Invesitgating the Feasibility of a Continuous Household Activity Survey in Calgary, Alberta

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Introduction
The City of Calgary (The City) uses household activity surveys to collect travel behaviour information from residents to support the on-going development of travel demand models for the Calgary Region. Historically, these surveys have been conducted on a decennial basis in order to align with federal and civic census cycles. However, as with most jurisdictions that use episodic household surveys, Calgary has struggled with the resource requirements for these studies, loss of staff expertise and susceptibility to one-time events such as labour action or significant changes in the economy.

In 2009, Calgary City Council approved and adopted a new Calgary Transportation Plan (CTP), a 60 year long range plan for transportation improvements in The City. One key element of the plan is the establishment of core indicators with specific 60 year targets and a monitoring program to report on the progress of those indicators. The monitoring program requires reporting every three years and includes a target for city-wide daily mode split that can be best monitored through a household travel survey. However, the three year cycle required for the monitoring program and the 10 year cycles used to develop travel models are not compatible. As a result, The City began to investigate other options for collecting this information.

After reviewing other options, it was determined that a continuous household activity survey would best meet the needs of both programs. However, continuous household activity surveys are not common across North America so The City retained PTV NuStats to conduct a feasibility study to determine whether a continuous household activity survey would be feasible in Calgary and, if so, how one would be implemented to meet the needs of the travel modelling program and the Calgary Transportation Plan Monitoring Program.

Study Methodology
The purpose of this study was to determine whether or not a continuous household activity survey is feasible in the Calgary Region and, if feasible, develop an implementation plan to initiate the program. The stages in this project included a literature review and research into other jurisdictions that are either currently operating a continuous travel survey program or have operated one in the past. The purpose of the literature review was to determine key success factors in sustaining a continuous program as well as reasons why continuous programs were abandoned. The goal of this phase was to develop an understanding of the strengths, weaknesses, opportunities, and threats associated with a continuous survey program.

The second phase of the project was to examine some practical details around sampling and using the data. This was to provide information that would allow The City to determine what resources would be necessary and what processes would need to be altered or developed to successfully implement the program. In addition, the sample size was evaluated as the survey must produce statistically significant results and enable statistically valid comparisons between reporting periods.

The final phase of the project is a feasibility report that includes information from the previous phases as well as options for implementation, costs, benefits, a risk assessment conducted by The City and an
implementation recommendation. This information will be presented to senior management who make the final decision on whether or not a continuous program could proceed. Then, if The City decided to go ahead with the program, a detailed implementation plan will be developed.

Results

Types of Continuous Surveys
The idea of a continuous survey can mean many things. There are continuous surveys that refer to surveys that have field work in every month of the year; there are annual surveys that collect data every year, but only during specific times of the year. There are multi-day surveys that obtain data through a multi-day reporting period, and there are panel surveys that collect the same information from the same people at different points in time.

The benefit of continuous surveys include that they can observe seasonal variation in travel, this results in the requirement of a larger sample size to account for that variation. Annual surveys can use smaller sample sizes as they typically focus on one season, however they do not capture the variability in travel over the course of a year. Both continuous and annual surveys are associated with fast data analysis and processing as these tasks become routine as the data is reported on annually.

Multi-day surveys capture the high degree of daily variance in travel behaviour, but have a high respondent burden that leads to recruitment challenges. Panel surveys offer insight into how travel behaviour changes are related to external factors such as a change in job location. They should have multi-day reporting periods to minimize the effects of daily travel variance. However, these surveys are complicated to manage as the sample would need refreshing on a regular basis to ensure the survey continues to represent the general population. Panel surveys are also prone to large degrees of attrition due to a high survey respondent burden.

Literature Review
The literature review focused on jurisdictions that executed different types of continuous surveys with a focus on multi-day surveys. Fifteen survey programs across Europe, Australia and New Zealand were reviewed to assess key success factors. Of those fifteen, seven are still ongoing today including three in Europe, three in Australia and one in New Zealand. The European surveys were national surveys and did not survey at a resolution that would support the development of regional travel models; however, the data is used in a more general sense such as the cross-validation of model results. The surveys in Australia were regional surveys and are used to support the development of travel models in the region as well as other transportation planning activities.

Through the literature review, it was found that continuous surveys are the best survey design to provide up-to-date data for transportation planning and modeling. Not only because they take place on a regular and frequent basis, but because the data processing and reporting processes are institutionalized and guarantee a readily available source of data in a format that is well understood. As well as supporting policy research, this data has practical advantages in that the surveys can measure
changes in travel behaviour due to major changes in infrastructure, policy or the economy. These changes in behaviour can be slow to observe as travel behaviour does not change quickly and stakeholder expectations may need to be managed. In addition, changes to survey design and methodology need to be carefully considered as changes have the potential to significantly affect the results and the ability to observe changes in travel behaviour.

