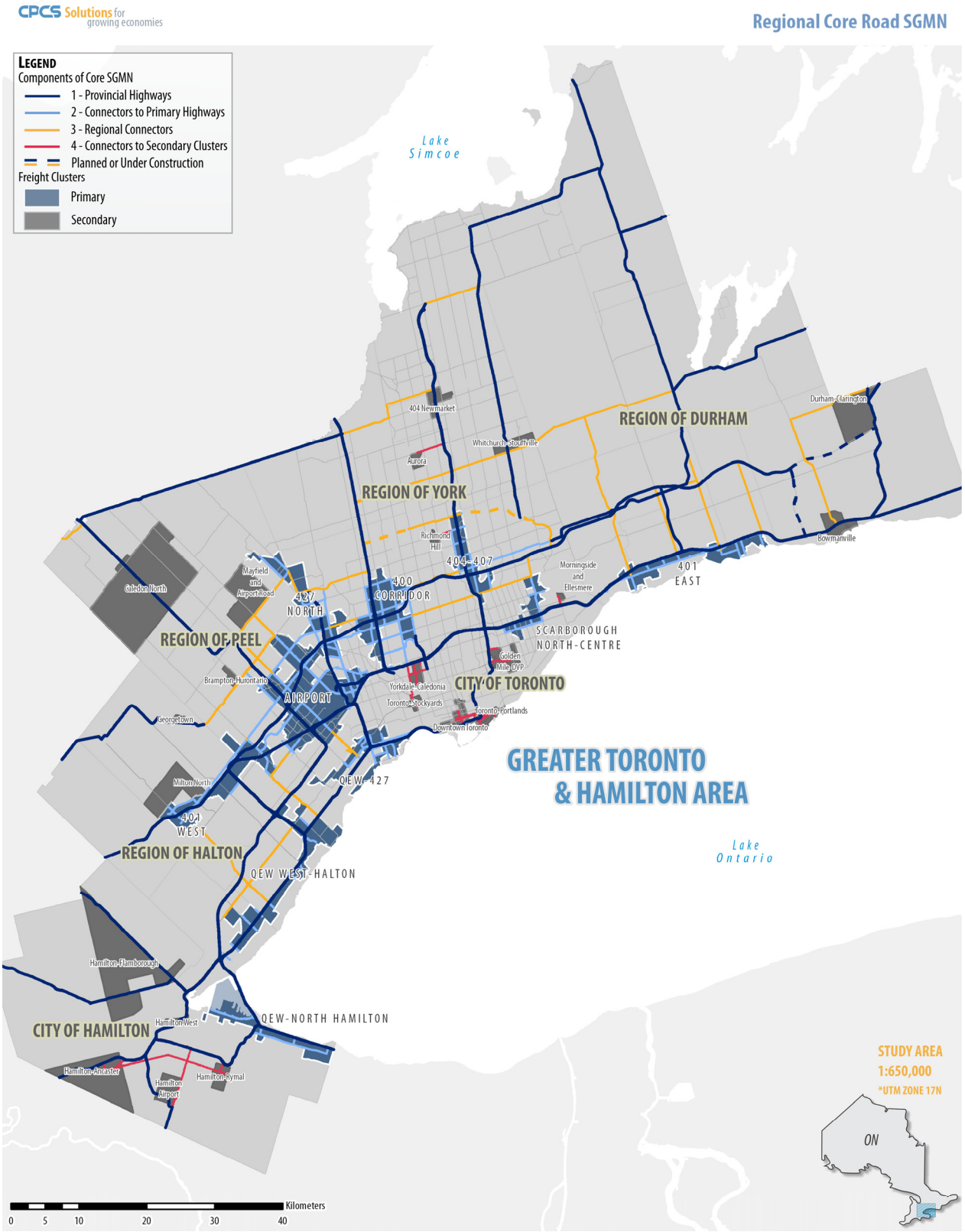
Figure 6-1 presents the core road SGMN. Detailed maps of each of the six upper-tier municipalities are provided in Appendix B. The ensuing sections describe the multi-step procedure that was used to develop the core SGMN. Several premises should be noted first:

- "Regional" means that this SGMN applies to the entire study region, i.e. the GTHA. The roads included in the network are deemed to be of regional importance.
- The core road SGMN is not meant to replace or conflict with other SGMNs, including ones already defined by the Regions of Durham, Peel and York and by the City of Hamilton.[63] Rather, the core SGMN is meant to fulfill the objective of linking together the most important freight clusters and freight corridors in the region, with the goal of enhancing the economic prosperity of the region through safe and efficient freight transportation. The core SGMN complements, and is a subset of, the network concept that compiles and builds on the municipal SGMNs, as shown in Figure 5-22. The core network in no way replaces individual SGMN designations that have been adopted by various upper-tier municipalities for their own roads.
- "Road" indicates that this SGMN does not cover other modes of transportation such as rail, water or air. However, access to the intermodal terminals and ports is taken into account and, as noted, a separate map is provided to cover the SGMN rail network. References to the term 'road' are assumed also to include 'highways.'
- To ensure consistency across the region, the core SGMN is not limited to the roads that the four upper-tier municipalities have identified in their own SGMNs. However, note that only upper-tier roads and provincial highways are included in the core SGMN. No lower-tier roads are included in the core SGMN, even if they have been included in individual SGMNs (as is the case with Peel Region's SGMN).[64]

[63] As described in Section 2.5.1.

[64] However, future updates to the GTHA-wide SGMN could consider selected lower-tier roads in exceptional cases, for example when they are carrying high volumes of trucks as part of the first/last kilometre connections between key generators or terminals and highways or upper-tier roads. In the meantime, the proposed implementation plan recommends that upper-tier municipalities establish this connectivity by developing their own secondary SGMNs in collaboration with their lower-tier municipalities (proposed action 11). See Section 6.2.5 for details.

Figure 6-1. Regional Core Road SGMN



- The core SGMN only considers currently existing and planned roads, and not proposed ones, except in such a case as an upper-tier municipality has already included a proposed upper-tier road in its SGMN. This occurred only in York Region. Highway 407 East Phase 2B is also included, with the dashed lines indicating that the highway is under construction.[65] Regardless, it should be emphasized that the SGMN is not meant to be static, but will be refined as conditions change, particularly with respect to the emergence of new freight clusters and as new roads and highways are constructed.

- Figure 6-1 shows the primary freight clusters (blue areas) and the secondary freight clusters (grey areas). Their boundaries correspond to Transportation Analysis Zones (TAZs), which are geographies that are commonly used in the GTHA's travel models and data. Data from MTO's CVS and ATRI were used to define the freight clusters, and were provided to the consultant according to the TAZ geographies.[66] Again, the reader is reminded that the **TAZ boundaries do not necessarily reflect actual employment areas and, in some cases, may incorporate other land uses. While these geographies are adequate for the purposes of this analysis, they should not be construed as reflecting land uses that have been designated in municipal Official Plans.**

  Note that these clusters are defined as a function of the actual truck volumes that have been observed in the CVS and ATRI data sets. As a result, some lands that have been designated in municipal Official Plans as future employment centres do not currently have sufficient (or any) truck traffic to be designated as a primary or secondary freight cluster. Nonetheless, the SGMN has accounted for these future generators, as described in Section 6.2.3.5 and as listed in Table 6-8. As part of the monitoring and periodic updating of the SGMN, these future generators should be reviewed along with the primary and secondary freight clusters.

Table 6-1 outlines the key technical principles that were applied in the development of the core SGMN. These technical principles assured a rigorous, clear, transparent, systematic and consistent treatment across the GTHA.

Table 6-1. Key Technical Principles

Key Technical Principles
• Encompasses most important, most highly used corridors • Provides access to most important freight clusters • Direct and connected routes • Continuous across jurisdictional boundaries • Supports redundancy and reliability

[65] The section of Highway 407 East between Harmony Road and Taunton Road / Highway 418 is scheduled to open in early January 2018, and so Figure 6-1 depicts that section as a solid line. See https://news.ontario.ca/mto/en/2017/12/ontario-opening-new-stretch-of-highway-in-durham-region.html?_ga=2.61036905.451948633.1513621937-1074537684.1420212591

[66] For details, see Chapter 5.

6.2.2 Five Steps for Developing the SGMN

Drawing together the aforementioned technical principles, the core road SGMN is developed in five sequential steps. The steps are shown in order of importance in Table 6-2 below, along with the explanation for their placement in the sequence. It can be seen that, using the major highway and expressway network as its backbone, the primary and secondary freight clusters are then connected. The steps and the sequences are detailed in the ensuing sections.

Table 6-2. Five Steps for Developing the SGMN

Step	Explanation
1. Include all provincial highways	These corridors are the backbone of the regional freight network.
2. Ensure direct connectivity to primary freight clusters	The primary freight clusters are the engines of the regional freight economy. Key is connectivity from these clusters to 400-series highway network.
3. Support reliability for primary clusters and provincial highways	Further bolster accessibility to primary clusters and to provincial highways by ensuring network of linkages to support reliability, through directness, connectivity and redundancy.
4. Ensure access to secondary freight clusters	Secondary clusters, though not as critical as primary clusters, require access to provincial highway network.
5. Ensure compatibility with land use, road restrictions and rapid transit plans	Consider removing and providing alternatives to any corridors that are deemed incompatible with these factors, or adding any other corridors that provide access to future freight centres such as planned employment areas.

6.2.3 Development of the Core Road SGMN

This section describes the development of each step. This development allows a systematic designation of the core SGMN elements throughout the GTHA. The five steps were developed in sequence and, through steps 1-4, road segments were added to the SGMN if they met a sufficient number of criteria. In step 5, the network was mapped so as to visually assess any missing links that otherwise have not been identified – for example, to close obvious gaps.

Step 5 also identified road sections for possible subsequent removal from the core SGMN, in order to avoid conflicts with rapid transit lines that are under construction or are planned and to account for structural restrictions. Methods for developing alternatives to these sections are considered in Chapter 7.

Section 6.2.4 provides additional explanatory notes on the derivation of the core road SGMN.

6.2.3.1 Step 1: Include all provincial highways

Step 1 includes in the core network all provincial highways, including 400-series and equivalent municipal highways as well as King's Highways. These highways are the backbone of the regional road freight network. They help ensure the safe and efficient movement of

goods into, out of, across and through the region. These are listed in Table 6-3 below. They are shown in **dark blue** on the accompanying map in Figure 6-1.

Table 6-3. Provincial and Equivalent Highways (Step 1)

Category	Corridors
All 400-series and equivalent highways	Highways 400, 401, 403, 404, 407*, 409, 410, 412, 418, 427, Queen Elizabeth Way, Gardiner, Don Valley Parkway, Allen Road **, Red Hill, Lincoln Alexander
All King's highways	Highways 5, 6, 7/7A, 8, 9, 10, 12, 35, 48, 115

* Note that Phase 2 of the Highway 407 East is under construction. The section of Highway 407 East between Harmony Road and Taunton Road / Highway 418 is scheduled to open in early January 2018, and so Figure 6-1 depicts that section as a solid line.
** Note that the Allen Road is included only as far south as Lawrence Avenue West, at which it is connected to a red (secondary) connector. This ensures network connectivity. Otherwise, the Allen Road would end at Eglinton Avenue West, which is not part of the SGMN. See Section 6.2.3.4 for more information.

6.2.3.2 Step 2: Ensure direct connectivity to primary freight clusters

Step 2 provides accesses to the primary freight clusters. These clusters are critical to the region's economic competitiveness and therefore truck access from these clusters to the provincial highway network (especially 400-series highways) is imperative. Specifically, it is important that the roads to, from and within these clusters provide safe, direct and effective truck access to the aforementioned highway network.

Under Step 2, the following criteria were used to determine inclusion in the regional core SGMN:

i. The roads should facilitate access between the cluster and the 400-series and equivalent highway network, including by leading directly to an interchange or by leading to redundant access points to the highway network;

ii. The roads should facilitate access to commercial/ industrial areas within the clusters, with the target that any such parts of a cluster should not be more than 1 km from a core SGMN corridor providing reasonably direct access to 400-series highways;

iii. The roads should not pass through a strictly residential area or other sensitive area (e.g. roads with extended residential land uses on both sides), unless no other direct access points are available;

iv. The roads should be higher-order rather than local roads, specifically either:

    a. Regional roads (for regional municipalities) or arterial roads (otherwise); or

    b. Identified by an upper-tier municipality as a (primary) SGMN corridor.

With respect to arterial roads in the City of Toronto, which are sub-classified by the City as major and minor arterials, the approach was to use major arterials except in the case that these are insufficient to meet the other criteria, in which case minor arterials were selectively employed as needed to meet the criteria.

Table 6-4 below lists the corridors that are added through Step 2. These corridors are shown in **blue** on the accompanying map in Figure 6-1. The table has three special designations that should be noted:

- The corridors designated in **bold** are also identified by the upper-tier municipalities in their respective SGMNs.
- Those corridors that are designated with a single asterisk (*) are included in the regional SGMN, but not over the full length that is included in Table 6-4. This applies only to selected segments in Durham Region.
- Those corridors that are designated with dual asterisks (**) are also designated as 'primary' segments in the respective SGMNs (noting that not all SGMNs make this distinction). This applies only to selected segments in York and Peel regions.[67]

Table 6-4. Direct Highway Connections to Primary Freight Clusters (Step Two – **Blue Connectors**)

Category (Cluster)	Corridors
401 East	Whites Rd from Bayly to 401 **Brock Rd from Montgomery Pk Rd to 401*** Westney Rd from Bayly to 401 Salem Rd from Bayly to 401 **Lake Ridge Rd from Bayly/Victoria to 401** Brock St from Victoria to Consumers Dr **Thickson Rd from Wentworth to Consumers Dr*** Stevenson Rd from Philip Murray to Champlain Park Rd from Philip Murray to Bloor **Farewell St from Harbour Rd to 401** **Bayly/Victoria/Bloor from Whites Rd to Harmony*** Consumers/Champlain from Brock St to Stevenson Rd
Scarborough North-Centre	Markham Rd from Ellesmere to Steeles Finch Ave from Middlefield to Neilson McCowan Rd from Ellesmere to 401 Kennedy Rd from Ellesmere to 401 Warden Ave from Ellesmere to 401 Ellesmere Rd from Warden to Markham
404-407	Hwy 7 from Leslie to Donald Cousens Pkwy 16th Ave from Leslie to Woodbine Major Mackenzie from Leslie to Markland Elgin Mills from Leslie to Woodbine Leslie from 407 to Elgin Mills **Woodbine from Steeles to 16th Ave** Woodbine from 404 to Steeles

[67] The GTHA-wide SGMN does not otherwise distinguish these primary segments. However, York and Peel might do so in their respective planning and improvement decisions.

Table 6-4. Direct Highway Connections to Primary Freight Clusters (Step Two – **Blue Connectors**)

Category (Cluster)	Corridors
	Warden from Steeles to 407
400 Corridor	Dufferin from Allen Rd to Langstaff Rd **Keele from 401 to Rutherford Rd**** Jane from Black Creek to Wilson Jane from Steeles to Rutherford Rd Weston Rd from Finch to Rutherford Rd Pine Valley Dr from Steeles to Hwy 7 Wilson Ave from Jane to Wendell Ave Sheppard from Dufferin to Keele Finch from Milvan Dr to Dufferin Steeles from Hwy 27 to Dufferin Hwy 7 from Langstaff Rd to Pine Valley Dr **Langstaff Rd from Hwy 7 to Weston (Jane to Keele is conceptual)** Rutherford Rd from Keele to Weston
427 North	**Hwy 27 from Rexdale Blvd to Major Mackenzie**** **Highway 50 from Steeles to Queensgate Blvd**** Coleraine Dr from Mayfield Rd to Manchester Ct Mayfield Rd from Hwy 50 to Coleraine Dr **Major Mackenzie from Hwy 27 to Hwy 50** **Rutherford Rd from Hwy 27 to Hwy 50** **Langstaff Rd from Hwy 27 to Hwy 50** Hwy 7/Queen St from Hwy 27 to Goreway **Steeles from Hwy 27 to Goreway**** Albion Rd from Hwy 27 to Steeles Finch Ave from Hwy 27 to Steeles
Airport	**Britannia Rd from Hurontario to Erin Mills Parkway** **Derry Rd from 427 to Mississauga Rd** **Steeles Ave from Goreway to Kennedy** **Queen St from Goreway to Kennedy** Islington Ave from Rexdale Blvd to 401 Kipling Ave from Taber Rd to 401 Martin Grove Rd from Rexdale Blvd to 401 Hwy 27 from Rexdale Bvd to 401 Renforth Dr from Eglinton to Carlingview Carlingview Dr from Renforth to Disco Rd Disco Rd/Goreway from Carlingview to Derry Dixon Rd from 401 to 427 Rexdale Blvd from Islington to 427 **Airport Rd from 427 to Bovaird** **Dixie Rd from Eastgate Pkwy to Queen** **Kennedy Rd from Steeles to Bovaird**
QEW-427	Islington Ave from Lake Shore to The Queensway Kipling Ave from Lake Shore to Norseman Dr Brown's Line from Lake Shore to 427 The East Mall from the Queensway to Dundas The West Mall from QEW to Dundas

Table 6-4. Direct Highway Connections to Primary Freight Clusters (Step Two – **Blue Connectors**)

Category (Cluster)	Corridors
	Evans Ave from the West Mall to Islington Ave Horner Ave from Brown's Line to Kipling Ave Park Lawn Rd from The Queensway to QEW The Queensway from S Kingsway to Toronto/Peel boundary **The Queensway from Toronto/Peel boundary to Cawthra**** Dundas from the East Mall to Toronto City Limits **Dixie from QEW to Dundas** **Cawthra from QEW to Dundas**
401 West	**Erin Mills/Mississauga Rd from Britannia to Steeles** Winston Churchill from 401 to Steeles Trafalgar Rd from Derry to Steeles Derry Rd from Trafalgar to 407 Steeles Ave from Mississauga Rd to Industrial Dr James Snow Pkwy from 401 to end RR 25 from Steeles to 5 Sideroad
QEW West-Halton	Ford Dr from Cornwall Rd to QEW Winston Churchill from QEW to Dundas Dundas from Winston Churchill to 403 Trafalgar Rd from Cornwall Rd to Leighland Ave Dorval Rd from Speers Rd to N Service Rd Bronte Rd from Speers Rd to N Service Rd Burloak Dr from Harvester Rd to Mainway Appleby Line from Fairview St to Upper Middle Rd Guelph Line from Fairview St to Mainway Brant St from Fairview St to N Service Rd
QEW – N Hamilton	N Tesla Blvd/Burlington St from Victoria Ave to QEW Woodward Ave/Eastport Dr from N Tesla Blvd to Hamilton City Limit Barton St from Red Hill Valley Pkwy to Fifty Rd **Centennial Pkwy from Barton St to QEW** Fruitland Rd from Barton St to QEW Fifty Rd from Barton St to QEW

Note: Bold indicates already part of the SGMN for RM/City. A single asterisk indicates that part of the identified route is included in Durham Region's SGMN. Dual asterisks indicate that the identified route is also designated as a primary segment in the York or Peel SGMN.

6.2.3.3 Step 3: Support reliability for primary clusters and provincial highways

Step 3 promotes reliability by strengthening the regional connectivity between the primary clusters and the highways. This step builds on the previous step, which focused on connecting the primary clusters to the nearest highways. To support reliability, trucks require not just multiple access points to a single highway but also multiple ways of accessing and traversing the highway network as a whole. The focus of this step is directness and redundancy for the 10 primary freight clusters and the highway network, both of which are critical for the GTHA's economic success.

Specifically, the principles supporting Step 3 are the following:

i. Ensuring connectivity between primary clusters. To a large extent, connectivity between primary clusters is achieved through the existing provincial highway network. However, there are some cases in which the connectivity is inadequate, for example between Milton and Burlington (where the most direct 400-series highway connection is highly circuitous).

ii. Ensuring connectivity from primary clusters to parallel/redundant 400-series highways. This supports reliability, for example in the event that there are incidents on particular highways that necessitate rerouting.

iii. Ensuring connectivity between parallel/redundant 400-series highways, which likewise helps to support reliable freight movement.

Following from the above principles and to assist with defining the criteria for this step, interior and outer areas of the GTHA were defined. An interior area is one that matches at least one of the following (and an outer area one that matches none of the following points):

i. located geographically between two primary freight clusters, or

ii. located between a primary cluster and a 400-series highway that is within 10 km of the cluster;

iii. located between two parallel 400-series highways within 15 km of one another.

Under Step 3, the following criteria were considered:

i. Is the road identified in a RM/City SGMN as a primary truck corridor;

ii. Is the road a regional road (in the case of regional municipalities) or arterial road (otherwise)

and,

iii. Does the road have high truck volumes, as evidenced by available ATRI GPS data on relative truck volumes, indicating its importance as a regional connector;

iv. Does the road serve as a parallel route to a tolled highway, within an interior area;

v. Is the road otherwise necessary in order to ensure a dense grid within the interior area, specifically a spacing of no more than 10 km between SGMN corridors.

For this step, in order to be included in the core regional SGMN, a given road had to satisfy at least one of points (i) and (ii), and also at least one of points (iii) to (v).

Table 6-5 below lists the corridors that are added through Step 3. The table also indicates the specific criterion or criteria according to which each corridor was added. These corridors are shown in **orange** on the accompanying map in Figure 6-1.

