Transportation Association of Canada

Phase 1 of the Framework for High Quality Data Collection of Urban Goods Movement in Canada

November 2007

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Abstract

The *Phase 1 of the Framework for High Quality Data Collection of Urban Goods Movement in Canada* project was conducted to develop an understanding of the types of data that are needed to address urban goods movement issues as they relate to land use planning, infrastructure planning, traffic safety and operations, demand management and sustainable transportation.

Through a review of the literature and through consultation with selected stakeholders, Phase 1 identified several needs and applications for urban goods movement data. The research has provided a comprehensive overview of urban goods movement issues as they relate to infrastructure planning, land use planning, traffic safety and operations, demand management, and sustainable transportation. The research also identified the challenges facing practitioners as well as the best practices around the world.

Phase 1 also found that there are many deficiencies with the existing data sets as well as gaps in data; and there is no single, comprehensive source of quality goods movement data for use in urban (or inter-urban) goods movement planning. The sources of freight data for Canadian planners have been explored, and their strengths and weaknesses have been discussed. There are some public and commercial data sources, and many organizations conduct their own surveys and counts, but a more comprehensive program would be of use to many organizations that were consulted.

Based upon this assessment, Phase 1 developed and tested a web-based questionnaire to identify stakeholders' current urban goods movement data collection practices, data usage and needs. A contact list of stakeholders was also developed. A planned future Phase 2 of the research will administer the survey across Canada in order to inventory existing urban goods movement data and to identify data needs.

Keywords

- Traffic and transport planning
- Economics and administration
- Data acquisition
- Goods traffic
- Planning
- Statistics
- Urban area

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This report was developed under the supervision of a project steering committee. The effort and participation of the project steering committee members was integral in the development of the report:

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EXECUTIVE SUMMARY

A. Purpose

The Transportation Association of Canada (TAC) identified the need to improve goods movement (freight) data collection in Canada. As a first step, TAC established two needs: first, to develop an understanding of the types of data that are needed to address urban goods movement issues as they relate to land use planning, infrastructure planning, traffic safety and operations, demand management and sustainable transportation; and, second, to develop a framework to guide potential future goods movement data collection.

This initiative provided the basis for the research project, *Framework for High Quality Data Collection of Urban Goods Movement in Canada*. The specific purposes of this research project are, first, to understand the data that are used or are needed for urban and inter-modal goods movement planning; and, second, to synthesize this understanding into a framework that can guide public and private organizations in the development of their own data. This was to be achieved in two phases: Phase 1 conducts an international literature review (including follow-up interviews with 'best practitioners'), develops a survey questionnaire to better grasp the stakeholders current needs and practices, develops a sampling and stratification plan for that survey and pilot-tests the survey. Phase 2 then would administer the survey, synthesize the results and develop an overall data-gathering framework for urban goods movement in Canada. This report documents Phase 1 only.

B. Organization of Phase 1

The report has eight chapters. Chapter 1 introduces the subject and the report. Chapter 2 provides an overview of the research approach.

Chapters 3, 4 and 5 provide a contextual background, derived from the literature. Chapter 3 presents best practices in urban goods and services data collection, from a review of the literature. Chapter 4 reviews current and ongoing inter-urban surveys. Chapter 5 outlines a number of recommendations for the application of urban goods movement data.

Chapter 6 describes the stakeholder questionnaire to be used in Phase 2 of the study. The survey is based upon the needs that were identified in the preceding chapters. Chapter 6 explains how the stakeholder questionnaire was designed. The chapter also presents the results and implications of the pilot testing of the survey, and describes the organizations to which the survey would be administered in Phase 2.

Chapter 7 completes the research with a summary and some concluding thoughts regarding trends and potential opportunities in goods movement data collection. Finally, Chapter 8 complements the report with a list of references.

The report is complemented by two appendices. **Appendix A** presents the text of the Stakeholder Questionnaire. **Appendix B** presents the briefing document, which accompanies the web-based questionnaire.

C. Overview of Findings

Through a review of the literature and through consultation with selected stakeholders, Phase 1 identified several needs and applications for urban goods movement data. The research has provided a comprehensive overview of urban goods movement issues as they relate to infrastructure planning, land use planning, traffic safety and operations, demand management, and sustainable transportation. The research also identified the challenges facing practitioners, as well as the best practices around the world.

Phase 1 also found that there are many deficiencies with the existing data sets as well as gaps in data; and there is no single, comprehensive source of quality goods movement data for use in urban (or inter-urban) goods movement planning. The sources of freight data for Canadian planners have been explored, and their strengths and weaknesses have been discussed. There are some public and commercial data sources, and many organizations conduct their own surveys and counts, but a more comprehensive program would be of use to many organizations that were consulted.

Based upon this assessment, Phase 1 developed and tested a web-based questionnaire to identify stakeholders' current urban goods movement data collection practices, data usage and needs. A contact list of stakeholders also was developed.

D. Survey

The survey has six sections. These are outlined below:

- **Section 1: Issues and Applications of Existing Data Collection**. This section begins the survey by identifying applications. It first asks respondents to identify themselves (in confidence), in order to allow for possible follow-up if needed for clarification or to solicit further information, reports, etc.

  Next, Section 1 asks respondents to identify the freight planning issues that they consider in their planning function (or that impact their business decisions). The use of the word "consider" is intended to allow both for actual applications and for planned or desired applications. The choices are: capacity enhancement, system preservation, operations, safety, environmental, policies, human resources, or other. (The "other" choice generally is provided throughout the survey, along with a space for the respondent to explain this response.)

  Section 1 then asks respondents to identify how they use (or would use) freight data to address the aforementioned freight planning issues. The choices are: developing profiles and trends, modelling and forecasting, traffic operations analysis, facility/access design,

environmental (and similar) assessments, cost-benefit or financial analysis, investment decision-making, responding to community, political or public concerns, and other.

- **Section 2: Data Collection Programs**. This section asks respondents to describe the types of freight data that their organizations collect, fund / sponsor or purchase from others. Respondents are asked to select all types of surveys that apply: for each selected survey, details then are solicited that describe the survey and discuss the availability of the data to the public. A similar set of questions is posed for traffic counts. Finally, respondents are asked about the use of Intelligent Transportation Systems (ITS) technologies for collecting data: a list of 15 choices is offered.

- **Section 3: Public and Commercial Data Sources**. This section asks respondents to describe the types of freight data that they have procured or purchased externally, from public or commercial sources. Respondents are asked to select all types of data that apply, from a list of 41 Canadian and U.S. sources. For each selected source, respondents are asked to assess the quality of the data, identify shortcoming or limitations, identify their importance to planning, and describe the purposes for which they use the data and how they are maintained.

- **Section 4: Freight Data Requirements**. This section asks respondents to specify their freight data requirements. The questions distinguish among freight data that respondents currently use, data that they need but which are not available to them and data that do not apply to them. This is achieved with three sets of questions: first, respondents are asked to indicate general information about the details that are needed (e.g., commodity flows, origin-destinations, etc.) followed by the types of modes that they consider in their planning. These modes are highway/trucks, rail, air, water and other. Next, for each selected mode, respondents are asked to indicate the specific data that are currently used, are needed but not available, or are not applicable. Finally, respondents are asked whether they use or need data on intermodal freight transportation – for example, truck/rail – and then are asked to describe the selected data.

- **Section 5: Other Data Sources**. This section asks respondents to describe complementary data sets that they use for freight planning. Three choices are offered: economic data, land-use data and transportation network data. For each selected choice, respondents are asked to describe the pertinent data sets, and assess their quality, shortcomings and limitations.

- **Section 6: Lessons Learned**. This section concludes the survey by asking respondents to assess their existing urban goods movement data, and identify specific needs and priorities. In contrast with the previous sections, these questions are mainly qualitative and largely open-ended: they are intended to draw comment and insight from the respondents; and also to engage respondents for possible future initiatives. Some of the questions focus on possible needs surveys that might have been conducted by respondents among the users of their data. Fourteen questions are asked:
  a) How well existing data meet the respondent's needs that were identified in Section 1.

b) Improvements or new data that are needed to address any deficiencies or gaps.
c) Priorities for improvements or new data.
d) Benefits of having these improvements or new data.
e) Factors that contribute to the respondent's success in collecting urban goods movement data.
f) Plans for expanding, enhancing or changing the respondent's data collection and storage methods.
g) Other needed data items (not otherwise identified).
h) Primary problems with the respondent's existing data, and the most improvements to address these problems. Respondents also are asked whether or not they have conducted a needs survey among the users of their data and, if so, the findings.
i) Problems encountered by participants in the respondent's user needs survey, the reasons for these problems and they might be avoided in future surveys. (Note that this question and the next question focus on the conduct of the user needs survey; in contrast to the previous question which asks about the content of a user needs survey.)
j) Technical or content problems or limitations identified from user needs surveys, and how these might be addressed in future surveys.
k) Legal / confidentiality considerations that impacted the respondent's user needs survey, and how these considerations were addressed.
l) Indication of the respondent's level of interest in participating in a (possible future) TAC program to coordinate the collection of urban goods movement data.
m) Approximate cost devoted by the respondent's organization to freight collection; distinguished between internal and external costs.
n) Willingness to provide sample data from the surveys carried out by the respondent's organization (i.e., in order to help explain the needs, limitations and opportunities in the documentation of the Phase 2 survey results).

E. Next Steps: Phase 2 Framework

Phase 2 of this study will administer the Phase 1survey to stakeholders across Canada. This would develop further information about the data collection needs and practices of Canadian practitioners, which is needed to determine the state of the practice across Canada and to aid in future data collection projects.

The Phase 2 survey will be the basis of the development of a framework for high quality data collection on urban goods movement in Canada. The final form of this framework is dependent on the feedback received from Canadian practitioners through the stakeholder survey.

However, the framework also should account for two other elements, described below.

First, a qualitative assessment of the factors that underlie a particular respondent's data collection activities or needs - for example, the motivation behind Edmonton, Calgary or Vancouver's initiatives in goods movement data collection. That is, why have these agencies

moved in the 'right direction'? What support did they have (or was needed)? What institutional or other obstacles were in the way, and how were these addressed? How could other agencies apply this understanding – and be encouraged to apply the framework in general – in order to develop their own data?

Second, emerging issues provide both obstacles and opportunities for implementing urban goods movement data. The obstacles and opportunities – as well as a growing interest in the topic – are exemplified by a recent TRB workshop on the topic. Key emerging obstacles include the need to address security concerns in the movement of goods; the growing use of electronic and remote sensing technologies; and, budgetary pressures for new data collection. However, each of these obstacles also represents an opportunity, in that other partners and interests can be brought to the table in a collaborative effort to augment and improve the quality of urban goods movement data.

1. INTRODUCTION

1.1 Project Scope

A recent Transportation Association of Canada (TAC) scoping study established the need to provide transportation planners in Canada with:

1. An understanding of the types of data that are needed to address urban goods movement issues as they relate to land use planning, infrastructure planning, traffic safety and operations, demand management and sustainable transportation, and
2. A framework to guide goods movement data collection efforts.

Conducting urban goods movement surveys remains challenging, for several reasons:

- The many vehicle types and urban modes that are involved. In addition to trucks, these can include service vehicles (such as vans) and couriers, which in turn can include cyclists, pedestrians, taxis, and private autos.
- The need to consider a variety of inter-urban modes, all of which can have an urban presence. These include inter-urban truck, rail, air, marine, and pipeline.
- The multi-faceted nature of goods- and service-generating land uses. A 2005 European Union study found that each urban worker generated, on average, one goods trip per week (Dablanc 2006): "*Everyone generates goods, no matter where they live or work.*" A similar statistic could be generated for each resident – i.e., households also generate goods.
- The traditional approach has been to conduct origin-destination surveys of vehicles. These record the stops, arrival / departure times, load (commodity) carried, etc. A key challenge associated with this method is in the sampling – notably, traditional sources such as vehicle registries are not always current or accurate, nor does the registry address always reflect where the vehicle is used; and non-truck goods movement may not be captured, for example, a private van or a bicycle courier. Commensurate with this is the use of vehicle logs as survey instruments, which typically resulted in very small sample sizes. Roadside intercept surveys provide an effective means of capturing samples; however, they are not conducive to busy urban streets or expressways.
- Some authorities have reversed the question by conducting commodity flow surveys, which sample the generators of goods in order to define what they ship, when, to / from where; and then translate these into discrete vehicles. Commodity flow surveys have been applied successfully in the U.S. to record trips generated by major activity centres such as marine ports. However, this approach does not capture local commercial trips, and can require important assumptions about the types, capacities and load factors of vehicles.
- Advances in travel demand modelling, notably towards activity-based and micro-simulation modelling, have further changed the data requirements. Recent surveys and modelling work in Calgary and Edmonton, discussed below, have focused on the use of surveys of goods and commercial trips drawn from a sample of urban establishments, stratified by industrial sector. These provide a holistic treatment of the subject, and opportunities for advanced modelling.

- Planning, zoning and socio-economic data are essential independent variables that are required for forecasting. For example, Portland, Oregon has developed a successful 'atlas' of industrial sites, which its economic development authority uses to promote the area. This is discussed below. The atlas contains information regarding existing and available industrial sites, categorized by area, degree of 'flatness,' zoning and proximity to the major road / highway and rail system. Some Canadian cities, such as Calgary, are now considering this tool, which can make use of existing municipal GIS. Zoning information also is important for planning. A critical data need is an inventory of jobs by industrial sector (and other information, for example, square footage): iTRANS' recent study of goods movement in Central Ontario for the Ministry of Transportation of Ontario (MTO) found that only a few Greater Toronto Area municipalities have such data, and many of these are out of date (iTRANS Consulting Inc. and others 2004). The City of Ottawa's data similarly are out of date.
- An understanding of the planning and regulatory context also is important and in addition to zoning, urban by-laws often impact when and how goods are moved. These include permissible hours of operation or delivery times (notably, supermarkets must be restocked daily before stores open each morning, but because they tend to be located in residential areas, delivery times are constrained) as well as truck route restrictions.

The inherently complex nature of the demand for urban freight transportation and its temporal variability makes it difficult to collect data, as compared to the demand for passenger transportation. A recent study identified a number of factors that contribute to this complexity. These factors were the number and greatly varying characteristics of the decision makers, the diversity of commodities, origin-destination patterns, data on freight cost, units for freight movements, and the variety of activities at the urban level (Victoria and Walton 2004; FR Friedrich and others 2003):

- Freight transportation services are provided by private enterprises that involve more decision makers than in the movement of passengers. Key decision makers in the supply chain include the firms or individuals sending and receiving the goods, the shippers and receivers organizing the consignments and modes, the carriers undertaking the movement, and several other companies responsible for related activities such as trans-shipment, cross-border shipment, storage, and terminal facilities. These decision makers determine whether or not a particular shipment is made and, if so, when, by what transportation mode, what shipment size, and by what route.
- The range and diversity of commodities, in terms of their characteristics, values, and time sensitivity, determine the most suitable freight vehicle in which the commodities should be transported. As a direct result of this diversity, the characteristics of these commodities make some freight vehicles more appropriate than others for their transportation. For example, refrigerated containers are used to transport perishable commodities while security vehicles are used to highly valuable items, such as money destined for banks. This variability in matching freight modes with commodity characteristics is greater for freight than for passenger modes and people. Furthermore, time value exhibits a much wider range for freight than for passengers, adding more complexity to the freight modelling process.

- Goods movement is a function of derived demand from economic activities and relationships between suppliers at the origins and consumer demand at the destinations. Given this relationship, the origin and destination patterns of a given product will be determined by the location of primary supply sources, other inputs needed to finish the product, and the location of manufacturers, distribution centers, retailers, and markets for that product. In addition, seasonal factors and consumer tastes play an important role in changing goods movement patterns.
- Obtaining data on freight cost is problematic, and this finding has been noted in other previous research efforts (Kriger 2004). In general, freight carriers and shippers believe that divulging information on freight charges could undermine their competitiveness so this information is kept confidential. As well, freight tariffs can vary within the same market since they can be negotiated on a case-by-case basis, according to the volumes involved and the duration of the contracts.
- Since freight movements are described in various units of measure involving value, weight, and volume, planners often must deal with data transformation in order to reconcile the information during the modelling process. Sometimes, this process does not represent the actual freight patterns at the urban level. This is because many goods are transported by pick-up and delivery vehicles handling assorted cargo types, so there is not a clear relationship between shipment characteristics (e.g., value, weight, and volume) and truck characteristics.

The complex nature of urban freight transportation manifests itself in the following manner:

- It is part of a logistics chain that links private equipment, services, and facilities, but it operates in a public environment (i.e. right of way is public).
- Freight trips can be direct or chained. For direct trips, goods are usually transported by large trucks delivering full loads (i.e., full-truckload or FTL) to a single destination and travelling longer distances. In the latter, trips are usually made by light trucks or other types of pick-up and delivery vehicles handling mixed freight and parcels (i.e., less-than-truckload or LTL) and travelling very short distances.
- Some freight trips must use designated routes due to the nature of the commodities being transported, for example, when transporting oversized or overweight loads or hazardous materials.

In actuality, most cities throughout the world have little of the data that are needed to evaluate the effectiveness of their policy measures concerning urban goods transport. A study by the OECD verified that many of its member countries had data (Organisation for Economic Co-operation and Development 2003): however, this is not uniformly the case in Europe or around the world.

1.2 Research Objectives

The specific purposes of this research project are, first, to understand the data that are used or are needed for urban and inter-modal goods movement planning; and, second, to synthesize this understanding into a framework that can guide public and private organizations in the

development of their own data. This is to be achieved in two phases: Phase 1 conducts an international literature review (including follow-up interviews with 'best practitioners'), develops a survey questionnaire to better grasp the stakeholders current needs and practices, develops a sampling and stratification plan for that survey and pilot-tests the survey. Phase 2 then would administer the survey, synthesize the results and develop an overall data-gathering framework for urban goods movement in Canada. This report addresses Phase 1 only.

1.3 Report Organization

The remainder of this report is structured as follows: Chapter 2 provides an overview of the research approach.

Chapters 3, 4 and 5 provide a contextual background, derived from the literature. Chapter 3 presents best practices in urban goods and services data collection, from a review of the literature. Chapter 4 reviews current and ongoing inter-urban surveys. Chapter 5 outlines a number of recommendations for the application of urban goods movement data.

Chapter 6 describes the stakeholder questionnaire to be used in Phase 2 of the study. Chapter 6 explains how the stakeholder questionnaire was designed. The chapter also presents the results and implications of the pilot testing of the survey, and describes the organizations to which the survey would be administered in Phase 2.

Chapter 7 completes the research with a summary and some concluding thoughts regarding trends and potential opportunities in goods movement data collection. Finally, Chapter 8 complements the report with a list of references.

The report is complemented by two appendices. **Appendix A** presents the text of the Stakeholder Questionnaire. **Appendix B** presents the briefing document, which accompanies the web-based questionnaire..

1.4 Key Definitions

This report discusses several types of data. However, at the outset of the study, it is useful to define and clarify certain key terms. This is important, because some of the terms are often confused: they may be related, but they are not interchangeable. Moreover, some terms have more than one definition, depending upon the source and the application. Accordingly, the definitions discussed below focus on the specific needs of this research. This matters, because it impacts the types of data that are collected as well as the associated characteristics, such as source, method, frequency and so on. Accordingly, the definitions discussed below focus on the specific perspective and needs of this research; that is, on urban goods movement data collection.

Additional definitions are provided in a glossary in **Appendix B**. The glossary is included in the briefing document that would be sent to each respondent in the Phase 2 survey.

1.4.1 Freight v. Goods Movement

To some degree, the terms "*freight*" and "*goods movement*" are interchangeable. Both terms refer to the carriage of "*commodities*" for a price, by any mode. Importantly, however, the broader term "goods movement" also includes the movement of people and goods in order to provide "*commercial*" services, such as appliance repair, parcel delivery and waste collection.

Both types may operate on fixed routes (e.g., waste pick-up) or may be generated randomly (on demand). The importance of trips related to the provision of services is illustrated in a recent study in Calgary in which surveys revealed that 50% of all business stops are made to provide a service (Stefan and others 2005). Clearly, a complete profile of urban commercial movements requires consideration beyond just freight movements and must include service deliveries within the urban area.

1.4.2 Commodities

For the purposes of this study, the term "commodity" refers to any tangible item that is transported by goods movement modes. Commodities are defined for all sectors of the economy, including both raw materials and finished products: standard classification systems are used to define these commodities. A commodity might be discrete – such as, a courier package or a piece of furniture – or bulk, for example, aggregate stone or oil. For the purposes of this research, the electronic transmission of documents is not included in this definition.

1.4.3 Movement v. Flow of Goods

The *"movement"* of goods refers to a trip, while *"flow"* describes the good that is being moved.

Specifically, ***goods movement*** describes the characteristics of the trip made by a vehicle(s) or person(s) to transport a particular good between a single origin and a single destination. The characteristics are depicted in terms of their origin-destination, the mode or modes used, trip start or end time, frequency, trip route or itinerary, cost, vehicle ownership, points of intermodal transfer, loading factors, etc.; that is, in terms that are typical of an origin-destination survey.

The ***flow of goods*** (i.e., commodity flow survey) describes the characteristics of the goods that are generated at a location for distribution to another location(s). The flow is expressed commonly in terms of economic activity or output, such as the type of good generated (i.e., the commodity; and typically according to a standard industrial classification), the total

volume that is generated in a given period, its value and so on. In addition to the economic reference, the description might also be based in land use. Critically, however, there may be no reference to the actual movement of the good, nor is the description necessarily developed for purposes of transportation, nor might there be a reference to the actual movement of the good. However, flows are often translated into vehicle trips through the use of factors.

Goods movement characteristics, such as origin-destination surveys and traffic counts, are most commonly associated with urban and inter-urban road vehicle transportation. Commodity flow data typically are reported for all types of inter-urban goods movement, for example, Statistics Canada's annual *Shipping in Canada* report of marine flows.

This study considers both the movement of goods and the flow of goods (commodity flow surveys).

2. RESEARCH APPROACH

2.1 Phase 1: Task 1 Work Plan

The work plan for Phase 1 was divided into two groups of tasks. These were defined by TAC's Terms of Reference for the research, with modifications made by the consultant. Task 1 established the scope of requirements for goods movement and commodity flow information. Task 2 focused on the design of the Stakeholder Questionnaire. The eight individual sub-tasks that comprise Task 1 are described below. The eleven Task 2 sub-tasks are described in Section 2.2.

Task 1(a): Define and categorize different freight data needs. This task was combined with interviews of representatives / owners of best practice cases, Task 1(c). This was done following the completion of the literature review in Task 1(b). By doing so, the research team had the opportunity first to understand how data are being collected in Canada and overseas through the literature review, as the basis for establishing during the interviews how the data are being used by the various municipalities and higher levels of government.

Task 1(b): Review literature and identify best practices. The research team obtained and reviewed recent references on goods movement within North America and around in the world. The following libraries and sources were particularly important:

- BESTUFS (Best Urban Freight Solutions), European Commission.
- Institute of Transportation Engineers (ITE) digital library.
- IRRD (International Road Research Database).
- OECD (Organization of Economic Cooperation and Development) library.
- TAC (Transportation Association of Canada) library catalogues.
- TRIS (Transportation Research Information Services).
- Information collected and developed by iTRANS in previous studies.

The research team also accessed several goods movement databases, as well as technical descriptions of other databases. These included:

- Urban goods movement surveys conducted in several Canadian cities.
- Inter-urban truck surveys conducted in 1999 and 2000 as part of the National Roadside Survey (NRS), and associated provincial inter-urban truck surveys – notably, MTO's Commercial Vehicle Survey (CVS) and the Ministère des Transports du Québec's (MTQ's) Enquête sur le camionnage.[1]
- Inter-urban truck, rail, marine and air freight data collected or disseminated by Statistics Canada or Transport Canada.
- Freight data collected or disseminated by the U.S. Federal government or agencies, including: the Commodity Flow Survey (Bureau of Transportation Statistics - BTS);

[1] It should be noted that the CVS and other provincial truck surveys are conducted periodically. It also should be noted that a new NRS was conducted in 2006 and 2007. However, the data are not expected to be disseminated until early 2008.

Waterborne Commerce of the United States (U.S. Army Corps of Engineers); data from the Maritime Administration Office of Statistical and Economic Analysis; Rail Waybill Sample (Surface Transportation Board); and, the St. Lawrence Seaway Traffic Report.
- Commercial data sources and reviews, including Transearch (formerly Reebie, now Global Insights); RAILINC (American Association of Railroads); PIERS; and, the LECG Marine Industry Benefits Study.
- Database reviews conducted by iTRANS in previous studies.

It should be noted that in no case were confidential or proprietary data used or accessed without permission.

Task 1(c): Interview representatives / owners of best practice cases and data. This task aimed to provide an improved understanding of how data are actually collected and used. The research team interviewed or communicated by e-mail with representatives of several jurisdictions or data owners identified as 'best practices' with potential applicability in Canada. These included governments at all three levels across Canada (including transport, statistics, planning and economic development / industry departments and Ministries); national and regional truck, rail, marine and air carriers; marine and air port authorities; shipper and carrier industry associations; economic developers and Chambers of Commerce; co-users of facilities (such as GO Transit, which uses freight rail lines in Toronto); NGOs and academic researchers. Other direct contacts included goods movement planners at the U.S. Federal Highway Administration (FHWA); the BTS; U.S. DOT; academic researchers; various state DOTs; MPOs and cities in the U.S.; members of the U.S. Transportation Research Board (TRB) Urban Freight Committee; and BESTUFS and other overseas researchers.

The interviews gained insights on the goals of the respondents' data collection programs; determined what has worked in the past; and identified lessons learned. Issues related to urban freight (trucks) were examined separately from urban "*goods and services*," which can be provided by vans, light trucks, passenger vehicles, motorcycles, taxis, bicycles and even on foot.

Task 1(d): Identify and categorize primary participants / stakeholders. The critical success factor for the Phase 2 survey will be to assure that there is participation from the broad goods- and services-generating communities, as well as those who are impacted by goods movement. Bearing in mind also the objectives of Transport Canada's Transportation Planning / Modal Integration initiative, the impacts on sustainable transportation and greenhouse gas emissions also must be taken into account. To do so, the research team identified and categorized the primary stakeholders involved in goods and service transportation in Canada. The final list comprises: governments at all three levels across Canada (including transport, statistics, planning and economic development / industry departments and Ministries); national and regional truck, rail, marine and air carriers; marine and air port authorities; shipper and carrier industry associations; economic developers and Chambers of Commerce; co-users of facilities; emergency services; non-governmental organizations (NGOs) and academic researchers. Given the history of data collection on

goods movement in the U.S., the research team also added the following participants to the list: federal government and academic researchers in the U.S., selected state Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) that are active in goods movement planning (most large urban areas have conducted goods movement studies). Finally, selected European governments and OECD, United Kingdom and Australian researchers also were added.

Task 1(e): Canvas Canadian authorities to obtain examples of previous experience. As part of the canvassing of Canadian authorities, the research team developed a questionnaire to address two topics of interest:

1. The primary needs of Canadian stakeholders with respect to urban goods movement. In addition to ensuring that these needs were addressed in the Phase 2 Stakeholder Questionnaire, this topic also was intended to engage the interest of stakeholders to participate in the actual Phase 2 survey.
2. The level of interest and commitment of the various stakeholders to participate in potential future programs for goods movement surveys. This task also helped to determine the type of data collection effort that would make different stakeholders more likely, less likely or unlikely to participate during Phase 2.

In addition, the research team solicited examples or documentation of previous goods movement data collection, in order to further assist the team's understanding of the stakeholders' issues.

Task 1(f): Review the current status of other surveys. The research team reviewed other current data sources, including the following periodic surveys: the U.S. Commodity Flow Survey; the 2006-2007 NRS; the Canadian Vehicle Survey; and the For-Hire Trucking Survey. Other sources included data gathering / databases including border crossing data; the Transborder Surface Freight Dataset; commercial data such as Global Insight's [formerly Reebie] Transearch Data and the RAILINC data; Road Motor Vehicle Registration data; Road Motor Vehicle Fuel Sales data; and import and export data of goods by product. To further supplement the understanding of ongoing urban goods movement data collection efforts, the team also reviewed a number of special, one-off studies, such as the *Climate Change Table's Assessment of Freight Forecasts and GHGs*, the *1999 Lower Mainland Truck Freight Study* and the *IMTC* (Washington-BC), Eastern Border Transportation Coalition (EBTC) cross-border studies, and state-of-the-practice initiatives such as the recent goods and commercial movement surveys in Calgary and Edmonton and the upcoming initiative in Vancouver.

Task 1(g): Recommend potential applications of the commodity flow data. In keeping with the distinctions in terminology made in **Section 1.5**, the research team understood this task to describe and recommend potential applications of both "goods [commodity] flow" data and "goods movement" data.

Task 1(h): Submit the final draft Overview Paper. The PSC had the opportunity to review and comment on draft versions of this report.

2.2 Phase 1: Task 2 Work Plan

Task 2 focused on the development of the Stakeholder Questionnaire, for administration in Phase 2. As noted, it comprised the following eleven sub-tasks:

Task 2(a): Determine the scope and scale of data to be collected. It was recognized that a multilevel integrated framework for the conduct of goods and services movement surveys likely would require multiple surveys, conducted using various methods to address the specific needs of different stakeholders. Potentially the surveys included in the integrated framework may include some of the same surveys used by Hunt et al. during the development of a data collection framework for Calgary and Edmonton (Hunt and others 2004b):

- Origin-destination surveys and/or roadside counts where usually a sample is collected and the results are expanded to represent the population
- Commodity flow studies of business establishments in order to obtain descriptions of the basic patterns of goods and services flows
- Fleet allocation surveys to obtain route and/or coverage areas, frequency of operation, fleet size and vehicle characteristics, and vehicle kilometres travelled per vehicle and in total. According to this study, fleet allocations represent roughly one third of all commercial vehicle movements.
- External truck surveys to obtain data on the movement of commercial goods by trucks, usually accomplished by sampling specific locations at a certain time of the year.

It was recognized that a single scope and scale for the integrated framework was unlikely. Instead, it was recognized that there were multiple implementation levels that would require different levels of resources and would meet corresponding levels of need of the various stakeholders. Accordingly, the research team attempted to determine the priorities for stakeholders' needs.

Task 2(b): Develop questions to probe. The research team identified the key points of interests that are suitable for questionnaire analysis, based upon the Task 1(b) literature review and the Task 1(e) canvassing of stakeholders. In particular, questions were developed relating to how the data were used to meet their needs, or how stakeholders would like to use the data to meet their needs.

Task 2(c): Determine the sampling plan. This task envisioned the development of a sampling plan for the Phase 2 administration of the survey. Upon review with the PSC, it became evident that the use of a web survey allowed a broad solicitation among respondent groups and, as a result, the need for sampling would be obviated. That said, however, it was determined further that the Task 1(d) sample list should ensure that the necessary stakeholder groups and interests were covered.

Task 2(d): Identify jurisdictional issues. It was understood that jurisdictional issues perceived by data users and providers could reflect provincial, regional, and local priorities for data collection. Accordingly, the Stakeholder Questionnaire solicited information regarding confidentiality, legal, proprietary and other institutional issues, in addition to asking about technical needs and applications.

Task 2(e): Identify complementary data needs and sources. The Stakeholder Questionnaire also identified complementary data needs and sources. These complementary data sources and needs included land use and economic data. Also included were questions regarding the goods movement aspects of traffic counts and travel time surveys (i.e., data that commonly form the basis of urban transportation data collection, even if they are not specifically collected for goods movement planning).

Task 2(f): Study user opinions about the frequency of data collection. The Stakeholder Questionnaire asked respondents to comment on the usability of their existing data, how their outstanding needs could be met, and their willingness to contribute in terms of time and resources towards participation in a potential goods movement survey.

Task 2(g): Estimate budget ranges. A key input for the planning of the Phase 2 survey was the development of a budget statement and allocation of resources. (This information is provided under separate cover to TAC.)

Task 2(h): Develop a pre-interview stakeholder briefing document. The research team developed a stand-alone briefing document, in order to provide background information, instructions and a glossary to assist Phase 2 respondents.

Task 2(i): Pre-test the stakeholder briefing documents and questionnaire. The research team conducted several pre-tests of the Stakeholder Questionnaire and of the text of the briefing document. The members of the PSC were the primary testers. They were augmented by testers from other agencies and academia, in order to get a broader perspective from interests that were not familiar with the research. The results of the pre-tests were incorporated into the final Stakeholder Questionnaire and the briefing document.

Task 2(j): Submit the "Stakeholder Questionnaire Design" report. The final Stakeholder Questionnaire design and the briefing document were documented and reviewed with the PSC.

Task 2(k): Complete the final report for Phase 1. This report describes the findings of all the Task 1 and Task 2 sub-tasks. The final report was submitted in the following formats, as specified by the RFP:

- Electronic version of the complete report (text, graphics, appendices, etc.) in Adobe PDF and Word formats.
- Hard copy of the complete report.
- Electronic version of the graphics (tables, figures, charts, photos, etc.) used in the report (in their original formats and not in PDF).

TAC will translate the final report into French separately.

In addition, the research team and the PSC presented the work to Transport Canada in September 2006 and April 2007. The research team and the PSC presented the findings to the Transportation Planning and Research Standing Committee and the Urban Transportation Council at the TAC 2007 Spring Technical Meetings. A final presentation is scheduled for the TAC 2007 Annual Conference in October 2007, as part of a panel session on urban goods movement data.

