Edmonton Urban Roadside Truck Survey: Planning and Operations

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Abstract

The City of Edmonton's Transportation Master Plan identifies the City's commitment to efficient goods movement as part of enabling economic development and supporting the competitiveness of businesses. In April 2012, a number of questions were raised by councilors wanting to better understand truck movement needs within the city, including impacts of infrastructure investments over the past decade and changes in goods movement patterns. After a review of possible methodologies, a roadside truck survey was implemented in order to gather qualitative and quantitative goods movement data within tight time and budget constraints.

A survey was designed that included questions about vehicle characteristics, travel patterns, route preferences, commodities carried and driver experience. The survey was conducted with 2,294 participants over 14 days in fall 2012. The surveys were performed on major city arterial roadways, freeways, provincial highways within City limits and the Anthony Henday Drive ring road. The survey data was supplemented by classified volume counts across the city conducted on the day of and the day before the survey. Subsequent data processing and analysis were performed in order to report results that could be compared with past goods movement surveys which used regional roadside cordon and business establishment survey methods.

Roadside surveys have not been used often within urban limits in Canada, likely due to challenges in collecting data from drivers due to the nature of large vehicles within a congested roadway network. Also, sampling challenges results from the disruption to the roadway network that is caused by the survey itself. Based on the experience of this survey, recommendations are made for the planning, field operation and data analysis involved in an urban roadside truck survey. Survey site planning and staff training are important for delivering a safe and effective survey. Through careful planning and implementation of best practices, an urban roadside survey can yield cost effective results for jurisdictions contemplating urban goods movement studies.

1.0 Introduction

When studying the movement of goods in urban areas, collecting data that is accurate, timely and cost effective is a challenge for many government agencies. The data and analysis are used to inform decisions made that affect multiple levels of government, due to the direct impact that transportation of goods has on the livelihood of citizens. It is in urban areas, as the focal points of regional economic activity, where the movement of goods and services is most critical. At the same time, due to higher intensity of development, wide geographic truck networks and background traffic congestion, the task of collecting and analyzing data in these areas is more complex and requires a broader set of tools.

In April 2012, Edmonton City Council passed a motion to review and update the understanding of goods movement within Edmonton and the region. After a review previous studies and possible methodologies, a roadside truck survey was undertaken in September and October 2012. This paper discusses the methodology used as well as highlights some areas for improvement that should be considered by other agencies who may be contemplating an urban roadside truck survey.[1]

1.1 Previous Studies in Edmonton

Edmonton plays an important role in Alberta's economy and has undergone significant growth over the past decade. The city's transportation and warehousing sector is a major contributor to this growth and that is expected to continue into the future. Two key studies were conducted over the past two decades in order to gain a better understanding of the impacts, characteristics and requirements for efficient goods movement in Edmonton: the 1996 *Truck Route Study* and the 2001 *Commodity Flow Study*.

1996 Truck Route Study

In 1995, in preparation for the development of the City of Edmonton Transportation Master Plan (TMP), the City commissioned a study of the truck route system as a technical component of the TMP process. The intent of the study was to identify a means of resolving and minimizing current problems associated with the truck route system at the time, "including regulations pertaining to restrictions by time, by types of goods and by vehicle weight, and establishing criteria to assist in the rationalization of future truck route system changes"(Morrison Hershfield, 1996). The data collection phase of the project included a literature review, a review of the City's previous truck route changes, a public involvement component and a detailed survey of trucking activity.

2001 Commodity Flow Study

During 2001 and 2002, the City of Edmonton and Alberta Transportation undertook a study of truck and commodity movements in both the city and the region. There were two components to the study: a commodity flow survey and an Edmonton region roadside survey. The study provided the data needed to "assist in the assessment of

[1] Information regarding the previous studies in Edmonton and study results have been previously published by the City of Edmonton (City of Edmonton, 2013)

regional transportation needs, and in particular truck and service vehicle needs, and to include these needs in the development of short-term and long-term transportation plans." (International Results Group, 2002)

Drawing on the past experience in the Edmonton roadside truck survey, the following points were considered:

- Conduct surveys in daylight hours between 8:00am and 4:00pm.
- Minimize the delay to truckers by keeping interviews to between 90 seconds and 2 minutes.
- Staff resources should be allocated according to the anticipated trucks during the eight-hour time frame.
- Clearly define definition of a trip, an origin and destination in terms of time for the roadside survey staff
- Use of the words "type of load" instead of "commodity".
- Specifically asking if trip was part of a round trip

1.2 Goods Movement Studies across Canada

As part of evaluation of possible methodologies, a review of studies from jurisdictions across Canada was performed. Roadside surveys have been used in Canada in the past decade, especially in Ontario and Quebec. Although experience in an urban context is somewhat limited, many of the processes used in roadside surveys conducted in other jurisdictions were applied to the Edmonton survey.

National Roadside Survey

The National Roadside Survey (NRS) is a joint project of the federal and provincial governments provides valuable information on heavy, long haul trucking in Canada. The survey most recently took place between July 2006 and August 2007. Information was captured from drivers on their trip, the routes taken and the commodities being hauled. Vehicles were counting and in many cases weighed as they passed over embedded equipment in the roadway (Transport Canada, 2010). The resulting data set includes: number of trips; distance travelled, weight of cargo carried, output, truck weigh, and impact (HDR iTrans, 2010).

Interprovincial Roadside Truck Survey (National Capital Region)

In June 2007 a roadside truck survey was conducted on two bridges between Ottawa, Ontario and Gatineau, Quebec and was coordinated by TRANS[2]. This National Capital Region truck survey was conducted within city boundaries on busy roadways and provided guidance on how to conduct such surveys for Edmonton. The purpose of the survey was to establish a database of heavy truck travel characteristics in the National Capital Region between the two provinces. The interprovincial roadside truck survey was part of the National Roadside Survey program led by Transport Canada with participation of the provinces and territories.