Table 6-5. Regional Connections to Support Reliability (Step Three – Orange Connectors)

Category	Corridors	Justification
Regional Connectors	Orangeville Bypass from Town Line to Hwy 10	(i)(ii)(iii)
	Bronte Rd / RR 25 from QEW to Derry	(ii)(iii)(v)
	Dundas St from 407 to 403	(ii)(iv)
	Erin Mills Pkwy from QEW to Britannia	(i)(ii)(iv)
	Steeles Ave from Industrial Dr to Dufferin St	(i)(ii)(iii)(iv)
	Mayfield Rd from 410 to Hwy 50	(i)(ii)(v)
	Bovaird Dr from Hwy 7 (Georgetown) to Airport Rd	(i)(ii)(iii)
	Dixie from QEW to Eastgate Pkwy	(i)(ii)(v)
	Dixie from Queen to Mayfield	(i)(ii)(v)
	Airport Rd from Bovaird to Mayfield	(i)(ii)(v)
	Hwy 7 from 427 to Leslie	(ii)(iii)(iv)
	Steeles Ave from Dufferin to Warden	(i)(iv)(v)
	Markham Rd from Steeles to 407	(ii)(v)
	Major Mackenzie from 400 to Mayfield (some sections are conceptual)	(i)(v)
	Donald Cousens Pkwy from 48 to 407	(i)(ii)
	Markham Bypass from 407 to 400 (some sections are conceptual)	(i)(v)
	Bloomington Rd from York/Durham boundary to 400 (some sections are conceptual)	(i)(v)
	Green Ln / Davis Dr W from 404 to 400	(i)(v)
	Ravenshoe Rd from 404 terminus to 48	(i)(ii)
	Regional Hwy 47 / Goodwood Rd from York-Durham boundary to Hwy 7 & 12	(i)(v)
	Brock Rd from Bayly to Goodwood	(i)(v)
	Lake Ridge Rd from Bayly to 407	(i)(iv)(v)
	Thickson Rd from Victoria to Baldwin St N	(i)(iv)(v)
	Harmony Rd from Bloor to 407	(i)(iv)(v)
	RR 57 from 401 to RR 20	(i)(iv)(v)
	RR 20 from RR 57 to Hwy 35	(i)(iv)(v)

6.2.3.4 Step 4: Ensure access to secondary freight clusters

Although they do not approach the economic importance of the primary clusters in terms of freight movement, the 22 secondary clusters are still sufficiently important to merit consideration as origins and destinations of significant freight trips. As with the 10 primary clusters, it is important that the 22 secondary clusters also have access to the provincial highway network. Secondary clusters are distinguished in two key ways in this analysis:

i. Secondary clusters require access to at least a provincial highway, whether or not that is a 400-series or equivalent municipal highway or a King's Highway;

ii. Redundant access points and routes are not as critical for secondary clusters, from a regional perspective (notwithstanding the local importance of redundant connectivity).

Specifically, the considerations applied in this step were as follows:

i. If the cluster is already connected to provincial highways, either directly or by roads that have already been added to the core regional SGMN, no further action is needed;

ii. Otherwise, the cluster should be connected to the nearest provincial highway in the most logical manner, utilizing:

   a. Roads that are already part of a RM/City SGMN

   b. Otherwise, regional or arterial roads that are most direct, with consideration given to avoiding strictly residential areas if possible

iii. Additionally, if the cluster is proximate to both north-south and east-west provincial highways, connections to each should be considered

Table 6-6 lists the corridors that are added through Step 4. These corridors are shown in **red** on the accompanying map in Figure 6-1.

Table 6-6. Connections to Secondary Freight Clusters (Step Four – **Red Connectors**)

Category (Cluster)	Corridors
Durham-Clarington	Satisfied by 115
Bowmanville	Satisfied by 401
Morningside-Ellesmere	Morningside Ave from 401 to McLevin
Golden Mile-DVP	Eglinton Ave from Birchmount to Don Mills Lawrence Ave from Carnforth Rd to DVP
Toronto-Portlands	Cherry St from Lake Shore to Unwin Lake Shore Blvd from Leslie to Cherry Leslie St from Lake Shore to Unwin Carlaw Ave from Lake Shore to Unwin Don Rdwy from Lake Shore to Commissioners Commissioners St from Leslie to Cherry
Downtown Toronto	Eastern/Richmond from DVP to Spadina Eastern/Adelaide from DVP to Spadina York/University from Harbour St to Dundas
Toronto Stockyards	Keele St from 401 to Rogers Rogers Rd from Keele to Weston Weston Rd / Keele St from Rogers to Dundas W
Yorkdale-Caledonia	Dufferin St from 401 to Yorkdale SC entrance Bridgeland Ave from Dufferin to Caledonia Caledonia Rd from Bridgeland to Bowie Lawrence Ave W from Allen Rd to Keele

Table 6-6. Connections to Secondary Freight Clusters (Step Four – **Red Connectors**)

Category (Cluster)	Corridors
Richmond Hill	Elgin Mills from Yonge to 404
Aurora	Wellington St from Industrial Pkwy to 404
Newmarket-404	Satisfied by 404
Whitchurch-Stouffville	Satisfied by 48, but Bloomington Rd added to provide connection to 404
Mayfield-Airport Rd	Satisfied by Mayfield Rd and Airport Rd (connections)
Caledon North	Satisfied by Hwy 10
Brampton-Hurontario	Satisfied by Bovaird Dr (connections)
Georgetown	Satisfied by Hwy 7
Milton North	Satisfied by 401
Hamilton-Flamborough	Satisfied by Hwy 5 / Hwy 6
Hamilton- Ancaster	Wilson St W from Hwy 52 to 403 Hwy 52 from Wilson St W to 403 Rymal Rd E / W and Garner Rd E / W from Trinity Church Rd to Wilson St W
Hamilton West	Satisfied by 403
Hamilton- Rymal	Dartnall Rd from Twenty Rd to Lincoln Alexander Pkwy Rymal Rd E / W and Garner Rd E / W from Trinity Church Rd to Wilson St W
Hamilton Airport	Upper James St from Hwy 6 to Lincoln Alexander Pkwy

6.2.3.5 Step 5: Ensure compatibility with land use, road restrictions and transit plans

Potential conflicts were identified with other road uses (i.e., light rail transit and bus rapid transit corridors), road restrictions (i.e., 50 tonne load limits on bridges in the City of Toronto) and compatibility with future land use plans. These are discussed below.

- **Rapid transit plans.** Where possible, roads on which LRT or BRT exists, is planned or is under construction were avoided. However, in many instances, these roads provide the most direct accesses to freight clusters. Moreover, no obvious alternatives were identified either by the consultant or by the Review Group, or might be predicated only as detailed LRT/BRT plans materialize. As a result, Table 6-7 lists the eight corridors on which potential conflicts were identified in Step 5.[68] Note that three of these refer to potential conflicts along specific sections of the actual corridor (Highway 7 Rapidway, Eglinton Crosstown LRT and Finch West LRT) while the other five refer only to intersections or crossings of the LRT/BRT corridor and a SGMN route (Hamilton LRT, Hurontario LRT, Yonge Rapidway, Sheppard East LRT and Durham-Scarborough BRT). Potential solutions to these conflicts, if and where required, will be elaborated in any subsequent development of the core network and/or as the LRT/BRT plans materialize. This is addressed further in Chapter 7.

[68] See Section 5.7 for a description of the planned LRT/BRT systems.

The list does not include corridors that individual municipalities have identified as candidates for future transit priority treatments. Specifically, Halton Region's Mobility Management Strategy was endorsed by Regional Council in February 2017. This Strategy identified several Transit Priority Corridors that are also included in the SGMN. However, the character of potential improvements has not yet been identified. Further to discussion with Halton Region staff, it was agreed that these corridors would be retained in the GTHA-wide SGMN, and will be reviewed in the future as Halton Region proposes specific transit priority measures on individual corridors.[69] More broadly, the GTHA-wide SGMN is designed to allow periodic updates as conditions change and new needs emerge, such as new transit plans and municipal studies that might result in conflicting designations on selected roads.

Table 6-7. Potential Rapid Transit Conflicts (Step Five)

Category	Corridors	Nature of Potential Conflict
LRT or BRT corridor (existing, planned or under construction)	• Hamilton LRT	• Crossing of planned LRT at Highway 403 and Lincoln Alexander Parkway
	• Hurontario St in Peel Region	• Intersection of planned LRT at Steeles Avenue and Derry Road
	• Highway 7 Rapidway in York Region	• Existing and planned BRT from Highway 50 to Cornell
	• Yonge Street Rapidway in York Region	• Intersection of planned BRT at Elgin Mills Rd, 19th Ave / Gamble Rd, Bloomington Rd, Wellington St and Green Lane
	• Finch Ave W in Toronto	• Planned at-grade LRT on Finch Ave W between Milvan Dr and Keele St
	• Sheppard East LRT in Toronto	• Intersection of planned LRT at Markham Road
	• Eglinton Crosstown LRT in Toronto	• At-grade LRT between DVP and Warden Ave
	• Durham-Scarborough BRT in Durham Region	• Intersection of planned BRT at Brock Rd, Lake Ridge Rd, Thickson Rd and Harmony Rd and crossing of Hwy 412

- **Road restrictions.** In <u>all</u> cases, the roads shown in the Figure 6-1 core road SGMN permit heavy trucks. However, it is recognized that some SGMN roads might be subject to geometrical or design constraints that could limit their effectiveness for the movement of heavy trucks. To this end, the SGMN provides a road map that upper-tier

[69] Halton Region letter to the consultant, July 26, 2017. See also *Mobility Management Strategy Halton*, presentation to Halton Region Planning and Public Works Committee, February 8, 2017, https://sirepub.halton.ca/cache/2/oqlizxw0l4sjmke52k5nowsm/20629611032017031122667.PDF

municipalities can use to identify priorities for improvements: As noted in Section 2.5.1, this is a key application for some of the municipal SGMNs.

Review Group members did not identify specific concerns with the final GTHA-wide SGMN. However, within the City of Toronto, several load limits and structural clearance restrictions exist on certain roads within the City of Toronto.[70] The designation of the SGMN within the City of Toronto took these restrictions into account. Routes with restricted structural clearances have been avoided, as were almost all categories of bridge load limits. However, three sections that exceeded the highest load limit category of 50 tonnes were seen as unavoidable, given their importance in accessing key goods generators or as high-volume truck corridors, or given the lack of reasonable alternatives. The three sections are:

- Steeles Avenue West at the Humber River.
- Finch Avenue East, west of Markham Road.
- Markham Road south of Progress Avenue.

On the one hand, this category has the minimum impedance among all weight restrictions, but on the other hand, the restrictions nonetheless prohibit the use of these sections by at least some vehicles (the extent to which is not known). The identification of potential alternatives, where none is immediately apparent currently, or even the need for such alternatives (given that the extent to which these restrictions inhibit their use by heavy trucks), must be considered in future studies.

- **Land use plans.** Visual reviews were conducted to confirm compatibility with future land use plans, specifically to ensure or allow for connectivity with designated employment lands.

  Table 6-8 lists the results of the review, which covered the six upper-tier municipalities. All designated employment lands were found to be connected or close to the core SGMN, with the sole exception of the City of Hamilton, in which two additional corridors were added to account for the Airport Employment Growth District and the Rymal employment lands.

  The review also included the new Provincial *Growth Plan for the Greater Golden Horseshoe*. The *Growth Plan* does not identify specific employment areas; however, the core SGMN was found to be consistent with the *Growth Plan*'s designation of the major highway network as key goods movement corridors.

[70] See *Oversize Vehicles / Mobile Cranes Road Use Plan*, Transportation Services, City of Toronto, January 2017.

Table 6-8. Additions and Changes Made to Account for Designated Employment Lands (Step Five)

Jurisdiction	Additions and Changes
Province of Ontario	No additions or changes made. A review of the new *Growth Plan for the Greater Golden Horseshoe (2017)* found that, inasmuch as it talks to specific employment areas, the *GGH Plan* and the core SGMN are consistent. *Schedule 6 Moving Goods* shows only highway connections (only Provincial highways of all types, plus all municipal expressways); however no other roads are shown. *Schedule 6* also shows rail lines.
Durham Region	No additions or changes made. All significant areas are connected directly to or are close to the core SGMN, per review of *Durham Region Official Plan, Office Consolidation of May 11, 2017, Sub-Section 8C Employment Areas and Schedule 'A' Regional Structure.*
Halton Region	No additions or changes made. A review of *Halton Region Regional Official Plan Amendment 38, Map 1 Regional Structure (approved 2015-09-28)* determined that all designated Employment Areas are connected directly to, or are close to, the core SGMN.
City of Hamilton	Further to a review of the City of Hamilton's "*Urban Hamilton Official Plan, Schedule E-1, Urban Land Use Designations*," August 16, 2013, two corridors were added: • Rymal Road / Garner Road / Wilson Street, from Hamilton-Rymal cluster westward to Hamilton-Ancaster cluster. • Hwy 6 / Upper James St, from HIA to Lincoln Alexander Parkway. These corridors were added to connect the Airport Employment Growth District (AEGD) and the Rymal Employment Lands, as identified by the City of Hamilton. The improved designation to the AEGD also to addresses a concern expressed by the Hamilton International Airport, which notes that the need for alternatives to Highway 6 / Highway 403, which it cites as being congested for courier access to the airport. Moreover, the City of Hamilton has noted that the Flamborough Business Park area in the vicinity of Highways 5 and 6 is expected to become an important freight cluster, especially with the completion of the Morriston Bypass: the SGMN connects this area, recognizing both the current activity in the area as a secondary freight cluster (designated as Hamilton-Flamborough) and its future potential.
Peel Region	No additions or changes made. The *Peel Official Plan, Office Consolidation December 2016, Section 5.6* refers to the Official Plans of the three area municipalities for the designation of employment areas: • *Mississauga OP, Office Consolidation of August 2, 2017, Section 17 Employment Areas* describes nine employment areas (see also *Schedule 10 Land Use*). All these locations are connected directly to or are close to the core SGMN. However, it is noted that some 'last kilometre' accesses cannot be included in the core SGMN because they are under Mississauga's jurisdiction. • *Brampton OP, Office Consolidation September 2015, Section 4.4 Employment* describes several employment areas, which are shown on *Schedule A General Land Use Designations* (as industrial and business corridor uses). All these locations are connected directly to or are close to the core SGMN. • *Caledon OP Office Consolidation of November 2016, Section 5.5 Employment Areas* notes that employment areas will be focused primarily in the Rural Service Centres of Mayfield West and Bolton, and also will be permitted in the Industrial / Commercial Centres of Tullamore, Sandhill and Victoria (Schedules A, B, C, C5, N and R). All these locations are connected directly to or are close to the core SGMN.
City of Toronto	No additions or changes made. The City of Toronto identified several freight clusters that are not necessarily included in the GTHA-wide designation of primary or secondary freight clusters but are nonetheless of municipal interest. The City also noted that some of these clusters might become significant freight generators only in the future while

Table 6-8. Additions and Changes Made to Account for Designated Employment Lands (Step Five)

Jurisdiction	Additions and Changes
	others are significant despite having relatively little goods movement activity today. The relevant Official Plan Amendment 231, *Official Plan and Municipal Comprehensive Reviews: Amendments to the Official Plan for Economic Health and Employment Lands Policies and Designations and Recommendations on Conversion Requests*, was partially approved by Toronto City Council in December 2013.[71] A review of this report, the supporting documents and the *Toronto Official Plan Office Consolidation of June 2015, Section 4.6 Employment Areas* and *Map 2 Urban Structure*, found that some of these clusters are connected directly to or are close to the core SGMN. However, many are not. Further to discussions with the City of Toronto, it was determined that no new additions would be made to the core SGMN, pending a more detail review in the City's upcoming goods movement strategy.
York Region	No additions or changes made. The *York Region Official Plan Office Consolidation April 2016, Section 4.3 Planning for Employment Lands* describes the designation of employment lands, and *Figure 2* shows the employment land concepts. All these locations are connected directly to or are close to the core SGMN.

6.2.4 Discussion

As noted, the final core road SGMN was developed in consultation with the Review Group members. Figure 6-1 and the accompanying lists of roads incorporate these comments.

Some explanatory notes are in order:

- **Some roads have different colours** – for example, Highway 7, Steeles Avenue and Airport Road. These differences reflect the role assigned for specific segments, meaning that some segments serve as direct highway connections to primary freight clusters (step 2) while other segments support reliability (step 3). In a few instances, the colouring also reflects the specific perspective of a Review Group member. Regardless of changes in colour (and presumptive role in the SGMN), the key point is that the road is included in the SGMN.

- Efforts were made to **provide continuous east-west routes** that serve several municipalities and also serve as alternatives to the Provincial expressway system. These are:

    - Highway 7, which traverses the entire study area between the Halton-Wellington boundary and Durham – Kawartha Lakes boundary.

    - Steeles Avenue between Industrial Road in Milton (Halton Region) and Markham Road (Highway 48) in the City of Toronto.

[71] See http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2013.PG28.2. Information provided by the City of Toronto, memorandum to the consultant dated August 11, 2017. Note that portions of Official Plan Amendment 231 are under appeal at the Ontario Municipal board.

- Bloomington Road – Durham Regional Highway 47 – Goodwood Road from east of Highway 400 in York Region to Highway 7 & 12 in Durham Region.

Steeles Avenue and, especially, Highway 7 also serve as non-tolled alternatives to the Highway 407 ETR. Note also that these and other SGMN roads could serve as emergency detours in the event of a blockage on the Provincial expressway system.

- **Certain north-south routes serve a similar function**, complementing the north-south expressways. While mainly intra-regional, they also provide an appropriate density of SGMN routes. Key among these routes are:
  - Dixie Road in Peel Region, between the QEW in Mississauga and Mayfield Road at the Brampton/Caledon boundary.
  - Airport Road in Peel Region, between Highway 427 in Mississauga and Mayfield Road at the Brampton/Caledon boundary.
  - Highway 27, between Highway 401/427 in the City of Toronto and Major Mackenzie Drive in York Region.
  - The Markham Road / Highway 7 / Donald Cousens Parkway / Highway 48 / Highway 12 corridor, between Ellesmere Road in the City of Toronto and the Durham Region / Simcoe County boundary.
  - Brock Road in Durham Region, between Bayly Street in Pickering and Goodwood Road in Uxbridge.
  - The Thickson Road / Highway 7 & 12 corridor in Durham Region, between Wentworth Street in Whitby and the Durham Region / Simcoe County boundary.
  - Regional Roads 57 and 20 in Durham Region, between Highway 401 in Bowmanville (Clarington) and Highway 35 at the Durham Region / Kawartha Lakes boundary.
- **The SGMN does not include proposed highways links**. However, the SGMN is designed to be updated as future conditions warrant or as such links are programmed for construction. Note also that potential future links are being considered in MTO's *GGH Multimodal Plan*, which is developing a future multimodal passenger and goods network to 2051 for the broader GGH region.
- At the same time, note that **some SGMN links in York Region are conceptual only**. These conceptual York Regional Roads are included because they have status in York Region's SGMN and its recently approved Transportation Master Plan. These links are:
  - Langstaff Road between Jane Street and Keele Street.

- Markham Bypass between Highway 48 and Highway 400. (Some sections of this corridor exist, along Gamble Road and 19th Avenue. This connection assumes an interchange at Highway 400, which does not have status with MTO.)
- 15th Side Road and Bloomington Road east of Highway 400. (This connection assumes an interchange at Highway 400, which does not have status with MTO.)

6.2.5 Secondary SGMNs

It is expected that this core (GTHA-wide) SGMN will complement, rather than replace or supersede, other definitions of strategic goods movement networks in the region. The objective of the core SGMN is to bring a GTHA-wide perspective to bear by utilizing a clear and consistent methodological framework across the region.

The core SGMN should be seen as a subset of a wider regional SGMN, which consists of the compilation of the municipal networks shown in Figure 5-22. As noted, the definition of the core SGMN, by design, has focused on the ability to move heavy trucks at a broad, GTHA-wide perspective.

This section identifies the need for secondary SGMNs, which would fill gaps within individual upper-tier municipalities. The need can be characterized in at least three ways:

- **'First/last kilometre' connections.** Special attention was given to ensuring that accesses to the two key airports, intermodal rail terminals and marine ports were included in the GTHA-wide SGMN. However, some of these 'first/last kilometre' accesses are under the jurisdiction of lower-tier municipalities, which, by definition, are not included in the SGMN.[72] In particular, the cargo facilities at Toronto Pearson International Airport are accessed by City of Mississauga roads such as Courtneypark Drive East and Britannia Road East. Peel Region's own SGMN, which was developed together with its three lower-tier municipalities in 2013, does include these connections. However, not all upper-tier municipalities have developed SGMNs, and not all of the existing SGMNs include roads that are under lower-tier jurisdiction. This suggests that individual upper-tier municipalities should work with their lower-tier municipalities develop their own SGMNs, in order to ensure seamless last kilometre connections with these terminals and with other major generators.
- **Dense urban centres.** Some Review Group members commented that it is important to note that other types of trucks – i.e., small and medium trucks, in addition to heavy trucks - circulate throughout the GTHA. While municipal truck route restrictions generally focus on controlling the movement of heavy trucks, some parts of the GTHA, especially denser urban centres, are not designed to support heavy trucks and so – by

[72] However, as noted in Section 6.2.1, exceptional lower-tier connections could be included in future SGMN updates – such as the connections to the cargo facilities at Toronto Pearson International Airport.

the numbers of heavy trucks alone - these areas may not be as well represented in the SGMN as (other) truck volumes and commercial activity would dictate. The specific operating, parking and other requirements associated with small and medium sized vehicles could be addressed through a secondary SGMN.

- **Compatibility with Complete Streets.** Complete Streets schemes promote the shared use of roads among all users. However, the need to maintain good accessibility to individual destinations can create conflicts between trucks and, especially, cyclists, and these conflicts are likely to increase with the growing demand for express and courier deliveries.