2.3 Challenges and Approach

Approximately 50 references from the sources noted above were reviewed. Most of these sources describe inter-urban or, at best, regional flows: they are important nonetheless because they obviously impact urban goods movement. However, the aforementioned data sources are mode- or country-specific. They do not provide a complete profile of freight flows, nor are they necessarily compatible in terms of coverage, categorization by mode, origin / destination, or level of detail. Specific challenges associated with existing data and sources included:

- Differences regarding the geographic definitions.
- An inability to trace the entire route that a specific commodity uses between its true origin and true destination. The particulars in between (e.g., trans-shipment points, use of other modes) or beyond (i.e., the true origins and destinations especially for cross-border traffic) are not always captured.
- Origins and destinations are provided at different levels of geographic detail, and according to different units, for example, the use of the postal Forward Sortation Area [FSA] as opposed to a geocoded address.
- There is an inconsistency in the years for which the data are available as well as limited information regarding the impact of seasonal differences. This also occurred in some cases as a function of the source of information (i.e., both Canadian and U.S. sources of the same / complementary data sometimes were available only for different years). There also can be budgetary pressure to reduce or eliminate surveys: the funding for the 2007 Commodity Flow Survey, which is considered to be a primary data source in the US, was eliminated in 2006 before being restored (and the Survey is now underway).
- Units of measure, commodity categorizations (i.e., in which a particular commodity is categorized) and currencies are not always consistent. For example, some information is available as freight tonnes (or tons) and some as freight ton-miles (tonne-km), and there is insufficient information to convert one to the other.
- Methods of data collection / sources of samples vary, for example, the survey of the carrier en route, compared with the survey of the shipper at the place of origin. The U.S. Commodity Flow Survey surveys a very small sample of shippers, which are then expanded to state or regional levels, with little or no sub-area detail possible.
- When multiple modes are involved, the records do not indicate which leg of the trip was travelled by each mode.

- The purpose of the data collection varies. Notably, many data were collected for administrative, legal, fiscal, insurance or other reasons that limit their usability for transportation planning. This means that details regarding the complete trip of the commodity are often lacking or have been collected in separate sources. The same is true of data that have been collected to record economic or trade flows, in that the ability to translate these data to true 'trips' may be limited. For example, the port or yard at which the mode was accessed or cleared customs is noted, but not the true destination.
- Quality shortcomings and inconsistencies exist in some data sets. For example, government sources indicated that inconsistencies in the location of trip ends in Statistics Canada's international trade data render them unreliable for transportation planning purposes, in which the geographical structure of shipments is of paramount importance. Often, a flow recorded for a particular origin and destination pair would clearly not make sense when matched to the recorded port and mode of entry or exit. Accordingly, it is not clear whether recorded trip ends refer to the true origin or destination of a given shipment or - more likely - to the address of the broker or, perhaps, the address of a head office; or whether it was an error. (See also **Section 4.8.1**.)
- Gaps in some data result in a significant underestimation of goods and thus the data are unreliable for transportation planning purposes. For example, the sampling universes of the Trucking Commodity Origin and Destination (TCOD) Survey is limited to establishments that record annual revenues of at least $1 million, and covers only shipments of at least 25 km. in distance. (See also **Section 4.3.6**.)
- Records for international shipments are better than domestic records, possibly due to more stringent reporting requirements for international transport. This was uncovered in iTRANS' *Freight Intermodal Opportunities and Barriers Study* (prepared for Transport Canada, 2007) when the consultant attempted to get an impression of the cargo activity at Lester B. Pearson International Airport. Airport authorities indicated that an initiative is underway to have better domestic air data available within the next year (ECATS - Electronic Collection of Air Transport Statistics, which has recently been pilot-tested by Transport Canada and Statistics Canada).
- However, the reverse also was true, in that shipments may not move according to the advertised mode. For example, records of international air shipments may reflect only the location at which the goods cleared customs: it is common practice for some air carriers and couriers to transport 'air' cargo by truck to another airport for ultimate shipment by air, for example, Edmonton to Calgary and Toronto to JFK in New York. This is faster and cheaper for the courier or airline, since the company can consolidate low-volume loads. There also can be on inconsistency in how these air / truck trips are recorded, further making it difficult to trace the actual movement: for example, on at least some routes, Air Canada assigns a 'flight number' to its inter-airport trucks.
- Many of the best data sources are confidential. This is the case with the major Canadian rail companies who are very protective of their data. Sources of detailed OD information exist – notably, RAILINC (a commercial arm of the Association of American Railroads [AAR]) – but these are available only at cost, and only with the permission of the source railway. The AAR also can provide data for shortlines and regional railroads.
- Data on intermodal movements, for example, rail and truck movements to / from an intermodal rail yard, are also lacking. An exception is MTO's Commercial Vehicle

Survey, which provides truck trip generation to / from selected intermodal terminals in the Greater Toronto Area. However, these data are confidential.

- Existing truck trip generation studies and 'quick-response' guides provide some macroscopic insight into truck trip analysis: however, these largely reflect U.S. conditions and, in any event, there remain significant gaps.

3. URBAN GOODS AND SERVICES DATA COLLECTION - BEST PRACTICES

3.1 Evolution of Urban Goods Movement Surveys in Canada

It is useful to begin this chapter with a discussion of the traditional urban goods movement surveys and counts that were conducted in Canada until recently. This provides a context against which the evolution in needs (**Section 3.2**) and in best practices (**Section 3.3**) can be examined.

A 2001 review compared a number of studies of urban goods movement throughout Canada over the past few decades (Woudsma 2001):

- Calgary (1974) profiled movement of goods and trucks using the truck / firm as the sampling unit. The data focus was on trip and commodity. Classifications for the trucks were related to body style of the truck. Screenline counts, cordon surveys, ride along and end-point surveys were used as the sample methods. A network simulation model was used for analysis, and land use at the end points of the movements was considered.
- Toronto (1987) goods movement study explored importance to the local economy by trying to determine cost of congestion, pick up and delivery restrictions, and movement of exceptional loads and dangerous goods. The survey focused on Municipality of Metropolitan Toronto (now the City of Toronto) and neighbouring Peel Region, which is home to Toronto's international airport, an extensive warehouse / distribution industry, several intermodal truck/rail terminals and key junctions on the regional expressway system. Trucks registered in the study area were sampled, as were firms located in the area. Trucks were categorized by body style. A large number of mail-out surveys solicited OD information and a smaller number of in depth interviews and focus groups took place among selected firms. Operating costs were estimated from these interviews and focus group meetings. Trip generation was analyzed with regression equations based on zonal employment and accounting for land use. A Fratar (growth factor) trip distribution model was developed.
- Ottawa-Hull (1989) collected information on travel patterns, trends, costs of goods movement, and evaluated the effects of the goods movement on the network as well as implications of changes to that network. The metropolitan Ottawa-Hull (now Ottawa-Gatineau) region was covered and the trip was the data focus. The truck was the sampling unit and was classified by body style and weight. Telephone interviews, manual counts, and focus groups were used to collect information. Operating costs were estimated from the interviews and focus groups. Land use was not taken into account for this study; however, trip generation using regression equations and zonal employment information was used to analyze the data. A simple truck matrix was developed for use in the regional travel demand forecasting model.
- Vancouver's (1990) truck study focused on OD, time of the trips and the purpose of trips. The region was covered and trucks over 4,500 kg were the sample unit. Mail-out surveys

and follow-up telephone calls were used to gather information, along with visits to larger firms to collect specific information. Future land uses were considered, while trip generation was a regression equation based on zonal employment. A comprehensive 1999 study conducted an OD survey of urban (internal) trucking. This was complemented by a roadside survey at a cordon surrounding the Vancouver region. The results were used to develop trip generation equations for different land use types and major goods generators (such as Vancouver International Airport, the ports and the intermodal rail yards). Light and heavy truck matrices were developed, using a Fratar-based distribution. The resultant 24-hour matrices were factored and incorporated into the regional urban passenger travel demand model (Reid Crowther and Partners 2000).

- Edmonton (1996) truck route study assessed current route deficiencies in the region and also current and future route characteristics. The trip was the focus with trucks over 4,500 kg as the sample unit. Truck categories were based entirely on weight. There was mention of land use controls in thinking about future conflict.[2]

From the perspective of the current research, these studies generally can be characterized by the following:

- These were primarily surveys of goods movement trips; that is, origin-destination surveys that captured the movement of vehicles. Only the 1974 Calgary study appears to have surveyed commodity flows.
- Goods-carrying vehicles were surveyed, with a general exclusion of light vehicles. This meant that 'informal' or smaller operators tended not to be captured. In addition, service vehicles were not captured. It is not clear the degree to which couriers were included, if any.
- Use of the vehicle as the sampling unit, based largely on provincial vehicle registry data.
- Use of mail-back logs to record the OD characteristics, sometimes with a telephone follow-up. In practice, these yielded relatively small samples; of the order of 1% - 2% of all trucks.
- Other data collection, in addition to the surveys, comprised 'traditional' intersection and screenline counts, classified by vehicle type (although generally not able to distinguish light vehicles by use), and travel time surveys.
- Some operating cost data were collected. However, these were high-level data, collected primarily from limited samples at focus group discussions. Accordingly, the findings were considered reasonable at the time. However, complementary or qualifying data were not available for verification or detailing.
- There were only limited applications of the data to modelling. The traditional four-step method was used for the models. The resultant trip matrices, sometimes categorized by vehicle type (light and heavy vehicles), were added to the existing urban passenger models.
- The results typically were used for 'traditional' transportation planning activities, such as the development of transportation master plans and truck route planning. However, as described in a 2004 MTO study of goods movement in Central Ontario, even these

[2] Recent initiatives in Edmonton and Vancouver are discussed separately in **Sections** Error! Reference source not found. and **3.3.10**, respectively.

[limited] applications have tended to be somewhat high-level and generalized (iTRANS Consulting Inc. et al. 2004).

3.2 Categorization of Goods Movement Data Needs

Data needs have evolved and increased relative to the applications exemplified by the aforementioned studies. The Terms of Reference for this study note that urban goods movement data are needed to help planners understand and model urban freight patterns, as a basis for formulating and evaluating strategies or policies to improve the efficiency of goods movement. This introduces the notion of "efficiency," which in turn has been driven by many transportation plans that seek to minimize the adverse environmental impacts of urban trucking on noise, vibration, air pollution, greenhouse gases and fuel consumption, by seeking ways to better manage truck travel or by diverting traffic to other modes. Less apparent, but no less important, are the linkages between transportation and economic development, in order to ensure that an effective and efficient multi-modal urban goods transportation system is in place to support economic growth. Similarly, there is a need to ensure that land use plans accommodate both existing brownfields industries and planned greenfields industrial areas, again so that these lands can be served efficiently and effectively by the goods transportation system (iTRANS Consulting Inc. et al. 2004).

A recent study on this subject in the U.S. points out that urban freight models can shed light on infrastructure, safety, and environmental issues pertaining to the transportation system. Having such models will enable planners to identify and evaluate alternative actions based on performance measures obtained through the modelling process (Victoria and Walton 2004).

Accordingly, the U.S. study groups the data needed for urban goods movement planning into five categories: cargo, road transportation, major freight generators and corridors, non-road transportation modes, and economic, land-use, and socio-economic data (Victoria and Walton 2004). These five data categories are detailed in **Table 1** through **Table 5**, respectively.

Four key points may be drawn from the categorization and the tables:

1. Urban goods movement data needs are significantly greater than those that traditionally would be associated with model development and forecasting.
2. These needs must address operational, safety, logistical and regulatory issues, which – although related to planning – again, they go beyond those that are traditionally associated with planning.
3. The data cover several perspectives, which include land use and economic development, in addition to transportation. However, the needs may differ. They also may overlap or coincide.
4. Private and public sector interests are stakeholders in urban goods movement data, both as users and as providers of data. Their needs may differ, but – as before – they also may overlap or coincide. One critical difference is that private sector data may be held as confidential or proprietary.

Table 1: Cargo data attributes relevant to urban freight planning

Attribute	Level of Detail
Commodity Classification	Formal classification system (i.e. Standard Industrial Classification Code (SIC), Standard Transportation Commodity Codes (STCC), Harmonized System (HS), Standard International Trade Classification (SITC), North American Industry Classification System (NAICS)
	Other classification system (e.g., economic sectors)
Commodity Type	Aggregate categories (e.g., bulk, break-bulk, neo-bulk, container)
	Hazardous materials (HAZMAT)
	Empty v. non-empty
Origin-Destination Patterns	Provinces
	Municipalities
	Census Metropolitan Areas (CMA) / Census Agglomeration (CA)
	Postal codes or FSA
	Shipper detail (names and locations)
	Traffic Analysis Zone (TAZ)
	Customs for exit / entry
Shipment Details	Value
	Weight
	Volume
	Size
	Mode(s) of transportation
	Average tour length
	Number of stops per tour
	Time-sensitivity
	Load type (i.e., FTL or LTL shipments)
	Empty shipments
Routing Details	Major routes used
	Number (and purpose) of stops
	Interim trip origin and destinations
	Vehicle routing
	HAZMAT vehicle routing

Source: Adapted from (Victoria and Walton 2004)

Table 2: Road transportation data attributes relevant to urban freight planning

Attribute	Level of Detail
Highway/Truck Mode	Truck type
	Truck size categories (e.g., heavy, medium, light)
	Average vehicle speed
	Vehicle emission data
	Incident data
	Traffic volume
	Commodity type
	Payload weight (i.e., cargo weight)
	Truck Origin-Destination patterns
	Trip Origin-Destination patterns
	Average tour length
	Number of stops per tour
	Number of truck stops for LTL shipments
	Travel Time
	Transit time
	Travel time reliability
	Line-haul costs
	Drayage costs
	Transit cost
	Quality of service (e.g., on-time delivery, reliability, frequency and scheduling of shipments)
Network Data	Link attributes (e.g., road grade, overhead clearance, intersection geometric, traffic control devices, axle limit regulations, vehicle type / class allowed, pavement condition, posted speed limit)
	Truck-only routes
	Designated hazardous routes
Cross Border Data	Origin-Destination patterns
	Commodity type
	Shipment attributes (i.e., value, weight, volume)
	Freight modes attributes
	Stop / Delay data
	Rail-grade crossing safety data

Source: Adapted from (Victoria and Walton 2004)

Table 3: Major freight generator and corridor data attributes relevant to urban freight planning

Attribute	Level of Detail
Terminal and Intermodal Transfer Facilities	Commodity types produced and consumed
	Cargo types produced and consumed
	Shipment attributes (i.e., value, weight, volume)
	Location of the markets for the commodities produced and consumed
	Freight modes serving the facility
	Service attributes of available modes (e.g., frequency and scheduling of shipments)
	Storage and handling operations at the facility
	Volumes of trucks entering or exiting the facility
	Sizes and capacity of the vehicles serving the facility
	Average daily truck activity by truck classification
	Geometric and operational characteristics of access roads
	Travel time contours around the facility
	Congestion-related delays on access roads
	Length of queue on access roads
	Incident rates on access roads to the facility
Major Freight Corridors	Commodity types moving along the corridor
	Shipment attributes (i.e., value, weight, volume)
	Truck types using the corridor
	Geographic coverage (intra-urban, intra-state, inter-state, etc.)
	Geometric and operational characteristics of roads
	Road network bottlenecks
	Road network deficiencies
	Access conditions to terminals and intermodal transfer facilities along the corridor
	Parking conditions of terminal and transfer facilities located along the corridor
	Residential areas along the corridor

Source: Adapted from (Victoria and Walton 2004)

Table 4: Non-road transportation mode data attributes relevant to urban freight planning

Attribute	Level of Detail
Rail Mode	Origin-Destination patterns
	Commodity type
	Equipment details (e.g., car type)
	Shipment attributes (i.e., value, weight, volume)
	Routing data
	Travel time
	Drayage costs
	Hazardous materials
	Ramp-to-ramp costs
	Stop / delay data
	Quality of service (e.g., on-time delivery, reliability, frequency and scheduling of shipments)
Water Mode	Origin-Destination patterns
	Commodity type
	Equipment details (e.g., vessel type)
	Shipment attributes (i.e., value, weight, volume)
	Routing data
	Travel time
	Drayage costs
	Hazardous materials
	Port-to-port costs
	Quality of service (e.g., on-time delivery, reliability, frequency and scheduling of shipments)
Air Mode	Origin-Destination patterns
	Commodity type
	Shipment attributes (i.e., value, weight, volume)
	Routing data
	Travel time
	Drayage costs
	Hazardous materials
	Air freightage
	Quality of service (e.g., on-time delivery, reliability, frequency and scheduling of shipments)

Source: Adapted from (Victoria and Walton 2004)

Table 5: Economic, land-use and socio-economic data attributes relevant to urban freight planning

Attribute	Level of Detail
Economic Data	Value of output for commodity type
	Volume shipped for commodity type
	Employment by industrial sector
	Earnings by industrial sector
	Output per employee
	Personal income
Land Use Data (by industrial sector)	Employment
	Floor areas
	Land
Socio-economic Data	Employment
	Population
	Number of households
	Income

Source: Adapted from (Victoria and Walton 2004)

A road-based perspective on data requirements is provided by a recent analysis from Germany. The analysis identifies the types of data that are needed to analyze urban goods movement and logistics. These are grouped into three categories: data regarding the business establishments (enterprises) within an urban area; data regarding the goods that are being moved and the vehicles that are involved; and, data that describe the interaction of these trips with the transportation network and land use. These data are detailed in **Table 6**.

Several FHWA reports address the data needs for freight planning and modelling. One study examined how urban transportation models account for commercial vehicles, and recommended ways to address three key gaps: the need for improved information on vehicles by type, improved and increased establishment surveys and improved forecasting methods (Cambridge Systematics Inc and others 2004).

Another study found that although the lack of urban goods movement data is well established, state DOTs and MPOs still needed to specify the types of data they needed (Cambridge Systematics Inc. 2005).

A joint Oregon DOT-FHWA study found that there is a great deal of research that addresses the data needs for state-wide freight truck movements but much less that actually identifies the freight data attributes necessary for modelling and planning and alternative data collection methods to attain these attributes. Two pilot studies were conducted in Oregon to evaluate different data collection methods that can be applied to obtain origin-destination details, route identification, land-use at stops, commodity, weight, vehicle configuration, time of day, volume of shipments, and location of trip generators. The report recommends data

collection techniques that should be implemented based on the findings from the pilot studies (Jessup and others 2004).

Table 6: Data requirements for analyzing urban (truck) goods movement and logistics

Data on Enterprises Within the Urban Area	Data on Urban Commercial Traffic and Goods Movement	Data Describing the Interaction Between Goods Movement and the Transportation Network and Land Use
▪ Number of enterprises ▪ Size of enterprise ▪ Number of employees ▪ Number of vehicles ▪ Branch / kind of organization (e.g., subsidiary, self-standing, store) ▪ Location (inside urban area, at the urban periphery, etc.) ▪ Volume and kind of goods moved / services provided ▪ Area allocated for deliveries and storage ▪ Volume of inbound and outbound flows	▪ Number of vehicles ▪ Size and type of vehicles ▪ Weight and volume of transported goods ▪ Commodity type ▪ How loaded and means used to load ▪ Number of trips ▪ Type of trips / number of stops / frequency of trip chain ▪ Origin and destination, and land use types at each [for each trip] ▪ Trip length [of the vehicle and of the good being carried] ▪ Trip duration, including time spent in traffic [i.e., in actual movement] ▪ Duration of loading / unloading activities	▪ Daily, weekly, monthly and annual volumes of vehicles / trips on primary roads and on roads inside the urban area ▪ Composition of daily traffic volumes (size and type of vehicles) ▪ Temporal distribution of urban goods movement, daily and weekly ▪ Origin and destination of trips ▪ Time spent in traffic (by the vehicle and by the goods being carried) ▪ Time spent loading / unloading at the origin / destination ▪ Logistics requirements ▪ Delivery timetables / windows in urban areas ▪ Adequacy of loading / unloading facilities within the urban area [core] ▪ Availability of information on traffic conditions, and the reliability of this information

Adapted from (Binnenbruck 2005)

A recent TRB study proposed a framework for a national freight data program in the U.S. (Transportation Research Board 2003a). The report explained that both private and public sectors require freight transportation data. The private sector can use the data to identify underserved or emerging markets and match loads to empty capacity to improve efficiency at low marginal rates to reduce shipping costs. The public sector can use the data to monitor or analyze transportation or trade activities at different levels. These data are also needed at the stage of opportunity and impact studies for major transportation infrastructure projects or for designing traffic management programs.

One of the big problems facing data users is that the data collection efforts are not coordinated and the data sets vary in quality and reliability and cannot provide an accurate depiction of the national freight movements. Given this problem, the report focuses on

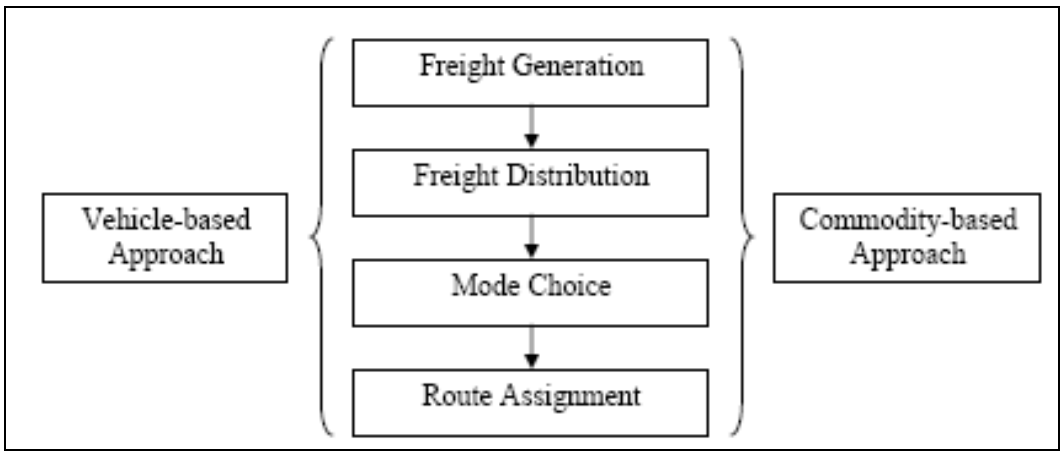
increasing the links and filling the links between data sources. The question is how do we collect and obtain the necessary data: these must be developed from freight surveys and electronic data streams. Data from other sources such as urban truck surveys would be regarded as supplementary. The most important characteristics of freight movements are: origin and destination; commodity characteristics; weight; value; modes of shipment; routing and time of day; and, vehicle or vessel type and configuration. Many of these attributes are collected from different sources. However, combining the data under one framework is the challenge (Transportation Research Board 2003a).

As a comment, the expense of surveys makes the use of electronic data collection methods such as GPS technology very promising, for example, as developed by Transport Canada in its courier and auto truck carrier surveys in southern Ontario. These initiatives focus on inter-regional trips; however, a considerable amount of urban trips also is included. A recent initiative by Transport Canada, with the Ministry of Transportation of Ontario and others, has used GPS technology to measure delays and congestion in southern Ontario and to provide near real-time wait times for trucks at selected border crossings .(Tardif 2007)

Another recent study established data needs for urban freight planning through a survey of MPOs and an investigation of the suitability of archived Intelligent Transportation Systems (ITS) data in meeting some of those needs (Victoria and Walton 2004). These data needs are highly dependent on the modelling approach to be adopted by the planning organization. Various approaches have been suggested to model urban freight demand; all of these approaches can be classified into one of two categories: the structural approach and the direct approach (Jessup et al. 2004).

The structural approach to freight modelling is illustrated in **Exhibit 1**.

Exhibit 1: Structural approach to urban freight demand modelling



Source: (Victoria and Walton 2004)

The structural approach integrates the freight component of the urban transportation system into the traditional four-step travel forecasting process and estimates the entire demand for

the two components of the system, namely, passengers and freight.[3] The direct approach to freight modelling is a simplification of the structural approach in that it forecasts the freight demand for specific components of the system such as a corridor or freight transfer facility. The structured process can be conducted using two sub-approaches: the vehicle-based approach, which focuses on commercial vehicle trips, and the commodity-based approach, which focuses on commodity flows.

Table 7 summarizes the advantages and disadvantages of the vehicle-based approach in comparison with the commodity-based approach.

In the structural approach, freight traffic generation and distribution are often thought of as separate steps, but whether this is actually the case depends on the available data. These two steps are combined when commercial vehicle trips and commodity data are available. In contrast, if data are missing, freight generation and distribution are treated separately. In this case, simulation techniques are used to estimate the vehicle trips or commodity flow matrix in the base year. Various types of matrices can be estimated as part of the freight generation and distribution steps, ranging from a single origin-destination matrix that represents vehicle trips or commodity flows between analysis zones in the base year, to several matrices that represent vehicle trips or commodity flows between analysis zones in future years. In either case, freight distribution patterns can be classified in three separate categories (Victoria and Walton 2004):

1. Origin and destination within the study area (internal trips).
2. Origin or destination outside of the study area (internal to external trips or external to internal trips).
3. Origin and destination outside of the study area (external trips).

Some of the most popular techniques to develop demand-generation models for freight are growth factor methods, regression techniques, and generation rates. For freight distribution, the most commonly used techniques are the Gravity Model and the linear programming approach. Each of these techniques and modelling approaches has different data needs as shown in **Table 8**. The list of data requirements is not exhaustive, but is intended to provide an overview of typical data needs for urban freight modelling purposes. A more detailed treatment of these various modelling approaches can be found in several studies [(Ogden 1992; Pendyala 2002; Victoria and Walton 2004)] and additional information on freight demand models in use in the U.S. can be found at www.fmip.gov . Similar information on models in use in Europe is provided in another recent study (The National Institute for Transport and Logistics 2005). A European Model Directory (MDIR) that contains information on 222 transport models in Europe has been established and is available at http://www.mcrit.com/spotlights. Sixty-five of these models are freight transport models and

[3] The four steps are: trip generation (estimation of trips produced by and attracted to each traffic analytical 'zone' in the territory covered by the model); trip distribution (distribution of the produced and attracted trips among the zones, as a function typically of zonal land uses and inter-zonal transportation 'costs'); modal share (allocation of trips by mode [may not be appropriate to urban freight]); and trip assignment (loading of trips onto the actual transportation network).

29 are joint passenger and freight transport models (The National Institute for Transport and Logistics 2005).

Table 7: Comparisons between the vehicle-based approach versus the commodity-based approach

Approach	Vehicle-based	Commodity-based
Advantages	▪ Highway/truck data are more available than commodity data, ▪ Truck trips are estimated in the beginning of the modelling process so conversion to truck trips from commodity shipment volumes is not required, and ▪ Truck trips are easily combined with passenger car trips for route assignment.	▪ It is concerned with the movement of commodities (not vehicles) that produce the demand for freight movements in that it links the producers and consumers of goods.
Disadvantages	▪ It provides little or no information about commodities transported between analysis zones, ▪ It does not provide any basis for estimating trip end control totals, ▪ Internal trips made by external truck trips are ignored, ▪ Few existing models seem to address trip chain patterns, and ▪ It has limited capability to analyze policy options such as changes in modal attributes, new freight modes or facilities, new links or pricing measures.	▪ Focuses on movement of goods directly from producers to consumers, so it tends to overlook freight movements that involve multi-channel distribution chains (e.g., wholesalers, warehousing operations) as well as transshipment and intermodal movements, all of which form important components of freight movement patterns in metropolitan areas. ▪ Requirements for more accurate and reliable cargo and highway/truck data.

Data sources for urban freight planning can be classified as either a primary or secondary source. Primary data sources include surveys, traffic counts and the use of ITS technologies capable of collecting freight data. Secondary sources include information available in public and commercial data sources (Victoria and Walton 2004).

The next sections highlight some additional findings as they relate to data collection by transportation mode.

Table 8: Data requirements for urban freight demand models

Approach	Typical Data requirements
Freight Generation	
Growth Factor Methods	Value of Output ($); Volume shipped by commodity type or group (lbs., tons, etc.); employment and earnings by industry sector; output per employee; population; personal income
Regression techniques	Socio-economic and land use data such as: population; number of households; income; employment; floor area; land-use type.
Generation rates	Truck trip data or commodity flow data. Vehicle-based approach uses: land use data; number of households; employment by land use. Commodity-based approach uses: economic data such as levels of industrial production; employment in producing and consuming industries[4]; input-output (IO) tables. In the case of models for intermodal facilities, data requirements could extend to include: land area; floor area; commodity types; shipment characteristics (e.g. value, weight, volume); location of markets; sizes and capacities of vehicles serving facilities; average daily truck volumes by class; modes available; frequency and scheduling of shipments; storage and handling operations at facilities; geometric and operational characteristics of access roads.
Freight Distribution	
Gravity Model	Travel time; trip length (distance); vehicle or commodity trip length distribution (TLD). For freight destination choice models involving trip chains, typical data inputs used are: value; weight; volume, mode of transportation; average tour length; number of stops per tour; load type (e.g. LTL or TL); average vehicle payloads.
Linear Programming	Data requirements for this approach are undetermined at this point as no application at the urban level has been found.
Freight Mode Choice	
Traditional mode choice models	Commodity characteristics (e.g. bulkiness; shelf life; value; use rate); origin and destinations, transportation costs
Modal diversion models	Generalized costs of intermodal transfer, including time and actual costs
Disaggregated models	Total logistics costs (e.g. inventory carrying costs while goods in transit; insurance costs for loss and damage claims; drayage costs; various other handling / processing costs); shipment characteristics (e.g. value; size; time-sensitivity; shipment distance); service quality attributes (e.g. on-time delivery; frequency and scheduling of shipments; reliability; damage-free delivery; ability to expedite)
Aggregate models	Commodity flow data (e.g. transit cost and transit time by commodity; shipment size)
Network model	Data requirements for this approach are undetermined at this point as no application at the urban level has been found.
Freight Route Assignment	
All-or-nothing	Link attributes for road network available to trucks (e.g. presence / absence of truck-only lanes, designated hazardous routes); time period factors; Passenger car-equivalent factors (PCEs); travel time reliability; applicable tolls; etc.
Incremental assignment	
Multi-path assignment	

[4] This approach requires the conversion of commodity shipment volumes or tonnage into truck trips using a variety of methods that are based on VIUS and / or Global Insight / TRANSEARCH data.

3.2.1 Truck

Rail, ship, and air transport are inefficient over the smaller scale of urban areas; hence urban goods movement is almost exclusively road-based and truck dependent. Given the role of trucking as the predominant mode of transportation for the movement of goods, any form of freight planning requires a statistically sound truck travel survey, even if collecting full origin-destination (OD) information is not practical. Ideally, this survey should be supplemented with truck counts at several locations. Some important issues to consider when collecting data include deciding the number of truck classes the data should be disaggregated into for modelling purposes and determining type and size of destinations as a basis for generating trip rates. If truck counts are comprehensive and accurate enough, a mathematical procedure could conceivably be used to generate an OD matrix using count data as input. However, this method has as yet not been widely used (Chatterjee 2004).

It should be noted that airports, marine ports and rail terminals and intermodal yards often are located in congestion urban cores (rail, marine) or have become significant suburban activity centres in their own right (air, rail). Regardless of their location, they tend to generate high levels of truck trips, thus contributing to and being impacted by road congestion.

A large component of commercial movements within urban areas is made with light commercial vehicles (LCVs) including four-tire, two-axle vehicles such as pickup trucks, vans and even passenger cars. This is in contrast to interurban transport where load consolidation makes better economic sense and large volumes of goods moving between large areas also increases the importance of larger, heavier commercial vehicles such as tractor-trailer combinations.

A recent review of freight demand models noted, by and large, that modelling efforts in North America are carried out at the regional, national or even international level, but not at an urban level as typically done in Europe (Ambrosini and Routhier 2004). The inherent difficulty in comparing data collection efforts from one country to the next is that methods, scope and focus of data collection efforts all vary greatly. Even the definition of what constitutes urban freight is different. Countries with low-density urban areas only focus on commercial vehicles, while countries with high-density urban areas include trips related to commercial service calls, waste transport and many other trip types in a wide scope of the logistics chain. There are clear challenges in capturing some of the vehicle movements within the logistics chain. For instance, an understanding of empty vehicle movements or deadheading, is critical for repositioning the vehicles in the transportation system, but is notoriously difficult to survey.

Many data collection efforts focus on goods flows. However, the collection of data based on goods flows leads to models that conceptually are inconsistent with those based on vehicle trips, as goods flows indicate real demand and exclude empty vehicles movements, while trips are based on logistical decisions. Difficulties associated with collecting good data are exacerbated with the growth of e-commerce as it leads to the generation of goods flows from

points represented by neither the shipper nor the receiver. A review of international data collection efforts revealed the following (Ambrosini and Routhier 2004):

- In the past, Toronto and Ottawa have both used mail-out carrier surveys based on vehicles recorded in the urban area, face-to-face interviews with forwarders, and practitioners' discussion groups. Another recent study also added that a review of data collection efforts in Toronto, Calgary, Edmonton, Ottawa and Vancouver shows them all involving truck trip sampling disaggregated by size and body style (Woudsma 2001). Vancouver and Edmonton start their samples at 4,500-kg trucks. To varying degrees, these cities have used mail-out surveys, with visits for larger firms, discussion groups, screenline and cordon counts, ride-along surveys, and end-point surveys for data collection.
- France and Germany use similar methods as Canada. In France, interview-surveys of drivers identified the size of the delivery truck, the split between round-trip tours and single trips, the professional carrier / own account vehicle split and the breakdown of the distance travelled. France also surveyed on-street parking times to determine the occupancy impact of commercial vehicles.
- In Germany, in-depth surveys were carried out at 9,000 locations across the country and were supplemented by surveys of drivers regarding their traffic behaviour.
- In the United Kindgom, vehicle logs were also used for data collection. The United Kingdom has a wider definition of urban freight transport that includes all types of vehicles and movement to or from premises, measured with thorough qualitative interviews and discussion groups.
- Japan is looking at real-time information-processing technology to feed probabilistic routing and dynamic simulation models.

The aforementioned international review concluded by recommending that the definition of urban goods movement be expanded to include household purchasing trips (i.e. cars), urban road construction / maintenance, waste collection, and other trips so as not to restrict the term's application to movement of goods between premises (Ambrosini and Routhier 2004). Methods based on economic premise surveys describing pick-up and delivery operations are shown to be the most relevant and efficient.

The Colorado Department of Transportation (CDOT) has used hundreds of permanent and portable counting stations which quickly identify freight-intensive places. An additional weigh-in-motion (WIM) program classifies truck counts by speed and weight / axle. A recent Freight Infrastructure study collected truck vehicle-miles travelled and tons moved by truck type and commodity transportation information aggregated into five groups. CDOT also assessed different data sources and approaches used in Colorado and elsewhere in the United States (Felsburg Holt & Ullevig and Cambridge Systematics 2005):

- The TRANSEARCH[5] database as used by CDOT gives the amount of each of 30 commodities moved broken down by modes into private truck, less than truckload truck and full truckload truck. The Colorado Department of Revenue also collects some

[5] A more detailed discussion of the TRANSEARCH database can be found in Section 4.9.1.

information on commercial vehicles, but this is done for enforcement purposes, is inconsistent, and cannot easily be compared with the DOT counts.

