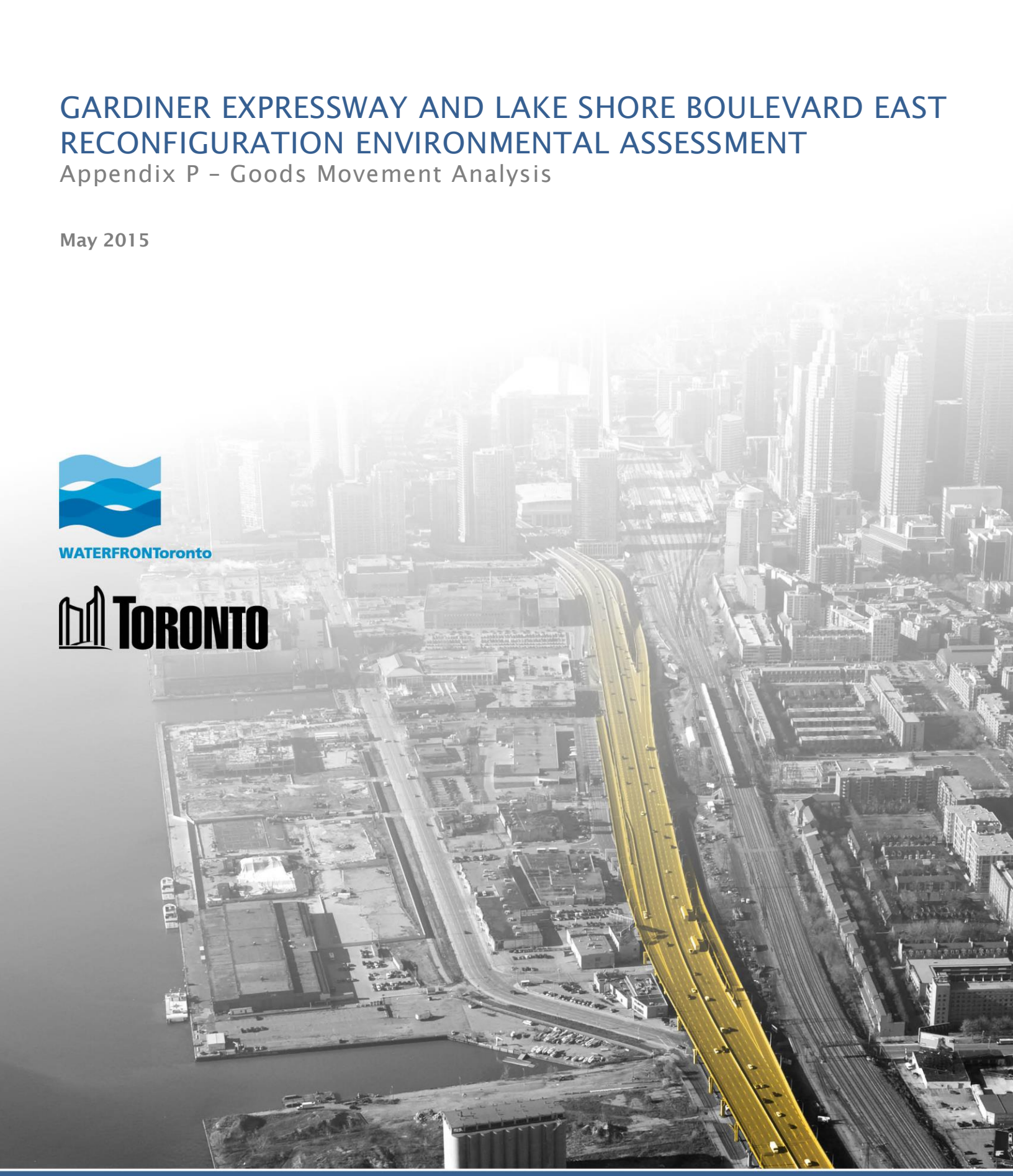
GARDINER EXPRESSWAY AND LAKE SHORE BOULEVARD EAST RECONFIGURATION ENVIRONMENTAL ASSESSMENT

Appendix P – Goods Movement Analysis

May 2015



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Final Report

Gardiner Expressway and Lake Shore Boulevard East Reconfiguration EA and Integrated Urban Design Study

Goods Movement Analysis

Prepared for:

Dillon Consulting

Prepared by:

CPCS

Solutions for growing economies

CPCS Ref: 14238
May 1, 2015

Ackowledgments

CPCS acknowledges the input of all of those consulted in the preparation of this Report. We also thank the City of Toronto and Waterfront Toronto as well as the Ontario Ministry of Transportation for providing data in support of this project.

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Acronyms / Abbreviations

AADT	Annual Average Daily Traffic
AADTT	Annual Average Daily Truck Traffic
ATMS	Advanced Traffic Management System
B/C	Benefit/Cost
BIA	Business Improvement Area
CCTV	Closed-Circuit Television
DC	Distribution Centre
DfT	Department for Transport (UK)
DOT	Department of Transportation
DVP	Don Valley Parkway
EA	Environmental Assessment
GE	Gardiner Expressway
GE/LSB	Gardiner Expressway and Lake Shore Boulevard
GGHA	Greater Golden Horseshoe Area
GIS	Geographic Information System
GM	Goods Movement
GTA	Greater Toronto Area
GTHA	Greater Toronto and Hamilton Area
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
HST	Harmonized Sales Tax
ITS	Intelligent Transportation System
LSB	Lake Shore Boulevard
MTO	Ontario Ministry of Transportation
NYC DOT	New York City Department of Transportation
O/D	Origin/Destination
OPD	Off-Peak Delivery
QEW	Queen Elizabeth Way
RESCU	City of Toronto's Road Emergency Services Communication Unit
SCOOT	Split, Cycle, and Offset Optimization Technique
T&L	Transportation and Logistics
TfL	Transport for London (UK)
TOC	Traffic Operations Centre
TTI	Texas Transportation Institute
VEH	Vehicle(s)
VMS	Variable-Message Sign

Executive Summary

Introduction

In support of the Gardiner Expressway and Lake Shore Boulevard East Reconfiguration Environmental Assessment (EA) and Integrated Urban Design Study, CPCS has been retained by Dillon Consulting to carry out an analysis of goods movement in the Transportation Study Area being considered under the ongoing EA.

The objectives of the goods movement analysis are as follows:

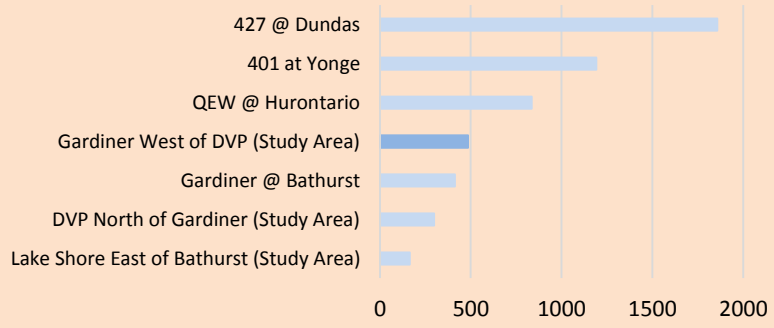
- To provide a better understanding of the nature of goods movement in the Gardiner/Lake Shore corridor, Transportation Study Area considered in the EA, and the Greater Toronto Area.
- To provide a comparative assessment and explanation of the opportunities and constraints for goods movement between the Remove (Boulevard) and the Elevated Expressway alternatives being considered in the EA; and
- To recommend high-level mitigation measures for any constraints identified that may be placed on goods movement under the Remove Alternative.

Nature of Goods Movement in the Study Area

Traffic Patterns

- The flow of trucks on Highway 401 at Yonge Street between the peak 8:00-9:00am hour is approximately 2.5 times the flow of trucks on the Gardiner Expressway in the Study Area at the same time.[1]

Figure ES-1-1: Peak Hour Truck Traffic on Select Highways



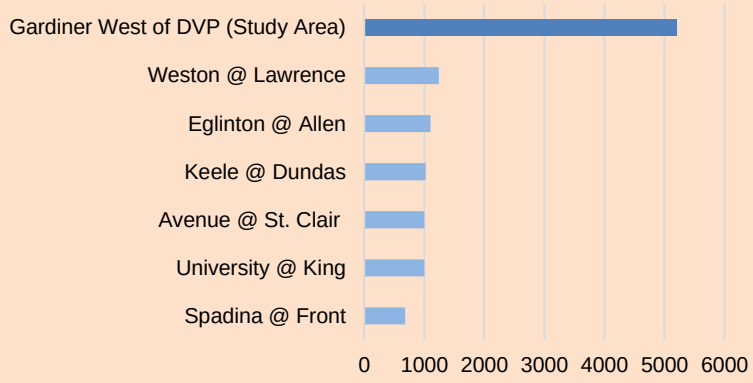
Source: Ministry of Transportation iCorridor Data (2008 data) and City of Toronto Cordon Count data (year indicated)

[1] Ontario Ministry of Transportation iCorridor data for 2008 annual average daily truck traffic (AADTT) and City of Toronto Cordon Counts for the Gardiner Expressway in the Study Area for 2011. Toronto Cordon Count Data includes Commercial Vehicles classified as "Medium" or above

- For longer distance trips, including those passing through the City of Toronto or those that are not originating in or destined to the Gardiner EA Transportation Study Area (defined between Woodbine and Spadina and Dundas and Lake Ontario), the 400 series highways are the preferred routes for commercial vehicle traffic.

- The Gardiner Expressway facilitates some of the largest flows of commercial vehicles in Toronto outside of the 400 series highways; it has been identified by stakeholders as the preferred route for most commercial vehicle trips starting or ending within the Study Area considered in the EA.

Figure ES-1-2: Daily Truck Trips in Toronto Surface Routees



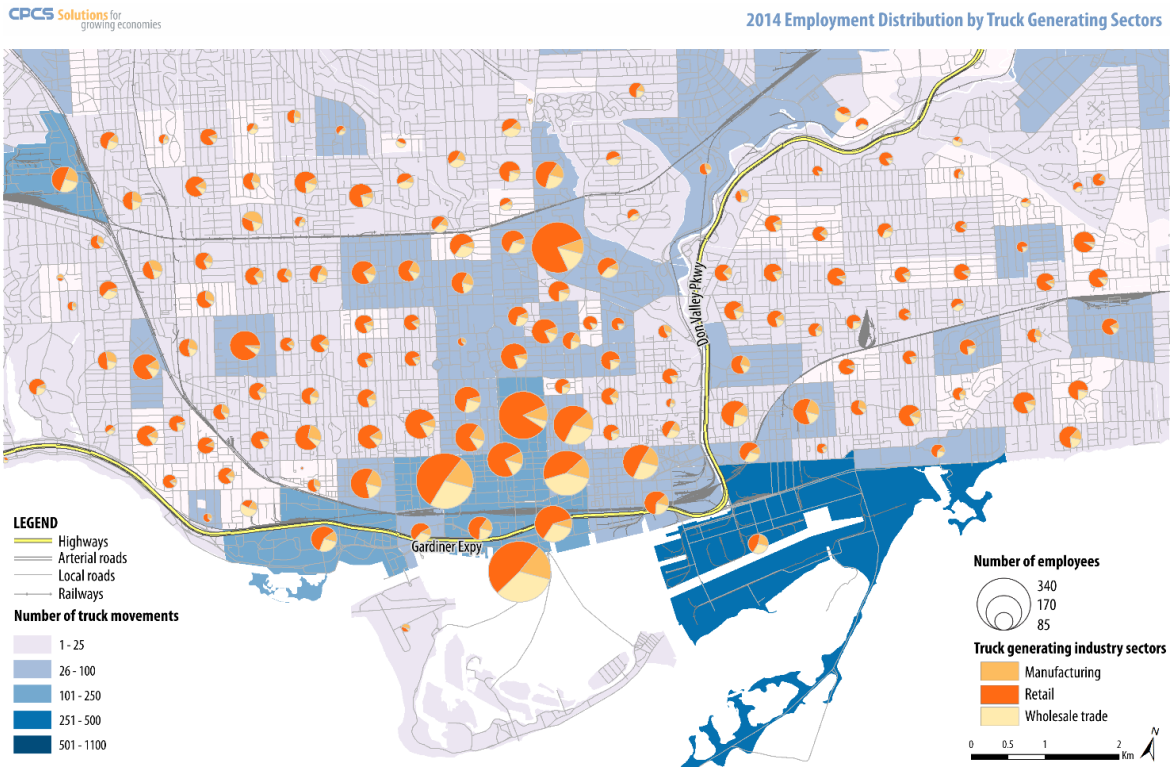
Source: Ministry of Transportation iCorridor Data (2006 data)

- On a wider scale, the Gardiner Expressway/Lake Shore Boulevard Corridor, along with the Don Valley Parkway (DVP), 401 and 427 form a higher speed and higher capacity network around the City that allows for the transportation of goods around the City of Toronto.

- Local traffic is a significant component of all commercial traffic on the expressway in the Study Area.

- A large number of truck stops currently occur in the southeast corner of the Study Area being considered under the Environmental Assessment. Truck stop patterns for 2031 (EA time horizon) will be affected greatly by development, growth, and changing land use in the Study Area over this time horizon.

Figure ES-1-3: Goods Movement Sector Employment and Truck Trips



Source: CPCS Statistics Canada Data on Canadian Business Patterns and Ontario Ministry of Transportation Truck GPS Data

Transportation Decisions

- Transportation decisions of goods movement stakeholders in the Study Area are generally dictated by downstream customer requirements.
- Key factors that goods movement stakeholders consider in transportation decisions are **(A) Travel Time, (B) Reliability, and (C) Cost**. Goods movement stakeholders value all three factors, but weigh each factor differently depending on the nature of the supply chain in which they operate.
- The main types of goods movement generators using the expressway in the study area are categorized into three principal groups (1) Industrial and Manufacturing, (2) Retail, and (3) Courier and Logistics stakeholders.
- Industrial and Manufacturing stakeholders tend to move larger volumes of goods and have a strong focus on cost of transportation. Retail stakeholders often focus on reliability for restocking shelves, and courier services tend to focus on both travel time and reliability in order to meet customer expectations.

Impact of Remove Alternative

Proposed metrics to compare the alternatives considered under the EA were developed based on the supply chain analysis of impacted firms and key concerns raised by stakeholders during consultations. In order to better understand stakeholder feedback received, a framework was developed to convert comments into objective and measurable concerns in order to better understand the potential impact of the Remove Alternative as compared to the Elevated Expressway alternatives.

Concerns identified are examined through the lens of the impact they may have on goods movement stakeholders in terms of travel time, travel reliability, and cost. Evaluation metrics prepared to compare the Remove Alternative to the Elevated Expressway alternatives are also based on these three considerations. Recommended evaluation metrics include:

Figure ES-1-4: Evaluation Measures for Impact of Remove Alternative on Goods Movement

Key Concern	Measurement Indicator
Travel Time	Change in travel time for recommended O/D Pairs
	Change in distance to nearest on/off ramp
	Impact of construction period
Reliability	Estimated change in travel time for trips in the top 95th percentile of travel times (longest trip in a month)
	Network redundancy in case of incident
	Congestion on alternate routes
Cost	Estimated change in transportation costs (based on change in travel time)

Cases Studies

On a macro scale, main congestion indicators for major US cities that have removed or do not have elevated urban freeways are comparable to those that have maintained elevated urban freeways. In other words, the maintenance or removal of urban expressways alone does not seem to be a significant factor in predicting the traffic outcomes in major cities. Macro studies examining the removal of roadway capacity have shown that traffic demand tends to respond to roadway capacity, partially offsetting the impacts of adding or removing highway capacity.

Seoul, New York, San Francisco, and Seattle have all removed urban expressways. All except Seattle elected to replace elevated expressways with surface boulevards. While there were often fears of traffic “chaos” following removal of elevated expressways in the case studies analyzed, traffic generally adjusted to the new reality without very significant disruption using the best alternate route available, adjusting trip time, or in some cases changing mode or avoiding trips all together.

Mitigations

Ongoing modelling work being carried out under the wider EA suggests that the Remove Alternative may result in marginally increased congestion in the Study Area and the Gardiner Expressway/Lake Shore Boulevard (GE/LSB) corridor than under an Elevated Expressway alternative. A proposed toolbox of potential mitigation measures that could be employed by the City of Toronto and Waterfront Toronto are proposed in this report to either reduce overall congestion in the corridor that will improve goods movement flows, or measures specifically targeted to improve the movement of goods in particular. Mitigation measures should be targeted both to the GE/LSB corridor as well as alternate routes to the corridor as appropriate; both will mitigate the impact on the movement of goods.

Figure ES-1-5: Potential Mitigation Measures to Address Constraints of Remove Alternative on Goods Movement

Mitigation Approach	Improves Overall Traffic	Targets Goods Movement Specific	Barriers to Implementation in Toronto
Application and expansion of existing tools in City of Toronto's Congestion Management Plan to Corridor and Key Alternate Routes	✓		**Low**
Off-Peak Delivery Programs	✓	✓	**Low**
Preferential Lane Treatments	✓	✓	**-**
Truck-Only Lanes		✓*	**Medium**
Peak Shoulder Lanes	✓		**Medium**
HOV Lanes	✓	✓	**Medium**
HOT Lanes	✓	✓	**Medium**
Congestion Pricing	✓		**Medium/High**
Increase Alternate Road Capacity	✓		**High**
Increase Public Transit	✓		**Medium/High**
Operational Improvements	✓		**Low**
Improve Wayfinding for Trucks for Alternate Routes		✓	**Low**
Creation of Goods Movement Stakeholder Committee		✓	**Low**

*Depending on whether or not goods movement vehicles will be allowed to utilize preferential lanes.

1 Introduction

Key Messages

Under an Environmental Assessment and Urban Design Study (EA) carried out for the City of Toronto and Waterfront Toronto, four options were considered for the section of the elevated Gardiner Expressway approximately east of Jarvis Street:

1. Maintain
2. Improve
3. Replace
4. Remove

Following analysis carried out under the EA, the Remove alternative was recommended to the Public Works and Infrastructure Committee. Following directive from the PWIC to carry out further analysis on goods movement, CPCS has been retained by Dillon Consulting to support Waterfront Toronto and the City of Toronto with additional analysis focused on the movement of goods on the Gardiner Expressway and in the Study Area of the EA as well as proposing approaches to measure the impact of the Remove alternative on goods movement.

An additional fifth option, the Hybrid option, is now being considered as a part of a revised terms of reference for the EA.

1.1 Context for Assignment

1.1.1 EA Terms of Reference

In 2009, the Terms of Reference for an Environmental Assessment (EA) on the eastern portion of the Gardiner Expressway and Lake Shore Boulevard were approved by City Council and the Ontario Minister of the Environment.

Purpose

> *The purpose of the study was to determine the future of the eastern portion of the elevated Gardiner Expressway and Lake Shore Boulevard from approximately Lower Jarvis Street to just east of the Don Valley Parkway at Logan Avenue.*[2]

Key problems and opportunities that were identified in the EA as reasoning for the study were:

Figure 1-1: Problems and Opportunities Considered in EA Terms of Reference

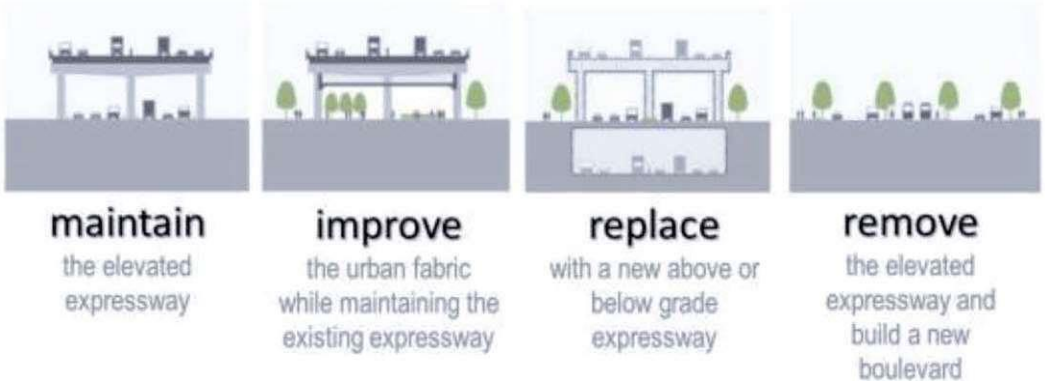
Problems	Opportunities
Deteriorated Structure	Revitalize Waterfront
Disconnected Waterfront	Create a Sustainable Waterfront
	Generate and Capture Economic Value
	Rebalance Transportation Modes

Source: Gardiner Expressway and Lake Shore Boulevard Reconfiguration EA Terms of Reference, September 2009

Proposed Options

Four options were considered under the EA for the elevated portion of the Gardiner Expressway in the Study Area.

Figure 1-2: Four Alternatives Considered Under EA



Source: Presentation made at Public Information Centre #3, February 6, 2014.

[2] Gardiner Expressway and Lake Shore Boulevard Reconfiguration EA Terms of Reference, September 2009. p.7

Maintain: Maintain the elevated expressway includes completing the Gardiner East rehabilitation program with complete reconstruction of the deck of the expressway. Maintain also includes implementation of the precinct plans as they are approved today. This includes the realignment of Lake Shore Boulevard through the Keating Precinct between Cherry Street and the Don Roadway. The realignment of Lake Shore Boulevard would position Lake Shore further north through this area of Keating and allow the Keating Channel edge to be reclaimed for a pedestrian promenade, recreation, and public space. The Keating Precinct Plan was approved by Council in 2010.

Improve: Improve the urban fabric while maintaining the existing infrastructure involves the following elements:

- Rebuilding the expressway deck with four lanes. The four lanes would be on the north side of the deck. The space where the southern two lanes currently exist would be opened up to light and air that would improve the pedestrian experience at grade.
- Lake Shore Boulevard would largely stay where it is between Jarvis and Cherry Streets. Modest improvements would be made at intersections to improve crossings for pedestrians and limit auto conflicts with pedestrians and cyclists.
- The Jarvis Street on- and off-ramps to and from the Gardiner would be shortened to open up more space at grade.
- Dedicated turning lanes for Gardiner on- and off-ramps would be reduced to connect directly with Lake Shore Boulevard. This would reduce the number of access ramps that pedestrians have to cross at intersections.

Replace: Replace with a new elevated structure includes:

- Construction of a new four-lane elevated expressway between Jarvis Street and the DVP. Design of the structure would include a single, centre column to support the structure that would be more widely spaced than the distance between columns today.
- New ramp connections would be built to connect to the DVP.
- The new elevated expressway would be aligned through the north section of the Keating Precinct between Cherry Street and the DVP ramps. This would open up land along the Keating Channel for redevelopment.
- The new structure would be 5 m higher than the existing Gardiner structure. This opens up access to light and air at grade and allows for landscaping and tree planting along Lake Shore Boulevard.
- New ramp connections would be built to provide the Jarvis/Sherbourne connections.

- Lake Shore Boulevard would be rebuilt as a four-lane boulevard situated underneath the new elevated expressway.
- Development parcels along the south edge of Lake Shore Blvd would be expanded and opportunities for new parks and public spaces would be created between the rail corridor and the north side of Lake Shore Blvd.
- A new east-west continuous bicycle path would be developed on the north side of Lake Shore Boulevard.

Remove (Boulevard): The Remove (Boulevard) alternative solution involves the demolition of the existing Gardiner Expressway east of Jarvis Street and the construction of a new eight-lane boulevard with potential for new development on both the north and south sides of the street. This alternative would open up the corridor to light and air and would allow for a boulevard planted with continuous rows of trees. The transition from the boulevard back up to the existing elevated expressway in the west end of the Study Area would occur between Yonge Street and Jarvis Street.

Opportunities for new development parcels on the north side of the new green boulevard would allow for a buffer between the rail corridor and Lake Shore Boulevard. Dedicated left-turn lanes would exist at the intersections and the potential for off-peak parking would exist in the southern eastbound lane. A new continuous bicycle path would be developed on the north edge of Lake Shore Boulevard.

Rationale

These options were to be considered within the context of:

1. Waterfront Toronto's Guiding Principles
   - Sustainable development;
   - Public accessibility;
   - Economic prosperity;
   - Design excellence; and
   - Fiscal sustainability

2. Themes from The Toronto Official Plan
   - Promoting growth that is less reliant on the private automobile;
   - Developing transit-based growth strategies that support development in areas with good transit and improve transit in major growth areas;
   - Emphasizing environmentally sustainable development;
   - Having design policies to guide the physical form of development and public realm improvements; and,

- Ensuring the social and environmental infrastructure is in place to serve Toronto's present and future residents.

3. The City's Central Waterfront Secondary Plan
   - Removing barriers and making connections;
   - Building a network of spectacular waterfront parks and public spaces;
   - Promoting a clean and green environment; and,
   - Creating a dynamic and diverse community.

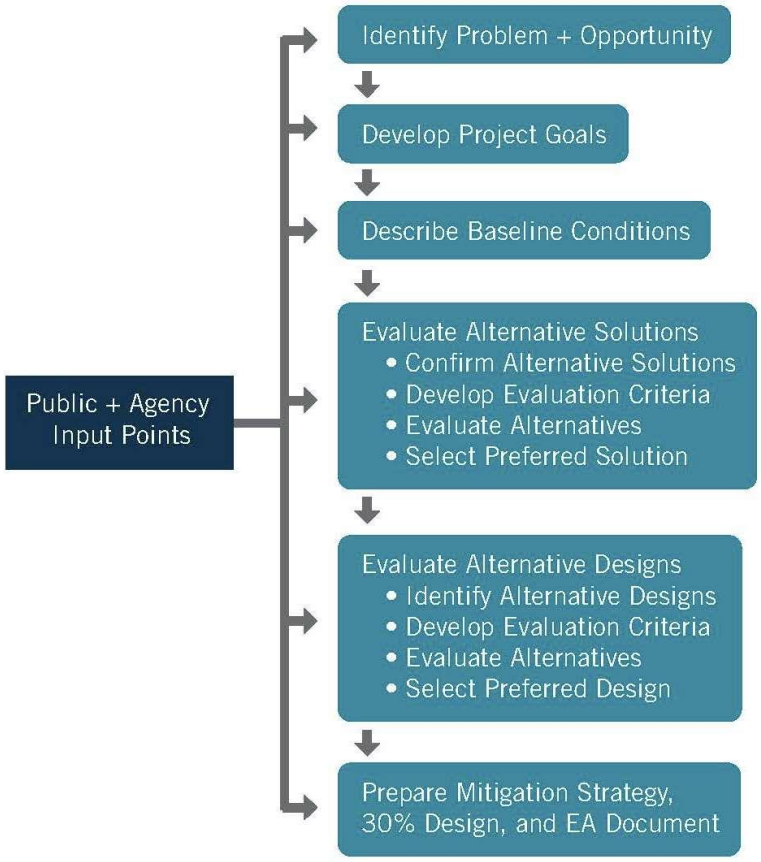
4. Study Goals of the Environmental Assessment

   - Revitalize the Waterfront
   - Reconnect the City with the Lake
   - Balance Modes of Travel
   - Achieve Sustainability
   - Create Value

Study Process

The process to carry out the Environmental Assessment and identification of the preferred option is outlined in the figure below.

Figure 1-3: EA Study Process

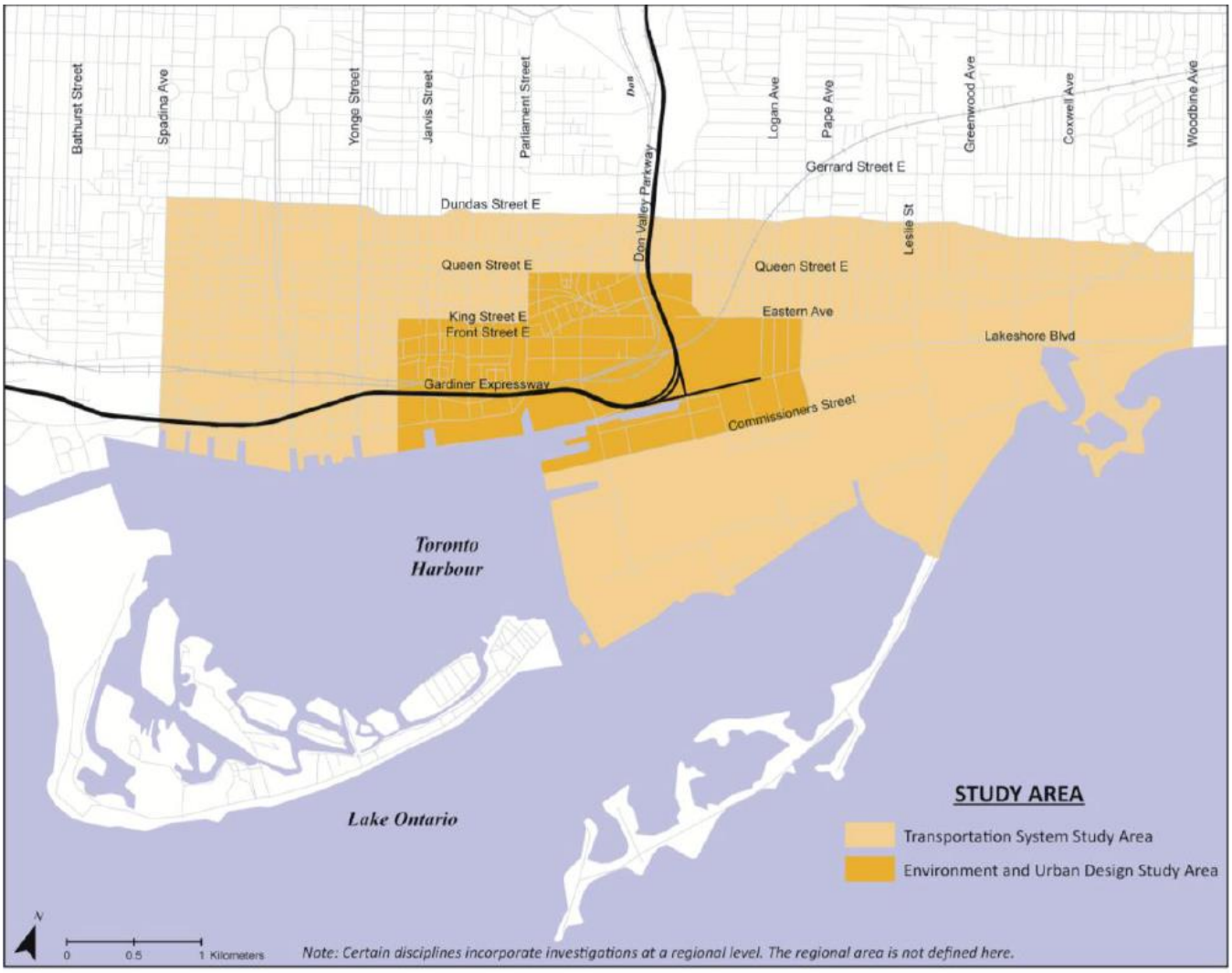


Source: Gardiner Expressway and Lake Shore Boulevard Reconfiguration EA Terms of Reference, September 2009

1.1.2 Environmental Assessment and Urban Design Study Area

The Environmental Assessment and Urban Design Study Area (immediate Study Area) as well as the wider Transportation System Study Area that were considered as a part of the EA are depicted in the dark and light orange areas respectively in the figure below. The GE/LSB corridor is the corridor through the Study Area comprised of the combined Lake Shore Boulevard surface route and elevated Gardiner Expressway system and is shown in black moving west-east and east-west through the Study Area.

Figure 1-4: Study Area



Source: Alternative Solutions Evaluation Interim Report, February 2014. Gardiner Expressway and Lake Shore Boulevard East Reconfiguration Environmental Assessment and Urban Design Study

1.1.3 Remove Alternative and Past Recommendations to the PWIC

Comparative Evaluation

The four alternatives were compared (relatively) under the four lenses of:

- Transportation and Infrastructure
- Urban Design
- Environment
- Economics

Each lens had a set of criteria under which each option was evaluated. The summary of this evaluation is shown below as it was reported to the PWIC in 2014.