These secondary SGMNs would complement the core GTHA-wide SGMN, and would aim to promote a balance in ways to incorporate trucks and express delivery vehicles in the denser parts of the GTHA. It would also provide a means of explicitly considering the needs of 'first/last kilometre' access, thereby further enhancing the ability of trucks to get from origins to destinations safely and efficiently. If a corridor is identified on a secondary SGMN, truck movement then is highlighted as one of the factors that must be explicitly considered in the design and operation of the road.

Such a definition is beyond the scope of the development of the GTHA-wide SGMN and this project. However, some guidance can be provided for the definition of secondary SGMNs:

- One application of a secondary SGMN would be to identify ways to better integrate trucks (of all appropriate sizes) and express delivery vehicles into confined corridors, especially where there are high numbers of pedestrians and cyclists, as well as transit, taxis and other vehicles sharing the corridor. Such an application could be used to identify locations where there is a need to pay special attention to ways for minimizing truck encroachment onto bicycle lanes and ensuring the sufficient provision of designated and enforced loading spaces for trucks and express deliveries. While some municipalities in the GTHA are actively doing this as part of their Complete Street schemes, other municipalities are not, as evidenced by some municipal Complete Streets guidelines that do not even mention goods movement vehicles.

- A secondary SGMN likely would be specific to individual municipalities and likely would include some lower-tier municipalities. The individual secondary SGMNs would not necessarily be contiguous with each other but would be consistent with the core GTHA-wide SGMN (i.e., defining a hierarchy among these networks) and, ideally, would be based upon common criteria and definitions.

- As a starting point, a secondary SGMN could be based on the municipality's network of truck routes. Functionally, the truck routes could be signed as such, or simply designated on a map. In terms of enforcement, designating a truck route network may involve identifying a series of corridors designed to channel trucks away from roads with prohibitions on truck movement (including at certain times of day, or by certain types of vehicles). Alternatively, a truck route network may consist of roads built to a

higher standard, where those roads are recommended for trucks (but alternate routes are not prohibited).

- The coverage of the secondary SGMN could range from specific road sections to all roads on which trucks are permitted. For example:
    - Specific corridors: Identify locations that require goods movement access (industrial zones, commercial areas including shopping malls and plazas, areas of dense employment or residence), and map out truck routes that provide access to these areas.
    - All roads: Include all roads that trucks are permitted to use (i.e. all roads that are structurally and geometrically capable of handling commercial vehicles).
    - Moderate coverage: Provide basic grid coverage across the jurisdiction, selecting individual roads based on factors such as utilization (truck volumes), land use, conflicts with other vehicles, etc.
- The principles of directness, redundancy and connectivity are equally important for secondary networks as for the core network. In addition, there may be additional considerations that a secondary network should consider. Table 6-9 suggests some possible considerations.
- Finally, it should be noted that the most appropriate vision and considerations for a secondary SGMN might differ through the region. For example, the extent of unavoidable conflicts, and the extent to which trucks are prioritized relative to other road users, may depend on the setting. As an example, there may be greater justification for wider turning radii in more suburban or outlying areas than in urban centres. Overall, individual municipalities are likely best placed to define secondary SGMNs in their jurisdictions, given the trade-offs and local-level assessments required.

Table 6-9. Considerations for Secondary SGMNs

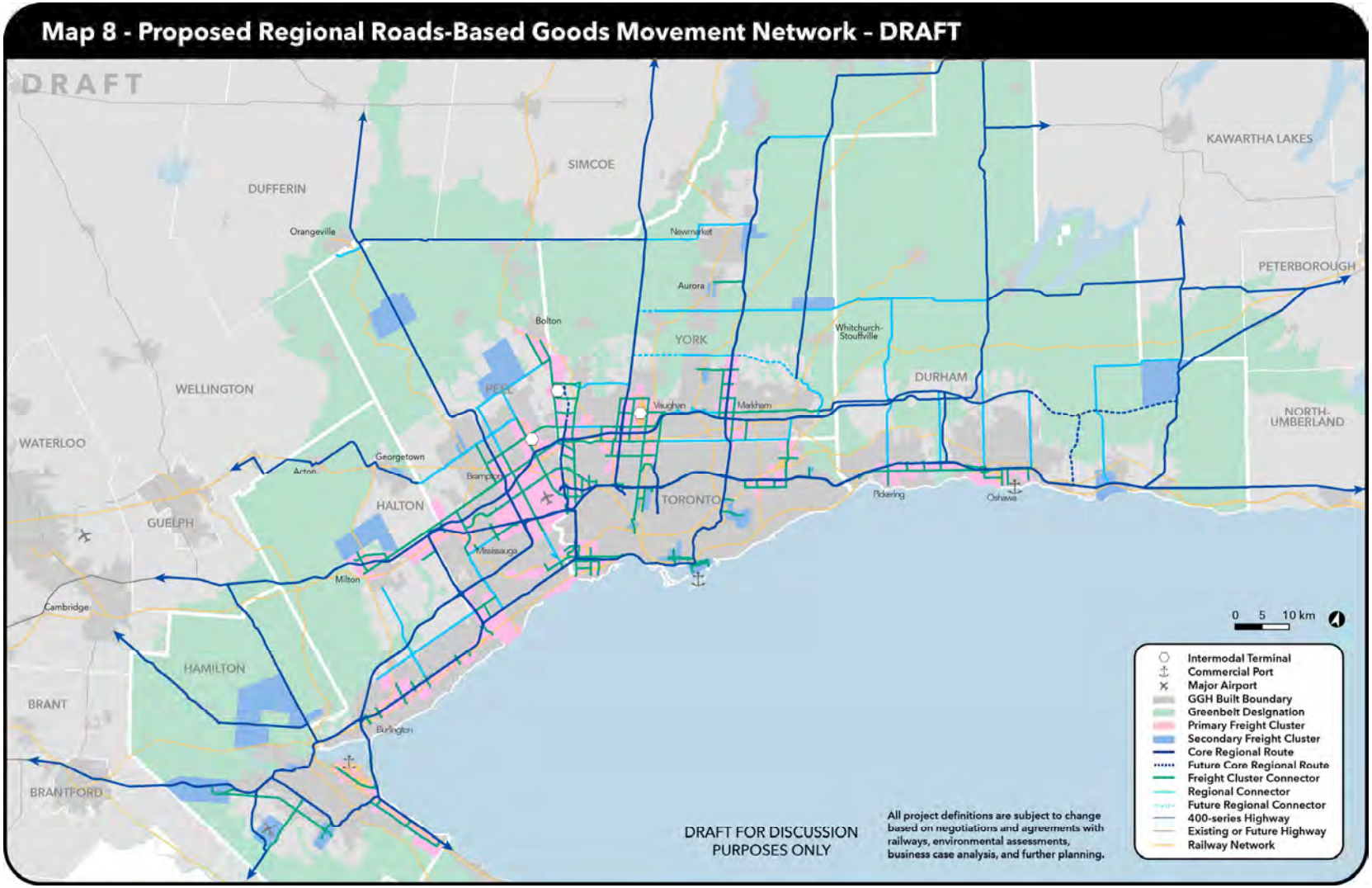
Considerations for Secondary Goods Movement Network
• First / last kilometre connections: Ensure that major generators and multimodal freight hubs are connected to the upper-tier and GTHA-wide SGMNs.
• More expansive v. less expansive: more expansive network may spread trucks out across multiple routes, whereas less expansive could funnel them onto a few specific corridors.
• Truck needs: If a road is identified as belonging to an SGMN, does it have design features that support truck movement, such as adequate pavement thickness and turning radii? Are other truck needs taken into account, such as avoiding steep gradients, sharp turns and conflicts with other road users (to the extent possible)?
• Sufficient coverage: Insufficient coverage may result in trucks utilizing roads that are not intended as truck routes.
• Existing usage: Which routes have high truck volumes today? If these routes are not included, will nearby parallel routes be included?
• Future growth: Will future employment lands and developments be adequately served?
• Relative importance: Consider the relative importance of the road for trucks versus passenger vehicles. Fewer conflicts with passenger vehicles may be justification for including a road as a truck route, even if the actual usage by trucks is not all that high
• Designation as a Complete Streets corridor: promoting ways to better manage the conflict between trucks and bicyclists / pedestrians while accommodating the need to maintain access for deliveries.
• Functional classification: Consider including municipal collector roads or minor arterials in industrial/ commercial areas, in addition to arterial or regional roads.
• Land use: Given the land uses along a corridor, how appropriate is the corridor for truck traffic relative to other nearby corridors?
• Key facilities: Identify specific key facilities and ensure these are adequately connected at the local level – along multiple routes if possible.

6.2.6 Draft Regional Transportation Plan

An identical copy of the core road SGMN also appears in Metrolinx's Draft Regional Transportation Plan, which was issued for public comment in September 2017. The RTP rendition is shown below in Figure 6-2, and has the same content as that shown above in Figure 6-1. It is presented in the Draft RTP as part of one of several goods movement actions by Metrolinx, which include to "support implementation of the Regional Strategic Goods Movement Network to link goods-generating activity centres, intermodal terminals and regional gateways."[73] The link to RTP actions is discussed further in Section 9.3.1.

[73] Priority Action 3.10, *Draft 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area*, Draft for Consultation, Metrolinx, September 2017, p. 80.

Figure 6-2. Core Road SGMN as presented in the Draft Metrolinx RTP



Source: *Draft 2041 Regional Transportation Plan for the Greater Toronto and Hamilton Area*, Draft for Consultation, Metrolinx, September 2017, p. 81.

6.3 Core Rail SGMN

This section defines the core rail SGMN. Unlike the core road SGMN, it was apparent that the rail SGMN had limited conceptual options and so alternative rail concepts were not developed.

To begin, for the purpose of this project the rail component of the SGMN was initially defined as the mainlines of the two Class I railways (CN and CP) and Metrolinx (GO Transit). However, some reviewers commented on the desirability of accounting for the GTHA's rail network in greater detail in three ways:

- Include the GTHA's short lines as potential SGMN segments. The five short lines are the Orangeville-Brampton Railway, Goderich-Exeter Railway, Southern Ontario Railway, Guelph Junction Railway and the York-Durham Heritage Railway.[74] All these lines are shown in Figure 2-3.
- Exclude those Metrolinx lines whose primary purpose is to carry passenger (GO Rail) traffic.
- Account for the volume of freight tonnage or traffic as a means of gauging candidate segments' appropriateness for inclusion in the core rail SGMN.

To address these comments, the study team examined freight flows on all GTHA rail corridors (Class I, GO Rail and short lines) as a means of determining the importance, hence appropriateness of including individual lines in the rail SGMN.

However, rail freight volumes are not publically available. Accordingly, as a reasonable proxy, the study team accessed Transport Canada's *Grade Crossings Inventory* database, which provides information on the average number of daily freight trains that traverse at-grade crossings.[75] This publically available database lists the number of daily freight and passenger trains at rail crossings along all rail lines across Canada. Although the database is primarily focused on the safety aspects of crossings, it also serves as a useful resource for gauging the utilization of the various tracks, the data on which are otherwise proprietary and not easily available. Note that data for grade-separated crossings are not available.

The core rail SGMN could include all rail lines in the GTHA that have significant rail freight volumes (i.e., trains), whether they are Class I railways, GO Rail lines or short lines. Drawing from the aforementioned Transport Canada *Grade Crossings Inventory* database, Figure 6-3 depicts the frequency of daily freight trains across the GTHA. The sections are colour-coded by

[74] The York-Durham Heritage Railway does not operate freight. However, it was included initially for completeness.

[75] See *Grade Crossings Inventory*, Transport Canada, https://www.tc.gc.ca/eng/railsafety/railsafety-1000.html.

ownership, hence are distinguished among the Class I railways (CN and CP), GO Rail (Metrolinx) and the short lines. It can be seen that:

- The daily frequency of freight trains varies across the GTHA. The data indicate that some of the CN and CP lines carry as many as 26-50 freight trains daily. On the other hand, three of the four freight-carrying short lines have five or fewer freight trains daily. However, it is recognized that the freight-carrying short lines serve specific industries, which otherwise must be served by truck or would be forced to relocate. As a result, even a small number of trains serves to keep trucks off roads and highways, hence the short lines can be seen as having a GTHA-wide impact. Accordingly, the four freight-carrying short lines are retained in the core rail SGMN.

- Some portions of the Class I rail network, especially in central Toronto but also in other parts of the urban environment, do not have any data because these sections have all been grade separated. However, it can be surmised, for most if not all of these sections, that there are sufficient volumes of freight trains to warrant inclusion in the core rail SGMN, given that most of the same trains continue onto the sections where counts exist and connect key rail facilities. For example, CN's MacMillan classification yard is located on one of these sections, and the volume of activity generated by this yard clearly would meet the threshold.

- The Class I railways have running rights over the sections of track that are owned by GO Rail (Metrolinx), with one exception. The running rights allow the Class I railways to serve industries along the corridors. The volumes and frequencies vary. It can be seen from Figure 6-3 that the GO Kingston subdivision carries between 6 and 15 freight trains daily and the GO Oakville subdivision carries between 16 and 25 freight trains daily. [76] The sole exception is GO's GO subdivision in Durham Region, which is dedicated exclusively to GO Rail service (i.e., it does not carry freight) and is parallel to the CN main line, which does carry freight. Accordingly, even though the GO Rail lines' primary purpose is to support passenger traffic, they do carry varying numbers of freight trains, and so they are retained in the core rail SGMN.

Figure 6-4 shows the final core rail SGMN. Based upon the preceding analysis and further to consultation with the Steering Committee and the Review Group, the final core rail SGMN comprises three components, which define a hierarchy:

- All Class I (CN and CP) freight-only rail lines. Note that only main lines are included, and not spur lines. For reference, Figure 6-4 also shows the locations of the CN and CP intermodal terminals as well as the CN MacMillan and CP Toronto classification yards.

[76] Moreover, it is important to note that the running rights are not necessarily defined over an entire subdivision. However, the applicable sections cannot be discerned meaningfully for the purpose of this analysis.

- All Metrolinx-owned GO Rail lines, with the exception of the passenger-only GO subdivision in Durham Region. GO Rail's GO subdivision is not included in the core rail SGMN but is shown in a wide yellow band in Figure 6-4, for context.
- The four freight-carrying short lines. The GTHA's fifth short line, the York-Durham Heritage Railway, does not carry freight and so it is not included.

Note that the core rail SGMN shown in Figure 6-4 also includes the New Freight Corridor as a conceptual link. This link is the subject of ongoing analysis by Metrolinx and others. The inclusion of this link in the core rail SGMN ensures consistency with Map 3 of the September 2017 Draft RTP, on which the New Freight Corridor concept is shown along with existing and in-delivery regional rail and rapid transit projects. Note that the portrayal of this link in Figure 6-4 is conceptual only, and should not be construed as representing a final configuration or alignment.

Finally, it should be noted that scheduled VIA Rail services use some Class I and GO Rail corridors. However, VIA does not own any rights-of-way in the GTHA, and so the relevant corridors are **not** shown in the figure.

6.4 Summary

The regional core road and rail SGMNs are designed to support the GTHA's economic prosperity by linking together the most important freight clusters, highway corridors and rail corridors in the GTHA.

Although the core road SGMN covers only highways and arterial roads, its focus can be considered multimodal in that it links together the key rail, air, and port facilities in the region, all of which depend on trucks for last kilometre connections. The core road SGMN and the core rail SGMN complement each other.

This study fills a gap by applying a consistent, objective method across the entire GTHA to define a core SGMN. The intention is to draw attention to the roads and rail corridors that are most important for freight movement in the region. The study does not propose or presuppose any specific steps in terms of corridor design or investment, or in the identification of future improvements. Some corridors may merit further study and/or funding related to improving current operations or traffic control, or to improving the structural capacity or throughput of an existing corridor. In other cases, new infrastructure may be in order. While the SGMN is intended to inform these considerations by the relevant authorities, this study does not comment on or evaluate the appropriateness of particular solutions for specific corridors.

Figure 6-3. Daily Freight Train Volumes

Figure 6-4. Core GTHA Rail SGMN

7 Resolution of Conflicts

Key Chapter Takeaway

This chapter proposes approaches for resolving potential conflicts, should they arise, with planned rapid transit lines and with load restrictions on bridges along SGMN-designated routes.

7.1 Introduction and Approach

Because the core road and rail SGMNs were developed in consultation with the Review Group, most potential issues and conflicts have been addressed. The consultation included one-on-one meetings and teleconferences with individual organizations, as well as the exchange of maps and other information. This approach proved effective in identifying and accommodating Review Group comments.

As a result, relatively few potential conflicts remain. The only identified potential conflicts that remain concern eight corridors on which rapid transit is planned or is under construction, and the treatment of three road sections in the City of Toronto that have load restrictions (see Section 6.2.3.5). In the case of the eight rapid transit corridors, potential conflicts should be addressed as corridor design progresses – meaning that the issues concern geometric design and operations. In the case of the three segments with load restrictions, the extent to which any of these constitutes an actual constraint on the movement of goods is not clear, and might be best addressed if the City of Toronto identifies this as a constraint or if the City of Toronto proposes to rehabilitate any of the bridges in question.

In addition, it should be noted that Halton Region and the City of Toronto propose to review the need for possible additional SGMN segments, or possible changes to the core road SGMN, as part of future studies – notably, the planned update to the Halton Region Transportation Master Plan (TMP) and a planned freight strategy for the City of Toronto.[77] The SGMN is designed to accommodate future updates as conditions and needs changed, as is explained further in Chapter 9.

Finally, it should be noted that many of the issues and potential conflicts that are described in this report influence and are influenced by the plans, policies and guidelines that lower-tier

[77] See Halton Region letter to the consultant, September 15, 2017, and the City of Toronto memorandum to the consultant, August 11, 2017.

municipalities have developed. As with other planning and policy initiatives, it is reasonable to expect that the resolution of potential conflicts would benefit from ongoing collaboration between upper- and lower-tier municipalities on planning for goods movement.

This chapter proposes approaches to addressing these conflicts, if and as specific needs arise. Note that the approaches are generic and so – given the lack of urgency or specificity in the identified conflicts – the approaches serve only as guidelines, providing alternatives in some cases.

For the purposes of this discussion, approaches are described at three levels or steps. The approaches are progressively more focused on individual corridors and on actual implementation. These are:

- At the master planning or strategic planning level, providing a municipality-wide, network-level perspective. The object is to coordinate the SGMN with transit and other major corridor improvements at a broad, strategic level.
- At the corridor and sub-area planning level, focusing on smaller numbers of corridors. The object is to integrate goods movement needs as corridor and area plans become more specific.
- At the level of planning and design for individual corridors. The object is to ensure that truck circulation and parking are considered explicitly in road and intersection design, especially as Complete Streets and other shared corridor guidelines are implemented on individual roads.

These are described in the ensuing sections.

7.2 Master Plans

The ideal approach is to develop an SGMN within the context of a transportation master plan, so that the SGMN can be coordinated with the identification of new and widened roads and with rapid transit improvements.

All six upper-tier GTHA municipalities and many lower-tier municipalities have developed TMPs. Metrolinx is currently updating the GTHA-wide Regional Transportation Plan to 2041, and the MTO is currently developing a multimodal transportation plan for the entire Greater Golden Horseshoe to 2071. Although goods movement is generally incorporated into these plans and its importance is recognized, the emphasis is typically on actions and plans to improve the mobility of people.

The development of SGMNs was integral to the recent Durham Region and York Region TMPs. The two SGMNs were developed in consideration of rapid transit and other initiatives to improve personal mobility. Peel Region's 2013 SGMN was developed separately from that region's TMP. However, it provides the road map for specific initiating goods movement

actions, which in turn are coordinated with mobility improvements – such as intersection improvements.

However, in practice, in many other TMPs actions and plans to address goods movement needs can be complementary to or even secondary to rapid transit or Complete Streets initiatives. Often, these needs are noted but are not elaborated at the TMP level, and may be left to subsequent detailing once the rapid transit scheme has been elaborated.

Therefore, as a first step, it is important to recognize the need to integrate goods movement planning into the development of TMPs at a level that is commensurate with that of personal mobility planning – not as a complementary or secondary activity. In practice, this can mean:

- Developing the components of a SGMN within the TMP, as York Region and Durham Region have done. This both puts goods movement 'on the radar' and ensures that goods movement is considered at the same time as transit and other personal mobility actions are put forward.

- Analyzing and addressing goods movement needs directly within the TMP – in other words, developing a goods movement plan within the TMP framework and coordinated with all other TMP components. Although a goods movement plan encompasses much more than a SGMN, it has the advantage of integrating goods movement needs directly into other topics that the TMP considers, such as congestion management, land use planning and transportation demand management. To address goods movement issues at an appropriate level of detail, and recognizing that the stakeholders for personal and goods movement plans may vary, some municipalities have developed goods movement strategies in parallel to but at the same time as their TMPs. The City of Edmonton 2013 goods movement strategy and the 2016 TransLink (Vancouver) goods movement strategy are examples of this approach, wherein the goods movement plan is one of a series of stand-alone documents that are incorporated into the overall TMP. Metrolinx's current RTP Update is a related example, in which a 2016 goods movement discussion paper considered issues and potential actions that informed Metrolinx in the definition of proposed goods movement actions in the actual Draft RTP.[78] Other municipalities find that goods movement issues are too complex to address within the TMP structure, and instead use the TMP to scope and mandate the subsequent development of a goods movement plan – for example, Peel Region's TMP has led to the development of a goods movement action plan, which has recently been updated.