- In California, Caltrans conducts weekday 9-5 truck surveys gathering information on origin, destination, next stop, last stop and commodity. Caltrans also uses the Intermodal Transportation Management System, a database that estimates flows of goods between California counties based on state-provided production and consumption data.
- In order to collect truck data in Portland, Oregon, a combination of 24-hour vehicle classification counts, roadside OD surveys on both highways and at freight-intensive facilities, trip diaries and a licence plate survey were all used. The Port of Portland also collected logistics information by shipper, including commodity details, locations and modes for all consumed and produced goods.
- Washington State and Texas have both collected roadside data at weigh stations. In Washington this led to the Strategic Freight Transportation Analysis, which includes an OD truck survey. In Texas there was also a roadside OD survey that collected information for emissions estimates.
- The U.S. Transportation Bureau's Commodity Flow Survey (CFS) provides data on the flow of goods classified by origin, destination, type, weight, value, mode(s) used, container type, hazardous / non-hazardous status and whether they are for export.
- The U.S. Federal Highway Administration's Freight Analysis Framework (FAF) estimates commodity flows and related transportation activity by weight, type, mode, origin and destination, including estimated (1998) and forecasted (2010 and 2020) flows along major routes by weight, mode and number of trucks. Previous experience working with the FAF and CFS data has shown that the quality and validity of such data are debatable, particularly when disaggregated into too fine a level, as is needed for urban goods movement.
- The U.S. Vehicle Inventory and Use Survey, which is conducted every five years, collects information on trucks including VMT, weight, type and materials carried.

3.2.2 Rail

The TRANSEARCH database as used by the Colorado DOT gives the amount of each of 30 commodities moved broken down into modes including carload rail and intermodal rail (Felsburg Holt & Ullevig and Cambridge Systematics 2005). The aforementioned CDOT study also noted that the Washington Strategic Freight Transportation Analysis, which included a component on commodity and product information for shortline railways in order to determine their investment requirements. Finally, as with trucks, the FHWA's FAF provides estimated (1998) and forecasted (2010 and 2020) tonnage by origin, destination and commodity type for rail segments of freight movements.

3.2.3 Air Carriers

The Colorado DOT is in the process of organizing a survey of the operators of 50 of 77 smaller airports in the state to determine inbound / outbound commodity information and

load weight, including both dedicated carriers such as FedEx and UPS and mixed passenger / cargo aircraft (Felsburg Holt & Ullevig and Cambridge Systematics 2005).

3.2.4 Marine

The FHWA Freight Analysis Framework provides estimated (1998) and forecasted (2010 and 2020) tonnage by origin, destination and commodity type for aquatic segments of freight movements (Felsburg Holt & Ullevig and Cambridge Systematics 2005).

3.3 Best Practices

3.3.1 Overview

This section describes best practices in urban goods movement data collection from Europe, Australia and Canada. The European experience documents practices from several countries. Key considerations are the availability of national databases from which to draw samples and related information, and which can serve as holistic frameworks for the analysis of urban goods movement. The European experience thus highlights the importance of appropriate supporting databases. The Australian approach (Sydney) builds upon similar existing regional databases with focused goods movement surveys and data collection. Its benefit to this research is that it offers a reasonably straightforward 'jump-off' approach blending available information with selected new data, which could be applied relatively easily to many Canadian cities. Finally, the Canadian experience cites recent initiatives in Edmonton and Vancouver. The Edmonton experience, which was based upon a similar approach for Calgary, expands the technical content of data collection by including service trips; provides a systematic treatment for developing a sampling frame; and, providing the basis for modelling tours. The Vancouver approach proposes to integrate supply chain, economic and land use and community design data with goods movement data.

These examples were selected because they focus on urban goods movement data, they were identified in the literature as being the most recent or best practice, and they potentially can be applied to Canada. It should be noted that the literature review identified several best practices in goods movement data collection in the United States. However, these tended to focus on inter-urban goods movement; and such urban data collection activities as were identified as novel or best practice focused on port-related goods movement (i.e., inter-urban goods movement). As a result, these were not considered further in the best practices discussion.

3.3.2 State of the Art Data Collection for Urban Transportation in France

In 1990, France made the transition from having no specific tools to deal with the study of urban freight movements, to including those movements in the study of urban transport and having specific urban goods surveys. The Transport Ministry launched a research program in

1993 to increase knowledge about urban goods movement. This knowledge was to be used to create local and national level decision making tools that could improve the movement of goods in France. Assisting stakeholders in innovating transport solutions, and the creation of a legal framework for better decision making, were also goals of the new program (Routhier 2005).

France has four main databases for urban freight transportation information – registers and census, periodic surveys, occasional surveys (large), and one-shot surveys (small). Registers and census are the responsibility of the Ministry of Finance and the National Institute for Statistics and Economic Studies. These databases cover vehicle characteristics and economic and land use aspects of goods movement. The databases are useful for weighting statistics, large counts, and the calibration of models.

Periodic surveys were handled by the Ministry of Transport, which worked in collaboration with other agencies and with local authorities, which handled counting and cordons. This database serves the purpose of weighting statistics and interurban traffic modelling. Occasional surveys were carried out by the Ministry of Transport, government research agencies, and academia. These large urban goods movement surveys and shipper surveys served the purpose of creating a database useful for national scale diagnostics, urban goods modelling, and qualitative and quantitative analyses. Subsets of this database are: pick ups and deliveries, trips for purchase, and urban management flows. Small one-shot surveys covering purchases, e-commerce, reserved parking and other topics, formed a database suitable for local scale diagnostics and decision making as well as qualitative analysis.

Key lessons learned include:

Registers and Census

- All of France covered in exhaustive and fine spatial database
- Periodic updating
- Easily accessible at scale of town for commercial vehicle licensing data

Periodic Surveys

- Good knowledge of stock and types of vehicles
- Exhaustive yearly results
- Good knowledge of breakdown between goods transport and other uses
- Covers individual trips, by car v. other modes, for household trip surveys

Occasional Surveys (large)

- Joint survey modelling approach for large urban goods movement surveys.

One-Shot Surveys (small)

- The results of these surveys cannot be generalized, given their specificity and uniqueness and, as a result, they cannot be used for modelling.

Key gaps that remain in urban freight data in France include:

- Non-road transport data
- Quantitative data on home deliveries
- Data describing operating costs
- Traffic generated from warehousing activity

- Consumer purchasing behaviour patterns
- Commercial data related to logistics[6]

The joint survey modelling initiative links the logistics of the firm with the urban transport organization to give more accurate information on urban goods movement. This process starts by analyzing delivery and pickup, and then involves parallel surveys for the establishment and the driver, and finally analyzing traffic and parking time, and generation per zone. The survey for the establishment covers generation of deliveries, type of good, and activity and environment of the premise. The parallel driver survey deals with type of vehicle, type of run, and identifies who is working.

3.3.3 State of the Art Data Collection in the United Kingdom

In the United Kingdom, there are a number of organizations that collect freight-related data on an on-going basis. The Department for Transport, Office for National Statistics, urban authorities, trade organizations, and the Revenue and Customs department are all involved in regular collection of freight related data. The Department for Transport is the main organization collecting data and covers all forms of transportation with a large number of continuous surveys that are updated on at least an annual basis. At present, data collection efforts mainly target inter-urban goods movement. Exploratory studies specifically for urban freight data are beginning to take place, mostly in academic (university) environments. Commodity flow surveys, shipper surveys, and loading / unloading / parking infrastructure data for commercial vehicles are still lacking. Key gaps in urban freight data in the U.K. include:

- Vehicle routing / journey information.
- Journey time / reliability of journeys (i.e. freight trip performance).
- Environmental impacts at the supply chain / industry-sector level.
- Data on loading / unloading activity.
- Lack of linkages between modes.
- Lack of information about the specific supply chain stages between which freight is transported.
- Lack of detail about land uses between which goods movements take place.

One of the keys to the success of the data collection effort in the U.K. is the idea of having continuous surveys on road goods transport in Britain (Browne 2005). In 2004 a survey achieved a 94% response rate. Surveys that took an average time of 26 minutes to complete were being used and since the process is always on-going, all definitions and technical terms were consistent, clear and understood by all parties. There was little confusion about what the

[6] It should be noted that all of these data are important for transportation planning. For example, operating costs dictate how carriers route or time their deliveries / pick-ups, as well as the tariffs they charge to customers (who, in turn, choose modes or intermodal combinations in large part on the basis of cost). As well, consumer behaviour is a determinant of demand: the frequency of retail cycles dictates, in part, the volume and frequency of goods movement – food stores must be replenished daily, because consumers demand fresh food, whereas the retail cycle for department stores may vary only weekly, monthly or seasonally (depending on the specific good).

survey was asking. Both survey staff and respondents understood the survey unambiguously and in the same way. Also, telephone reminders were used to get the attention of non-respondents. All of these factors led to the overall success of the surveys. The topics for the surveys included trends in freight, commodity flow, vehicle information, road goods vehicle trip information, safety and security, major freight generating facilities and depots, and social and environmental impacts of the operations.

An investigation of various sources of information on freight transport in Scotland found that they could be classified into three groups (McKinnon and others 2000b; The National Institute for Transport and Logistics 2005):

1. Annual series, published at least annually, often quarterly, with consistency of method and scope.
2. Periodic series published at intervals of greater than one year with consistency of method and scope.
3. Occasional series, one-off reports with a specific business purpose and unique design.

In total, 18 primary sources of freight data for Scotland were identified and reviewed. After having reviewed the data sources and identifying deficiencies, it was found that industry participation should be founded on well focused and professionally administered research. The key to getting industry buy-in is involvement in survey design, and most importantly, quick, tailored and accessible feedback of the data collected (McKinnon and others 2000a; The National Institute for Transport and Logistics 2005). In general, researchers found that industry is open to providing data via a variety of formats. Approaches to data collection should be tailored to the individual company capabilities, which may range from automatic download of information, face-to-face interviews or telephone interviews, to postal questionnaires.

Given the nature of the highly variable, qualitative and confidentiality of logistical data and performance data more direct and expensive face-to-face methods are typically required. Therefore, it is likely that the postal questionnaire and interview, either telephone or ‘face-to-face’ will remain the principal methods of data collection for the foreseeable future (McKinnon et al. 2000a; The National Institute for Transport and Logistics 2005). As an alternative to one-off surveys of sample companies, the use of panel-based surveys, in which the same group of companies is polled at regular intervals, was also recommended. This would make it possible to exploit the typically high degree of concentration of companies in the various industry sectors of the economy and permit more consistent analysis of freight and logistics trends.

3.3.4 State of the Art of Data Collection in Italy

Much of the urban freight data collection efforts in Italy have been done on an *ad hoc* basis. At present, there is no national body or organization responsible for the coordination of freight data collection. ISTAT, the national statistics institute, only focuses its efforts on vehicles with gross vehicle weights in excess of 3.5 tonnes. Recent studies have been carried

out in cities like Rome, Milan, Padova, Bologna, Genova, Sienna and Ferrara. Alternative data sources for Italian planners have included data collected from carriers such as express courier companies. In the case of courier companies, OD information can be derived from electronic forms. However, there is currently no guarantee of the availability of this data as there are no formal arrangements with those companies.

Unlike in North America, many of the transport providers publish information on pricing for consumers on their websites. However, these cost figures may be inaccurate as prices may be modified depending on user subscription to annual or monthly services, for example, laundering services for hotels (Guglielminetti 2005).

3.3.5 State of the Art of Data Collection in Spain

A number of urban goods movement studies have been carried out in various cities throughout Spain over the last ten years. Cities surveyed have included Vigo, Barcelona, Seville, Granada, Valladolid, Malaga and Zaragoza. In the larger cities such as Barcelona and Madrid, a series of surveys is typically carried out. These include receiver and carrier surveys, retailer surveys, census of load zones, establishment surveys and investigations of violation rates of restrictions at loading zones. On occasion, special studies on select commercial corridors have also been carried out such as in Seville (Muñuzuri 2005).

3.3.6 Urban Goods Movement Data Collection in Holland

There is an abundance of general data, such as the number of registered trucks and economic data as published by the Netherlands Bureau of Statistics. However, these data are not provided at the level of detail that is required for urban freight planning. Land use data and road network data are also available, but at a cost. A recent development is the creation of a database, Connekt's Delivery Profile, which has been used to collate and make available freight data from local authority members. However, this is only a one-time survey that includes several cities. At present, there has yet to be any collaborative efforts between planners and logistics experts to investigate opportunities for data sharing (Vleugel 2005).

3.3.7 Urban Goods Movement Data Collection in Germany

Like many countries, Germany has carried out extensive data collection efforts at a national level. In terms of data collection at the urban level, the focus to date has been mainly on vehicle-based surveys and commodity data, while information on transport costs has been lacking. Data are lacking for non-road modes of transportation. Several surveys have been carried out at the urban level since 1994, as shown in **Table 9**.

Of note is the survey that was carried out in Munich in 1995. The survey consisted of three parts (FR Friedrich et al. 2003), which are described below.

Table 9: Sample surveys on urban freight data in Germany since 1994

Data Collection	Domain	Characteristics	Method	Extent
Region of Hannover 1993, 1994	Commercial transport	Status-quo-analysis of the whole commercial transport (all modes), etc.	Questionnaire postal delivery, traffic counts	6,000 questionnaires nearly 25% response rate
City of Cologne 1994	Goods transport	Number and kind of trips by utility vehicles interior of the city-core, etc.	Questionnaire postal delivery	Sample is unknown
City of Düsseldorf 1994, 1995	Goods transport	Trips of utility vehicles in different branches, duration of trips, etc.	Questionnaire postal delivery	2,350 questionnaires 17% response r ate
Region of Dortmund 1995	Goods transport	General goods transports (all modes), number of trips on road, different branches, use of computerized systems and telecommunications technology, etc.	Questionnaire postal delivery	816 questionnaires; quota of response is unknown
Region of München 1995	Commercial transport	Commercial transport (all modes) in different branches, number of trips, transportation, delivery service, etc.	Questionnaire postal delivery	3,120 questionnaires 58% response rate
City of Bielefeld 1995	Demand on logistics service by receivers	Volume and structure of daily shipments and deliveries, trips of vehicles, conditions of delivery, requests of service-quality, possibility of shipment-bundling, etc.	Questionnaire postal delivery	3,662 questionnaires 11% response rate
Region of Stuttgart 1996	Goods transport	Trips of vehicles in hire and reward sector, number and kind of vehicles, volume and kind of goods, destinations, etc.	Questionnaire postal delivery	2,760 questionnaires 14.3% response rate
Region of Münster 1998	Operational database for city logistics	Number and kind of private enterprises and public establishments in the city, volume of logistics-service and waste, demand on logistics-service, etc.	Questionnaire postal delivery	859 questionnaires 14% response rate
City of Hamburg 1998	Express-and-courier-service	Local situation of express-and courier-service, supply of logistics-services, structure of clients, solutions of real problems, etc.	Questionnaire postal delivery	120 questionnaires 47% response rate
City of Heidelberg 1999	Integrated city-logistics	Theoretical testing of three logistics-scenarios with new vehicle- and vessel-technology for city-logistics, parcel goods service, beverage delivery service, etc.	Interview and round-table-discussions	20 interviews, 4 tables 90% response rate
Total Germany: Motorized traffic in Germany KID 2002	Commercial transport on road in typical housing-estates	Number and kind of vehicles and trips, trip-purposes of motor-bicycles, cars, vans and utility vehicles under 3.5 tons loading capacity on inland routes, traffic-staying-time, speed of trips inside different areas (overcrowded, urbanized and rural regions, professional and private holders, volume and kind of transported persons and goods, departure and destination sites, etc.	Questionnaire postal delivery special care for holders of large fleets, hotline-service for all	100,729 questionnaires 50.6% response rate Additional questionnaires for some interesting Länder (states): ca 23,000

Source: (Binnenbruck 2005)

1. **<u>Written Postal Behaviour Survey</u>**. This survey used two types of questionnaires. "*Questions on workplaces*" were directed at private firms and asked about the number of employees, number of vehicles and number of received deliveries. "*Questions for the*

employees" were designed as a trip diary asking the mobile employees (actively travelling on the key date) for details on the vehicle used, destinations, loads, etc.

2. **Survey of Singular Transport Generators**. In order to accurately capture traffic flows that were dependent on the behaviour of individual, large traffic generators, and the traffic flows resulting from the remaining commercial transport not otherwise surveyed, an additional survey accompanied the main survey. The survey of "*singular transport generators*" included freight forwarders and the flows of the remaining commercial transport by taxis and buses, and even municipal services such as emergency services, fire brigade, police, etc.:
   - The group freight forwarders consisted of 19 major Munich freight forwarders and businesses that operate central logistics points. Their surveys were used to compare the results of the general survey with the actual behaviour of the freight forwarder branch and to improve the quality of the results for these traffic zones.
   - The remaining commercial transport consisted of taxis, buses, postal transportation, emergency services, the police and the local authorities. The objective of that part of the survey was to estimate the kilometres travelled.

   A total reply rate of 79% of all questionnaires was achieved.

3. **Roadside Survey of Drivers**. In order to check and calibrate the traffic flow from the commercial transport model, information on the actual structure of the traffic flow, (i.e. the share of commercial traffic), was surveyed by means of driver interviews. Drivers were interviewed at five selected locations in the Munich network of arterial roads in the morning (8:00-11:00) and the afternoon (14:00-17:00). This survey enabled the planners to calibrate their trip generation and assignment models and also confirmed findings from the business surveys.

These various surveys have allowed planners in Germany to collect data on the shippers and their shipments (Binnenbruck 2005):

1. National shipper information:
- Number of companies
- Location
- Size
- Number of employees
- Number of transport vehicles

2. Shipment details:
- Traffic volume
- Weight and volume of goods
- Vehicle type and size
- Commodity type
- Number of trips and stops
- Trip frequency and chaining
- Origin-destination
- Tour / Trip length

- Transit time
- Trip purpose
- Volume of consolidated shipments or bundles
- Loading and unloading time
- Delivery timetables

Much of the traffic counting is done using ITS technologies such as GPS, tube / loop sensors, and AVC. Manual counts also are used. Data from private companies typically are gathered using telephone or mail-back surveys.

An analysis of survey data revealed several problems related to overly small sample sizes (low response rates), high costs in conducting non-response surveys, compatibility among different datasets, and compatibility of the collected data with European standards. To overcome these data issues, a quality-control system was introduced to guide and monitor ad-hoc data collection. Initial results appear to indicate that there have been significant improvements in the quality of the data collected (Binnenbruck 2005).

3.3.8 The Sydney Commercial Transport Study

In 1996, the Sydney, Australia Transport Data Centre, now called the Transport and Population Data Centre (TPDC), commenced the Commercial Transport Study (CTS). The goal of the CTS was to produce small-area estimates of trips by rigid and articulated trucks (heavy vehicles) and light commercial vehicles (LCVs) in the Sydney Greater Metropolitan Area. These estimates would supplement the existing estimates on personal travel to give a complete picture of vehicle movements in the Greater Metropolitan Area. After years of developing and testing the estimation procedure, TPDC has now produced data for 1996 and 2002, and is in the process of further enhancing the method as a result of a review of the initial sets of estimates.

The CTS Trip Table Estimation Procedure, which adopts a commodity-based approach, provides 2002 and base year (1996) estimates of trips for the three aforementioned classes of vehicles by zone in the Sydney metropolitan region.

At the time the CTS started, the only source of detailed commercial vehicle data for Sydney was TPDC's 1991/92 Commercial Vehicle Survey. This survey was a comprehensive survey, supported by an appreciable budget, but it still suffered from the limitation inherent in any survey – the data were not reliable at a small-area level, in this case, the TPDC travel zone level. Given this limitation, rather than repeat the Commercial Vehicle Survey, TPDC instead decided to develop an estimation method that would provide acceptable estimates of commercial vehicle movements (Medigorin and Peachman 2005).

The CTS uses separate processes to estimate heavy and light vehicles. The CTS estimation method for heavy vehicles uses the MVESTM module of the CUBE-TRIPS software which applies the Maximum Likelihood method. The matrix estimation procedure uses the

following inputs to produce origin by destination estimates of commercial trips by vehicle type:

- Trip ends: These are trip counts by travel zone derived using: FreightInfo commodity flow data; Australian Bureau of Statistics (ABS) Survey of Motor Vehicle Use data on the proportions of commodity tonnages moved by type of commercial vehicle, ABS Input-Output make and absorption matrix and Journey to Work zonal industrial employment, and TPDC's 2001 Industry Survey data on vehicle loading factors and service vehicle attraction rates for LCVs. FreightInfo is a database of all freight flows within, to and from Australia. It is owned by FDF Management and is updated every three years. The database includes freight movements (in kilotonnes) by commodity type (using 4-digit FreightInfo commodity codes), by region (using FreightInfo zones), and by mode (road, rail, sea international, sea coastal, pipeline, conveyor, air international and air domestic).
- Screenlines: These are sourced mainly from TPDC's 2002 Classified Vehicle Counts Study and also use the regional transportation authority's AADT counts.
- Road Network.
- Prior Matrix: This is the seed matrix that gives the initial shape of vehicle flows and is partly based on the results of TPDC's 1991 Commercial Vehicle Study.

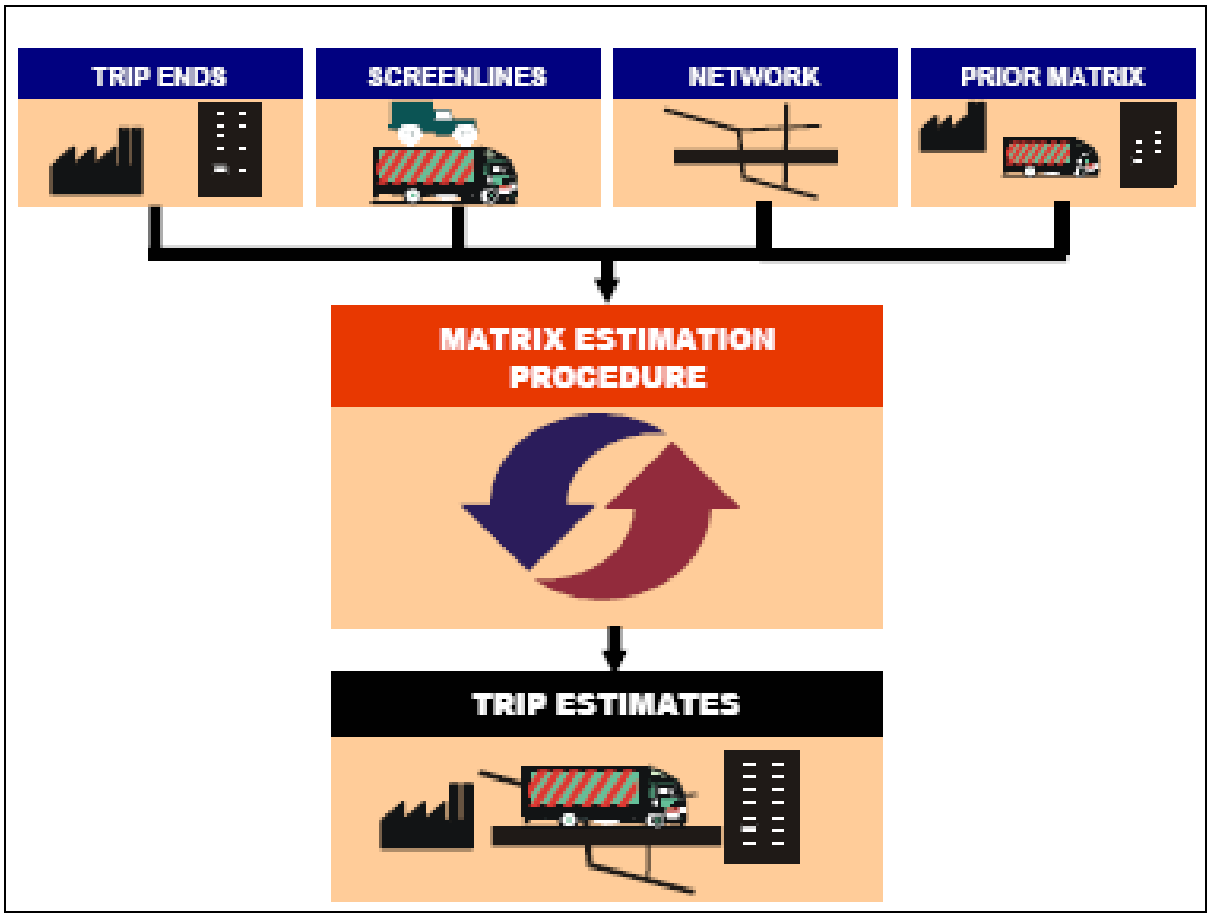
The method used in the CTS for estimating heavy vehicle trips is illustrated in **Exhibit 2**.

For the estimation of LCV trips, an alternative approach was required due to the lack of two key inputs for LCV estimation. First, light commercial vehicles providing services, rather than carrying commodities, are excluded from the FreightInfo tonnage data. Second, virtually none of the traffic counts distinguishes light commercial vehicles from passenger vehicles. Without accurate LCV traffic counts, there was little purpose in using a matrix estimation procedure.

LCVs are separated into commodity-carrying, or Light Goods Vehicles (LGV), and Light Service Vehicles (LSV), which provide services. Trip ends for LGVs are produced in the same way as those for heavy vehicles, using the FreightInfo tonnage data and conversion process.

However, due to the lack of trip end information for LSVs, TPDC conducted the Service Vehicle Attraction Rate study in order to determine trip generation and attraction rates to households and businesses. The rates obtained from this study were applied to household and employment distributions to obtain trip end estimates. The trip table for LCVs was developed using the TRIPS MVGRAM module and uses trip ends and a cost matrix to distribute the trips across travel zones. The MVESTM module was not used for LCV estimation because currently there are no LCV screenline counts to use as an input to the process. This is because LCV counts cannot be obtained from tube or other automated counters, since the determination of whether or not a vehicle is an LCV depends on function as well as the vehicle type. The LCV estimation process is shown in **Exhibit 3**.

Exhibit 2: The CTS heavy vehicle trip estimation process



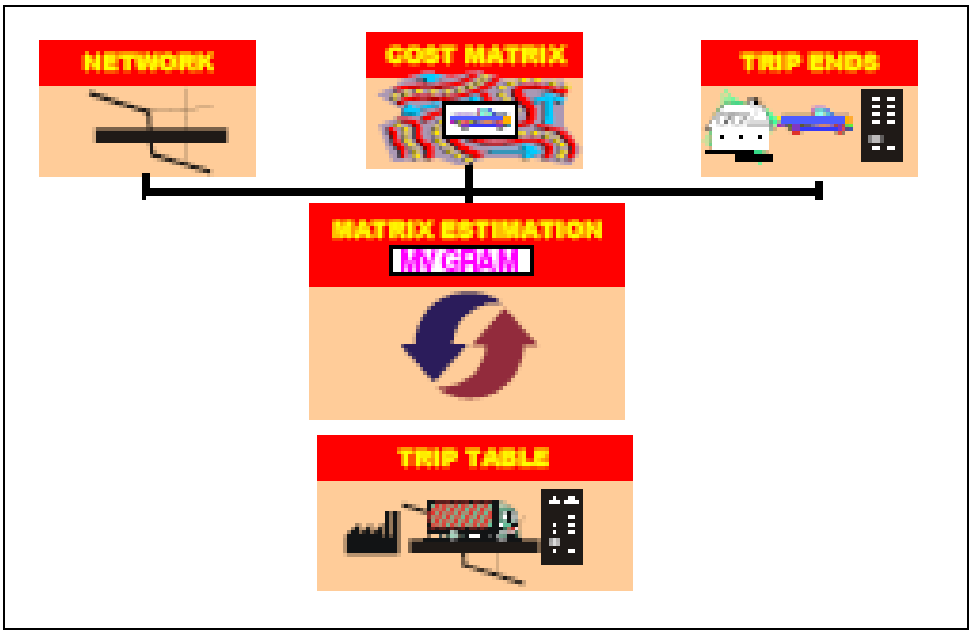
Source: (Transport and Population Data Centre 2005)

In sum, the CTS relies to a great extent on available external data, such as, the FDF FreightInfo data, and the ABS Survey of Motor Vehicle Usage, Input Output commodity flow data and Census Journey To Work. However, it also relies heavily on various studies conducted by TPDC itself to capture the commercial vehicle travel patterns specific to Sydney metropolitan area; namely, the Commercial Vehicle Survey, the CTS Industry Survey, the Service Vehicle Attraction Rates Study, and the Classified Vehicle Counts Study.

3.3.9 Edmonton Commercial Movement Surveys

Two surveys of the nature of goods and services movements were carried out by the City of Edmonton and Alberta Transportation in 2001 and 2002 (Hunt and others 2004a). These were the Edmonton Region Commodity Flow Study, and the Edmonton Region External Truck / Commodity Survey. Both were similar to surveys conducted by the City of Calgary in 2000.

Exhibit 3: The CTS LCV trip estimation process



The Edmonton Region Commodity Flow Study surveyed businesses to obtain descriptions of the basic patterns of goods and services flows throughout the Edmonton region. It also captured the nature of the person- and vehicle-movements generated by businesses in the shipment of goods and services from location of production to location of consumption. Given the variety of types of goods and the units in which they are measured, the overall magnitude of goods shipments was difficult to quantify. For example, goods can be measured and shipped in pallets, board feet, kilograms, tonnes, and litres just to name a few. Hence, a variety of units of measure was needed to ensure flexibility in the data collection. Services were measured in terms of 'visits', which typically include site visits or trips to a customer's establishment (City of Edmonton and Alberta Transportation 2003).

The Edmonton Region External Truck / Commodity Survey focused on the movement of commercial goods by trucks in and out of the Edmonton Region. More than 6,500 truckers transporting commodities into and out of the Edmonton Region were interviewed over a three month period in 2001. The interviews targeted truckers entering and exiting the region on various provincial highways. The survey gathered the following information (Ishani 2003):

- Commodities carried
- Origins and destinations
- How those goods reach their destinations
- Vehicle type being used, including all sorts of multi and single unit trucks, light trucks, vans, etc.
- Stops being made in the region
- Time of day of travel

- The highways used to transport the commodities
- The ownership of the vehicles

Based on the data captured through both surveys the following information can be summarized:

- Vehicle characteristics
- Fuel type
- Vehicle ownership
- Trip generation by vehicle type
- Trips by goods category
- Trips by service category
- Spatial pattern of origins and destinations
- Trips by time of day
- Truck volumes on roadways

The participants of the study note several important lessons learned during the design and execution of the surveys:

- 'Buy-in' to the study from the local business community and trucking associations is vital.
- The study should be designed to minimize survey burden and give consideration to confidentiality.
- Respondents must see how their participation will result in improved planning, which will result in improving their current situations.
- Sufficient resources must be available to complete the data collection appropriately and with accuracy. In this case, it involved face-to-face contact which can be very expensive.

3.3.10 Greater Vancouver Goods Movement Study

Recognizing the role of Vancouver as a major goods movement hub in North America, the Greater Vancouver Transportation Authority (TransLink), in association with the Ministry of Transportation of British Columbia, Transport Canada, the Greater Vancouver Gateway Council (the regional freight forum), the Vancouver Port Authority, and the British Columbia Trucking Association, commissioned a study to develop a multi-modal regional freight strategy for the area (Cambridge Systematics and others 2006).

The 2006 study identified a number of major gaps in goods movement data. In terms of flows through rail gateways, there is a lack of information on flows originating and terminating in the Greater Vancouver Regional District (GVRD), the facility types at origins and destinations, and the operating characteristics of those rail facilities. For international marine flows, there is a lack of information on inland origins and destinations of flows through seaports. As the study points out, this lack of information represents a significant data gap in identifying the fraction of inland destinations served by British Columbia relative to the U.S. West Coast ports. Further, the proponents of the study found that there is no good comprehensive commodity flow database for the Greater Vancouver region. There are

several good modal databases that provide commodity information but these tend to be reported at the inter-provincial level only. This therefore makes it difficult to determine the true significance of inter-provincial trade flows to regional traffic patterns.

Due to the increased presence of trade and transportation / warehousing industries, as well as the high fraction of the economy in service industries, the study determined that local distribution and service activity comprises a major component of the goods movement system in Vancouver. As such, accurate estimates of local distribution movements are critical for planning purposes. However, in Vancouver, as in many other parts of Canada, there is a lack of sufficiently detailed data to portray the complexity of origin-destination patterns and trip chaining behaviours. Although data on origin-destination patterns of local truck trips and the characteristics of land use / business type at the ends of these trips were collected in the 1999 Lower Mainland Truck Freight Study, the relationship between local distribution traffic and international and domestic trade remains poorly documented and understood because of a lack of information on supply chains.

At the conclusion of Phase I of the study, the primary data gaps identified were found to relate to three key areas. These are described below:

1. **Supply chain data**. The study recommended that supply chains of key industries in the Vancouver region be documented by defining the key suppliers, modes, OD patterns, and timing of shipments for the key industries. This data collection effort, to be carried out in Phase II, is expected to provide an understanding of the operational performance of the transportation system through the use of analytical tools specifically developed as an addendum to Vancouver's existing regional truck model. This tool will help planners in the GVRD evaluate how supply chain performance is affected by transportation system performance.
2. **Economics**. Another data gap identified in the study was the lack of understanding of the economic importance of the goods movement industry in Vancouver, the actual value of goods moving in the region, and the precise financial implications of current and forecasted bottlenecks in the system. Understanding these economic relationships will help provide information on the relative magnitude of transportation problems in the region and their impacts on the cost of doing business for various industries.
3. **Land use and community impacts**. The third major category of data gaps in the Greater Vancouver region is related to land use and community impacts. Through the study, the authors established that it is important to collect information on the location of demand for goods movement facilities in the region based on forecasts of goods movement demand. This information can be used to compare land use options based on current policies and community acceptance of freight-related facilities. A related topic is to understand the type and amount of transportation related and transportation-dependent firms that have relocated in the recent past, as well as understanding the locations of new, expanding and relocating facilities and how this event of attrition subsequently impacts the supply chains and transportation operations in the region.