[2] Comprised of the City of Ottawa, Ville de Gatineau, Société de transport de l'Outaouais, Ministry of Transportation of Ontario, Ministère des Transports du Québec and the National Capital Commission

The survey was a roadside method where trained crews were stationed on the south and north sides of the Ottawa River. The survey approach took advantage of the ability of a bridge to focus heavy vehicles. For sampling, trucks were selected from the stream of traffic by an enforcement officer and directed to a location for vehicle weighing (Trans, 2011).

1999 Trucking Survey - Interurban Heavy Vehicle Traffic in Québec

Research into whether a goods movement study was conducted in the Montreal revealed that although there was no metropolitan survey conducted, in 1999 the Province of Québec conducted a Trucking Survey to profile long-haul trucking activity in the province. The roadside survey was part of the National Roadside Survey and sponsored by the Canadian Council of Motor Transport Administrators (CCMTA). The survey was a collaborative effort by Transports Québec, Transport Canada and the other Canadian provinces and territories and US States under the coordination of the Eastern Border Transportation Coalition (EBTC) and the Federal Highway Administration (FHWA). (Transport Quebec, 1999).

The survey collected information from each trucker on the origin and destination of the trip, truck weight and configuration, commodity, vehicle type and equipment and carrier type. 16,800 heavy vehicles were intercepted at one of the 51 survey sites established along Québec roads and an additional 7,900 observations were collected from trucks intercepted in the rest of Canada which are known to have used Québec roads during their trips.

TAC Framework for High Quality Data Collection of Urban Goods Movement in Canada

On a national level, the Transportation Association Canada (TAC) completed a report in 2010 which presented a recommended framework and a program for gathering high-quality data for urban goods movement surveys in Canada . The proposed framework had two components, the first focusing on origin-destination surveys and commodity flow surveys (CFS), and the second with respect to geographic scale, i.e. the urban and interurban areas. The report focuses on the need for an interurban Canadian CFS similar to the current U.S. Commodity Flow Survey.

A nationwide online survey on goods movement data usage and needs in Canada was also conducted as part of the project. The report included an implementation strategy to advance the identified needs and develop the framework was included in the report. On a national level the National Roadside Survey (NRS) conducted by Transport Canada was seen providing an example of best practices in inter-urban origin-destination surveys.

1.3 Direction from City Council

In April 2012, at a meeting of the Transportation and Infrastructure Committee of Edmonton's City Council, a number of questions were raised by councilors in relation to goods movement. They expressed the need for a better understanding of truck movements in the city, in particular with regards to volumes, origins and destinations and routes taken for goods movement. This need was identified in light of the many infrastructure changes that had occurred over the past decade in Edmonton, including the construction of Anthony Henday Drive. There was also a need to investigate possible changes in the movement of truck traffic between the city and the region, and the types of loads carried.

Direction was given to update the information presented in the 1996 Truck Route Study. This updated truck survey report will serve as an important input to the development of an Edmonton Goods Movement Strategy and Implementation Plan which will provide strategic direction for enabling safe and efficient goods movement in Edmonton.

1.4 Transportation Industry Trends

In Alberta, the transportation and logistics industry is an important aspect of the competitive advantage of the province. According to the Government of Alberta, trucks are "moving over 60% of all freight within the province" and are responsible for "about $7 billion or 29% of Alberta's non-pipeline international exports (Alberta Enterprise and Advanced Education, 2012). This significant proportion points to the importance of a current and accurate understanding of truck movement needs.

Since the most recent study of movement of goods in the Edmonton region, there has been significant growth in the economic condition in Alberta. As Alberta's economy grows it has a direct impact on transportation and logistics. Between 1991 and 2011, Alberta's gross domestic product (GDP) grew at an average annual rate of 3.4% while over the past 10 years alone, the registration of heavy trucks in the province increased by 46%. (Alberta Enterprise and Advanced Education, 2012).

Truck Volume Trends

One-day truck volume counts have been collected annually at various locations around the city since 2004. Some data collection units are set up around the city such that they effectively provide a cordon count between the city and the region. From these units we are able to gain an idea about the volume of trucks travelling between the city and the region on a given day. Data collected between 2004 and 2012 indicates that city-region truck travel is increasing with volumes between the city and the West Region nearly doubling. Data collected from a unit on Calgary Trail south of Ellerslie Road show truck volumes entering and leaving from the South Region increased by over 75% in the 8-year period. According to the counts, city-region truck travel has increased by nearly 40% between 2004 and 2012. This data is representative of the interaction between the city and the immediate surrounding region as well as the city and areas outside of the region.

Truck travel on the Inner Ring Road is also captured and provides a view into the travel internal to the city. According to truck volumes collected between 2004 and 2012 on these facilities, volumes have remained effectively unchanged. Volumes collected from Anthony Henday Drive however have shown a three-fold increase in the same time period indicating that some of the growth in truck travel demand is being absorbed by Anthony Henday Drive.

1.4 Selecting a survey methodology

Due to budgetary and schedule constraints, it was decided early in the planning process that data collection on truck movements in Edmonton for the purposes of the 2012 study would be less extensive than previous survey collection. Two main methods were evaluated, a roadside method and an establishment method. These were considered to be similar enough to previous efforts such that a survey could be manageably performed within the time available. Other promising methods, such as truck based GPS, were considered however the implementation time frame was prohibitive for 2012.