[78] *Regional Transportation Plan Legislative Review Backgrounder: Urban Goods Movement*, Metrolinx, Toronto, July 2016.

7.3 Corridor and Area Plans

Accounting for goods movement often means considering ways to avoid or mitigate conflicts between trucks and other modes, especially by separating major freight and major transit corridors where possible or by incorporating design treatments to mitigate conflicts where separations are not possible. Land uses and other potential conflict points such as avoiding at-grade rail crossings also must be considered in including a road segment in the SGMN.

As a second step, goods movement needs also should be actively considered in all subsequent steps of corridor plans. The MTO's 2015 *Freight-Supportive Guidelines* serve as a detailed guide for ways to do this. Relevant to resolving – or, better, anticipating – SGMN conflicts, several points can be drawn from the *Guidelines*:[79]

- Conduct a freight audit – i.e., a background study that identifies existing and planned goods-generating activities and their locations, operating constraints that impact freight service levels on the existing network and site accesses, and other considerations that may be relevant. The audit also includes consultation with various stakeholders, to understand issues and opportunities.

- Develop minimum standards for freight corridors and intersections, accounting for design, construction, maintenance, operations and the communication of information.

- Ensure that the segments designated in the SGMN are based on or will incorporate in the future appropriate clearances and structural capacities to accommodate heavy trucks.[80]

- Consider alternatives to corridors that are shared by trucks and transit, in order to allow the efficient flow of both types of traffic. Designating roads parallel to key transit corridors for the SGMN is one option. Methods include:

    - Locate "major transit services" on different roads from "major freight corridors, especially where conflicts between trucks and transit generate concerns about pedestrian safety (notably, in and around transit nodes) and when transit services negatively impact the efficiency of goods movement.

    - Alternate transit and freight corridors on parallel arterial roads, but only if a reasonable walking distance can be maintained to transit service.

    - Account for the area's land use, "place making" and community development goals. Transit should be located on roads where "high quality, pedestrian-oriented development and place-making opportunities" are present. If goods

[79] *Freight=Supportive Guidelines*, Ontario Ministry of Transportation, Toronto, 2015.

[80] As an example, it is Durham Region's policy to upgrade pavement structures so as to remove seasonal load restrictions, whenever a designated (regional) SGMN road segment is scheduled for improvement.

movement must be rerouted, considerations should be given to the alternative road's characteristics, adjacent land uses, whether or not the infrastructure is in place to support goods movement and trying to minimize the additional distance that would be incurred due to the proposed rerouting. The nature of the alternative road's users and means of maintaining their safety also must be considered.

- Where is it not possible to separate truck and transit corridors, "careful design" must be deployed to support a safe environment for all users, along the corridor, at intersections and at locations that have high pedestrian activity, such as transit nodes. This includes ensuring that truck movements are accommodated, through appropriate design of centre medians, setting up new developments to provide truck access from side streets, providing a loop of right turns via collector streets to allow trucks to manoeuvre when left turns from the SGMN corridor cannot be made, and ensuring that pedestrian-friendly design is incorporated at intersections and along the corridor.

- Avoid or minimize the use of corridors that have at-grade rail crossings. Where possible, corridors should have grade-separated crossings of heavily used rail lines.

- On corridors that have physically-separated transit lanes in the median of the road, provide left-turn and U-turn lanes at appropriate spacing to enable trucks to cross the transit lane safely and access sites for deliveries.

- On all corridors, transit stops and truck loading areas should be separated to avoid conflicts between these vehicles. Lane widths should be adequate for trucks. Far-side transit stops should be used, where possible, to accommodate truck turns at intersections, and curb radii and intersections should be tailored to accommodate large truck right turns.

7.4 Complete Streets

The concept of Complete Streets is well established as an effective means of improving the throughput of all modes while providing a safe environment for all corridor users, especially for the most vulnerable users. However, in practice, many schemes and guidelines do not fully account for goods movement needs or fully recognize the existence of major truck corridors outside industrial areas. Without obviating the mobility and safety needs of other corridor users, it is important that the pervasiveness of goods movement be recognized and accommodated in all urban environments.

The preceding section considered general approaches to avoid or mitigate conflicts between transit and goods movement. This section extends and details the discussion. It does so in the context of Complete Streets guidelines, recognizing that upper- and lower-tier municipalities across the GTHA (and elsewhere) are actively reworking individual roads to make them more accommodating and safer for all road users.

The concept of a Complete Street is well described elsewhere, and so it is not elaborated here except to note that, in practice, several recent plans and guidelines have very little to say about how goods vehicles actually can be accommodated. By definition, Complete Streets initiatives have focused on integrating safe and convenient paths for non-motorized users and transit into urban road rights-of-way, with less said on the accommodation of goods movement vehicles, except in industrial areas. For example, Chicago's 2013 Complete Streets guide adopts a four-level "pedestrian-first modal hierarchy," with pedestrians at the top of the hierarchy, followed by transit, bicycles and autos. Goods movement is not listed explicitly in the hierarchy "because it is cross-modal – trucks (auto), bike trailer (bicycle), and delivery person (pedestrian)." The concept of a "design vehicle," based on a 23' delivery vehicle, is incorporated into residential street design (but not other goods vehicles). The need to accommodate snow removal vehicles, truck routes and industrial areas is noted, suggesting the possibility of "a more auto-oriented [i.e., truck-oriented] hierarchy" on certain streets thus designated.[81]

The trucking industry is cognizant of the need to protect vulnerable users – for example, the Ontario Trucking Association is working with the Province and municipalities to address ways to improve cyclist and pedestrian safety.[82] The OTA also has developed design and operational guidelines to inform the implementation of Complete Streets initiatives.[83]

Locally, the 2015 *Complete Streets Catalogue* describes several Complete Street case studies in the Greater Golden Horseshoe. However, only one example (Simcoe Street in downtown Toronto) refers to goods movement, and this is only to note that loading was accommodated within an improved active transportation corridor.[84]

As a result, although Complete Streets by definition must accommodate all users, in practice less attention has been given to accommodating trucks and delivery vehicles than it has to other modes. For example:[85]

- Curb extensions, despite their other benefits, can block site access for a truck, hence might not be appropriate in all contexts or on all streets.
- Roundabouts, despite their pedestrian- and cyclist-friendly designs, can be difficult for trucks to manoeuvre.

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81 Complete Streets Chicago, Design Guidelines, City of Chicago Department of Transportation, Chicago, 2013.

82 *Truck, Cyclist and Pedestrian Safety*, OTA Briefing Note, Ontario Trucking Association, Toronto, August 2017.

83 For example, *Accommodating Commercial Vehicles in Roundabouts: Discussion Paper*, Ontario Trucking Association, Toronto, December 2010.

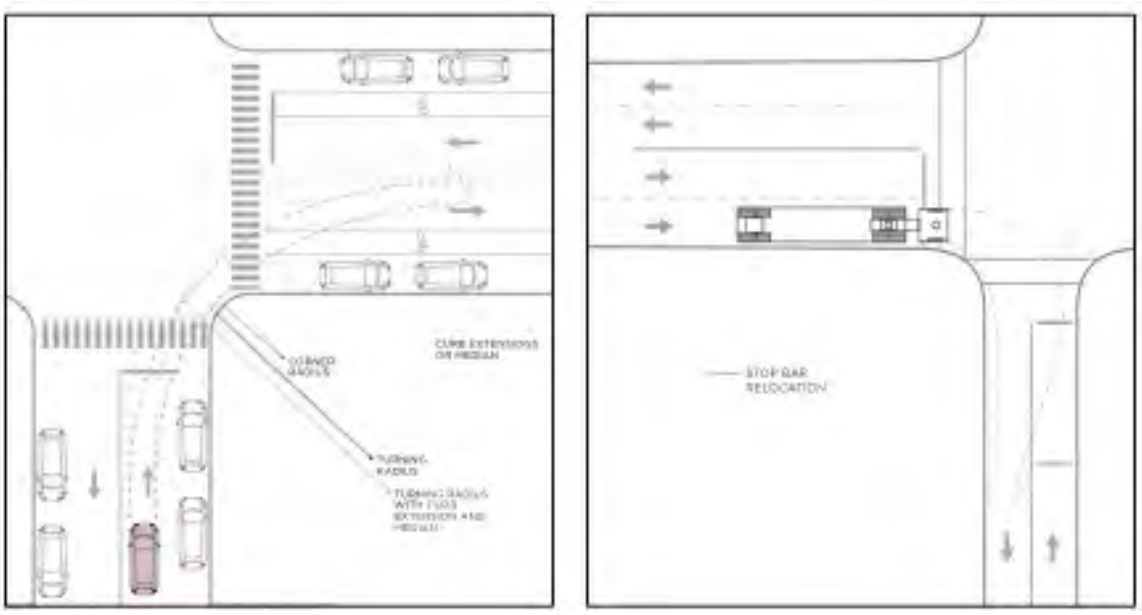
84 *The Complete Streets Catalogue: Understanding Complete Streets in the Greater Golden Horseshoe Region*, Toronto Centre for Active Transportation, Toronto, March 16, 2015. Note that one case study, Cannon Street in Hamilton, cites a reduction in truck traffic that occurred as the area transitioned from an industrial economic base to more diverse uses as a key factor in the conversion of the street to a Complete Street.

85 J. Green, *Complete Streets vs. Trucks*, The Dirt, online newsletter of the American Society of Landscape Architects, January 21, 2015. See http://dirt.asla.org/2015/01/21/complete-streets-vs-trucks/.

- Many Complete Streets initiatives place a bicycle lane next to the curb, which must be crossed by drivers making deliveries, even if they are parked in designated spaces.

The need for flexibility and creativity is cited as a way forward in order to balance the competing needs. For example, one common source of conflict is the use of large corner radii to accommodate trucks turning from the right lane into the right lane. Some guides accommodate the turning of large vehicles onto smaller streets with curb extensions by crossing over the centre line of the smaller street, which requires the stop bar to be moved back (see the right illustration in Figure 7-1). The left illustration shows that a curb extension at the intersection provides a larger turning radius, which, in combination with a centre median or allowing the vehicle to cross the centre line, could accommodate the turning vehicle without overriding the curb extension.[86]

Figure 7-1. Corner Design Concepts



Source: Figure 30, *Complete Streets Chicago, Design Guidelines*, City of Chicago, 2013.

Note that this example is provided here only to illustrate the concept: a detailed design guide would be required before any actual application. The point is that proven methods exist to address conflicts, thereby potentially allowing trucks and other activities to co-exist safely on corridors that are important to various users.

[86] *Complete Streets Chicago, Design Guidelines*, City of Chicago, 2013.

7.4.1 Designation of Major Truck Corridors

Many Complete Street guidelines accept that, in industrial areas, vehicular traffic – and, especially, trucks - will have priority over other corridor users. However, it is important to recognize that high truck volumes can be found anywhere in the urban environment. This is exemplified by many of the primary and secondary freight clusters identified in this project, many of which are located in or are accessed through areas of mixed land uses.

As a result, it is important to recognize the need for a broader accommodation of trucks beyond industrial areas. Here, the City of Seattle provides some insight in a Complete Streets policy context: "Mobility" is noted as the policy's second priority, after safety. Consistent with these two priorities, on streets that have been designated as "Major Truck Streets," the policy requires that design and operational improvements "support" all modes, and "are consistent with freight mobility." As defined in 2005, a Major Truck Street is:

> "an arterial street that accommodates significant freight movement through the city, and to and from major freight traffic generators. The street is typically a designated principal arterial ... Major Truck Streets generally carry heavier loads and higher truck volumes than other streets in the City. [The Department of Transportation] uses the designation of Major Truck Street on an on-going basis as an important criterion for street design, traffic management decisions and pavement design and repair." [87]

In other words, a Major Truck Street does not have to be within an industrial area; instead, it can include arterials anywhere in the city that are "significant" to freight activity. This broader consideration of freight resulted from a "major debate" that took place during the development of the City's Complete Streets ordnance. The debate concerned the treatment of freight. As a result, the final policy reads:

> "Because freight is important to the basic economy of the City and has unique right-of-way needs to support that role, freight will be the major priority on streets classified as Major Truck Streets. Complete Street improvements that are consistent with freight mobility but also support other modes may be considered on these streets."

Pedestrian and bicycle advocates were not happy with the clause, but the City determined that the inclusion of this wording was necessary to gain the support of the freight community.[88]

Note that the wording of Seattle's overall Complete Streets policy is sensitive to the needs of freight: for example, the policy notes that reducing the number of lanes "usually" means lanes can be slightly wider, thereby improving circulation for buses and "freight."[89]

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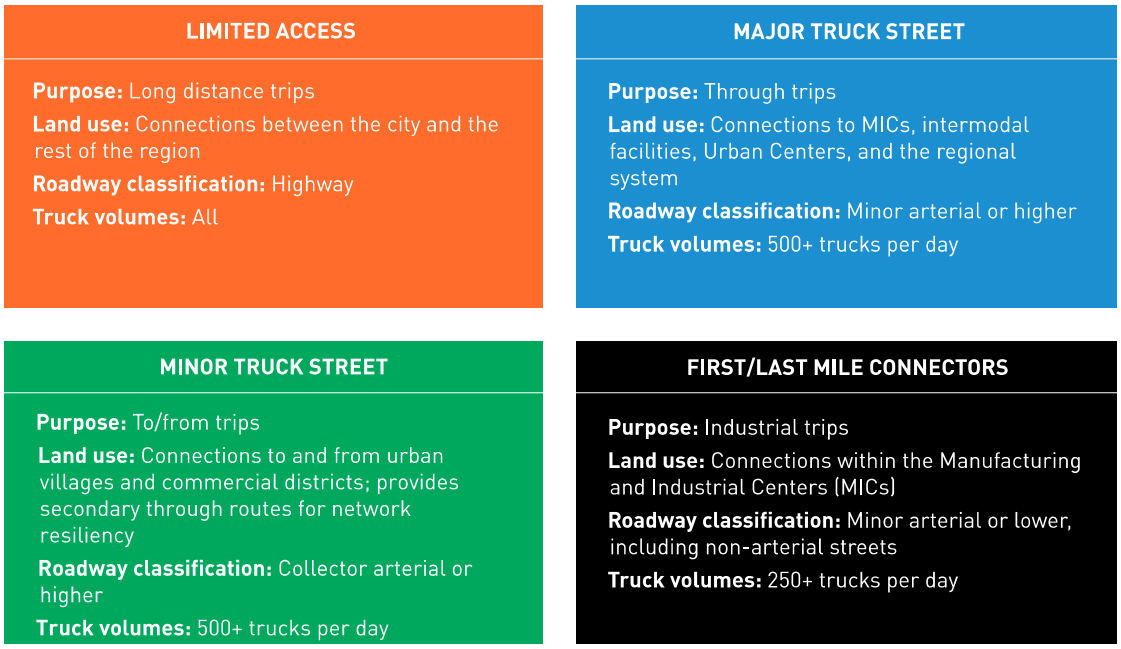
[87] *Truck Classification Legend Definitions*, City of Seattle. See http://www.seattle.gov/transportation/streetclassmaps/trucklegend.pdf.

[88] B. McCann and Rynne, S., editors, *Complete Streets: Best Policy and Implementation Practices*, Planning Advisory Service Report Number 559, American Planning Association, Chicago, March 2010. Seattle's ordnance was approved by City Council in 2007.

In 2016, Seattle updated its freight network. In doing so, it grouped the city's roads and highways into four categories. The categories are illustrated in Figure 7-2. They are in many ways similar to those that were developed for the GTHA-wide SGMN, with the key differences being their analytical basis in travel demand model forecasts (whereas the GTHA-wide SGMN is based on current conditions) and the use of threshold truck volumes as a category distinction (whereas volumes are used in Canada as guidelines)[90]. Of relevance to this discussion, however, the Seattle network connects 'urban centres,' 'urban villages,' commercial districts and other non-industrial generators, in addition to manufacturing and industrial centres and intermodal terminals. The document also points out that:[91]

> " Designating a street as part of the freight network will not necessarily change its overall function, design or character. Rather, the designation underscores the importance of ensuring that goods movement can be accommodated on that street in a safe manner."

Figure 7-2. Seattle's Freight Network Designations and Criteria



Source: Figure 4-3, *City of Seattle Freight Master Plan*, City of Seattle, September 2016.

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[89] *Designing Safer Streets*, City of Seattle, February 27, 2014. See http://www.seattle.gov/transportation/saferstreetsforall.htm.

[90] York Region's 2016 SGMN cites "typical" truck volumes and medium/heavy truck percentages as distinguishing among highway goods movement corridors (400-series highways and secondary highways), primary arterial goods movement corridors (urban arterials serving employment and industrial lands) and secondary arterial goods movement corridors (all other Regional arterial roads). However, it is not clear whether or on these designations include forecasted volumes.

[91] *City of Seattle Freight Master Plan*, City of Seattle, September 2016.

7.5 Summary

Because the core road and rail SGMNs were developed in consultation with the Review Group, most potential issues and conflicts have been addressed. The multi-faceted and iterative one-on-one consultation with individual agencies proved effective in identifying and accommodating Review Group comments.

As a result, relatively few potential conflicts remain. These comprise eight corridors on which rapid transit is planned or is under construction, and the treatment of three road sections in the City of Toronto that have load restrictions. In the case of the eight rapid transit corridors, potential conflicts should be addressed as corridor design progresses. In the case of the three segments with load restrictions, the extent to which any of these constitutes an actual constraint on the movement of goods is unclear, and might best be addressed if the City of Toronto identifies this as a constraint, or if the City proposes to rehabilitate any of the bridges in question.

In addition, it should be noted that Halton Region and the City of Toronto propose to review the need for possible additional SGMN segments, or possible changes to the core road SGMN, as part of future studies – notably, the planned update to the Halton Region TMP and a planned freight strategy for the City of Toronto.

Accordingly, this chapter proposes approaches to addressing these conflicts, if and as specific needs arise. The approaches are necessarily generic, drawing from best practices elsewhere, and serve as guidelines for future analyses.

The approaches can be described at three levels or steps. The approaches are progressively more focused on individual corridors and on actual implementation. These are:

- At the master planning or strategic planning level, providing a municipality-wide, network-level perspective. The object is to coordinate the SGMN with transit and other major corridor improvements at a broad, strategic level.
- At the corridor and sub-area planning level, focusing on smaller numbers of corridors. The object is to integrate goods movement needs as corridor and area plans become more specific.
- At the level of planning and design for individual corridors. The object is to ensure that truck circulation and parking are considered explicitly in road and intersection design, especially as Complete Streets and other shared corridor guidelines are implemented on individual roads.

8 Implementation and Monitoring Plans for the SGMN

Key Chapter Takeaway

This chapter proposes a fifteen-part plan for implementing the SGMN, drawing on experiences elsewhere. It also proposes a fourteen-part program to monitor the performance of the SGMN and progress towards its implementation.

8.1 Introduction

This chapter proposes a plan for implementing the SGMN, based on a review of other recent practices. The proposed plan recognizes that the implementation of the SGMN requires a cooperative approach among the relevant jurisdictions.

The chapter also proposes performance measures for monitoring the progress of the plan.

Note that the implementation plan actions might require updating in the future, pending the outcomes of MTO's GGH Multimodal Plan, which is now underway.

8.2 Proposed Implementation Plan

Table 8-1 lists the elements of a proposed implementation plan for the GTHA-wide SGMN. The list has fifteen actions. These are drawn from a review of SGMN implementation plans proposed locally in Peel (2013), Durham (2017) and York (2016) and in recent US SGMNs in Seattle, Phoenix and Chicago. These SGMNS were selected because they are recent and comprehensive. With one exception, the cited SGMNs comprise only roads and highways: Chicago's CREATE Program (Chicago Region Environmental and Transportation Efficiency Program) focuses on that region's rail network. The CREATE initiative is also a public-private partnership (P3).

The reviews are detailed in Appendix C. The review describes the key elements of each implementation plan, and also comments on its focus and its applicability to the GTHA-wide SGMN.

The proposed implementation plan recognizes that all implementation elements must be collaborative, given that the SGMN does not have a GTHA-wide status. Thus, although individual upper-tier municipalities are encouraged to adopt the GTHA-wide SGMN as a first step, adoption is not a precursor to its actual implementation. Moreover, it is recognized that the upper-tier municipalities might reflect varying balances between accommodating passenger and goods movement in infrastructure investments and priorities, as described in Section 4.2.

Table 8-1 lists the proposed implementation action. It describes what the action achieves. The table also lists the participants, noting, where appropriate, which agency would serve as the lead.

Table 8-1. Proposed Implementation Plan for the GTHA-wide SGMN

Action	What This Achieves	Participants
1. Give the SGMN status by encouraging the Councils of the upper-tier municipalities to adopt it, or by encouraging upper-tier municipalities to incorporate the SGMN into their own plans and policies.	• Provides a legal framework for subsequent implementation actions within each municipality within the context of its own respective plans and policies. The intent is to complement (but not supersede) existing municipal SGMNs, where they exist, so that municipal decisions on infrastructure improvements can be considered in the broader GTHA-wide perspective. • Provides a basis for developing secondary SGMNs in collaboration with lower-tier municipalities.	• Individual upper-tier municipalities.
2. Encourage the Province and upper-tier municipalities to align and prioritize their individual operational, management and capital network improvements to support those elements of the SGMN that are under their respective jurisdictions. Coordinating initiatives across	• Helps the Province and individual upper-tier municipalities establish priorities and approve budgets for improving and upgrading the individual components of the SGMN that are under their jurisdiction, as well as those that cross between jurisdictions, in a timely manner. The intent is to inform existing individual agencies' priority- and budget-setting processes, so that decisions can be made with the broader GTHA-wide perspective taken into account. • Ensures that potential improvements can be implemented	• All facility owners (MTO, upper-tier municipalities, Highway 407 ETR).