3.3.11 Stated Preference Surveys - Québec – Windsor Corridor

The origin-destination surveys described in the preceding sub-sections fall under a category of data collection that is known as *revealed preference* (RP) surveys. RP surveys collect information from respondents that describes their actual, observed behaviour: the trip's actual origin, its actual destination, when it actually started, the mode(s) actually used, the commodity actually carried, and so on. However, a 2005 study of freight modal choices in the Québec City – Windsor corridor illustrates some of the limitations that are associated with revealed preference surveys (Ewing and others 2005):

> "It is almost a cliché to say that getting access to freight data is difficult. There are many reasons for this, the primary one being that the transportation industry is very competitive. Moreover, freight data is generally private and as a result of its competitive importance, companies can be reluctant to provide information … that they think might compromise their competitive position, or simply because they are constrained by contractual obligation not to reveal information.
>
> "In the context of freight choice analysis, information requirements can be particularly burdensome. If one is attempting to estimate conditional discrete choice models … information is required not only on the alternative chosen, but also on the alternatives rejected. That is, the analyst needs to know about the cost, on-time reliability, etc. of the chosen mode, as well as the same characteristics for the other alternative(s). It is quite possible that the respondent does not know accurately (or even at all) the characteristics of the rejected alternatives, and while there are methods to estimate what those characteristics might be, the fact remains that this information will be unreliable and will introduce measurement error into the predictor variables. For example, it is generally true that a carrier that places more emphasis on on-time reliability is also more expensive. That is, cost and on-time reliability are correlated in the 'real world.' The result of this is that the use of 'real' (or RP data) can lead to statistical problems in accurately estimating the influence of the different characteristics on model choice.." (p. 11)

Researchers have started to use *stated preference* (SP) surveys in an attempt to overcome the limitations of confidentiality, contractual obligations, inaccurate information, lack of knowledge and incomplete information. SP surveys ask respondents "to choose between hypothetical (albeit realistic) alternatives, designed to simulate the actual choice environment." SP surveys were developed initially for consumer research. They have been applied to transportation in situations where RP information is limited. Notable examples are toll roads, a key choice determinant for which is the driver's value of time – i.e., how much the driver is willing to pay to save a certain amount of travel time. This information typically is not available from RP surveys, or is not sufficiently precise to support reliable choice modelling. If a region has no prior experience with tolling (pricing), then SP surveys are the only statistically reliable basis for estimating the values of time. SP surveys also have been used to evaluate the transit rider's valuation of the need to transfer; for example, when the

rider's current, single-bus trip is replaced by a new bus – rapid transit combination that is faster but requires a transfer (and where there is no prior experience with rapid transit). SP surveys also have been applied to assess traveller responses to transportation demand management measures, which may exist in a particular urban area but whose users typically make up a very small proportion of the trips that are recorded in a regional RP survey – that is, too small a proportion to be forecasted reliably and usefully.

With respect to freight, the Québec City – Windsor study notes that because respondents can "make [hypothetical] choices between alternatives for which [realistic] information has been provided means that the respondent does not have to reveal any information of a competitive nature that might discourage participation in the survey."

Freight SP studies can be categorized in different ways (Ewing et al. 2005). One distinction is between 'within-mode' surveys, in which choices within only one mode are considered (e.g., the choice is among truck carriers); and 'between-mode' surveys, in which more than one mode or modal combinations is considered (e.g., a choice between truck-only and intermodal transportation).

A second distinction is by the type of decision-maker: shippers (the agents that have a shipment that needs to be delivered), receivers (the agent to whom the shipment is destined), and carriers (the agents that actually move the shipment from the shipper to the receiver). Although these decision-makers are not necessarily mutually exclusive – for example, the shipper and the carrier may be part of the same firm – the choices, the information available for making these choices and the impacts of the decision (e.g., ranging from short-term dispatching decisions regarding vehicle routing to long-term locational decisions) can vary significantly.

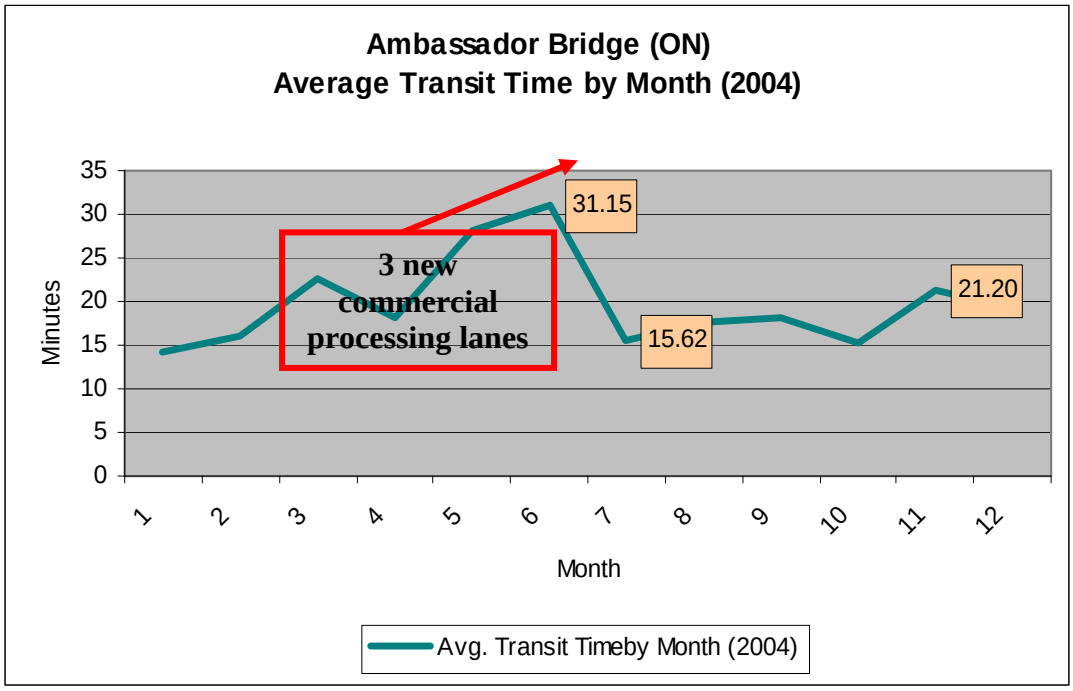
The Québec City – Windsor study examined the potential for using TOFC (trailer on flat car) as means of diverting traffic from road to rail. The resultant SP survey proposed 18 different shipment scenarios. Scenarios hypothesized the need to ship goods of different values and 'fragility' (e.g., television sets were used to represent high-value, 'fragile' goods) and different delivery time frames (e.g., with a fixed, "by-appointment" delivery time and date). Each scenario considered different combinations of five attributes: cost, on-time reliability, damage risk, security risk and how the shipment would be carried (truck all the way or TOFC for part of the trip) (Ewing et al. 2005).

3.3.12 GPS Surveys – Border Wait-Time Measurement Project

The use of Global Positioning Systems (GPS) in transportation surveys is growing. GPS provides a satellite-based means of accurately depicting the location of a vehicle (or a person) at any point in time. GPS allows a vehicle's itinerary and stops to be tracked, along with the travel time between stops - thus allowing travel speeds, congestion, and attributes such as fuel and emissions to be calculated precisely.

Transport Canada has used GPS to track border crossing and other inter-urban and urban truck transit in southern Ontario for the last few years. A recent initiative focused on quantifying border-crossing wait time at several locations in southern Ontario. The surveys are able to track the locations of delays, the durations of delay and where stops occur for inspection (as well as other stops, such as at the duty-free store or due to construction). They surveys also show the impacts of improvements – for example, the impact of additional commercial vehicle processing lanes at the Ambassador Bridge in Windsor, in March 2004 (see **Exhibit 4**) (Shallow 2006).

Exhibit 4: Example of GPS-based truck travel times



Source: (Shallow 2006)

3.3.13 Trends and Explanatory Factors – Greater Toronto Area

A recent paper demonstrated the utility of, first, examining available historical data sets and, second, relating the resultant trends to other socio-economic and demographic explanatory factors. In other words, despite the many gaps in urban goods movement data, existing data sources at the same time may be under-utilized.

A comprehensive set of screenline and cordon counts, classified by vehicle type, has been developed for the Greater Toronto Area for several years. Heavy trucks and medium trucks are among the vehicle type classifications. A 2007 study analyzed truck trends in these counts, which were available for various years from 1986 to 2004. The study found several key trends, including a shift to the use of medium trucks instead of heavy trucks (which

historically were dominant) within the overall truck flow, and that – even with the increase in congestion – the proportion of truck flows by time of day had remained constant. To understand these and other trends, the study examined the role of various possible explanatory factors. The study found that the heavy truck growth generally followed growth in population, and the mix of truck vehicle type was linked to the degree of urbanization. On the other hand, changes in diesel fuel prices did not appear to have a direct impact on truck flows (although a mathematical relationship could be derived). The study hypothesized that changes in the composition of the economy and in logistics patterns could be factors; however, data were not available to confirm this. (It should be noted that each of these trends and relationships varied according to location within the Greater Toronto Area.) (Solecki and Roorda 2007)

3.4 Summary of Best Practices and Lessons Learned

Part of the freight transportation demand modelling process involves partitioning the freight market based on demand and trip characteristics. Following that, the zone system to be used to analyze the data is defined. However, these zone systems are often developed for passenger transportation models, and then are adapted to freight modelling (D'Este 2000). In addition, they are adapted specifically to inter-regional freight transportation modelling. In urban freight demand modelling and the activities needed to collect related data, there is a need to define zoning systems in accordance with urban goods movement rather than using hereditary zoning systems that were defined for passenger transport modelling.

In the case of intra-urban modelling, it must be remembered that just focusing data collection efforts on major freight focal points such as ports will ignore a large amount of intra urban freight activity which does not pass through major modal interchanges (D'Este 2000). It should be further noted that not all links in the road network will be accessed equally, given that the type of freight determines the transport vehicle used. In turn, this affects the kinds of roads that are used to transport the goods commonly moved in that vehicle.

Commodity flows are derived from data sources in either tonnes or dollars. Finding the effects of freight on the transportation system requires that commodity flows be converted to trucks, rail cars, shiploads, aircraft, barges, or containers. The correct conversion requires knowledge of how much of a commodity is carried by a particular vehicle. These payload factors (tons per vehicle) can be obtained from several sources, such as, the VIUS database, commercial freight data vendors, such as, the TRANSEARCH database, railroad carload waybill sample (see Chapter 4 for more detailed descriptions of these datasets) or truck intercept studies.

Many sources of freight data give commodity flows as yearly totals. For modelling purposes which require single-day forecasts (or peak periods within a single day), it is necessary to determine the fraction of yearly commodities transported in a day. This fraction can be obtained implicitly through OD table estimation techniques or explicitly by calculating the number of truck days in a year.

Freight components that are commodity-based usually require that commodity production totals be estimated for each commodity category by zone. A recent study found that almost all states with this requirement derived commodity productions from employment estimates and commodity output per employee. One state in particular, Kentucky, obtained its production totals directly from the TRANSEARCH database (Horowitz 2006).

Commodity flow databases are often reported for fairly large spatial units such as provinces or states. Many states in the U.S. with freight components have created procedures for disaggregating their commodity flows. The method most often cited by states was to factor county-to-county flows into zone-to-zone flows using employment categories and population totals (Horowitz 2006).

Major urban distribution centres should be surveyed, for two reasons (Finnegan and others 2005). First, established transport and distribution operators are striving to obtain competitive advantage through new and improved freight consolidation and urban delivery operations. Second, the increased popularity of cooperation and partnerships along the supply chain - for example, between retailers and major contract distribution companies – means that much of the goods movement profile otherwise would be lost.

The presence of large urban distribution centres in an urban area typically facilitates more flexible delivery times. As such, night deliveries are more likely to occur and this should be accounted for when conducting data collection.

To survey business involved in the urban goods movement, some cities have opted to use diaries. Businesses were asked to complete a diary for a typical delivery day. As a starting point, members of a city's City Centre Business Association or its equivalent should be surveyed. This list of stakeholders can then be supplemented with representatives from major industries operating within the urban area. For example, a survey was conducted in Dublin, Ireland, and with more than 700 members of the Licensed Vintner's Association (LVA) located within the city centre, the survey was expanded to include LVA members as it was opportunity to survey delivery patterns of bars in the downtown Dublin (Finnegan et al. 2005).

Postal or mail-out surveys can often generate low response rates. These types of efforts can be supplemented by having surveyors personally distribute survey forms to business on predetermined streets such as primary shopping corridors. This survey approach is useful in that helpful feedback and comments made by shop personnel can be noted along with collected data (Finnegan et al. 2005).

Surveys might require coordination according to the type of commodity being delivered in urban areas. This is because there is evidence that the timing of deliveries is sometimes correlated to the type of good being delivered. For example, a study in Dublin, Ireland found that food deliveries peaked at between 7 and 8 am, whereas the greatest amount of household goods, hardware, general mail and parcels arrived at between 11 am and noon (Finnegan et

al. 2005). For some types of goods, off-peak trips by trucks may be more limited due to the move to just-in-time delivery and the demands of integrated supply chain management (Woudsma 2001). Consequently, when surveying business or private sector stakeholders to capture information on delivery times, a distinction must be made among the following four types of businesses (Holguin-Veras and others 2005):

1. Businesses that are required to make off-peak deliveries (e.g. newspaper distribution, transportation of vegetables to consumer markets).
2. Companies that make off-peak deliveries because it is beneficial to them (e.g. deliveries to 24/7 establishments such as convenience stores).
3. Companies that could make off-peak deliveries given the right incentives.
4. Business for which off-peak deliveries are not feasible because additional costs are too high or the marginal benefits are too small.

The literature suggests that the most 'successful' urban freight studies use a number of different survey methods or combination of data sources. Depending on the objectives of the study, research suggests that the best outputs are achieved using a combination of the following survey methods (Taylor 1997):

- Employer surveys of (origin) generation rates
- Mail-out / mail-back questionnaires [also applicable to shippers]
- Surveys and interviews with truck drivers and terminal operators
- Truck counts
- Truck origin-destination surveys
- "*Expert groups*" comprising of trucking operators, police forces and industry representatives

A detailed examination of commercial vehicle surveys carried out in Sydney, Australia listed a number of lessons (Taylor 1997):

- There is a need to publish errors or, more specifically, relative standard errors (RSE) to enable data users to ascertain the level of confidence they can place on the dataset. Comparisons between data might be drawn erroneously because apparent differences could be due to variability in the data (high error) rather than real differences.
- There may be a need to conduct a series of surveys rather than one single survey to capture the needed data. The characteristics of the freight industry vary according to the types of goods being moved, the size and type of vehicles used, the payment methods, use of logistics, unloading / loading requirements, the type of industry sector, for example, manufacturing, retail, express, wholesale, and the culture or ethos of the people involved. This means that the method of data collection including the sampling frame, survey instrument, degree of aggregation, stratification, response rate, and nature of non-responses all must be investigated or chosen carefully, bearing in mind the final needs of the data, for example, disaggregate or aggregate analysis of goods or vehicles.
- There may be a need to over-sample small or individual truck operators because large fleet operators tend to have a better response rate due to greater resources. Drivers are generally loath to fill out surveys as they are already required to fill out log books, paperwork for firm records, handle invoices, etc., so unless they can see a real benefit or they are instructed to fill out the survey forms, they are unlikely to respond to the survey.

- Response rates for light vehicles are generally poor and extremely variable. It is noted that while these vehicles are classified as commercial, they have very different objectives and functions to the generic freight vehicle. Given that these types of vehicles typically comprise a large proportion of the total population (over 70% in the case of Sydney), there may be a need to collect this data separately, or alternatively, obtain a larger sample.
- Results from the Sydney CVS appear to indicate that, in general, articulated vehicles operating within urban areas show more homogeneity than either rigid or light vehicles, therefore requiring a smaller sample size relative to the latter types of vehicles. However, there may be a need to further investigate this homogeneity in larger vehicles as it may be the result of response bias towards larger firms, as noted previously.

To facilitate movement of intra urban goods, time of day vehicle classification counts are needed. In order to find a balance between off-hours deliveries and resistance from neighbourhoods to night-time truck movements, classification counts on major / minor arterial and collector roads is required for local land use planning. Trip generation by land use also is important to movement of goods within an urban area. Detailed categories of land use will give more accurate results to impact studies. Truck operations data and "*last mile*" studies for freight movements are not common today, but needed in Ontario. The dwell time, linked trip behaviour, number of trips per day, and loading and unloading characteristics of urban goods delivery would greatly assist in planning for intra urban freight movements.

In the U.S., some MPOs have found that the information and databases needed to undertake comprehensive freight planning are sometimes priced beyond their reach. Access to such information has been gained through members and associates involved in freight movement task forces. Facility site visits, electronic data, and hard-copy information have all been secured through this networking effort. However, a link between the data provided and the output in the planning process must be evident in the near term to maintain an ongoing willingness on the part of participants to provide such access (Plumeau and Jones 1998).

To obtain a comprehensive view of the issues related to urban goods movement, there is the need to collect both quantitative and qualitative data. Data collection in the *Goods Movement in the New York Metropolitan Area Study* was done in two stages (Morris and others 1998). The first part of the study was designed to gather qualitative data through industry-sector focus groups that addressed broad urban freight movement issues. The focus groups also assisted in gaining the input needed to develop and refine the interview form to be used in the second part of the data collection process. The interview, administered as the second part of the data collection effort, collected data through structured interviews with logistics, transportation and distribution managers. The following practices were found to work well:

- Participants can be drawn from membership lists of major trade associations and programs serving logistics companies. Recruitment procedure includes sending a cover letter stating the study's goals and the interview's purpose, along with the survey instrument to prospective interviewees. Non-attendees and participants also received a summary of their industry sector Focus Group findings and overall results as an incentive for participation.

- Follow-up telephone calls were placed one week after cover letters were mailed out, followed by a reminder telephone call the day before the scheduled interview. The reminder phone calls also allowed the interviewers to ensure that the participants had a copy of the survey instrument.
- Focus groups should be organized by industry sector. Participants are recruited on the basis of their having extensive operational experience in managing their firms' domestic transportation needs. Having senior-level executives is also essential since it allows planning staff to locate appropriate contacts from the private sector for follow-up interviews to collect quantitative data. These senior executives will also have the authority to permit proprietary company data to be shared. This establishment of trust is also important when attempting to gather data from companies using third party logistics companies.
- Safeguards must be in place to meet confidentiality requirements of the study's industry representatives, particularly if information on costs and performance are requested. For example, participants are informed that data would be pooled and that no individual organization would be identified. Further, the word "CONFIDENTIAL" is printed in bold face across all written survey instruments (Morris and others 1999).
- Meeting time must be flexible enough to accommodate busy schedules of those executives willing to participate. In the case of the New York study, interviews could be scheduled from 7:30am to 7:30pm. In addition, participants were given the flexibility of choosing the form of the interview, for example, face-to-face versus telephone. Follow-up telephone calls were used liberally to collect missing data.
- Focus groups limited to two to four members to allow sufficient time to discuss and explore issues in depth and to ensure sessions could be completed within the scheduled time of two hours.
- A Moderator's Guide (consisting of six questions and related probes dealing with barriers to urban freight mobility, a review of the interview instrument, and how to improve industry access to the local planning organization) along with informational material was provided to participating executives well in advance of their session.
- Visual displays, a flip chart that listed seminal points for questions and probes, and a large map highlighting the Central Business District's (CBD's) geographic boundaries were all used to reinforce the attendees' attention to topics under discussion. Some representatives also participated via speaker phone as a last resort.

The most common survey method for conducting truck travel surveys in urban areas is the combined telephone – mail out / mail back method. It is a cost effective approach and yields a reasonably high response rate. The Commodity Flow Survey for goods shipped from the City of Edmonton and the Edmonton Region utilized a hybrid of the telephone – mail out / mail back methods coupled with personal contact and with assisting company officials in filling out the survey forms using records of the shipment information.

Also of interest, the Edmonton survey accounted for all business establishments, and thus covered the generation of both goods and services trips. A large survey sample was used. The survey also sought information on individual shipments and movements, and incorporated

special surveys to address different needs (e.g., establishments with large numbers of small shipments, such as couriers, newspaper deliveries and waste collection).

The second most used survey method is the roadside interview method. Roadside interviews produce very high response rates with complete information. They are ideal for cordon surveys or for surveying trucks travelling in from outside the survey area. The External Cordon Commodity Flow Survey used this method for the collection of data at the entry and exit points into the study area (City of Edmonton and Alberta Transportation 2003).

Running continuous surveys or having surveys that use similar survey instruments may be an attractive option since they allow survey participants to become familiarized with the survey process (Browne 2005).

When designing surveys and analyzing their results, details of sample size, sampling frame, sample stratification, response rates and survey accuracy all must be carefully controlled and clearly stated. For example, in the calculation of the overall sample size, it is the required level of accuracy of the smallest variable or segment to be measured that will be the critical factor. This has considerable implications if regional analysis of freight flows by commodity groups or vehicle types is required (The National Institute for Transport and Logistics 2005; McKinnon et al. 2000a). In actuality, few studies typically mention confidence intervals or levels of accuracy. Even when such information is provided, there is little indication of how it is to be used and there is usually no guidance as to which variables it is relevant. As the size of the confidence interval depends on the standard deviation of the variable concerned and on the estimate of the variable, the width of the interval will change. It is important that clear guidance is given on the interpretation and accuracy of the data from sample surveys and that their limitations are fully recognized (The National Institute for Transport and Logistics 2005; McKinnon et al. 2000a).

Two emerging types of data activities provide promise for urban goods movement data:

- Most surveys can be categorized as revealed preference surveys – i.e., they record actual behaviour. However, these cannot capture behaviour regarding situations that do not exist; information about choices that have not been taken (route or mode choices); the necessary information may not be available and the information that is available may be inaccurate or incomplete; and, contractual, legal or confidentiality considerations may be restrict the availability of information. To address these, stated preference surveys have been introduced to freight data collection: these surveys focus on hypothetical but realistic situations that allow respondents to provide meaningful information that analysts can use to develop usable, quantitative behavioural choice relationships.
- A second type of emerging data collection, the satellite-linked Global Positioning System, quantifies the location of a moving vehicle, thus providing accurate information on the vehicle's (or person's) location at any time, as well as the route, travel time and speed, stops made, duration at the stop, and other information such as fuel consumption and emissions. On the other hand, GPS data cannot record any information about the goods (if any) that are being transported by the vehicle, or about the purpose of stops made along the route (although that sometimes can be inferred).

Finally, a recent study of truck flow trends in the Greater Toronto Area shows evidence that – notwithstanding the many gaps in urban goods movement data – the existing available sources may be under-utilized, and that much insight and useful information can be gained by exploiting these databases. The study linked historical screenline and cordon trends with socio-economic and demographic explanatory factors.

4. REVIEW OF INTER-URBAN SURVEYS AND DATA BASES

4.1 Overview and Synopsis

This chapter reviews selected inter-urban surveys and databases. Inter-urban goods movement is considered in this research because it impacts urban goods movement, for example, in terms of truck trips that are generated by marine and airports or intermodal rail yards; and because in some cases or locations it represents the only source of information on urban activity (however limited).

Both Canadian and U.S. sources are reviewed. The U.S. sources are included because they capture some cross-border traffic and also because they provide examples of data that could be used or developed in Canada. The focus is on truck data; although marine, rail and air data also are considered.

The remainder of this chapter provides an overview of the various data sets examined. It also highlights some concerns with the available data. Although these concerns address the specific inter-urban datasets, to different degrees they are applicable also to urban goods movement.

No one single source of data exists that would address all of the specified requirements for freight flow analysis, in either Canada or the U.S. Several partial sources of data exist. However, they do not provide a complete profile of freight flows, nor are they necessarily compatible in terms of coverage, categorization by mode, origin / destination, etc., or level of detail.

Specific challenges include:

- Differences regarding the geographic definition of the terms and boundaries, for example, the waterways and ports that constitute the "Great Lakes / St. Lawrence Seaway" or the provinces or portions of provinces that constitute "Central Canada." Similarly, statistical descriptions of urban regions for which many data are defined, such as the "Census Metropolitan Area," do not always correspond to the actual or legal area that is used for transportation planning purposes.
- An inability to trace the entire route that a specific commodity uses between its true origin and true destination. The particulars in between, for example, trans-shipment points, use of other modes, or beyond (i.e., the true origins and destinations especially for cross-border traffic) are not always captured.
- Origins and destinations may be provided at different levels of geographic detail.
- There is an inconsistency in the years for which the data are available, as well as limited information regarding the impact of seasonal differences. This also occurred in some cases as a function of the source of information: both Canadian and U.S. sources of the same / complementary data sometimes were available only for different years.

- Units of measure, commodity categorizations (i.e., in which a particular commodity is categorized) and currencies are not always consistent.
- Methods of data collection / sources of samples vary, for example, in a survey of the carrier en route compared with a survey of the shipper at the place of origin.
- The purpose of the data collection varies. Many data were collected for administrative, legal, fiscal, insurance or other reasons that limit their usability for transportation planning. One important manifestation of this is the treatment of international or cross-border air cargo: in some cases, information regarding tonnage and commodity type (but not destination) is available according to the airport at which air cargo cleared customs. However, the cargo may be transported, by truck or by air, to another Canadian airport, for trans-shipment onto an aircraft that is bound for the ultimate destination. Neither the intermediate airport nor the inter-airport mode of transfer is recorded. In some cases, Air Canada assigns flight numbers to its inter-airport truck trips, meaning that the cargo is recorded as having moved by air. Also of importance, 'air' courier cargo often is treated in the same way, with the true modes of transportation not recorded.

Data sets are described below, categorized by type of information or by mode. U.S. data sets are included, insofar as they include Canadian data or otherwise impact Canadian data, or they can serve as examples for Canadian data sets.

4.2 U.S. Commodity Flow Survey

The Commodity Flow Survey (CFS) captures data on shipments originating from select types of business establishments located in all 50 U.S. states and the District of Columbia. The 2007 CFS is now underway. This survey is sampling 100,000 establishments. According to the CFS website, the CFS is a shipper-based survey that "collects information on how U.S. establishments transport raw materials and finished goods; the types of commodities shipped by mode of transportation; the value, weight, origin, and destinations of shipments; and the distance shipped." Establishments of all sizes are sampled from the mining, manufacturing, wholesale and selected retail industries, as well as from selected ancillary industries such as warehousing. Participation in the CFS is mandatory.[7]

The Bureau of Transportation Statistics and the U.S. Census Bureau have summarized data from the previous CFS, which was conducted in 2002. That survey gathered data from 50,000 establishments across the United States. The 2007 CFS represents a doubling of the sample (although it should be noted this is still smaller than the 1993 CFS' sample of 200,000 establishments and is only equal to the 1997 CFS' sample of 100,000 establishments; the reductions in sample size reflecting successive budget cuts). The 2002 CFS data are available in summary tables online and, separately, in more detailed special tabulations. The 2002 CFS covers business establishments with paid employees that are located in the United States and are classified using the 1997 North American Industry Classification System (NAICS) in mining, manufacturing, wholesale trade, and select retail

[7] For more information, see: http://www.census.gov/svsd/www/cfsmain.html.

trade industries, namely, electronic shopping and mail-order houses. Establishments classified under services, transportation, construction, and most retail industries were not surveyed. Farms, fisheries, foreign establishments, and most government-owned establishments also were excluded.

The data do not cover shipments originating from business establishments located in Puerto Rico or other U.S. possessions and territories. Shipments traversing the U.S. from a foreign location to another foreign location, for example, from Canada to Mexico, were not included, nor were shipments from a foreign location to a U.S. location. Imported products were included in the CFS at the point that they left the importer's domestic location for shipment to another location. Shipments that were shipped through a foreign territory with both the origin and destination in the U.S. were included in the CFS data. The mileages calculated for these shipments excluded the international segments, for example, shipments from New York to Michigan through Canada did not include any mileages for Canada. Export shipments were included, with the domestic destination defined as the U.S. port, airport, or border crossing of exit from the U.S. (Federal Highway Administration 2002).

Some relevant freight flow and good movement data include:

- Mode of transportation (truck, rail, water [categorized by shallow draft, Great Lakes or deep draft vessels]), including intermodal combinations.
- Value of the shipment ($US).
- Commodity type and description (according to the SCTG).
- Distance travelled.

A recent TRB report identified three important constraints of the CFS (Transportation Research Board 2003b):

1. The origins and destinations of the data are aggregated to large geographical levels (i.e., "*census divisions and regions, individual states and major metropolitan areas*"). However, in order to maintain the confidentiality of the individual responses, the available level of disaggregation varies according to the sample in a specific place.
2. Because the CFS samples domestic establishments, the importation leg of a good is not recorded. (As noted, however, the subsequent movement of the same good from the importer's location is recorded.) Similarly, the destination of exported goods is recorded as the point of exit from the United States.
3. At the time the TRB report was prepared, the future of the CFS was in question due to the high level of dissatisfaction of the U.S. transportation planning community [with the usability of the data] and the-then current decision to hold back the implementation of the 2007 CFS. As well, the sample size had been reduced in each of the previous three surveys, although the 2007 CFS reversed that trend.

4.3 Road and Truck Surveys

4.3.1 U.S. Vehicle Inventory and Use Survey

The Vehicle Inventory and Use Survey (VIUS), formerly known as the Truck Inventory and Use Survey, collected data on the operation and physical characteristics of commercial vehicles. Its primary goal was to produce national and state-level estimates of the total number of trucks.[8] A questionnaire was mailed to the registered owner of each selected truck registration and the registrant then was asked to provide data about the truck identified by the vehicle registration information imprinted on the questionnaire. Questionable responses were reviewed and corrected when necessary. Operating characteristics collected in the survey included the number of miles driven and commodities carried. Individual truck records are available for almost 100,000 trucks. For the development of travel models, the most relevant operational characteristics were base state, average weight with payload, type of business, miles driven outside state, miles driven by trip length, miles driven by commodity group (50 groups including empty and waste), miles driven by hazardous materials class and type of service (Horowitz 2006).

The survey was conducted approximately every 5 years from 1963 to 2002. The survey has now been discontinued. However, VIUS data may be obtained from the U.S. Census Bureau.

4.3.2 Canadian Vehicle Survey

The Canadian Vehicle Survey (CVS) is a voluntary vehicle-based survey that provides quarterly and annual estimates of road vehicle activity (vehicle-kilometres and passenger-kilometres) of vehicles registered in Canada.[9] A quarterly sample of vehicles is drawn from vehicle registration lists provided by the provincial and territorial governments.

Before the development of the CVS, no measures of total vehicle-kilometres or passenger-kilometres were available and as a result, the CVS was developed at the request of Transport Canada to fill this data gap. The survey provides quarterly and annual estimates of the amount of road travel, broken down by types of vehicles and characteristics, such as age and sex of driver, time of day and season. The results are the prime source of Canadian road vehicle use information for researchers and interested members of the public.

Prior to 2004, the survey was sponsored by Transport Canada. Since then, the survey has been co-sponsored by Transport Canada and Natural Resources Canada. Their intentions are to combine the survey data with other data to improve road safety, monitor fuel consumption and deal with the impact of vehicle usage on the environment.

[8] http://www.census.gov/svsd/www/vius/products.html

[9] http://www.tc.gc.ca or http://www.statcan.ca

The survey began in 1999, and results for 2000, the first complete calendar year of surveying, were released in 2001. Problems with the small sample sizes have been reported, along with a high proportion of missing data that must be imputed. Planners have often expressed concern over the overall quality of estimations for vehicle subsets, given the very small sample size, as well as the lack of regional estimates. Also, the survey does not capture information regarding the trips for which the vehicle was used.

4.3.3 National Roadside Survey of Canada

The National Roadside Survey captures information on the movement of heavy trucks throughout Canada. Surveys were conducted in 1991, 1995 and 1999-2000. As noted, an update of the National Roadside Survey was conducted in 2006-2007, although these data are not expected to be available until early 2008.

However, data from the 1999-2000 survey are available on CD from the Canadian Council of Motor Transport Administrators.[10]

That was conducted by Transport Canada in association with provincial and territorial governments, on highways throughout the country, as well as at border crossings and other strategic internal connections. Importantly, MTO and MTQ funded and conducted surveys at additional locations, as part of their own data collection activities. (These are described in **Sections 4.3.4** and **4.3.5**.) All surveys were conducted by roadside interviews, and all solicited the same information regarding truck origin-destination, vehicle configuration and characteristics, nature of the cargo, and so on. The FHWA and six U.S. border states contributed financially to the survey, in order to increase the sample of trucks intercepted at the Canada-U.S. border. Classification counts were conducted at the same time as the survey.

The purpose of the NRS was to fill gaps in existing data pertaining to inter-urban movement of truck freight (Canadian Council of Motor Transport Administrators 1998). It was determined that the major gaps were the lack of:

- Links between existing sources of driver, carrier, truck, cargo and trip characteristics.
- Characteristics of trucks in use, for example, axle spacing.
- Information on freight moved by private carriers.
- Information on activities of non-Canadian carriers.

The survey targeted domestic and trans-border activity on Canada's main truck arteries by heavy trucks (4 tonnes and up) used to haul cargo. The resulting data set includes:

- Number of trips.
- Distance travelled (kilometres).
- Cargo carried (tonnes).
- Output (tonne-kilometres).
- Truck weight (tonnes).
- Impact (tonne-kilometres).

[10] For more information, see www.ccmta.ca.

The survey also captured over 70 characteristics of the truck, driver, trip and cargo. It was documented that due to the sampling design the survey provides a reasonable representation of the volume of activity by heavy truck when the trip haul length is 200 km or greater. However, it underestimates the volume of activity by heavy trucks when the trip haul length is less than 200 km as local trips of less than 80 km were not to have been captured.