When considering an establishment-type survey, the sample size would have been necessarily smaller than those of previous Edmonton studies due to budgetary limits. To mitigate the smaller sample size, consideration was given maintaining a business establishment that would be representative of the industry, number of employees and location (sector of the city) in order to maintain some consistency between previous studies. Use of online tools were explored in an effort to increase cost effectiveness and response rates. In the end, a basic mail-out mail-back survey was contemplated. In addition, qualitative type questions to respond to council inquiries would likely have required telephone follow up to prepare statistically relevant results. A major challenge of the establishment type survey was the low response rates that have been experienced in the past.

When considering a roadside truck survey, the original proposal was to use the same regional locations that were used in partnership with the Province of Alberta. Due to budget limitations at the Provincial level, these were found to no longer be available therefore the survey was limited to locations within City limits. Conducting a roadside origin-destination survey was deemed to provide a good balance of information and high response rate. The use of in-house monitoring services for data collection was planned as a strategy to further limit the cost of the data collection as there is a yearly program of temporary staff available. A main challenge identified was setting up roadside survey locations along busy arterial roads within city limits. A benefit of the roadside survey approach is that it would provide the opportunity to obtain truck driver feedback on a number of qualitative questions identified by City Council.

2.1 Study Methodology

The survey was conducted by the City of Edmonton's Transportation Services Department, in cooperation with Edmonton Police Service in September and October of 2012. Police officers directed trucks with a gross vehicle weight of 4,500 kilograms or more into a safe waiting area where they were voluntarily interviewed by survey staff. The survey areas were clearly signed and marked with Variable Message Signs (VMS) and high visibility cones. The police were instructed to randomly select vehicles when site staff were available to receive trucks.

For the purposes of this survey, vehicles weighing more than 4,500 kg were surveyed in order to remain consistent with the methodology of the 2001 Edmonton Region roadside survey. In addition, under federal legislation, trucks registered with a weight of more than 4,500 kg must comply with National Safety Code standards on regional highways. Weight suitability was determined visually by survey staff based on truck dimensions and markings.

2.2 Study Area and Timeframes

The survey was conducted at fourteen separate locations around the city over 14 days. The locations were selected based on the following criteria: high volume truck routes, ability for trucks to stop safely, survey staff safety and sufficient road capacity to minimize impacts on motorists. A map of the survey locations and dates is provided in Figure 1.

The survey was conducted on fourteen different days between Tuesday to Friday and between 9 a.m. and 3 p.m., as previous studies have shown this is peak period for trucks. It also had the added benefit of reducing impacts on background roadway traffic. Truck volumes are typically higher Tuesday through Friday and during the off-peak periods .

The first three survey days were selected in order to coincide with the Edmonton Police Service Provincial Fall Check Program. This is a vehicle safety program administered where trucks are selected for an inspection in accordance with Provincial regulations. On these days, the survey was administered briefly prior to an interview with a police constable.

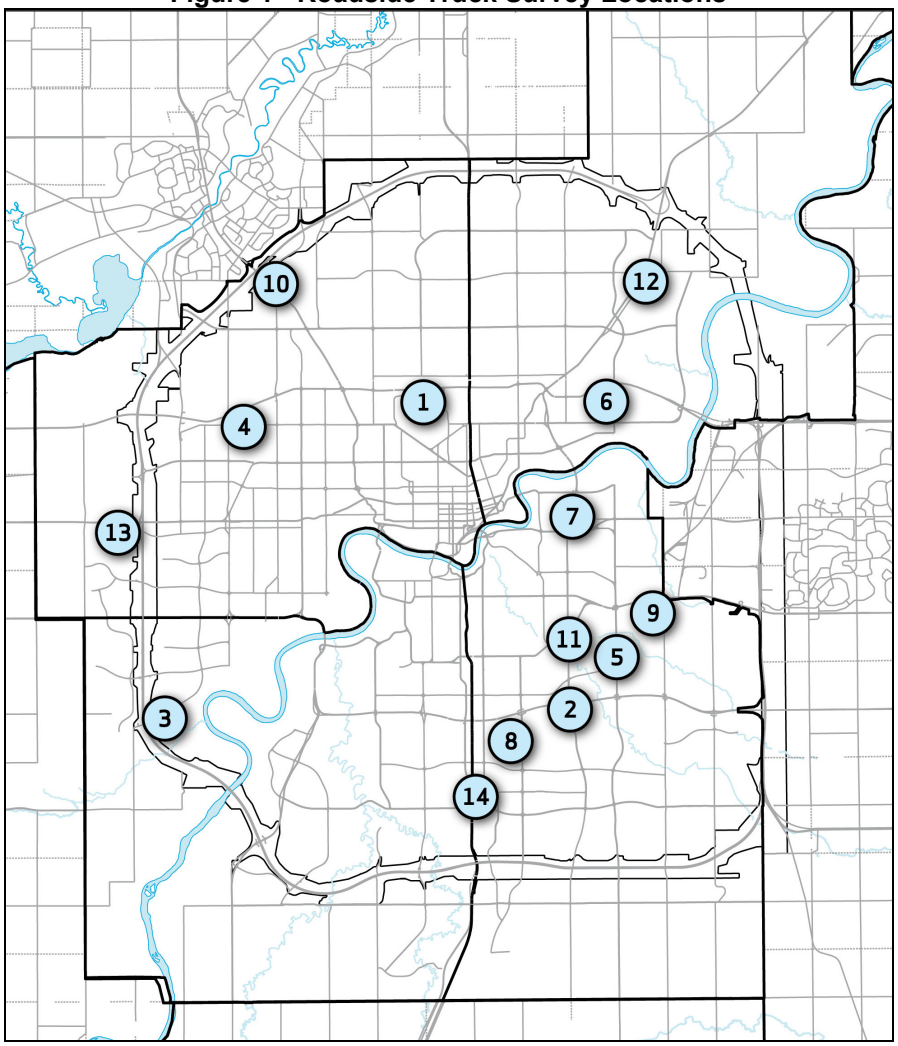
2.3 Survey Site Planning and Safety

As the survey was taking place in an urban area, safety was top priority for the data collection team. All surveyors were required to wear high visibility vests and a spotter was present at each site to ensure that trucks and surveyors were interacting safely. Each day, there were 10 staff on site, with surveys occurring in two directions each day.