Figure 1-5: Preliminary Evaluation Results

	Study Lens/ Criteria Group Summary	MAINTAIN	IMPROVE	REPLACE	REMOVE
TRANSPORTATION & INFRASTRUCTURE	Automobiles				
	Transit				
	Pedestrians				
	Cycling				
	Movement of Goods				
	Safety				
	Constructability				
URBAN DESIGN	Planning				
	Public Realm				
	Built Form				
ENVIRONMENT	Social & Health				
	Natural Environment				
	Cultural Resources				
ECONOMICS	Regional Economics				
	Local Economics				
	Direct Cost and Benefit				

Preferred | Moderately Preferred | Least Preferred

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Source: Presentation made at Public Information Centre #3, February 6, 2014.

Key Findings and Recommendations

Based on the evaluation summarized in Figure 1-5 above, John Livey, Deputy City Manager, Cluster B, submitted the recommendation to the Public Works and Infrastructure Committee on February 21, 2014 to proceed with the Remove Alternative as the preferred solution for the Gardiner Expressway and Lake Shore Boulevard East Reconfiguration Environmental Assessment and Integrated Urban Design Study.

1.1.4 Public Works and Infrastructure Committee Decision

As part of the EA process, some goods movement stakeholders raised concerns that reflect a variety of perspectives, but all relate to concerns that the removal of the eastern portion of the Gardiner will result in increased traffic congestion, which in turn will reduce the speed and reliability, and increase the cost, of transportation into and out of the downtown core. In regard to goods movement specifically, these concerns affect shipper industries (those that ship and

receive goods), service-movement industries (those that undertake service movements, such as repair persons and others who provide services at client sites), and carrier industries (those who physically transport goods, in this case, by truck). Collectively, we refer to these industries as goods movement industries. Each of these industries has specific requirements and circumstances that affect their use of the City's transportation system.

A number of deputations were made at the City of Toronto Public Works and Infrastructure Committee meeting, including the request that new options be studied. The following are a summary of the concerns related to goods movement:

- Relying too heavily on the assumption that transit will be in place
- Lack of focus on movement of goods in EA
- Impacts on access to goods, services, and businesses
- Increase in travel time is too high in Remove Alternative
- Removing the Gardiner will limit access to downtown core
- Capacity must be maintained during construction

The Public Infrastructure Committee referred the item back to the Deputy City Manager, Cluster B and requested that he undertake to:

1. Work with Waterfront Toronto and community stakeholders to review the recommended option under the EA process to mitigate congestion concerns;

2. Prepare an additional option that combines the Maintain and Replace components to preserve expressway linkage and functionality between the Gardiner Expressway and the Don Valley Parkway, and evaluates it against the EA criteria and the following:

    - Transportation functionality;
    - Impacts on key economic sectors;
    - Cost benefit;
    - Future land use considerations;
    - Public transit components;
    - Environmental impact; and
    - Neighbourhood growth and compatibility.

3. Report back to City Council in 2015, through the Public Works and Infrastructure Committee.

Waterfront Toronto and the City of Toronto then undertook to carry out further study on goods movement in response to direction from the committee. CPCS has been retained, through a sub-contract to Dillon Consulting, to carry out the goods movement study in support of the EA process. This report forms part of the overall 2015 report back to PWIC.

1.2 Objectives

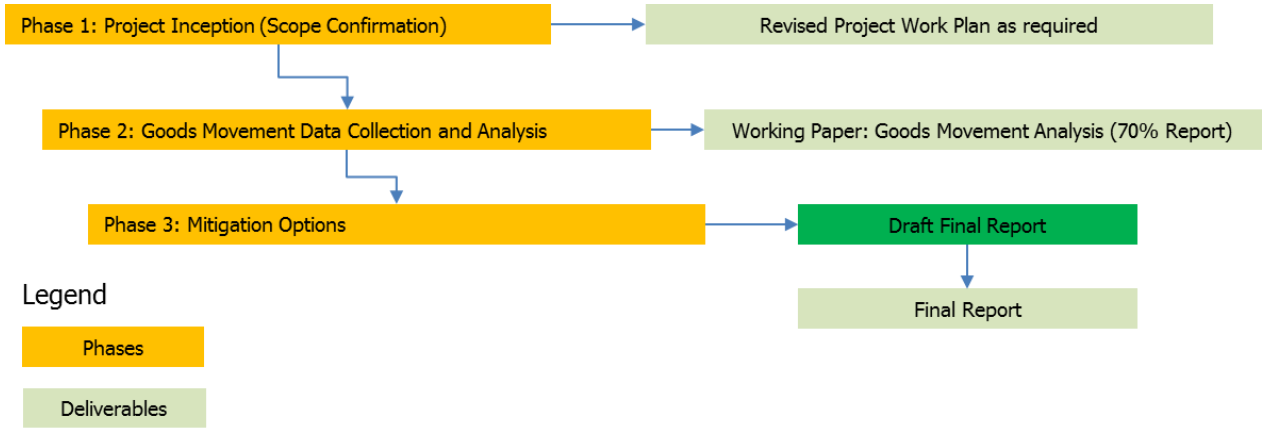
The objectives for this project are

- To provide a better understanding of the nature of goods movement in the Gardiner/Lake Shore corridor, Transportation Study Area (downtown) and Greater Toronto Area.
- To provide a comparative assessment and explanation of the opportunities and constraints for goods movement between the Remove and the Elevated Expressway alternatives being considered in the EA; and
- To recommend high-level mitigation measures.

1.3 Project Structure

The project has been developed in three broad phases, as set out in Figure 1-6. This final report is the output of all three phases. It incorporates comments provided on the Working Paper, which was the output of Phase 2.

Figure 1-6: Phased Approach to the Study



1.4 Key Questions

This report seeks to answer or address several key questions.

What is the nature of goods movement within the Study Area?

- What geographical areas would be affected by the implementation of the Remove Alternative?

- What type of businesses, located within the Study Area and GTA, are the key goods movement companies (shippers, carriers, and service-movement) that may be affected by the implementation of the Remove Alternative?
- What are the relevant characteristics of the supply chains in which these companies operate (e.g. just-in-time, 24-hour operations, peak/off-peak, modes used, origins and destinations of shipments, on-site storage and loading/delivery considerations, key drivers and seasonality of shipment volumes, etc.)?
- How are businesses currently responding to the rehabilitation construction of the Gardiner Expressway?

What comparative measures can be used to evaluate the potential impacts of the Remove Alternative relative to other Elevated Expressway alternatives?

- What are the specific (local) concerns of the key goods movement companies associated with the Remove Alternative?
- What would be the key issues with the implementation of the Remove Alternative for key goods movement companies?
- What are the potential general (regional) impacts of the implementation of the Remove Alternative on goods movement within the Greater Toronto Area including through movement on the Gardiner and Don Valley Parkway?

What steps could be undertaken to mitigate the negative impacts on goods movement of the Remove (Boulevard) alternative relative to the Elevated Expressway alternatives?

- Based on work already undertaken, how have other jurisdictions addressed the negative implications of initiatives similar to the Remove (Boulevard) alternative in their jurisdictions?
- What steps could be taken, including in terms of design, to mitigate the negative implications of the Remove Alternative?

1.5 Methodology

This report has been prepared through a combination of review and analysis of background data and literature and stakeholder consultations.

1.5.1 Background Data

In Toronto, comprehensive sources of local goods movement data are scarce, so it is necessary to use multiple data sources to “triangulate” a picture of goods movement in the impact area.

The starting point for this assignment is City traffic count and cordon count data and other data already incorporated into the EA.

Additional data sources include:

- **Municipal Property Assessment Corporation zoning data and Canadian Business Patterns data** (from December 2013) used to identify the location of goods movement industries.
- **Ontario Ministry of Transportation (MTO) Global Positioning System (GPS) data** to identify major truck traffic generators. MTO provided GPS-based data on truck stops, which indicate key goods movement origins and destinations (due to confidentiality constraints, this is only available at the county level for this study).
- **MTO iCorridor data.** MTO's iCorridor web application provided data on average speeds of commercial vehicles on roads, including the Gardiner, as well as commercial vehicle counts for 400 series highways.

In many cases, data from more than one source were combined in order to gain a better understanding of the movement of goods. For example, iCorridor data from MTO for 400 series highways is combined with City cordon count data.

Beyond the data sources mentioned above, other micro-data required for this assignment were largely gathered through interviews.

In the longer term, better data can be available to the City of Toronto through cooperation with the Ontario Ministry of Transportation (MTO). MTO could provide the City performance metrics for goods movement, a truck origin/destination matrix based on data available to MTO (GPS tracking data) using MTO algorithms (they estimate they are currently capturing 30-40% of trucking activity). MTO is interested in collaborating with the City to receive data on hourly commercial vehicle volumes (total, medium, and heavy) for every link in the City's road system to be incorporated into the iCorridor program. Similar data has been provided to MTO by Peel Region.

Limitations of Data

Much of the analysis included in this report is dependent on third-party data. CPCS cannot warrant the accuracy of the data from third parties, but has attempted to verify information or make note of limitations of the data available in this assignment. No single data source provides a complete picture of the movement of goods in the GTA or on the Gardiner Expressway. MTO iCorridor data are based on a sub-sample of all movements from GPS sources, surveys, traffic counts, and other sources that have been put together to create the best possible understanding of traffic. At times, information has been modelled or assumptions have been made by MTO when not all data were available. Cordon count data provided by the City of Toronto are limited to counts on a single day of the year and may not be representative of overall traffic patterns for that year. In the absence of other data, the cordon count information

is used as indicative of traffic volumes on the Gardiner Expressway and Lake Shore Boulevard. No single data source provides a complete and true picture of the movement of goods, but all the points of data in conjunction allow us to make useful inferences and gain more understanding about the magnitude and pattern of the movement of goods.

Feedback provided by stakeholders represents their views and not necessarily the views of CPCS. We have provided feedback as per the views of these stakeholders as well as examined considerations to take into account in the evaluation of the impact of goods movement.

1.5.2 Stakeholder Consultations

A large part of this assignment was informed through stakeholder consultations. The purpose of consultations was to gather information on supply chains and stakeholders' current use of the Gardiner Expressway, likely impacts of the Remove Alternative, and discuss any relevant issues raised by stakeholders. Some supply chain issues discussed as appropriate include the differing impacts of the Remove Alternative by time of day (peak vs. off-peak movement), by local vs. through movement, estimates of the reliability of the network, and perceived challenges to reliability.

A list of stakeholders was identified through an analysis of Canadian Business Patterns data as well as truck stop data in order to identify areas where larger generators of goods movement flows are located. Several of these were the same as those who deputed at the Public Infrastructure and Works Committee. Additionally, industry associations were contacted in order to gain a better understanding of the perspective of stakeholders that may not be located in the Study Area but would be impacted by the Remove Alternative. In some cases, industry organizations recommended particular additional stakeholders that may be significantly impacted by the Remove Alternative.

Stakeholders consulted include key goods movement companies (shippers and receivers of significant volumes of freight; carriers, particularly truckers and couriers; and service-trip generating businesses, those travelling on the road network to provide on-site service) that could be affected by the implementation of the Remove Alternative.

A consultation package was put together for distribution to the identified stakeholders providing some background information on the project as well as a template questionnaire intended to be indicative of the topics that would be discussed during consultations. This is provided in Appendix A.

2 Nature of Goods Movement Affected by Remove Alternative

Key Messages

The 400 series highway system is the preferred option for the movement of goods around the GTHA. During peak hour, the section of the Gardiner Expressway in the Study Area is estimated to handle 40% as many trucks as the 401 at Yonge Street during the 8:00-9:00am peak hour. A large portion of these trucks travelling through the Gardiner Expressway in the EA Study Area originate in or are destined for locations in the Study Area.

The Gardiner Expressway and Lake Shore Boulevard corridor is an important piece of infrastructure for the movement of goods in the City of Toronto. When compared to arterial roads, the Gardiner Expressway and Don Valley Parkway often represent a faster way to move goods in Toronto and exhibit some of the heaviest volumes of commercial vehicle traffic in the City outside of the 400 series highways.

2.1 Geographical Areas Affected

Approximately 30% of Canada's economic activity and over 400 million tonnes of goods pass through, originate in, or are destined for the GTHA annually.[3] Goods move into, out of, and through the GTA by road, air, rail, and water. The 400 series highways, Toronto International Airport and Hamilton Airport, railways, as well as the ports in Toronto and Hamilton comprise key goods movement infrastructure serving the City. Still, the majority of freight movements in the GTHA are by road. Road congestion creates real economic costs for the movement of people and goods. In 2008, it was estimated that the economic burden of congestion was $3.3 billion on commuters and $2.7 billion in lost opportunities for economic expansion in the GTHA.[4] The City of Toronto experiences the most congestion and highest cost due to congestion of all the areas in the GTHA. The City has developed a Congestion Management Plan in order to help it manage congestion using innovative best practice techniques combining increasing availability of information to travellers and planners, real-time adjustments to traffic management, and demand management among other factors.

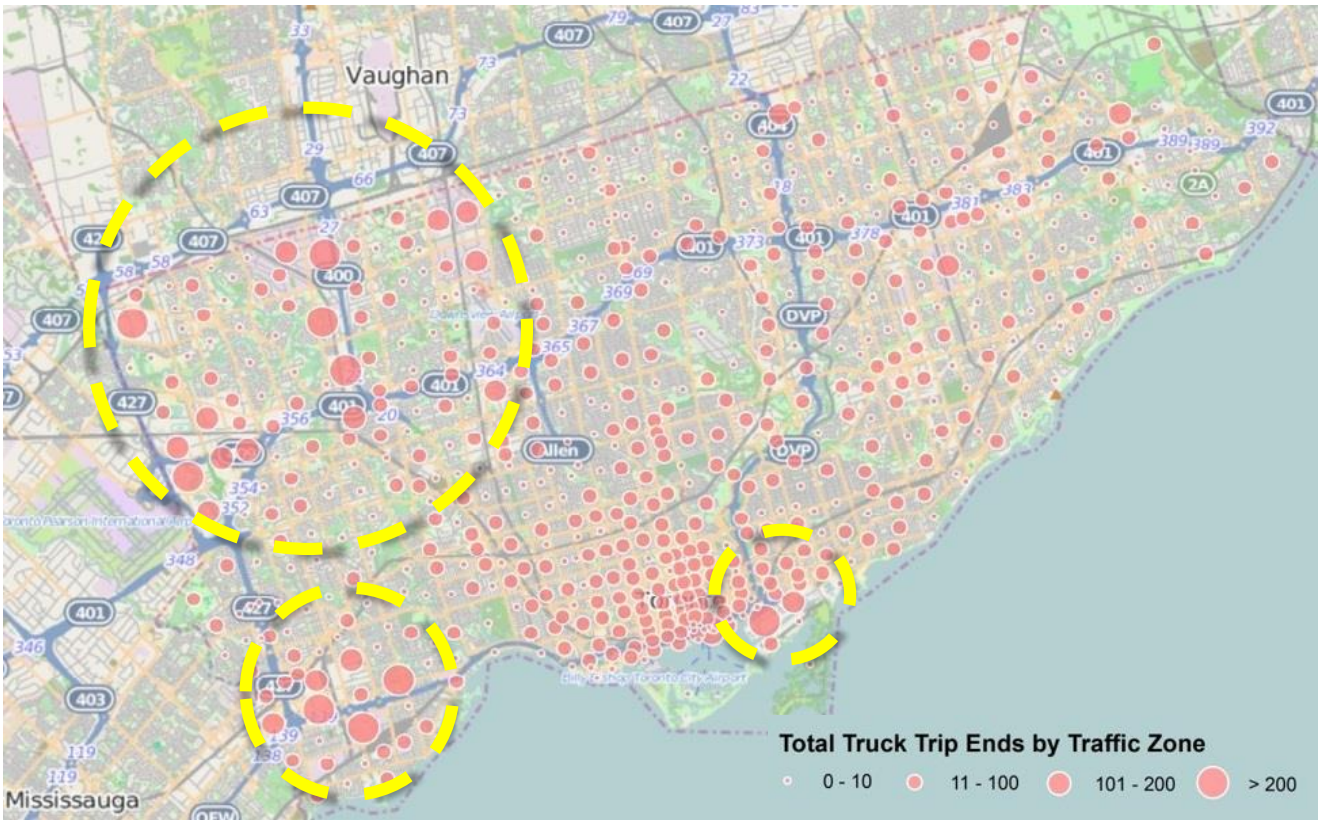
In Toronto, the Don Valley Parkway and Gardiner Expressway/Lake Shore Boulevard system is a limited-access, high-speed highway system that provides access to downtown Toronto for both passenger and commercial vehicles. Goods movement stakeholders consulted indicate that for traffic passing through the GTA or for interregional trips, the Gardiner Expressway is *not* a preferred route for travel. For example, for a trip between Durham Region and Peel Region, stakeholders prefer to use Highway 401 or potentially Highway 407 for east to west travel. The Gardiner Expressway is used primarily for trips originating in or destined to somewhere in the Study Area shown in Section 1.1.2.

As shown in Figure 2-1, some of the areas showing the largest truck traffic south of the 401 in Toronto include areas along the Gardiner Expressway, with particular emphasis on the Port Lands in the southeastern end of the Study Area. Mississauga and Etobicoke are also seen as major hubs for truck traffic.

[3] Metrolinx, *Moving Goods and Delivering Services: Development of a Regional Transportation Plan for the Greater Toronto and Hamilton Area (Green Paper No. 5)*, February 2008

[4] HRD, Costs of Road Congestion in the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan. December 1, 2008. p.1

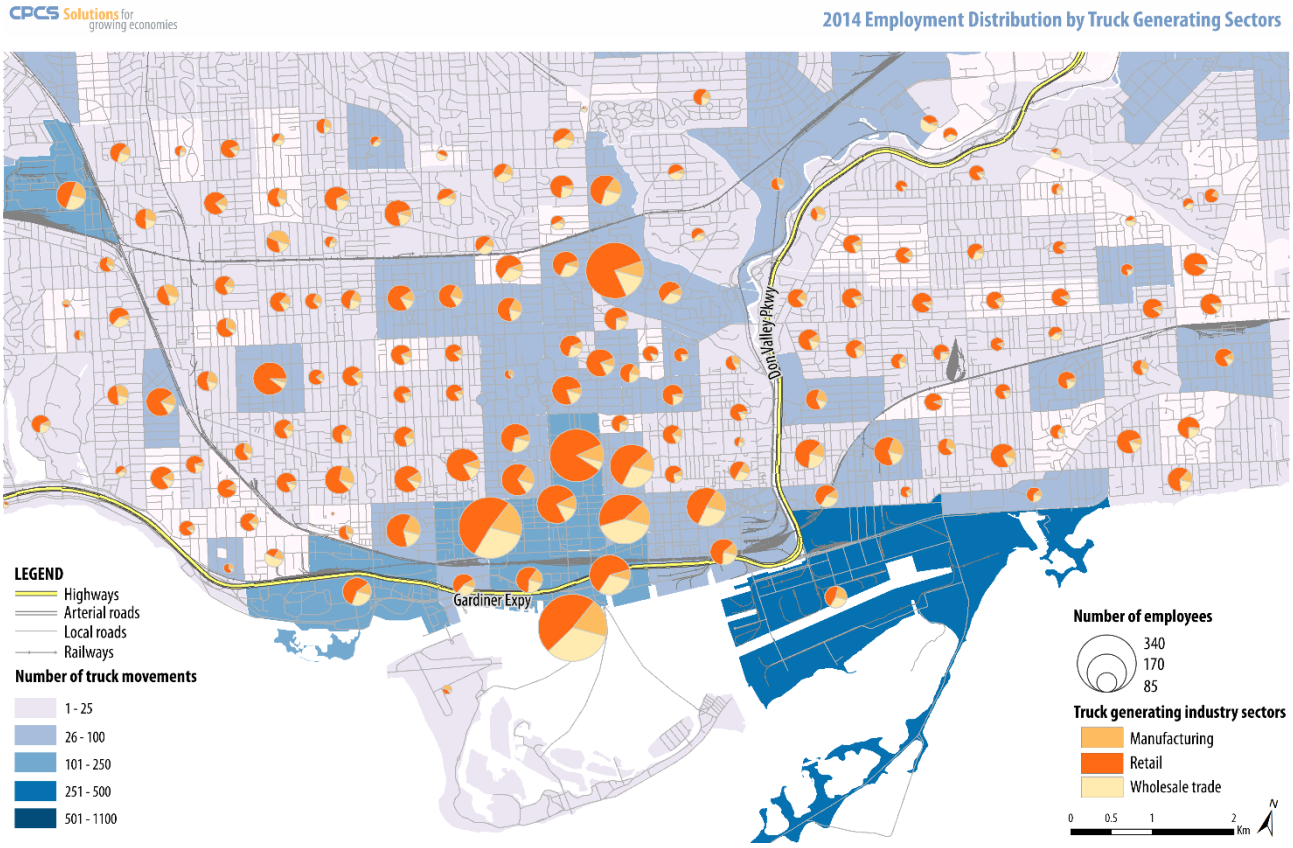
Figure 2-1: Truck Trip Ends in Toronto



Source: Ontario Ministry of Transportation GPS data for Truck Trips in October 2011

The map below provides an overview of the location and breakdown of employment in goods-producing industries within Toronto compared to the number truck trips ending in each location (from the sample data provided by MTO for October 2011 of a sub-sample of all truck trips).

Figure 2-2: Goods Movement Sector Employment and Truck Trips



Source: CPCS, Statistics Canada Data on Canadian Business Patterns, and Ontario Ministry of Transportation Truck GPS Data

Employment in goods movement generating sectors such as retail, manufacturing, and wholesale trade is centralized within the densest areas of downtown Toronto. Truck trips are much more heavily clustered around the 400 series highways in Peel Region as well as in the industrial areas on the Waterfront in Downtown Toronto close to the Study Area being contemplated as a part of the EA.

The clusters of employment[5] in goods movement industries shown do not seem to be reflective of the areas of the highest truck stop activity based on the MTO truck data sample. While this may partially be a by-product of the non-random nature of the sample of trucks included in the data, likely this is also an indication that the intensity of the number of goods movement trips, even among goods movement jobs and goods movement economic activity, can vary greatly depending on the unique business and supply chains of each individual firm and sector.

[5] Sourced from Statistics Canada Canadian Business Patterns Data

2.1.1 Trends

It is important when analyzing current goods movement traffic information in Toronto and in the Study Area to recognize that goods movement patterns are expected to change as a result of changing land use patterns in the city.

As part of the Central Waterfront Plan a number of redevelopment plans for mixed-use communities are being completed. Over the next two decades these districts will transform the waterfront into new communities and will directly influence the urban design and public realm characteristics of the area. These include: East Bayfront (approved plan), West Don Lands (approved plan), and the Keating Channel-Lower Don Lands (plan in progress). Included in the plans for Keating Channel-Lower Don Lands are plans for improving Keating Channel as a recreational waterway, improving flood protection plans, and naturalizing the mouth of the Don River. Flood protection and naturalization plans for the Don River mouth have been completed through a separate EA. A major development has been planned on the Unilever site by developer First Gulf that will also be expected to dramatically impact the landscape of the region.

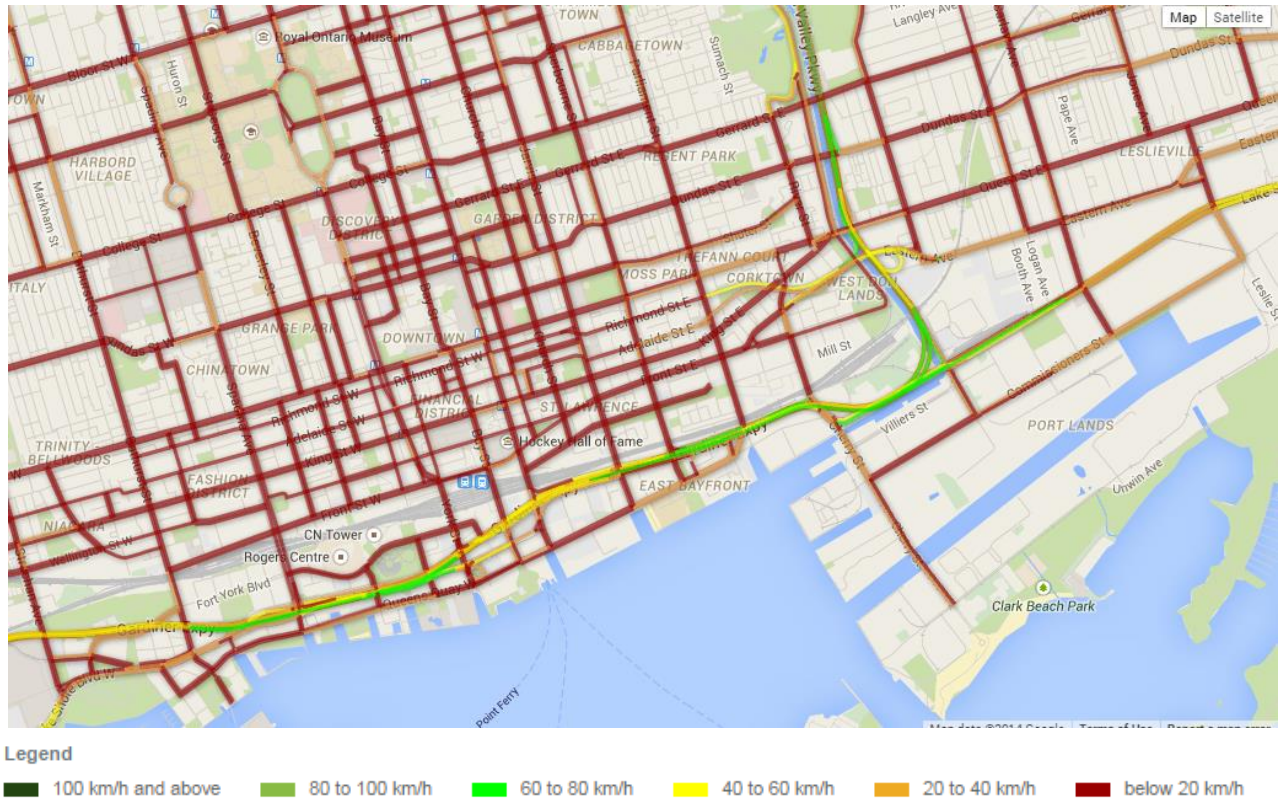
As Toronto develops, changes in land use and population and employment density have impacts on the goods movement networks in the City and the GTHA. Most goods movement industries have experienced employment growth in the last few years. While growth has been somewhat geographically diverse, the areas with close access to the Don Valley Parkway and Gardiner Expressway have seen some of the largest employment growth in the goods movement generating sectors including: manufacturing, retail, courier, wholesale trade, and distribution support, according to Statistics Canada employment data. Appendix B shows maps for each of these sectors showing the geographical location of changes in employment in these sectors.

Going forward, changes are expected in both employment and residential population that may have an effect on the goods movement network. The expansion of road and highway infrastructure in downtown Toronto in order to accommodate increased population and employment in the region is difficult and unlikely due to constraints imposed on expansion by the existing development of the area. The City of Toronto, in its Official Plan, is focused on strategies to reduce the reliance on road networks in transportation through demand management strategies, encouraging the use of other transport modes, and other wider developmental initiatives. These strategies are highly effective in managing the reliance on automotive transportation for passengers, but may not be able to as effectively respond to the movement of goods that are still predominantly reliant on roads for transportation and may require some additional strategies.

2.2 Traffic Volumes, Origins, and Destinations

The Gardiner Expressway is a key connection for the movement of goods to, from, and through the downtown area. The figure below displays the average traffic speeds for commercial vehicles as reported by MTO for 2011 on key roads in the downtown region around and outside the Study Area. The Gardiner Expressway and Lakeshore Boulevard corridor currently provides for the quickest flow of commercial vehicles and goods through the area identified.

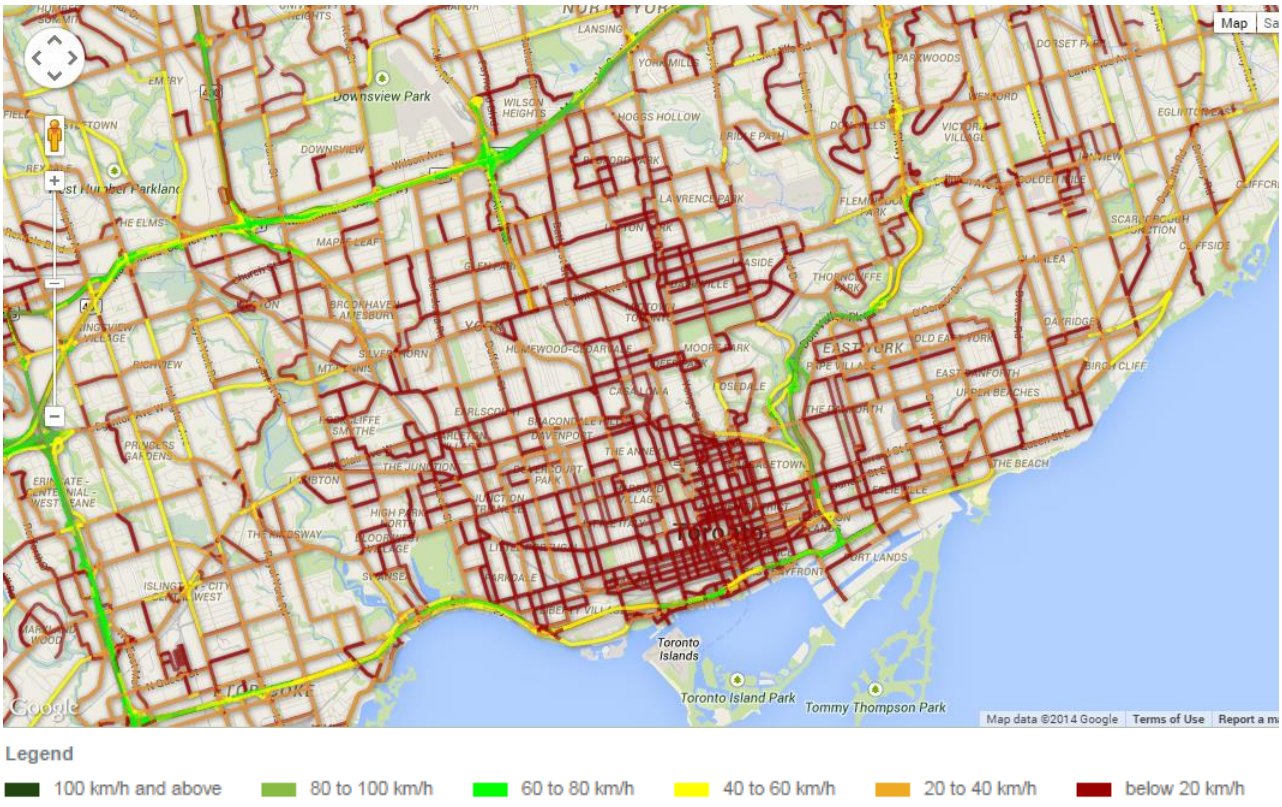
Figure 2-3: Average AM Peak Commercial Vehicle Traffic Speeds around Study Area (2011)



Source: Ontario Ministry of Transportation iCorridor system

When examined on a slightly wider scale, it can be noted that the Gardiner Expressway/Lakeshore Boulevard corridor forms part of a higher capacity and higher speed freeway network encircling the downtown area that allows for a relatively efficient movement of goods compared to other arterial roads. This ring is formed by the Don Valley Parkway to the east, Highway 401 to the north, Highway 427 to the west, and the Gardiner Expressway/Lake Shore Boulevard to the south.

Figure 2-4: Average AM Peak Commercial Vehicle Traffic Speeds in Toronto (2011)



Source: Ontario Ministry of Transportation iCorridor system

This network allows for a relatively efficient and reliable movement of goods as well as people encompassing the city. Growth will likely lead to increased demand on all of these existing routes. It is expected that travel times would increase as vehicle use increases on the existing roadways. The EA will take into account this change in demand when carrying out analysis on the relative impact of the Remove Alternative as compared to the Elevated Expressway options (travel time through the GE/LSB corridor will be expected to increase under all options).

2.2.1 Traffic Volumes

As shown above, Gardiner Expressway/Lakeshore Boulevard provides higher average speeds than most other routes through the Study Area. It also receives a comparatively large amount of traffic through the downtown Toronto and has been identified as the preferred route by most stakeholders to get into and out of the Study Area. The figure below shows traffic volumes on the major routes into and around downtown Toronto, including the Study Area.