Of importance, the 1999-2000 survey data were expanded according to three different methods. A method developed by Transport Canada was applied systematically to their countrywide version of the database (including some of the supplemental information collected by MTO and MTQ). MTO and MTQ developed methods to expand the data from their respective provinces, using different validation processes and different criteria for the rejection of incomplete records or invalid data. As a result, the resultant origin-destination and flow tables vary according to the source. Attempts are underway to ensure consistency in the expansion method for the current NRS.

4.3.4 Ontario - Commercial Vehicle Survey

The Ministry of Transportation of Ontario has conducted its Commercial Vehicle Survey (CVS) approximately every 5-6 years since the mid-1980s. As noted, the CVS augmented the 1999-2000 NRS, as it did the 2006-2007 NRS. The additional locations included Provincial highways not otherwise included in the NRS. Importantly, the CVS also included major truck generators in the Greater Toronto Area, such as the accesses to a sample of intermodal rail terminals and to Pearson International Airport. As noted, the CVS and NRS used a common method. The CVS provides comprehensive data, aggregated by station, on commercial vehicle driver, carrier and commodity characteristics derived from surveys largely conducted at vehicle inspection stations on the principal provincial highway network. There are 30 core stations in Central Ontario, operating 24 / 7, recording approximately 116,000 truck movements a day. This includes O-D information, trip lengths and vehicle type. Taken together, the 1999-2000 CVS and NRS collected 46,000 interviews at 142 locations in the province.

4.3.5 Québec - Enquête sur le camionnage

This survey was conducted by MTQ on its highway network in conjunction with and to supplement the 1999-2000 NRS.[11] Taken together, 16,800 heavy vehicles were surveyed at 51 sites along Québec highways.[12] An additional 7,900 observations were collected from trucks known to have also used Québec roads during their trips but intercepted elsewhere in Canada.

[11] http://www.mtq.gouv.qc.ca/fr/camionnage/enquete1999.asp

[12] Defined as trucks carrying loads greater than 3,000 kg.

The process of validating the 1999-2000 data was extensive and required half the collected results being modified in some way. This specific attention to the quality of data along with the large sample size created very reliable results from the study.

The survey provides data on routes taken by truckers, their points of origin and destination, truck weight and configuration, nature of cargo, vehicle type and equipment, carrier type, etc. The information was detailed enough such that in addition to capturing truck movements between Québec and the provinces and states that are its major economic partners, it also provided a detailed snapshot of the major interregional movements within Québec itself.[13]

The MTQ similarly augmented the 2006-2007 NRS with its own sites.

The three datasets – NRS, CVS and the MTQ data - survey all types of heavy trucks, without distinction to ownership (e.g., for-hire; see **Section 4.3.6**), place of registration, or use. However, only heavy trucks are included. Moreover, each location is surveyed only for a limited period of time and thus the seasonal variations in commodity flows that are necessary to produce accurate annual or average daily commodity flows are not captured. The surveys have large sample sizes, although they do not provide the size required to produce highly disaggregated commodity and origin-destination detail; and the inconsistencies associated with the expansion methods have been noted above. Finally, although they serve as a good source of OD data for inter-city truck trips, a major limitation is their poor coverage of intra-regional truck trips. For example, the CVS is estimated to capture only between 35% to 45% of truck trips along Highways 401 and 400 in the Greater Toronto Area.

4.3.6 For-Hire Trucking Survey

This purpose of the Statistics Canada "For-Hire Trucking Survey" is to measure outputs of the Canadian for-hire trucking industry by providing estimates of inter-city commodity movements.[14] The quarterly survey targets Canada-based for-hire trucking companies with annual operating revenues of one million dollars or more, the majority of which derive revenues from long distance trucking operations, and complements the results of the Motor Carriers of Freight Survey by providing additional information. These companies are drawn from Statistics Canada's business register. A sample of shipments of more than 24 km by the carriers surveyed is captured, and the resultant sample then is expanded to develop an aggregate profile. Courier and messenger services are not covered by this survey.

With the exception of major carriers that have a substantial impact on the survey estimates, Statistics Canada implements a sample rotation policy in order to reduce response burden (Statistics Canada 2005). Thus, rather than selecting an independent sample in the first quarter of every reference year, the previous year's fourth quarter sample is rotated to minimize the sample overlap from one year to the next. This sample is then updated each

13 http://www.mtq.gouv.qc.ca/en/camionnage/enquete1999.asp#texte1

14 www.statcan.ca

quarter so that it would remain representative of the survey population. Each segment of the industry and each province and territory of Canada were represented in the sample.

Responding to the survey is mandatory. Data are collected directly from respondents by interviewers from Statistics Canada's regional offices. The interviewers visit each selected respondent's Document Storage Location Point (DSLP), determine the apparent size of the files (number of shipments), and, using the appropriate sampling interval from a table, transcribe the data from the shipping documents.

For each sampled shipment, the origin and destination of the shipment, a description of the commodity or commodities carried, the shipment weight, and the transportation revenue earned are recorded.

The sample design for this survey is based on a two-stage sample of approximately 800,000 shipments made by the inter-city for-hire carriers. The population is first stratified according to areas of operation, type of services, commodities carried and revenue class. The first stage consists of selecting, in each stratum, a number of firms corresponding to the desired number of firms determined at the sample selection stage. The sample of firms is then converted to a sample of DSLPs by including in the latter sample all DSLPs of the selected firms. The second stage of the sample design consists of selecting a systematic sample of shipments from the files of each selected DSLP.

The For-Hire Trucking Survey was re-designed and, since 2004, has been replaced by the Trucking Commodity Origin and Destination (TCOD) Survey. The TCOD Survey is managed by Statistics Canada's Transportation Division and is sponsored by Transport Canada. The survey's objective is to measure the commodity movements and the outputs of the Canadian trucking industry. The estimates produced include total tonnage transported by commodity type, and revenue by origin and destination of the shipments. Stakeholder consultation sessions prior to the design of the TCOD revealed a general desire to expand the scope of the survey to include Canadian non-trucking companies involved in some trucking activity as well as foreign companies operating within the country. However, budgetary constraints precluded their inclusion in the new survey. The most recent available data are from the 2005 survey, and these were released in June 2007.

Table 10 describes the major differences and similarities between the TCOD and its predecessor, the For-Hire Trucking Survey. Both surveys use the same three data collection methods – electronic data reporting, profiles and on-site visits - although the TCOD now uses computer-assisted telephone interviews to develop the profile.

The primary difference lies in the broadening of the sample frame: The For-Hire Trucking survey sampled only trucking companies that had annual revenues of at least $1 million. The TCOD has added to this non-trucking companies that have trucking establishments (e.g., some national retail chains or distributors have their own for-hire trucking operations) and which have annual revenues of at least $1 million. The TCOD also includes a sample of new companies (i.e., which meet the aforementioned criteria) that began operation during the

survey year; that is, to augment the annual sample frame which includes companies that existed as of 1 January in the given year.

Despite the augmented sample frame, the TCOD provides only a limited profile of urban goods movement activity, for two reasons. First, the TCOD still does not account for the significant number of small trucking and non-trucking companies that typically make up a large portion of urban goods movement activity.

Table 10: Comparison between the For-Hire Trucking Survey and the Trucking Commodity Origin and Destination Survey (TCOD)

For-Hire Trucking Survey	TCOD
Trucking companies on Statistics Canada's Business Register (BR) with annual revenues of $1 million or more that were classified as Long-Distance (48412, 48423) or as Used Household and Office Goods Moving (48421) in the North American Industry Classification System (NAICS). Shipments of less than 25 kilometres made by these companies were deemed to be out of scope.	The new survey population for the first stage consists of all companies on the BR with at least one trucking establishment (NAICS: 484XXX) and at least $1 million in annual revenue. The Local Trucking sector NAICS (48411, 48422) were added to the previous survey coverage.
The sample frame is created on January 1st of the reference year. Companies that were birthed on the BR later in the reference year were not considered nor were the non-trucking companies with trucking establishments considered	The sample frame is created on January 1st of the reference year to allow the interviewers to start collection early in the year. However, this sample frame is augmented with a sample of 'births' selected at the end of the reference year from the list of companies that were not in the TCOD survey population on January 1st of the reference year but that appeared in the survey population for at least one day during the reference year.
Three collection methods used, as described below. ▪ **Electronic Data Reporting (EDR)**: the coding and imputation processes were not totally automated and only about 10% of the shipments information received electronically was used in the survey. ▪ **Profiles**: when the trucking company was specialized in some types of shipments (same origin / destination, same commodity, same weight, etc.), the interviewer only collected information about "*typical shipments*" and noted the number of each "*typical shipment*" that was made by the trucking company. ▪ **On-site visits**: Statistics Canada interviewers visited each trucking company selected in the sample, selected a sample of these shipping documents and transcribed the data from the sampled documents onto laptop computers. The data was then encrypted and sent by the interviewer to Statistics Canada via modem. This collection process was expensive due to the length of time required for each visit (usually less than a day, but sometimes more), as well as the cost of travelling to and from the company. Further, the process was a burden to trucking companies as they had to have a Statistics Canada staff member working at their premise for extended periods of time.	The redesigned TCOD survey uses the same three collection method, although computer-assisted telephone interviews (CATI) are now used to develop the profile. These are described below. ▪ **Electronic Data Reporting (EDR)**: Now, 100% of the data submitted will be processed (compared to 10% in the previous survey) using totally automated coding and imputation systems. This is expected to add 2 million shipments to the sample. The goal is to significantly increase the number of trucking companies that report in an electronic format so that it becomes, in the long term, the primary collection method for the redesigned survey. This method of collection has the potential to reduce costs, thus permitting us to increase the overall size of the sample of shipments in later stages. It has the potential to improve timeliness (through elimination of the time required to set up interviews, travel and visits), improve response rates (through the reduction in response burden), and improve data quality (e.g., through elimination of data capture errors). ▪ **Profiles**: These are used to a greater extent in the redesigned TCOD survey. All companies specialized in some specific types of shipments, i.e. those that reported less than 50 origin / destination / commodity combinations in the previous year, will be collected through a profile via CATI. Instead of visiting the storage location of shipping documents of a company to collect data, the interviewer will collect, through a CATI interview, information about each "*typical shipment*" and note the number of each "*typical shipment*" that was made by the company during the reference period. The newly developed CATI application significantly reduces the cost of data collection for those companies whose activities can be described through profiles. ▪ **On-site visits**: The on-site visits, although reduced in number compared to the previous TCOD survey, remain the most frequent mode of collection in the redesigned survey. As in the case of the previous survey, Statistics Canada interviewers visit each company selected in the sample, select a systematic sample of shipping documents, then select a sample of shipments on each shipping document selected and finally transcribe the data from the documents onto laptop computers. Once transcribed, the data are encrypted and sent by the interviewer to Statistics Canada via modem.

Source: Adapted from (Statistics Canada 2005)

Second, neither survey considers trips of less than 25 kilometres; effectively excluding most (if not all) intra-urban trips that might be made by the sampled companies (although trips to or from an urban area would be included).

4.3.7 Road Motor Vehicle Registration

This annual survey, conducted and maintained by Statistics Canada, presents statistics on light vehicles, heavy vehicles (trucks), buses, trailers and off-road vehicles registrations obtained from the provincial and territorial governments.[15] This information is used by various levels of government for the planning and development of transportation infrastructure and by special interest groups for production and marketing strategies.

In 1999, Statistics Canada implemented a revised method for Motor Vehicle Registration Data in Canada. In previous years, data were obtained by a questionnaire sent to the provinces and territories. Starting in 1999, the sources are files obtained from the vehicle licensing bureau of the provinces and territories. Prior to 1999, changes in the way individual provinces and territories reported registrations and licenses would have a direct impact on the published figures. Since the new data collection and classification methods are unchanged from year to year, data users are provided with greater consistency in the data over time and data are more easily comparable across jurisdictions.

Prior to 1999, the annual figures were based on differing time periods, and some of the differences between provinces could be accounted for by the dates for which the information was reported. Starting in 1999, quarterly figures are used to obtain an annual figure that matches the calendar year, so the entire country is reporting for the same time period.

The target population for this survey consists of light vehicles, heavy vehicles (trucks), buses, trailers and off-road vehicles registered by provinces and territories. However, the definition of the type of vehicle that must be registered differs from one province to the next. It is a census survey with a cross-sectional design. Responding to this survey is mandatory. The data are derived from administrative records extracted from provincial and territorial road vehicle registration files. Motorcycles and mopeds, trailers, off-road vehicles, buses, light vehicles weighing less then 4,500 kg, trucks weighing between 4,500 kg and 15,000 kg and trucks weighing more than 15,000 kg are identified.

For quality control purposes, all records, which expired during the month prior to the file creation month or expired earlier, are removed as well as provincial duplicates (the most recent transactions are kept).

[15] www.statcan.ca

4.3.8 Road Motor Vehicle Fuel Sales

This survey which is also maintained and conducted by Statistics Canada, collects data on the sales of gasoline, diesel fuels and liquefied petroleum gas (LPG) for which road taxes were paid. Excluded from the data are: sales of aviation gasoline and turbo-fuel; marine transport fuels; diesel oil consumed by railways; and fuel used for heating, industrial power, electricity generation or similar non-transportation purposes.[16]

The cross-sectional survey is aimed at all provinces and territories within Canada. Subsequently, data are only available at that level. Data are collected by means of a questionnaire submitted monthly to each province and territory. Telephone, e-mail and fax follow-up is conducted to resolve editing problems with questionnaires and to collect data from respondents who have not returned the questionnaire.

Some major changes in provincial regulations related to energy consumption have occurred over the years. These policy changes impact the data collected, and influence both comparisons between years and between jurisdictions in Canada. These changes include:

- The province of Quebec removed the tax on LPG as of May 1997.
- Alberta abolished the road-use tax effective April 1978 and reinstated it in July 1987.
- The Government of Saskatchewan abolished the road-use tax in April 1982 and reinstated it in July 1987; introduced a Fuel Tax Rebate Program on June 22, 1988, including fuel purchased for personal use, retroactive to June 22, 1987. Revisions were made to the net fuel sales data for the years 1987 and 1988; introduced changes to the tax rates and the rebate programs on March 31, 1989 (for fuel purchased in 1989, the program rebated only half of the tax paid on fuel for personal use while fuel purchased for farming and other primary producing activities was still eligible for a full rebate); eliminated the rebate for fuel purchased for personal use on January 1, 1990; and, eliminated the rebate for farm-use gasoline on May 8, 1992.
- Since January 1986, the Government of New Brunswick has given a 25% rebate to farmers, fishermen and truckers. This rebate is part of the International Fuel Tax Agreement (IFTA).
- The Government of British Columbia removed the road-use tax on LPG effective April 1982.

4.4 Rail Surveys

Canadian railways provide origin-destination data to the Federal government. Statistics Canada provides an annual tabulation of rail flows, commodities and other characteristics of rail freight activity in its *Rail in Canada* reports. However, these tabulations are provided at a high-level – e.g., province-to province totals – with the details being held as confidential. RAILINC, an arm of the Association of American Railroads, collects detailed data regarding origin and destination characteristics for Canadian National and for Canadian Pacific

[16] www.statcan.ca

Railway. Data for these Class 1 railways may be purchased, but only with the permission of the individual railway. (See also **Section 4.9.2**.)

In the United States, the *Rail Waybill Sample* provides some useful information. (There is no parallel data set in Canada.) Developed by ALK Technologies Inc., the waybill sample is an annual stratified sample of freight movements terminating on railroads in the United States.[17] Railroads transporting more than 4,500 carloads per year are required to submit a sample of their waybills to the U.S. Surface Transportation Board. Waybills contain information on origin and destination points, type of commodity, number of cars, tons, revenue, length of haul, participating railroads, interchange locations, and cost. Publicly available data from the sample are geocoded to Bureau of Economic Analysis (BEA) regions. Commodities are reported to five-digit STCC. However, it should be noted that data within the waybill about revenue from a shipment are considered to be inaccurate by the Surface Transportation Board (Horowitz 2006).

Permission to use this file must be obtained from the Surface Transportation Board. It should be noted these data are collected from the terminating railroad, and, accordingly, U.S. exports to Canada typically are not included within the dataset.

The database is extensive. The 2002 sample contains information on nearly 600,000 shipments from 66 railroads. The confidential data are available to a single point of contact with a state government, often an agency that regulates railroads. As a result, it is possible for state departments of transportation to gain access to data with precise geocoding. However, strict rules apply to the dissemination of data outside of state government.

4.5 Marine Surveys

4.5.1 Shipping in Canada

Statistics Canada publishes an annual report entitled *Shipping in Canada*, which presents a comprehensive overview of domestic and international (US and other countries) shipping activities at major Canadian ports (Statistics Canada 2007). The report has been published annually since 1996, most recently in July 2007 for 2004 data. Reports for all years can be downloaded from Statistics Canada's website.[18]

The report summarizes vessel traffic data and commodity detail by points of loading and unloading; containerization and commodity movements. The report covers four regions: Atlantic, St. Lawrence, Great Lakes, and Pacific. Data are summarized by commodity loaded and unloaded for both domestic and international freight, in over 100 statistical tables.

17 www.alk.com/products/business/services/waybill.asp

18 www.statcan.ca/cgi-bin/downpub/listpub.cgi?catno=54-205-XIE

Statistics Canada does not provide raw data in order to maintain the confidentiality of the sources. However, custom tabulations (aggregations of data) can be provided for a fee.

The *Shipping in Canada* report provides breakdowns of major commodities, and the most important Canadian ports can be identified. The annual reports also provide a consistent historical record. However, details are not provided regarding the true origins or destinations of commodities that move through the ports (i.e., only the loading or unloading port is identified).

4.5.2 The St. Lawrence Seaway-Traffic Report

These data comprise records for marine traffic along the St. Lawrence Seaway, Montreal / Lake Ontario and the Welland Canal (Cambridge Systematics Inc. 2004).[19] Data include:

- Class and type of vessel.
- Classification and type of cargo.
- Weight of cargo in tonnes.
- Commodity classification and nationality (upbound and downbound).
- Traffic by major 25 Canadian ports.
- Traffic by major 25 United States ports.

The raw data and other information are available from the Saint Lawrence Seaway Development Corporation. Data are available from 1999-2003, although historical records can be obtained dating back to 1959. However, it should be noted that the origin and destination of the traffic are not be readily determined from the available data.

4.5.3 U.S. Maritime Administration Office of Statistical and Economic Analysis

Vessel entrance and clearance files from U.S. customs are maintained in a database.[20] The data can be purchased, but it is important to note that Hamilton, Ontario is the only relevant Canadian port that appears to be included in these data. Samples of the fields captured are:

- Date of entrance and clearance.
- Port of entrance and clearance.
- Flag of registration (vessel's country of registry).
- Type of trade.
- Last port.
- Type of cargo transaction.

A Channel master file contains codes representing waterways and facilities used by vessels engaged in international commerce and is maintained by the U.S. Army Corps of Engineers.

19 www.seaway.dot.gov

20 www.marad.dot.gov

A second database details monthly, quarterly, and annual import and export waterborne data. The data fields captured are more specific to the cargo characteristics, including:

- U.S. coastal region.
- Country of origin and destination.
- Customs import value.
- Shipping weight.
- Standard international trade classification code identifying type of merchandise.

The data are comprehensive; however, the paucity of information on Canadian ports highlights the need for more reliable and regulated data on vessel entrance and clearance in Canada.

4.6 Air Surveys

Air cargo is carried in the belly-hold of passenger aircraft, in passenger/cargo combination or in all-cargo aircraft. There are no restrictions on routing, capacity or price in Canada's deregulated domestic air cargo market while bilateral air agreements, other international agreements, and national policies govern transborder and international air cargo services. A few all-cargo airlines provide charter services outside of Canada on behalf of foreign-based airlines but have little presence on their own in international markets. However, a significant amount of cargo is carried in the belly-hold of passenger aircraft.(Transport Canada 2006)

Some operators in Canada provide dedicated all-cargo service, with a total of 30 aircraft in operation. For example, all-cargo airlines provide jet service on behalf of Canada Post, courier companies, freight forwarders, consolidators and shippers. These providers include Cargojet Canada of Mississauga, Kelowna Flightcraft of British Columbia and Morningstar Air Express of Edmonton. In addition, Air Canada provides air cargo service as part of its scheduled passenger air services – cargo accounted for 6% of Air Canada's revenues in the first three quarters of 2005.

Detailed data are available only from the individual airport authorities. The availability of these data is subject to the discretion of the individual authority, and the data are not necessarily consistent from airport to another. Transport Canada does have access to more detailed disaggregations of the data, such as by geographic area. However, these are not generally available since the data are held as confidential. At the same time, it is known that these data do not necessarily capture all air movements completely or accurately – in particular, goods that clear customs at a given airport may not actually travel by air to or from that airport; as noted above.

Transport Canada is developing a new and standardized reporting system that will provide details by airport (ECATS – Electronic Collection of Airport Transportation Statistics).

4.7 Multi-Modal Data (U.S. Freight Analysis Framework)

The Freight Analysis Framework or FAF was developed by the U.S. Federal Highways Administration (FHWA) as a modelling system to forecast freight travelling on multimodal networks (rail, truck, and water) throughout the United States. The original version, FAF[1], provides estimates for 1998 and forecasts for 2010 and 2020. The new version, FAF[2], provides estimates for 2002, provisional estimates for 2005 plus forecasts through 2035.[21] The FAF[1] was primarily used as a policy tool for the federal government, but the model itself and the input data was not made available for use by states or any other external parties. This has since changed with the FAF[2]. The other major differences between the FAF[2] and its predecessor are that input data resolution has changed from country level to state / regional level; and, previously, there were limited O-D data whereas there is now, at a minimum, regional or sub-state O-D information.

FAF[2] produced the 2002 Commodity Origin-Destination Database that is comprised of three four-dimensional matrices (for tons, ton miles, and value) in which the four dimensions are origin, destination, commodity, and mode. Origins and destinations consist of 114 regions as defined and used in the 2002 Commodity Flow Survey (CFS) plus 17 international gateways and 7 international trade regions (Canada, Mexico, Europe, Latin and South America, Asia, the Middle East and the Rest of the World). Commodities are defined at the 2-digit SCTG (Standard Classification of Transported Goods) level; modes are defined as in the 2002 CFS (i.e., 11 separate modes, multimodal combinations, and unknown modes, but reported for only 7 aggregated modes in FAF).

The 2002 CFS serves as the foundation of the 2002 Commodity Origin-Destination Database. However, the CFS has several major commodity gaps, commonly referred to as out-of-scope commodities. In addition, the CFS undercounts some categories of trade and movements of freight, for example, in-transit movements, petroleum products, and exports. These CFS out-of-scope commodities and undercounts are addressed through a series of special reports. Although the use of Waterborne Commerce, rail waybill, and Air Carrier data help to address some of the known weaknesses of the CFS survey in terms of mode coverage, other gaps remain. For example, several commodities were totally absent in the 2002 CFS survey and in some cases, one or more shipments in a commodity's supply chain were absent from the CFS survey. In other cases, whole categories of shipments were omitted from the survey, such as the movement of retail commodities from the point of final purchase to the home, business, etc. In yet other cases, there was evidence that the 2002 CFS undercounted some commodities and types of shipments based on significant differences with other reliable data sources. As part of the 2002 FAF, a significant effort was launched to bridge the most serious of these CFS gaps. Oak Ridge National Laboratory (ORNL) worked in collaboration with BTS and MacroSys Incorporated to estimate 15 CFS gaps and undercounts, including imports (which were completely outside the scope of the CFS), exports (which were likely

[21] http://ops.fhwa.dot.gov/freight/freight%5Fanalysis/faf/

underestimated, based on previous research studies (Federal Highway Administration 2002)), construction, retail (CFS does not cover shipments originating from retail trade stores), in-transit shipments[22] and services. Of special note, CFS does not cover shipments originating from establishments involved in service industries. Special studies were carried out by the ORNL to augment the FAF^2. These studies included service industries such as finance and insurance; real estate, rental and leasing; professional, scientific and technical services; health care and social assistance; accommodation and food services; and other services, for example, repair and maintenance, personal and laundry, religious, etc.

Due to shortcomings with the FAF data, the Freight Model Improvement Program (FMIP) was launched in 2004 by the U.S. Department of Transportation. It is managed by the FHWA's Office of Freight Management and Operations in collaboration with the U.S. Departments of Agriculture and Energy, the U.S Army Corp of Engineers, and Oak Ridge National Laboratory.

The FMIP is intended to bridge the gap between the FAF's national focus with needs for local planning and its website serves as a clearinghouse to provide up-to-date information on current developments in freight modelling, disseminate inventories and assessments of freight modelling strategies and related data collection methods, and develop a library of current research, data, and methods.[23]

4.8 Cross-Border and International Trade Flow Data

4.8.1 International Trade Flow Data

This annual database is maintained by Statistics Canada. It describes imports to Canada from the U.S. and other countries and exports from Canada to the U.S. and other countries, by commodity, mode and port of entry / exit (i.e., the port of customs clearance).[24] The data fields include:

- Port (i.e., port of customs clearance; as noted above).
- Province (in which the port of customs clearance is located).
- Postal Code (Forward Sortation Area [FSA]; that is, the first three characters of the port's postal code).
- State (U.S.) / country.
- Mode used for the portion of the trip entering or leaving Canada (water, rail, road, air).
- SCTG (commodity classification).
- Weight of shipment (tonnes).
- Value ($ Canadian).

Outside Canada, the level of disaggregation is by state for U.S. and by country elsewhere.

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22 The CFS does not include shipments of commodities that originate outside of the United States, enter the United States by whatever mode, and then are shipped to some other country. Such shipments are called In-transits.

23 www.fmip.gov

24 www.statcan.ca

The International Trade Flow data provide a comprehensive, multi-modal profile of commodity movements to and from Canada. However, several constraints limit their usability for goods movement planning:

- For imports to Canada, the province of customs clearance is recorded as the province of destination, as opposed necessarily to the true destination of the shipment. On the counterpart, shipment origin and destination are recorded (by U.S. Customs) for Canadian exports to the United States, as well as the place of clearance.
- The recorded origins and destinations do not necessarily reflect the true origin or destination of the freight, or whether (or where) any trans-shipment occurred. They may reflect a corporate address of the shipper, recipient or broker, as opposed to the location of the actual ultimate trip ends.
- Since customs clearance processes for non-road shipments generally are done at the loading terminal or port, the place where the actual border crossing occurs becomes immaterial. The nearest customs office often will be marked (through look-up tables) as the virtual place of crossing, even when it does not reflect the physical route of shipment. For example, Pigeon River, at the northern Ontario land crossing with Minnesota, often is listed as the point of crossing for marine traffic travelling between Québec and the United States via the Great Lakes). Similarly, even though an air shipment might have cleared customs at a particular airport, the shipment might be transported by truck to another Canadian airport, at which point it is actually loaded onto a cross-border or international flight (and some air carriers assign 'flight' numbers to these truck movements). As a result, at best, only the mode used for the cross-border or international portion of the full trip 'chain' between the true origin and the true destination are known. The aforementioned air shipment example demonstrates that even this mode may not be known.
- Although detail at the FSA geography is provided for Canadian origins and destinations, a number of inconsistencies between provinces and postal codes have been observed in the database – that is, the province and the postal codes did not match. The FSA data pertain to the final destination; thus the origin port is difficult to determine for inland locations. The raw data also contain errors such as improper or missing FSA data.

4.8.2 Other Data on Imports and Exports of Goods

Two other Canadian reports tabulate import and export trade data and trends. These are:

- **Industry Canada Trade Data**. International trade data are available from Industry Canada through the Department's *Strategis* website. Strategis provides international trade data by product (using 6-digit Harmonized System [HS] codes) and by industry (using North American Industry Classification System [NAICS] codes). Origin-destination data are provided at the state / province, regional (4 pre-defined regions for U.S. states and Canadian provinces), and national levels for the U.S. and Canada, and at the national level for all other countries. While Strategis provides state, province, and regional level detail for Canadian exports to the U.S., state to province data for U.S. exports to Canada are not provided. These data are only provided at the national level. The following data are available in current Canadian or U.S. dollars:

- Total exports, or all goods leaving the country for a foreign destination. Total exports is the sum of domestic exports and re-exports.
- Domestic exports, or all goods grown, produced, or manufactured in the country and leaving the country for a foreign destination.
- Re-exports, known as foreign exports in the U.S., are goods that have previously entered the country and are leaving for a foreign destination in the same condition (i.e.. with little or no value-added).
- Total imports, which includes all goods that have entered the country, whether for immediate domestic consumption or for storage in bonded warehouses. In the case of Canada, re-imports are included. These are goods re-entering Canada after having been exported abroad without having been materially altered or substantially enhanced in value while abroad. In the case of the United States, general imports, goods entering U.S. Foreign Trade Zones, and goods destined for bonded warehouses are included.
- Trade balance, which is the difference between total exports and total imports.

- **Transport Canada – Transportation and North American Trade**. This report issued by Transport Canada presents profiles of various dimensions of trade and transportation, both domestic and trans-border, covering the road and rail modes. However, Transportation and North American Trade data provide commodity flow and other data at the national level only. While useful in understanding the broad issues and trends affecting trade and transportation in North America and in making high-level policy decisions, which was the data's original intended purpose, the lack of commodity detail and breakdown of flows by border crossing makes the data unsuitable for use in detailed provincial or metropolitan freight studies. The report currently contains the following information:
  - Issues affecting trade and transportation in North America, such as north-south and east-west connectivity, deployment of ITS, Canada-U.S. border planning requirements, intermodal linkages, and standards and data compatibility.
  - Highway corridor information including the general characteristics of U.S. and Canadian highway routes (by region) including automobile and truck traffic levels, road condition, capacity utilization, and number of lanes; and provides demographic structure of the corridor route.
  - Border crossing information including trade and traffic flows at the principal US-Canada border crossings.
  - U.S. – Canada trade information, which provides an analysis of U.S. – Canada surface trade, including mode split and commodity flows. Also provides detailed information on cross-border rail flows, ranking rail imports and exports according to commodity groupings, value, source and destination.
  - Inter-provincial trade, which provides information describing the structure of Canada's internal trade and shows the breakdown of provincial, inter-provincial and foreign trade movements.
  - Truck movements, which provides a summary of inter-provincial and Canada-U.S. cross border truck traffic from the 1999 National Roadside Survey.

4.8.3 U.S. Border Crossing Data

The Bureau of Transportation Statistics (BTS) tabulates incoming annual and monthly border crossing / entry data for vehicles, containers, passengers and pedestrians, for both the borders with both Canada and Mexico. The data are provided to BTS by the U.S. Department of Homeland Security – Customs and Border Protection. Data are available back to 1994.[25]

The data fields include: state, port, year, month, and vehicle/mode type and status of container (loaded or empty). Additional U.S. – Mexican border crossing data are available via the FHWA's Gateway and Borders and the Texas Center for Border Economic and Enterprise Development, which collect northbound and southbound crossing data from bridge operators and the Mexican government.

Additionally, incoming border wait times at the port facility level are available from the U.S. Department of Homeland Security – Customs and Border Protection. Border crossings are potential bottlenecks in the freight transportation network. The Office of Freight Management and Operations conducted a systematic review of border crossing activities at 7 ports-of-entry handling over 60% of U.S. truck trade among the three NAFTA nations. Those ports of entry were Otay Mesa, El Paso, and Laredo at the Mexican border, and Blaine, Ambassador Bridge, Peace Bridge, and the Blue Water Bridge at the Canadian border.

The captured data fields include: crossing location, inbound average daily volume, outbound average daily volume, average volume, average delay per trip (in minutes), buffer time (extra % of average time that must be budgeted to cross the border), delay per truck trip (in minutes or hours), survey date, and survey time.[26]

4.8.4 U.S. Transborder Surface Freight Dataset

The Transborder Freight Dataset provides North American merchandise trade data by commodity type, by surface mode of transportation (rail, truck, pipeline, mail and other), and with geographic detail for U.S. exports to and imports from Canada and Mexico. These data, available since April 1993, are a subset of official U.S. international merchandise trade data. It is now available online, at http://www.bts.gov/transborder, through an interactive query system. The purpose of the data, updated on a monthly basis, is to provide transportation information on North American trade flows. This type of information is being used to monitor freight flows and changes to them since the signing of the North American Free Trade Agreement (NAFTA) by the United States, Canada and Mexico in December 1993 and its entry into force on January 1, 1994. The data are also being used for trade corridor studies, transportation infrastructure planning, marketing and logistics analyses, and other purposes.

The data fields are organized into two separate categories, imports and exports. For imports into the U.S. from Canada and Mexico, approximately 95% (in terms of value) of the data are

[25] www.bts.gov

[26] http://ops.fhwa.dot.gov/freight/freight_analysis/brdr_synthesis/index.htm

collected electronically via the Automated Broker Interface (ABI). The customs entry documents collected by the Customs Service and transmitted to the U.S. Census Bureau are another source of import statistics. A third source is tapes that are sent directly to the Census, covering imports from foreign trade zones.[27]

On the export side, data on 55% of the value of all U.S. exports are collected electronically. Of these, 60% is collected through the U.S. / Canada Data Exchange and 40% through the Automated Export Reporting Program (AERP).

Shipments moving in-bound through the U.S. (i.e., shipments moving through the U.S. which neither originate nor terminate in the U.S.), are not included in the Transborder Freight Database. The U.S. Census Bureau does not consider these types of shipments to be part of the U.S. international merchandise trade, because they are neither an import to nor an export from the United States.

Import data fields include mode, container code, TSUSA commodity number, province of origin, U.S. state of destination, district and port of entry, country of origin, value, charges, shipping weight, and statistical month. Export data fields include mode, U.S. state of origin, U.S. state of exporter, national transportation analysis regions, domestic / foreign (tag), district and port of export, Canadian province of clearance and Mexican state of destination, country of destination, value, and statistical month.

Although these data are comprehensive, as with other cross-border trade data, the Transborder Surface Freight Dataset does not necessarily provide the true origin or destination on the Canadian side.