Priority was given to adequate deceleration lengths and pull over areas were provided with sufficient advance notification for truck drivers. In addition, planning a staging area and the location of the police squad vehicles was important for efficient site operations. Temporary staff received half-day of training in truck safety, site operations and survey

methodology, in partnership with Edmonton Police Service's commercial vehicle inspection officers, prior to undertaking the roadside survey.

Figure 1 - Roadside Truck Survey Locations



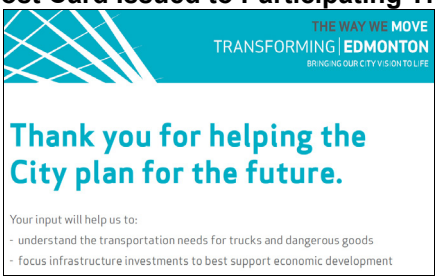
Site Map Legend

SITE	LOCATION	DATE	SITE	LOCATION	DATE
1	Yellowhead Trail west of 121 Street	Sept. 18	8	99 Street south of 39 Avenue	Oct. 12
2	Whitemud Drive at 75 Street	Sept. 19	9	Sherwood Park Freeway west of 34 Street	Oct. 19
3	Anthony Henday Drive north of Lessard Road	Sept. 20	10	Anthony Henday Drive near St. Albert Trail	Oct. 24
4	170 Street north of Yellowhead Trail	Sept. 25	11	75 Street north of McIntyre Road	Oct. 25
5	50 Street north of Eleniak Road	Sept. 26	12	Manning Drive north of 153 Avenue	Oct. 26
6	Yellowhead Trail west of 50 Street	Sept. 27	13	Highway 16A at Winterburn Road	Oct. 30
7	Wayne Gretzky Drive at 101 Avenue (northbound only) and 116 Avenue (southbound only)	Oct. 5	14	Gateway Boulevard north of 23 Avenue (northbound) and Calgary Trail south of 42 Avenue (southbound)	Oct. 23

2.4 Communications

, drivers were informed that the survey was voluntary and were not required to participate. In order to increase response rates and show appreciation for the time of the driver, a small thank you post card was given along with a coffee voucher. At a nominal cost, these were an effective tool to achieve very few refusals throughout the course of the study.

Figure 2 - Post Card Issued to Participating Truck Drivers



In order to ensure truck drivers in general were aware of the study, communication was sent out to the membership of the Alberta Motor Transport Association (AMTA). As well, information was distributed to City Council, the media, industry representatives, government agencies and the public along with a supporting website.