Figure 2-5: AADTT Commercial Vehicle Traffic Volume (2006)

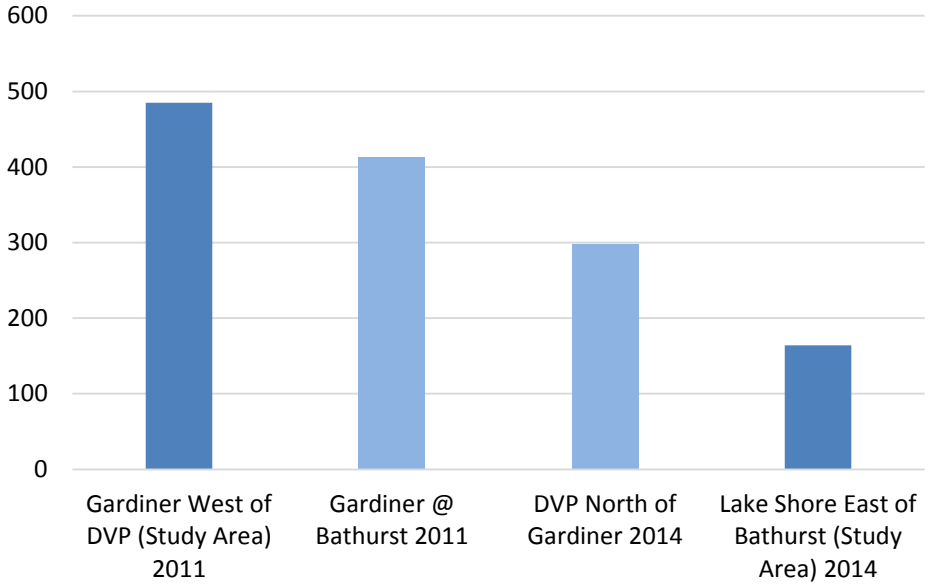
Source: Ontario Ministry of Transportation iCorridor program

According to 2011 City of Toronto cordon count data for the Gardiner Expressway in the Study Area and 2014 City of Toronto cordon count data for the Lake Shore Boulevard in the Study Area, the LSB handled 22% of the sum of the reported Gardiner Expressway and Lake Shore Boulevard traffic.[6]

Figure 2-6 compares commercial vehicle traffic on the elevated Gardiner Expressway through the Study Area (2011) with the Gardiner just east of Bathurst (2011) and the LSB (2014).

[6] Note: City of Toronto cordon counts are data of traffic for a single day only. Available data for commercial vehicle traffic on the Gardiner was for 2011 while data for the Lake Shore was for 2014. These results are not directly comparable but may be indicative of the true split of commercial vehicles between the LSB and elevated Gardiner Expressway.

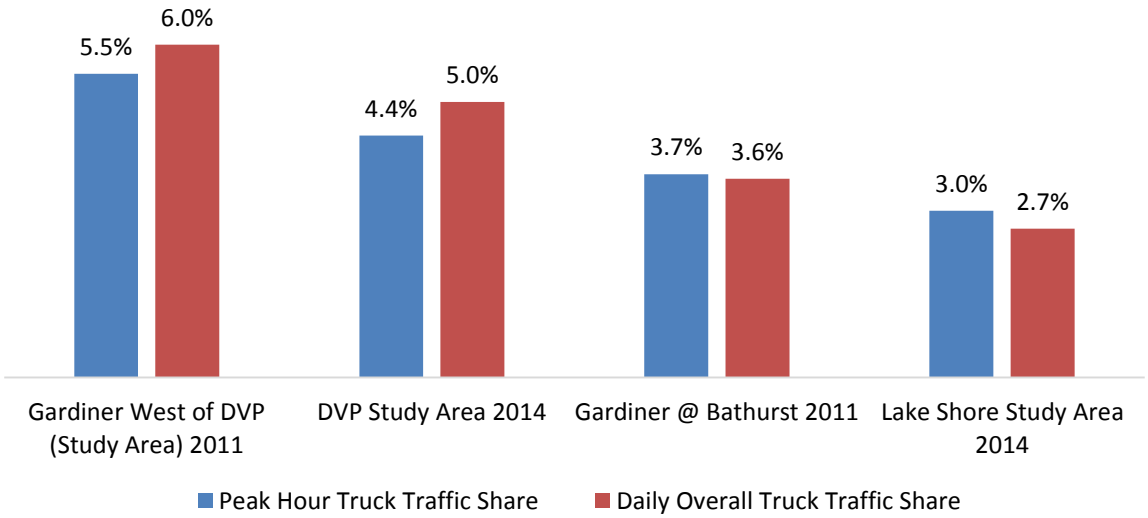
Figure 2-6: Peak Hour Truck Traffic in GE/LSB Corridor (# of trucks at 8-9am)



Source: City of Toronto Cordon Count Data

This analysis supports general comments made by stakeholders during consultation that the elevated expressway is currently the preferred method of travel for commercial vehicle traffic through the GE/LSB corridor.

Figure 2-7L GE/LSB Corridor Truck Traffic Share (as % of total number of vehicles)

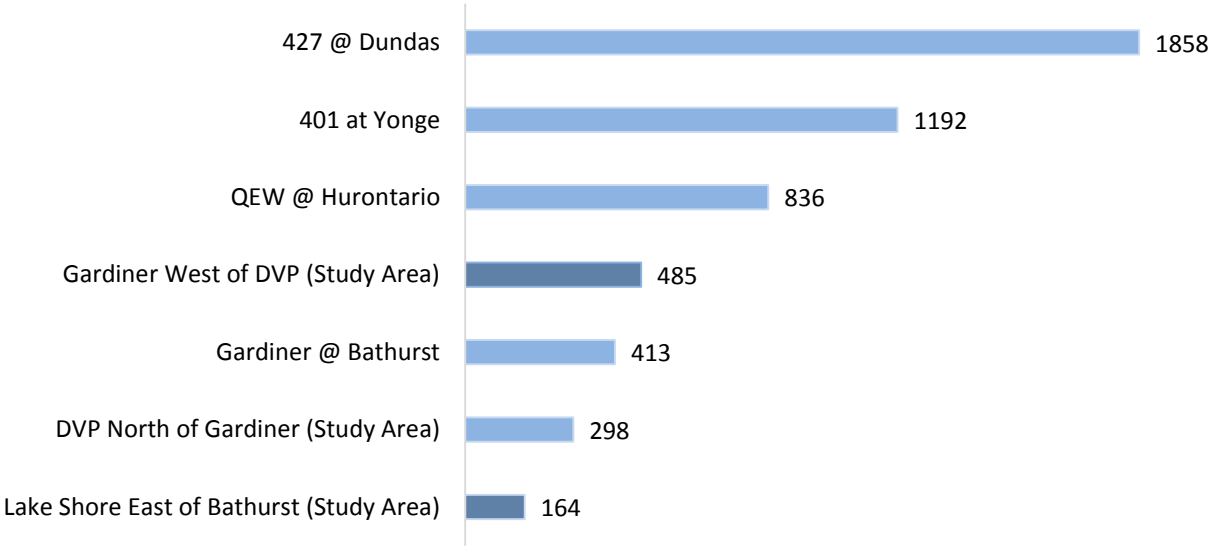


Source: City of Toronto Cordon Count Data

Truck traffic also tends to make up a larger percentage of total vehicles during off peak as compared to peak hour. This is mostly due to a relatively larger reduction in passenger vehicles as seen in commercial vehicles during off-peak daytime hours.

When compared on a larger scale to some major highways in the GTA, the Gardiner Expressway moves a relatively small amount of commercial vehicles. In general, it was noted through stakeholder consultation that goods movement stakeholders use higher capacity highways such as the 400 series highways for longer distance travel whenever possible. Inter-regional trips or trips bypassing the downtown core tend to use routes such as the 401, 407, and 427 as opposed to the Don Valley Parkway or GE/LSB corridor whenever possible. Figure 2-8 shows the comparative daily truck trips on many of the major highways and the Gardiner Expressway within the Study Area in the year 2006 (the last year for which comparable data is reported for the Gardiner and the 400 series highways).

Figure 2-8: Peak Hour Truck Traffic on Comparative Highways (# of trucks 8-9am)



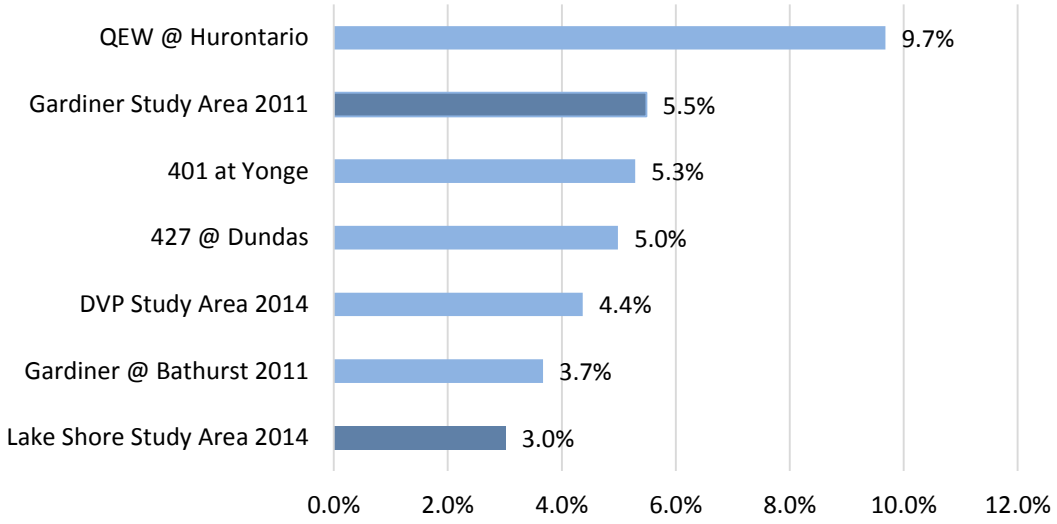
Source: Ministry of Transportation iCorridor Data, City of Toronto Cordon Count Data

Comparatively, the Gardiner Expressway in the Study Area handles 40% as many trucks in a day as the 401 at Yonge Street and 26% as many trucks as the 427 at Dundas during the 8:00-9:00am peak hour.[7]

In terms of intensity of truck traffic, trucks make up a larger share of total traffic on the Gardiner Expressway in the Study Area than most other highways analyzed.

[7] Ontario Ministry of Transportation iCorridor program, 2008 AADTT data, and City of Toronto Cordon Count data

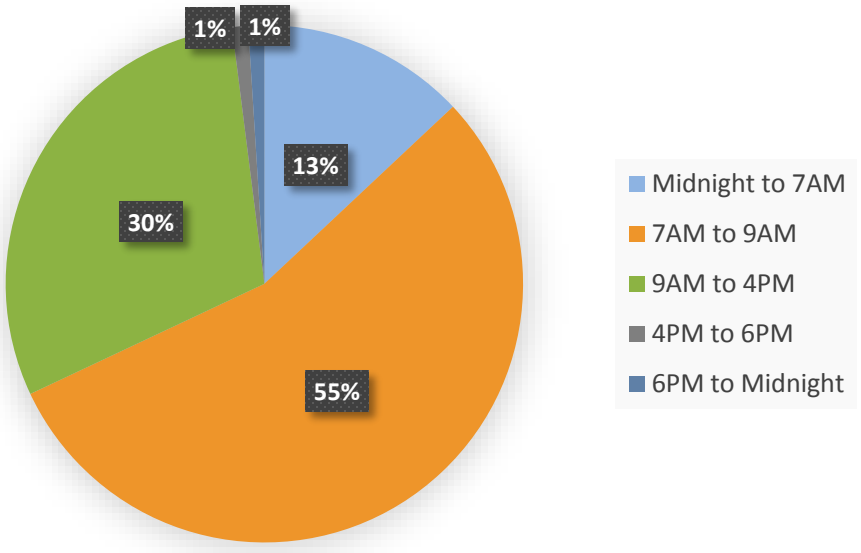
Figure 2-9: Truck Traffic as a Percentage of Number of Vehicles During Peak Hour



Source: Ministry of Transportation iCorridor Data, City of Toronto Cordon Count Data

Most outbound trips generated by goods movement stakeholders are dependent on customer schedules. Many customers expect to receive goods prior to the start of the business day or at some point during the business day (depending on the type of good and business involved). For this reason, most trips occur prior to the morning peak, during the morning peak period or during daytime business hours.

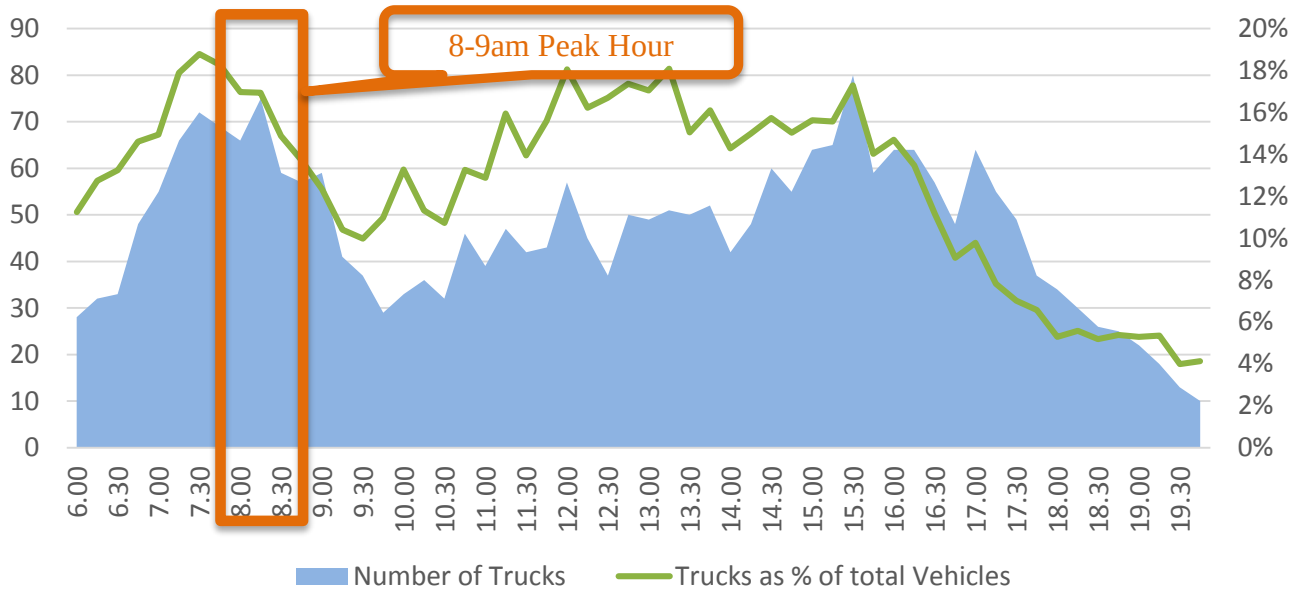
Figure 2-10: Estimated Commercial Vehicle Trip Start Times in the GTHA



Source: McMaster Institute for Transportation and Logistics. Estimating Urban Commercial Vehicle Movements in the Greater Toronto-Hamilton Area. July 2010

While transportation costs may be cheaper for carriers during off-peak hours due to lower road congestion, trips are made based on the supply chains and demands of goods movement producers and consumers. Section 3.1.5 mentioned some trends towards off-peak delivery programs trips for the movement of goods. In particular, progress in off-peak delivery has been made in the densest cities such as London and New York, where strains are highest on transportation systems for competing uses of the network. Often, it is necessary for government action through incentives or other programs to encourage off-peak deliveries as a desirable alternative for trips during peak hours (or through regulation that encourages or compels off-peak delivery).

Figure 2-11: Truck Traffic Patterns in the Study Area



Source: City of Toronto Cordon Count Data

In general, passenger vehicle trips tend to experience larger peaks and valleys in terms of utilization of the expressway in the Study Area than commercial vehicles. Many stakeholders consulted indicated that many of their trips commenced early in the morning and ended prior to the afternoon peak period. This corresponds well with the pie chart above in Figure 2-10, which shows that estimated commercial vehicle trip start times occur primarily in the morning, with few trips commencing in the afternoon or evening periods. This is often as a consequence of downstream customers' needs, where deliveries are destined for receivers that are only capable of receiving deliveries during their business hours. Many require deliveries prior to or at the start of opening hours (such as many retailers).

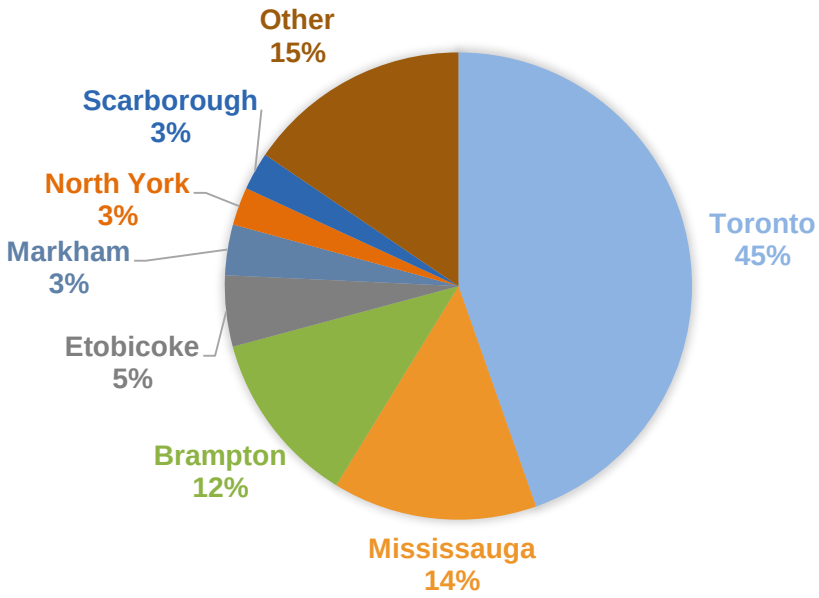
2.2.2 Origins and Destinations

The value of goods moving through Southern Ontario is particularly large in the corridor between the border crossings into the United States and along the 401 through to the Quebec

border. The GTA is at a critical juncture in the middle of the corridor, with many goods destined to or originating in the GTA as well as many goods passing through the region.

During consultations, goods movement stakeholders indicated that the preferred route for through traffic, in particular traffic that is not originating or destined for the City of Toronto, is the 400 series highways. Goods movement traffic that is destined for Toronto, particularly downtown Toronto, often uses the Gardiner Expressway and/or Don Valley Parkway as its preferred route to travel through the Study Area. The major origins of trucks travelling on the Gardiner in the Study Area include the Toronto and Peel Region with smaller portions coming from other regions in the GTA.

Figure 2-12: Origins of Trucks Travelling on the Gardiner Expressway in Study Area



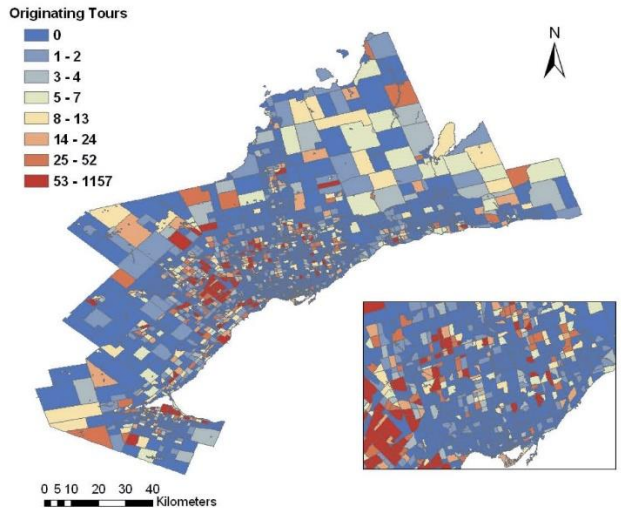
Source: CPCS Analysis of Ontario Ministry of Transportation GPS data.

Note: Scarborough, North York and Etobicoke are separated out form the original City of Toronto boundaries in this data

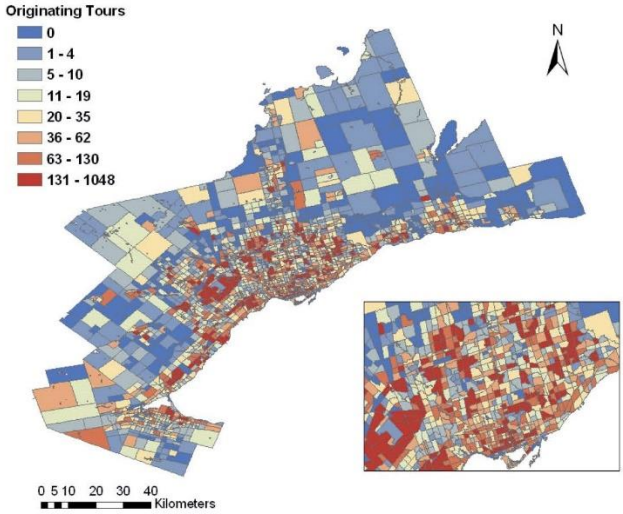
Heavy vehicle trips tend to occur in regions close to 400 series highways. Heavy vehicles that use these highways to travel tend to make longer trips. Additionally, land necessary to support heavy vehicle trips (distribution, warehousing, etc.) is often adjacent to these highways, with a particularly heavy cluster in Peel Region. Conversely, lighter vehicles, which tend to make shorter trips and can manoeuvre in smaller streets more easily, tend to make many more trips in the downtown and midtown areas of Toronto. Few heavy vehicles travel through downtown Toronto or the Study Area.

Figure 2-13: Heavy Versus Light Vehicle Trip Tour Origins in the GTHA

Heavy Commercial Vehicles



Light Commercial Vehicles



Source: McMaster Institute for Transportation and Logistics. Estimating Urban Commercial Vehicle Movements in the Greater Toronto-Hamilton Area. July 2010

MTO purchases GPS data for a sample of trucks travelling in Ontario. It is estimated that this represents less than 20% of all trucks on the road. Given the non-random nature of the sample of trucks (dependent on whether they have signed up for a GPS service from which MTO collects data) the information provided from this analysis can only be indicative of potential true origin/destination patterns. Based on GPS data provided from MTO, 48% of all trips on the Gardiner within the area of the Expressway east of York Street travelled through without stopping or exiting in this section of the highway. Just over half of all the trips in the sample travelling on the Gardiner Expressway through this same section either entered or exited the Gardiner within this area.

3 Supply Chain Analysis

Key Messages

Goods movement stakeholders' transportation and supply chain decisions are driven primarily by the needs and demands of their downstream customers. Goods movement trips often occur in the early hours of morning prior to business hours, and throughout business hours, with volumes starting to reduce by the afternoon peak and through to the night.

Supply chain and transportation decisions are made by goods movement stakeholders in relation to three key considerations:

1. Travel time for the delivery of goods
2. Reliability in the delivery of goods
3. Cost of the transport of goods

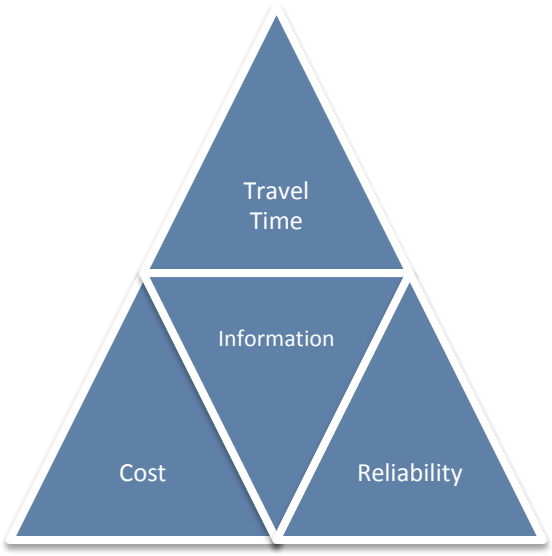
Different stakeholders make different trade-offs between these three items based on the needs of their unique value chains.

3.1 Key Transportation and Supply Chain Considerations and Trends

3.1.1 Transportation Considerations

For shippers and their customers, travel time, cost, reliability, and information are key decision factors. For a shipper the decision to locate in a particular region will be driven in part by how the location improves its position in terms of travel time, cost, and reliability in serving markets, sourcing inputs, and related information.

Figure 3-1: Supply Chain Decision Factors

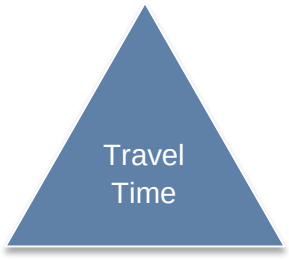


Source: CPCS

Figure 3-1 summarizes the overall key factors that affect the decision-making of shippers of goods. To the extent that locating in a particular area can allow a business to receive and/or deliver goods faster, at a lower cost, more reliably subject to less risk or better information, a location will be more desirable.

Different businesses value each of the elements in the triangle differently. For example, a shipper of coal, which is a relatively heavier, bulkier, and lower value product, will likely put the largest emphasis on cost of the transport. A shipper of very high value goods, such as the sending of an urgent document needed to complete a large transaction prior to a deadline, may put almost no weight on cost while valuing travel time and reliability highest, and be willing to pay much more for transporting the document to ensure it arrives quickly and in time. Each supply chain of each goods movement stakeholder dictates their relative weighting of the elements shown in the above pyramid. Stakeholders operating under a just-in-time supply chain will put the largest emphasis on reliability.

3.1.2 Travel Time

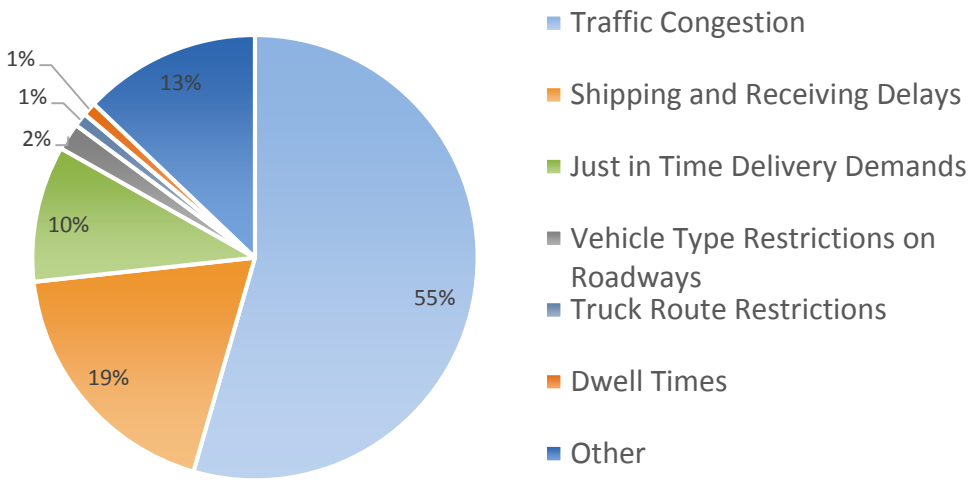


Average travel time is an important consideration for stakeholders. In the example above, a shipper of an important document is highly concerned about the expected time that the document will arrive in order to complete an important contract. This customer places the highest value on the expected travel time. While he places some value on reliability of the delivery, travel time most directly influences how he estimates the expected arrival time of the document he is shipping.

As part of its *Developing Urban Goods Movement Data in the GTHA: Framework and Preliminary Implementation Draft Final Report,* prepared for Metrolinx by the University of Toronto, a

survey was carried out asking goods movement stakeholders to identify the largest demands on their business. Traffic congestions proved the largest factor.

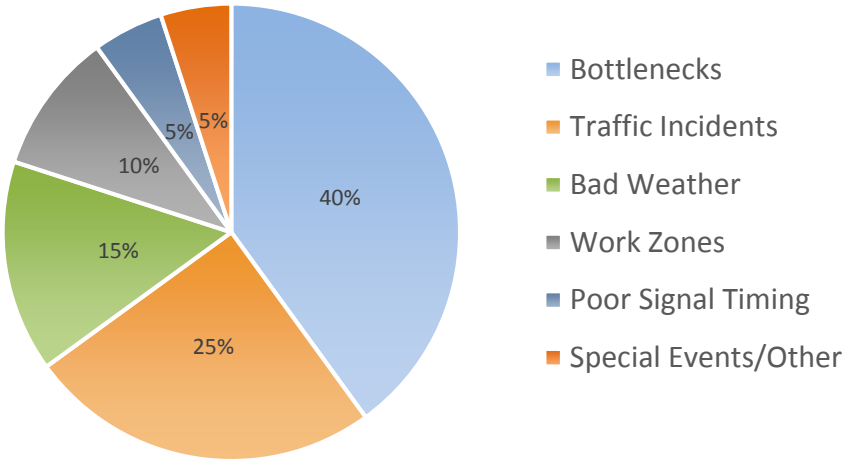
Figure 3-2: Issues Impacting Goods Movement Businesses in the GTHA



Source: Developing Urban Goods Movement Data in the GTHA: Framework and Preliminary Implementation Draft Final Report, Prepared for Metrolinx by the University of Toronto. 2013

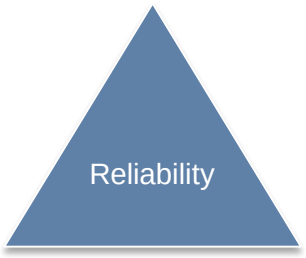
Average travel time can be influenced by overall volumes of traffic, road capacity, highway speeds, number of access points (highways), traffic signalling, and a host of other factors. The figure below summarizes the key estimated factors that contribute to congestion in the United States.

Figure 3-3: Estimated Sources of Congestion on National Highways in the United States



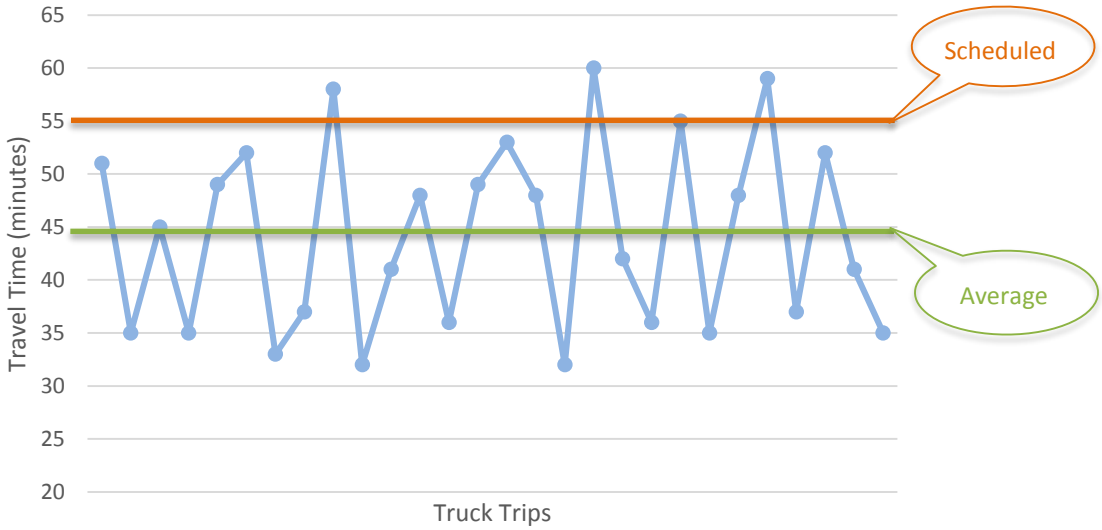
Source: Cambridge Systematics, Final Report prepared for the Federal Highway Administration. Traffic Congestion and Reliability: Linking Solutions to Problems

3.1.3 Reliability



Previous work has indicated that commuters as well as shippers value the variable component of their travel time up to six times more than average travel time.[8] A stakeholder operating a just-in-time supply chain, such as a retail store located downtown that does not have any space to store inventory, may place particularly high emphasis on the reliability of deliveries. If a delivery does not arrive when it is expected to arrive, this can translate into lost sales for this retailer. While average travel time is of some consideration, under most circumstances this stakeholder can plan ahead to allow sufficient time for goods to arrive. This stakeholder will also allow for a buffer in case of delays.

Figure 3-4: Average and Scheduled Delivery Times



In order to ensure the predictability of the arrival of goods, goods movement stakeholders often schedule travel time for trips above the average travel time in order to ensure goods arrive when they are needed. In the above example, average travel time was approximately 45 minutes while scheduled travel time was 55 minutes in order to account for the variance in actual travel times. This ensures goods arrive on time for almost all trips[9].