Table 8-1. Proposed Implementation Plan for the GTHA-wide SGMN

Action	What This Achieves	Participants
municipal boundaries also is encouraged.	on a timely basis while maintaining consistency with the available budgets.	
3. Implement operational, management and capital network improvements that support the SGMN.	• Upgrades the SGMN in a timely manner.	• All facility owners (MTO, upper-tier municipalities, Highway 407 ETR).
4. Prepare inventory of existing barriers such as load restrictions, turning radii, height requirements and inadequate pavement structures.	• Helps facility owners identify specific problem areas for subsequent improvements by informing their network improvement decisions. • Can be used as the basis to establish priorities for improvements.	• Metrolinx (lead) – prepares and coordinates the inventory, working with the upper-tier municipalities, MTO, Highway 407, the railways, the two airports and the three marine ports.
5. Establish a SGMN committee to coordinate and advance the implementation of SGMN initiatives.	• Provides a practical and focused forum to continue and coordinate efforts for implementing the SGMN, exchange ideas and best practices, coordinate data collection and conduct research.	• Metrolinx (lead) – coordinates the SGMN committee, with the participation of the Review Group members. • So as not to duplicate existing commitments in other GTHA goods movement forums, the SGMN committee could be structured as a topic-specific sub-committee of the Metrolinx Urban Freight Forum (UFF) under the general direction of and reporting to the UFF.
6. Establish signage, route guidance and maps for the SGMN, covering the GTHA and possibly areas beyond.	• Immediately establishes the SGMN as the 'go-to' network for truckers. • Communicates the importance of the multimodal road/highway and rail goods movement network in the GTHA and its connections to intermodal terminals and key goods generators, with the guidance and maps perhaps extending to the Greater Golden Horseshoe and beyond. • Signals that goods movement needs will be considered explicitly in any plans for the GTHA's SGMN elements.	• Facility owners (MTO, upper-tier municipalities and Highway 407 ETR) for signage and route guidance. • Metrolinx for maps, in consultation with the facility owners.

Table 8-1. Proposed Implementation Plan for the GTHA-wide SGMN

Action	What This Achieves	Participants
7. Review and remove any existing by-law restrictions from the designated SGMN, where feasible.	• Guides trucks towards the designated SGMN and away from other routes. • Focuses on removing time/day of use restrictions where the road geometry, load limits and clearances otherwise support heavy trucks	• Individual upper-tier municipalities.
8. Design and promote common approaches to set priorities for each implementation action, incorporating benefit-cost analysis.	• Individual agencies must evaluate and prioritize investments according to their own practices. However, it would be useful to have a common, GTHA-wide approach to assessing SGMN investments. This would ensure that goods movement is given the appropriate profile when individual agencies develop their own business plans. • A common GTHA-wide approach, focused on benefit-cost analysis, would be needed to attract potential private sector contributors.	• Metrolinx (lead) – designs the approach, in consultation with the upper-tier municipalities, monitors its usage, refines it as needed, and maintains a database of procedures, methods, guidance, data and findings. • Collaborators are MTO, Transport Canada, the upper-tier municipalities and Highway 407 ETR, and possibly also the railways, the two airports and the three marine ports.
9. Develop and promote consistent guidelines and best practices for evaluating zoning and land use plans along the SGMN corridors, to ensure that goods movement needs are accommodated while maintaining compliance with individual agencies' land use and transportation policies and aspirations.	• Helps ensure that individual upper-tier municipalities consider land use plans and zoning from the perspective of goods movement, so as to minimize conflicts with the SGMN. • Could constitute an addendum to MTO's *Freight-Supportive Guidelines*, focused on the SGMN, along with best practice illustrations.	• MTO or Metrolinx (leads), in combination with facility owners.
10. Develop and promote common approaches and best practices for evaluating transportation proposals along the	• Helps ensure that individual facility owners (MTO, upper-tier municipalities, Highway 407 ETR) are able to maintain the necessary rights-of-way and corridor capacity to allow for future growth in truck travel as well as for industry trends	• MTO or Metrolinx (leads), in combination with facility owners.

Table 8-1. Proposed Implementation Plan for the GTHA-wide SGMN

Action	What This Achieves	Participants
designated SGMN corridors and for assessing right-of-way protection requirements, to ensure that goods movement needs are accommodated while maintaining compliance with individual agencies' policies.	such as long-combination vehicles. • Helps ensure that development plans adjacent to rail corridors do not conflict with rail freight movements. • Protects rights-of-way for accesses to future intermodal facilities.	
11. Encourage upper-tier municipalities to develop their own secondary SGMNs in conjunction with lower-tier municipalities, in order to ensure first/last kilometre connectivity.	• Addresses local SGMN needs – for example, an SGMN for dense urban areas. • Ensures that first/last kilometre connections are taken into account in establishing SGMN priorities. • By working with lower-tier municipalities, provides a seamless SGMN within each region.	• Upper-tier municipalities in conjunction with their respective lower-tier municipalities.
12. Develop and promote Complete Streets guidelines and best practices that account for goods movement.	• Provide guidance to municipalities to help ensure that truck needs are explicitly incorporated in their own Complete Streets guidelines, focusing on best practices to avoid conflicts with other corridor users.	• MTO or Metrolinx (leads), in combination with upper-tier municipalities and Complete Streets researchers.[92]
13. Review existing funding sources to ascertain their potential application to SGMN corridor improvements.	• Potentially leverages and optimizes existing funding sources, especially from senior governments, to upgrade the SGMN. • Shows how the SGMN could support transit, international trade, economic development, and so on.	• Metrolinx (leads) develops an inventory of existing funding sources, and describes how funding applicants (upper-tier municipalities) could leverage these sources to implement SGMN improvements
14. Consider creating P3 structures to implement at least some types of improvements.	• Allows for cost-sharing of key infrastructure improvements that benefit private sector interests.	• MTO or Metrolinx (leads), in combination with facility owners.

[92] Note that Policy 3.2.2.3 of the Province's recently adopted *Growth Plan for the Greater Golden Horseshoe* requires municipalities to adopt a Complete Streets approach to the design, refurbishment or reconstruction of the existing and planned road network. Details can be found at: http://placestogrow.ca/index.php?option=com_content&task=view&id=430&Itemid=14#3.2.2

Table 8-1. Proposed Implementation Plan for the GTHA-wide SGMN

Action	What This Achieves	Participants
15. Implement a performance monitoring program, and use this program for public information, to inform planning and investment decisions, and to help determine when a SGMN update is warranted (see Section 8.3 for details)	• Monitors progress towards the implementation of the SGMN across the GTHA. • Can be used as the basis to identify obstacles and to update the GTHA-wide SGMN if appropriate. • Can also be used to inform the public and decisions-makers as to the importance and effectiveness of the SGMN (by tracking the value of the goods movement and so on). • Implies a coordinated data collection program across the GTHA, which can be used as the basis for broader goods movement data.	• Metrolinx (lead) – designs and coordinates the program • MTO • Upper-tier municipalities • Highway 407 ETR • Transport Canada • Might also be appropriate to invite the railways, the two airports and the three marine ports.

8.3 Proposed Monitoring Program

Table 8-2 presents potential performance metrics for the SGMN. The list is drawn from a review of performance metrics that were proposed for other SGMNs and from the consultants' experience with other GTHA goods movement strategies. The review is detailed in Appendix D.

The focus is on outcomes, i.e. the ultimate goals of the SGMN, and not on intermediate outputs that are instrumental to achieving outcomes such as infrastructure condition.

Table 8-2 proposes fourteen performance measures. The table also indicates the desired outcome and the data source, as well as any relevant comments. Key points to note:

- The measures focus on the use of existing and available data. However, the need for additional data, or for expansions of existing data sources, is noted in the table.
- Most of the data sources are developed by the public sector, or are data purchased by the public sector such as GPS fleet traces. Most of these data are available, although their format, coverage and recentness can vary across the GTHA.
- Data for measure 14, on-time delivery performance, must be sourced from individual (sample or indicative) private sector carriers, which might impose conditions of use restrictions so as to maintain certain confidentialities.
- Data on the monetary value of the goods being moved (measure 2) can be difficult to source. However, such values signal the importance to the public and to decision makers of planning for and supporting goods movement. MTO estimates these values

from its Commercial Vehicle Survey, which could be used either by conducting surveys on certain SGMN segments or by estimating values from the existing CVS data.

- The measures generally reflect public planning needs. The measures also can be used in education and awareness campaigns to improve public and political acceptance of the SGMN, showing its effectiveness overall and showing how SGMN goals have been met, how they fit TMP, OP and policy aspirations, and so on.
- Some measures are of specific interest to the private sector, especially on-time delivery performance (measure 14), travel time reliability (5) and delay and its costs (6). Some measures are especially helpful to report to regional / municipal Councils, to show how their investments in the SGMN address planning and policy aspirations – notably, delay and its costs / impacts (6) and value of investments (9). The measures also can be used to inform and educate communities and the public at large with respect to what the SGMN is achieving – notably, delay and its costs / impacts (6) and the two collision measures (10 and 11).
- Most of the measures refer to the performance of the core road SGMN. Two measures consider the performance of the core rail SGMN: measure 12 tracks the incidence of delays on shared used rail corridors and measure 13 examines the impact of improved road-rail crossings.
- Finally, the development and ongoing maintenance of these measures requires a coordinated effort across the GTHA in order to be meaningful. This coordination could come under the purview of the SGMN coordination committee, proposed as implementation action 7 in Table 8-1.

Table 8-2. Potential Performance Metrics for the SGMN

Performance Measure	Desired Outcome	Data Source	Comment
1. Truck volumes on SGMN corridors.	Increased truck volumes on the SGMN corridors, perhaps with stable or decreasing truck volumes on other road. Also could show improved distributions by time of day (i.e., better utilization of the network), even if total daily volumes remain stable.	Cordon and intersection counts conducted by facility owners. Counts should use common categories, durations, frequencies, and so on in order to ensure comparability.	Ensure that counts are conducted at regular intervals along the SGMN and at frequent, regularly scheduled intervals.
2. Value of goods carried on SGMN corridors, or value of goods carried per truck.	Increased value of goods carried along each corridor, or per truck.	MTO's Commercial Vehicle Survey, either through surveys that are conducted on specific SGMN sections or estimated from the CVS.	Demonstrates economic importance of the SGMN. Can also demonstrate increased corridor effectiveness ($/load carried), increased connectivity (more sites

Table 8-2. Potential Performance Metrics for the SGMN

Performance Measure	Desired Outcome	Data Source	Comment
			that generate more value) and increased reliability (more willingness of carriers to use it).
3. Average truck travel times (along one or more corridors or on the entire SGMN).	Reduced average truck travel times. Can be calculated separately for different times of day or days of week.	GPS fleet traces or travel time surveys. Important that travel times are specific to trucks.	
4. Average truck travel speeds (along one or more corridors or on the entire SGMN).	Increased average truck travel speeds. Can be used to assess impact of non-recurrent congestion (e.g., work zones or inclement weather) on free-flow or posted speeds.	GPS fleet traces or travel time surveys. Important that travel speeds are specific to trucks.	Differs from average truck travel times
5. Travel time reliability (along one or more corridors or on the entire SGMN).	Reduced variation in average travel speeds over time.	GPS fleet traces or travel time surveys. Important that travel times are specific to trucks.	Used by private sector to plan delivery schedules with a high degree of confidence. Use by public sector to better understand recurrent and non-recurrent congestion.
6. Travel time delays (magnitude and duration) and costs of delays (monetary, fuel, GHG, pollutants), along one or more corridors or on the entire SGMN.	Reduced magnitude / duration of delay (vehicle-hours travelled, or VHT) and in associated costs (monetary costs to drivers, fuel use, GHG emissions and air pollutants).	GPS fleet traces or travel time surveys to derive speeds, coupled with traffic counts on individual segments. Values of truck time ($/hr) can be derived from stated preference surveys or from the literature. Fuel consumption rates (l/km), GHG emission rates (kg/km) and emissions of CO, NOx, PM and other pollutants (g/km) can be derived from local data or from the literature – note that these rates vary by engine / fuel type and by speed.	Calculate delay relative to a threshold speed (post speed, free flow speed or a certain percentage of these speeds). Shows tangible impacts of SGMN improvements on TMP, OP and policy aspirations. Changes in fuel consumption, GHG and pollutants also are of interest to corridor residents and to the public generally.
7. Percent of the SGMN that has an acceptable pavement	Increased percent of SGMN route-km that has an acceptable pavement	Municipal and MTO pavement condition indexes.	Must determine a common definition of acceptability.

Table 8-2. Potential Performance Metrics for the SGMN

Performance Measure	Desired Outcome	Data Source	Comment
condition.	condition.		
8. Percent of the SGMN that does not have restricted clearances or permanent or seasonal load restrictions.	Increased percent of SGMN route-km that is not subjected to clearance or load restrictions.	Upper-tier municipalities' truck route maps and seasonal road restriction maps or tabulations.	All calculations should be based on permitted dimensions (i.e., not on over-dimensioned vehicle routes). Could be informative to distinguish between seasonal and permanent load restrictions and between load and clearance restrictions.
9. Value of annual investments in SGMN network improvements.	Increase or maintain at least a constant level or percentage of total road expenditures.	Annual budgets or 5-year capital plans of upper-tier municipalities and MTO.	Improvements to the SGMN segments also aid other corridor users.
10. Number of collisions involving trucks on the SGMN, per truck trip (volumes).	Decreasing rate.	Regional/municipal and Provincial collision statistics.	Changes in collisions are of interest to corridor residents and to the public generally.
11. Number of fatal and serious injury collisions involving trucks on the SGMN, per truck trip (volumes)	Decreasing rate.	Regional/municipal and Provincial collision statistics.	Changes in collisions are of interest to corridor residents and to the public generally.
12. Delays to freight trains and GO trains in the GTHA	Decreasing frequency and magnitude of delays on shared or intersecting tracks.	Railways and GO Rail.	Must ensure that delays are attributable to congestion and not to other factors such as equipment malfunction.
13. VHT of delays incurred at at-grade crossings, for all road traffic and separately for trucks.	Decreasing VHT.	Travel time surveys and counts at specific road-rail crossings.	Measures before-and-after impacts of improvements to road-rail crossings, such as changed signal timings, upstream or downstream road improvements, introduction of grade separations and so on.
14. Percent on-time delivery (proportion of total trips that are made within a certain threshold).	Industry expectations are to achieve 95% - 98% on-time performance for all trips.	Private trucking companies.	Industry metric. However, data might be held as confidential.

8.4 Summary

The implementation plan proposed in this chapter is intended to help MTO, Metrolinx, upper-tier municipalities and other stakeholders bring the SGMN into actual use across the GTHA. The monitoring plan is designed to track progress in the implementation but also to demonstrate the importance and effectiveness of the SGMN to goods movement stakeholders as well as to corridor residents, regional/municipal Councils and the public at large.

9 Applications and Future Steps

Key Chapter Takeaway

This chapter details the many ways that the GTHA-wide SGMN can be applied to municipal transportation plans, investments and priorities, and how it can inform industry, residents, landowners and other corridor users. It also proposes possible future steps.

9.1 Introduction

The GTHA-wide SGMN is intended for use as a tool to guide municipalities and facility owners in making plans and investment decisions for their goods movement infrastructure. It also can inform infrastructure users, both goods movement and others, as well as the community at large, in making their own decisions. These applications are elaborated in the next section.

The chapter and this report conclude with a discussion of potential future steps to further advance and refine the SGMN.

9.2 How the GTHA-wide SGMN Can Be Applied

The GTHA-wide SGMN has a number of potential uses, which vary by stakeholder. The potential applications and benefits are described in Table 9-1. The table categorizes perspectives from four stakeholder groups:

- Goods movement industry – the users of the SGMN.
- Infrastructure owners – that is, the Province, upper-tier municipalities and the Highway 407 ETR, as well as the railways, airport authorities and port authorities. Because most of the potential applications and benefits fall here, the potential applications are organized into four additional sub-groups:
    - Investment priorities and funding decisions.
    - Design, operational and technological improvements.
    - Land use and environmental planning decisions.

- Data and performance monitoring.

Many of the initiatives described in the implementation and monitoring plans influence and are influenced by the plans, policies and practices of lower-tier municipalities. Accordingly, it is clear that the benefits that accrue to upper-tier municipalities also would accrue to their lower-tier partners, especially in the event that lower-tier roads are added to the GTHA-wide SGMN. As with other planning and policy initiatives, it is reasonable to expect that the implementation of the SGMN would benefit from collaborative initiatives between upper- and lower-tier municipalities. A prime example is the inclusion of first / last kilometre lower-tier roads in the GTHA-wide SGMN, as discussed in Section 6.2.5.

- Other users of the same infrastructure – that is, people who travel by auto, transit and active transportation on road corridors, as well as those who travel by commuter rail and intercity passenger rail, sharing the use of the facility or corridor with the movement of goods. This group also includes the providers of transit services, GO Bus, GO Rail and VIA Rail Canada.

- Residents who live or plan to live on or near the SGMN corridors, and owners of lands that are adjacent to or near the SGMN corridors.

The table shows that there are many potential benefits. Key points to note:

- The goods movement industry benefits through the identification of a seamless, multimodal priority network across the GTHA, providing guidance on routes and alternatives. The SGMN also signals to industry that improvements will take place to further enhance the efficiency of goods movement in the GTHA.

- Infrastructure owners benefit in several ways: The SGMN can serve as a road map for locating upgrades and improvements that will benefit the movement of both goods and people. The SGMN informs planning, right-of-way protection and investment decisions and priorities, as well as zoning and land use planning decisions. The SGMN enhances the integration of goods movement with Complete Streets schemes and other corridor improvements. The SGMN can serve as a tangible focus for a broader goods movement data collection initiative and for research in goods movement. Finally, the SGMN informs political decision-makers at all levels of government about the economic and other benefits of maintaining an efficient goods movement network in the GTHA.

- Other users benefit through the knowledge of how goods movement uses shared infrastructure, which informs their own mode and route choices.

- Residents and landowners benefit through an improved understanding of how the SGMN impacts traffic levels in their neighbourhoods as well as its potential impacts on mitigating congestion, energy consumption, GHG emissions and air pollution. It also informs them as to the types and timing of potential improvements.

Table 9-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
Goods movement industry – the users of the SGMN	• **Designates a seamless, multimodal priority goods movement network that covers the entire GTHA.** • **Provides positive guidance on routing**, i.e. the optimal route to get from point A to point B while keeping trucks off routes that are not desirable for users and the community alike. 'Optimality' refers to routes that are direct, well connected to generators, are reliable, are operated to maintain throughput and steady speeds, have minimal interference among users, are well maintained (state of repair), have appropriate geometric designs, have adequate load limits, have adequate clearances, are clearly marked and have readily available and designated alternatives should they be needed. • Indicates those routes that, in the short term, could serve as **alternatives to congested routes**, such as the 400-series highways, thereby reinforcing the 'positive guidance' message. In the long term, if and as municipalities make appropriate improvements to the designated routes, the SGMN informs truck drivers and dispatchers where they could reasonably **expect to have a high level of service**, thereby helping to concentrate trucks where on the desired routes. • Conveys to private sector goods movement stakeholders that they are **being listened to** and that goods movement is important to municipal land use planning, road asset management and investment priorities. This further establishes **a cooperative approach** to meeting goods movement needs. • Provides the basis for potentially **attracting private partners** to help implement and possibly help fund improvements that have broad benefits, potentially including fleet owners, courier companies, railway companies, industries that are adjacent or linked to an SGMN segment and so on. CREATE, a successful example of a P3 in Chicago, is described in Appendix C. • Can influence the **locational choices** of prospective businesses that want to ensure they have adequate access for commercial vehicles.
Infrastructure owners (Province, upper-tier municipalities): Investment priorities and funding decisions	• Informs **prioritization of capital expenditures** – for example, funding dedicated to goods movement infrastructure should be directed to improvements to SGMN infrastructure. More generally, the SGMN designation brings an explicit recognition of which infrastructure is important for goods movement and where, for example, bottlenecks cause the greatest negative impacts to truck (and passenger) travel times and costs. • Informs the **prioritization of operating expenditures**: e.g. priority maintenance and snow clearing, priority incident management and policing. • Provides a '**road map**' for implementing other goods movement actions – for example, Peel Region has used its own SGMN to inform where other goods movement actions and improvements should be implemented. • Identifies possible **priorities for initiatives where multiple jurisdictions must collaborate** – for example, York Region identifies two future Highway 400 interchanges as being important to its SGMN. • Informs **corridor right-of-way protection decisions and investments** for future roads and for intersection improvements. • Identifies candidate corridors that should be included in **emergency detour plans**, especially as alternatives to the 400-series highways. • Identifies existing corridors that should serve to **connect to planned or proposed 400-series highways** (such as the Bradford Bypass), or which would **serve as interim**