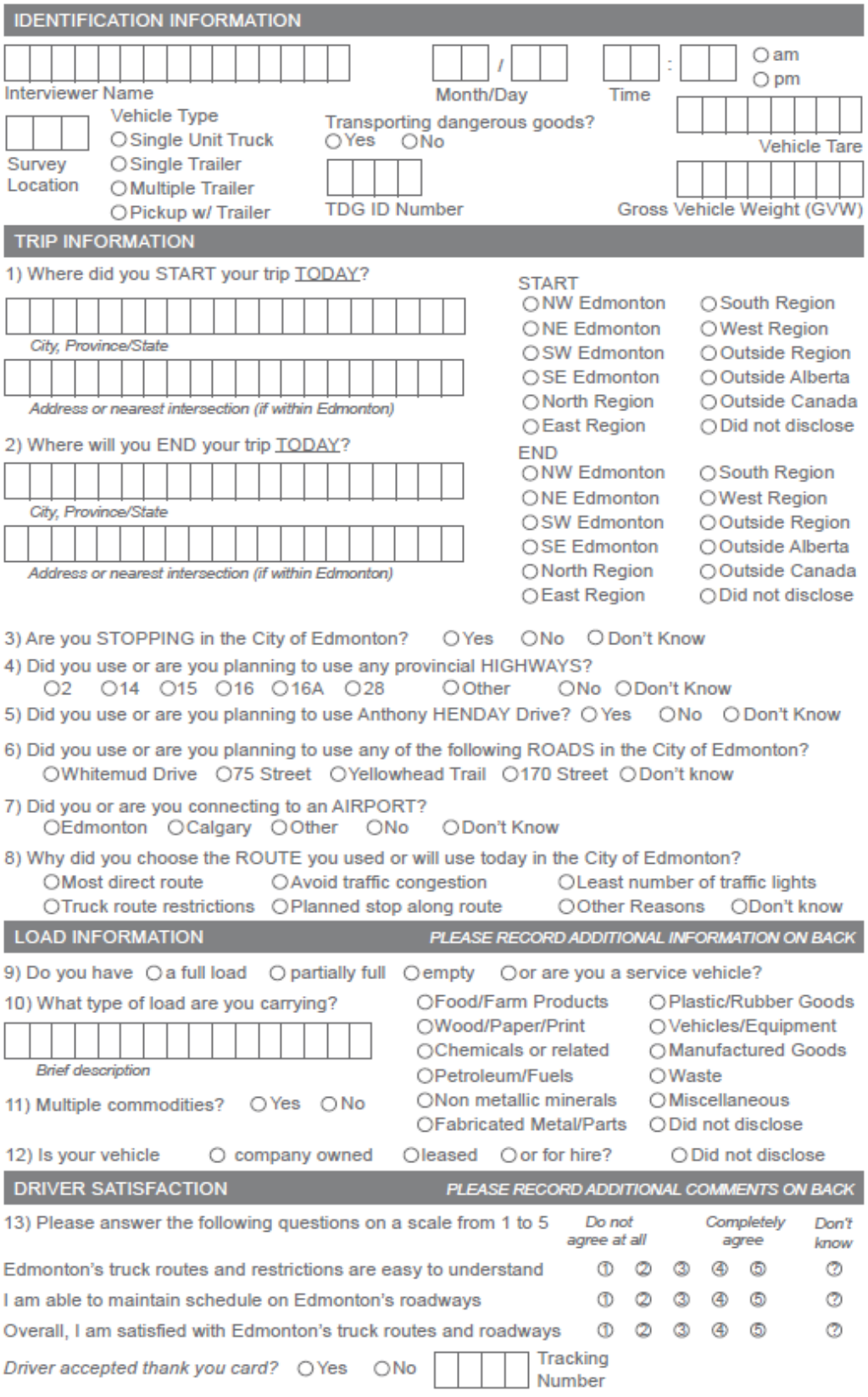
2.5 Survey Design

The survey was designed to gather qualitative and quantitative information on the movement of trucks in Edmonton by way of a two- to three-minute interview. A survey questionnaire was developed after a literature review, internal consultation and review by an expert advisor.

The types of questions asked included the origins and destinations of the truck, types of commodities carried, routes used and the quality of the driving experience (see figure 3). The survey form also had a second page, not shown, which was used to record the most recent stops (previous and next) in the case the driver was making a tour based trip. The survey form included bubbles which were filled out by the survey staff and then checked by a supervisor prior to being scanned electronically.

The questions were broadly similar to those asked in the *2001 Commodity Flow Study* with the main differences being that in 2001 a comprehensive trip diary was used, no driver satisfaction questions were asked and information on the value of the goods carried was gathered. The budget for the 2001 survey was more than ten times larger than the 2012 roadside survey, which allowed for greater detail to be obtained on trips made over a 24-hour period.

Figure 3 - Roadside Survey Tool



IDENTIFICATION INFORMATION

Interviewer Name

Month/Day

Time

○ am ○ pm

Survey Location

Vehicle Type
○ Single Unit Truck
○ Single Trailer
○ Multiple Trailer
○ Pickup w/ Trailer

Transporting dangerous goods?
○ Yes ○ No

TDG ID Number

Vehicle Tare

Gross Vehicle Weight (GVW)

TRIP INFORMATION

1) Where did you START your trip TODAY?

City, Province/State

Address or nearest intersection (if within Edmonton)

2) Where will you END your trip TODAY?

City, Province/State

Address or nearest intersection (if within Edmonton)

START
○ NW Edmonton ○ South Region
○ NE Edmonton ○ West Region
○ SW Edmonton ○ Outside Region
○ SE Edmonton ○ Outside Alberta
○ North Region ○ Outside Canada
○ East Region ○ Did not disclose

END
○ NW Edmonton ○ South Region
○ NE Edmonton ○ West Region
○ SW Edmonton ○ Outside Region
○ SE Edmonton ○ Outside Alberta
○ North Region ○ Outside Canada
○ East Region ○ Did not disclose

3) Are you STOPPING in the City of Edmonton? ○ Yes ○ No ○ Don't Know

4) Did you use or are you planning to use any provincial HIGHWAYS?
○ 2 ○ 14 ○ 15 ○ 16 ○ 16A ○ 28 ○ Other ○ No ○ Don't Know

5) Did you use or are you planning to use Anthony HENDAY Drive? ○ Yes ○ No ○ Don't Know

6) Did you use or are you planning to use any of the following ROADS in the City of Edmonton?
○ Whitemud Drive ○ 75 Street ○ Yellowhead Trail ○ 170 Street ○ Don't know

7) Did you or are you connecting to an AIRPORT?
○ Edmonton ○ Calgary ○ Other ○ No ○ Don't Know

8) Why did you choose the ROUTE you used or will use today in the City of Edmonton?
○ Most direct route ○ Avoid traffic congestion ○ Least number of traffic lights
○ Truck route restrictions ○ Planned stop along route ○ Other Reasons ○ Don't know

LOAD INFORMATION — *PLEASE RECORD ADDITIONAL INFORMATION ON BACK*

9) Do you have ○ a full load ○ partially full ○ empty ○ or are you a service vehicle?

10) What type of load are you carrying?

Brief description

○ Food/Farm Products ○ Plastic/Rubber Goods
○ Wood/Paper/Print ○ Vehicles/Equipment
○ Chemicals or related ○ Manufactured Goods
○ Petroleum/Fuels ○ Waste
○ Non metallic minerals ○ Miscellaneous
○ Fabricated Metal/Parts ○ Did not disclose

11) Multiple commodities? ○ Yes ○ No

12) Is your vehicle ○ company owned ○ leased ○ or for hire? ○ Did not disclose

DRIVER SATISFACTION — *PLEASE RECORD ADDITIONAL COMMENTS ON BACK*

13) Please answer the following questions on a scale from 1 to 5

	Do not agree at all				*Completely agree*	*Don't know*
Edmonton's truck routes and restrictions are easy to understand	①	②	③	④	⑤	⑦
I am able to maintain schedule on Edmonton's roadways	①	②	③	④	⑤	⑦
Overall, I am satisfied with Edmonton's truck routes and roadways	①	②	③	④	⑤	⑦

Driver accepted thank you card? ○ Yes ○ No Tracking Number

3.1 Survey Results

Over the course of the 2012 Edmonton Roadside Truck Survey, 2,294 trucks were surveyed at fourteen locations around the City of Edmonton on various days. As the data represents only a sample of all the truck movements in Edmonton, the data had to be expanded to represent the overall truck movements on a given day. All analysis was conducted on the expanded data set. In combining the data from fourteen different sites, a representative day was created.