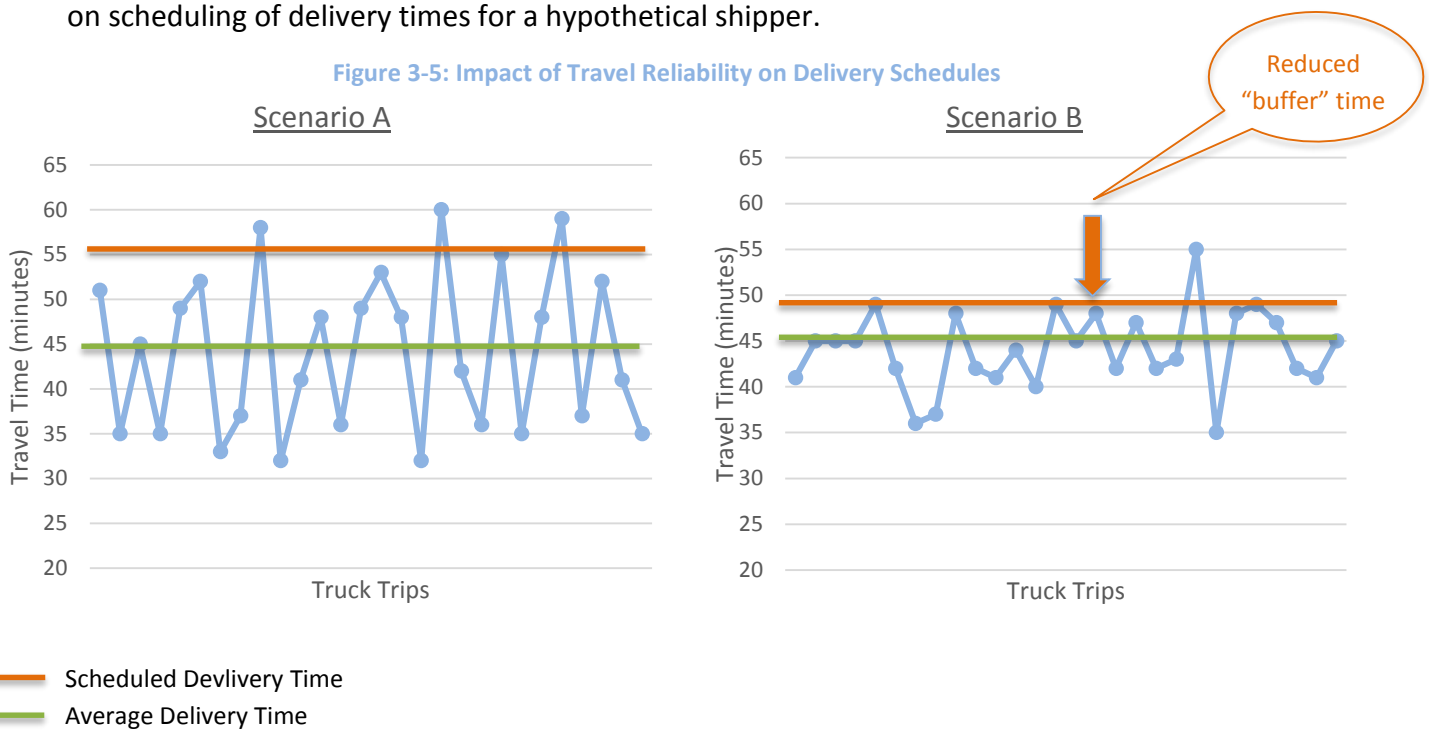
As reliability increases (or variance in trips decreases), the "buffer" a stakeholder may need to schedule between the average delivery times and scheduled delivery time reduces. The figure

[8] Cambridge Systematics, Final Report prepared for the Federal Highway Administration. Traffic Congestion and Reliability: Linking Solutions to Problems

[9] For example, a travel time buffer index is often calculated at the difference between average travel time and the time in which 90% or 95% of all trips take. In practice, scheduled times will depend on the needs of an individual goods movement stakeholder.

below shows the impact of increasing travel reliability (moving from Scenario A to Scenario B) on scheduling of delivery times for a hypothetical shipper.

Figure 3-5: Impact of Travel Reliability on Delivery Schedules



Source: CPCS

In both scenarios above, the average travel time is 45 minutes. In Scenario A, where reliability is lower, a buffer time of 10 minutes above average travel time is scheduled to meet their targeted arrival time. In Scenario B, the shipper only needs to schedule a buffer time of 4 minutes to achieve the same standard for the same number of trips. Although the green (average time) line is at the same point in the left and right charts, the shipper is only concerned about the orange line, or the amount of time it needs to schedule in order to ensure its goods arrive predictably.

Reliability can be impacted by weather, number and severity of incidents on a roadway, response time to incidents, congestion (increased congestion has been shown to reduce traffic reliability), as well as a host of other factors.

The Texas Transportation Institute provides estimates of the 2011 Planning Time Index (PTI) for major cities in the United States. The PTI is measured as the ratio of the travel time for a route on the worst day of each month[10] compared to travel speeds under free flow conditions. For example, if the Planning Index is 2, a trip that takes 20 minutes in light traffic should be planned for 40 minutes during peak conditions in order to reliably arrive on time.

[10] I.e. travel time for trips in the top 95th percentile of trip durations experienced, divided by the free flow travel time

Figure 3-6: Planning time Indices for Major Cities in the United States

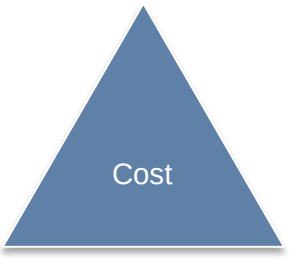
Urban Area	Planning Time Index (95th percentile)
Washington DC-VA-MD	5.72
Los Angeles-Long Beach-Santa Ana CA	4.95
New York-Newark NY-NJ-CT	4.44
Boston MA-NH-RI	4.25
Dallas-Fort Worth-Arlington TX	4
Seattle WA	3.99
Chicago IL-IN	3.95
San Francisco-Oakland CA	3.74
Atlanta GA	3.71
Houston TX	3.67
Miami FL	3.6
Philadelphia PA-NJ-DE-MD	3.46
Detroit MI	3.22
Phoenix-Mesa AZ	3.19
San Diego CA	2.9

Source: Texas Transportation Institute 2012 Urban Mobility Report

This means that in New York, in order to ensure a trip arrives on time 19 times out of 20, a goods movement stakeholder will need to schedule on average almost six times the amount of time that the trip would take in free flow conditions. Comparatively, estimates provided by the City of Toronto Traffic Data for 2012 report a Planning Time Index on the Gardener Expressway Eastbound of 4.35 and Westbound of 3.87.

In reality, stakeholders may have very different expectations and needs in terms of delivery of goods (schedules are made within a "window" or time, allow for delays by maintaining buffer inventory at location, etc.) and 95% may be a very high threshold for some stakeholders. Actual planning of trip times will depend on each stakeholder's balance between the costs of planning additional buffer time in trips and the costs to their business of late deliveries due to unreliability. In some cases, carriers have agreements with larger goods movement stakeholders that specify penalties in case of late arrival. Penalties can be costly to carriers, requiring them to plan to ensure timely arrival.

3.1.4 Cost



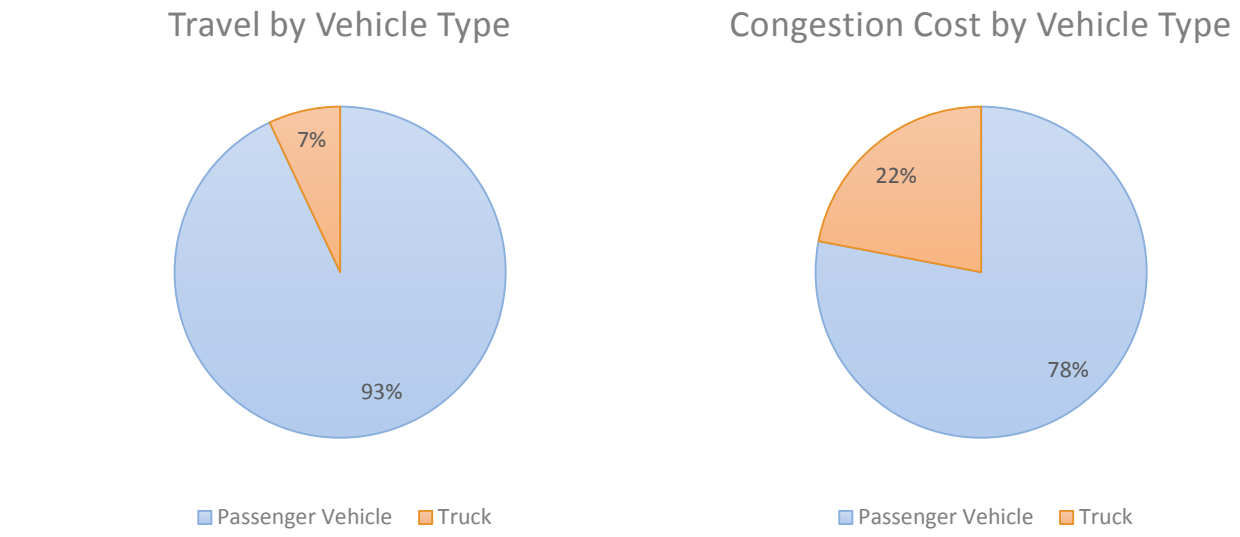
Transportation cost is the third critical factor considered by stakeholders. As mentioned in Section 3.1, cost often becomes an increasingly important factor to shippers as the average value per volume/weight of the goods being shipped decreases.

Cost can be impacted both by internal factors such as travel time and reliability as well as external factors. Transporters incur more costs when goods take longer to

transport or more buffer times are needed to transport a good due to unreliability (increased labour, fuel costs, etc. due to increased times).

The American Transportation Research Institute has carried out a study to get an understanding of the cost of time for carriers. In 2013, they found that the average marginal costs per hour of truck operations were US$67. In many analyses of the cost of congestion, the value of time is used to estimate the impact of changes in travel times. The most straightforward approach is to multiply the expected change in travel time by the value of that time and the number of vehicles expected to be impacted. Whether this increase in cost is borne by carriers or passed on directly to shippers (or likely some combination of the two) is a more difficult question to answer. Goods movement vehicles bear a disproportionately high percentage of the costs of congestion in a roadway.

Figure 3-7: Estimates of the Impact of the Cost of Congestion in the United States



Source: Texas A&M Transportation Institute, 2012 Urban Mobility Report

In this way, changes in travel time can have direct implications on changes in travel costs for the movement of goods.

Non-Transportation Cost Considerations

A whole host of non-transportation factors can also impact the cost of business for goods movement stakeholders. It is not expected that these costs would be significantly impacted by the Remove Alternative, but may be impacted by wider development and growth in the Study Area.

Almost all jobs in goods movement sectors require specific skills. As such, the availability of skilled labour can be an important factor in locating a business. Most of these factors impact the “Cost”.

There is a strong network effect associated with having a large pool of skilled labour. With many employers and a large labour pool, workers can move quickly from one job to another, and there are always workers available. A larger pool of skilled labour also improves the viability of third-party training programs, such as those offered by colleges, since the market for such programs is larger. With these network effects, the more goods movement industries in a region (manufacturing, industrial, retail, transportation, and warehousing), the easier it is for new companies to set up shop, since similar labour will be readily available.

Of particular relevance for many goods movement stakeholders is the availability of labour that is accustomed to shift work.

Labour Cost

Closely related to the availability of skilled labour is the cost of using that labour. Beyond supply and demand issues, factors including unionization and local labour laws can have an impact on labour cost.

Labour also places value on the cost of transportation to and from their place of employment. Travel time and reliability also impact the labour pool available to industry.

From the employer perspective, labour cost includes wages, salaries, and benefits as well as the employer shares of payroll taxes (Employment Insurance, Canada Pension Plan, employer health premiums).

Availability and Price of Serviced Industrial Land

Ready availability of serviced industrial land has been one of the most crucial non-transportation factors in attracting manufacturing and transportation/warehousing to a particular area. Land cost is another major factor in goods movement businesses' locational decisions. Generally, land close to major urban areas and major transportation infrastructure such as a 400 series highway, tends to be more expensive than land that is more remote.

The development and growth patterns in the City of Toronto have led to less availability over time of industrial lands available to goods movement stakeholders. The availability and price of such lands will continually be evaluated by goods movement stakeholders and impact their locational decisions.

Business Taxes and Fees

Taxes that affect business can also be an important factor in locational decisions. Taxes such as development charges, property taxes, and business taxes vary at the regional and municipal level in Ontario. Value-added taxes (i.e. HST) vary from province to province and province to US state, as do business income taxes.

Energy Costs

Energy costs including electricity can be important in attracting businesses. This is particularly true for warehousing, where lighting and temperature control consume a significant amount of energy and thus represent a significant cost.

Availability and Price of Appropriate Support Services and Clustering

Having a competitive pool of relevant support services is also a key factor in a goods movement business' locational decision. What constitutes a support service will depend on the type of business being undertaken. Having a cluster of suppliers will make a region more attractive to a business.

3.1.5 Key Trends

A strong commonality among all supply chains is the incorporation of service sensitivity in their design. In general, the goal in supply chain management is to fulfill users'/customers' needs with as little investment in inventory as possible (inventory has costs). Companies adjust their supply chains based on their reliability and performance experiences. Often there is larger flexibility in trips that are scheduled for larger distances, with the shortest trips being more sensitive to changes in delivery time or reliability. Congestion is one of the top challenges to supply chain performance.[11] In addition to impacting performance, congestion can impact the number of deliveries that can be made by a single vehicle. As delivery time increases, more delivery vehicles are required to be on the road to make the same number of deliveries.

Supply chains are constantly evolving in response to technological, commercial, and regulatory developments. This section reviews some ongoing trends in supply chains that are likely of relevance to the Study Area.

Off-Peak Delivery

Off-peak delivery (OPD) is the delivery of goods outside of normal business hours, usually during the night. OPD is often suggested as a means of delivering goods more quickly and reliably than is possible during the day, given traffic congestion. The result should be cost savings for carriers and shippers as well as reduced congestion and pollution. However, it is argued that there is a market failure that prevents the expansion of OPD: receivers are unwilling to accept deliveries off peak.[12] The solution in New York City (a leader in this area) was to facilitate OPD that does not require receiver staff to be available to receive deliveries. In some cases, local noise bylaws may also curtail or prevent OPD. The results of OPD in New York City have been highly favourable with carriers, drivers, and receivers.

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[11] National Cooperative Freight Research Program, Transportation Research Board. *Report 14, Guidebook for Understanding Urban Goods Movement.* 2012

[12] http://www.civil.engineering.utoronto.ca/Assets/Civil+Engineering+Digital+Assets/aUTTRI/2.2+Jose+Holguin-Veras+Off-Hour+Deliveries+in+NYC+Lessons+Learned.pdf

MTO has commenced a pilot project in Toronto associated with the Pan-Am Games. If successful, this pilot could open the door to broader application of OPD throughout Ontario.

Some further analysis of off-peak delivery is discussed in Appendix D of this Report.

E-Commerce

The rapid growth of E-commerce, i.e. shopping online and direct product delivery to the customer, has important implications for urban goods movement. E-commerce in Canada is significantly less developed than in the United States or the United Kingdom. In Canada 6% of retail sales are online, while in the United States it is 9% and in the United Kingdom 15%.[13] Many predict Canada will close the gap in the years ahead.

The impact of the expansion of E-commerce on urban goods movement in Toronto is multifaceted. At a high level, traditional patterns of deliveries from distribution centre (DC) to retail store will be affected. There will be more DC pick-up by carriers for direct delivery to customers, probably using smaller vehicles than are typically used for store deliveries. But there will also be more shoppers who order products for pick-up at stores, likely affecting the frequency of deliveries to stores. Finally, customers may cut down their own shopping trips. The net result of all of these sometimes offsetting factors means that the impact of E-commerce is not knowable, at least in the aggregate.

3.2 Supply Chain and Goods Movement

Supply chain refers to the interconnected processes and systems that are involved in producing, distributing, and supplying goods. This starts from the earliest stage of raw materials, through refining, manufacturing, or other value-added measures, through to distribution for use or consumption. Each of these stages can generate varying levels of trips to move goods from one point to another in a supply chain.

Supply chains impact goods movement choices and demands on goods movement networks. For example, Section 3.1.3 described how reliability impacts a supply chain and what goods movement stakeholders may do to address reliability issues. Different stakeholders will make different transportation and supply chain choices depending on the nature of their business.

3.2.1 Last Mile

One of the main distinguishing features of the movement of goods in urban centres from other regions is the “last mile” of trips, which is generally highly concentrated within urban regions. The last mile may mean the local distribution from a distribution centre to end retailer or end

[13] http://www.cbc.ca/news/business/e-commerce-explosion-coming-for-2014-holiday-shopping-dianne-buckner-1.2818640

consumer. For a door-to-door delivery it can mean navigating local and arterial streets to arrive at a destination after exiting higher capacity and higher speed freeways. Often, last mile trips may be made with smaller vehicles to more dense urban areas where it is difficult for larger trucks to travel. Chapter 2 reviewed some of the patterns of commercial vehicle use in the GTHA, and estimated vehicle size of commercial vehicle traffic in downtown Toronto was notably smaller than that of other regions, such as Peel.

Challenges in last mile deliveries include parking restrictions and lack of curbside space, narrow streets and turning radii, lower clearance levels, increased "stop and go" traffic and more shared space with other modes such as cyclists and pedestrians, among other concerns.[14] From a planning perspective, it is useful to attempt to understand and quantify last mile inefficiencies in order to better understand the implications of these and potentially address them where necessary.

3.3 Characteristics of Supply Chains Affected by Remove Alternative

Currently most freight movements in the GTHA are local, and 89% of all movements are by truck.[15] Stakeholders consulted as a part of this assignment identified one key message in regards to the management of their supply chains: **the supply chains of goods movement stakeholders are in a large part dictated by the needs of their downstream customers**.

Industry stakeholders consulted for this assignment are diverse, each with its own unique business, customer base, and characteristics that drive their unique supply chains. For this reason, providing an overview of how supply chains may be affected by the Remove Alternative will necessarily require some simplification of the unique needs and challenges each stakeholder faces. In order to provide some understanding of this, we have categorized stakeholders consulted into three categories of goods movement stakeholders[16]:

1. Industrial and Manufacturing
2. Retail
3. Courier and Logistics

[14] National Cooperative Freight Research Program, Transportation Research Board. *Report 14, Guidebook for Understanding Urban Goods Movement.* 2012

[15] http://www.metrolinx.com/thebigmove/en/strategies/strategy9.aspx

[16] Types of stakeholders contacted include trucking carriers, general (sugar, salt, concrete) and high end industrial and manufacturers, film industry, general retailers, grocery and food retailers, courier companies, messenger companies, third party logistics providers, among others.

Figure 3-8 below provides an overview of high-level feedback from goods movement stakeholders as to their key priorities in managing their supply chains. We have broken these priorities down into the three key supply chain metrics identified in Section 3.1.1.

Figure 3-8: Supply Chain Priorities of GM Stakeholders[17]

	Travel Time	Reliability	Cost
Industrial and Manufacturing			
Retail			
Courier and Logistics			

Legend

Top Priority

Secondary Priority

Industrial and Manufacturing

Many stakeholders involved in the industrial and manufacturing sector create heavy, high-volume goods. Transportation of these goods can be expensive. Most stakeholders are able to store some inventory on site and rely less on just-in-time delivery for inputs into their production processes. For stakeholders who are generally producing goods of higher value and weight, transportation costs as a percentage of the total value of final goods can be significant. The cost of transportation is a key concern to such stakeholders. While often these goods still move by truck, as often as possible stakeholders look to manage their inputs and outputs to minimize transportation costs. For example, an express rush door-to-door delivery service of a small quantity of product will not often make sense.

When asked about the response to ongoing maintenance activities on the Gardiner Expressway, stakeholders have generally indicated that the same trips are taking longer than before. There haven't been many significant operational changes as a result of this maintenance; sometimes carriers are allocating more time for these customers, and sometimes customers are attempting to manage travel times increasing by ensuring they have sufficient inventory to prevent any shutdowns from a delay in the arrival of inputs.

An example of a supply chain that may be impacted by the Remove Alternative is the concrete sector. Cement is made with concrete and aggregates, which are normally shipped in bulk to a plant. Concrete is a very time sensitive product and transportation time to final destination needs to be less than one hour for road construction and less than two hours for residential and

[17] Note: this is a generalization of the true nature of supply chain considerations for goods movement stakeholders, and not all stakeholders in every category will value each factor in the same way.

commercial construction.[18] Given the time sensitive nature of the product, supply chain performance is significantly degraded by local and regional freight bottlenecks, maintenance activities, and general congestion on roadways.[19] Increasingly, approvals for new concrete facilities have become more difficult for cities throughout North America, mostly due to increasing requirements and regulation to reduce noise levels and control dust and pollution.

Retail

In the retail sector, the key goods movement generation is on the input side – deliveries of products to restock shelves for example. The locations affected by the Remove Alternative are mostly downtown or in mid-town where an alternative preferred route, such as the 400 series highways, is not available. Land values are at a premium at these locations and, as such, dedicating space to inventory is often too costly for these stakeholders. The retail sector in downtown Toronto relies much more heavily on just-in-time shipments of products in order to restock shelves. For these stakeholders, reliability is the single most important factor in most circumstances. An increase in average travel time can be adjusted by scheduling longer deliveries, but deliveries need to arrive on time and as expected in order for these businesses to be able to sell their products to consumers.

In response to the ongoing maintenance on the Gardiner Expressway, it appears that thus far the impacts have not been significant enough to have a major impact on business. Many trips occur in off-peak hours (i.e. restocking overnight or early morning prior to business hours), where impacts have not been as strong, and in other cases it appears that carriers or distribution arms of companies are responding by ensuring deliveries still arrive in time.

In a survey carried out for the National Cooperative Freight Research Program (NCFRP), it was estimated by one of America's top grocery store chains that produce and frozen foods are kept on the shelves for one to three days on average, eggs and dairy for two days on average and dry goods for up to seven days.[20] For an urban grocer, if deliveries are disrupted, this can impact the availability of goods within one to two days.

Courier and Logistics

In the courier and logistics sector, customers have very high expectations about the reliability and timing of the arrival of products. Many customers use these services for products where the speed and reliability of the delivery of a product is critical. This can range from several business days to a rush door-to-door delivery service where a product is expected to arrive in

[18] National Cooperative Freight Research Program, Transportation Research Board. *Report 14, Guidebook for Understanding Urban Goods Movement.* 2012
[19] Ibid
[20] National Cooperative Freight Research Program, Transportation Research Board. *Report 14, Guidebook for Understanding Urban Goods Movement.* 2012

two to three hours from when it leaves the destination of origin. Small changes in reliability and average travel time can have large impacts on the courier and logistics business. If either reliability or speed of the road network decreases, these services generally respond by allocating additional vehicles and labour for the same number of units of shipments in order to ensure everything arrives on time.

When consulted on the issue of current maintenance on the expressway, these stakeholders have indicated that the impacts have been felt. In some cases they have had to allocate additional vehicles and labour in order to ensure the same goods arrive on time to meet customers' expectations.

4 Stakeholder Consultation

Key Messages

A key element of this goods movement study is stakeholder consultations. As a part of the process, CPCS developed a list of goods movement stakeholders and then circulated a consultation package to all stakeholders with some background information on the EA process and key questions.

Key themes of importance identified by stakeholders regarding the EA include: road capacity, travel times, reliability, network redundancy, long-term investment in road networks, and the impact of the construction period under various EA options.

4.1 Consultation Methodology

Beginning on November 10, 2014, stakeholders were contacted by email or by phone when email was unavailable or email addresses unknown. Stakeholders were sent a "consultation package" that consisted of three elements (contained in Appendix A):

1. An introductory letter from Waterfront Toronto introducing CPCS and the assignment to be carried out.
2. A "background materials" document outlining the proposed alternatives with a focus on the proposed Remove Alternative.
3. A "template questionnaire" document that was provided to stakeholders in advance of consultation in order to provide stakeholders with a broad idea of the topics intended to be discussed during consultations. This questionnaire was provided while recognizing that the unique situation of various stakeholders would drive overall talks, and questions would be adapted depending on the stakeholder consulted.

Times were then arranged to speak with stakeholders, either in person or over the phone if more convenient to them. While talks were structured around the template questionnaire sent to stakeholders in advance of the meeting, stakeholders were encouraged to speak to issues important to them or that they deemed would provide a greater understanding of the movement of goods within the Gardiner Expressway/Lake Shore Boulevard corridor.

Questions centred on (1) stakeholders' current use of the Gardiner Expressway and their businesses' supply chains and (2) stakeholders' views of the impact of the Remove Alternative on their businesses. Most questions were designed to obtain objective and measurable information that would inform an objective analysis of the impact of goods movement, but efforts were made to gain deeper understanding of any concerns that stakeholders held.

4.2 Summary of Feedback

Some of the key issues identified in supply chains of stakeholders consulted have been discussed in Section 3.3 of this report. Aside from supply chain issues, stakeholders expressed many wider views on the impact of the Remove Alternative based on their unique business and reliance on the Gardiner Expressway/Lake Shore Boulevard corridor for the movement of goods. Several key themes identified throughout consultations are discussed further below. All discussion in Chapter 2 is based on viewpoints of various stakeholders consulted, and has not been adjusted based on any CPCS analysis or verification.

The figure below summarizes the key comments received from stakeholders and represents them as objective concerns using the framework described in Chapter 3 of this report.

Figure 4-1: Key Stakeholder Comments and Underlying Concerns Regarding the Remove Alternative

Main Comments Received	Understanding and Measuring Key Stakeholder Concerns	Objective/Measurable Concern
This will reduce the capacity of the corridor Stakeholders indicated that congestion is already impacting their businesses and the city, and removing capacity will only make this worse.		• Will lead to increased **travel times.** • Will reduce **reliability** of travel. • Will increase **cost** of transportation.
Travel will take longer Stakeholders were concerned that trips would take longer under the Boulevard alternative than if the elevated expressway was maintained.		• Will lead to increased **travel times.**
Arrival times of trips will be less predictable Stakeholders were also concerned that increased congestion may reduce the reliability of travel time in the corridor (i.e. more unexpected delays).		• Will reduce **reliability** of travel.
Alternate routes will also become busier Stakeholders indicated that they felt that congestion would also increase on alternate routes as a result of some traffic being diverted from the existing corridor.		• Will lead to increased **travel times** on alternate routes. • Will reduce **reliability** of travel on alternate routes. • Will increase **cost** of transportation on alternate routes.
Construction will be "chaotic" Stakeholders indicated that were concerned that the removal of the elevated expressway would cause larger traffic disruptions than the rehabilitation under the Maintain scenario.		• Will lead to increased **travel times** during construction. • Will reduce **reliability** of travel during construction. • Will increase **cost** of transportation during construction period.
Will be less safe Stakeholders indicated that the removal of the limited-access expressway would require further interaction between trucks and other modes such as pedestrians and cyclists.		• Will result in more traffic incidents with trucks or other commercial vehicles.
Once capacity is removed, we will never get it back Stakeholders were concerned that if the elevated expressway was removed, land freed up would be developed and the elevated expressway couldn't be replaced later.		• In the future, road travel demand will be greater than in the present. • Will lead to even greater increases in **travel times** in the future. • Will lead to even greater reductions in **reliability** in the future • Will lead to even greater increases in **cost** of transportation in the future

1. **Road Capacity.** Most stakeholders consulted indicated that maintaining existing road capacity was their top concern and felt that this should be the top concern of planning the road networks.

    - Stakeholders indicted they felt the Gardiner Expressway was already at capacity at peak periods and reducing this capacity would only put further strain on the highway and road network.

    - Goods movement supports economic activity in the city and reducing capacity when roads are already operating at full capacity would mean:

        i. Some truck trips would still occur but use an alternate route to the Gardiner, increasing traffic on these routes, or

        ii. Traffic to the origins and destinations using the Gardiner Expressway would reduce, which could have negative economic implications

    - At least one major stakeholder in the area indicated they would likely leave the area for somewhere else in the GTA if the Remove Alternative were to proceed.

Measure: Change in travel time, reliability of travel time, and transportation costs.

2. **Travel Time.** Many stakeholders opined that the Remove Alternative would lead to decreased average traffic speeds compared to the Elevated Expressway alternatives and that this would have real cost and competitiveness implications for them compared to existing conditions.

    - For just-in-time supply chains, increased travel times may, under circumstances where shippers cannot adjust schedules to allow more time for delivery, lead to increased time delay costs for shippers of goods.

    - Many stakeholders noted that congestion on roads in Toronto and the GTA has been increasing as the city grows and develops and that this has led to real cost increases to their business, as well as operational constraints that impact their ability to serve customers' expectations of timely deliveries or their need for timely arrival of inputs for their businesses. Increased travel times impact their profitability, pricing of their products, and choice of location.

Measure: Change in travel time.

3. **Reliability.** The reliability and predictability of the travel time of goods was identified as being as important as or more important than the average travel time of goods.

    - Many stakeholders felt that the existence of the Gardiner Expressway and Lake Shore Boulevard allowed for a level of redundancy in the corridor giving them further choice

in routing in the event of an incident in the road network. For example, if an incident occurs on the Gardiner Expressway, stakeholders have the option of using the Lake Shore Boulevard where there is not an incident.

- Many businesses do not have significant space for inventory for inputs into their businesses, often due to space constraints that can be higher in Toronto where land values are more costly than in other regions in the GTA. In many cases, businesses rely on the timely arrival of inputs to their business.
- In the retail sector, unexpected delays in the arrival of goods to a store location can mean loss of sales. If a product isn't in stock or on the shelf, a customer may elect to purchase it somewhere else.
- In the industrial sector, lack of inputs can, under more extreme circumstances, mean the stoppage of production until inputs arrive.
- For carriers, late arrivals can mean large penalties being paid to customers for the delay in the arrival of goods. One carrier reported that the late arrival of a shipment to a customer resulted in a penalty on the carrier of $75,000 to compensate for the stoppage of operations.
- Carriers and shippers address reliability concerns by adding in a "buffer time" to account for potential delays. As reliability of travel speeds decrease, carriers and shippers need to increase the amount of time they allocate for a given trip to ensure goods arrive on time.

Measure: Reliability of travel time.

4. **Alternate Routes.** Many stakeholders expressed concern that the Remove Alternative would lead to more traffic being diverted from the corridor and to other routes. They fear that this would result in alternate routes, such as Richmond, Adelaide, and Queens Quay among others, becoming more congested than if an elevated expressway link were maintained.

Measure: Impact on Alternate Routes.

5. **Impact of Construction Period.** Stakeholders have indicated that they believe the Remove Alternative will lead to significant impacts on the movement of goods during construction and that construction will take several years to carry out. Some stakeholders indicated that they expected both the Gardiner Expressway and Lake Shore Boulevard to be closed for much of the construction period. They believe that these impacts would be very significant on business.
    - Some stakeholders did not fully appreciate that all options, including maintaining an elevated expressway, would require road closures to implement.

- Stakeholders have indicated they would like to understand more about the duration and severity of road closures in all scenarios, and believe that some analysis should be done on the impact of the construction periods as opposed to focusing only on the steady state once the options have been fully implemented.

Measure: Impact of Construction

6. **Safety.** Some stakeholders have indicated they felt that the removal of the elevated expressway would be less safe. They cite that there will be more commercial vehicles at street level that will interact with other travel modes than under the Remove alternative and this will lead to more potential for incidents.

Measure: Safety.

7. **Long-Term Investment in Infrastructure.** Several stakeholders indicated that they felt the removal of the eastern portion of the Gardiner Expressway and capacity in the Gardiner Expressway/Lake Shore Boulevard corridor was a form of "divestment" in the City's road transportation network at a time when the network requires further investment.

    - Stakeholders indicated that the Gardiner Expressway cannot be considered in isolation from the other major road networks in the city and GTA.
    - Many identified the GE/LSB, 427, 401, and Don Valley Parkway system as a crucial "ring road network" functioning as a critical piece of road infrastructure for the city that facilitates the flow of goods in the city.
    - Many also indicated they felt Toronto was fortunate to have such a network and this positively impacted the competitiveness of the city.
    - Stakeholders indicated that the loss of a limited-access expressway link from the Gardiner through to the DVP would be a loss of critical infrastructure that we would never be able to regain due to subsequent development in the corridor under the Remove Alternative.
    - Stakeholders felt reduced capacity to move goods may also affect the future growth of the goods movement industry in the region.