4.9 Commercial Databases

4.9.1 TRANSEARCH

TRANSEARCH is a privately maintained market research database for intercity freight traffic flows compiled by Global Insights (which now owns the original developer, Reebie Associates). The rail dataset was purchased by the Eastern Border Transportation Coalition for use in its recent *Study of Rail Freight Crossing the Canada-U.S. Border* (which is cited below) and includes the following:

- Origin and destination by U.S. county and Canadian province
- Commodity detail (code)
- Value ($)
- Crossing detail (i.e., the county where the rail freight crossed the Canada-U.S. border)

It should be noted that the TRANSEARCH data are developed from several sources, notably including the U.S. Commodity Flow Survey. Because TRANSEARCH can provide data at

[27] http://www.bts.gov/programs/international/transborder/desc.html

more detailed geographies (origins and destinations) than the Commodity Flow Survey and is updated more frequently (annually), many users prefer it over the CFS (Transportation Research Board 2003b). There are however, some limitations to the data as well. As a start, the price of purchasing the data is prohibitive for many communities, particularly the smaller ones. Further, many planners are cautious about the use of TRANSEARCH data because the sources and metadata about the data collection and expansion processes are not revealed and can lead to the data being misused or misinterpreted as a result of the unknown statistical accuracy.

4.9.2 RAILINC Data

Railinc is a large source of real-time, interline rail data for the North American transportation industry. Railinc maintains the North American railroad industry's official code tables and industry reference databases.[28] Reference databases are used to edit and ensure the quality of data reported by railroads to key industry systems. They are also used in inter-carrier exchanges of shipment information to ensure consistency in data interpretation.

Databases include:
- Centralized Station Master (CSM)
- Customer Identification File (CIF)
- Itinerary Database (ROUTE)
- Junction Interchange Database (JUNC)
- Mark Register (MARK)
- Official Railroad Station List (OPSL)
- Serving Carrier / Reciprocal Switch Database (SCRS)
- Shipment Conditions (SCF)
- Standard Transportation Commodity Code (STCC)

Railinc's data exchange is a family of systems that consolidates various types of railroad accounting data. Output is produced on a monthly basis and is available to subscribers in a computer processing format.

The following is a list of Railinc's data exchange systems:
- Car Hire Data Exchange System (CHDX)
- Car Repair Billing Data Exchange (CRBDX)
- Freight Loss and Damage Data Exchange (FLDX)
- Switching Settlements Data Exchange (SSDX)

As noted, RAILINC includes data for Canadian National and Canadian Pacific. However, these data are available for purchase only with the permission of the individual railway.

[28] www.railinc.com

4.9.3 PIERS

This source is advertised as a comprehensive database of timely and accurate import and export information on cargo moving through ports in the United States, Mexico, Latin America and Asia. The Port Import / Export Reporting Service (PIERS) database, developed by Commonwealth Business Media, Inc., is one of the most comprehensive databases on U.S. foreign waterborne imports and exports (Mani and Prozzi 2004). The database also reports trade shipment statistics for cargo movements between ports in Mexico and South America to major trade partners around the world. The data are available for purchase from www.piers.com. Search criteria include country of origin; U.S. port of arrival; port of load; overseas exporter; U.S. importer; U.S. importer state; and, product (for example, grain).

It is anticipated that these data are intended to provide evidence of carriage for contractual, legal and insurance purposes. They do not necessarily represent the true origin or destination prior to or beyond the marine portion of the trip (Transportation Research Board 2003a).

4.10 Special Studies

Various stand-alone studies have been conducted to address or analyze specific topics or issues. From the perspective of this study, they do not generally develop their own or new data sets. However, they are able to combine data sets and link goods movement data with other information, thus providing insight, analysis and interpretation that would not otherwise be available and adding to the overall understanding of issues related to freight planning in general. Two examples are described below.

4.10.1 LECG Marine Industry Benefits Study

A 2004 study examined the economic impact of the Canadian marine transportation industry. The four study objectives were to (LECG 2004):

- Present a quantitative assessment of the complete economic impact of the Canadian marine transportation industry.
- Demonstrate the significance and value of marine transportation to the Canadian economy.
- Provide a regional breakdown of economic impacts as well as sectoral impacts on a regional basis.
- Accomplish all of the above using methods accepted and recommended by the scientific literature.

The study quantified the economic impacts of the marine transport industry on the Canadian economy by estimating not only the direct effects, but also the indirect and induced effect of the industry using Statistics Canada data. As such, the results were presented in monetary terms or were related to the GDP, with no detailing into the actual flow or movement of commodities.

4.10.2 Eastern Border Transportation Coalition Studies

The Eastern Border Transportation Coalition (EBTC) prepared an analysis of the cross-border component of the 1999-2000 NRS data (Parsons Brinckerhoff Quade & Douglas Inc. 2002a). After noting that although the study "*allowed EBTC members to better understand the trade and travel patterns of cross-border truck traffic, it did not provide a comprehensive picture of all surface freight movements between the United States and Canada*." In order to obtain more comprehensive information on truck travel between Canada and the U.S., EBTC developed arrangements with CCMTA, Transport Canada and the FHWA of the U.S. Department of Transportation to supplement the 1999-2000 NRS with additional surveys at the U.S. – Canada border crossings. Truck travel in both directions was surveyed on the Canadian side of Maine's border crossings with New Brunswick and Quebec; Vermont's crossings with Quebec; New York's crossings with Quebec and Ontario; Michigan's crossings with Ontario; Minnesota's crossings with Ontario; and Washington's crossings with British Columbia.

For the truck study, 24,409 survey records were included in the EBTC dataset prepared by CCMTA. The data included observations collected at 40 sites partially or wholly funded through the EBTC, as well as data collected at sites in the interior of Canada for trucks that crossed the U.S.-Canada border. By prior agreement between the parties and for confidentiality reasons, data that would identify the respondent, shipper, or recipient of the shipment were omitted. The exact address of the origin or destination also was not provided. Information on origins, destinations, and stops within Canada is limited to the Canadian Census Division of the trip end. Many of the data attributes collected in the NRS, such as, data on axle spacing and configuration were not used in the analyses and were subsequently removed. The dataset was screened to ensure that certain attributes that were considered essential for use in the analyses were valid. For example, each record had to contain valid information about the origin and destination of the trip, as well as weight and commodity carried.

The EBTC prepared a second study of land trade between the United States and Canada. The 2004 *Rail Freight Crossing the Canada-U.S. Border* study summarized the existing cross-border rail flows originating, terminating, or crossing the Canada-U.S. border within the EBTC region. It also examined how those movements might change in the future. Of relevance, the study noted that cross-border rail information is collected and summarized in many different sources and datasets, namely, the,BTS, the Transborder Surface Freight Trade Data, Statistics Canada, the TRANSEARCH, the Surface Transportation Board, and the FHWA. However, both the input data upon which these are based and the information that is provided to users varies significantly. The study noted the lack of a "single, reliable, comprehensive source of cross-border rail data." (Cambridge Systematics Inc. 2004) The study also found that the accuracy of the data decreases as the geographic regions become smaller, because confidentiality concerns suppress the details.

5. POTENTIAL APPLICATIONS FOR COMMODITY FLOW DATA

The various elements that comprise typical policy and planning objectives associated with urban goods movement are summarized in **Table 11**.

Table 11: Policy and planning objectives on urban goods movement

Policy and Planning Objectives	Specific Elements
Economic	Develop and improve the freight system for the purposes of improving local, regional and national economy; Focus on trade-exposed sectors with urban economy; Focus on ports and intermodal facilities
Efficiency	Minimization or reduction in transport operation costs related to en route travel, end-point activity and energy; Focus on congestion; role of freight and costs to freight; Road network deficiencies including road design and geometry, maintenance, signage, local area traffic management and arterial capacity; End-point costs associated with loading and unloading, parking, terminal activities, hours of operation, and site access and aggress; Energy costs associated with vehicle speed and character and shipment type.
Road Safety	Minimization of property damage, injury- and fatality-related accidents; Focus on policy related to traffic management, road design, vehicle design, driver training and land use.
Environmental	Focus on mitigation of noise, air and vibration pollution; Perceived threat of large vehicles and intrusive activity in residential areas.
Infrastructure and Management	Explore government influence through regulations, pricing controls, taxation and investment; Road construction and maintenance and its relationship with freight sector.
Urban Structure	Focus on interaction between freight facilities and urban structure including interaction between freight and urban structure, city size and its effect on freight costs, and freight as a user of urban land

Source: (Woudsma 2001)

With markedly increasing urban congestion, it is unsurprising that logistics companies, shippers and carriers have often expressed the need for planning organizations to tackle issues related to overall congestion, inadequate docking space or curb space for commercial vehicles, and security. By collecting qualitative and quantitative information through interviews, surveys or focus groups, mitigating measures can then be taken. For instance, the *Goods Movement in the New York Metropolitan Area Study* administered an interview to collect data from logistics, transportation and distribution managers and the participants were asked to provide company-specific information about moving product into the CBD. Categories of information included a description of transportation services and distribution

channels used and the related cost, time, and barriers to freight mobility. By identifying industry-specific barriers in moving product into Manhattan's CBD, recommendations were then made to tackle the problems. For example, companies dealing with hospital products, apparel, consumer products and hi-tech merchandise had identified the problems of congestion, lack of sufficient docking space, and excessive cost and wait times at toll booths. Subsequently, recommendations were made to institute off-hours delivery, establish a centre outside the city to consolidate shipments from several companies to a single customer in the CBD, and introduce dedicated freight lanes and toll-free trips through tunnels during off-hours (Morris et al. 1998).

There is the potential to blend survey findings, existing data and research findings through innovative methods. For example, a recent study used data describing geographical features within an urban area, such as, road network, roadway classification, AADT features, employment and business pattern zone information (i.e. commercial, industrial or office land use), weekly and daily truck pickup and delivery trip rates, and forecasted illegal parking incidence to calculate increases in travel time resulting from illegal parking of delivery trucks used for pickups and deliveries in urban areas (Han and others 2005).

There is the potential for linking various existing datasets to form a cohesive, comprehensive database needed for urban freight planning. However, the task is far from easy as the success of any freight data program will depend on the large number of public and private sector participants that comprise the multitude of stakeholders involved in the movement of freight, goods and services at the urban level. A recent U.S. study determined that a freight data framework must include integrated freight surveys, a freight informatics initiative, syntheses of existing data and a standardized set of survey and data collection methods (Transportation Research Board 2003a). Although the scope of that particular study was at a national level, clearly, all of these issues are still pertinent to planners at the metropolitan or urban scale.

Freight movements are much more complex to study than person trips and the patterns change much more quickly or are more random. The process of a good moving from its origin to its destination and all the steps in between the supply chain further complicates the situation. For the purposes of urban freight planning, it is important to understand supply chains and all the steps in that process to know how a particular modal change would affect the movement of freight to its destination, and what could be done to improve efficiency of the transport of freight. For this new freight framework to be truly comprehensive, every step in the supply chain must be covered by survey and analysis.

To synthesize information from every step of the supply chain, surveys must capture information from three types of sources, as described below:

- Establishments refers to both shippers and receivers. Shippers are fewer in number and are easier to classify and characterize; therefore, shipper surveys are preferred. They also are more likely to own their own means of transportation and know the details of how goods are shipped. Receivers are greater in number and receive small amounts of many goods, often from many shippers, that are then distributed: receivers (which can include distribution centres) are the origin point for many subsequent inter-urban freight transport

trips. Surveys to shippers and receivers reveal what kinds of goods are being distributed in a society. The large sampling size here is a limitation. Shipping and receiving should be analyzed together to provide good insight into freight movement.

- Distributors are the intermediary between shippers and the final destination of the freight, the consumers. Distributors have become extremely important in freight movement in the last 20 years. Distributors understand the linkages in the movement of freight from origin to destination due to their position and involvement in the process. Surveying distributors would provide the necessary data to understand and plan for the "*last mile*". Distributors are becoming the best source of information, despite their concerns about confidentiality and about the desire to protect the identity of the firms that ship to or receive goods from them.
- Carrier surveys are the third data collection method involved in making sure all steps of the supply chain are covered. Capturing data about shipments while they are in transit is the easiest and cheapest way to collect information (Transportation Research Board 2003a).

The purpose and application of the data must be determined prior to the data collection effort in order to make the most of limited resources as the process of collecting data for urban freight planning can be onerous and expensive. For example, if the data are to be used for modelling purposes and a vehicle-based approach is adopted instead of a commodity-based approach, data requirements will be different.

Data collection for urban freight planning can require significant resources. Accordingly, the ability to exploit or build upon existing databases provides a way to reduce resources. Innovative methods have been developed over the last few years to link together existing databases. The available information also can be supplemented by using ITS technologies to collect selected data. These technologies include Automated Vehicle Identification (AVI), Automated Vehicle Classification (AVC), GPS-based Automatic Vehicle Location (AVL), and toll tags. Some of these technologies, for example, GPS-based AVL, can provide routing details that are often lacking. Other technologies, such as AVI and toll tags, can provide commodity O-D patterns so long as the data can be linked to the specific waybill for the observed trip (which in turn raises concerns regarding confidentiality). In addition to providing better and more complete data for urban freight planning, ITS could facilitate route optimization and load optimization for individual modes and across modes and services. ITS also could enable virtual transhipment schemes, such as Freight Traders in Europe, in which loads are auctioned on the Internet. Finally, ITS could support the coordination of smaller urban goods movements over "the last mile" to help mitigate congestion and capacity issues in core downtown areas (Moving the Economy 2004).

However, simply collecting more data will not alone improve the quality of data for the purposes of urban freight planning. Also required is consistency in commodity classification, boundary definitions, units of measure, and techniques to map supply chains and intermodal movements (The National Institute for Transport and Logistics 2005; McKinnon et al. 2000a). The EBTC takes this point further by suggesting the need to adopt the Harmonized System (HS) of classifying commodities as the status quo. The Standard Classification of

Transported Goods (SCTG) was adopted by the U.S. and Canada as a standard in 1996. It was designed to be compatible with the Harmonized System, which is used for reporting imports and exports. However, in practice, the desired compatibility has not been achieved. Moreover, globalization is becoming increasingly more significant in the North American economy; and the differences between domestic freight flows (SCTG) and international flows (HS) impede the ability to understand a global phenomenon such as freight (Parsons Brinckerhoff Quade & Douglas Inc. 2002b).

6. STAKEHOLDER QUESTIONNAIRE DESIGN

6.1 Phase 1: Task 2 Work Plan

The second portion of work for Phase 1 was the design of a web-based questionnaire to identify stakeholders' current urban goods movement data collection practices, data usage and needs. This section describes the tasks and deliverables that comprise Task 2.

Task 2(a): Determine the scope and scale of data to be collected. A multilevel integrated framework for conducting goods and services movement surveys would likely require the ability to account for the specific needs of different stakeholders.

Task 2(b): Develop questions to probe. The Task 1(b) literature review, combined with the Task 1(e) stakeholder canvass, identified the key points of interest that were suitable for questionnaire analysis. These questions were related to the types of commodity flow data that are commonly used, how the data are accessed, and the data attributes and characteristics that are used. From this understanding of how the data are used, or how users would like use the data, the consultant determined the appropriate scale and geographical resolution of a data acquisition process that would meet stakeholder needs. In other words, the stakeholder questionnaire was designed to determine user needs and interest in particular data sets.

Task 2(c): Determine the sampling plan. The Terms of Reference for this study envisioned a sample of stakeholders would be surveyed in Phase 2. However, subsequently, the consultant and the PSC determined that a better approach would be to develop comprehensive lists of stakeholders, and send the survey to all contacts on the list. In other words, the use of a Web-based survey would support a broad coverage, without the need to develop a sample. The resultant stakeholders' lists are described in **Section 6.2.6**. The lists are provided to TAC under separate cover.

Task 2(d): Identify jurisdictional issues. The survey questionnaire accounted for jurisdictional issues that were perceived by data users and providers to reflect provincial, regional, and local priorities and confidentiality, legal and proprietary issues.

Task 2(e): Identify complementary data needs and sources. The development of a multilevel integrated framework requires an understanding of complementary data needs and sources among stakeholders. Examples include traffic count data, land use and employment data, and other pieces of useful information, such as, truck trip generation rates by land use type. By looking across all stakeholders, potentially easier and less costly ways can be identified for data providers to share their information and to make the most of data that are readily available to them. These needs were accommodated in the survey questionnaire.

Task 2(f): Study user opinions about the frequency of data collection. The survey questionnaire also queried respondents about the frequency of data collection.

Task 2(g): Estimate budget ranges. The consultant estimated a budget for conducting the Phase 2 survey. (The budget is provided separately to TAC, and is not discussed in this report.)

Task 2(h): Develop a pre-interview stakeholder briefing document. In order to support the Phase 2 survey questionnaire, the consultant developed and tested a pre-interview stakeholder briefing document. The document summarizes the research effort, provided background information, and outlines the reasons for the conduct of the surveys. The briefing document also contains instructions and definitions that are useful to complete the survey. It was released and revised as part of Task 2(i). The final version is included as **Appendix B**.

Task 2(i): Pre-test the stakeholder briefing documents and questionnaire. In this task, the consultant conducted three rounds of pre-tests of the survey questionnaire. The first two rounds were conducted with the PSC to test the ease of use, the time / resources required to complete, and the usefulness of the data collected. The PSC also reviewed the survey content and wording prior to the pre-tests. The comments from these round were incorporated into the survey questionnaire, which was then refined and finalized through a third round of pre-tests with the PSC and with a selected group of other agencies (i.e., which had not been part of the study). The resultant questionnaire is presented in **Appendix A**.

Task 2(j): Submit the "Stakeholder Questionnaire Design" report. **Chapter 6** of this report provides the documentation.

Task 2(k): Complete the final report for Phase 1. This report has been developed in fulfilment of Task 2 (k). It documents the entire research effort as a final report and includes the Overview Paper, Stakeholder Questionnaire Design and the complementary briefing.

6.2 Questionnaire Development

6.2.1 Survey Questions

Several drafts of the questionnaire were prepared and refined following feedback received from the PSC. The content of the questionnaire was developed using materials drawn from the literature review process. The questionnaire takes into account the types of information that has been gathered or referenced in recent goods movement or commodity flow surveys in Edmonton and Calgary, various MPOs in the U.S. and the European community.

The survey has six sections. An overview of the key components of each section follows. As noted, details may be found in **Appendix A**.

- **Section 1: Issues and Applications of Existing Data Collection**. This section begins the survey by identifying applications. It first asks respondents to identify themselves (in confidence), in order to allow for possible follow-up if needed for clarification or to solicit further information, reports, etc.

Next, Section 1 asks respondents to identify the freight planning issues that they consider in their planning function (or that impact their business decisions). The use of the word "consider" is intended to allow both for actual applications and for planned or desired applications. The choices are: capacity enhancement, system preservation, operations, safety, environmental, policies, human resources, or other. (The "other" choice generally is provided throughout the survey, along with a space for the respondent to explain this response.)

Section 1 then asks respondents to identify how they use (or would use) freight data to address the aforementioned freight planning issues. The choices are: developing profiles and trends, modelling and forecasting, traffic operations analysis, facility/access design, environmental (and similar) assessments, cost-benefit or financial analysis, investment decision-making, responding to community, political or public concerns, and other.

- **Section 2: Data Collection Programs**. This section asks respondents to describe the types of freight data that their organizations collect, fund / sponsor or purchase from others. Respondents are asked to select all types of surveys that apply. For each selected survey, details then are solicited that describe the survey and discuss the availability of the data to the public. A similar set of questions is posed for traffic counts. Finally, respondents are asked about the use of Intelligent Transportation Systems (ITS) technologies for collecting data: a list of 15 choices is offered.

- **Section 3: Public and Commercial Data Sources**. This section asks respondents to describe the types of freight data that they have procured or purchased externally, from public or commercial sources. Respondents are asked to select all types of data that apply, from a list of 41 Canadian and U.S. sources. For each selected source, respondents are asked to assess the quality of the data, identify shortcoming or limitations, identify their importance to planning, and describe the purposes for which they use the data and how they are maintained.

- **Section 4: Freight Data Requirements**. This section asks respondents to specify their freight data requirements. The questions distinguish among freight data that respondents currently use, data that they need but which are not available to them and data that do not apply to them. This is achieved with three sets of questions. First, respondents are asked to indicate general information about the details that are needed (e.g., commodity flows, origin-destinations, etc.) followed by the types of modes that they consider in their planning. These modes are highway/trucks, rail, air, water and other. Next, for each selected mode, respondents are asked to indicate the specific data that are currently used, are needed but not available, or are not applicable. Finally, respondents are asked whether they use or need data on intermodal freight transportation – for example, truck/rail – and then are asked to describe the selected data.

- **Section 5: Other Data Sources**. This section asks respondents to describe complementary data sets that they use for freight planning. Three choices are offered: economic data, land-use data and transportation network data. For each selected choice,

respondents are asked to describe the pertinent data sets, and assess their quality, shortcomings and limitations.

- **Section 6: Lessons Learned**. This section concludes the survey by asking respondents to assess their existing urban goods movement data, and identify specific needs and priorities. In contrast with the previous sections, these questions are mainly qualitative and largely open-ended: they are intended to draw comment and insight from the respondents; and also to engage respondents for possible future initiatives. Some of the questions focus on possible needs surveys that might have been conducted by respondents among the users of their data. Fourteen questions are asked:
  a) How well existing data meet the respondent's needs that were identified in Section 1.
  b) Improvements or new data that are needed to address any deficiencies or gaps.
  c) Priorities for improvements or new data.
  d) Benefits of having these improvements or new data.
  e) Factors that contribute to the respondent's success in collecting urban goods movement data.
  f) Plans for expanding, enhancing or changing the respondent's data collection and storage methods.
  g) Other needed data items (not otherwise identified).
  h) Primary problems with the respondent's existing data, and the most improvements to address these problems. Respondents also are asked whether or not they have conducted a needs survey among the users of their data and, if so, the findings.
  i) Problems encountered by participants in the respondent's user needs survey, the reasons for these problems and they might be avoided in future surveys. (Note that this question and the next question focus on the conduct of the user needs survey; in contrast to the previous question which asks about the content of a user needs survey.)
  j) Technical or content problems or limitations identified from user needs surveys, and how these might be addressed in future surveys.
  k) Legal / confidentiality considerations that impacted the respondent's user needs survey, and how these considerations were addressed.
  l) Indication of the respondent's level of interest in participating in a (possible future) TAC program to coordinate the collection of urban goods movement data.
  m) Approximate cost devoted by the respondent's organization to freight collection; distinguished between internal and external costs.
  n) Willingness to provide sample data from the surveys carried out by the respondent's organization (i.e., in order to help explain the needs, limitations and opportunities in the documentation of the Phase 2 survey results).

6.2.2 Online Survey

The contents of the survey were agreed with the PSC. The consultant then created a usable web interface to distribute the survey and analyze the results. The resulting survey underwent three rounds of testing. This section summarizes the process by which the survey was

created, the results of testing, and the modifications made. As noted, the final version of the survey is presented in **Appendix A**. The accompanying pre-interview briefing document may be found in **Appendix B**.

The first version of the online survey incorporated both the questions and the format approved by the committee earlier in the project. The survey was created using *Vovici*, a commercial online survey software that allows users to create and analyze data from surveys.[29] A few adjustments were made to the original survey structure to insure compatibility with the *Vovic*i software and to increase the usability of the survey.

When the PSC reviewed the questionnaire, it was observed that although it was extremely important to collect information based on each sub-item in the question set (surveys administered, traffic counts, ITS technologies, data sources, and the various detail types), it would be tedious for users to cycle through questions concerning data they did not use, need, and/or collect. This led to the first modification between the online survey and the original questionnaire. The online survey contains more questions to address the need to gather information about each data sub-set. However, it allows the respondent to skip questions that are not applicable.

The survey that resulted from this process was too long for simple publication by the *Vovici* software. This led to the splitting of the survey into five sections. These sections do not reflect a change in data being collected, but were created for solely technical purposes. These sections are actually mini-surveys, each having its own virtual web address.

In order to protect the data being stored in these surveys, a specific list of instructions must be provided to each individual taking the survey. These instructions are included in the pre-interview briefing document (see **Appendix B**).

6.2.3 Survey Pre-Tests

The first round of survey testing took place in mid-February 2007. All of the tests completed took the same format. Representatives of iTRANS participated in a conference call with the survey testers as they completed the online survey. The testers were encouraged to ‘think aloud’ as they went through the steps of answering the survey questions. Meanwhile, the representatives of iTRANS listened as silent observers, recording any issues or questions (i.e., of clarification) encountered by the testers as they completed the survey.

Three groups of participants participated in the first round of survey testing. The first test was completed by Pierre Tremblay and his colleagues, from MTQ. Second to complete the survey were Brice Stephenson and Dr. Alan Brownlee of the City of Edmonton. The final test was done by Rob Tardif of MTO. All testers found that the survey took a minimum of an hour to

[29] Prior to April 2007, this software was available under the *Websurveyor* name. The *Vovici* software offers certain improvements over the original *Websurveyor* software. The final survey incorporated these improvements.

complete. Although the comments from the three groups differed slightly, there were some overall themes in the suggestions for improvements.

In all cases, the respondents found that there were terms that were not well defined. In some cases, these were specific goods movement terms such as “drayage.” In other cases a term had a broad meaning, making it difficult to respond with accuracy to the relevant questions. This was the case for the question set concerning “economic data.”

Further, all the respondents expressed concern with the length of the survey and experienced frustration before completing the survey. The information required is very extensive and specific, which in turn leads to many questions. Also, the respondents felt that they were answering the same question multiple times (i.e., because there were common supplementary questions for several questions). It seems that for almost every jurisdiction there was some repetition in the questions because one data collection program may involve a wide variety of activities. Generally, there was a sense that the survey should be streamlined.

There were also a few specific requests. The testers asked that the respondents in the final survey be given the option of requesting that their answers be provided to them by email for review. This would be especially useful since the user is not able to change their answers once a section has been completed. It was also requested that there be more opportunity to give general comments where a survey might not fit into the typical response type. In some cases, answers had atypical units or extraneous circumstances that required greater explanation. Finally, the respondents requested that there be some space to comment on the positive data collection experiences and lessons learned.

Using this feedback, the consultant completed a significant redevelopment of the survey, while maintaining the ability to meet the original intent of the survey. The survey was streamlined by combining closely related questions, reducing the number of repetitive questions and improving the flow between questions. The survey was reorganized to improve flow; and some questions were reordered. “Signpost” comments were added to guide the respondent through survey, and to allow him/her to anticipate the upcoming questions. Some wording was also changed in order to improve clarity. Several questions were also added to provide additional depth. Questions about positive experiences and lessons learned were added, as were questions probing more into the uses of the available data. Finally, to address the testers’ concern that the definitions of certain terms were unclear, a glossary was added to the pre-interview briefing document.

This new version of the survey was provided to the PSC in Adobe PDF format and was published for the second round of testing. This round had two participants, Pierre Tremblay and his colleagues of MTQ and Dr. Mona Abouhenidy of the City of Ottawa. Both testers found that the survey took approximately two hours to complete. Although the overall size of the survey had been reduced and the survey had been streamlined, the respondents found that they needed supplementary information to complete the survey. Not having this information on hand increased the amount of time required to complete the survey.

After their review, the PSC developed a list of further improvements. At this point (March 2007), the consultant further revised the survey and the pre-interview briefing document in accordance with the recommendations of the PSC. The study was reordered for flow, sections were renumbered and an additional section was added. Many questions were edited for further clarity and precision. Additional questions focused on needs were added along with questions that addressed intermodal goods movement. More definitions were added to the glossary. An advisory was inserted in both the briefing document and the introduction to the survey: the advisory stated that completing the survey might require some additional information and advised the respondent to assemble necessary information before beginning the survey and/or have other colleagues present to assist during the actual survey. This statement is intended to reduce the time required to complete the survey.

The PSC requested that the responses to the survey be automatically delivered to the respondent's email after the completion of the survey. The technical support team at *Vovici* were contacted to investigate if the software contained that capacity. It does not and so it is difficult to effectively resolve this request.

In June 2007, the final beta version of the survey was released to the PSC for testing, as well as to a select list of stakeholders. The additional stakeholders were chosen to represent a range of perspectives from across the country. They constituted organizations that had not been involved previously in the study and, accordingly, which could provide a completely objective perspective. The 6 additional testers comprised one large city (Ville de Montréal), a regional transportation authority (TransLink), a municipal economic development commission (Edmonton Economic Development Council), an academician (Professor Matthew Roorda of the University of Toronto), a marine port (Port of Halifax) and a provincial government (Manitoba Infrastructure and Transportation.[30] No significant concerns were encountered, although some of the new respondents commented on the length of the survey. The final survey questionnaire, reproduced from the online format, is included in **Appendix A**. It should be noted that both English and French versions of the survey will be distributed; and that the virtual (online) version of the survey is considerably shorter than the text shown in **Appendix A**: the *Vovici* software does not allow the 'cleaner' version of the survey to be printed in its more concise format. In particular, the version appended to this report lists all questions but does not indicate clearly the 'branching' that allows respondents to pass over questions that are not relevant to them.

6.2.4 Initial Responses

This section describes some initial results from the pre-tests: whereas **Section 6.2.3** describes the comments regarding the survey itself, this section describes the content of the actual responses. Because the survey formats used in the first two pre-test rounds were significantly different, different response sets were received from the testers in different rounds. It is also important to note that these represent preliminary responses from a very small number of

[30] Three other agencies were solicited but were unable to participate in the available time: another large city, an international airport and a federal department.

agencies. Accordingly, these results clearly cannot be considered as representative of the goods movement stakeholder community. Nonetheless, the results provide some insight into urban goods movement data and needs.

The respondents addressed a wide range of issues in their freight planning processes. All of the respondents indicated that they consider policies, environmental, safety, operations, system preservation, and capacity enhancement issues. There is also a wide range of intermodal transfer facilities in the jurisdictions represented by the respondents, with all modes and all intermodal facilities represented.

All jurisdictions administer some type of survey, with most being involved in more than one survey type. The roadside / intercept survey is the most common survey, followed by personal interviews. All jurisdictions also use some type of traffic count, with a wide variety of counts being used. All respondents indicated that they conduct cordon or screenline counts, while toll or turnpike counts, turning movement / intersection counts, and traffic counts at weigh stations were all indicated at least once. Cordon or screenline counts are conducted with great regularity, with most respondents indicating some frequency pattern, and two respondents showing annual counts. Many methods of conducting traffic counts were indicated, with the most popular being vehicle classification recorders. Video classification counts, electronic sensors, and tube counts were also indicated by at least one respondent. A wide range of ITS technologies is also used, with GPS being the most popular response. Some, such as smart cards, cellular phone coordinates (probe vehicles), advanced video image processing, aerial videos, and environmental sensor stations were not indicated by any respondents.

A large amount of information is stored in both hard copy and electronic formats; however, when only one format is used, it is most likely to be electronic. The availability of information to the public is split evenly in responses and seems to be more highly related to the respondent than to the data type; however, there are too few respondents to make generalized assumptions of this type. Also, it appeared to be more likely that traffic count data were available to the public than were survey data.

Respondents indicated that they use 22 of the 41 possible public or commercial data sources to populate their freight databases. No single source is used by all the respondents.

The respondents indicated that they use a large variety of data. However, a significant portion of data were needed, but were not available. The most commonly reported needs were for data that described terminal and intermodal transfer facilities. Trip origin-destination patterns and travel times for trucks also were identified as being needed, but not available.

Some respondents indicated that they use land-use and economic data in their urban goods movement planning. However, the majority of respondents use some transportation network data set. The arterial network and geobase both were listed as transportation network data sets useful to planning, as was a city database on road structures that is used to determine

seasonal restrictions. One respondent commented that further transportation network data concerning the intermodal facilities would be "incredibly useful."

The lessons learned section included some of the most interesting responses of the survey. Some jurisdictions are considering implementing a large commodity flow survey, while others are satisfied with their current survey program. Further information on the economic flow between and within provinces would be helpful, as would further intermodal information. There are gaps in existing data, and some data are old or incomplete. Methods of expanding data may be inconsistent, and it is difficult to combine data without inconsistency. There seemed to be interest in a TAC goods movement survey program, but one respondent cautioned that much legal and political ground had to be covered before such a program could proceed.

In the event, as noted, these preliminary results clearly are not representative of urban goods movement data needs. However, the results do demonstrate a wide variety of data usage and needs; and more important, they demonstrate that the survey questionnaire can yield meaningful results.

6.2.5 Representation of Phase 2 Survey

An important issue concerns how to determine and maximize the representation of the Phase 2 survey. A statistically-representative sampling of the survey is not feasible, for two reasons. First, parts of the survey are open-ended; i.e. statistical tests cannot meaningfully be applied to the results. Second, the full 'population' (sampling frame) of potential respondents cannot be defined completely and precisely.[31] (By comparison, statistically-representative sampling for an actual goods movement origin-destination survey could be possible, so long as the sampling frame is well defined and the survey is numeric [quantitative].)

Instead, in order to achieve meaningful and usable results, a stratified sampling approach is proposed. In this approach, the users of the data have been divided into groups that reflect the diversity of the user population. This stratified sampling approach is efficient and it improves the overall accuracy of the conclusions by focusing on important subpopulations (groups of users). As discussed below, these subpopulations have been defined by the consultant and the PSC based upon available information and individual experience.

In terms of being *statistically* representative, in general it is not feasible to apply statistical tests to non-quantitative data such as the types that are to be collected in the survey. The consultant is aware of the formal statistical tests to determine if the obtained sample size provides the reliability in the estimate desired but, again, they are not applicable for the

[31] For example, a sampling frame that comprises all municipalities having a population greater than a certain level can be defined precisely and completely,. The Census of Canada provides this frame. However, the number of municipalities having a population greater than a certain level and that are active in goods movement planning cannot be defined precisely – no objectively-defined sampling frame exists.

current effort. In consultation with the PSC, the consultant will determine appropriate minima numbers or proportions of target respondents for each stratum.

6.2.6 Contact List for Phase 2 Survey

Ideally, the Phase 2 questionnaire should be disseminated to as many members of the Canadian goods movement planning community as possible. As a minimum, the list of participants should include representatives from municipalities of every province and territory in Canada so as to reflect the jurisdictional differences in data collection practices, goods movement data usage and needs. The participation of all 33 Canadian CMAs (Census Metropolitan Areas; i.e. the country's largest urban areas) also should be targeted.

In addition, the survey will be distributed to representatives from regional, provincial and federal agencies and organizations to further expand the applicability of the results. An online survey will be used because of the lower respondent burden when compared to paper surveys.