The data was expanded based on a 48-hour study of truck volumes using temporary video cameras, including the day of the survey and an adjacent 24 hours. At each site, sampling varied from 2% to 20% of daily 24 truck volumes. Same site day to day truck volumes were found to fluctuate and decreases of up to 30% was observed when comparing the day of the survey to the adjacent 24 hours. The video recorded volumes were classified by the video vendor (MioVision) into medium and heavy volumes and scaling was based on the adjacent 24 hour classified volume to account for differing levels of diversion at each site.

3.2 Vehicle Characteristics

The data collected on vehicle characteristics, including truck type, weight and information on dangerous goods loads, helped us to better understand the types of vehicles transporting goods on Edmonton roadways. These characteristics also helped to determine whether the vehicle was subject to the sections of the City of Edmonton's Bylaw 5590 pertaining to truck routes and movement of dangerous goods. Drivers were also asked about the type of vehicle ownership of the truck. Details on the data expansion methodology can be found in the *Roadside Truck Survey Data Expansion Report*.

Truck Types

Trucks travelling on Edmonton roadways take many forms. Some of these trucks may not have fallen under the category of a 'heavy vehicle' as defined by the City of Edmonton Bylaw 5590 and so would not be subject to heavy vehicle regulations. The focus of this survey was to gather information on trucks having a gross vehicle weight of 4,500 kg or more which was consistent with the methodology used in the 2001 Edmonton Region roadside survey

From the roadside study, 56% of trucks travelling on Edmonton road consist of single-unit trucks and a small number of pickups with trailers. The remaining 44% include the larger tractor-trailers with either single or multiple trailers.

Vehicle Weight and Ownership

The tare (empty) weights and gross vehicle weights of all trucks were collected when available if printed on the truck or provided by the driver. The distribution of gross vehicle weight is shown in Figure 5. The weight distribution of the vehicles indicates that the majority of trucks fell within the 20,000 kg to 70,000 kg gross weight range.

The information collected on vehicle ownership found that the vast majority of the trucks, 85%, are company-owned and the remainder are leased or for-hire vehicles.

3.3 Trip Characteristics

To gain insight into truck trip patterns, origin-destination and route choice information was collected. In addition, drivers were asked to provide the reasons for their route choices within the context of the survey questionnaire.

Overall Trip Patterns

Drivers were asked to provide the address at which they began and ended their trip on the day of the survey as well as the most recent stop before and after the survey.. Data was also aggregated for all truck trips in and around Edmonton with the most predominant truck movement patterns shown visually in Figure 4.

The results show that within the city, the origin-destination pair with the highest movement of trucks occurs between the Northwest and Southeast quadrants. This is consistent with the results of the *2001 Commodity Flow Survey* as well as the *1996 Truck Study*. This also aligns with the land use characteristics of these two quadrants as they have high industrial land use. Also significant was truck movements between the Northwest and Northeast as well as the Northeast and Southeast quadrants of the city.

'Home base' Movements

Of the trucks surveyed over 40,000, or 74%, began and ended their day at the same location, or what drivers often referred to as their 'home base'. These trucks are typically company-owned, single-unit vehicles that make many daily stops. Notably, of all the trucks surveyed, 84% planned to or had made a stop in the City of Edmonton during their day. These trucks are an important part of the Edmonton economy as they are likely to be used for local goods movement. The survey identified the Northwest industrial area as the largest 'home base' in Edmonton, with nearly 13,000 trucks reporting starting and ending their day in this area.