Objective/Measurable Concern: Travel time, reliability and costs (in the future).

Additional Topics

Some additional issues were brought up that were deemed significant concerns by stakeholders.

- The ability to attract labour may be impacted by increased automobile travel times. Many stakeholders are already identifying this as an issue and feel any increase in travel times or perceived increase in travel times may impact their ability to attract skilled labour.

This is to be addressed through the economic competitiveness study being carried out in support of the EA.

- Many stakeholders have said that parking bylaws have a strong impact on their ability to move goods. Stakeholders' customers in downtown Toronto require deliveries of products, but stakeholders feel that it is "almost impossible" in many circumstances to stop a delivery vehicle to make a delivery to these customers. They feel this makes Toronto a less desirable location to serve. If any of the Remove Alternative could have an impact on parking in Toronto (changes to side streets, etc.) this may be of relevance to the assignment.
    - Stakeholders also indicated they felt travel times would be impacted on many alternate routes such as Richmond, Adelaide, Dundas, Bloor, and Queens Quay.
    - Transportation costs themselves may increase as a result of the Remove Alternative. Increased travel times equal increased labour costs for drivers for the same trip, increased fuel costs as well as increased wear and tear for vehicles spending more time on the road and more stop and go in traffic. These may lead to higher transportation costs or shipping costs for goods.

Parking/unloading space availability in the Study Area is not expected to be different under the four options. Parking strategies are included as a part of Toronto's Congestion Management Plan for 2014-2018 and include developing dedicated delivery zones in the city.

5 Potential Comparative Measures to Evaluate Options

Key Messages

While there is not a standard list of performance measures for goods movement, some common measures include measures of travel time, reliability, level of service, and safety of roads for goods movement. Performance measures are often based on policy or goals of a particular jurisdiction with respect to goods movement. The development of a goods movement strategy by the City of Toronto could allow for the establishment of specific performance measurement indicators for the movement of goods in Toronto.

For the purposes of this study, some proposed comparative measures to evaluate the impact of the Remove alternative compared to the Elevated Expressway alternatives are based on the key considerations of stakeholders identified in Chapter 3. These include standard indicators to measure travel time and reliability, measures based on the particular concerns of stakeholders in the corridor, plus the availability of data through the transportation modelling being carried out to support the EA. Evaluation of the Remove alternative as compared to the Elevated Expressway alternatives is being carried out as a part of the wider EA process using proposed metrics from this Report.

5.1 Introduction

A comprehensive report by the National Cooperative Freight Research Program in the United States entitled "Performance Measures for Freight Transportation" reviews the existing use of performance measures for the transportation of freight in the United States. The report notes that:

> *Although the research literature identified hundreds of potential freight performance measures, in practice the minority of states that have freight performance measures use only a handful. Mature performance measurement states such as Washington, Missouri, and Minnesota use between five and 10 measures. It was noticeable that no two states had the same measures, and in most cases there were wide differences in the metrics.*[21]

While performance measurement of freight transportation is not standardized across jurisdictions, some common metrics have arisen including level of service (LOS), traffic volume, vehicle miles travelled, average speed and reliability or delay measures.

One of the key challenges in measuring the performance of goods movement is the availability of data to carry out performance measurement. Some discussion on the availability of data on the movement of goods on the Gardiner Expressway is included in Section 1.5.1. In comparing the options considered in the EA (Maintain, Improve, Replace, Remove and the new Hybrid Option), this task becomes more difficult as it is dependent on the ability to predict the future state of the Gardiner Expressway/Lake Shore Boulevard corridor under these scenarios. Some data may be available through existing modelling that has been carried out as part of the EA process, whereas other data may not be easily predicted in a quantitative manner.

Another consideration in the measurement of performance is the overall policy goals that are used to define what is measured. Often a goods movement policy is developed or is included as part of a wider transportation plan document. For example, Peel Region has a Goods Movement Strategic Plan document for 2012-2016 that lays out the Region's vision, objectives, and specific actions to achieve the objectives for goods movement identified in its plan. In Toronto's Official Plan, there is some mention of goods movement, with one of the goals of shaping the transportation system listed as "developing an enhanced and comprehensive system of policies and practices for moving goods that boosts the economic competitiveness of the City and the Region".[22] The development of a goods movement strategy for the City of Toronto would allow for the establishment of specific performance mechanisms that could monitor performance in line with the particular policy goals of the City.

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[21] Transportation Research Board of the National Academies, *NCFRP Report 10 Performance Measures for Freight Transportation.* 2011

[22] City of Toronto Official Plan, Consolidated December 2010. p. 2-26

One of the strategies identified in the *Big Move* by Metrolinx is to "Improve the movement of goods within the GTHA and with adjacent regions". The key goal of this will be the development of a comprehensive strategy for goods movement. Developing a strategy along with other data-gathering initiatives on the movement of goods will allow for better measurement of the performance of goods movement networks in the GTHA in the future. Coordination and engagement with Metrolinx and MTO may allow for efficiencies and exchange of information that can support the City in fostering an environment for the efficient movement of goods within the City's wider policies and plans for development and growth.

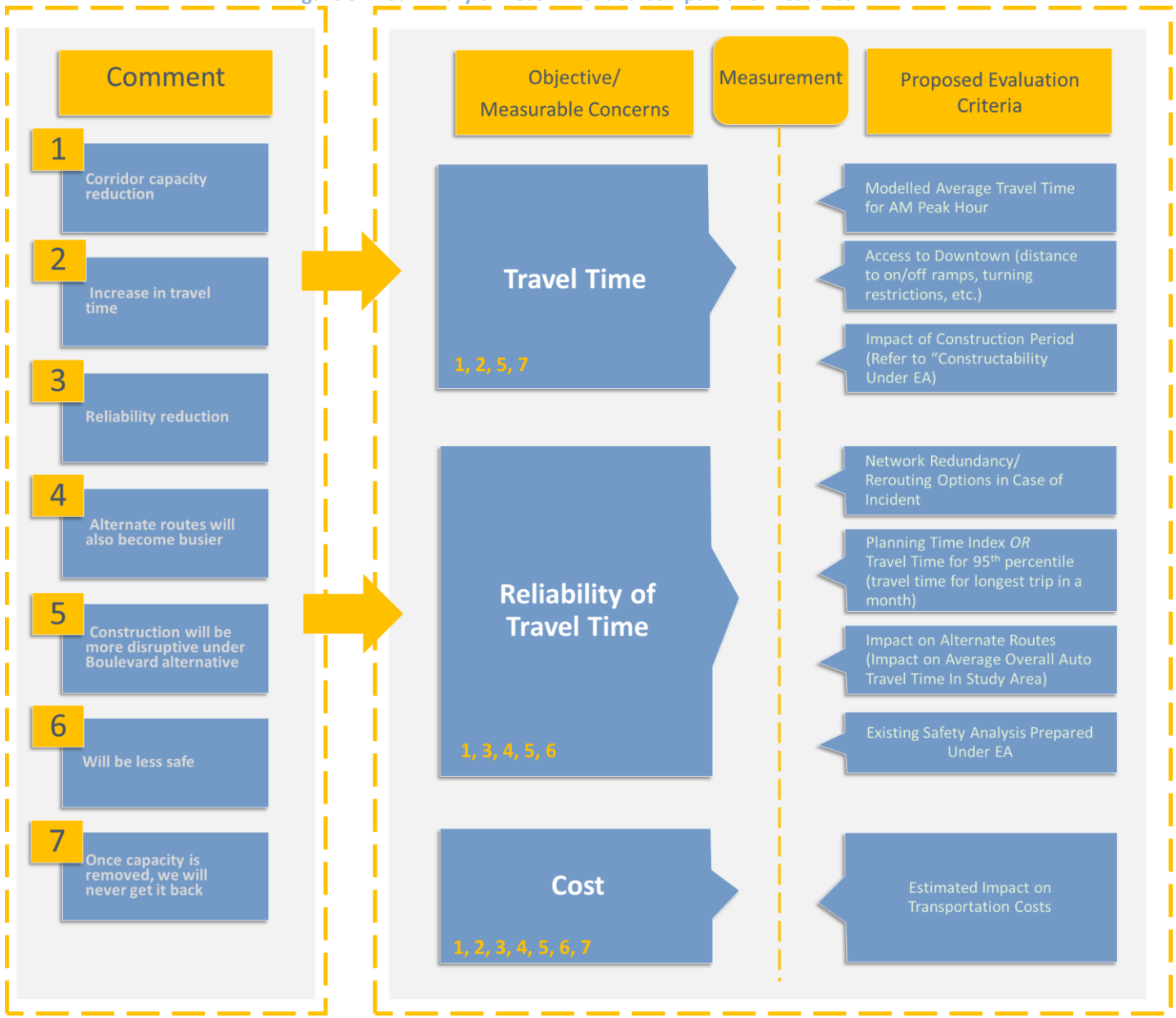
Specific potential performance measures that can be used to evaluate the movement of goods on the Gardiner Expressway/Lake Shore Boulevard corridor for the purpose of the EA are discussed below. Potential metrics are considered within the context of the availability of data to compare the Remove and Elevated Expressway alternatives. Since these alternatives are potential future options, evaluation of the options is based on forecasted data contained in transportation modelling developed for the EA.

5.2 Recommended Measures

Since the alternatives considered under the EA are not observable today (time horizon is 2031), data is not available to evaluate these scenarios. The comparison of the EA alternatives will depend on forecasts from modelling as well as qualitative evaluation based on an understanding of the changes in infrastructure and their impacts on key metrics. Some potential measures comparing the impact of the four alternatives on goods movement are shown in the table below. Recommended key measures are highlighted in blue and potential additional measurements are included in white cells. The use of measures will depend on the availability of sufficient information for analyzing the impacts of the EA alternatives on a particular metric. Comment is also made on the availability of information for evaluating the metrics. Additional information may be available as part of the ongoing evaluation process under the EA.

Measures were established based on the key factors considered under supply chain analysis in Chapter 3 and additional key stakeholder concerns discussed in Chapter 4, as well as some additional considerations on the change in design. In the figure below, we attempt to isolate the key concerns received from stakeholders, understand this feedback, and interpret it as specific, measurable concerns that can be evaluated, and then propose evaluation criteria to measure the comparative impact of the Remove Alternative compared to an elevated expressway.

Figure 5-1: Summary of Recommended Comparative Measures



5.3 Travel Time

Some discussion of expected travel time is already contained in Chapter 3 on supply chain analysis. Average travel time has been identified as a top issue to stakeholders for the movement of goods. Longer travel times create greater costs for firms in their supply chains and production processes and can lead to increases in transportation costs due to increased fuel consumption and longer driver hours for a route driven. Modelling work is carried out separately from this report to measure the impact on travel times for selected origin/destination pairs in the corridor.

Change in Average Travel Time (Remove versus Expressway)

Use existing model to estimate the difference in travel time between the Remove and Expressway alternatives. Currently some Origin/Destination pairs provide for fairly representative flows of overall traffic, and do provide insight on commercial vehicle traffic. In order to provide further insight on commercial vehicle traffic in particular, representative goods movement Origin/Destination (O/D) pairs through the Study Area could be targeted. Proposed O/D pairs include:

- Bay and Adelaide (financial district) to Gardiner and Spadina
- Leslie and Commissioners (Port Lands) to DVP and Dundas
- DVP and Dundas to the Gardiner and Spadina (through movements)

Access to Downtown

In order for stakeholders to better understand the change in access to the expressway system, it is proposed to graphically show the change in distance to the nearest on- and off-ramps on a "heat map" where areas are coloured based on the change in distance in access to the nearest ramp in the Remove Alternative compared to maintaining the elevated expressway. Stakeholders will be provided with a better representation to allow them to understand the change in distance to the nearest freeway access point in the Study Area. This should be contextualized with any information on the number of through trips versus local trips in order to better understand the nature of the trips using the elevated expressway in the study area.

Impact of Construction Period

Compare the impact on goods movement flows of construction of the Remove Alternative to the impact of construction associated with maintaining the existing elevated expressway. This analysis is already being done under the EA and it is proposed that this evaluation metric can simply reference the existing "Constructability" analysis on the impact of construction periods on traffic under the different alternatives.

5.4 Travel Time Reliability

Reliability was also discussed as a part of the supply chain analysis contained in Chapter 3. Recognition of the importance of travel time reliability in the movement of goods has been growing steadily and many consider this metric may be more important than average travel time alone. When travel times are unreliable, shippers or carriers often schedule additional "buffer" times to ensure that goods arrive when they are needed. Trends towards the increase in just-in-time supply chain management have also made reliability an even more pressing issue in the movement of goods.

Reliability of travel time is impacted by a number of factors including weather, traffic incidents, work zones, etc. Another factor that has been found to affect reliability is congestion itself.[23]

Reliability of the future EA scenarios is not presently observable. Still, some estimation may be able to be made based on the existing work carried out under the EA process. Factors that may be considered under each scenario should include:

Travel Time for Trips in the Top 95th Percentile of Travel Forecasted

The US Department of Transportation Federal Highway Administration identifies the 90th or 95th percentile travel times as the "simplest method to measure travel time reliability".[24] Intuitively, measuring the travel time of trips at the 95th percentile can be compared to the expected travel time for the "worst trip in a month". This provides an understanding of the variability in travel times compared to average travel times that will be estimated under Section 5.3. It is recommended that the travel time for the 95th percentile be calculated for the same O/D pairs identified under Section 5.3 for comparability to average travel time.

Network Redundancy/Rerouting Options

It is hard to objectively quantify the ability of road users to respond to incidents under different road designs. For example, will a truck better be able to find a new route or get to a new route in the event of an incident under the Remove versus Elevated Expressway alternatives? A possible solution is to use the EA model and simulate the shutdown of a lane due to construction or an incident and model the ability of the network to respond to the incident. These modelled results can be compared to understand the ability of the network to respond to an incident under the various EA options.

[23] U.S. Department of Transportation, *Traffic Congestion and Reliability: Linking Solutions to Problems*. July 19, 2004.
[24] United States Department of Transportation Federal Highway Administration. *Travel Time Reliability Brochure-Making it There on Time.*

Congestion on Alternate Routes

Alternate routes (arterial streets, local roads, etc.) provide for options in the event of a collision that impacts a preferred route of travel. For example, in the event that the GE/LSB corridor were closed due to an incident, stakeholders may use Queens Quay as an alternate route. In addition to impacting travel reliability, congestion on alternate routes also impacts average travel times for the "last mile" for any goods movement routes where the destination requires use of an alternate route or arterial street located near the Study Area.

An analysis of the comparative congestion anticipated on alternate routes under the Remove Alternative versus if the expressway were maintained should allow for an understanding of the impact of the Remove Alternative on traffic and congestion as compared to congestion on alternate routes under the Elevated Expressway alternatives. The use of the average estimated auto travel times in the study area should allow for a comparison between alternatives.

Safety and Incident Management

Incident management is another key concern for stakeholders. The existing EA has already carried out an analysis of the safety implications of the Remove Alternative versus the elevated expressway and this section can be referenced to understand the impact on safety from a goods movement perspective.

5.5 Increase in Transportation Costs

One of the main differentiators in transportation costs is the mode used. It is not anticipated that goods currently moving by truck will change modes as a result of the Remove Alternative. The main drivers of change in transportation costs for the purposes of this EA are estimated to be driven through differences in travel time and reliability between the Remove Alternative and the Elevated Expressway alternatives.

The American Transportation Research Institute (ATRI) has surveyed carriers for information to understand the operational costs of trucking on both a distance and time basis. They found that the breakdown of the marginal cost of an hour of transport time was:

Figure 5-2: Estimated Marginal Trucking Cost per Hour

Motor Carrier Costs	2013 Costs per Hour ($US)
Vehicle-based	
Fuel Costs	$25.78
Truck/trailer lease of purchase payments	$6.52
Repair and Maintenance	$5.92
Truck Insurance Premiums	$2.57

Permits and Licences	$1.04
Tires	$1.65
Tolls	$0.77
Driver-based	
Driver Wages	$17.60
Driver Benefits	$5.16
TOTAL	**$67.00**

Source: American Transportation Research Institute. An Analysis of the Operational Costs of Trucking: A 2014 Update.

In benefit-cost analyses, the impact of change in travel times is normally calculated as the change in travel time multiplied by the value of that time. The value of time of a passenger vehicle is significantly lower than that of a truck.

Understanding the changes in cost of transportation to goods movement stakeholders can be approximated by multiplying any change in travel time by the number of trucks impacted and by the estimated hourly operational costs of a truck.

In order to develop an estimate of the cost of additional delays of the Remove Alternative compared to the Elevated Expressway alternatives, the difference in forecasted travel times between these alternatives can be multiplied by the estimated cost of time of a truck.

Additional costs would also be imposed on goods movement stakeholders above the increased costs of trucking to the extent that delivery times also become less predictable for goods movement stakeholders.[25] This can impact supply chain management decisions; for example, a stakeholder may elect to increase inventory capacity in order to mitigate the impact of reduced delivery reliability. This depends on the extent to which carriers adjust.

5.6 Evaluation of Impacts

Based on information available as a part of the EA as well as feedback from stakeholders, the impact of the Remove Alternative compared to the Elevated Expressway alternative is carried out for the proposed measures below.

Many stakeholders located close to the Study Area are involved in industrial and manufacturing operations. Examples of major goods produced include sugar, cement, concrete, cooling systems, roofing, and other manufacturing goods. While supply chains of these stakeholders may not be as sensitive to changes in average time and reliability as some others consulted, in

[25] In many cases, carriers may respond by adding additional "buffer times" into delivery schedules in the event that delivery times become less reliable. Whether carriers fully adjust schedules to allow for the exact same level of reliability of delivery as prior to the implementation of the Remove alternative or whether they pass some of the unreliability on to their customers is difficult to estimate. Likely, costs of unreliability will be borne by both carriers and other goods movement stakeholders.

many cases stakeholders indicated above 90% of all their goods movement traffic would be impacted by the Remove Alternative. Their businesses currently rely significantly on the Gardiner Expressway/Lake Shore Boulevard corridor and for this reason may be particularly sensitive to proposed changes that may impact travel times of reliability.

For other stakeholders in retail and courier sectors, while reliance on the Gardiner Expressway for movements in Toronto may still be quite significant, a lower proportion of their total trips would be impacted by the Remove Alternative since these stakeholders operate in more diverse locations as opposed to an industrial stakeholder with a factory located in the Study Area. While the proportion of trips impacted for these stakeholders may be lower, these stakeholders may be more sensitive to changes in reliability and average travel times due to the nature of their supply chains and their businesses. For example, a courier company may need to allocate additional resources (additional delivery vehicles and additional labour) to carry out the same number of deliveries on routes that utilize the GE/LSB corridor or impacted alternate routes with the same level of reliability and delivery times compared to the Elevated Expressway alternatives. What this can mean is that for some stakeholders, reduced corridor capacity may equate to an *increase* in goods movement vehicles on the road for the same number of trips in order to maintain service standards.

6 Review of Comparable Jurisdictions

Key Messages

Seoul, New York, San Francisco, and Seattle have all faced similar debates as Toronto regarding elevated urban expressways. All except Seattle elected to replace elevated expressways with surface boulevards. While often there were fears of traffic "chaos" following removal of elevated expressways in the case studies analyzed, traffic generally adjusted to the new reality without very significant disruption, using the best alternate route available, adjusting trip time, or in some cases changing mode or avoiding trips all together.

On a macro scale, main congestion indicators for major US cities that have removed or do not have urban freeways are comparable to those that have urban freeways.

6.1 Macro Analysis of Urban Congestion and Urban Freeways

In support of the 2014 draft Environmental Assessment commissioned by Waterfront Toronto and the City of Toronto, an economic competitiveness comparison was carried out on key cities comparing the competitiveness of cities with and without expressway access. Here we provide a similar comparison of cities that have either removed or maintained elevated expressways and their current estimated Total Peak Period Travel Time and Planning Time Index (measure of reliability). The figure below summarizes the peak travel time and planning index for key cities that either (1) Removed, (2) Replaced or (3) Maintained urban expressways. The three groups appear relatively similar on all measures, with cities under the Maintain category reporting a somewhat higher (i.e. less reliable) Planning Time Index on average. While there are innumerable other differing factors between these cities that make any cause or effect difficult to isolate, there is no clear difference in congestion indices between the Remove versus Maintain or Replace groups. When examining population and population density, denser cities appear to be much more likely to remove expressways than less dense cities where there are fewer competing demands for use of public space that freeways may occupy.

Figure 6-1: Comparison of Peak Travel Time and Planning Time Indices for Key American Cities

	City	Freeway Access	**Peak Travel Time (mins)**	**Planning Time Index (reliability)**	Population	Density (pop/square mile)
1	New York	Remove	50	4.44	8,405,837	27,012
	San Francisco	Remove	47	3.74	837,442	17,179
	Chicago	Never Built	44	3.95	2,718,782	11,842
2	Boston	Replace (tunnel)	48	4.25	645,966	12,793
	Seattle	Replace (tunnel)	44	3.99	652,405	7,251
3	Washington	Maintain	53	5.72	646,449	9,856
	Los Angeles	Maintain	48	4.95	3,884,307	8,092
	Houston	Maintain	44	3.67	2,195,914	3,501
	Dallas	Maintain	42	4	1,257,676	3,518
	Atlanta	Maintain	50	3.71	447,841	3,154
1	**Remove/Never Built (average)**		**47**	**4.04**	**3,987,354**	**18,678**
2	**Replace (average)**		**46**	**4.12**	**649,186**	**13,938**
3	**Maintain (average)**		**47.4**	**4.41**	**1,686,437**	**10,629**

Sources: (Congestion Indices) Texas Transportation Institute. *2012 Urban Mobility Report.* And HR&A *Gardiner Expressway Economic Evaluation of Proposed Alternatives.* February 12, 2014 and Wikipedia (population and population density).

6.2 Case Study Review of Comparable Jurisdictions

A review of comparable jurisdictions that faced similar debates of whether to remove, replace, improve, or "maintain" an urban expressway was carried out under the existing Environmental Assessment. In this report, some follow-up work has been done to build off that analysis and try to get a better understanding of the impacts from the perspective of the movement of goods. For the most part, little to no analysis has been done on the impacts of freeway removal specifically on goods movement, but an understanding on the impacts on overall traffic allows for a strong understanding of the likely impact on the movement of goods.

Case studies of comparable cities were identified where urban expressways were removed. Considerations made by these cities prior to their removal and the mitigation measures they implemented to support the expressway removal, as well as any results of relevance to traffic outcomes, are reviewed in order to identify lessons learned for Toronto. The analysis in this Chapter feeds into the mitigation measures recommended in Chapter 7. Figure 6-2 below summarizes the case studies analyzed.

Figure 6-2: Overview of Case Studies Examined

	Cheonggyecheon	West Side Highway	Embarcadero Freeway	Central Freeway	Alaskan Way Viaduct
Location	Seoul, South Korea	New York City	San Francisco	San Francisco	Seattle
Current City Population	10,117,909	8,405,837	837,442	837,442	652,205
Prior Vehicle Traffic per Day (total and freight only)	120,000	140,000	80,000	93,100	103,000
Length of Area Considered	6.1 km (3.75 mi)	8.2 km	2.5 km	1.5 km	3.2 km
Outcome	Removed	Removed	Removed	Removed	Replaced with Tunnel
Timeline	July 2003-October 2005	1973-1989 (surface route completed 2001)	1989-1991	1989-1992 (surface route completed by 2005)	2001-Ongoing
Age	24	37	32		50
Main Reason for Removal	Large repair costs, improve urban environment	Earthquake/ structural damage	Earthquake/ structural damage	Earthquake/ structural damage	Earthquake/ structural damage

6.2.1 Seoul- Cheonggyecheon

Seoul is the only case study examined where the main reason for freeway removal was not structural damage due to natural disaster. This required strong political will, and the mayor led this removal program that was a part of his election platform.

Traffic speeds were noted to decrease by 18% following the removal of the expressway, with some traffic shifting to other modes, such as transit.

Under a cost-benefit analysis, the costs of traffic congestion were found to be very high, but were less than estimated benefits from increases in land values as a result of the removal.

Most mitigation employed to support the freeway removal involved demand management strategies.

Specific consideration was made for goods movement in the removal project, retaining lanes in the corridor, with goods movement being one of the primary considerations for the maintenance of road capacity.

6.2.2 New York- West Side Highway

Before removal, it was found that most traffic was using the West Side Highway for access to the city as opposed to through movements.

Trucks were not allowed on the elevated West Side Highway in New York. The replacement of the elevated expressway with a surface boulevard therefore actually increased road capacity available for goods movement in Manhattan.

Currently West Side is a significantly used route for trucks in New York, though in relative percentage many other arterials in New York see higher percentages of trucks than the West Side Highway.

6.2.3 San Francisco – Embarcadero

Removal for the Embarcadero was previously recommended but was never able to achieve approval. Removal was eventually carried out when the highway was damaged during an earthquake and could not be repaired.

Much of the traffic “chaos” predicted did not materialize, traffic was mostly routed to other arterial streets.

Some have claimed that increased vehicle incidents observed after the 1989 quake may be a result of elevated freeway closures, but such an outcome is difficult to measure and isolate from many other factors impacting safety in the City.

6.2.4 San Francisco – Central Freeway

The Central Freeway was removed after the elevated expressway system was damaged during an earthquake.

Traffic on the surface route was 52% lower than on the elevated expressway. The San Francisco Department of Parking and Traffic estimated that almost all of the displaced traffic was found on alternate routes.

6.2.5 Seattle- Alaskan Way Viaduct

The elevated expressway was removed following structural damage that was deemed to leave the elevated expressway unsafe.

The City and State considered replacing the elevated structure, creating a tunnel, or surface Remove Alternatives. In order to maintain travel times and road capacity while still increasing the urban environment, it was decided that a new tunnel would be built to accommodate traffic. It was estimated that the tunnel would accommodate over 120,000 trips daily, compared to around 100,000 on the existing structure.

The project has faced engineering challenges that are delaying the project schedule and increasing the project scope and budget.

Tolling of the tunnel has been considered, not as a tool to improve traffic flow but to generate revenue to help fund the project. The main concern with tolls was the estimated additional traffic that would be displaced onto alternate city streets as a result of the toll cost.

6.3 Key Themes and Lessons Learned

Removal of elevated expressways in urban centres has been discussed in the past but it has often been difficult to garner support for optional removals. The impact on goods movement is often a key issue brought up by opponents to the removal of such expressways. In the case studies analyzed, the removal of a highway has almost always been after structural damage was significant enough that the highway could not be repaired. In the case of San Francisco, it was recommended years before to remove the Embarcadero but support was not gained for the measure until an earthquake damaged the structure and necessitated removal. Removal or replacement of expressways are often difficult decisions for communities. For example, in Seattle options were brought to ballot for a vote. When asked to vote on whether they supported surface-tunnel hybrid or an elevated structure they rejected both options. Eventually the Governor of the state of Washington announced that a tunnel option would go ahead.

In most cases, following the damage or removal of the expressway, traffic “chaos” was predicted by media and local residents. For the most part such chaos did not materialize. In part this has been attributed by some to an “overreaction” by commuters and road users to the

feared congestion by either using routes much further away as opposed to alternate routes, changing mode of transport, or avoiding trips for the initial period after removal. It is hard to assess the longer-term impacts of such projects as they are often mixed with many other changes occurring in the dynamic transportation system of the cities. San Francisco's Department of Parking and Traffic estimated that most diverted traffic from the removal of expressway ended up on main alternate routes or other further routes in the city. Modal shift was not noted to be a very significant factor in making up for lost trips, but did also occur. For the most part, travellers adjust by using the route they deemed to be the least disruptive alternative to their current route.

Most removals were accompanied by traffic management plans and mitigation measures implemented by cities to mitigate the impact on automobile and freight traffic. Common measures included:

- Improved wayfinding for trucks on alternate routes
- Increased public transit capacity or services to provide passenger vehicles with an alternate mode of transport
- Temporary/permanent adjustments on alternate routes (changing parking restrictions, optimizing signal timing, review of truck routes in the city, etc.)
- Use of smart work zones during removal (provide current information on construction delays, suggest alternate routes, etc.)
- Introduction of other measures to increase capacity of alternate routes (for example introducing one-way streets, reversible lanes, etc.)
- Other targeted, demand-side measures for passenger or freight movements (regulation to limit passenger car use, restrictions on hours or routes for freight movements)

6.4 Implications for Toronto

In many cases examined, the removal of elevated, limited-access freeways in major urban cities has been preceded by fears of chaotic traffic and substantial and prohibitive impacts on traffic flows. For the most part, such chaos has not materialized. Traffic for the most part shifts to optimal alternate available routes in the city and utilizes other capacity in the city.

Many mitigation measures considered in the case studies to be implemented in conjunction with the removal of freeways in other cities have already been considered in one context or another under the City of Toronto's *Congestion Management Plan 2014-2018.* Some additional measures, including in particular the expansion of public transit projects to reduce passenger automobile demand, may also be considered by the City of Toronto. The following Chapter will examine in more detail some of the mitigation options used in the case studies analyzed above as well as in general congestion management and freight transportation planning strategies.

7 Mitigation Options

Key Messages

A toolbox of potential measures is available to mitigate any constraints imposed by the Remove alternative on the movement of goods in the Study Area. Mitigation measures are proposed to either directly target goods movement traffic, or to improve overall congestion in the Study Area which will have a positive impact on goods movement traffic.

It is recommended that implementation of mitigation measures not be limited to the Study Area, but also be implemented on key alternate routes that can reduce traffic demand in the corridor. Additionally, mitigation measures can also be applied to major goods movement routes, such as the Don Valley Parkway and the Gardiner Expressway outside of the Study Area, which will impact overall trip times for goods movement trips passing through the Study Area.

7.1 Summary of Mitigation Measures

A wealth of potential mitigation measures exists to ensure the efficient flow of goods to counteract any potential constraints the Remove Alternative may impose on goods movement. All options have costs associated, either upon goods movement stakeholders, the City, or both parties. A comprehensive review of measures available to counteract any constraints on the flow goods movement is contained in Appendix D.

In order to be effective, mitigation measures should be targeted on the section of the GE/LSB corridor where the elevated expressway is proposed to be removed under the Remove Alternative and also on alternate streets that may alleviate congestion in the corridor as well as other areas in the corridor that will allow for a reduction in overall trip times. Improving the flow on alternate routes may be another method to reducing increased congestion in the corridor.

The City of Toronto's Congestion Management plan should be the primary toolbox used to mitigate impacts on goods movement of increased congestion. Some options represent particularly "low-hanging fruit" for the City such as traffic coordination studies that have thus far had an estimated **overall benefit/cost ratio of 66:1.**[26] For every dollar spent on such a study an estimated $66 dollars is saved through improved traffic flow. Where applicable, such studies should be prioritized for the Lake Shore Boulevard as well as key alternate routes around the corridor. Such a measure would be advisable whether or not the Remove Alternative is chosen given the potential benefits. Other measures from the Toronto's Congestion Management Plan should be prioritized for the GE/LSB and key alternate routes to the corridor as is appropriate and possible. Such measures together may have the potential to mitigate any constraints of the Remove Alternative on their own.

Off-peak deliveries are another option for the City to pursue in order to reduce freight traffic during peak periods as well as to improve travel times and reliability for freight movements. Key constraints to off-peak delivery programs include noise concerns as well as the constraints goods movement companies face from their customers who demand goods arrive at a certain time. The New York pilot program of providing incentives to receivers to install and implement unassisted deliveries has proven a resilient option to encouraging the shift of goods movement travel to off-peak hours. The City should study and pursue such a program whether or not the Remove Alternative is implemented.

Preferential lanes offer another solution to address the impact of increased congestion. In particular, High Occupancy Toll (HOT) lanes allow for the highest utilization of infrastructure (by allowing all those eligible under High Occupancy Vehicle (HOV) lanes plus also those willing to pay) and also allows for a self-selecting of impacted goods movement stakeholders. Since goods

[26] City of Toronto. *Congestion Management Plan.* 2014-2018

movement stakeholders are very heterogeneous, the impacts on the stakeholders will also vary. To some, congestion may not represent a significant increase in cost, while to others that same congestion may represent very substantial increases in cost. More impacted stakeholders will be more likely to pay for HOT lanes, since the improved reliability will be worth the increase in cost to them. Therefore HOT lanes will allow for a measure to target those stakeholders most impacted by any increased congestion associated with the Remove Alternative through self-selection. The City may wish to consider converting some HOV lanes to HOT lanes, and/or adding HOV/HOT lanes in the GE/LSB corridor, the Don Valley Parkway, or other key goods movement routes in the city to allow goods movement stakeholders more options to move goods more efficiently.