Table 9-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
	SGMN routes pending the construction of these or municipal roads. • Informs municipalities, the Province, GO Rail and local transit authorities **where potential conflicts might arise on SGMN road and rail corridors** where rapid transit or other system upgrades (such as RER) are planned. • Provides an **overarching framework within which individual municipalities could develop their own secondary SGMNs** - for example, the City of Toronto has suggested the need for such a 'medium truck' SGMN network in the dense urban core. Municipal **truck route networks** also fall within and should be made consistent with this **SGMN hierarchy**, to promote consistency across the GTHA. • Could **inform funding decisions**, where multiple levels of government and even private landowners could collaborate to implement improvements. • Could **inform decisions on congestion pricing and other road charges**, by indicating where the corridors that would be most impacted by pricing decisions (e.g., causing truck drivers to use other routes) and, on the other hand, by indicating where non-tolled corridors should be provided (if tolling is the option).
Infrastructure owners (Province, upper-tier municipalities): Design, operational and technological improvements	• Promotes the **implementation of minimum design, geometrical, loading and clearance standards** to support heavy trucks when road and intersection improvements are made. These include pavement / sub-base load capacity, intersection turning radii, intersection truck turning storage and channelization, load-bearing capacity of structures, vertical and horizontal clearances for standard vehicles and for over-dimension vehicles (including for signal heads and wires), and so on. This means that any upgrades to the designated routes must be brought to these standards, so as to make the road ready for heavy trucks year round – i.e., eliminating seasonal load restrictions in the process. • Identifies **corridors where Complete Streets, traffic calming and transportation demand management measures should be carefully thought through**, so as to provide safe and smooth operations for other corridor users while maintaining the necessary throughput and accessibility for goods movement – for example, by providing separate corridors for vulnerable users or separate lanes for trucks and by minimizing road designs that impede truck flow on SGMN segments, such as roundabouts. • Informs where **heavy truck operations** along the designated corridors should be reviewed. For example, signal timings and progressions along designated corridors should be reviewed so that they are optimized for smooth truck flows. • Shows where **ITS and other new transportation optimization systems** should be put in place, if they are to maximize the benefit to truck movement. • Indicates corridors that could show promise for **demonstration projects**, such as truck-only lanes, especially across jurisdictions. • Provides a framework to **inform future plans for emerging technologies**, such as automated vehicles and truck platooning, as well as current and growing operational practices such as the growing use of long-combination vehicles (LCVs). Municipal LCV networks can be fitted into the SGMN, given that the 400-series highways are included in the SGMN and the SGMN connects key generators.
Infrastructure owners (Province, upper-tier municipalities):	• Indicates the **corridors where freight-supportive land use planning would be most effective**, both to improve the throughput of all corridor traffic and to provide the appropriate accesses to adjacent goods-generating industries. More generally, the SGMN also helps municipalities ensure that goods-generating land uses are located close to or are connected to the SGMN, while also indicating (as future employment

Table 9-1. How the SGMN Can Be Used

Stakeholder	Potential Applications and Benefits
Land use and environmental planning decisions	lands are developed) where updates to the SGMN should take place. The SGMN also identifies corridors that other, more sensitive land uses could avoid. As well, the SGMN also informs municipal zoning designations along SGMN, to help municipalities avoid conflicting land uses. • Indicates **which connectors must be protected** to maintain goods movement access to major goods generators, even as adjacent lands are converted to other uses. • Provides municipalities with a **quantitative basis for identifying major goods-generating lands** through the use of the 'freight cluster' definitions and analysis on which the SGMN was based. This quantitative approach would **complement existing approaches** that are based on employment, Official Plan land use designations, industrial land strategies and the like. • Promotes **increased use of multimodal air, rail and marine terminals and ports** through the designation of and, ultimately, improvements to the road and rail accesses to these terminals and ports. Promotes the continued economic growth of these terminals and ports by, ultimately, ensuring that improvements to these road and rail accesses are given high priorities to remove bottlenecks and increase throughput. • Supports **planning around key intermodal hubs**, namely the international airports, intermodal rail terminals and the marine ports, which are connected to the SGMN and which are already major GTHA employment nodes currently (such as TLBPIA) or are expected to be in the future (such as HIA and the HPA). • Supports **planning around mobility hubs** as they develop, especially in suburban areas, by indicating the potential SGMN routes to which mobility hubs should be connected hence identifying potential additions to the SGMN. • Informs **planning decisions on emerging topics**, such as the need for truck parking as mandatory use of electronic logging devices for hours of service is introduced. • Indicates corridors where **air quality improvements** related to goods movement and where **fuel reduction / GHG reduction measures** could build on industry initiatives and have the greatest potential.
Infrastructure owners (Province, upper-tier municipalities): Data and performance monitoring	• Indicates corridors where **Key Performance Indicators and other performance measures** would be most effective, in order to show how proposed network improvements benefit goods movement. • Indicates corridors where **data collection efforts** could be focused – truck travel time surveys, turning movement counts, classification counts and so on – with a view to coordinating data collection across the entire GTHA using common definitions, classifications and so on. • Inform **potential research needs**, such as new apps and other electronic technologies that could further improve truck travel times and reliability, inform driver/dispatcher route choices and so on.
Other users of the same infrastructure	• Provides information on the **likely location of high levels of goods movement activity**, so as to promote safe travel for all corridor users – for example, potential areas to avoid for pedestrians, cyclists and motorists who are uncomfortable around goods movement vehicles.
Residents and land owners	• Provides **clear indication of location of intensified goods movement activity**: e.g. possible input into land development decisions and residential purchase / leasing decisions.

9.3 Future Steps

This section discusses possible next steps to allow the adoption and implementation of the SGMN. Metrolinx and the Steering Committee identified five specific initiatives, which are detailed below: the development of policies and further actions regarding the SGMN, a plan for broader stakeholder consultation, the potential for public-private collaborations for implementing infrastructure improvements, future data collection and future research.

9.3.1 Policies and Further Actions

Potential policies or guidelines regarding the adoption, take-up, roles and implementation of the SGMN will be the subject of further discussions between Metrolinx and MTO, based upon but distinct from the outcomes of this study and accounting for potential future policy initiatives by MTO in its *GGH Multimodal Plan*, which is now underway. As with other transportation initiatives, collaboration among Metrolinx, other Provincial agencies, upper-tier municipalities, infrastructure owners and, as appropriate, lower-tier municipalities will be needed. A potential complementary or follow-up activity could be a workshop among the facility owners to discuss how the implementation plan and monitoring program could be actualized, and by whom. The workshop also could consider the need for and structure of a multi-agency committee to guide the implementation, as well as its governance (e.g., as a sub-committee of the Metrolinx Urban Freight Forum) and recommendations for subsequent research and broader consultation with industry (see below).

In the meantime, Metrolinx presented the core road SGMN plan in its September 2017 Draft RTP, which is now being reviewed for public comment. Among the actions that Metrolinx has proposed in its Draft RTP are two that relate specifically to the SGMN:

- Metrolinx will "advance collaboration between the public and private sector to support implementation of the Regional Strategic Goods Movement Network to link goods-generating activity centres, intermodal terminals and regional gateways." (Priority Action 3.10, Draft RTP, p. 80)

- Metrolinx will "study goods movement priority features for new and existing freight corridors, including but not limited to intelligent lane utilization and truck-only lanes." (Priority Action 3.10, Draft RTP, p. 80)

The proposed collaborative, cooperative approach recognizes that any future SGMN policies and actions will in no way supersede existing municipal SGMNs or other uses of the designated corridors by the responsible jurisdiction. The SGMN is intended to complement these uses in order to ensure that goods movement needs are explicitly considered when the responsible jurisdictions propose improvements or new infrastructure.

9.3.2 Recommendations for Future Consultation

The GTHA-wide SGMN was developed in close consultation with upper-tier municipalities, senior governments and multimodal facility owners. The SGMN incorporates road/highway and rail segments that these stakeholders found compatible with their own needs and

policies. The Ontario Trucking Association also was consulted, to provide a high-level industry perspective.

This process provides a basis for broader consultation with the goods movement industry. In the meantime, Metrolinx has included the core road SGMN in its September 2017 Draft RTP, which has been distributed for public comment.

Going forward, a consultation programme for the goods movement industry could have the following components, with all actions led by Metrolinx:

- (Metrolinx would) compile a list of industry organizations and associations, including the OTA and other transportation and logistics organizations but also accounting for manufacturers, developers and the like.
- Convene a workshop with these organizations and associations, to review the core SGMN, its derivation and its benefits. It would be appropriate to include the railways, airport authorities and port authorities as well. Comments would be recorded and then summarized for possible updates to the SGMN. The possible updates would be reviewed with the facility owners (the Province and the upper-tier municipalities) to ensure compatibility with their needs or to identify possible alternatives. This could entail one-on-one discussions with the affected jurisdiction.
- Make appropriate changes to the SGMN and report back to the SGMN coordinating committee – in effect, the Review Group reformulated – to ensure compatibility with the needs of the individual facility owners, and again allowing for separate one-on-one discussions with the affected jurisdiction to work through possible alternative solutions. Explain how the comments have been addressed, including those that are not incorporated into the updated SGMN. Ask for the Review Group's comments, as the basis for soliciting a consensus on the updated SGMN.
- Convene a second workshop, this time including the Review Group members, to gain consensus on the updated SGMN. Note any outstanding conflicts or concerns, and propose that these could be addressed by the SGMN coordinating committee in the future, in collaboration with industry.
- Ask the industry organizations and associations to disseminate the SGMN to their members for comments, which would be received via a dedicated website.
- Address these comments and update the SGMN appropriately.
- The SGMN is now ready for public review, should Metrolinx wish to allow for a second circulation in addition to the current Draft RTP review. However, it may be more appropriate and beneficial instead to present the final SGMN to each upper-tier municipal Council and staff for information, explaining the benefits to them, the implementation plan and monitoring plan. Metrolinx might also want to develop a public-facing brochure as an educational tool to explain the benefits to the public.

9.3.3 Potential for Using the SGMN to Establish Joint Public-Private Initiatives

The implementation of the SGMN will involve the investment of varying levels of funds, depending of course on the exact nature of each proposed improvement. Although funding for these improvements might be leveraged with other public sources, given that many benefits also would accrue to other modes (e.g., transit) or given that some initiatives would be handled best within a broader context (e.g., a Complete Streets corridor upgrade), it could be necessary to attract additional funding sources or to use alternative delivery mechanisms.

In particular, a public-private partnership mechanism could be deployed, especially on corridors where P3 is being used to implement rapid transit. Chicago's CREATE initiative uses a P3 structure to combine public funds and private railway resources to implement needed improvements to the rail infrastructure (see Appendix C for details). Federal funding programs aimed at improving transit and trade infrastructure might also be leveraged.

9.3.4 Recommendations for Future Data Collection

As a first step, an inventory should be prepared of the available data sources, as well as their coverage, frequency and currency. The intent is to identify gaps in locations on the SGMN and in the actual data types, as well as out-of-date information. The inventory also should list the categories that were used, and propose common definitions.

With the inventory in place, SGMN data collection could focus on:

- Corridor and intersection vehicle counts, allowing for the development of truck AADT volumes on individual corridor segments as well as hourly breakdowns.
- Travel time surveys, in conjunction with information from GPS fleet traces. The surveys should be conducted at frequent intervals and should allow for the estimation of delays at different times of day and different days of the week.
- Inventories of corridor configurations, capacities (numbers of lanes, etc.), characteristics (posted speeds, etc.) and so on.
- Compilations of existing data that are needed for the performance measures, such as collision reports.
- The frequencies of freight and GO Rail trains on individual corridors.
- The number of delays incurred by freight and GO Rail trains that share the same corridors.

The SGMN data collection should be coordinated and consistent across the GTHA. The SGMN data collection could also serve as a basis for broader goods movement data collection – for example, establishment and truck origin-destination surveys.

9.3.5 Recommendations for Other Research

Five research activities are listed in the Table 8-1 implementation plan. All of these are aimed at promoting best practices and guidance on common approaches for implementing the SGMN. These would be led by Metrolinx and/or MTO working with the upper-tier municipalities, Highway 407 ETR, the railways, the two airports and the three port authorities. The five research activities are:

- Prepare an inventory of existing barriers such as load restrictions, turning radii, height requirements and inadequate pavement structures (implementation action 4).
- Develop and promote common approaches to set priorities for each implementation action, incorporating benefit-cost analysis (implementation action 8).
- Develop and promote consistent guidelines and best practices for evaluating zoning and land use plans along the SGMN corridors (implementation action 9). This could take the form of an addendum to MTO's *Freight-Supportive Guidelines*, with a focus on the SGMN and including best practices for illustration.
- Develop and promote common approaches and best practices for evaluating transportation proposals along the designated SGMN corridors and for assessing right-of-way protection requirements (implementation action 10).
- Develop and promote Complete Streets guidelines and best practices that account for goods movement (implementation action 12).

Appendix A. NAICS Codes, Economic Sectors and Employment Ranges

This appendix lists the NAICS (North American Industry Classification System) codes that are used to classify the business establishments, and the associated economic sector to which the individual NAICS codes were grouped in order to define the freight clusters. For example, NAICS category 111 (crop production) is grouped in the Construction and Raw Materials sector.

Following the list of the NAICS – economic sector categories, a second table indicates how employment categories (ranges of the numbers of employees) were converted to single estimates, for the purpose of estimating total employment. For example, establishments that have between 5 and 9 employees are estimated to have 6.5 employees, as the basis for calculating total employment.

Section 5.1.3 provides further details.

NAICS	Economic Sector
111 – Crop production	Construction and Raw Materials
112 – Animal production and aquaculture	Construction and Raw Materials
113 – Forestry and logging	Construction and Raw Materials
114 – Fishing, hunting and trapping	Construction and Raw Materials
115 – Support activities for agriculture and forestry	Construction and Raw Materials
211 – Oil and gas extraction	Construction and Raw Materials
212 – Mining and quarrying (except oil and gas)	Construction and Raw Materials
213 – Support activities for mining, and oil and gas extraction	Construction and Raw Materials
221 – Utilities	Construction and Raw Materials
236 – Construction of buildings	Construction and Raw Materials
237 – Heavy and civil engineering construction	Construction and Raw Materials
238 – Specialty trade contractors	Construction and Raw Materials
311 – Food manufacturing	Manufacturing
312 – Beverage and tobacco product manufacturing	Manufacturing
313 – Textile mills	Manufacturing

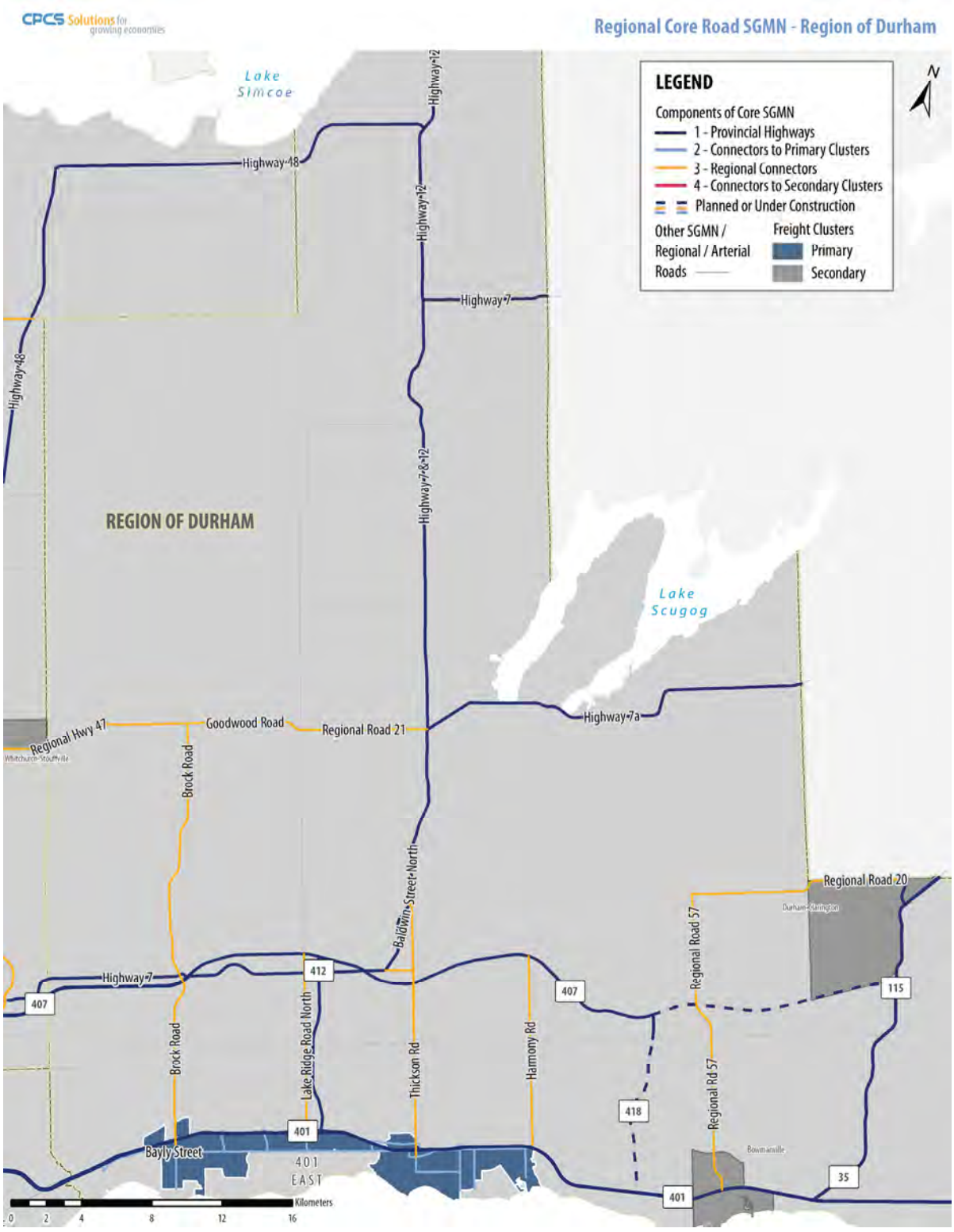
NAICS	Economic Sector
314 – Textile product mills	Manufacturing
315 – Clothing manufacturing	Manufacturing
316 – Leather and allied product manufacturing	Manufacturing
321 – Wood product manufacturing	Manufacturing
322 – Paper manufacturing	Manufacturing
323 – Printing and related support activities	Manufacturing
324 – Petroleum and coal product manufacturing	Manufacturing
325 – Chemical manufacturing	Manufacturing
326 – Plastics and rubber products manufacturing	Manufacturing
327 – Non-metallic mineral product manufacturing	Manufacturing
331 – Primary metal manufacturing	Manufacturing
332 – Fabricated metal product manufacturing	Manufacturing
333 – Machinery manufacturing	Manufacturing
334 – Computer and electronic product manufacturing	Manufacturing
335 – Electrical equipment, appliance and component manufacturing	Manufacturing
336 – Transportation equipment manufacturing	Manufacturing
337 – Furniture and related product manufacturing	Manufacturing
339 – Miscellaneous manufacturing	Manufacturing
411 – Farm product merchant wholesalers	Wholesale Trade
412 – Petroleum and petroleum products merchant wholesalers	Wholesale Trade
413 – Food, beverage and tobacco merchant wholesalers	Wholesale Trade
414 – Personal and household goods merchant wholesalers	Wholesale Trade
415 – Motor vehicle and motor vehicle parts and accessories merchant wholesalers	Wholesale Trade
416 – Building material and supplies merchant wholesalers	Wholesale Trade
417 – Machinery, equipment and supplies merchant wholesalers	Wholesale Trade
418 – Miscellaneous merchant wholesalers	Wholesale Trade
419 – Business-to-business electronic markets, and agents and brokers	Wholesale Trade
441 – Motor vehicle and parts dealers	Retail Trade & Food Service
442 – Furniture and home furnishings stores	Retail Trade & Food Service
443 – Electronics and appliance stores	Retail Trade & Food Service
444 – Building material and garden equipment and supplies dealers	Retail Trade & Food Service
445 – Food and beverage stores	Retail Trade & Food Service
446 – Health and personal care stores	Retail Trade & Food Service
447 – Gasoline stations	Retail Trade & Food Service
448 – Clothing and clothing accessories stores	Retail Trade & Food Service
451 – Sporting goods, hobby, book and music stores	Retail Trade & Food Service
452 – General merchandise stores	Retail Trade & Food Service
453 – Miscellaneous store retailers	Retail Trade & Food Service
454 – Non-store retailers	Retail Trade & Food Service