The consultant developed a spreadsheet contact list for the Phase 2 survey. For each contact, the list provides the name, title, organization, type of organization (e.g., government type or industry sector), province or territory (where appropriate), telephone number, e-mail address, website and – where applicable – reference comments.

The list was compiled from information by provided by TAC, members of the PSC and the consultant.

The spreadsheet has several distinct parts, corresponding to the different strata that should be covered. These are summarized below:

- **Federal government departments** that deal with freight transportation or freight statistics, and Federal agencies (e.g., Canada Border Services)
- **Provincial / territorial governments**; primarily ministries of transportation. Where possible, individuals who are responsible for freight activities were identified.
- **Regional and municipal governments**. All regional governments and transportation authorities – for example, the Regional Municipality of Peel in Ontario and TransLink in British Columbia – were included. Cities and municipalities having a population greater than 40,000 were included; the idea being that smaller municipalities likely would neither generate nor require urban goods movement data (but see also footnote 32). Exceptions were included in order to ensure that all provinces and territories were represented. Where possible, individuals who are responsible for freight activities were identified.
- **Economic development departments / commissions**. The municipal economic development organizations of the 33 CMAs cities having a population of at least 100,000 (as defined by the 2006 *Census of Canada*; and as included in TAC's upcoming *Urban Transportation Indicators Project*) were identified.
- **Carrier and industrial associations**. Carrier, transportation, industry and manufacturers' associations were identified. However, a complete list of relevant

associations does not exist. Associations for Canadian marine and airports also were identified: the Association of Canadian Port Authorities and the Canadian Airports Council, respectively, have agreed in principle to survey their key members (i.e., minor port and airport authorities would not be surveyed).

- **Goods-producing organizations and companies**. Commercial organizations were categorized in two ways: the first group comprises organizations that generate (ship and/or receive) goods. Within this group, firms were identified by economic sector and, where possible, industry associations were identified for these groups. Commercial directories that list Canadian 'businesses' by industrial sector exist, such as Dun and Bradstreet. However, these databases are not necessarily current and the completeness of coverage is not known. Also, it is not possible to know objectively which of the businesses would require or use goods movement data. For example, Dun and Bradstreet lists 1.5 million Canadian businesses, of which 89% have fewer than 20 employees:[32] judgement would be required to identify which of these organizations would meaningfully be able to contribute to the research. Government databases are complete and current; however, these are kept as confidential.
- **Service organizations and companies**. The second group comprised organizations that provide services, such as warehousing and distribution, postal services and waste pick-up. Carriers – including air, marine, rail, trucking, courier and third-party logistics providers – were included in this category. Where possible, industry associations were identified for these groups. The aforementioned issues concerning the directories apply also to service organizations and companies.
- **Others**. This group comprises academicians and other organizations, not otherwise categorized, that could be of interest.

6.2.7 Phase 2 Implementation Strategy

It is recommended that Phase 2 be implemented in two stages. The first stage will be a comprehensive survey of Canadian practitioners. This survey will use the finalized online survey developed as part of Phase 1 and will be distributed by email in English or French. Then, using the results from the first stage, the second stage will be the development of a goods movement data collection framework for Canada.

Stage 1 of Phase 2 will begin by finalizing the survey distribution list. The distribution list will identify survey participants from the organizations identified in the section below. Each survey participant will be sent an email connecting them with the online survey, as well as the pre-interview briefing document. The survey will be available to participants for two weeks, at which point the online survey will be discontinued. The short time line will encourage the participants to complete the survey shortly after receiving the email, increasing the likelihood of response. Each email will be followed with a telephone call to further promote participation and answer any questions the participant may have.

[32] http://www.dnb.ca/about/ourdatabase/default.html

Following the two week deadline, survey results will be summarized. The data will be incorporated into a Stage 1 report. Stage 1 will provide a comprehensive summary of the state of data collection on urban goods movement in Canada, but it will also provide the information necessary to determine the path for Stage 2. The last step in Stage 1 will be to utilize the data collected to formulate a work plan for Stage 2.

7. SUMMARY AND NEXT STEPS

7.1 Summary

This document and the accompanying appendices complete Phase 1 of the *Phase Framework for High Quality Data Collection of Urban Goods Movement in Canada*. Through a review of the literature and through consultation with selected stakeholders, Phase 1 identified several needs and applications for urban goods movement data. The research has provided a comprehensive overview of urban goods movement issues as they relate to infrastructure planning, land use planning, traffic safety and operations, demand management, and sustainable transportation. The research also identified the challenges facing practitioners, as well as the best practices around the world.

Phase 1 also found that there are many deficiencies with the existing data sets as well as gaps in data; and there is no single, comprehensive source of quality goods movement data for use in urban (or inter-urban) goods movement planning. The sources of freight data for Canadian planners have been explored, and their strengths and weaknesses have been discussed. There are some public and commercial data sources, and many organizations conduct their own surveys and counts, but a more comprehensive program would be of use to many organizations that were consulted.

Based upon this assessment, Phase 1 developed and tested a web-based questionnaire to identify stakeholders' current urban goods movement data collection practices, data usage and needs. A contact list of stakeholders also was developed.

Phase 2 of this study would administer the survey to stakeholders across Canada. This would develop further information about the data collection needs and practices of Canadian practitioners, which is needed to determine the state of the practice across Canada and to aid in future data collection projects.

7.2 Considerations for Phase 2 Framework

The Phase 2 survey will be the basis of the development of a framework for high quality data collection on urban goods movement in Canada. The final form of this framework is dependent on the feedback received from Canadian practitioners through the stakeholder survey.

However, the framework also should account for two other elements, described below.

First, a qualitative assessment of the factors that underlie a particular respondent's data collection activities or needs - for example, the motivation behind Edmonton, Calgary or Vancouver's initiatives in goods movement data collection. That is, why have these agencies moved in the 'right direction'? What support did they have (or was needed)? What

institutional or other obstacles were in the way, and how were these addressed? How could other agencies apply this understanding – and be encouraged to apply the framework in general – in order to develop their own data?

Second, emerging issues provide both obstacles and opportunities for implementing urban goods movement data. The obstacles and opportunities – as well as a growing interest in the topic - are exemplified by a recent (July 2007) Transportation Research Board workshop on freight data needs. Among other activities, the workshop summarized and assessed existing freight data sources. **Table 12** and **Table 13** provide the summary and assessment for generic and actual current sources of freight data, respectively, that were presented at the workshop. Although the emphasis is on U.S. data, the assessment is pertinent to the Canadian situation. (Fischer and others 2007)

The assessments generally echo the findings of this research, in that they generally confirm and amplify the challenges that were identified in **Chapter 4** of this research. Many of the problems identified for the U.S. data mirror those found for Canadian data: for example, inconsistencies of definition, accessibility and availability limitations, lack of a comprehensive picture, limited information for urban areas, and so on. Other problems – such as the unavailability of a profile of container movements – are presented starkly; and they apply as much to Canada as they do the United States.

However, at the same time, the assessments identify several emerging trends and opportunities that could be applied to the collection of urban – and other - goods movement data in Canada:

- Emerging issues – such as security – offer challenges but also opportunities for data collection. The challenges arise because of the complexity and scale of the issue; the need to account for international stakeholders; and the need to access or create sensitive information. The opportunities arise because the complete logistics chain and 'true' origin-destination by all modes must be captured; including notably the inter-modal transfer.
- The growing use of electronic and remote sensing technologies offers opportunities for improved and more precise data collection, in real time; although some problems remain to be addressed with emerging technologies. The availability of inexpensive, unobtrusive technologies, such as wayside and in-vehicle monitors, means that data for transportation planning can be collected as part of other information-gathering activities for business, administrative, accounting or other purposes: i.e., the potential exists for collaboration between the public and private sectors to collect data on goods movement, provided issues related to data confidentiality can be resolved.
- In recent years, budgetary pressure has been exerted in the United States to reduce or eliminate public freight data collection activities. In Canada, these types of pressures are not as apparent; but on the other hand not as many types of large data collection programs have been available in Canada as in the United States (e.g., a nation-wide commodity flow survey). Still, in combination with emerging issues and growing use of technological innovations to capture data, the opportunity exists to bring in new partners to capture urban goods movement data.

Table 12: Generic sources of freight transportation data

Data Source	Strengths	Weaknesses
Censuses and surveys	Coverage and representativeness usually well documented and based on useful distinctions; errors can be estimate from well-established theory; range of topics and ability to link with other data sets relatively unlimited.	Expensive and obtrusive to respondent; responses are often based on imperfect recollection. Local surveys have widely varying coverage and method making it difficult to merge across multiple sources.
Administrative records	Timely; quality is usually good if transaction is critical to business; expense and obtrusiveness are low once system for tapping records and assuring confidentiality is in place.	Topics limited to transactions for business purposes; coverage and representativeness rarely match useful distinctions; inconsistent formats at the company level makes merging data sets difficult.
Reports and filings (e.g., annual reports to the U.S. Securities and Exchange Commission.)	Data often a by-product of someone else's requirements; quality typically supported by potential for audits.	Not as timely as tapping administrative records; data often hard to combine across reports; coverage and representativeness typically limited.
Wayside monitors (e.g., loop detectors, Bluetooth receivers, weigh-in-motion sensors)	Very timely data; unobtrusive; low cost per observation once equipment deployed. Bluetooth technologies are embedded within widely used communications devices carried by the travelling public. Increasingly cars themselves transmit these signals. User travelling in all vehicle types hold the potential to replicate data similar to traditional license plate trace surveys. A flexible system-wide deployment of Bluetooth readers to rural inter-city and urban locations of interest permits a cost-effective solution to existing Freeway Traffic Management Systems embedded detectors.	Limited deployment because they are a lower-priority public expense, quality plagued by equipment failures and difficulty distinguishing some characteristics. Access to Bluetooth signals for transportation purposes may not be well received by the general public unless benefits can be effectively communicated.
In-vehicle monitors	Very timely data; high accuracy and precision; low cost per observation once equipment deployed; more widely deployed because they serve business purposes. Trucks act as probes, facing congestion conditions experienced by all road users. Provides detailed routing, time of day usage and dwell times. Carriers' concerns with access to detailed data can be satisfied.	Severe privacy and confidentiality issues given high degree of routing with address detail, travel speed and driver behaviour; coverage limited to technologically advanced operators. Probe bias of vehicle type, routes and commodity.
Remote sensing (e.g., air photos, Google Earth)	Increasingly timely and cost-effective data, often the by-product of wide deployment for other purposes; coverage nearly universal.	Topics limited to what can be observed from above. Access to date and time stamp is problematic.
Maps (paper and electronic)	Usually inexpensive; updates usually not timely.	Resolution often too limited; limited topological accuracy (e.g., differentiating intersections from bridges); facilities often missed or misclassified.
Models (e.g., Freight Analysis Framework [see **Section 4.7**], state and regional freight models)	Often the only available way to update or fill in missing data.	Accuracy difficult to establish; credibility easily challenged.

Source: (Fischer et al. 2007)

Table 13: Current sources of freight transportation data

Subject	Major Data Sets	Major Issues
Commodity flows	Commodity Flow Survey, Transborder Data, Rail Waybill, Waterborne Commerce, Freight Analysis Framework, commercial sources (e.g., Global Insight [TRANSEARCH] and PIERS), surveys by a very few ports and state DOTs (e.g., Washington Strategic Freight Transportation Analysis).	Mostly national and major intercity corridors (except Waterborne Commerce to dock level); typicall annual averages without seasonal, daily variation; timeliness improved with models; local surveys for local detail not common and links to national data limited; continuation of all but Rail Waybill threatened.
Truck roadside surveys	Canada-wide surveys, Transport Canada – National Roadside Survey. Interview with driver takes 7 to 12 minutes, captures unique and detailed characteristics related to: vehicle, trip, commodity and carrier. Collect trend data at consistent locations and flexible to gather data where gaps exist or investments are considered.	Intrusive to trucking industry, ideally managed with enforcement oversight. Costly to administer (Canada-wide estimated cost 2005-2007, $10 million) and time-consuming to process data. Traffic classification data are obtained during survey but are plagued with issues.
Vehicle / vessel / railcar / container flows and performance	Freight Analysis Framework, Rail Waybill, state vehicle classification counts and U.S. Highway Performance Monitoring System (HPMS), commercial sources (e.g., Lloyd's, RAILINC, PIERS).	Highway flows are rough estimates based on inconsistent vehicle counts and a discontinued survey; container movements by highway are rarely tracked.
Extent, condition and performance of freight infrastructure and fleets	U.S. National Transportation Atlas Database, HPMS, ATRI/FHWA Truck Traveltime project, railroad reports to American Association of Railroads, Lock Performance Monitoring System, commercial sources (e.g., Rand McNally, Dunn & Bradstreet, RL Polk), Vehicle Inventory and Use Survey (VIUS).	No industry-wide standards for measuring and reporting port capacity and performance; very limited data on railroads; VIUS has been discontinued without replacement; roadway performance monitoring from traffic control systems (e.g., continuous speed and volume data) has much potential but relevant metrics (e.g., speed variability) have not been consistently defined.
Employment, financial health and other shipper / carrier / 3rd party characteristics	U.S. Economy Census and Annual Surveys, U.S. Securities and Exchange Commission reports; commercial sources (e.g. Dunn & Bradstreet).	Accounting standards, new financial instruments and public-private partnerships may affect comparability over time and across institutions.
Transport costs	Commercial sources.	Public data sources discontinued; commercial sources have limited coverage.
Crashes	Every mode has one or more public data sources.	Differing definitions of fatality, etc.; inadequate links to causal and mitigating factors in some modes; inadequate coverage of near misses in some modes. In-vehicle monitors / GPS fleet management devices have the potential to identify sudden deceleration (hardbrakes) in near real-time, providing clues of infrastructure / geometric / signage "hotspots."
Cargo theft and security breaches	Studies of individual facilities and carriers. What about U.S. Department of Homeland	Data access.

Table 13: Current sources of freight transportation data

Subject	Major Data Sets	Major Issues
	Security?	
Energy consumption	VIUS, industry level fuel consumption from U.S. Department of Energy, metropolitan air quality conformity analysis. In-vehicle monitors / GPS fleet management devices have the potential to identify fuel consumption tied to spatial and time data.	Some estimates are based on simulations rather than observed from actual operations; VIUS has been discontinued without replacement.
Air quality effects	VIUS, industry level fuel consumption from U.S. Department of Energy, metropolitan air quality conformity analysis.	Most estimates are based on simulations rather than observed from actual operations; VIUS has been discontinued without replacement.
Noise	Local studies by public agencies.	Few if any national statistics.
Freight-related land use	Local studies by public agencies.	Land use classifications are inconsistent across jurisdictions and rarely sensitive to freight attributes.
Shipper / carrier decisions	Academic and consultant studies.	Supply chain logistics decisions translate inter-industry flows into physical freight movements and may be key to understanding sensitivity of freight to policy and economic change, yet such decisions are rarely measured and little understood; increasing use of third party and out-sourced logistics functions represents significant new source of data but approaches to gathering these data have not been adequately defined.

Source: (Fischer et al. 2007)

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Appendix A
Stakeholder Questionnaire

Data Collection of Urban Goods Movement in Canada Survey
Section 1: Issues and Applications of Existing Data Collection

Introduction

Thank you for participating in our survey of *Data Collection of Urban Goods Movement in Canada*

A study carried out by the Transportation Association of Canada (TAC) has established the need to provide transportation planners with a framework to guide data collection efforts and to help them understand urban goods movement issues as they relate to land use planning, infrastructure planning, traffic safety and operations, demand management and sustainable transportation. The specific purpose of this research project is to provide an improved understanding of the characteristics, operations, issues and opportunities of urban and inter-modal goods movement while the long-term goal of the study is to develop an overall data-gathering framework for urban goods movement in Canada.

As part of the study, this survey is intended to gather information on the types of goods movement data that are commonly used, how the data are collected and accessed, and the data attributes and characteristics that are used.

The survey is divided into six Sections:

Section 1: Issues and Applications of Existing Data Collection
Section 2: Data Collection Programs
Section 3: Public and Commercial Data Sources
Section 4: Freight Data Requirements
Section 5: Other Data Sources
Section 6: Lessons Learned

At the end of each Section, you will be asked to press "Submit Survey". This signifies the end of that section of the survey and you will then be taken to the beginning of the next section of the survey. Once you press the "Submit Survey" button, your answers become final. You cannot go back and change your answers.

With the appropriate preparation, this survey can be completed in 30 to 40 minutes. Before you begin the survey, it will be helpful to have assembled information and consulted with others in your organization about data collection on goods movement. Specific information on data collection exercises and data sets used by your organization will expedite the completion of the survey.

Please DO NOT use the back button on your browser at any time while completing this survey. Instead, please use the previous button provided in the survey form.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList**. You must use the same computer with

which you originally entered the survey. You may choose to reenter the survey at the point where you left it, or to restart the section you left. You may not edit sections you have already submitted.

Definitions

For the purposes of this research, **"urban goods movement"** refers to the movement of goods of any type within, to or from an urban area, by any mode or combination of modes – typically trucks, couriers, autos, taxis, bicycles or on foot. Local shipments to or from inter-urban freight terminals - such as airports, marine ports or inter-modal rail terminals – also constitute urban goods movement. The terms **"freight"** and **"goods movement"** are often used interchangeably. This research is also examining **"commercial vehicle movements**,**"** which account for service activity, such as appliance repair. Whereas goods or commercial vehicle movements tend to be described in terms of trip characteristics, **"commodity flow"** describes instead the generation and distribution of the good that is being transported.

Further definitions are provided in the briefing document you received with your survey invitation.

If you require any further clarification, please direct your questions or comments to:

Allison Clavelle, E.I.T.
Transportation Planner
1 (604) 682-8119 ext. 5822
aclavelle@itransconsulting.com

Your survey is confidential when completed. Your responses will be aggregated with those of other respondents for the purposes of documenting and presenting the findings of the survey. However, we would like your permission to cite individual comments, if appropriate to the discussion, with the understanding that no individual respondent or organization will be identified or attributed.

1) May we have your permission to cite individual comments, if appropriate to our reporting of the survey findings, with the understanding that neither the source nor your contact information will be identified?

- ❍ Yes
- ❍ No

Section 1: Issues and Applications of Existing Data Collection will now begin by asking for your contact information.

2) Your Contact Information: (Items marked with a * are required)

*Name: _____

*Email: _____
*Telephone Number: _____
*Organization: _____
Department/Group: _____

The next two questions are about the existing information that you consider in planning for freight movement in your area.

Issues and Applications of Existing Data Collection

3) Freight planning may include a wide range of activities and issues, depending on the jurisdiction or municipality involved. What freight planning issues do you consider in your planning function (impact your business decisions)? (Check all that apply)

- ❑ Capacity enhancement (e.g. dedicated truck lanes, access roads to rail intermodal yards, etc.)
- ❑ System preservation (e.g. road maintenance and rehabilitation, dredging port channels, etc.)
- ❑ Operations (e.g. routing restrictions for heavy loads, restrictions on terminal hours, etc.)
- ❑ Safety (e.g. highway-rail crossings, dedicated routes for hazardous material shipments, etc.)
- ❑ Environmental (e.g. restrictions on trucks traveling through neighbourhoods, air quality, etc.)
- ❑ Policies
- ❑ Human resources (availability of skilled labour, etc.)
- ❑ Other (please specify)

If you selected other please specify:

_____

4) How do you use freight data to address the aforementioned freight planning issues? (Check all that apply)

- ❑ Developing profiles and trends analysis of current conditions
- ❑ Modelling and forecasting freight demand
- ❑ Traffic operations analysis
- ❑ Facility/access design
- ❑ Environmental assessments/air quality or Climate Change assessments
- ❑ Cost-benefit or financial analysis
- ❑ Investment decision-making
- ❑ Responding to community, public or political concerns and questions
- ❑ Other (please specify)

If you selected other please specify:

_____

This is the end of Section 1 of the Data Collection on Urban Goods Movement survey. If you are satisfied with your responses, please press "Submit Survey" to be taken to the next section of the survey.

Data Collection of Urban Goods Movement in Canada Survey
Section 2: Data Collection Programs

You have entered **Section 2** of the **Data Collection on Urban Goods Movement Survey**. Section 2 includes questions about the types of surveys and traffic counts you fund, as well as the methods you use to collect data.

When you complete this section of the survey, you will be asked if you are satisfied with your answers. If you are satisfied, please press the "Submit Survey" button. After you press the "Submit Survey" button, you will not be able to return to this section and change your answers.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList** and you will be reconnected.

There are two subject areas of questions in Section 2. First, you will be asked about **surveys**; then you will be asked about **traffic counts**.

The first set of questions is about surveys. If you fund surveys, you will be asked to identify what type of surveys you fund. Then, you will be asked for more specific information about each type of survey you fund.

Surveys

1) Do you administer or fund surveys to collect freight data?

- ❍ Yes
- ❍ No

2) What types of surveys do you administer or fund? (Check all that apply)

- ❑ Roadside/intercept surveys
- ❑ Combined telephone mailout/mailback surveys
- ❑ Telephone surveys
- ❑ Commercial vehicle trip diaries (e.g. trip logs)
- ❑ Personal interviews
- ❑ Internet surveys

- ❑ Mailout/mailback surveys
- ❑ Other

3) For roadside/intercept surveys:

Please give a short description of your roadside/intercept survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

4) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

5) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

6) For combined telephone-mailout/mailback surveys:

Please give a short description of your combined telephone-mailout/mailback survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

7) Are the data resulting from your survey available to the public?

❍ Yes
❍ No

8) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

9) For telephone surveys:

Please give a short description of your telephone survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

10) Are the data resulting from your survey available to the public?

❍ Yes
❍ No

11) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

12) For commercial vehicle trip diaries:

Please give a short description of your commercial vehicle trip diary survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

13) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

14) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

15) For personal interviews:

Please give a short description of your personal interview survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

16) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

17) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

18) For internet surveys:

Please give a short description of your internet survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

19) Are the data resulting from your survey available to the public?

❍ Yes
❍ No

20) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

21) For mailout / mailback surveys:

Please give a short description of your mailout/mailback survey program (i.e. survey name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

22) Are the data resulting from your survey available to the public?

❍ Yes
❍ No

23) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

You indicated that you complete other types of surveys. The following questions will ask you for information about those surveys. You can enter up to 5 other survey types.

24) Please complete the following fields for one of the other types of surveys you conduct:

Please enter the name of the survey: _____

Please enter a brief description of your survey (i.e. objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

25) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

26) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

27) Do you have an additional other survey type you would like to add?

- ❍ Yes
- ❍ No

28) Please complete the following fields for one of the other types of surveys you conduct:

Please enter the name of the survey: _____

Please enter a brief description of your survey (i.e. objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

29) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

30) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

31) Do you have an additional other survey type you would like to add?

- ❍ Yes
- ❍ No

32) Please complete the following fields for one of the other types of surveys you conduct:

Please enter the name of the survey: _____

Please enter a brief description of your survey (i.e. objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

33) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

34) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

35) Do you have an additional other survey type you would like to add?

- ❍ Yes
- ❍ No

36) Please complete the following fields for one of the other types of surveys you conduct:

Please enter the name of the survey: _____

Please enter a brief description of your survey (i.e. objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

37) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

38) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

39) Do you have an additional other survey type you would like to add?

- ❍ Yes
- ❍ No

40) Please complete the following fields for one of the other types of surveys you conduct:

Please enter the name of the survey: _____

Please enter a brief description of your survey (i.e. objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of survey: _____

If data collection for this survey type was completed in a joint program along with other survey type(s) for which you have already provided information, please specify those other survey type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified survey type(s) also apply to this survey type: _____

What year was your last survey conducted (please use YYYY format)? _____

What was the sample size for your last survey (please specify units)? _____

How frequently do you conduct these surveys? _____

41) Are the data resulting from your survey available to the public?

- ❍ Yes
- ❍ No

42) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

43) You have filled all the available spots for other survey types. If you have more information to add, please comment below.

_____
_____
_____

This set of questions is about traffic counts. If you conduct traffic counts, you will be asked to identify what types of traffic counts you conduct. Then, you will be asked for more specific information about each type of traffic count you conduct.

44) Do you conduct traffic counts to collect freight data?

- ❍ Yes
- ❍ No

45) What type of traffic counts do you conduct? (Check all that apply)

- ❑ Cordon or screenline counts
- ❑ Toll or turnpike counts
- ❑ Turning movement/intersection counts
- ❑ Traffic counts at weigh stations
- ❑ Mid-block counts
- ❑ State-wide count program
- ❑ Others

46) For cordon or screenline counts:

Please give a short description of your cordon or screenline count program (i.e. count name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of traffic count: _____

What was the last year you conducted a count (please use YYYY format)? _____

What was the sample size for your last count (please specify units)? _____

How frequently do you conduct these counts? _____

What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

47) Are the data resulting from your count available to the public?

- ❍ Yes
- ❍ No

48) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

49) For toll or turnpike counts:

Please give a short description of your toll or turnpike count program (i.e. count name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

50) Are the data resulting from your count available to the public?

- ❍ Yes
- ❍ No

51) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

52) For turning movement/intersection counts:

Please give a short description of your turning movement/intersection count program (i.e. count name, objectives, etc.): _____

Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

53) Are the data resulting from your count available to the public?

- ❍ Yes
- ❍ No

54) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

55) For traffic counts at weigh stations:

Please give a short description of your traffic count program at weigh stations (i.e. count name, objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

56) Are the data resulting from your count available to the public?

❍ Yes
❍ No

57) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

58) For mid-block counts:

Please give a short description of your mid-block count program (i.e. count name, objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____

What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

59) Are the data resulting from your count available to the public?

❍ Yes
❍ No

60) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

61) For state-wide count programs:

Please give a short description of your state-wide count program (i.e. count name, objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

62) Are the data resulting from your count available to the public?

❍ Yes
❍ No

63) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

You indicated that you complete other types of counts. The following questions will ask you for information about those counts. You can enter up to 5 other count types.

64) Please complete the following fields for one of the other types of counts you conduct:

Please enter the name of your count: _____
Please enter a brief description of your count (i.e. objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

65) Are the data resulting from your count available to the public?

❍ Yes
❍ No

66) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

67) Do you have an additional other count type you would like to add?

❍ Yes
❍ No

68) Please complete the following fields for one of the other types of counts you conduct:

Please enter the name of your count: _____
Please enter a brief description of your count (i.e. objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

69) Are the data resulting from your count available to the public?

- ❍ Yes
- ❍ No

70) What is the format of data dissemination? (Check all that apply)

- ❑ Hardcopy
- ❑ Electronic

71) Do you have an additional other count type you would like to add?

- ❍ Yes
- ❍ No

72) Please complete the following fields for one of the other types of counts you conduct:

Please enter the name of your count: _____
Please enter a brief description of your count (i.e. objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

73) Are the data resulting from your count available to the public?

❍ Yes
❍ No

74) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

75) Do you have an additional other count type you would like to add?

❍ Yes
❍ No

76) Please complete the following fields for one of the other types of counts you conduct:

Please enter the name of your count: _____
Please enter a brief description of your count (i.e. objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

77) Are the data resulting from your count available to the public?

❍ Yes
❍ No

78) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

79) Do you have an additional other count type you would like to add?

❍ Yes
❍ No

80) Please complete the following fields for one of the other types of counts you conduct:

Please enter the name of your count: _____
Please enter a brief description of your count (i.e. objectives, etc.): _____
Please describe briefly your successes and lessons learned for this type of traffic count: _____

If data collection for this traffic count type was completed in a joint program along with other traffic count type(s) for which you have already provided information, please specify those other traffic count type(s) here. Please disregard the following questions and press the "Next Page" button if your answers for the specified traffic count type(s) also apply to this traffic count type: _____

What was the last year you conducted a count (please use YYYY format)? _____
What was the sample size for your last count (please specify units)? _____
How frequently do you conduct these counts? _____
What was the duration of your count (i.e. number of hours, days, weeks, etc.)? _____

81) Are the data resulting from your count available to the public?

❍ Yes
❍ No

82) What is the format of data dissemination? (Check all that apply)

❑ Hardcopy
❑ Electronic

83) You have filled all the available spots for other count types. If you have more information to add, please comment below.

_____
_____
_____

The remaining questions ask for more information about your traffic count programs. The first two questions ask about what types of data you collect and the classification system you use. After these questions, you will be asked about the methods you use to count traffic.

Traffic Count Program

84) What types of data are collected in your traffic counts? (Check all that apply)

- ❑ Vehicle weights
- ❑ Vehicle speeds
- ❑ Vehicle lengths
- ❑ Number of vehicles (no distinction by type)
- ❑ Number of vehicles (classified by type)
- ❑ Other (please specify)

If you selected other please specify:
_____

85) What types of classification/categorization systems do you use for the data types identified in the previous question? (Check all that apply)

- ❑ Highway Performance Monitoring System (HPMS) (FHWA - U.S.)
- ❑ Other U.S. Standard (Please specify in comment box below)
- ❑ Canadian Standard (Please specify in comment box below)
- ❑ Standard unique to your organization (e.g. vehicle count classification system) (Please specify in comment box below)

Additional comments:
_____

The next two question sets are about methods of collecting freight data. The first question is about different methods of counting traffic, and the second question set is about ITS technologies that may be used to collect freight data.

Methods of Counting Traffic

86) What methods do you use to conduct traffic counts? (Check all that apply)

- ❑ Tube counts
- ❑ Electronic sensors (e.g. loop inductors, WIM, piezoelectric, radar (RTMS), etc.)
- ❑ Video classification counts
- ❑ Vehicle classification recorders - Manual
- ❑ Vehicle classification recorders - Automatic
- ❑ Other (please specify)

If you selected other please specify:

_____

You will now be asked about the ITS Technologies you use to collect freight data. If you use ITS Technologies, you will be asked to identify which technologies you use.

ITS Technologies

87) Do you use ITS technologies to collect freight data?

- ❍ Yes
- ❍ No

88) Please identify the types of ITS technologies you use. (Check all that apply)

- ❑ Weigh-in-motion (WIM) technologies
- ❑ Sensors (i.e. loop detectors, acoustic sensors, infrared sensors, and radar/microwave sensors)
- ❑ Automated vehicle identification (AVI) technologies
- ❑ Environmental sensor stations
- ❑ Vehicle tracking and navigation systems (VT&NS)
- ❑ Closed circuit cameras (CCTV)
- ❑ Global position system (GPS) equipment
- ❑ Aerial videos
- ❑ License plate matching systems
- ❑ Advanced video image processing
- ❑ Cellular phone coordinates (probe vehicles)
- ❑ Automated vehicle classification (AVC)
- ❑ Electronic toll collection equipment
- ❑ Automatic vehicle location (AVL) system
- ❑ Smart cards
- ❑ Other (please specify)

If you selected other please specify:

_____

This is the end of Section 2 of the Data Collection on Urban Goods Movement survey. If you are satisfied with your responses, please press "Submit Survey" to be taken to the next section of the survey.

Data Collection of Urban Goods Movement in Canada Survey
Section 3: Public and Commercial Data Sources

You have entered **Section 3** of the **Data Collection on Urban Goods Movement Survey**. This section asks questions about the public and commercial data sources you use.

When you complete this section of the survey, you will be asked if you are satisfied with your answers. If you are satisfied, please press the "Submit Survey" button. After you press the "Submit Survey" button, you will not be able to return to this section and change your answers.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList** and you will be reconnected.

Section 3 asks questions about freight data sets that you purchase or acquire from an outside source. First, the survey asks **if you use any public or commercial data sources**, then you will be asked to **identify which sources you use**. Finally, you will be asked **a few questions about each of the sources** that you identified.

Public and Commercial Data Sources

1) Do you use any public or commercial data sources to populate freight databases?

- ❍ Yes
- ❍ No

You are now being asked to identify which public or commercial data sources you use. Once you have completed this question, you will be asked a few questions about the quality and importance of each of the data sources.

Identification of Public and Commercial Data Sources Used

2) Which public or commercial data sources do you use in your planning activities? (Check all that apply)

- ❑ Air Carrier Operations in Canada Quarterly Survey (Statistics Canada)
- ❑ Air Cargo Survey (Statistics Canada)

- ❑ Air Passenger Origin and Destination - Domestic Journeys/Canada-U.S. (Statistics Canada)
- ❑ Aircraft Movement Statistics (Statistics Canada)
- ❑ Airport Activity Statistics of Certificated Route Air Carriers - Bureau of Transportation Statistics
- ❑ Border Crossing Data - Bureau of Transportation Statistics
- ❑ Canadian Vehicle Survey (Statistics Canada)
- ❑ Coastwise Shipping Survey (Statistics Canada)
- ❑ Commercial Vehicle Survey (Ministry of Transportation of Ontario)
- ❑ Commodity Flow Survey (CFS) - U.S. Bureau of Transportation Statistics and the Census Bureau
- ❑ Coupon Passenger Origin-Destination Report (Statistics Canada)
- ❑ Cross-Rail Transportation (Statistics Canada)
- ❑ For-Hire Trucking Survey (Statistics Canada)
- ❑ Freight Analysis Framework (FAF) - U.S. Department of Transportation
- ❑ Freight Commodity Statistics - Association of American Railroads
- ❑ IANA Report - Intermodal Association of North America
- ❑ International Trade Flow Data (Statistics Canada)
- ❑ LECG Marine Industry Benefits Study (Statistics Canada)
- ❑ LTL Commodity and Market Flow Database - American Trucking Association
- ❑ MARAD - U.S. Department of Transportation Maritime Administration
- ❑ Marine International Freight Origin and Destination Survey (Statistics Canada)
- ❑ Maritime Administration Office of Statistical and Economic Analysis
- ❑ National Roadside Survey / Commercial Vehicle Surveys
- ❑ North American Trucking Survey (NATS) - Association of American Railroads
- ❑ Port/Import/Export Reporting Service (PIERS) - Journal of Commerce
- ❑ Quarterly Motor Carriers of Freight Survey (Statistics Canada)
- ❑ Rail Commodity Origin and Destination Statistics (Statistics Canada)
- ❑ Rail Waybill Sample - Surface Transportation Board
- ❑ Railway Carloadings Survey - Monthly (Statistics Canada)
- ❑ Railway Transport Survey - Annual (Statistics Canada)
- ❑ RAILINC (American Association of Railroads)
- ❑ St. Lawrence Seaway Traffic Report (Statistics Canada)
- ❑ Shipping in Canada Report (Statistics Canada)
- ❑ State Estimates of Truck Traffic - Federal Highway Administration
- ❑ Survey of the Couriers and Local Messengers Industry (Statistics Canada)
- ❑ Transborder Surface Freight Data - U.S. Bureau of Transportation Statistics
- ❑ Transportation Annual Survey - U.S. Census Bureau
- ❑ TRANSEARCH - Reebie Associates
- ❑ TranStats: The Intermodal Transportation Database - Bureau of Transportation Statistics
- ❑ Vehicle Inventory and Use Survey (VIUS) - U.S. Census Bureau
- ❑ Waterborne Commerce of the United States (US Army Corps of Engineers)
- ❑ Others

Please answer the following questions concerning the Air Carrier Operations in Canada Quarterly Survey (Statistics Canada).

3) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

4) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

5) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

6) For what purposes do you use these data?

_____
_____
_____

7) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Air Cargo Survey (Statistics Canada).

8) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

9) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

10) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

11) For what purposes do you use these data?

_____
_____
_____

12) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Air Passenger Origin and Destination - Domestic Journeys/Canada-U.S. (Statistics Canada).

13) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

14) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

15) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

16) For what purposes do you use these data?

_____
_____
_____

17) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Aircraft Movement Statistics (Statistics Canada).

18) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

19) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

20) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

21) For what purposes do you use these data?

_____
_____
_____

22) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Airport Activity Statistics of Certificated Route Air Carriers -Bureau of Transportation Statistics.

23) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

24) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

25) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

26) For what purposes do you use these data?

_____
_____
_____

27) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Border Crossing Data - Bureau of Transportation Statistics.

28) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

29) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

30) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

31) For what purposes do you use these data?

_____
_____
_____

32) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Canadian Vehicle Survey (Statistics Canada).

33) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

34) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

35) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

36) For what purposes do you use these data?

_____
_____
_____

37) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Coastwise Shipping Survey.

38) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

39) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

40) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

41) For what purposes do you use these data?

_____
_____
_____

42) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Commercial Vehicle Survey (Ministry of Transportation of Ontario).

43) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

44) What shortcomings/limitations have you encountered with these data?

_____
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45) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

46) For what purposes do you use these data?

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47) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Commodity Flow Survey (CFS).

48) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

49) What shortcomings/limitations have you encountered with these data?

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50) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

51) For what purposes do you use these data?

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52) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Coupon Passenger Origin-Destination Report (Statistics Canada)

53) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

54) What shortcomings/limitations have you encountered with these data?

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55) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

56) For what purposes do you use these data?

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57) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Cross-Rail Transportation (Statistics Canada).

58) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

59) What shortcomings/limitations have you encountered with these data?

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60) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

61) For what purposes do you use these data?

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62) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the For-Hire Trucking Survey (Statistics Canada).

63) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

64) What shortcomings/limitations have you encountered with these data?

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65) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

66) For what purposes do you use these data?

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67) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Freight Analysis Framework (FAF) - U.S. Department of Transportation.

68) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

69) What shortcomings/limitations have you encountered with these data?

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70) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

71) For what purposes do you use these data?

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72) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Freight Commodity Statistics - Association of American Railroads.

73) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

74) What shortcomings/limitations have you encountered with these data?

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75) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

76) For what purposes do you use these data?

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77) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the IANA Report - Intermodal Association of North America.

78) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

79) What shortcomings/limitations have you encountered with these data?

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80) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

81) For what purposes do you use these data?

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82) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the International Trade Flow Data (Statistics Canada).

83) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

84) What shortcomings/limitations have you encountered with these data?

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85) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

86) For what purposes do you use these data?

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87) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the LECG Marine Industry Benefits Study (Statistics Canada).

88) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

89) What shortcomings/limitations have you encountered with these data?

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90) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

91) For what purposes do you use these data?

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92) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the LTL Commodity and Market Flow Database - American Trucking Association.

93) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

94) What shortcomings/limitations have you encountered with these data?

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95) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

96) For what purposes do you use these data?

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97) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the MARAD - U.S. Department of Transportation Maritime Administration

98) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

99) What shortcomings/limitations have you encountered with these data?

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100) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

101) For what purposes do you use these data?

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102) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Marine International Freight Origin and Destination Survey (Statistics Canada).

103) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

104) What shortcomings/limitations have you encountered with these data?

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105) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

106) For what purposes do you use these data?

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107) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Maritime Administration Office of Statistical and Economic Analysis.

108) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

109) What shortcomings/limitations have you encountered with these data?

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110) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

111) For what purposes do you use these data?

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112) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the National Roadside Survey / Commercial Vehicle Surveys.

113) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

114) What shortcomings/limitations have you encountered with these data?

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115) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

116) For what purposes do you use these data?

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117) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the North American Trucking Survey (NATS) - Association of American Railroads.

118) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

119) What shortcomings/limitations have you encountered with these data?

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120) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

121) For what purposes do you use these data?

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122) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Port Import/Export Reporting Service (PIERS) - Journal of Commerce.

123) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

124) What shortcomings/limitations have you encountered with these data?

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125) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

126) For what purposes do you use these data?

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127) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Quarterly Motor Carriers of Freight Survey (Statistics Canada).

128) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

129) What shortcomings/limitations have you encountered with these data?

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130) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

131) For what purposes do you use these data?

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132) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Rail Commodity Origin and Destination Statistics (Statistics Canada).

133) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

134) What shortcomings/limitations have you encountered with these data?

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135) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

136) For what purposes do you use these data?

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137) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Rail Waybill Sample - Surface Transportation Board.

138) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

139) What shortcomings/limitations have you encountered with these data?

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140) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

141) For what purposes do you use these data?

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142) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Railway Carloadings Survey - Monthly (Statistics Canada).

143) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

144) What shortcomings/limitations have you encountered with these data?

_____
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145) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

146) For what purposes do you use these data?

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147) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following three questions concerning the Railway Transport Survey - Annual (Statistics Canada).

148) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

149) What shortcomings/limitations have you encountered with these data?

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150) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

151) For what purposes do you use these data?

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152) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the RAILINC (American Association of Railroads).

153) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

154) What shortcomings/limitations have you encountered with these data?

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155) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

156) For what purposes do you use these data?

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157) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the St. Lawrence Seaway Traffic Report.

158) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

159) What shortcomings/limitations have you encountered with these data?

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_____
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160) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

161) For what purposes do you use these data?

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162) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Shipping in Canada Report (Statistics Canada).

163) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

164) What shortcomings/limitations have you encountered with these data?

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_____
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165) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

166) For what purposes do you use these data?

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167) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the State Estimates of Truck Traffic - Federal Highway Administration.

168) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

169) What shortcomings/limitations have you encountered with these data?

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170) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

171) For what purposes do you use these data?

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172) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Survey of the Couriers and Local Messengers Industry (Statistics Canada).

173) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

174) What shortcomings/limitations have you encountered with these data?

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175) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

176) For what purposes do you use these data?

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177) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Transborder Surface Freight Data - U.S. Bureau of Transportation Statistics.

178) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

179) What shortcomings/limitations have you encountered with these data?

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180) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

181) For what purposes do you use these data?

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182) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Transportation Annual Survey - U.S. Census Bureau.

183) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

184) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

185) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

186) For what purposes do you use these data?

_____
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187) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the TRANSEARCH - Reebie Associates data source.

188) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

189) What shortcomings/limitations have you encountered with these data?

_____
_____
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190) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

191) For what purposes do you use these data?

_____
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192) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the TranStats: The Intermodal Transportation Database - Bureau of Transportation Statistics.

193) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

194) What shortcomings/limitations have you encountered with these data?

_____
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195) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

196) For what purposes do you use these data?

_____
_____
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197) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Vehicle Inventory and Use Survey (VIUS) - U.S. Census Bureau.

198) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

199) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

200) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

201) For what purposes do you use these data?

_____
_____
_____

202) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

Please answer the following questions concerning the Waterborne Commerce of the United States (US Army Corps of Engineers) data source.

203) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

204) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

205) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

206) For what purposes do you use these data?

_____
_____
_____

207) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

You indicated that you use other public or commercial data sources to populate freight databases. The following question will ask you for information about this sources of data. You can only enter one other source of data.

208) Please answer the following questions for the other data source you use.

What is the name of the data source: _____
Please give a short description of the data source: _____

209) How would you rate the quality of the available data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good

210) What shortcomings/limitations have you encountered with these data?

_____
_____
_____

211) How important are the data to planning?

- ❍ Critical
- ❍ Important
- ❍ Not used for planning

212) For what purposes do you use these data?

_____
_____
_____

213) How are the datasets from this source maintained? (Check all that apply)

- ❑ Electronic format e.g. Microsoft Access, Microsoft Excel, Oracle, etc.
- ❑ Hardcopy

214) You have the available spot for other public or commercial data sources. If you have more information to add, please comment below.

_____
_____
_____

This is the end of Section 3 of the Data Collection on Urban Goods Movement survey. If you are satisfied with your responses, please press "Submit Survey" to be taken to the next section of the survey.

Data Collection of Urban Goods Movement in Canada Survey
Section 4: Freight Data Requirements

You have entered **Section 4** of the **Data Collection on Urban Goods Movement Survey**. This section asks questions about your freight data requirements.

When you complete this section of the survey, you will be asked if you are satisfied with your answers. If you are satisfied, please press the "Submit Survey" button. After you press the "Submit Survey" button, you will not be able return to this section and change your answers.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList** and you will be reconnected.

Section 4 asks you to distinguish between **freight data that you currently use, those that you need, but which aren't available, and those which don't apply to you**. This is accomplished by using three question sets. The first question set asks about some **general freight details** and then asks you to **identify which transportation modes you consider**. In the second set of questions, you will be asked about **freight details for the modes identified by you in the first question set** - a combination of highway/truck, rail, air, and/or water. Finally, you will be asked questions about **intermodal freight transportation data**.

The questions in this section may pertain largely to inter-urban goods. The answers to these questions, however, are essential to the understanding of urban goods movement data requirements.

This question asks about your requirements for a series of general freight detail types.

General Freight Detail

1) For the following General Freight Detail please indicate whether you currently use the listed detail or if you need it, but it is not available. If you do not currently use or need the detail, please select N/A.

	Currently use	Need, but not available	N/A
Commodity Detail (i.e. formal classification system, etc.)	❍	❍	❍
Cargo Detail (i.e. aggregate categories, hazardous and non-hazardous cargo, empty vs. non-empty, etc.)	❍	❍	❍
Origin/Destination Detail (i.e. provinces/states, postal codes/zip codes, municipalities/counties, shipper detail, Traffic Analysis Zone (TAZ), customs port of exit/entry, etc.)	❍	❍	❍
Shipment Detail (i.e. weight, volume, value, mode of transport, average length of haul, number of stops per trip, time-sensitive shipment, truckload or less-than-truck load shipments, empty shipments, etc.)	❍	❍	❍
Routing Detail (i.e. major routes used, number of stops, interim trip origin and destinations, vehicle routing, Hazardous Materials (HAZMAT) vehicle routing, etc.)	❍	❍	❍
Cross Border Data (i.e. O/D patterns, commodity, vehicle type, shipment characteristics, mode, stop/delay data, etc.)	❍	❍	❍
Terminal and Intermodal Transfer Facilities (truck volumes entering/exiting, congestion-related delays on access roads, length of queue on access roads, incident rates on access roads, travel time contours around the facility, capacity of facility, etc.)	❍	❍	❍

2) What transportation modes are currently considered or may be considered in your planning activities? (Check all that apply)

- ❑ Highways/trucks
- ❑ Rail
- ❑ Air
- ❑ Water (marine port, barge, short sea shipping)
- ❑ Other (please specify)

If you selected other please specify:

_____

The following question asks about your freight data requirements for Highway/Truck Mode.

Highway/Truck Mode

3) For the following Highway/Truck Mode Freight Data please indicate whether you currently use the listed data or if you need it, but it is not available. If you do not currently use or need the data, please select N/A.

	Currently use	Need, but not available	N/A
Vehicle type	❍	❍	❍
Vehicle size	❍	❍	❍
Average vehicle speed	❍	❍	❍
Vehicle emission data	❍	❍	❍
Traffic counts & classification data	❍	❍	❍
Cargo type	❍	❍	❍
Payload weight	❍	❍	❍
Truck O/D patterns	❍	❍	❍
Trip O/D patterns	❍	❍	❍
Travel time	❍	❍	❍
Travel time reliability	❍	❍	❍
Number of truck stops for LTL shipments	❍	❍	❍
Incident data	❍	❍	❍
Line-haul costs	❍	❍	❍
Drayage costs	❍	❍	❍
Other (please specify in comments section)	❍	❍	❍

The following question asks about your freight data requirements for Rail Mode.

Rail Mode

4) For the following Rail Mode Freight Data please indicate whether you currently use the listed data or if you need it, but it is not available. If you do not currently use or need the data, please select N/A.

	Currently use	Need, but not available	N/A
O/D patterns	❍	❍	❍
Commodity	❍	❍	❍
Equipment details (e.g. car type)	❍	❍	❍
Shipment (weight, volume, value)	❍	❍	❍
Routing data	❍	❍	❍
Travel time	❍	❍	❍
Reliability	❍	❍	❍
Stop/delay data	❍	❍	❍
Ramp-to-ramp costs	❍	❍	❍
Other (please specify in comments section)	❍	❍	❍

The following question asks about your freight data requirements for Air Mode.

Air Mode

5) For the following Air Mode Freight Data please indicate whether you currently use the listed data or if you need it, but it is not available. If you do not currently use or need the data, please select N/A.

	Currently use	Need, but not available	N/A
O/D patterns	❍	❍	❍
Commodity	❍	❍	❍
Shipment (e.g. weight, volume, value)	❍	❍	❍
Routing data	❍	❍	❍
Travel time	❍	❍	❍
Reliability	❍	❍	❍
Air Freightage	❍	❍	❍
Drayage costs	❍	❍	❍
Hazardous materials	❍	❍	❍
Other (please specify in comments section)	❍	❍	❍

The following question asks about your freight data requirements for Water Mode.

Water Mode

6) For the following Water Mode Freight Data please indicate whether you currently use the listed data or if you need it, but it is not available. If you do not currently use or need the data, please select N/A.

	Currently use	Need, but not available	N/A
O/D patterns	❍	❍	❍
Commodity	❍	❍	❍
Equipment details (e.g. vessel type)	❍	❍	❍
Shipment (e.g. weight, volume, value)	❍	❍	❍
Routing data	❍	❍	❍
Travel time	❍	❍	❍
Reliability	❍	❍	❍
Port-to-port costs	❍	❍	❍
Drayage costs	❍	❍	❍
Hazardous materials	❍	❍	❍
Other (please specify in comments section)	❍	❍	❍

You will now be asked two questions about intermodal freight transportation data.

7) Do you use or need data on intermodal freight transportation? (Check all that apply)

- ❑ Truck/rail
- ❑ Truck/airport
- ❑ Truck/marine port
- ❑ Rail/marine port
- ❑ Rail/airport
- ❑ Other (please specify)

If you selected other please specify:

_____

8) For the intermodal freight transportation modes that you have checked, in the comments box below please describe the types of data that you use or need:

_____
_____
_____

This is the end of Section 4 of the Data Collection on Urban Goods Movement survey. If you are satisfied with your responses, please press "Submit Survey" to be taken to the next section of the survey.

Data Collection of Urban Goods Movement in Canada Survey
Section 5: Other Data Sources

You have entered **Section 5** of the **Data Collection on Urban Goods Movement Survey**.
This section asks questions about the other data sources you may use.

When you complete this section of the survey, you will be asked if you are satisfied with your answers. If you are satisfied, please press the "Submit Survey" button. After you press the "Submit Survey" button, you will not be able to return to this section and change your answers.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList** and you will be reconnected.

Section 5 asks questions about **other data sets** you might use for freight planning.

Below, you will identify which types of other data you use for freight planning. Then you will be asked a few questions about the quality of and importance of each data set you identified.

Other Data Sets

The question below asks for information about three other types of data sets you may use.

The first data set type is economic data. Some examples of economic data are information about population, employment, operation and fuel costs, consumption information, and industry statistics.

The second data set type is land-use data. This may include information about zoning, freight generators, or other information about how land is occupied or plans for future land-uses.

The final data set type is transportation network data. This may include, but is not limited to, definitions of truck routes, HAZMAT mapping, truck size, height, and weight limitations, seasonal closures for waterways, short and long haul rail line locations, seasonal restrictions, or border crossing characteristics, operations and procedures.

1) What other data do you use for freight planning? (Check all that apply)

- ❑ Economic Data
- ❑ Land-Use Data
- ❑ Transportation Network Data

You indicated that you use one or more economic data sets for freight planning. The following questions ask for information about one of those data sets.

Economic Data

2)
Please complete the following fields for one of the economic data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

3) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

4) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

5) Do you have an additional economic data set you would like to add?

- ❍ Yes
- ❍ No

6) Please complete the following fields for one of the economic data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

7) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

8) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

9) Do you have an additional economic data set you would like to add?

- ❍ Yes
- ❍ No

10)
Please complete the following fields for one of the economic data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

11) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

12) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

13) Do you have an additional economic data set you would like to add?

❍ Yes
❍ No

14)
Please complete the following fields for one of the economic data sets you use:

Please enter the name of the data set and the source: _____
Please enter a brief description of the data set: _____

15) What is the quality of the data?

❍ Very poor
❍ Poor
❍ Adequate
❍ Good
❍ Very good
❍ N/A

16) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

17) Do you have an additional economic data set you would like to add?

❍ Yes
❍ No

18)
Please complete the following fields for one of the economic data sets you use:

Please enter the name of the data set and the source: _____
Please enter a brief description of the data set: _____

19) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

20) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

21) You have filled all the available spots for economic data sets. If you have more information to add, please comment below.

_____
_____
_____

Please press the "Next Page" button to be directed to the appropriate page of the survey.

You indicated that you use one or more land-use data sets for freight planning. The following questions ask for information about one of those data sets.

Land-Use Data

22) Please complete the following fields for one of the land-use data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

23) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

24) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

25) Do you have an additional land-use data set you would like to add?

- ❍ Yes
- ❍ No

26) Please complete the following fields for one of the land-use data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

27) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

28) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

29) Do you have an additional land-use data set you would like to add?

- ❍ Yes
- ❍ No

30) Please complete the following fields for one of the land-use data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

31) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

32) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

33) Do you have an additional land-use data set you would like to add?

- ❍ Yes
- ❍ No

34) Please complete the following fields for one of the land-use data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

35) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

36) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

37) Do you have an additional land-use data set you would like to add?

- ❍ Yes
- ❍ No

38) Please complete the following fields for one of the land-use data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

39) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

40) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

41) You have filled all the available spots for land-use data sets. If you have more information to add, please comment below.

_____
_____
_____

Please press the "Next Page" button to be directed to the appropriate page of the survey.

You indicated that you use one or more transportation network data sets for freight planning. The following questions ask for information about one of those data sets.

Transportation Network Data

42) Please complete the following fields for one of the transportation network data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

43) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

44) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

45) Do you have an additional transportation network data set you would like to add?

- ❍ Yes
- ❍ No

46)
Please complete the following fields for one of the transportation network data sets you use:

Please enter the name of the data set and the source: _____
Please enter a brief description of the data set: _____

47) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

48) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

49) Do you have an additional transportation network data set you would like to add?

- ❍ Yes
- ❍ No

50) Please complete the following fields for one of the transportation network data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

51) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

52) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

53) Do you have an additional transportation network data set you would like to add?

- ❍ Yes
- ❍ No

54) Please complete the following fields for one of the transportation network data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

55) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

56) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

57) Do you have an additional transportation network data set you would like to add?

- ❍ Yes
- ❍ No

58) Please complete the following fields for one of the transportation network data sets you use:

Please enter the name of the data set and the source: _____

Please enter a brief description of the data set: _____

59) What is the quality of the data?

- ❍ Very poor
- ❍ Poor
- ❍ Adequate
- ❍ Good
- ❍ Very good
- ❍ N/A

60) What limitations and shortcomings have you found while working with this data set and what enhancements would be most useful for you?

_____
_____
_____

61) You have filled all the available spots for transportation network data sets. If you have more information to add, please comment below.

_____
_____
_____

You have answered questions about other economic, land-use, and transportation network data that you currently use. Now, please answer the following questions about data that you need, but are not available.

62) What other economic data do you need for freight planning, but are not available?

_____
_____
_____

63) What other land-use data do you need for freight planning, but are not available?

_____
_____
_____

64) What other transportation network data do you need for freight planning, but are not available?

_____
_____
_____

This is the end of Section 5 of the Data Collection on Urban Goods Movement survey. If you are satisfied with your responses, please press "Submit Survey" to be taken to the next section of the survey.

Data Collection of Urban Goods Movement in Canada Survey
Section 6: Lessons Learned

You have entered **Section 6** of the **Data Collection on Urban Goods Movement Survey**. This is the final section of the survey. This section asks overall questions about lessons learned concerning data collection about urban goods movement.

When you complete this section of the survey, you will be asked if you are satisfied with your answers. If you are satisfied, please press the "Submit Survey" button. After you press the "Submit Survey" button, you will not be able to return to this section and change your answers.

If you get disconnected from the survey at any time, please go to **http://vovici.com/wsb.dll/WSPersistentSurveyList** and you will be reconnected.

Section 6 contains some **additional questions about lessons you have learned** in collecting and using goods movement data.

The following series of questions ask for brief comments about your experiences with urban goods movement data.

Additional Questions on Needs and Lessons Learned:

1) How well do your existing freight data sources or data collection activities meet your needs (e.g., for forecasting, cost-benefit analysis, operational analysis, design, environmental assessment, investment decision-making, etc.)?

_____
_____
_____

2) What improvements to the existing freight data sources or data collection activities, or new data, would be needed to address any deficiencies or gaps?

_____
_____
_____

3) What priorities would you give to the improvements or new data needs that you identified in the previous question?

_____
_____
_____

4) What benefits do you see to having these improvements or new data (e.g., in terms of new capabilities, improved productivity, etc.)?

_____
_____
_____

5) What factors contribute to your success in collecting data for urban goods movement?

_____
_____
_____

6) What plans do you have to expand, enhance, or change your data collection and storage methods?

_____
_____
_____

7) What other data items are needed?

_____
_____
_____

8) What are the main problems with existing data? What would be the most important improvements to existing data? Has a needs survey been conducted among other users of your data and if so, what have they said?

_____
_____
_____

9) Are you aware of any problems encountered by the survey participants when answering the questions? What were the reasons for these problems? How do you plan to avoid these problems in future surveys?

_____
_____
_____

10) What technical or content problems or limitations have you found (e.g. precision, issues of confidentiality, unintended applications)? How do you plan to address these issues in future surveys?

_____
_____
_____

11) How have legal/confidentiality considerations impacted the design/collection of the last survey you conducted in which they were a factor? What steps have been taken to address legal/confidentiality issues?

_____
_____
_____

12) Please indicate your organization's level of interest in participating in a nation-wide TAC program to coordinate the collection of urban goods movement data. An indication of interest at this time does not imply commitment on the part of your organization. (Check all that apply).

❑ Contribution of metadata (e.g. lists, inventory and/or reports describing freight data collected or used by your organization)
❑ Contribution of freight-related and freight planning datasets including traffic counts (e.g. AVC and WIM counts, manual counts, etc.), O/D survey data, commodity flow data, establishment surveys, etc.
❑ Participation in development of national standards or formats for selected types of surveys related to goods movement
❑ Contribution of funding for any of the above
❑ Other (please specify)

If you selected other please specify:
_____

13) What is the approximate cost devoted by your organization to freight data collection, i.e. data collection/surveys (need to address specific datasets)? If possible, please distinguish between your internal costs and external costs (i.e. consultant fees, purchase of data, purchase of equipment, purchase of services, etc.).

_____
_____
_____

Sharing of information

14) Are you able to provide sample data from the surveys carried out by your organization and identified in the preceding sections of this online survey?

- ❍ Yes
- ❍ No

Thank you for taking the time to complete the TAC Data Collection on Urban Goods Movement Survey. Please don't forget to submit your survey by pressing the "Submit Survey" button once you are satisfied with your responses.

If you have any further comments or questions, please feel free to contact Ms. Allison Clavelle, E.I.T. by email at aclavelle@itransconsulting.com or by phone at (604) 682-8119 ext. 5822.

You have now completed the TAC Data Collection on Urban Goods Movement Survey.

Thank you for your participation!

Appendix B
Briefing Document

Introduction

This guide accompanies the Transportation Association of Canada's (TAC) *Data Collection on Urban Goods Movement* Survey. The survey has been distributed to representatives from municipal, regional and provincial governments who are involved with the collection of goods movement data for their area. The guide contains background information about the survey, as well some valuable information to help you in the completion of the survey. It is the intent of the project team that, with appropriate preparation, the survey can be easily completed in 30 to 40 minutes. This guide will provide you with some essential information to ensure the survey process goes as smoothly as possible.

Background

A recent TAC study established the need to provide transportation planners with a framework to guide data collection efforts and to help them understand urban goods movement issues as they relate to land use planning, infrastructure planning, traffic safety and operations, demand management and sustainable transportation. As a result, TAC embarked on a research project, entitled *Framework for High Quality Data Collection of Urban Goods Movement*. Phase 1 of the research developed an improved understanding of the characteristics, operations, issues and opportunities of urban and inter-modal goods movement. This understanding was used to develop a framework that could be applied across Canada to guide the development of urban goods movement data.

Phase 1 also developed a survey of practitioners. A planned future Phase 2 of the research will administer the survey across Canada in order to inventory existing urban goods movement data and to identify data needs. For the present, you and your organization constitute a select group of practitioners, who are now being asked to test the survey before its finalization for the planned future Phase 2. The results of Phase 1 will be will be made available to the general public for free, in both English and French, following the fall 2007 TAC conference.

This online survey is intended to gather information on the types of goods movement data that are commonly used, how the data are collected and accessed, and the data attributes and characteristics that are used. The results from the survey will also be used to identify best practices as they related to data collection of urban goods movement, and the lessons learned by the participating municipalities completing the online survey. Although the focus of the study is urban goods movement, some questions may also relate to inter-urban goods movement. These types of questions have been included because inter-urban goods data may have an impact on urban issues; in some cases it is even difficult to separate the two. Port data, for example, are largely inter-urban, but have significant implications for urban goods movement planning. Users complete the survey in their web browsers, and the data are automatically added to a database that will be used in the completion of the study.

Survey Organization

The survey is divided into six Sections. These are:

- Section 1: Introduction and Types and Methods of Existing Data Collection
- Section 2: Data Collection Programs

- Section 3: Public and Commercial Data Sources
- Section 4: Freight Data Requirements
- Section 5: Other Data Sources
- Section 6: Lessons Learned

The remainder of this guide provides instructions regarding access to and the conduct of the survey. In addition, **Appendix A** presents a glossary of key terms that may be helpful to you in the conduct of the survey.

Instructions

To expedite the completion of the survey, it may be helpful to consult with colleagues and have assembled information available to you as you complete the survey. In addition to the more general questions, some of the questions ask for specific information which may not be immediately available or difficult to answer without a reference. There are questions, for example, on the frequency and sample size of various survey types. The survey also asks you to name and review specific data sets that you may currently use or need. In addition, the survey asks about economic, transportation, and land use data sets that may be used in goods movement planning. By having information on hand, you decrease the time required to complete the survey, while increasing the accuracy of your answers. It is also important to remember that the survey is intended to address your organization as a whole. Please respond to questions, as best as possible, on behalf or your entire organization. Please do not respond to questions which do not apply to your organization.

To access the online survey, you must connect to the survey's website, located at vovici.com/wsb.dll/s/11cf6g27f35. This link connects to an introductory page, which gives some information about the survey and asks for contact details. This is the beginning of Section 1.

At the end of Section 1, and again after each of the Parts of Section 2, you will be asked to press "Submit Survey." This signifies the end of that part of the survey and when you press that button, you will be taken to the beginning of the next part of the survey. Once you press the "Submit Survey" button, your answers become final. You cannot go back and change your answers. You can only make changes to your answers in the part of the questionnaire you are currently on by clicking on the "Previous Page" button.

If you get disconnected from the survey at any time, please go to http://vovici.com/wsb.dll/WSPersistentSurveyList. You must use the same computer with which you originally entered the survey. You may choose to reenter the survey at the point where you left it, or to restart the section you left. You may not edit sections you have already submitted.

It is imperative that the back button in the browser is not pressed at any point while the survey is open. Pressing the back button will cause flaws in the data, and may cause you to lose your place in the survey. Instead, please use the "Previous Page" button provided in the survey form. It is also important that a second user does not start the survey from the same

computer as you before you have completed the survey. Two users completing the survey from the same computer, without one user being finished before the second begins, will cause errors in the data and will cause you to lose your place in the survey.

With appropriate preparation, the survey should take between 30 to 40 minutes to complete. It is not necessary to complete the survey all at once. If you would like to stop temporarily, please save your answers by pressing the "Next Page" button for the page you are filling in, and close your browser window. When you wish to resume the survey, go to http://vovici.com/wsb.dll/WSPersistentSurveyList and you will be reconnected.

It is recommended that you review **Appendix A** in this document before you begin the survey as it contains a glossary of terms for this study. This will help clarify the questions, increase the accuracy of your answers, and reduce the time needed to complete the survey.

In closing…
The study team thanks you for your participation in this survey. The information you supply will be tremendously useful in determining types of goods movement data that are commonly used, how the data are collected and accessed, and the data attributes and characteristics that are used. The results of your responses will be used to refine and finalize the design of the survey. After the survey is finalized, you will be given the opportunity to complete the final survey, which will be available in both official languages, in the planned Phase 2. This survey is an integral step in achieving the long term goal of developing a comprehensive and consistent data gathering framework for urban goods movement in Canada and your participation is greatly appreciated.

This survey and the Phase 1 research are being developed by iTRANS Consulting Inc. under contract to TAC. For information or questions regarding the survey test, please contact Allison Clavelle, Transportation Planner, at 1-604-682-8119, ext. 5822, or at aclavelle@itransconsulting.com. For more information regarding the research, please contact David Kriger, consultant Project Director, at 1-613-722-6515, ext. 5612, or at dkriger@itransconsulting.com.

… Appendix A – Glossary of Key Terms (*next page)*

Appendix A - Glossary of Key Terms

Term	Definition *(for the purposes of this survey)*
Automatic Traffic Recorder (ATR)	Used to capture directional speeds or to record speeds as well as conduct rudimentary traffic counts. Commonly referred to as *tubes*.
Automated vehicle classification devices	Used to establish the mix of vehicles in a traffic stream. These devices can vary substantially; some count axels; some use the "magnetic profile" over the loops; some use the "shape of the vehicle objects through video.
Commercial vehicle movements	Movement of vehicles involved in the transportation of goods or freight or the provision of services, such as appliance repair.
Commodity flow	The generation and distribution of the good that is being transported, as opposed to goods or commercial vehicle movements, which are generally described in terms of trip characteristics.
Drayage Costs	Fees charged by trucking or shipping companies for the transportation of freight to and from a local site. These costs could include amounts charged to complete the inbound carriers shipping documents, charges for unloading and delivering goods to a specific site from the receiving dock and costs to pick up goods from a specific site, delivery to the receiving dock and loading into a carrier.
Economic Data	Data concerning the economy. This may include data or statistics related to population, employment, operation and fuel costs, consumption information, and industry statistics.
Environmental sensors	Short, small cylindrical shaped device that is inset into the pavement, usually in the middle of a lane. Used to monitor the surface temperature of the road.
Environmental stations	Usually located at the side of the road and comprised of several devices. They are often connected to *environmental sensors* but also to weather detection equipment, such as thermometers, barometers, wind speed sensors, precipitation measurement equipment, etc. They sense not only the temperature of the road surface, but also the humidity and temperature of the air. The data from these devices can be used to predict the formation of ice on the road.
Freight	See *goods movement*.

Term	Definition *(for the purposes of this survey)*
Goods movement	The transportation of goods of any type, by any mode or combination of modes – typically trucks, couriers, autos, taxis, bicycles or on foot. Often used interchangeably with the term *freight*.
ITS (Intelligent Transportation System) Technologies	ITS refers to the use of information technologies such as computers, telecommunications, GPS (Global Positioning System) and the Internet to improve transportation system performance and efficiency.[33] In the case of online survey, it refers to devices used to automatically collect information about goods movement such as traffic counters, weigh-in-motion devices and the like.
Land-Use Data	Data about the composition of land-uses and plans for future land-uses. Such data may include information about zoning or the location of infrastructure related to goods movement such as freight generators, industrial sites and retail centres.
Loop Detectors	Coils of wire, often four feet by four feet or larger, embedded in the pavement. An electric current is passed through the coil which sets up a magnetic field above the roadway. As metal objects pass over the loop, they disturb the magnetic field and change the current flow. This is sensed by the detection equipment. Loop detectors are either installed under the asphalt when the road is built or laid into a saw cut and then covered with sealant.
Mid Block Counts	Temporary or permanent counts using electronic sensors or tubes at a mid block location.
Public and Commercial Data Sources	Data sets that are purchase or acquired from an outside source. This includes information from Statistics Canada, Provincial Ministries, or any other external source.
Transportation Network Data	Data about the supply and limitations of the greater transportation network. Data may include information about defined truck routes, HAZMAT mapping, truck size, height, and weight limitations, seasonal closures for waterways, short and long haul rail line locations, or other restrictions on goods movement.
Tubes	See *automatic traffic recorder*.

[33] Victoria Transport Policy Institute TDM Encyclopaedia; http://www.vtpi.org/tdm/tdm101.htm

Term	Definition *(for the purposes of this survey)*
Urban goods movement	The movement of goods of any type within, to or from an urban area, by any mode or combination of modes – typically trucks, couriers, autos, taxis, bicycles or on foot. Local shipments to or from inter-urban freight terminals – such as airports, marine ports or inter-modal rail terminals – may also constitute urban goods movement.