A host of other strategies, including additional wayfinding signage programs, developing a goods movement stakeholder committee, demanding management strategies, or increasing road capacity in other alternate routes are all additional options available to the City to reduce the impact of increased congestion on goods movement stakeholders.

Figure 7-1: Potential Mitigation Measures to Address Constraints of Remove Alternative on Goods Movement

Mitigation Approach	Improves Overall Traffic	Targets Goods Movement Specific	Barriers to Implementation
Application and expansion of existing tools in City of Toronto's Congestion Management Plan to Corridor and key Alternate Routes	✓		**Low**
Off-Peak Delivery Programs	✓	✓	**Low**
Preferential Lane Treatments	✓	✓	**-**
Truck-Only Lanes		✓*	**Medium**
Peak Shoulder Lanes	✓		**Medium**
HOV Lanes	✓	✓	**Medium**
HOT Lanes	✓	✓	**Medium**
Congestion Pricing	✓		**Medium/High**
Increase Alternate Road Capacity	✓		**High**
Increase Public Transit	✓		**Medium/High**
Operational Improvements	✓		**Low**
Improve Wayfinding for Trucks for Alternate Routes		✓	**Low**
Creation of Goods Movement Stakeholder Committee		✓	**Low**

*Depending on whether or not goods movement vehicles will be allowed to utilize preferential lanes.

Key strategies that target the flow of goods, have relatively low barriers to implementation and do not have implications for other traffic include off-peak delivery programs (described further in Appendix D), improving wayfinding for commercial vehicles on alternate routes throughout

the transportation study area, as well as the creation of a goods movement stakeholder committee in order to work effectively with industry on the issue of goods movement.

Appendix A: Consultation Package

WATERFRONTToronto

TORONTO

Dear Madam or Sir:

RE: Goods Movement Analysis: Gardiner Expressway and Lake Shore Boulevard East Reconfiguration Environmental Assessment and Integrated Design Study

Waterfront Toronto and the City of Toronto are undertaking the Gardiner Expressway and Lake Shore Boulevard Reconfiguration Environmental Assessment and Integrated Urban Design Study to help determine the future of the eastern section of the Gardiner Expressway running east of Jarvis Street to approximately Leslie Street. As a result of work completed thus far, the Deputy City Manager, Cluster B, has recommended to the Public Works and Infrastructure Committee (PWIC) that the elevated expressway be removed and that Lakeshore Boulevard east of Jarvis be widened by two lanes to a landscaped at-grade eight-lane boulevard. This option is known as the Remove Alternative.

PWIC directed staff to better understand the impacts of the Boulevard option including looking at opportunities to optimize the travel time. In addition, PWIC directed staff to look at a "Hybrid" option that maintains part of the existing expressway and combines it with a new expressway where it meets the Don Valley Parkway.

Waterfront Toronto and the City of Toronto have engaged Dillon Consulting, who have retained CPCS, a strategy consulting firm specializing in the transportation, to study the implications of the Remove Alternative on the movement of goods, and in particular:

- to provide a better understanding of the nature of goods movement in the study area;
- to provide an assessment of the consequences (both positive and negative) of the implementation of the Remove Alternative for goods movement in the Greater Toronto Area as compared to Maintain and or Hybrid; and
- to provide high level recommendations for mitigating impacts of the Remove Alternative for affected goods movement companies based on work already undertaken in the Environmental Assessment.

To gather and validate information required for the goods movement analysis, CPCS will be undertaking consultations with key goods movement stakeholders. We would appreciate your participation in these consultations. Your confidentiality is important to us. We will not attribute any quotations or specific information to you or your organization without your permission.

WATERFRONToronto

TORONTO

We thank you for your time and appreciate your participation in this important study. If you have any questions about this study or the related process, please contact Antonio Medeiros (Tel: 416.214.1344 x285, E-mail: amedeiros@waterfrontoronto.ca).

Sincerely,

Christopher Glaisek
Vice President, Planning and Design
Waterfront Toronto

John Mende
Director, Transportation Infrastructure Management
City of Toronto

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Gardiner Expressway Goods Movement Study

Stakeholder Questionnaire

Consultations with goods movement stakeholders will be carried out in person or over the phone. This questionnaire is being provided in advance of the consultations to inform goods movement stakeholders as to the topics to be discussed with CPCS. It is not necessary to fill out this questionnaire in advance of the consultations, though stakeholders are welcome to do so if they feel this would help guide their responses.

The questions contained in this document are meant as a guide for discussion and not intended to be inclusive of all topics discussed during consultations.

Results of these consultations will be shared with the City of Toronto and Waterfront Toronto in order to inform analysis being carried out under the Gardiner Expressway/Lake Shore Boulevard East Reconfiguration Environmental Assessment (EA) and Integrated Urban Design Study.

Peter Harrison, Principal Consultant, CPCS
pharrison@cpcs.ca
Robert Graham, Senior Consultant, CPCS
rgraham@cpcs.ca

We thank you for your willingness to participate in this important study.

PART A – RESPONDENT IDENTIFICATION

Organization name:	
Representative(s) name(s) and title(s):	
Representative(s) contact details (telephone and email):	

PART B – Goods Movement and Goods Movement Impacts of the Remove Alternative

Nature of your business and use of Lakeshore Blvd./Gardiner Expressway corridor

- Please describe the nature of your business

Expand box as needed

- What are some of the key characteristics of your firm's supply chain (e.g. just-in-time, 24-hour operations, peak/off-peak, modes used, origins and destinations of shipments, on-site storage and loading/delivery considerations, key drivers and seasonality of shipment volumes, etc.)?

Expand box as needed

- Which of your business locations rely on use of the Gardiner Expressway?

Expand box as needed

- What aspects of your business operations rely on the Gardiner/Lake Shore Boulevard (LSB) corridor and how does your business rely on it (what times of day, how often, etc.)? Are there alternate routes that you use? How does your use of the Gardiner Expressway compare with your use of other routes in the area?

Expand box as needed

- Where are the primary origins and destinations of trips you generate on the Gardiner Expressway?

Expand box as needed

- Which parts of the Gardiner Expressway do you use? Which on/off ramps do you use? How much of your traffic on the Gardiner Expressway relies on on/off ramps located within the study zone east of Jarvis?

Expand box as needed

- What percentage of traffic you generate on the Gardiner Expressway is “through traffic” versus “local traffic” (for the purposes of this question, please consider through traffic as traffic which originates on the Gardiner east of Jarvis and either continues on Lake Shore Boulevard East of the Don Roadway or continues northbound on the Don Valley Parkway)?

Expand box as needed

- What percentage of traffic you generate on the Gardiner occurs during each of these four periods?

  1. Evening and Overnight (7:00pm - 6:00am)
  2. Morning Peak (6:00am - 9:00am)
  3. Daytime (9:00am - 3:00pm)
  4. Afternoon Peak (3:00pm - 7:00pm)

Expand box as needed

- How is your business currently responding to the maintenance activities on the Gardiner Expressway and the traffic congestion that has resulted from these activities (any changes in schedule, routing, etc.)? What implications have these changes had on your business?

Expand box as needed

- How has your business adjusted operations over the years in response to changing traffic conditions both in the GTHA and in other regions (changes in schedule, routing, etc.)? What implications have these changes had on your business?

Expand box as needed

Consequences of the Remove Alternative

- Where do you operate that you believe would be significantly affected by the implementation of the Remove alternative (business location(s), delivery points, etc.)?

Expand box as needed

- What are the specific (local) changes your business may experience with the Remove alternative?

Expand box as needed

- How would you adjust your operations in the event that the Remove Alternative is pursued?

Expand box as needed

- What do you see would be the more general (regional) impacts of the implementation of the Remove alternative on the movement of goods within the Greater Toronto Area including through movement on the Gardiner/LSB and Don Valley Parkway?

Expand box as needed

- What changes do you feel will need to be made to your business/operations (if any) as a result of the wider growth being planned in the waterfront area (regardless of any changes made to the Gardiner Expressway)?

Expand box as needed

- Do you expect your businesses will be operating out of its current location 10 years from now? Do you expect your operations to be larger or smaller than they currently are? What impact do you believe this change would have on goods movement trips you generate on the Gardiner?

Expand box as needed

- The space below is left for any additional comments/feedback.

Expand box as needed

Please advise us if you have any data you can make available on the amount of traffic you generate on the Gardiner Expressway, your use of the Gardiner Expressway, or any other information you believe may inform this goods movement analysis. Such data can be kept confidential if requested.

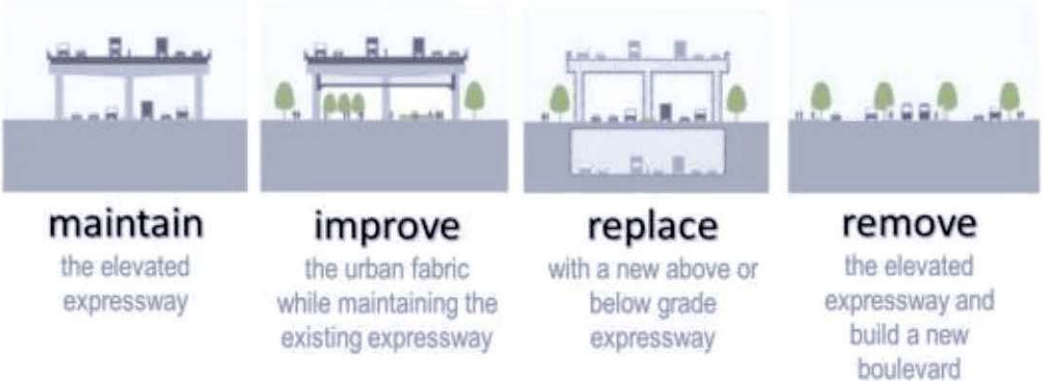
Gardiner Expressway Goods Movement Study

Project Background

The City of Toronto and Waterfront Toronto are jointly carrying out the *Gardiner Expressway/Lake Shore Boulevard East Reconfiguration Environmental Assessment (EA) and Integrated Urban Design Study*.

In 2008 Toronto City Council authorized a partnership between the City of Toronto and Waterfront Toronto to examine options for the future of the eastern portion of the Gardiner Expressway between approximately Jarvis Street and Logan Avenue. The *Gardiner East EA and Urban Design Study* was formally initiated following the approval of the study Terms of Reference by City Council and the Minister of the Environment in 2009.

The study Terms of Reference included four alternatives for the future of the eastern portion of the Gardiner Expressway:



On February 21, 2014, a City of Toronto Staff report was submitted to the Public Works and Infrastructure Committee (PWIC) seeking Council approval to proceed with Remove alternative as the preferred solution. The report was based on the results of stakeholder consultations and alternative solutions evaluated as part of the EA.

PWIC directed City staff to further study the impacts of the Remove alternative including looking at opportunities to optimize the travel time. In addition, PWIC directed City staff to look at a Hybrid option that maintains part of the existing expressway and combines it with a new expressway where it meets the Don Valley Parkway.

Waterfront Toronto and the City of Toronto have engaged Dillon Consulting, who have retained CPCS, a strategy consulting firm specializing in the transportation, to study the implications of the Remove alternative on the movement of goods, and in particular:

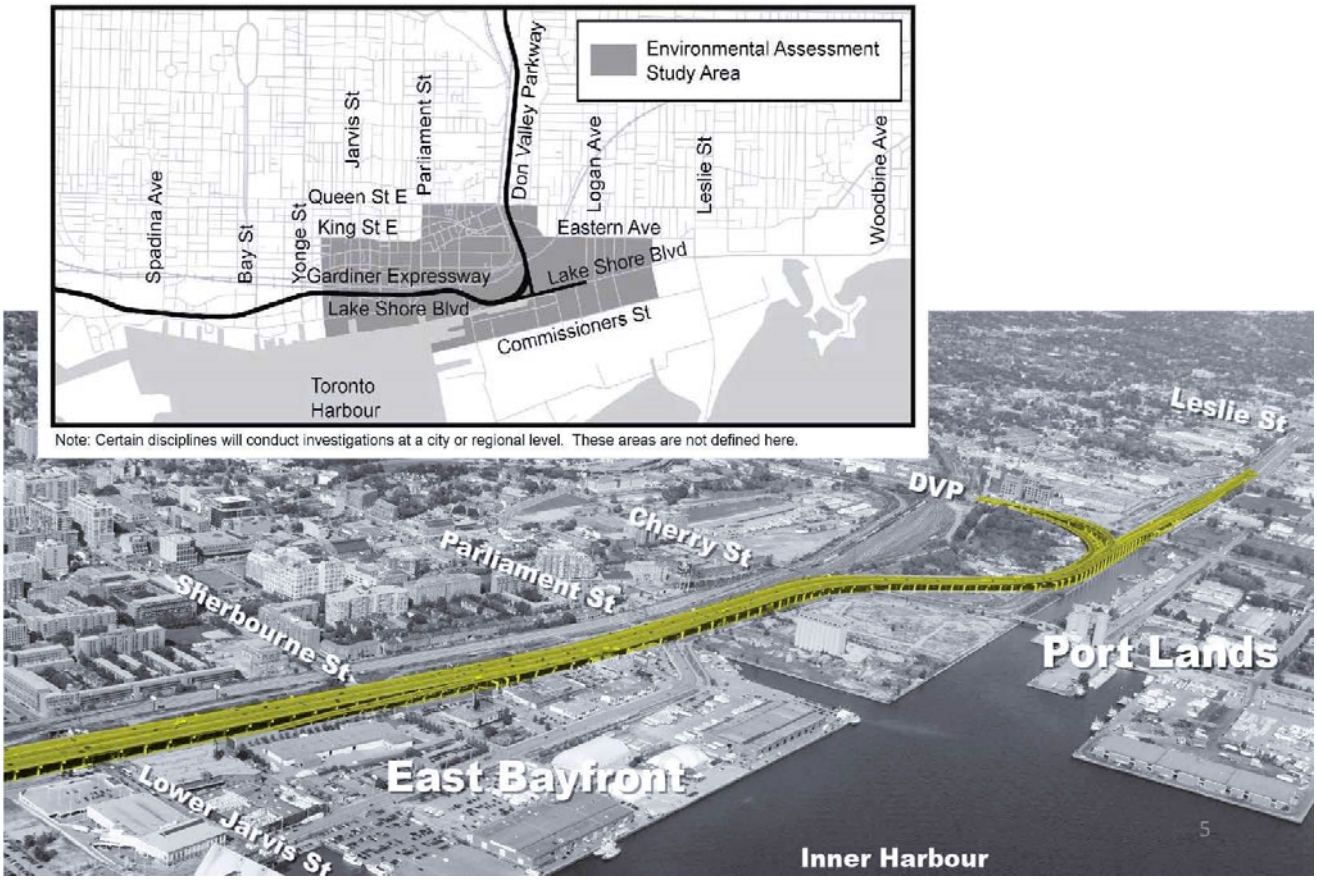
- To provide a better understanding of the nature of goods movement in the study area;
- To provide an assessment of the consequences (both positive and negative) of the implementation of the Remove alternative for goods movement in the Greater Toronto Area as compared to Maintain and or Hybrid; and
- To provide high level recommendations for mitigating impacts of the Remove Alternative for affected goods movement companies based on work already undertaken in the Environmental Assessment.

Consultations with goods movement stakeholders will allow us to better understand the implications of the Remove alternative on goods movement stakeholders, both located in the study area, as well as goods movement stakeholders located outside the study area that uses this section of the Gardiner Expressway.

Included on the following pages are some background materials from the Public Forum 3 Presentation[1] as part of the *Gardiner Expressway/Lake Shore Boulevard East Reconfiguration Environmental Assessment (EA) and Integrated Urban Design Study,* as well as some analysis as to what the Remove alternative in the area would look like. Further information on work completed to date can be found at http://gardinereast.ca/

[1] This presentation can be found at: http://gardinereast.ca/sites/default/files//documents/TRN%20-%20presentation%20-%20PIC%203%20-%202014%2002%2006.pdf

Study Area

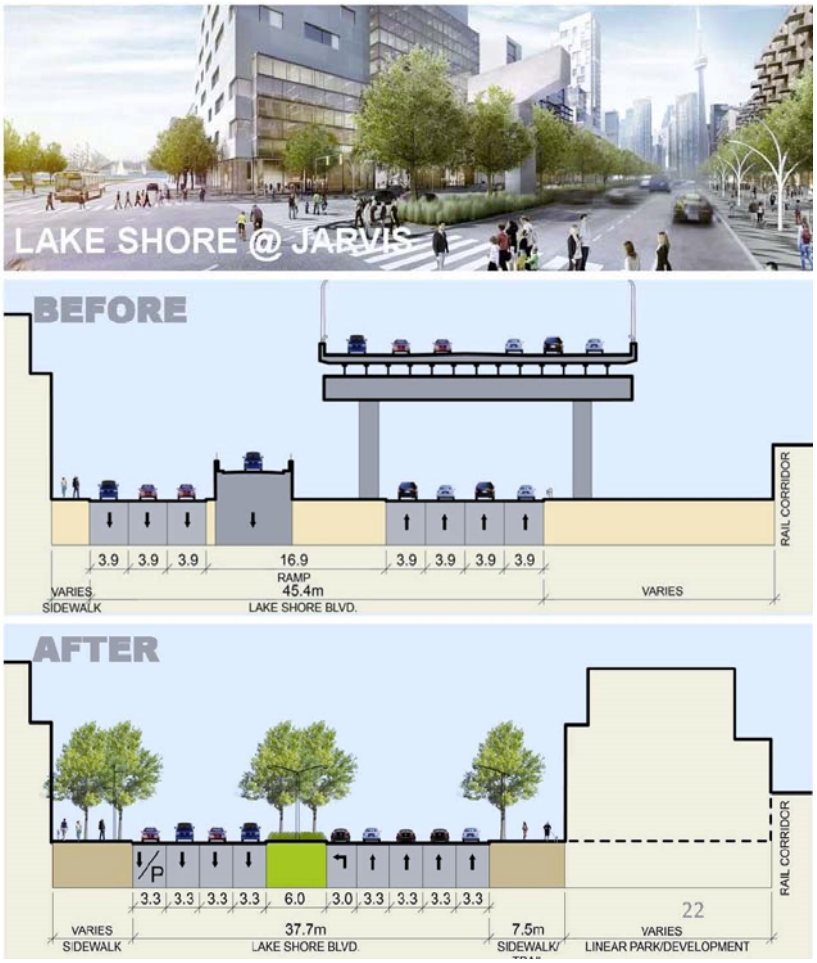


Source: Public Forum #3 Presentation, slide 5

Remove Alternative Overview

Revised Plan with a Two Sided Street

- Improved cross section to allow for an 8 lane boulevard with potential development along 85% of the north and south side of the street
- North side development provides a buffer from rail corridor
- Opens up entire ground level to light and air
- Extensively treed boulevard



Source: Public Forum #3 Presentation, slide 22

Remove Option vs. Maintain

1. Lake Shore at Sherbourne

Source: Public Forum #3 Presentation, slide 42

2. Gardiner at Sherbourne

Source: Public Forum #3 Presentation, slide 43

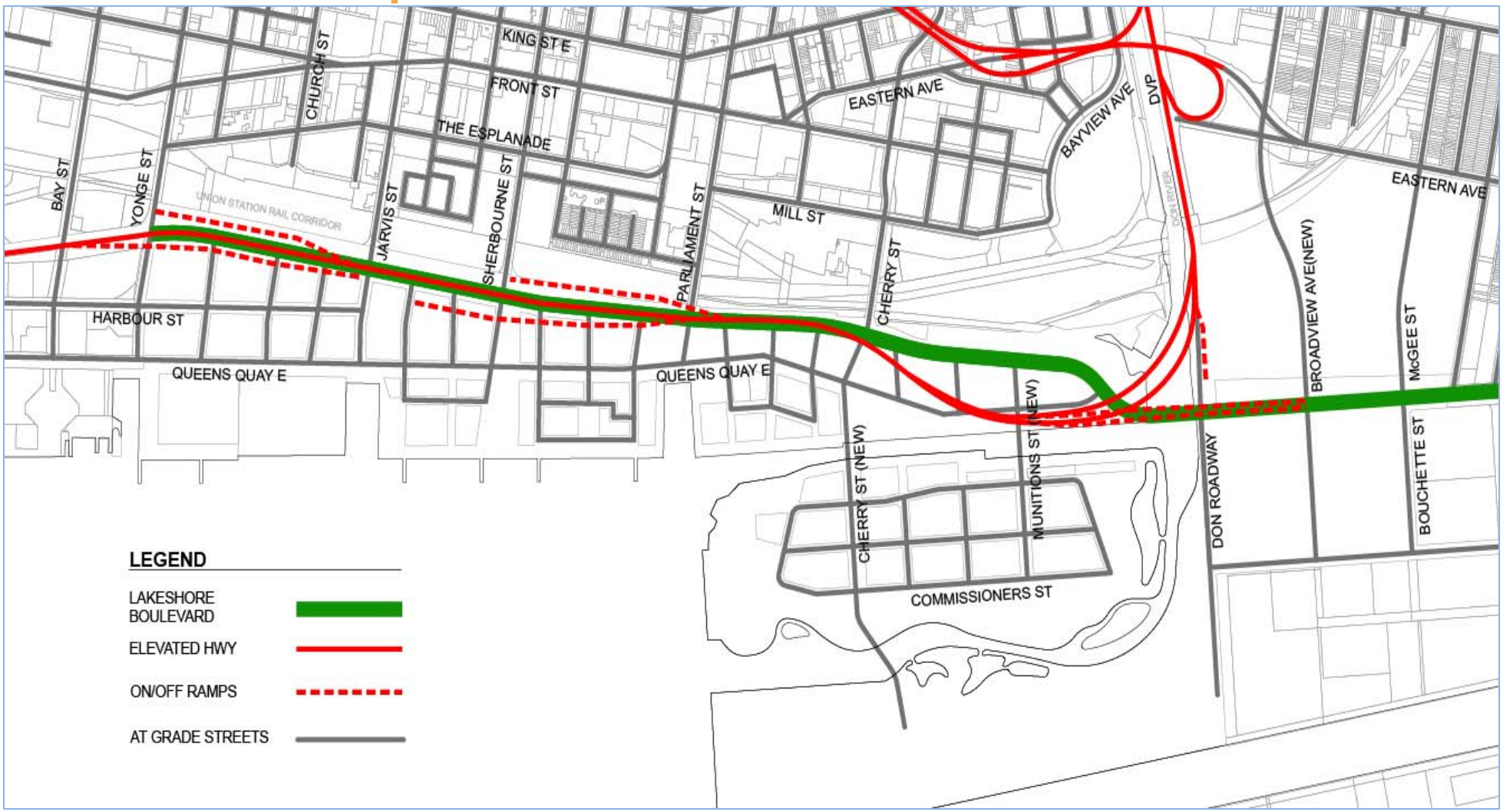
3. Don Valley Mouth

Maintain

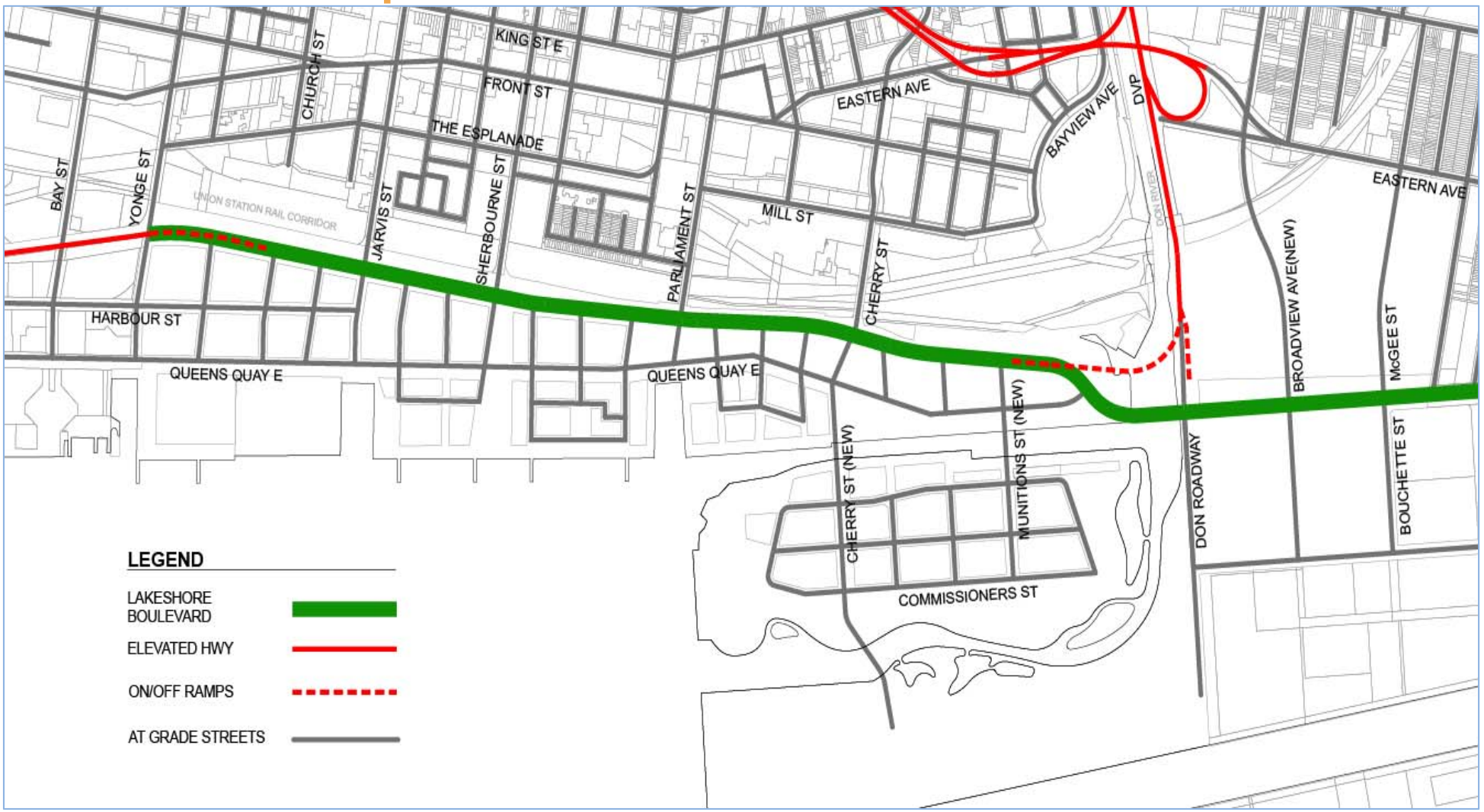
Remove

Source: Public Forum #3 Presentation, slide 46

Maintain Option



Remove Option



Preliminary Evaluation Results

	Study Lens/ Criteria Group Summary	MAINTAIN	IMPROVE	REPLACE	REMOVE
TRANSPORTATION & INFRASTRUCTURE	Automobiles				
	Transit				
	Pedestrians				
	Cycling				
	Movement of Goods				
	Safety				
	Constructability				
URBAN DESIGN	Planning				
	Public Realm				
	Built Form				
ENVIRONMENT	Social & Health				
	Natural Environment				
	Cultural Resources				
ECONOMICS	Regional Economics				
	Local Economics				
	Direct Cost and Benefit				

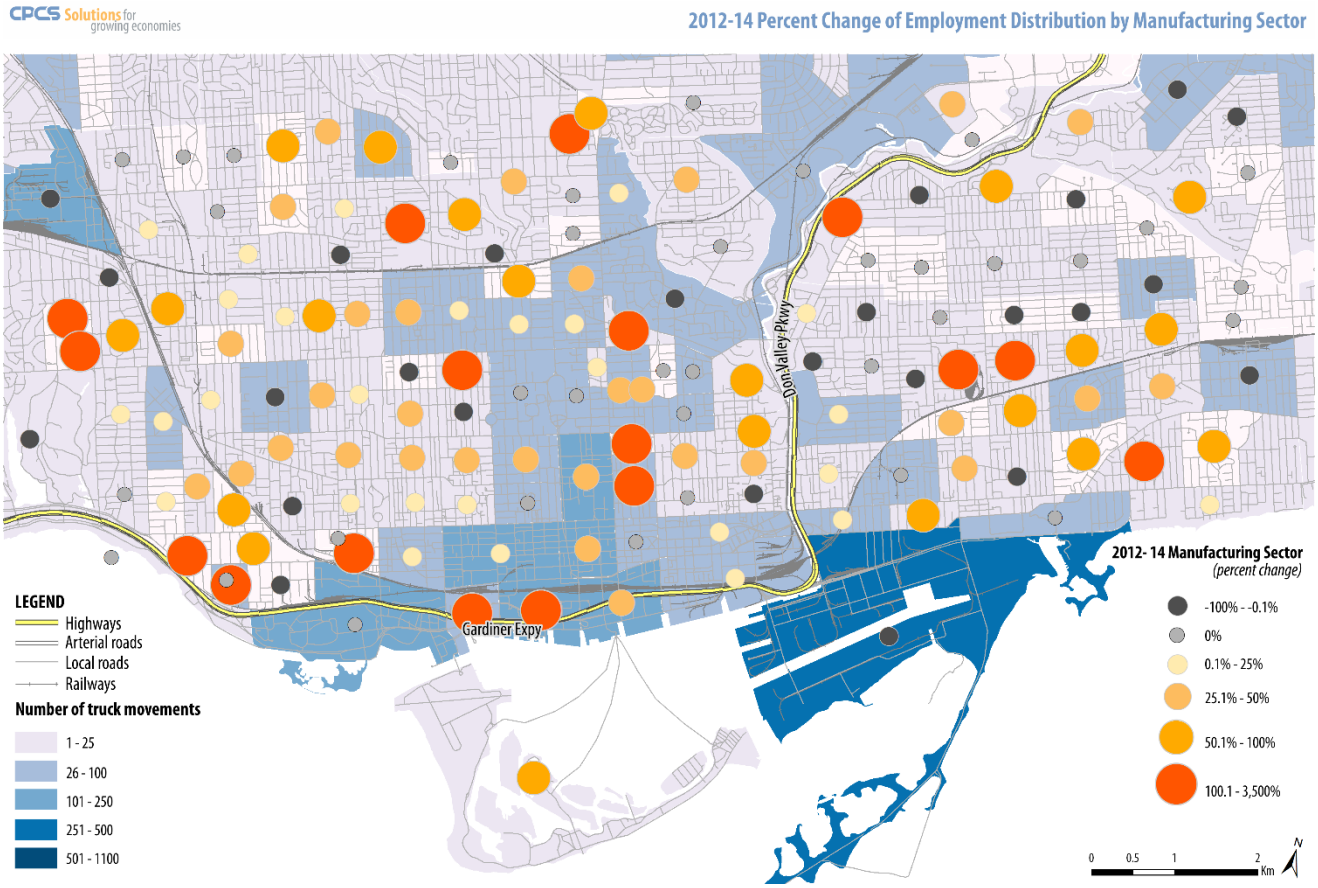
Preferred | Moderately Preferred | Least Preferred

59

Source: Public Forum #3 Presentation, slide 59

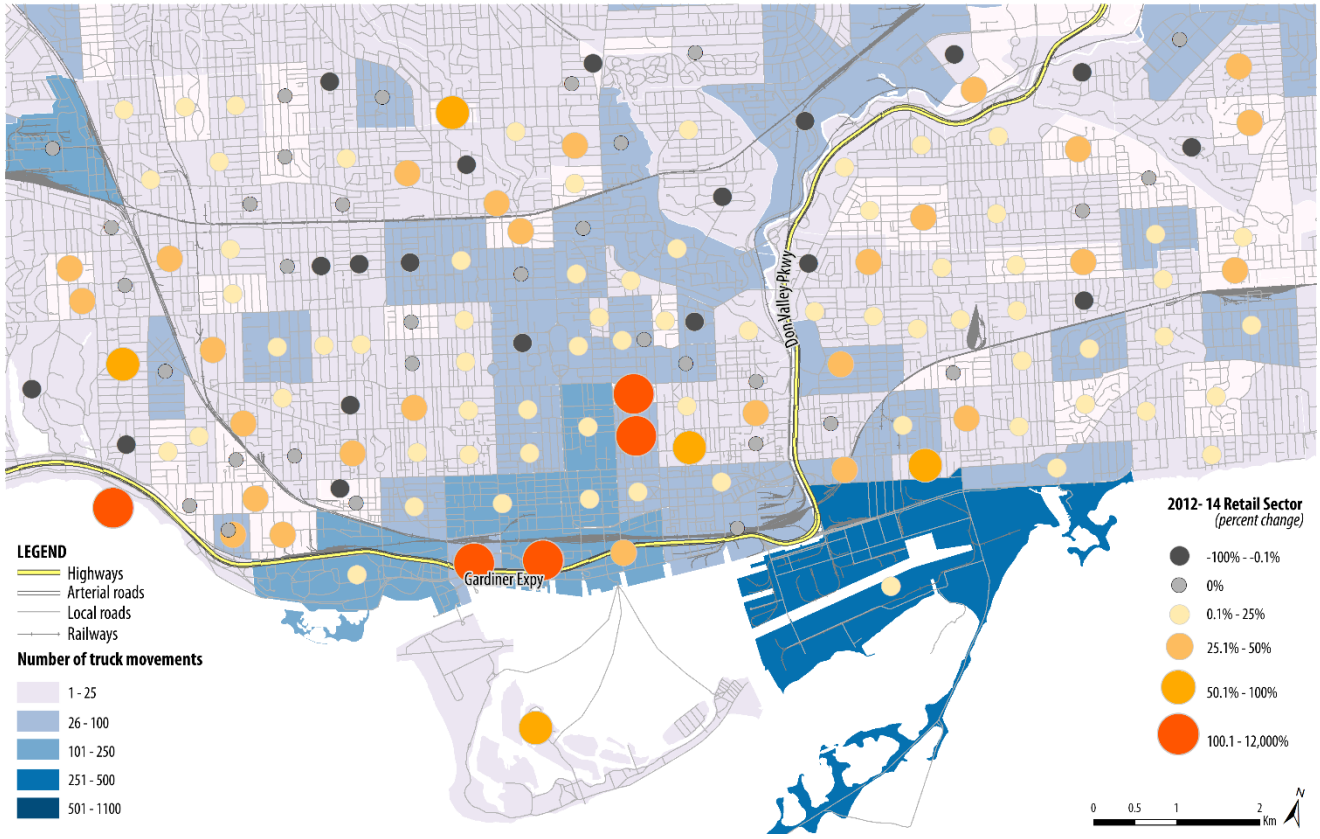
Appendix B: Employment Change by Sector: GIS Analysis

This appendix contains a series of maps on GIS employment data for 2012 and 2014 from Statistics Canada overlayed with truck stop data provided by the Ontario Ministry of Transportation. Some sampling and sampling techniques employed by Statistics Canada have changed between 2012 and 2014 and the results may not be directly comparable. Still, the overall analysis in the maps below should provide some indication as to the changes in goods movement employment experienced in Toronto as well as the key locations. In some cases the percentage change is quite high. This may be due to sampling changes by Statistics Canada or to the establishment of a new business location in the area.