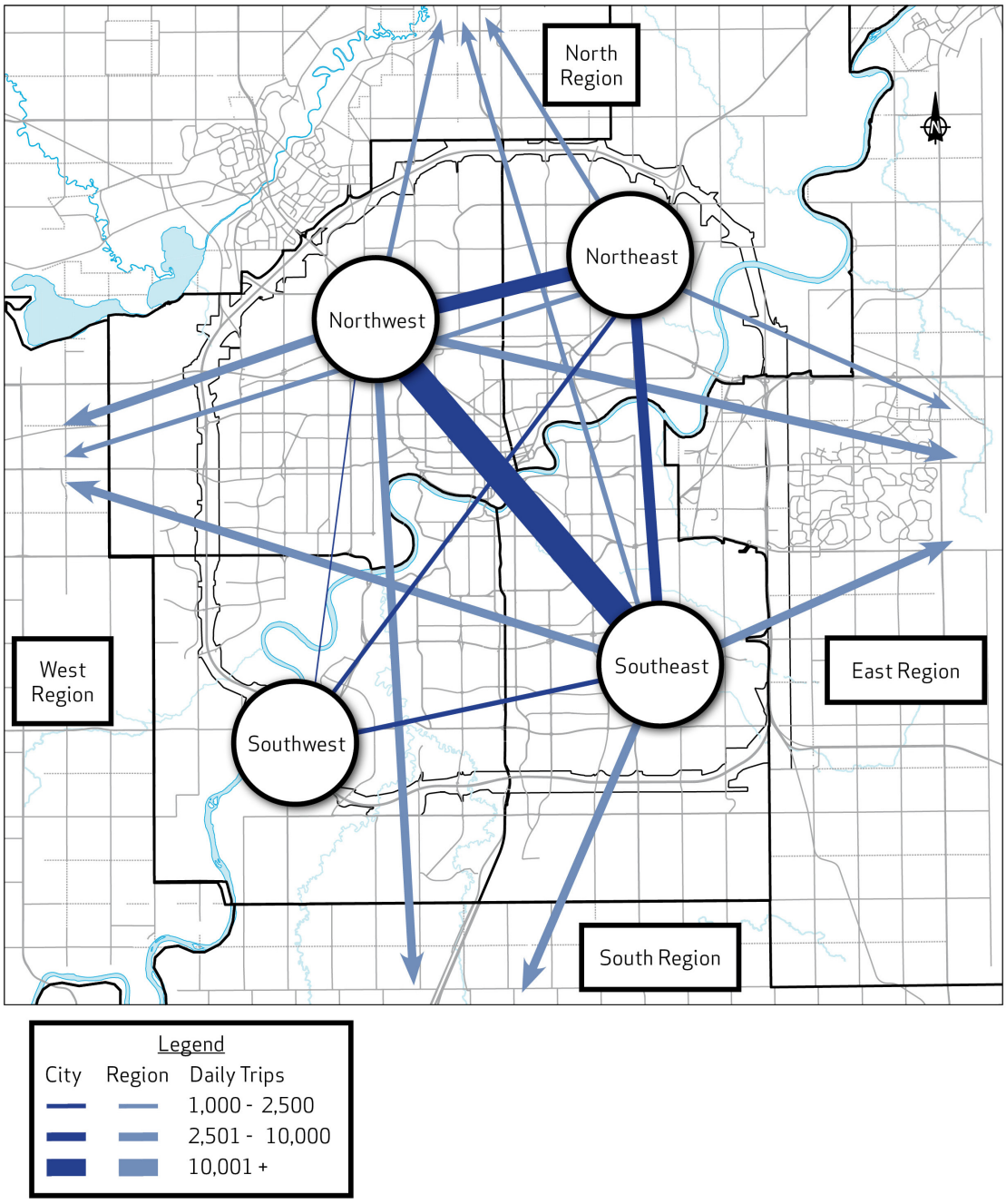
City-Region Truck Movements

Between the City and the Region the highest volume of trips were generated to and from the East, West and South Regions. The substantial movement of goods to and from the South Region is consistent with previous studies while the growth of movement to and from the West and East Regions is a new development. Overall, the most significant origins and destinations were between Edmonton and Sherwood Park, St. Albert, Spruce Grove, Stony Plain, Acheson, Nisku, Leduc and Fort Saskatchewan. Outside of the region, important origins and destinations were Calgary, Fort McMurray and Wetaskiwin. Outside of Alberta, a frequent origin-destination was Saskatoon.

To gain a better understanding of the factors influencing route choices, drivers were asked to select from a list of reasons of why they chose the routes they did or to provide

a reason of their own[3]. By far the factor that most influenced the drivers' route choice was that it was the most direct to their destination (81% versus 14% for all others).

Figure 4 - Daily Truck Trip Patterns



[3] Drivers were allowed to select more than one rationale for their route choice.

3.4 Load Characteristics

In this section of the survey truck drivers were asked to provide information on the type of load being carried and the load efficiency, i.e. whether the truck was full, partially full, empty or whether the truck was a service vehicle.

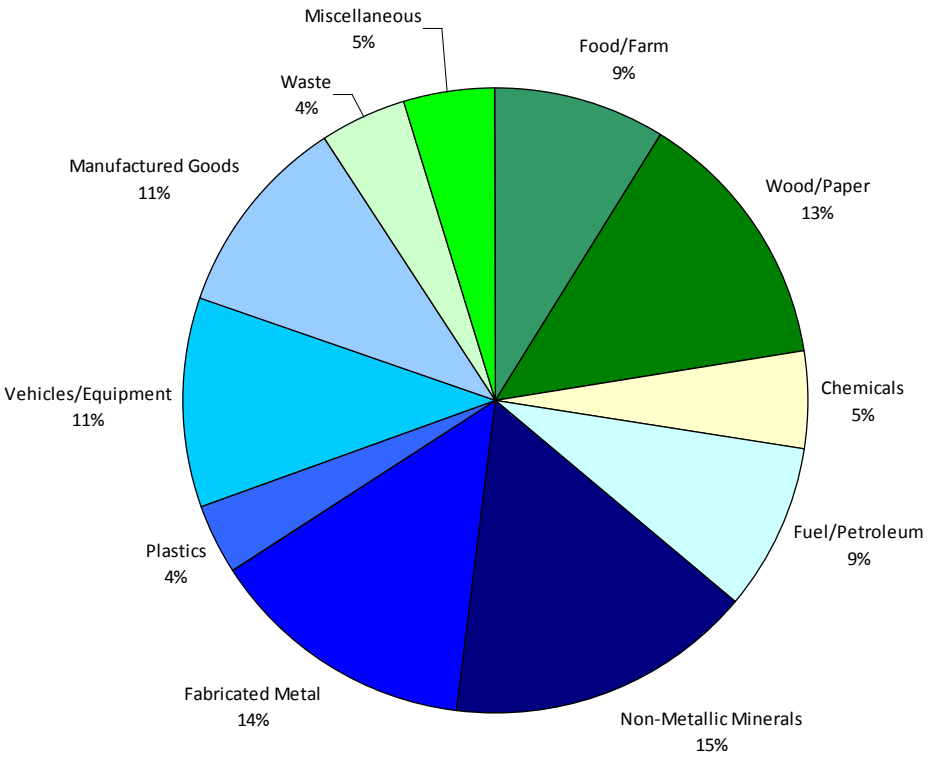
Load Efficiency and Diversity

Drivers were asked to provide information on how much load they were carrying in terms of having a full, partially full or empty truck.. In examining the travel patterns of load-carrying trucks, full trucks are more likely to have an origin or destination outside of the region as compared to those staying within the city and region. Just over a third of trucks reported travelling empty or “dead-heading” which indicates some inefficiency.