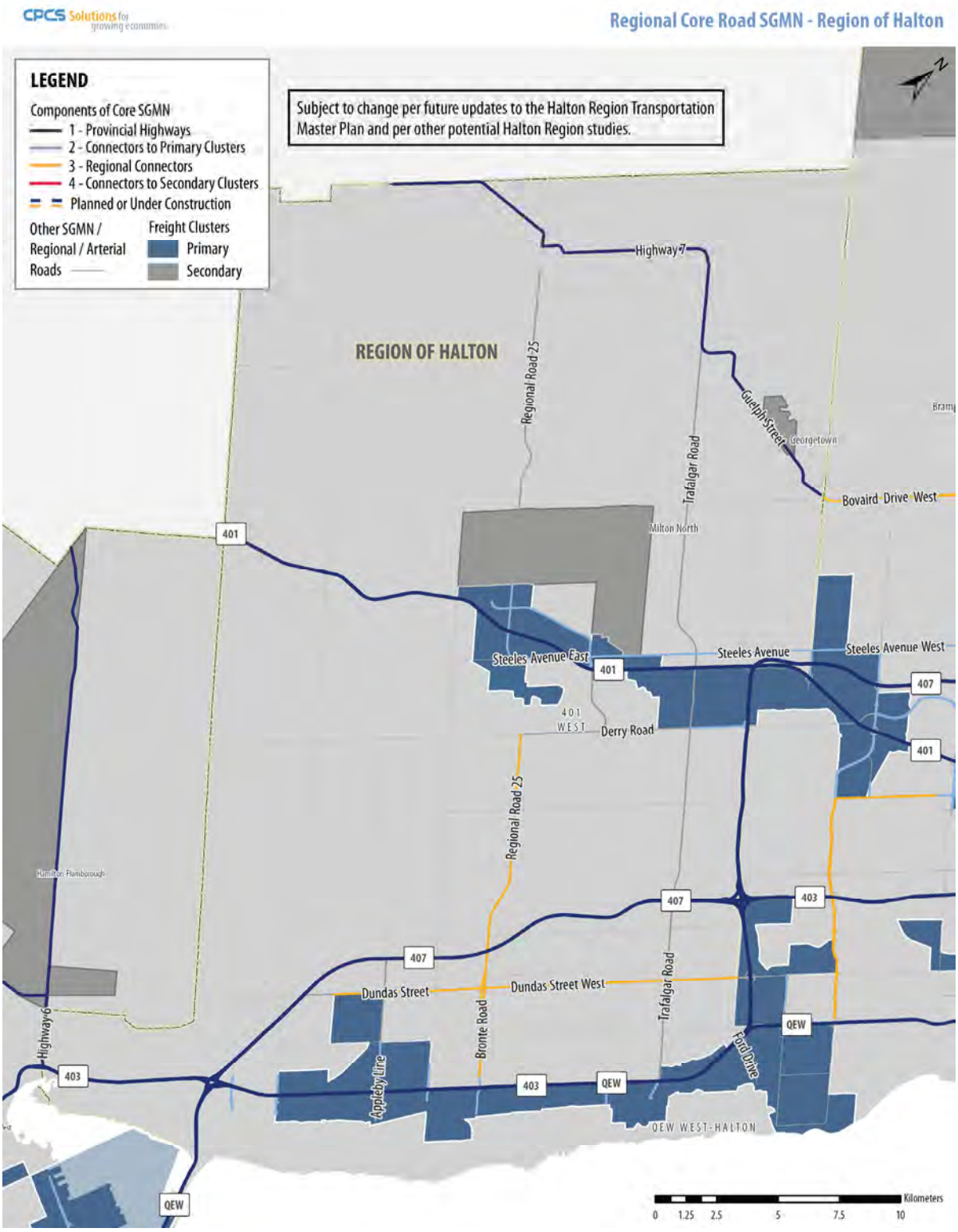
NAICS	Economic Sector
481 – Air transportation	Transportation & Logistics
482 – Rail transportation	Transportation & Logistics
483 – Water transportation	Transportation & Logistics
484 – Truck transportation	Transportation & Logistics
485 – Transit and ground passenger transportation	Transportation & Logistics
486 – Pipeline transportation	Transportation & Logistics
487 – Scenic and sightseeing transportation	Transportation & Logistics
488 – Support activities for transportation	Transportation & Logistics
491 – Postal service	Transportation & Logistics
492 – Couriers and messengers	Transportation & Logistics
493 – Warehousing and storage	Transportation & Logistics
511 – Publishing industries (except internet)	Office Sector
512 – Motion picture and sound recording industries	Office Sector
515 – Broadcasting (except internet)	Office Sector
517 – Telecommunications	Office Sector
518 – Data processing, hosting, and related services	Office Sector
519 – Other information services	Office Sector
521 – Monetary authorities – central bank	Office Sector
522 – Credit intermediation and related activities	Office Sector
523 – Securities, commodity contracts, and other financial investment and related activities	Office Sector
524 – Insurance carriers and related activities	Office Sector
526 – Funds and other financial vehicles	Office Sector
531 – Real estate	Office Sector
532 – Rental and leasing services	Office Sector
533 – Lessors of non-financial intangible assets (except copyrighted works)	Office Sector
541 – Professional, scientific and technical services	Office Sector
551 – Management of companies and enterprises	Office Sector
561 – Administrative and support services	Office Sector
562 – Waste management and remediation services	Non-Retail Service
611 – Educational services	Non-Retail Service
621 – Ambulatory health care services	Non-Retail Service
622 – Hospitals	Non-Retail Service
623 – Nursing and residential care facilities	Non-Retail Service
624 – Social assistance	Non-Retail Service
711 – Performing arts, spectator sports and related industries	Non-Retail Service
712 – Heritage institutions	Non-Retail Service
713 – Amusement, gambling and recreation industries	Non-Retail Service
721 – Accommodation services	Retail Trade & Food Service
722 – Food services and drinking places	Retail Trade & Food Service
811 – Repair and maintenance	Non-Retail Service

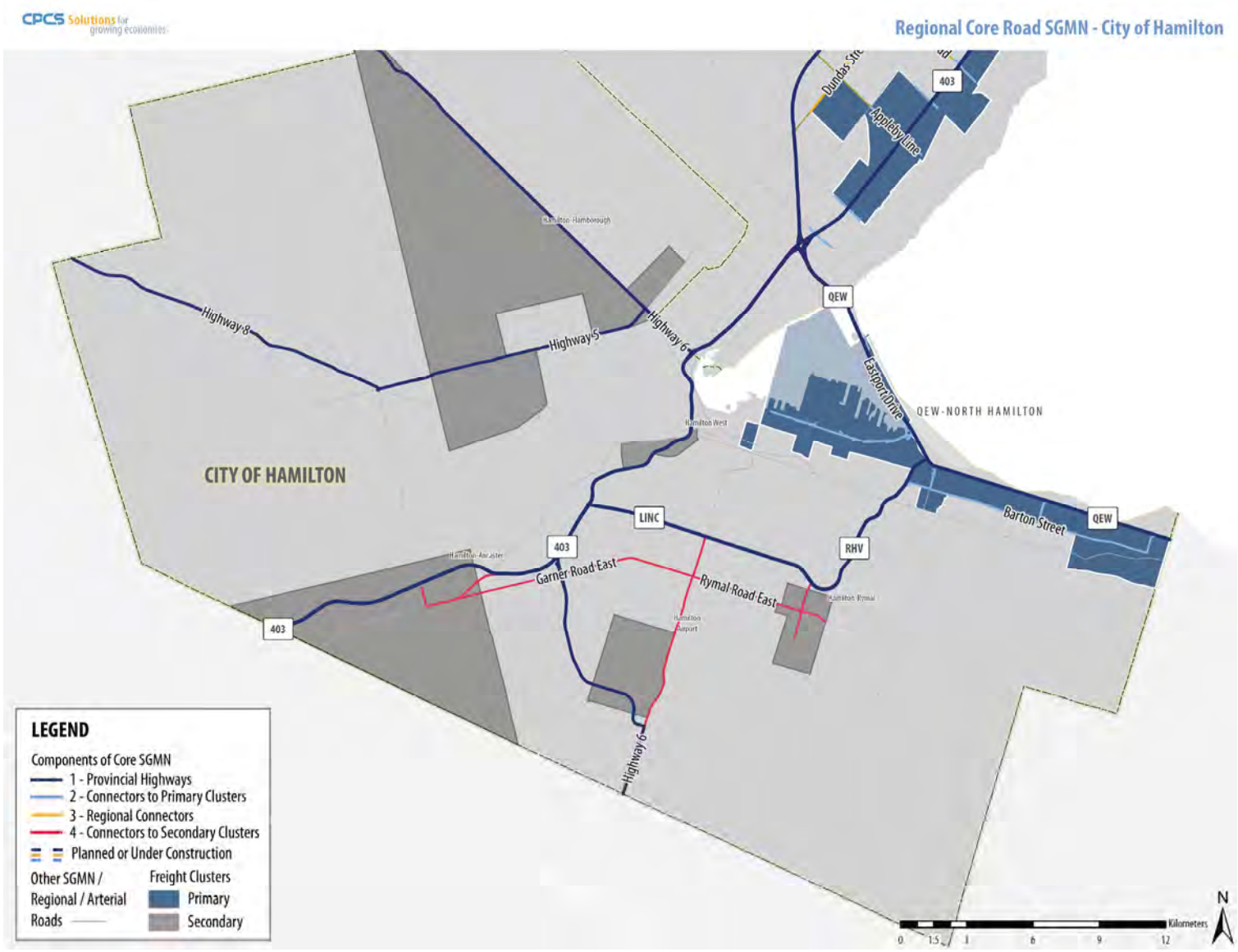
NAICS	Economic Sector
812 – Personal and laundry services	Non-Retail Service
813 – Religious, grant-making, civic, and professional and similar organizations	Non-Retail Service
814 – Private households	Non-Retail Service
911 – Federal government public administration	Non-Retail Service
912 – Provincial and territorial public administration	Non-Retail Service
913 – Local, municipal and regional public administration	Non-Retail Service
914 – Aboriginal public administration	Non-Retail Service
919 – International and other extra-territorial public administration	Non-Retail Service

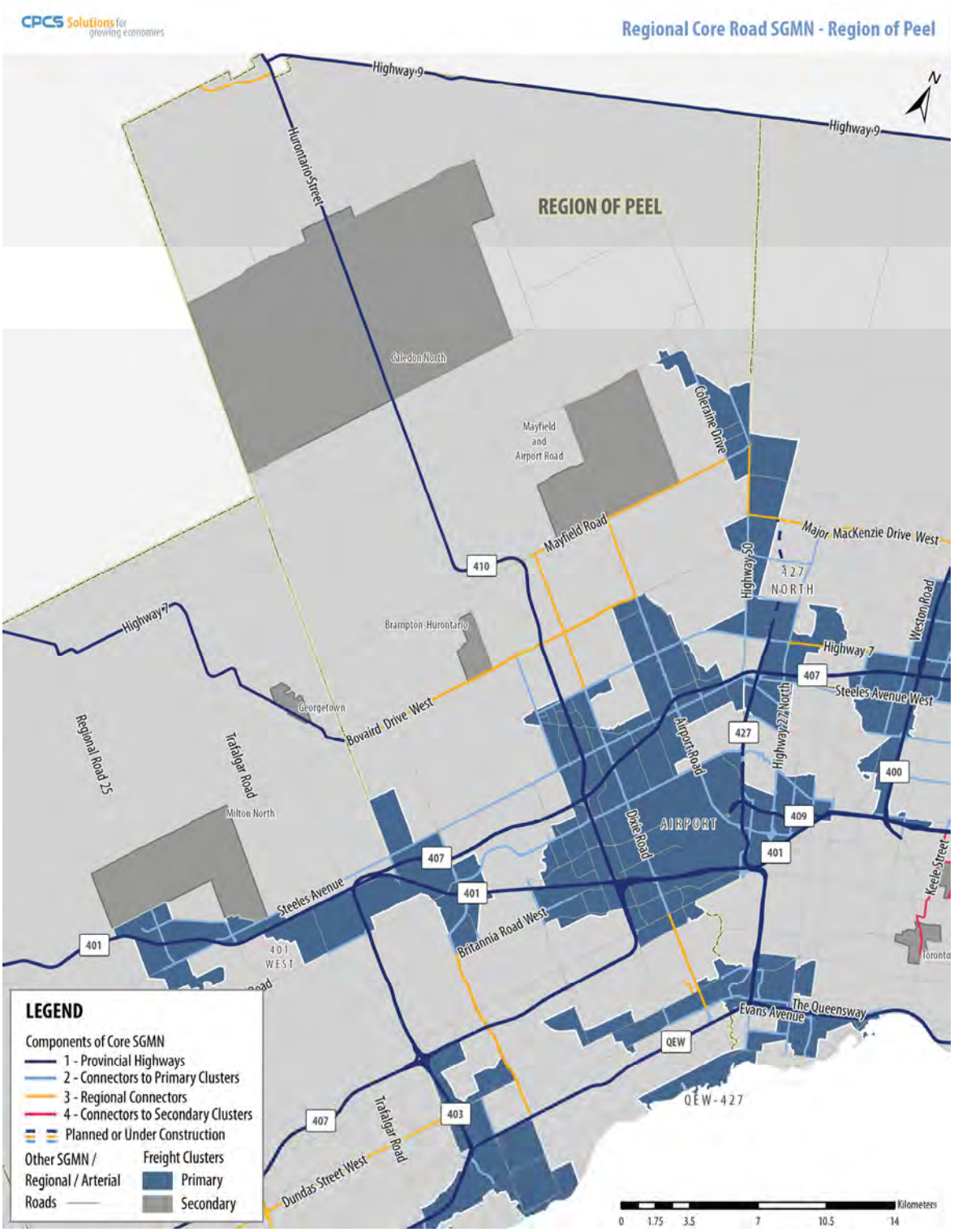
Employee Category	Employees (estimate)
1-4	2.5
5-9	6.5
10-19	12.5
20-49	28
50-99	63
100-199	125
200-499	265
500 +	665

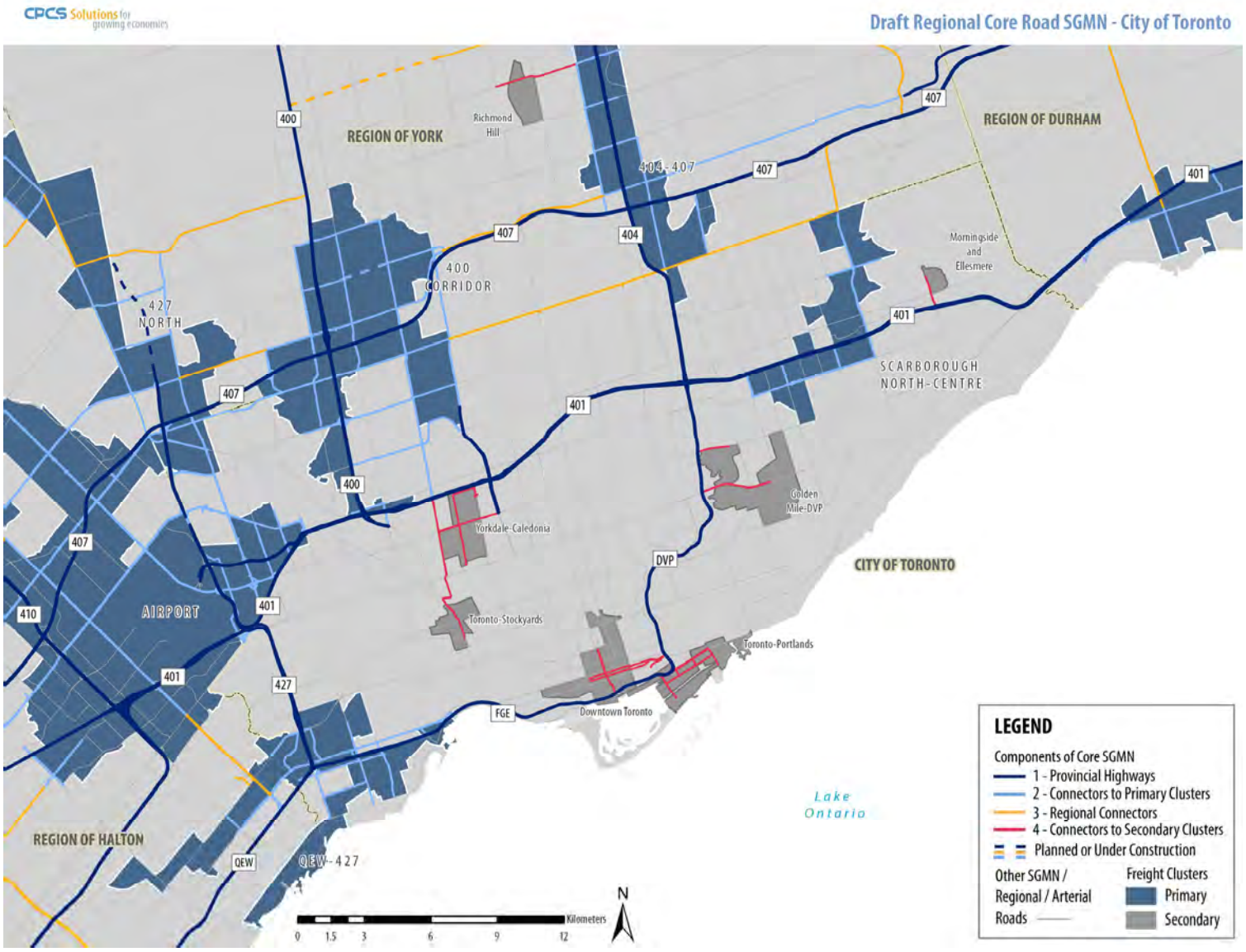
Appendix B. Detailed SGMN Maps

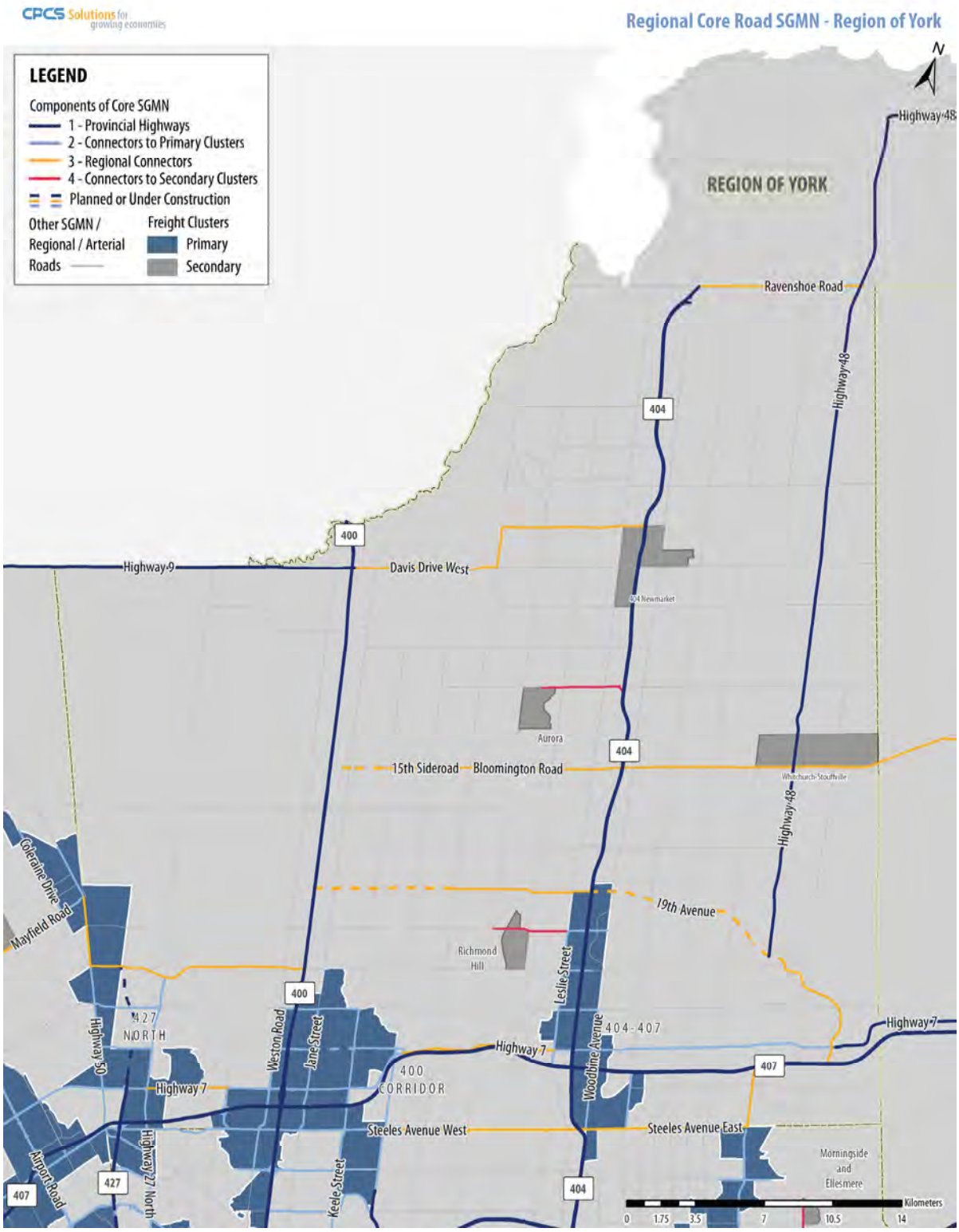

CPCS Solutions for growing economies
Regional Core Road SGMN - Region of Durham
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary
N
Lake Simcoe
Lake Scugog
REGION OF DURHAM
Highway 12
Highway 48
Highway 7
Highway 7&12
Regional Hwy 47
Goodwood Road
Regional Road 21
Highway 7a
Brock Road
Baldwin Street North
Regional Road 20
Regional Road 57
Highway 7
407
412
Lake Ridge Road North
Thickson Rd
Harmony Rd
115
418
Regional Rd 57
401
Bayly Street
401 EAST
35
Kilometers
0
2
4
8
12
16


CPCS Solutions for growing economies
Regional Core Road SGMN - Region of Halton
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary
Subject to change per future updates to the Halton Region Transportation Master Plan and per other potential Halton Region studies.
N
REGION OF HALTON
Highway 7
Regional Road 25
Trafalgar Road
Guelph Street
Georgetown
Bovaird Drive West
Milton North
401
Steeles Avenue East
Steeles Avenue
Steeles Avenue West
407
401 WEST
Derry Road
401
Regional Road 25
Hamilton Flamborough
407
403
407
Dundas Street
Dundas Street West
Trafalgar Road
QEW
Highway 6
403
Bronte Road
Appleby Line
403
QEW
Ford Drive
QEW WEST-HALTON
QEW
Kilometers
0 1.25 2.5 5 7.5 10


CPCS Solutions for growing economies
Regional Core Road SGMN - City of Hamilton
Dundas Street
403
Appleby Line
QEW
Highway 8
Highway 5
Highway 6
Eastport Drive
QEW - NORTH HAMILTON
CITY OF HAMILTON
LINC
Barton Street
QEW
403
RHV
Garner Road East
Rymal Road East
403
Highway 6
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary
N
Kilometers
0
1.5
3
6
9
12