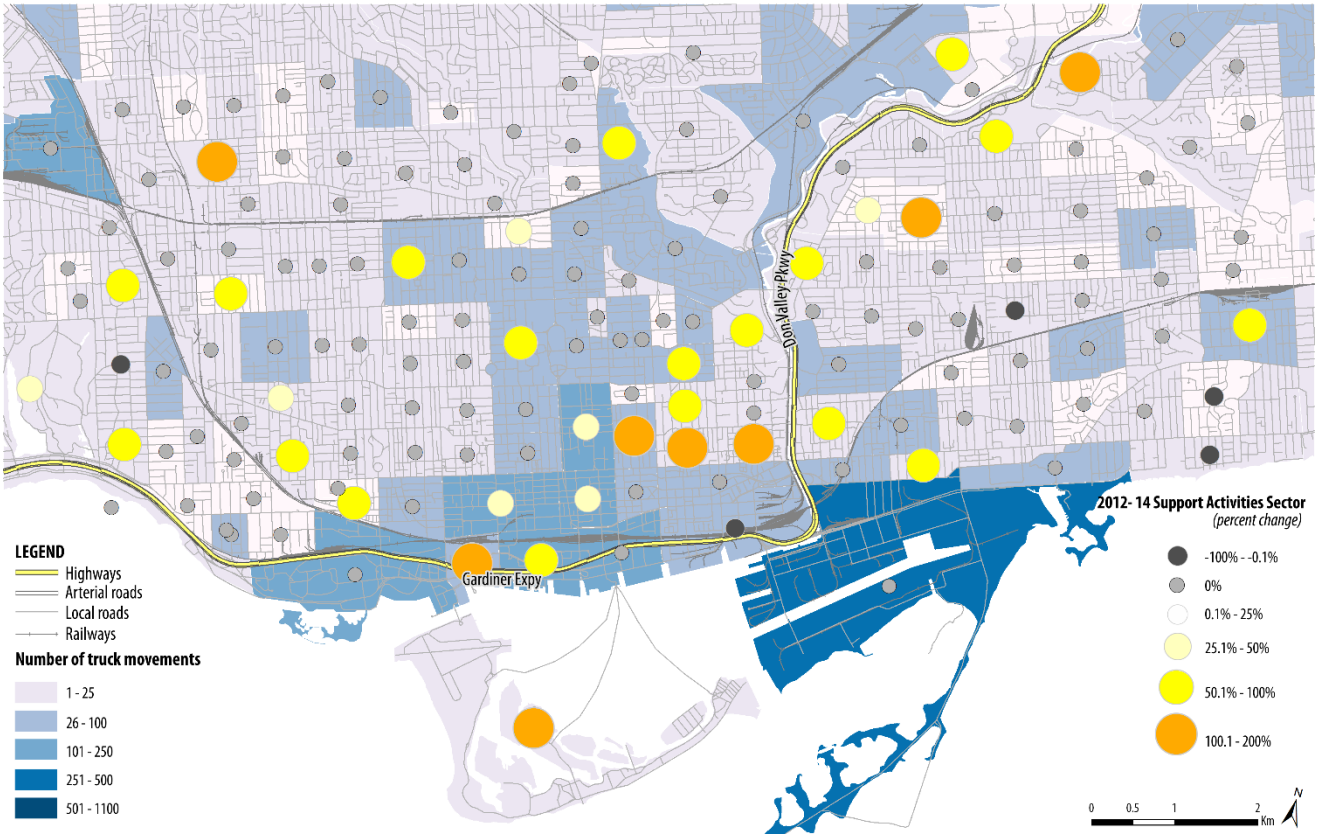
CPCS Solutions for growing economies

2012-14 Percent Change of Employment Distribution by Retail Sector



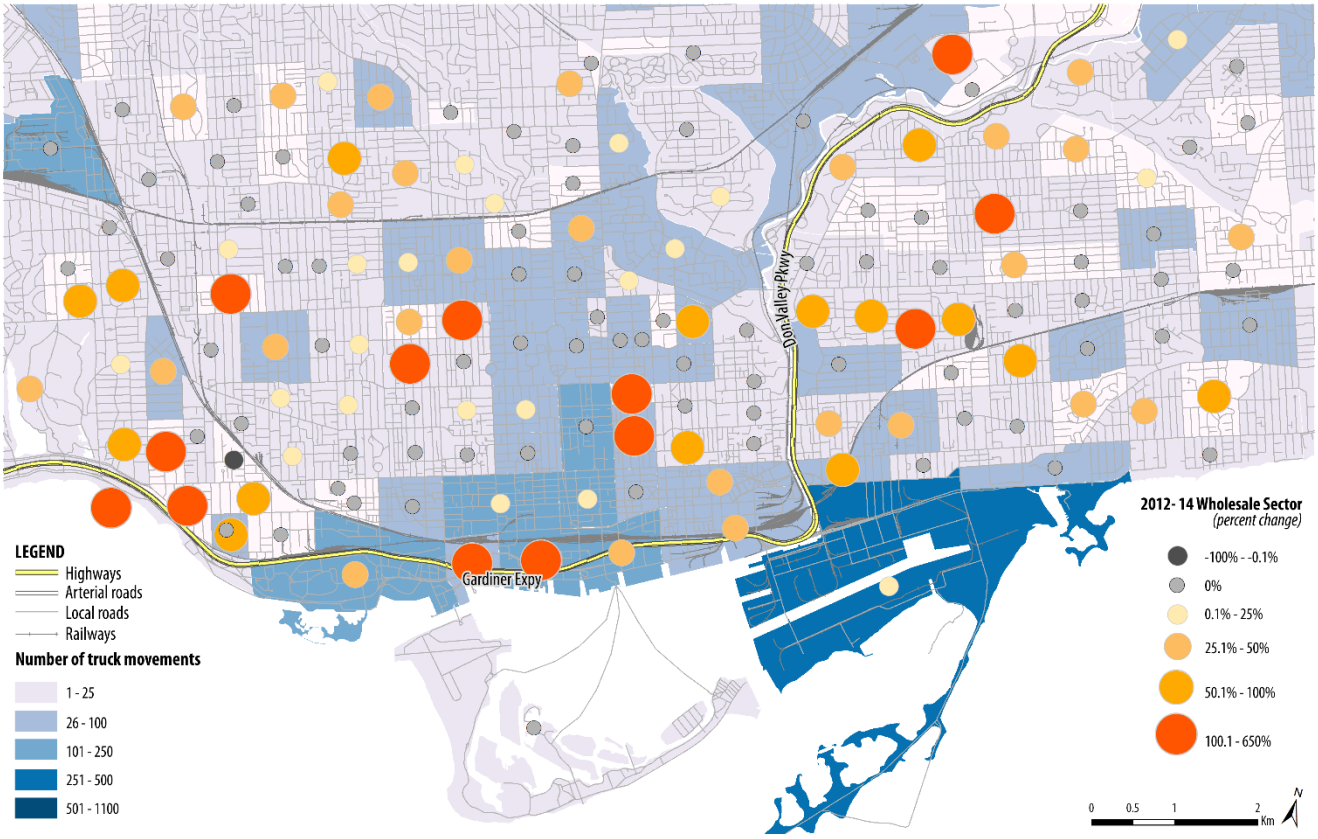
CPCS Solutions for growing economies

2012-14 Percent Change of Employment Distribution by Support Activities for Transportation Sector



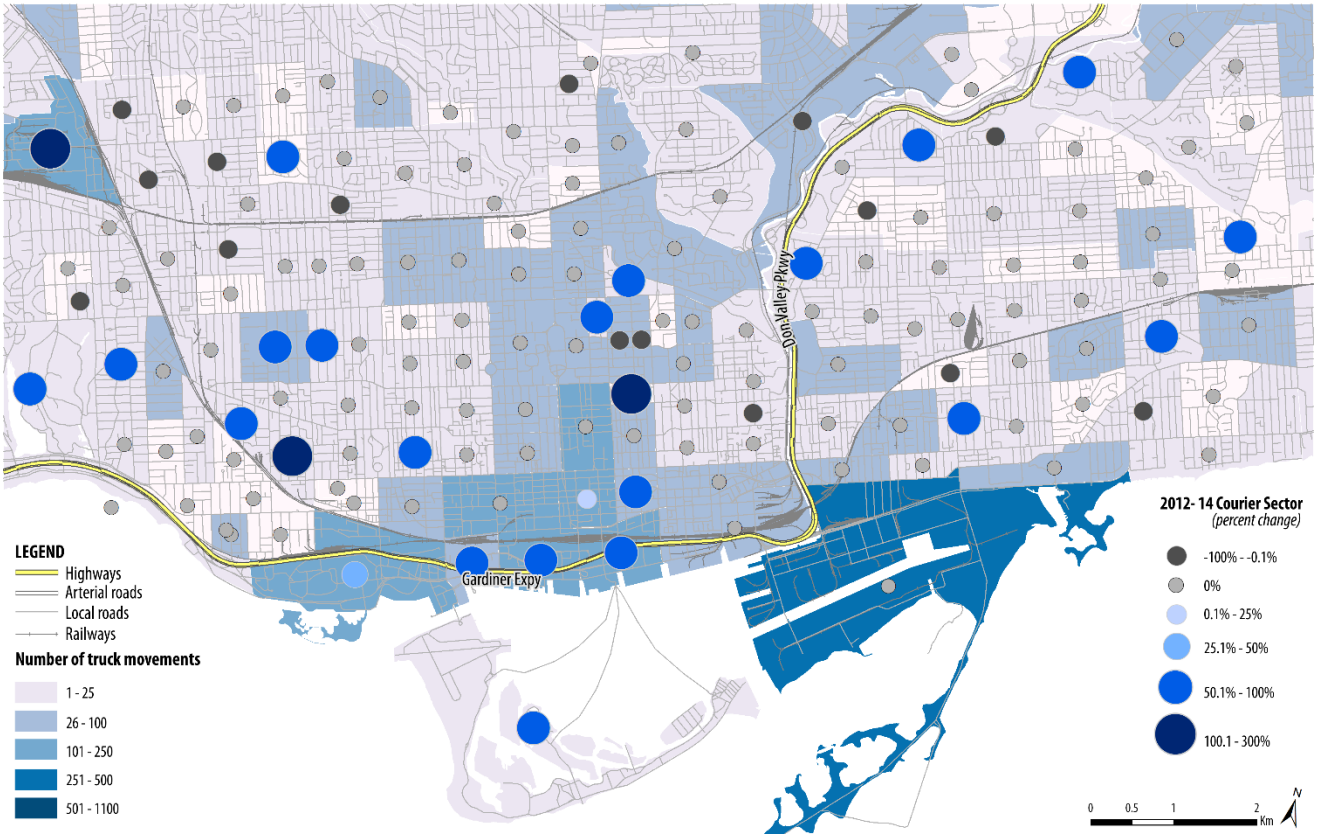
CPCS Solutions for growing economies

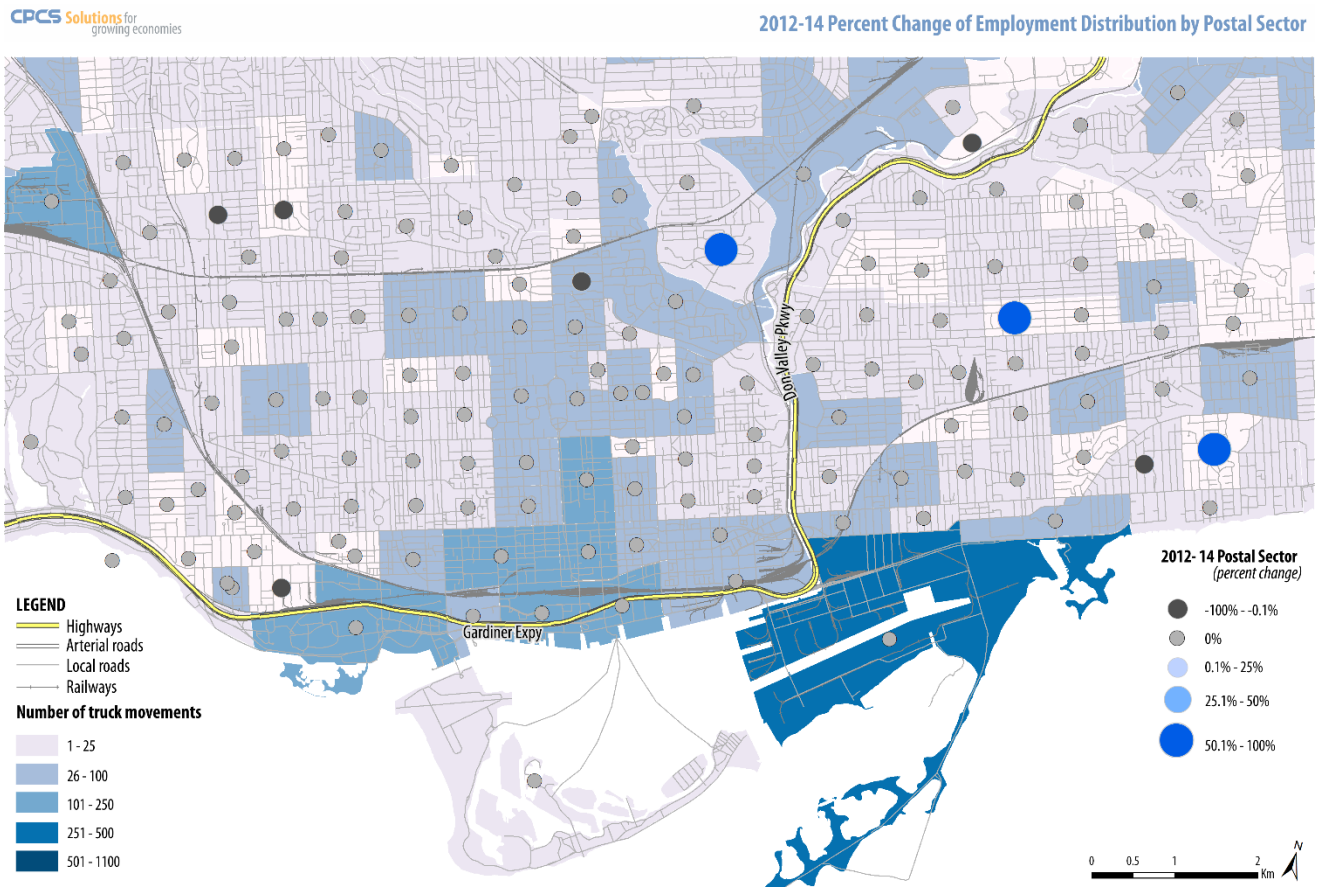
2012-14 Percent Change of Employment Distribution by Wholesale Sector



CPCS Solutions for growing economies

2012-14 Percent Change of Employment Distribution by Courier Sector




CPCS Solutions for growing economies
2012-14 Percent Change of Employment Distribution by Postal Sector
Don Valley Pkwy
Gardiner Expy
LEGEND
Highways
Arterial roads
Local roads
Railways
Number of truck movements
1 - 25
26 - 100
101 - 250
251 - 500
501 - 1100
2012- 14 Postal Sector
(percent change)
-100% - -0.1%
0%
0.1% - 25%
25.1% - 50%
50.1% - 100%
0 0.5 1 2 Km
N

Appendix C: List of Stakeholders Consulted

Stakeholders Consulted

Stakeholder
United Messengers
Toronto Industry Network
Tim Horton's
St. Mary's Cement Group
St. Lawrence Market BIA
Sleep Country Canada
Siltech Corporation
Matt Roorda – Centre for Urban Freight Analysis
Redpath Sugar
Purolator
Ontario Trucking Association
Green For Life Environmental Corp.
First Gulf
Food and Consumer Products Canada
Courier and Logistics Association
Core Logistics International Inc.
CIMCO Refrigeration
Canadian Salt Company Ltd
Burnbrae Farms Inc.

Appendix D: Review of Potential Mitigation Options

Overview of Potential Goods Movement Constraints of the Remove Alternative

Key concerns regarding the Remove Alternative (as compared to the Elevated Expressway alternative) from goods movement stakeholders surround potential increases in travel time, reduction in reliability, and increases in transportation costs. This Chapter will discuss some potential mitigation measures that may be implemented to help reduce the impact on these three factors for goods movement stakeholders.

On a wider basis, the city is growing and experiencing ongoing development and change that will have impacts on goods movement no matter which option is chosen. These impacts are likely to be larger than the comparative impacts of the different options examined here for the Gardiner Expressway in the Study Area. No matter which option is chosen, strategies may need to be adopted to help goods movement stakeholders adapt to the ongoing changes in the City of Toronto and the anticipated increases in demand from passenger and commercial vehicles on roads and highways in the city. Mitigation measures identified in this section may also be applicable no matter which option is chosen under the EA process.

Identification of Mitigation Measures

Mitigation measures fall broadly into two categories: (1) Those that are targeted specifically at goods movement flows, and (2) Those that may reduce general congestion in the corridor and on alternate routes to the corridor, which will in turn improve the flows of goods moving in the corridor.

A key starting document in the management of congestion is the City of Toronto's Congestion Management Plan. This document highlights many key best practices in the management of congestion, Toronto's successes thus far in utilizing these strategies, and plans for wider scale implementation of programs to address congestion.

Key applicable congestion management strategies are mostly proposed to be implemented not only in the corridor but key alternate routes to the corridor. While stakeholders have provided some anecdotal examples of routes they would identify as key alternate routes, identification of a defined list of alternate routes should be constructed in consultation with stakeholders and the City of Toronto and Waterfront Toronto. Potential key alternate routes to be considered could include: Queen's Quay, Richmond, Adelaide, King, Front, Lake Shore Boulevard (in areas in the Study Area where the Gardiner Expressway remains), Dundas, and Bloor.

City of Toronto Congestion Management Plan

The City's Congestion Management Plan identifies congestion as costing $2.7 billion annually in lost economic output and accompanying job loss, in addition to the $3.3 billion it reports as the annual cost in terms of delay and increased vehicle operating costs. The plan identifies eight key strategies with several associated projects per strategy.

Figure 7-2: City of Toronto Congestion Management Plan

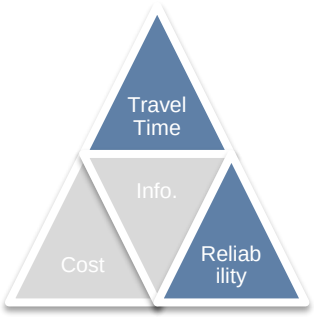
A. Intelligent Transportation Systems	B. Congestion and Engineering Studies	C. Incident and Event Response	D. Construction Coordination
A.1 Replacement of ATMS Software A.2 Enhanced Signal Control Modes A.3 Arterial CCTV Cameras A.4 Arterial Network Monitoring A.5 Update and Expand City Communications Networks A.6 Replacement of hardware	B.1 Auxiliary Signal Timing Plans B.2 Update Corridor Coordination Studies B.3 Active Traffic Management Feasibility Study B.4 Integrated Corridor Management Feasibility Study	C.1 Traffic Incident Management Team Procedures C.2 Service Patrols C.3 Steer It - Clear It Signage Program C.4 Universal Fire Station Pre-emption (Non-vehicle)	D.1 Smart Work Zones D.2 Lane Occupancy Permit Management D.3 Lane Occupancy Permit Review D.4 Work Zone Performance Management and Monitoring
E. Curbside Management	**F. Support of All Modes of Transportation**	**G. Traveller Information**	**H. Traffic Operations Centre (TOC)**
E.1 Parking Charge Review E.2 Develop Parking Strategies E.3 Smart Park	F.1 Transit Signal Priority F.2 HOV - Bus Lane Review F.3 Bicycle Facilities Expansion F.4 Corridor Renewal for Sustainable Transportation	G.1 Traveller Information Strategy G.2 VMSs including Display of Travel Times G.3 Event Database G.4 City Website Improvements G.5 Social Media G.6 Mobile Apps	H.1 Traffic Operations Centre Improvements H.2 Coordination with Emergency Services H.3 Coordination with Transit H.4 Coordination with External Agencies H.5 TOC Operations Coordination

Source: City of Toronto Congestion Management Plan. October 2013.

Mitigation measures proposed to reduce the impact on goods movement industries will build upon Toronto's existing congestion management plan as applicable, as well as propose some additional strategies based on case study reviews and reviews of trends and practices in freight transportation. The following sections review the eight congestion management strategies identified by the City of Toronto, and discuss how they can be best used to mitigate congestion in the GE/LSB corridor and wider Study Area. As relevant, they are also supplemented with additional discussion from review of other jurisdictions and best practice.

Some additional strategies not highlighted in the Congestion Management Plan that may be particularly applicable to goods movement are then also discussed.

Intelligent Transportation Systems



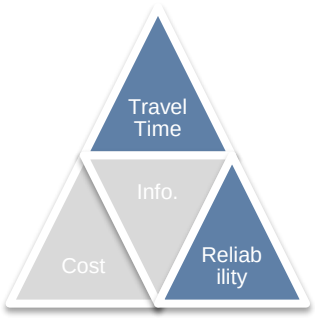
The City of Toronto has already been using Intelligent Transportation Systems (ITS) for years with the RESCU and SCOOT programs. Toronto's Congestion Management Plan notes that in Dallas-Fort Worth the implementation of ITS systems resulted in the equivalent of an estimated 30% increase in capacity.

A. Intelligent Transportation Systems
A.1 Replacement of ATMS Software
A.2 Enhanced Signal Control Modes
A.3 Arterial CCTV Cameras
A.4 Arterial Network Monitoring
A.5 Update and Expand City Communications Networks
A.6 Replacement of hardware

In terms of the initiatives identified by the City of Toronto a few may have particular applicability to support the reduction of congestion in the corridor and alternate routes, and speeding up the movement of goods in the corridor as a by-product of addressing overall congestion:

- Roll out enhanced signal control systems on intersections in the corridor as well as on key alternate routes
- Add additional CCTV cameras to corridor and key alternate routes
- Collect additional updated traffic flow data on key alternate routes to the corridor in order to prioritize actions on these routes

Congestion and Engineering Studies



One of the key initiatives identified by the City under this strategy is traffic signal coordination studies. The Congestion Management Plan predicts that traffic signal work completed in 2012 at 112 intersections along three corridors reduced traveller delays by 12%, number of vehicle stops by 12% and fuel consumption by 8%. The overall benefit/cost ratio of these activities was estimated at 66:1.[27] It is worth emphasizing the magnitude of the benefit/cost ratio estimated of this intervention. No infrastructure expansion plan or large capital intensive congestion management

B. Congestion and Engineering Studies
B.1 Auxiliary Signal Timing Plans
B.2 Update Corridor Coordination Studies
B.3 Active Traffic Management Feasibility Study
B.4 Integrated Corridor Management Feasibility Study

[27] City of Toronto. *Congestion Management Plan.* 2014-2018

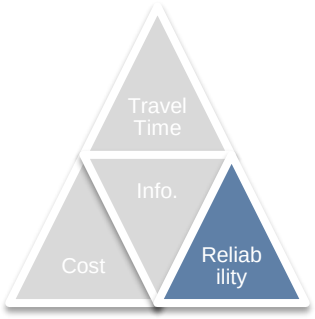
strategy would ever be expected to obtain benefit/cost ratios remotely approaching what has been estimated by the City under this program.

In 2014 such studies were carried out by the City on six corridors with 250 signals including: Sheppard Avenue East, Leslie Street, Islington Avenue, and Yonge Street. As a result of these studies total delay was reduced between 4-18% and reduced fuel consumption and associated emissions of between 1-7%.[28]

On the basis of the results achieved thus far, similar programs should be fast tracked for the corridor and alternate routes and other streets in the area where they have not already been carried out. Given such benefit/cost ratios it is recommended such programs be greatly expanded to aid congestion management in the corridor, alternate routes, and wider Study Area whether or not the Remove Alternative or an Elevated Expressway alternative is chosen under the EA process.

C. Incident and Event Response
C.1 Traffic Incident Management Team Procedures
C.2 Service Patrols
C.3 Steer It - Clear It Signage Program
C.4 Universal Fire Station Pre-emption (Non-vehicle)

Incident and Event Response



Traffic incidents are one of the key causes of delays and congestion on roadways. The efficient management and response to incidences can increase travel reliability and improve overall traffic flows on road and highway infrastructure. One of the key concerns identified by stakeholders under the Remove Alternative was the removal of an alternate routing (elevated expressway) in the event of an incident. For example, if there is an incident on the Gardiner, commercial vehicles can plan ahead and exit the Gardiner before the incident and use the Lake Shore Boulevard.

Conversely, the Remove Alternative may allow for design changes that could increase safety and reduce incidents in the corridor as well as increased accessibility for response vehicles that could allow for quicker response times to incidents than would be allowable comparably in the limited-access elevated expressway.

The City's RESCU system on the expressways currently represents a key asset in incident management. RESCU cameras currently exist on the Gardiner Expressway at several points in the Study Area. Under the Remove Alternative, RESCU cameras should be replaced at key points on the surface route to allow for real time information. Signage in support of the City's Steer It

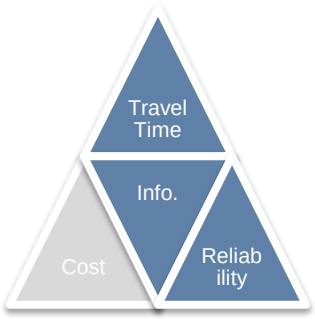
[28] City of Toronto. *Staff Report: Congestion Management Plan 2014-2018 – Update*. December 9, 2014.

- Clear It Program[29] should be prioritized in the corridor and key alternate routes if the Remove Option is elected.

Additionally, an ongoing feasibility study on exploring the potential for implementing roving service patrol vehicles along the Don Valley Parkway and Gardiner Expressway may result in additional options for more active incident management strategies for the corridor. Such strategies could lead to further reductions in incident response time and consequent reductions in the costs of delays caused by those incidents.

Construction Coordination

D. Construction Coordination
D.1 Smart Work Zones
D.2 Lane Occupancy Permit Management
D.3 Lane Occupancy Permit Review
D.4 Work Zone Performance Management and Monitoring



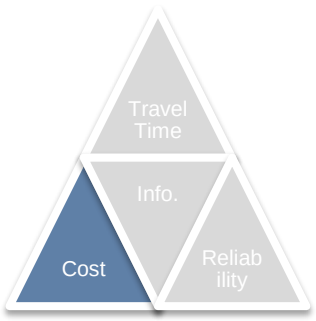
The impact of construction has been identified by stakeholders as one of the key concerns of the Remove Alternative. Stakeholders may presently not appreciate the impact of construction that the Elevated Expressway alternative would also represent on traffic flows. A coordinated campaign to educate goods movement stakeholders regarding the traffic disruptions from construction will allow stakeholders to plan ahead and allow for additional time for trips that need to be made or make other adjustments to their supply chains as applicable. In Los Angeles, an automated work zone information system was found to reduce vehicle hours of travel by 37% due to traffic diversion to alternate routes.[30]

Smart work zone systems including the use of cameras, vehicle detectors, and portable electronic messaging signs should be used as a part of the traffic management campaign during construction period under the Remove or perhaps also the Elevated Expressway alternatives. In Arizona, the smart work zone on SR-68 measured travel times on the work zone and reported the information to motorists to allow them to make real time route decisions; this was estimated to reduce traffic congestion from construction. The same system was used to monitor construction contractor performance, with financial incentives tied to traffic performance.

[29] Program encourages motorists involved in property damage only collisions on expressways to move their vehicles to a safe place if possible.
[30] City of Toronto. *Congestion Management Plan.* 2014-2018

E. Curbside Management
E.1 Parking Charge Review
E.2 Develop Parking Strategies
E.3 Smart Park

Curbside Management

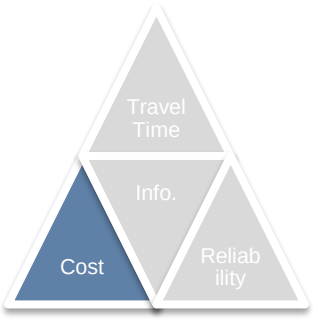


Though not directly related to the impacts of the Remove Alternative, many goods movement stakeholders mentioned parking availability for deliveries as a significant constraint to their operations in downtown Toronto. Time spent circling and looking for parking, or fines imposed when vehicles park illegally (stakeholders indicate sometimes they do not feel there are any options available) create real costs for goods movement stakeholders.

If the Remove Alternative results in increased travel times and/or reduced reliability, such costs may be partially offset for some stakeholders by an expansion of programs designed to increase the availability of parking and stopping areas for commercial vehicles making deliveries in the city. The City has recently implemented a courier zone pilot program in the downtown core to assist in the delivery of goods. Initial observations from the City were that these dedicated zones were being utilized during the defined times. The expansion of this program, especially within the transportation Study Area, would result in additional parking options available that would likely increase delivery costs for goods movement stakeholders.

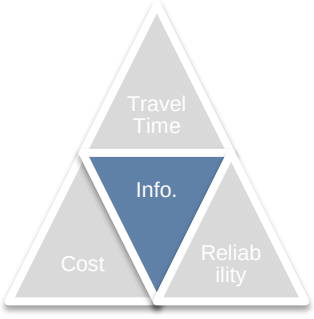
F. Support of All Modes of Transportation
F.1 Transit Signal Priority
F.2 HOV - Bus Lane Review
F.3 Bicycle Facilities Expansion
F.4 Corridor Renewal for Sustainable Transportation

Support all Modes of Transportation



While it is unlikely that goods movement stakeholders will change modes of transport used no matter whether the Remove or Elevated Expressway alternatives are proposed, supporting multimodal transportation can reduce passenger vehicle traffic, which in turn increases travel speeds for goods movement vehicles remaining. Separate discussion is included below regarding the use of HOV/HOT lanes, which has been mentioned as an initiative under this strategy.