Goods Profile

Of the trucks that were full or partially full, the goods carried were aggregated into eleven categories by truck type in Figure 5. Results indicate the most frequently transported good was non-metallic minerals such as gravel, soil and glass, followed by fabricated metal products such as metal pipes and beams. This is consistent with Edmonton’s position as a transportation hub for construction and heavy industry.

Figure 5 - Commodities Carried by Trucks



Dangerous Goods

Transportation of Dangerous Goods (TDG) is subject to federal legislation and the movement of trucks carrying these goods received a high degree of interest from City Council. From the survey, 4.3% were transporting one or more dangerous good. The majority of trucks with dangerous goods (72%) were hauling petroleum fuels, liquefied petroleum gases, petroleum distillates or crude oil. Of the remaining 28%, half were carrying industrial chemicals including acids, solvents, alcohols, ketones, peroxides and sulphur.

3.4 Driver Satisfaction

To gauge the quality of the driving experience for truck drivers on Edmonton roads, three qualitative questions were asked on the survey. For each of the questions, drivers were asked to rate their level of satisfaction on a scale of 1 to 5, with 1 being 'Do not agree at all' and 5 being 'Completely agree'. Although overall the majority of truck drivers interviewed were satisfied with their driving experience, drivers were most satisfied with their ability to understand the truck routes in Edmonton but were least satisfied with their ability to keep to their schedules. This last finding is consistent with verbal comments from drivers in which congestion and bottlenecks are highlighted as issues on some truck routes.

Along with answering the survey questions, drivers also offered their own personal comments regarding truck routes and their experiences in travelling on Edmonton roadways. A word cloud was created of the most commonly mentioned words and related issues such as traffic, construction and potholes. The ability to analyze and report direct comments from drivers is one of the unique features of a roadside survey which shows some similarity to customer intercept surveys used in product marketing.

4.0 Discussion

Overall, the data collected from the roadside truck survey offered the ability to better understand the movement of trucks as well as the motivations for selected particular routes and corridors. The data was used to validate trends that were observed in previous studies and offered insight into new or changing trends. The section below further explains the costs involved in performing the study and highlights some areas for future improvements.

Study Costs

Altogether, the study was performed with a budget of $40,000, not including the time of the research team or the temporary survey staff. Main expense incurred were the costs from Police Services and Traffic Control, which totaled $26,000 for the survey. Other costs involved consulting services for survey development and results analysis, driver appreciation (information postcard and coffee card voucher) and survey Optical Processing, printing and incidental costs. Based on 2,294 responses received, the average cost was $17.44 per sample record.

To compare to a detailed establishment based survey, the City of Edmonton was an overall budge between Alberta Transportation and the City of Edmonton at $235,000 and $600,000 respectively for a survey in 2001. The magnitude of this work was considerably higher and the data was used for calibration of a regional commercial vehicle model and required a high degree of error checking and sampling integrity.

Recommendations for Future Surveys

The principle challenge with an urban roadside survey is operation of the survey site on busy transportation facilities in a way that is safe. This was overcome through detailed planning and staff training. Edmonton's geography and infrastructure was such that a large number of sites were required to complete the overall goods movement picture, as opposed to a location where goods movements are restricted to several key entry or exit points. As a benefit, surveying at any one of these sites did not create traffic congestion that was noticeable beyond the immediate area. The wider area traffic impacts were mitigated by careful site selection and limited sampling time within the midday timeframe. To the extent that these conditions are not available in other municipalities, the use of an urban truck survey would be limited.

In an urban roadside survey, achieving a valid sample on high volume truck roadways is a challenge. Also, it was noted from discussions with experts and the trucking industry that the type of truck and trip can vary significantly with the time of day. Therefore, using a midday sample is not completely representative. Other methods would be required, perhaps early morning or late evening surveys; however these would have corresponding safety challenges. To expand the sample in an urban context, it is critical to have classified count data. In the Edmonton experience, a 48-hour count did not involve excessive costs and provided information on the magnitude of trucks that diverted from their routes to avoid the congestion of the survey site.

The driver Appreciation Token was well received by drivers who participated and resulted in a low rate of refusal to participate in the voluntary survey. The thank you card allowed the survey-driver interaction to be quite amicable and likely contributed to the minimal negative feedback from the truck drivers as a group.

Early in the planning of the study, it was decided to not include a trip diary portion in the survey as the concern was that the survey needed to be able to take less than 2 minutes per vehicle. To simplify, the beginning and end of day locations were recorded as were the most recent way points, the previous and next locations of travel. Through the survey, it was suggested that a hybrid approach could have been used where multiple vehicle stops could have be recorded in a diary type approach. There was observed a subset of vehicles in the urban transportation network which were making round trip deliveries throughout the city resulting in a large number of stops that were not captured in this survey. An approach that allowed a trip diary for selective vehicles would have significantly improved the information collected with respect to trip patterns.

Partnership with Edmonton Police Service was critical to the success of the survey. Having officers who are able to train staff in proper procedures, flag vehicles for the survey and oversee operation of the survey site was an important part of the safe and effective delivery of the survey. However, partnering the survey with the vehicle safety inspections, as was done for three days of the survey, is not recommended for future surveys. From observation of the vehicles inspected, the sample was not truly random as it favored vehicles which were more likely to fail inspection, perhaps due to the appearance of being poorly maintained or carrying an improperly secured load. This would not be a representative sample of trucks on the roadway and significantly underrepresented long haul and large corporation trucks to the extent that these were clean and well maintained.

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