CPCS Solutions for growing economies
Regional Core Road SGMN - Region of Peel
REGION OF PEEL
Highway 9
Highway 9
Huronatario Street
Caledon North
Mayfield and Airport Road
Coleraine Drive
Mayfield Road
Major MacKenzie Drive West
410
Highway 50
427 NORTH
Weston Road
Highway 7
Highway 7
Brampton-Hurontario
407
Steeles Avenue West
Georgetown
Bovaird Drive West
Regional Road 25
Trafalgar Road
Airport Road
Highway 427 North
427
400
Milton North
Dixie Road
AIRPORT
409
401
407
401
Steeles Avenue
Britannia Road West
401
401 WEST
Keele Street
Toronto
Evans Avenue
The Queensway
QEW
QEW - 427
407
403
Trafalgar Road
Dundas Street West
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary
0 1.75 3.5 7 10.5 14
Kilometers


CPCS Solutions for growing economies
Draft Regional Core Road SGMN - City of Toronto
REGION OF YORK
Richmond Hill
REGION OF DURHAM
404 - 407
400 CORRIDOR
427 NORTH
Morningside and Ellesmere
SCARBOROUGH NORTH-CENTRE
AIRPORT
Yorkdale-Caledonia
Golden Mile-DVP
CITY OF TORONTO
Toronto-Stockyards
Toronto-Portlands
Downtown Toronto
Lake Ontario
REGION OF HALTON
QEW
QEW-427
400
401
404
407
410
427
DVP
FGE
N
Kilometers
0 1.5 3 6 9 12
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary


CPCS Solutions for growing economies
Regional Core Road SGMN - Region of York
LEGEND
Components of Core SGMN
1 - Provincial Highways
2 - Connectors to Primary Clusters
3 - Regional Connectors
4 - Connectors to Secondary Clusters
Planned or Under Construction
Other SGMN / Regional / Arterial Roads
Freight Clusters
Primary
Secondary
N
REGION OF YORK
Highway 48
Ravenshoe Road
404
Highway 48
400
Highway 9
Davis Drive West
404 Newmarket
Aurora
404
15th Sideroad
Bloomington Road
Whitchurch-Stouffville
Highway 48
Coleraine Drive
Mayfield Road
19th Avenue
Richmond Hill
Leslie Street
400
427 NORTH
Highway 50
Weston Road
Jane Street
404 - 407
Highway 7
Highway 7
400 CORRIDOR
Woodbine Avenue
407
Steeles Avenue West
Steeles Avenue East
Mornings ide and Ellesmere
Airport Road
427
Highway 27 North
Keele Street
404
407
Kilometers
0
1.75
3.5
7
10.5
14

Appendix C. Review of SGMN Implementation Plans

C1. GTHA Examples of Best and Recent Practices

C1.1 Peel Region SGMN

The 2013 Peel SGMN included an implementation plan. The plan had four elements (strategies), which were to:[93]

- Give the SGMN status by having Peel Regional Council formally adopt the SGMN. Council's May 2013 of the SGMN provides a legal framework for implementing the SGMN.
- Align and prioritize operational, management and capital network improvements that support the SGMN. As noted, Peel's SGMN serves as a road map to guide the location and prioritization of goods movement actions and other network improvements.
- Act on and implement these improvements. Peel linked the SGMN and the priorities to its asset management plan, thereby ensuring that budgets and timetables for actually implementing the prioritized improvements are approved.
- Assess the impact of the implemented SGMN by monitoring its performance and updating the SGMN as conditions warrant. Peel developed a performance monitoring plan, which is described below.

Peel's implementation plan thus allows for continued cycles of SGMN development and implementation, as conditions warrant.

[93] *Strategic Goods Movement Network Study, Technical Report*, Region of Peel, Brampton, April 25, 2013.

C1.2 Durham Region SGMN

Durham Region's 2017 TMP proposes the implementation of the SGMN through several actions:[94]

- Identify and plan for the removal of barriers, such as load restrictions, turning radii, height requirements and inadequate pavement structures, as part of Regional road expansion and rehabilitation projects. (Action 83)
- Provide guidance to truck drivers by signing preferred truck routes and disseminating information about the network. (83, continued)
- Avoid by-law restrictions to truck movement on the preferred routes. (83, continued)
- Develop criteria for evaluating land use plans from a goods movement perspective, in order to minimize conflicts between truck traffic generated by employment areas and the adjacent communities. (84)
- Implement measures from Durham's *Traffic Management Guideline for Hamlets* to manage truck traffic impacts in small rural communities and hamlets. (85)
- Develop criteria for evaluating transportation initiatives from a goods movement perspective. (87)
- Review and update road design standards as needed to provide an acceptable and cost effective level of service for goods movement on Regional roads. (88)
- Protect rights of way to provide for safe and efficient truck connectivity to existing and future intermodal facilities, and improve connectivity between modes. (89)
- Design new or reconstructed Regional arterials linking employment areas with Highway 401 and Highway 407 to accommodate Long Combination Vehicles, where feasible. (90)
- Work with area municipalities to plan for efficient truck access to current and future intermodal hubs, including zoning and land use planning, as well as physical infrastructure such as turning lanes, turning radii, conditions of railway grade crossings and connectivity to the freeway system. (93)
- Work with all levels of government and the private sector to ensure that plans for goods movement address the entire route ("shelf to shelf") to maximize efficiency. (98)

[94] *Durham Transportation Master Plan November 2017*, as approved by Durham Regional Council, Whitby, December 13, 2017.

Durham Region's implementation plan is incorporated into its TMP, which means that it (and the SGMN) have status with the recent approval of the TMP. The plan largely considers procedures and planning processes in order to account for goods movement in the planning and evaluation of future road upgrades and expansions, incorporate goods movement into land use planning, and ensure that design standards are adequate. Some short-term initiatives are included, notably through the installation of route guidance (signage), dissemination of information and avoidance of restrictive by-laws on the SGMN routes.

C1.3 York Region SGMN

The 2016 York TMP proposes a high-level SGMN, recognizing that all Regional roads are intended to carry all types of vehicles. However, the TMP notes the further need to confirm a hierarchy / network of goods movement corridors, with a recommendation to designate a SGMN. In the meantime, the TMP proposes the following actions to advance the definition of the SGMN:[95]

- Identify and "protect" a Regional SGMN on Regional roads, especially near intermodal facilities where feasible.
- Review Street Design Guidelines to ensure minimum structural, geometric and operational requirements for Regional roads to support goods movement.
- Ensure that sufficient rights-of-way are protected to provide safe and efficient truck access to intermodal facilities and other major freight hubs.
- Major goods movement facilities and corridors should be protected for the long term, where applicable.
- Use the SGMN classifications (see footnote 90) to designate the relevant Regional roads as truck routes, and work with the freight industry to focus truck activity on higher-order goods movement corridors.
- Monitor truck volumes on Regional roads, to identify problems on specific roads or at specific intersections and employment areas.
- Monitor the speed and reliability of travel on primary arterial goods movement corridors and consider opportunities to advance road improvements on corridors that do not meet "acceptable" thresholds.

York Region's TMP identifies a SGMN. However, the TMP notes the need for the subsequent designation of the SGMN. In the meantime, it notes several preparatory procedural, planning and monitoring actions that can support the subsequent designation and then enable its implementation.

[95] *The Regional Municipality of York Transportation Master Plan*, York Region, Newmarket, July 2016.

C2. Best and Recent Practices Elsewhere

C2.1 Seattle

The City of Seattle's 2016 *Freight Master Plan* (FMP) developed a freight transportation (road) network, as described in Section 7.4.1. The *Plan* notes that an implementation plan for the network and other actions and strategies will be developed once the *Plan* has been adopted. The implementation plan will be similar to those that Seattle has developed for other modal master plans, in that it will:

- Identify near-term (3 to 5 year) improvements to move forward to implementation.
- Update the implementation plan regularly to ensure that planned improvements are matched with available annual funds, leveraged with other projects and programs to maximize the available resources, secure grants and funding partnerships, package projects for efficient delivery and use performance measures and new data to adjust the implementation plan.

Given that the implementation of all the FMP actions would require many years, a priority framework was developed. The framework develops data-driven evaluation measures for six quantitative criteria that are associated with the FMP goals of safety, mobility, economy, state of good repair, equity and environment. It also considers four qualitative criteria, which are the potential to leverage other funding, policy directives, community interest and the geographic balancing of funding spent among different parts of the city.

Of relevance to the GTHA-wide SGMN, the City of Seattle's approach focuses on establishing priorities for actual short-term network improvement projects, and allows for priorities to be updated annually. The priority-setting process is similar to those that are used for other modes, thereby following procedures that already have been established at the City.[96]

C2.2 Phoenix

The Maricopa Association of Governments (MAG) is the Metropolitan Planning Organization (regional planning agency) for the Phoenix, Arizona area. In 2017, MAG designated a core road freight network. The initiative was driven in part by the need to designate critical urban and rural freight corridors as the basis for state and federal funding applications. Specifically, the US federal Fixing America's Surface Transportation (FAST) Act created two new sources of funds to improve freight infrastructure: formula funds that are apportioned to each state, and FASTLANE competitive grants. Arizona is slated to receive $116.8 million (USD) in formula funds over five years, or approximately $23 million per year. The FASTLANE program offers $500 million nationwide over five years.

As a result, the designation of individual road and highway segments is determined in large part by truck traffic volumes, the locations of key industrial and commercial activity clusters,

[96] *City of Seattle Freight Master Plan*, City of Seattle, September 2016.

and the flow of goods generated by these industries, which is used to identify the roads upon which major industry depends and to estimate future truck traffic. The network design also accounts for corridor continuity and for route redundancy to protect service reliability.

At this writing, MAG has put together several draft network scenarios for further evaluation and distillation into the core road freight network. However, incorporated into these scenarios are factors that would determine implementation priorities. These vary according to the scenario. They include:

- Maintaining the status quo; that is, improving current conditions by orienting investments that would improve the state of good repair on the road network.
- Orienting investments to road segments that have higher truck volumes and where traffic conditions and congestion impose the need for drivers to allow high ("greater") travel time allowances to make their journeys.
- Orienting investments to road segments that have deficient performance but are expected to grow. Growth is measured in terms of truck traffic generated both by existing industries and by new industries that could be attracted to the Phoenix area. Examples of the latter include increased warehouse and distribution centre traffic and goods serving the construction sector.
- Variations to the preceding scenario include focuses on areas where local (internal) goods movement predominates, areas that are oriented to external goods movement (to and from the Phoenix region), and locations outside the built-up areas that could become more attractive to new industrial development if access is improved.[97]

Funding is not a factor in the GTHA-wide SGMN or in any of the other Canadian SGMNs examined in this project. Instead, the relevance to the GTHA-wide SGMN lies in identifying options for assessing priorities: addressing current conditions, accommodating expected future growth in traffic from existing generators, accounting for different types of generators in the future, orienting towards improving internal- or external-facing distribution of goods and planning for urban expansion. To varying degrees, these priority-setting options look at transportation priorities (e.g., improving network performance and throughput) or economic development priorities (by increasing the region's attraction for industries). Although the GTHA-wide SGMN looks only at the existing network, individual municipalities might want to account for expected future traffic in setting their own priorities. Moreover, as discussed in Section 4.2, municipalities can choose to achieve different balances in setting their investment priorities, in favour of different mixes of investments in passenger movement and goods movement; and the MAG discussion provides some insight into how they can determine balances that are appropriate to their needs.

[97] *MAG Regional Freight Network Guidance and Draft Definition, Technical Memoranda 1 and 2*, Maricopa Association of Governments, Phoenix, April 2017.

C2.3 CREATE (Chicago)

Chicago is the busiest rail hub in the United States. However, it has experienced significant delay and congestion over the last several years. As a result, delays can be propagated across the North American freight rail network, as well as to local road, transit and commuter rail services and to emergency vehicles (which can be blocked at congested at-grade crossings).

To address these bottlenecks, CREATE, the Chicago Region Environmental and Transportation Efficiency Program, was initiated in 2003. CREATE is a $4.4 billion (USD) public-private partnership (P3) aimed at improving the passenger and freight rail network in the Chicago area. Its members comprise local, state and federal governments, the six Class I railroads that operate in Chicago (including CN and CP), local terminal railroads, Amtrak (the US intercity passenger rail provider), the local commuter rail provider and the rail industry association.

The initiative comprises 70 projects, made up of 25 grade separations, 6 rail-rail separations (flyovers that separate passenger and freight rail lines), 36 rail network and signalling upgrades, viaduct improvements, safety enhancements at existing at-grade crossings, and the integration of information from the dispatch systems of the region's major railroads into a single display.

These projects were identified by the partners. Priorities have been established in varying ways according to the type of project, but nonetheless coordinated through the CREATE framework. The method of assessing priorities is not stated. However, several analyses and factors informed the setting of priorities:

- The freight, passenger and commuter railroads collectively identified bottlenecks across the entire rail network, working together through a collaborative and iterative process to identify potential improvements and refine scopes, costs and designs. These projects were then grouped into four "CREATE Designated" rail corridors.
- The identification of potential improvements and the setting of priorities used forecasts of train traffic and simulations of train operations under a variety of scenarios, which included operational improvements (e.g., using another railroad's lines to circumvent bottlenecks) and varying levels of infrastructure improvements (including one in which all improvements are constructed). Expected improvements in travel times for both freight and passenger trains were quantified and taken into account.
- The prioritization of grade-separations took into account several priority lists. The City of Chicago identified a list of critical "911" at-grade crossings, where emergency services experienced significant delays. Another analysis identified the thirty at-grade crossings that delayed the greatest number of vehicles and the thirty at-grade crossings that caused the greatest amount of time delay. Municipal priorities, safety benefits and relative accident risks also were taken into account.

- Although many of the projects benefit freight or freight and passenger traffic, it is important to note that some projects are specific to passenger traffic.[98]

The CREATE initiative is relevant to the GTHA in several ways:

- CREATE provides a framework within which key public and private interests can coordinate improvements in a cooperative, non-mandated framework according to a systematic evaluation and priority-setting process.
- Quantitative, monetized analyses were used to demonstrate benefits and costs to all participants, which in turn could be used to establish priorities. The process also considers municipal priorities, but is nonetheless based on these quantitative analyses.
- Demand forecasts and operational simulations provide a systematic and quantitative basis for establishing priorities, thereby accounting for current and future needs of both passenger and freight operations.
- The CREATE analyses showed that the shared use of rail corridors by freight and commuter trains often resulted in significant peak period delays to freight traffic as well as to cross and interchange traffic with other freight lines. Moreover, track or freight operating problems in turn delayed commuter trains. As a result, the CREATE initiative demonstrated tangible and quantifiable benefits to freight and passenger rail operators and owners, thereby attracting them as partners for implementing improvements through a P3 structure.
- Environmental impacts are important factors in determining the eligibility of individual transportation projects for approval and for funding. To expedite the initiative, the three governments developed a process to assess the environmental benefits of the CREATE projects collectively. The Systematic, Project Expediting, Environmental Decision-making (SPEED) Strategy provides a systematic way of allowing low risk (i.e., low environmental risk) component projects to move forward, while addressing environmental concerns and challenges associated with higher risk projects.[99]

[98] *CREATE Program FP&PS Clarification, Final Feasibility Plan Amendment 1*, CREATE, Chicago, July 18, 2012.
[99] *Final Feasibility Plan Amendment 1, CREATE Program FP&PS Clarification,* CREATE, Chicago, July 18, 2012.

Appendix D. Review of SGMN Performance Measures

D1. Performance Measures Used in Other SGMNs

D1.1 Peel Region SGMN

Peel Region's 2013 SGMN identified three groups of performance measures that can be used to monitor and evaluate the effectiveness of the SGMN. The three groups represent metrics that are important to private sector users of the SGMN, the public sector owners of the SGMN and the community at large.

From the private sectors' perspective, applicable measures focus on the need to meet tight delivery schedules in order to keep supply chains running smoothly. Important measures are:

- On-time delivery, which is usually the proportion of total trips that occurs within a certain threshold. Industry expectations today are for a 95% to 98% on-time performance.
- Cost-of-delays (time-based or production delay-based), which usually reflect an aggregated index of travel time delays to major shippers or manufacturing centres. These costs can be measured as those that exceed a defined baseline of minimal or necessary travel costs on each route. Alternatively, reductions or avoidance of delay costs due to system improvements can be measured.
- Cost of goods movement serves as an economic development measure for both the public and private sectors, and can be useful for zoning and site selection. The most common measure for cost-of-goods movement is a comparative aggregate transportation cost by corridor or a cost-of-delay deviation from an average travel time (as a baseline).
- Modal access measures monitor modal accessibility to certain geographic locations and facilities. The assumption is that improved/expanded modal access can improve the attractiveness of business expansion and support certain public sector objectives such as reduced air pollutants or greenhouse gases.

From the public sectors' perspective, applicable measures typically relate to truck travel characteristics, such as volumes, travel times, average speeds and reliability. Note that truck-specific data are needed: values derived from auto characteristics do not necessarily reflect truck operational characteristics. The key measures are:

- Average travel time, which measures the average travel time needed for a truck to transect a segment or corridor. The measure can be expressed for different time periods (e.g., peak and off-peak periods).
- Average travel speed, which can be used to determine the impact of recurring and non-recurring congestion and the impact that certain events such as work zones and weather can have on free-flow speeds or posted speeds.
- Travel time reliability, which calculates and monitors the likelihood that travel times and/or speeds are stable and reproducible. Reliability is a key priority for the private sector, and reliability measures are used by the private sector to plan delivery schedules with a high degree of confidence. These same measures can be used by public sector planners to better understand recurring congestion (such as the regular congestion that builds up every day during peak periods) and non-recurring congestion (e.g., congestion that is caused by unforeseen events such as an accident or inclement weather), and how volatility in travel times can be better managed.
- Travel time delays (duration) measure the deviation from ideal travel times and speeds. Delay time measures allow public sector agencies the ability to assess initiatives such as the use of night-time work zones as a means of reducing network delays. Travel time delays are particularly expensive for commercial vehicles, and so this measure is typically high on industry priority lists.

Other measures that can be important for public sector planning and investment decisions are:

- Truck driver values of time, for assessing the impact of road pricing or congestion pricing measures.
- Freight system conditions, ranging from levels of service on individual roads to truck network route- or lane-kilometres and inventories of bridge clearance concerns.
- Freight-related environmental measures, such as fuel efficiency (tonne-km per litre of fuel).
- Truck safety measures, which track the number of collisions that involve trucks and the factors that underlie these incidents.
- Freight network investment measures, which track the investments that are made to the SGMN and other goods movement infrastructure.

From the community's perspective, residents and landowners seek to understand how transportation improvements such as a SGMN impact fuel use, greenhouse gas emissions, air pollutants, noise and vibrations.

The Peel SGMN notes that although these measures can provide useful information for monitoring the effectiveness of the SGMN as it is implemented, many of these measures require data that do not exist or – in the case of the private sector – are generally held as confidential.[100]

D1.2 Durham Region SGMN

The 2017 Durham Region TMP proposes four measures to assess goods movement improvements to support economic development. All of these measures are applicable to the SGMN:[101]

- Average truck travel times based on travel time surveys.
- Lane-km of Provincial highway network added.
- Lane-km of Provincial highway network rehabilitated.
- Percent of the Durham SGMN that is capable of year-round full-loads for trucks.

Note that the last measure directly assesses the usability of the designated SGMN for heavy trucks, and the third measure does so indirectly. The second measure speaks to future network additions, although interestingly it focuses only on Provincial highways.

D1.3 York Region SGMN

The 2016 York Region TMP includes two direct and two indirect measures that relate to the development of York's SGMN. The two direct measures are:[102]

- Number of (road) kilometres designated for the SGMN.
- Reported number of collisions involving trucks on the goods movement network, per truck trip or per truck kilometres-travelled.

The two indirect measures quantify average truck travel times and the total amount of annual truck hours of delay.

D1.4 Seattle

The 2017 *Freight Master Plan* identified five performance measures, all of which could be applied to the implementation of the freight network. Table D-1 lists the five measures, along

[100] *Strategic Goods Movement Network Study, Technical Report,* Region of Peel, Brampton, April 25, 2013.
[101] *Durham Transportation Master Plan November 2017,* as approved by Durham Regional Council, Whitby, December 13, 2017.
[102] *The Regional Municipality of York Transportation Master Plan,* York Region, Newmarket, July 2016.

with the desired trend for each measure and the source of data.[103] Note that the data for all measures are available from the City of Seattle's databases. As well, while most measures assess actual performance outcomes – travel time reliability, collisions and pavement conditions – one measure assesses the coverage of the network in the City's annual count program (i.e., it is a planning and procedural measure that aids the monitoring process, but not the network performance *per se*).

Table D-1. Performance Measures – Seattle Freight Network

Performance Measure	Desired Trend	Data Source
Travel time on selected network corridors	Improve reliability rate	City-wide speed and travel time reliability counting program
Number of collisions involving trucks	Decreasing number	City of Seattle's collision database, sourced from traffic collision reports
Number of fatal and serious injury collisions involving trucks	Fatal and serious injury collisions involving trucks reach zero by 2030	City of Seattle's collision database, sourced from traffic collision reports
Percent of network segments with annual volume counts	Increase the number of network segments with annual counts	City of Seattle's city-wide wide count program
Network miles of major truck streets in fair or better pavement condition	Maintain and/or improve pavement condition on major truck streets	City of Seattle's pavement condition index

Source: Table 6-4, *City of Seattle Freight Master Plan*, City of Seattle, September 2016.

[103] *City of Seattle Freight Master Plan,* City of Seattle, September 2016.