Traveller Information



The availability of information allows stakeholders to make informed decisions regarding routing and transportation of goods. Some discussion is already contained above in obtaining additional real-

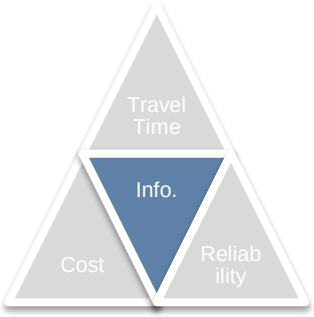
time traffic data and communicating real time traffic conditions, especially during construction periods when impacts on goods movement in the corridor may be highest. In Houston, Texas, real time travel information posted was shown to influence drivers' route choices: 85% of respondents stated they changed their route based on the information provided and 66% said that they saved travel time as a result. Variable-message signs (VMS) are one of the most direct ways to communicate with goods movement stakeholders regarding real-time traffic conditions. Information can also be shared with mobile applications or with carriers and fleets.

G. Traveller Information
G.1 Traveller Information Strategy
G.2 VMSs including Display of Travel Times
G.3 Event Database
G.4 City Website Improvements
G.5 Social Media
G.6 Mobile Apps

H. Traffic Operations Centre (TOC)
H.1 Traffic Operations Centre Improvements
H.2 Coordination with Emergency Services
H.3 Coordination with Transit
H.4 Coordination with External Agencies
H.5 TOC Operations Coordination

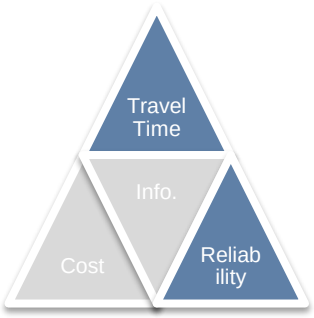
Traffic Information Centre

The City of Toronto has also identified several initiatives for the City's Traffic Operations Centre (TOC). This is the main centralized body to monitor and coordinate traffic conditions with other agencies such as public transit, government bodies, and emergency services, among others. While no specific initiatives have been identified under this category for goods movement, ongoing improvements planned will benefit the overall management of traffic and therefore the movement of goods throughout the City.



Off-Peak Deliveries

Off-peak delivery has been in use in a number of cities, most notably London and New York. Some businesses (e.g. those staffed 24 hours) have seen clear benefits, but for many off-peak delivery entails an additional cost. Thus, either the benefits in the form of passed-through savings and/or financial incentives must outweigh these costs, or new technologies and systems must bring down the cost of off-peak delivery.



Case Studies of Off-Peak Delivery Models

In London, the higher costs of freight transportation during the 2012 Olympic Games led many businesses to adjust their delivery schedules, including to the night-time. However, when the Games were over these businesses mostly reverted to their previous practices.

In New York, financial incentives were used to attract businesses to a night delivery trial. Receivers moving to unassisted night delivery largely retained these methods after the trial was over, due to the increased convenience and reliability.

London

Over 80% of freight in London moves by truck, with congestion being the biggest cost to the movement of goods in the city at £800 million per year and freight activity expected to increase by 15% by 2025.[31] In 2008, 33% of warden-issued penalty charges and 59% of camera PCNs (fines for parking/loading) were issued to commercial vehicles in 2008. In 2007, there were 419 incidents resulting in death or serious injury related to collisions involving commercial vehicles.

London has been a leader in off-peak deliveries, having implemented a number of off-peak trials. Much of the focus in London has been on making off-peak delivery quieter. In November 2014 the city hosted the Quiet Cities Global Summit for operators, customers, and policymakers, where Transport for London (TfL) released a guidance for fleet operators making off-peak deliveries[32] and where exhibitors showcased new urban freight products, such as DHL's bespoke 'city quiet' gas-powered truck. TfL's guidance was based on the experiences of the Re-timing Deliveries Consortium, a joint effort of freight industry representatives, retailers, and several London boroughs, which is conducting trials on quiet delivery technology and practices.

The UK's Department for Transport (DfT) spearheaded Quiet Delivery Demonstration Scheme (QDDS) trials in 2010 at six retailer premises, predominantly supermarkets, across England.[33] A larger trial was led by TfL during the 2012 Olympic Games. Building on these, the DfT has prepared a good practice guide for retailers, operators, and local authorities.[34] The Freight Transport Association, one of the partners of these studies, has also prepared a toolkit for implementing night-time delivery trials.[35]

Surveys found that 57% of businesses and 58% of freight operators made at least one change to their operations during the Olympic Games (1,000 of each were surveyed) – 41% of businesses changed delivery times; 5% retained these changes after the Games. Night-time deliveries were used by 15% of businesses. The biggest barriers to night-time delivery cited by businesses were cost increases (e.g. staffing costs), night-time delivery restrictions, and

[31] National Cooperative Freight Research Program. *Report 14: Guidebook for Understanding Goods Movement*. 2012
[32] Transport for London, Re-timing Deliveries Consortium, *Getting the timing right: Making the most of quieter times for deliveries.* 2014.
[33] Department for Transport, with the Freight Transport Association and the Noise Abatement Society. *Quiet Deliveries Demonstration Scheme: Case Studies.* 2011.
[34] Department for Transport, *Quiet Deliveries Good Practice Guidance* (several documents for various different stakeholders: see http://www.fta.co.uk/export/sites/fta/_galleries/downloads/delivery_improvement.pdf)
[35] Freight Transport Association, *Delivering the goods: a toolkit for improving night-time deliveries.*

unsupportive customers. TfL noted that other motivational factors would need to be in place to sustain shifts to night delivery.[36]

A smaller, separate trial in the borough of Wandsworth was carried out by Sainsbury's (third largest supermarket chain in the UK) working with a local organization called the Noise Abatement Society. Between October and December, the trial was found to have:

- Reduced the maximum recorded noise level by 8-10 decibels by using dock curtains
- Reduced average delivery vehicle journey times by 60 minutes over a round trip from the distribution centre
- Produced a savings in drivers' time of two hours per day
- Removed 700 vehicle journeys from the road annually
- Increased store sales by 5-6% because of product availability at opening time (as opposed to receiving throughout the day)

New York

A study for the New York City Department of Transportation (NYC DOT) found that increased truck tolls, for example those implemented on the Tappan Zee Bridge, were minimally effective at changing delivery schedules.[37] Financial incentives to receivers were found to be somewhat more effective. A 2007 study of Manhattan showed that every $2,000 in tax deductions to receivers would increase carriers' off-peak delivery market share by around 1-2 percentage points.[38] A combination of commercial vehicle tolls and tax deductions would have the largest effect.

New York carried out a 2010 pilot project to shift Manhattan deliveries to night hours with businesses including Sysco, Whole Foods, New Deal Logistics, and Foot Locker. Receivers gained improvements in reliability and higher staff productivity, while carriers saved time and money from faster speeds, shorter unloading times and fewer parking tickets.

The night delivery was of two kinds: staffed and unstaffed. The pilot project found that **all of the receivers trying staffed night delivery reverted back after the pilot project, whereas almost all receivers doing unassisted delivery retained night delivery.**

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[36] Transport for London. *Olympic legacy monitoring: Adaptations to deliveries by businesses and freight operators during the Games. Travel in London supplementary report.* 2013.

[37] Cambridge Systematics. Technical memorandum prepared for the New York City Department of Transportation and the New York City Economic Development Corporation. *Congestion Mitigation Commission Technical Analysis: Night Delivery Incentives.* 2007.

[38] Holguín-Veras et al, Journal of the Transportation Research Board, No. 1966. *Effectiveness of Financial Incentives for Off-Peak Deliveries to Restaurants in Manhattan, New York.* 2006.

The key findings relating to receivers were[39]:

- Superior reliability of off-peak delivery compared to regular-hour delivery
- Ability to rectify delivery errors earlier in the day, with less of an impact on business operations compared to regular delivery
- Off-peak delivery can be performed safely, with neither the driver nor the business at risk
- Off-peak delivery can have minimal impact on local communities (no noise or other complaints received during the pilot)
- Superior reliability, reduced inventories, and more efficiencies in staff usage resulting from unassisted delivery compared to staffed delivery
- Participants reported that fewer daytime deliveries allowed shops and restaurants to focus more on their customers and staff were more productive since they were not waiting for deliveries
- Time spent by carriers at the receiver's location was reduced from 1.8 hours to 0.5 hours
- Travel times from depot to the first stop in Manhattan improved by 75%

The attractiveness of unassisted delivery was affected by whether the business had a trusted vendor, and also the risks perceived by the business. It was noted that the optimal level of off-hours delivery for a single receiver was typically much less than 100%. Generally, the trade-off between staffed and unstaffed delivery is between cost and risk. Inclination to participate in unassisted delivery was highest for mid-sized companies with 16-20 employees.

In the Manhattan case study, the effects of various incentives on receiver participation in unassisted off-peak delivery were studied. A one-time financial incentive to receivers ranging from $1,000 to $9,000 was found to be effective up to $4,000, above which level financial incentives have little effect. An incentive of $4,000 increased participation by 16.4% (compared to no incentive), while carrier discounts of 50% increased participation by 20.6% (compared to no discount). Business support services and public recognition had a modest effect of under 5% apiece.[40]

Some of the systems and technologies that can facilitate unassisted delivery are:

- Giving the carrier access to a receiving area by key or keypad, where the receiving area may be separated by locked door from the rest of the premises
- A "virtual cage" using laser beams that activates an alarm if penetrated

[39] Holguín-Veras et al, Transportation Research Board, *Unassisted Off-Hour Deliveries and Their Potential Role in Freight Transportation Demand Management: Results From an Attitudinal Survey.* 2013.
[40] Holguín-Veras et al, 2013

- Giving the carrier a separate key providing access to a box that contains the key to the receiving area

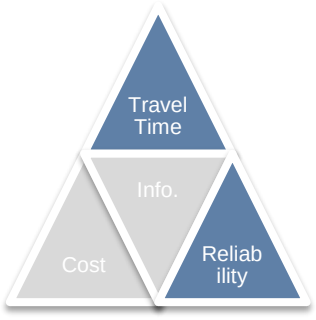
Key Lessons

Although Off-Peak Delivery programs may appear simple and straightforward solutions, both the supply chains of industries affected as well as existing laws and regulations can provide hurdles to program implementations. Challenges, for example, include increased noise pollution that may be caused by overnight deliveries (vehicles backing up, vehicles unloading, etc.) especially in mixed-use areas with residents close by.

While transportation costs for carriers are much less during off-peak hours, many receivers are not equipped to receive deliveries at night. Generally, receivers do not deem the cost of staffing for overnight deliveries to be worth the benefits of potentially increased transport costs or more reliability and reduced travel time in deliveries. In both London and New York, assisted deliveries (where the receiver paid staff overnight to receive the delivery) were not continued after trial periods were complete. In the New York case, where financial incentives were provided to encourage receivers to invest in technologies to allow for unassisted deliveries, most receivers elected to continue with off-peak deliveries once they had the systems in place to receive them unassisted.

Off-peak deliveries may be used as a strategy to address increased congestion as a result of the Remove Alternative or as a result of the general wider increase in congestion resulting from growth in the city, but likely these will require planning for noise reduction strategies on the carrier side and providing programs or incentives to encourage receivers to develop systems to allow them to receive deliveries unassisted.

Preferential Lane Treatments



Truck Only Lanes

While currently not widely used, truck lanes are an alternative that can facilitate reliable, efficient goods movement in an urban area. Truck lanes have typically been implemented or proposed on routes that are highly congested and either provide access to important ports or intermodal facilities or are on significant truck through routes. For example, the Clarence Henry Truckway in Louisiana provides access to the Port of New Orleans. In the Los Angeles area, dedicated truck lanes exist on I-5 and are being considered on I-710, which connects I-5 to the ports of Los Angeles and Long Beach. In Chicago, a two-lane “Mid-City Freightway” has been proposed as a grade-separated bypass road and intermodal connector.

A feasibility study in southern California suggests a minimum of 30% trucks with peak hour volumes greater than 1,800 veh/lane.[41] The cost of financing truck-only lanes is a complicated and controversial issue. Most proposals have assumed that new lanes should be paid through tolls, but there are various disagreements about whether non-users should contribute, either because of benefits related to congestion reduction or because of the equity truck operators may have in existing roads.[42]

Truck lanes have often been proposed as large-scale facilities, sometimes with their own on- and off-ramps, but there are also cases where simpler urban truck-only roads have been built. A good example is the South Boston Bypass Road in the growing Seaport District, which received federal funding as part of the Big Dig construction project and was intended to redirect truck traffic from I-93. This two-lane road, grade-separated at most intersections, is restricted to commercial vehicles, with simple signposts indicating its restricted use. However, there are increasing pressures to open up the road to all vehicles. In 2014, road usage nearly tripled when it was temporarily opened to regular traffic during the closure of the Callahan Tunnel. The Massachusetts DOT intends to launch a pilot project in 2015 allowing public use of the road in the northbound direction between 6:00 and 10:00am on weekdays.

Reversible Flow and Peak Shoulder

Reversible flow lanes use either signs or movable barriers to increase road capacity in the high-demand direction. Toronto has experience with these with the Jarvis Street fifth lane. Examples of roads that use movable barriers include the Tappan Zee Bridge in New York and the San Diego-Coronado Bridge in California. HOV restrictions can be combined with reversible flow lanes.

The state of Colorado is implementing peak period shoulder lanes on the I-70 toward Denver. This will allow the centre shoulder lane to serve as a third travel lane at peak hours, reducing congestion. In this case, the lane will also be priced. While there may not be the availability of a shoulder on the proposed Lake Shore Boulevard surface route, implementing peak shoulder lanes may be possible in other parts of the corridor where goods movement vehicles travel (for example further west on the Gardiner or on northern parts of the DVP where GO buses currently use shoulder lanes). While this may not change the travel time in the surface route east of Jarvis, this would reduce the overall travel time of a goods movement trip using that route and mitigate the impacts of any increase in travel time associated with the Remove Alternative.

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[41] Southern California Association of Governments, cited in US DOT Federal Highway Administration, Forkenbrock and March, *Issues in the Financing of Truck-Only Lanes.* 2005.
[42] FHWA, 2005

Use of shoulder lanes during peak travel times is also used internationally in countries like Germany and the UK. This strategy is often combined with speed harmonization, such that the lane becomes available for use when upstream congestion causes the traffic speed to drop. Emergency call boxes are provided at refuge areas to support safe operation in case of vehicle breakdown or accident.

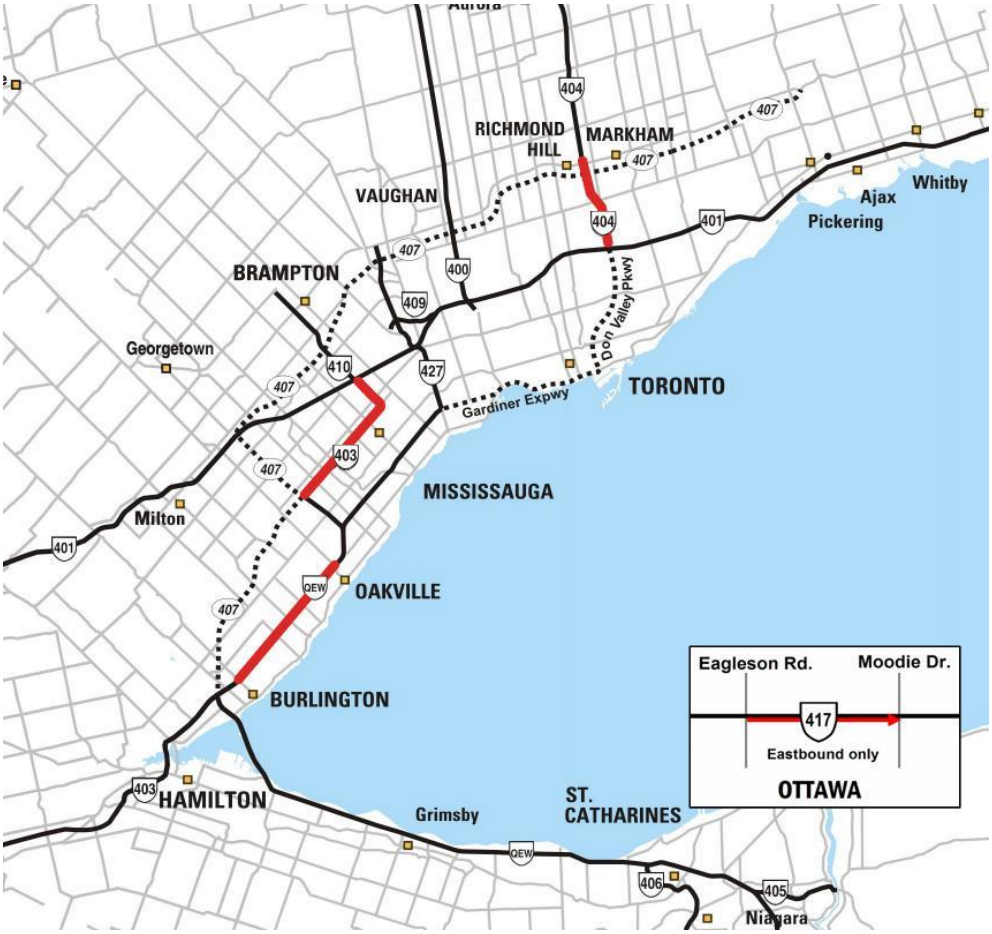
HOV Lanes

The simplest approaches in preferential lane treatments are most notably high occupancy vehicle (HOV) lanes. Such lanes have been in use since at least 1969, when they were introduced on the I-395 in Virginia between Washington D.C. and the Capital Beltway. HOV lanes have rapidly increased in popularity since the 1980s. HOV lanes are used on five arterial corridors in the City of Toronto and have been used on Toronto-area highways since 2004.

HOV lanes vary in their operating characteristics in a number of ways, including number (one lane or several), type (left or right), separation (stripes, buffers, or barriers), access (continuous, intermediate, or none), minimum number of patrons (typically two or three), hours of operation (all day or at peak periods), and alternative eligibility (e.g. buses, motorcycles, alternative fuel vehicles).

In the GTHA, there are several HOV lanes currently in place managed by the Ontario Ministry of Transportation. These lanes are accessible to passenger vehicles and commercial trucks less than 6.5 metres long carrying at least two passengers.

Figure 7-3: HOV Lanes Maintaned by the Ontario Ministry of Transportation



Source: Ontario Ministry of Transportation

HOV lanes are a part of the demand-side management of congestion that encourages passengers to carpool and allow for a more efficient utilization of the existing road infrastructure. MTO plans to expand the use of HOV lanes on the 400 series highways over the coming years to better manage congestion of the highways.

In order to lessen the impact of congestion from the Pan American Games, the Province of Ontario is planning on implementing a widely expanded network of “priority lanes” during the games; these lanes will be dedicated to high-occupancy vehicles (3+), transit, and Games Family. The lanes will be implemented in advance of the games to allow travellers to adjust to the lanes prior to large increases in traffic expected as a result of the games. Below is a proposed network of priority lanes in the downtown region, including through the Study Area.

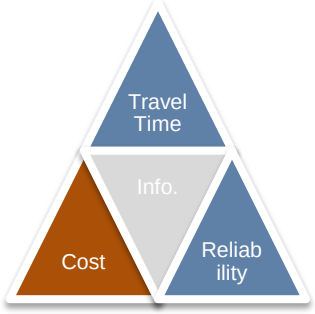
Figure 7-4: Proposed HOV/Priority Lanes to be Implemented for 2015 PanAm Games

Source: Let's Go: Toronto 2015 Pan Am/Parapan Am Games Strategic Framework for Transportation

The implementation of these lanes through the Study Area and the GE/LSB corridor will allow for a real test evaluation of the effectiveness of HOV lanes in managing congestion in the corridor. This should be monitored and evaluated as a part of the identification of preferred mitigation measures in the event the Remove Alternative is chosen as the preferred option.

The proposed priority lanes include access for transit vehicles and Games Family. A more guaranteed method of mitigating impacts on reliability and travel time for commercial vehicles under the Remove Alternative would be the inclusion of commercial vehicles in those vehicles permitted in proposed HOV lanes through the corridor. Such a proposal would need to be examined in the context of the effectiveness of the Pan Am Games program and the feasibility,

safety, and desirability of prioritizing commercial vehicles in addition to high occupancy vehicles through the corridor.



HOT Lanes

High Occupancy Toll (HOT) lanes are similar to HOV lanes, except they also permit single occupant vehicles provided such vehicles pay a toll. This allows those most willing to pay for preferential travel time and reliability to do so. Many argue that traditional HOV lanes are often under-utilized and therefore are not an efficient use of road infrastructure (i.e. actually reduce road throughput). HOT lanes allow for additional traffic to pay for the reduced travel time and increased reliability that HOT lanes provide.

The creation of an HOT lane in the GE/LSB corridor and potentially on the Don Valley Parkway (for example using existing GO Bus exclusive lanes) that is accessible to commercial vehicles willing to pay would provide a mitigation tool for goods movement stakeholders who deem the costs of the increased travel time to be greater than the costs of the HOT lane (i.e. they save money by using the HOT lane as this allows for quicker travel). Decisions on when to use HOT lanes may depend on goods being moved, delivery schedules and supply chains, and traffic conditions on a particular day, among other reasons. In this case, stakeholders using a HOT lane would be exchanging improvements in reliability and travel time for increased transport cost (cost of toll).

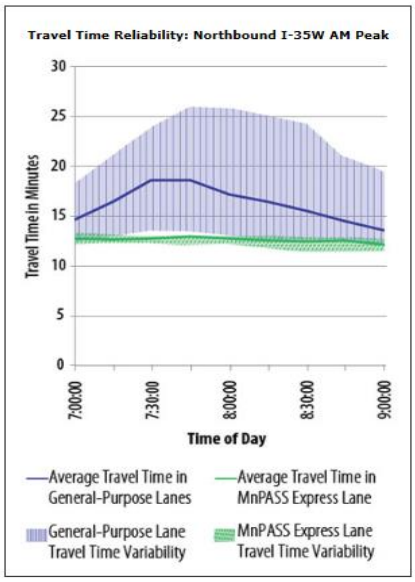
The table below summarizes some key HOT lanes in urban areas in the United States.

Figure 7-5: HOT Lanes in the United States

Corridor	Metropolitan Area	Free Travel	Maximum Price
I-15	San Diego	2+ person vehicles, low emission vehicles	$0.50 to $8
IH 45, US 59, US 290, I-10	Houston	2+ to 3+ person vehicles	$1 to $7
I-394, I-35	Minneapolis	2+ person vehicles	$0.25 to $8 for each of two segments
I-25	Denver	2+ person vehicles	$0.50 to $5
I-15	Salt Lake City	2+ person vehicles, C Decal clean vehicles	$0.25 to $1 for each of 6 payment zones
SR 167	Seattle	2+ person vehicles	$0.50 to $9
I-95	Miami	3+ person vehicles, hybrid vehicles	Was $0.50 to $10.50 – now Phase 2 to open spring 2015
I-680	San Jose (Alameda County)	2+ person vehicles, low-emission vehicles	$0.30 to $7.50

SR 91	Los Angeles (Orange County)	3+ person vehicles (free or 50% discounted)	$1.45 to $9.85
I-85	Atlanta	3+ person vehicles	$0.01 to $0.90 per mile
I-110 and I-10	Los Angeles	2+ to 3+ person vehicles, clean air vehicles	$0.25 to $1.40 per mile
I-95, I-495	Washington D.C. (Virginia)	3+ person vehicles	$0.20 to $1.50 per mile

Source: CPCS research (State agencies, websites accessed 2015)



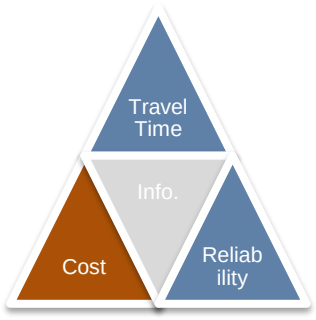
Minneapolis Case

Source: USDOT FHWA 2013

Minneapolis – HOT Lane Implementation

In Minneapolis, the conversion of HOV to HOT lanes has resulted in increased peak throughput. Corridor peak throughput increased by 5% on I-394, and by 6.5% and 9% in the am and pm peak periods, respectively. There was also evidence of increased travel speeds in the general lanes as traffic was spread out more evenly across the roadway: a 6% growth in the case of the I-394 (maintained from 2006 through at least 2012).[43]

Compared to general-purpose lanes, the major advantages of HOT (as well as HOV) lanes are travel time and reliability. The HOT lanes on the I-35 achieve time savings of up to 6 to 7 minutes compared to general-purpose lanes, and have substantially lower variability in travel time (see graphic).[44]



Other Pricing Strategies

In addition to these corridor-based measures, several cities in the world have adopted cordon-based congestion pricing schemes in the city centre.

[43] US Department of Transportation, *Post-hoc evaluation of a HOT lane implementation in Minneapolis-St. Paul*. 2013.

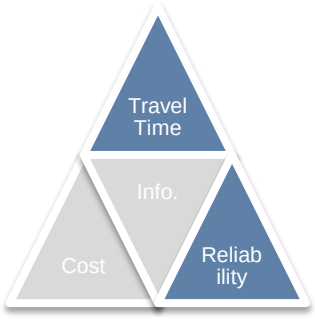
[44] US Department of Transportation, Federal Highway Administration, *2011 Urban Congestion Trends: Improving Travel Time Reliability with Operations.* 2013.

Figure 7-6: Major Cities with Congestion Charges

City	Year	Time of Day	Charge	Notes
London	2003	Weekdays 7:00 am-6:00pm	£11.50 ($22)	Cameras and licence plate readers. Charge is for full day's access; exemptions for accessible vehicles, taxis, buses, electric vehicles; discounts for residents. Modest discounts for business fleets
Milan ("Area C")	2012	Weekdays 7:30am-7:30pm (-6:00 pm on Thursdays)	€5 ($7)	Cameras and license plate readers. Charge is for full day's access; exemptions for various vehicles (including electric vehicles); discounts for residents and with multiple-day tickets
Singapore	1975	Weekdays & Saturday. All-day	Varies	Gantries and in-vehicle units. Functionally similar to express toll routes (e.g. 407 ETR near Toronto), but all roads into downtown area are tolled. Rate varies by route and time period and is revised quarterly, with the objective of optimizing speeds on arterial roads and expressways. Present system replaced an area-pricing scheme dating to 1975. Heavy trucks and buses pay a proportionally higher rate of 1.5-2 times the light vehicle rate
Stockholm	2007	Weekdays 6:30am-6:30pm	Varies; Max 60 SEK ($9)	Cameras and licence plate readers and transponders. Charge is for single passage and varies by time of day; there is a daily maximum. Exemptions for various vehicles, including electric vehicles

Source: CPCS (Government agencies, websites accessed 2015)

Increase Alternate Capacity



New Road Capacity

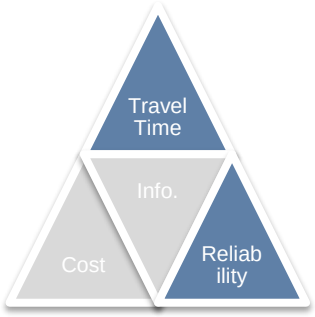
Another way to mitigate the impacts of increased travel time or reduction in reliability under the Remove Alternative would be to increase capacity in other alternate corridors or routes in order to relieve congestion through the GE/LSB corridor. For example, expanding capacity where feasible on alternate routes such as Front, Queens Quay, Richmond, Adelaide among others would relieve congestion on the surface Lake Shore Boulevard under the Remove Alternative by attracting traffic away from the corridor. Other strategies to increase capacity such as increasing the off-ramp capacity at interchanges leading up to the Study Area to allow for quicker entrance to the city from earlier off-ramps may also relieve congestion in the proposed surface route.

Increasing capacity is generally a more capital intensive mitigation strategy than some of the other mitigations proposed but allows for a higher total flow of vehicles and capacity to move goods and passenger vehicles. Increased highway capacity in other parts of the region may also draw trips away from the Study Area. Metrolinx has identified increased highway capacity, particularly for goods movement, as one of its key goals in *The Big Move.*[45]

Public Transit Improvements

Several public transit improvements are already considered in the 2031 projections in the Gardiner Expressway Environmental Assessment Report. Increased public transit is identified in most case studies as one of the main mitigation measures planned. For example, San Francisco increased ferry service when the Embarcadero Freeway was removed. While the movement of goods will not be expected to shift to public transit in any meaningful way, increased public transit may reduce congestion faced by commercial vehicles by removing demand from passenger vehicles.

Operational Improvements



In addition to the operational improvements proposed under the City's Congestion Management Strategy, identification of other operational improvements may allow for other tools to reduce congestion without significant capital expenditures. The Federal Highway Administration with the US Department of Transportation published a Congestion Reduction Toolbox[46] that outlines various measures to improve congestion including "Improving Service on Existing Roads". Topics on Arterial Management, Traffic Operations and Road Weather Management may be of use to supplement ongoing work from the City of Toronto's Congestion Management Report.

The Texas Transportation Institute analyzes the impact of operational treatments to improve congestion using existing infrastructure and summarizes the impact of operational improvements on urban congestion in the United States.

[45] http://www.metrolinx.com/thebigmove/en/lookingforward/5_4_longerTerm.aspx
[46] http://www.fhwa.dot.gov/congestion/toolbox/service.htm

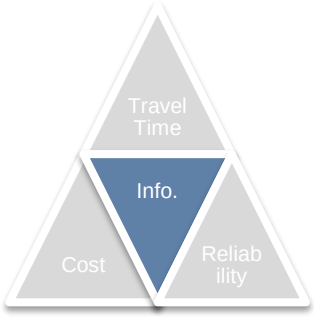
Figure 7-7: Estimated Delay Reduction From Operational Improvements

City Size and Number Analyzed	Estimated Reduction Due to Current Projects			Estimated Delay Reduction If in Place on All Roads (millions hours)
	Hours of Delay Saved (millions)	Gallons of Fuel Saved (millions)	Dollars Saved (USD$ millions)	
Very Large	250	151	5760	619
Large	71	30	1617	97
Medium	16	4	358	42
Small	4	1	89	9
Other	33	8	750	75
TOTAL	374	3	8484	842

Source: Texas Transportation Institute

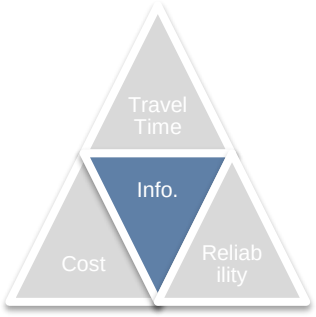
For example, ramp metering exists on the eastbound QEW in Mississauga, where the average waiting time between signals is between 5 and 6 seconds. Ramp metering has also been widely used elsewhere. The rate at which cars are allowed access to the freeway can depend on the demand on the on-ramp or on downstream traffic conditions. Currently, many on-ramps to the Gardiner Expressway experience strong congestion; ramp metering may help to speed the flow of vehicles entering the elevated expressway.

Improve Wayfinding



In the case studies analyzed in Chapter 6, several cases identified improving wayfinding signage on alternate routes as a mitigation measure to be implemented to reduce the impact of the removal/closure of an urban freeway. This is especially applicable to truck movements which may not be permitted on all streets or at all times. The clear communication to trucks of potential alternate routes allows for quicker adaption to new routings to be used, reducing the increases in travel times. For example, in 2008 the NYC DOT petitioned the Federal Highway Administration to conduct a pilot program for improved truck route signage in the city to make signs more identifiable to truck drivers. Identification of alternate routes during construction through distinctive and clear signage will also allow drivers to quickly adapt to new routes during construction periods.

Goods Movement Stakeholder Committee



Engaging goods movement stakeholders through a structured forum will allow for greater understanding between planning authorities and stakeholders on current issues faced by goods movement stakeholders and potential resolutions for these issues. On a larger scale, congestion management strategies can be developed with input from goods movement stakeholders. Stakeholders consulted in Toronto identified Goods Movement Stakeholder Committees, such as in Halton Region, as an effective tool in allowing them to engage directly with representatives from the Region in a structured format that facilitated cooperation and engagement on key issues.