Two key elements were found to lead to a successful continuous survey program. The first was the availability of stable, long term funding. Continuous surveys are more cost efficient than episodic surveys provided the survey is executed over a long period of time as the initial start up costs do not occur repeatedly. In addition, a continuous survey program ensures the procedures are well rehearsed; this includes staff procedures as well as data processing and reporting. If a continuous program is abandoned after one or two iterations, it is often more expensive than an episodic survey.

The second element of success was the widespread use of the survey data. This builds as the program produces reliable, high quality data that is comparable over time. Easy access to the data, appropriate documentation and a comprehensible data format all contribute to increasing the stakeholders who use the data, which, in turn increases support for the program.

**Process Change Implications**

Implementing a continuous household activity survey program represents a significant change in business process at The City of Calgary. Business process changes result in new procedures that would need to be developed as well as altering existing procedures to meet the expectation of project stakeholders. The second phase of the feasibility study examined these new and altered procedures to understand the impact a continuous household travel survey would have on current city procedures. The processes include the determination of sample size, weighting and expansion of the sample, and using the data in model estimation procedures.

In the case of episodic surveys, determining the sample size is a straightforward process based on the level of accuracy required for the study. In the case of a continuous survey program, not only does the aggregated sample size need to reflect an appropriate level of accuracy for the study, it also needs to ensure that comparisons between reporting periods are statistically valid. In Calgary, the CTP Monitoring Program intends to report on daily mode split which includes cycling as a mode that represents approximately 1.2% of daily travel. The CTP Monitoring Program expects that a 1% change in mode would be statistically valid. This would result in a sample size of 6,000 households every three years, or 2,000 households annually. It is also possible to reduce the accuracy of the results through a smaller sample size if this proved outside the approved resources.

Continuous household activity surveys collect smaller samples over time rather than a single, large sample as is the case with episodic surveys. This poses some complications in how the survey data is weighted and expanded. In an episodic survey independent data is collected for a single time period and weightings are derived from that data and applied to the entire survey dataset. In a continuous program, however, the samples are collected over multiple years; as a result a single set of weightings is not appropriate. Instead, independent data needs to be collected each year that the survey is in
operation so the dataset can be expanded annually using the independent data for that year. The data could then be aggregated based on the required reporting cycles.

The City also intends to use the continuous household activity survey dataset for estimating travel demand models. To use continuous survey data for model estimation, it is necessary that The City conduct periodic updates of the transportation networks, land use and economic inputs to match the on-going data collection program. Models could then be estimated knowing transportation conditions that were available at the time the data was collected. Currently the independent data to expand the survey and the representations of the transportation networks are collected every 5 years when The City conducts updates of the travel demand model. If The City were to change to a continuous data this information would need to be collected annually.

**Integrated Risk Management**

As mentioned previously, a move to a continuous household activity survey program in Calgary would be a significant shift in business process. Any change in business process is accompanied by risks and it is essential that those risks are understood, managed and communicated to stakeholders. To facilitate communication surrounding risk, The City has developed an integrated risk management framework to assist in identifying, evaluating and mitigating risks associated with city projects. This risk assessment process was applied to the continuous household activity survey project in order to communicate the challenges associated with this program to stakeholders and decision makers.

The project team conducting the risk assessment was a cross divisional team with representatives from the Forecasting Division, responsible for the travel models in The City, and the Transportation Data Division, responsible for the CTP Monitoring Program. The risk assessment process enabled the team to identify and evaluate the risks in order to develop effective mitigation strategies.

The risk assessment process identified two primary categories of risk, risks associated with project funding and risks associated with stakeholder expectations. These risks are consistent with what was found during the literature review. Mitigating these risks was determined to be an exercise in communication to ensure the project sponsors have a complete understanding of the impacts their decisions would have on the project both in the short and long terms.

**Calgary Context**

The findings from the studies led to a conclusion that moving to a continuous program contained enough risks to question whether or not this program could be successful in Calgary. There were a few factors in Calgary that mitigate these risks. First of all, the adoption of the CTP Monitoring Program by City Council led to a high level of support for a continuous method of data collection in order to report progress towards the CTP targets. Secondly, The City is conducting an episodic survey in 2011 – 2012 and would change to a continuous program when that project is completed. This provides The City with the survey information to update travel models and supply baseline information to the monitoring program without waiting to collect data through a continuous program. Lastly, conducting a full survey prior to implementing a continuous survey allows The City to determine the survey design and
methodology and ensure it operates effectively before changing to a continuous program where changes in design and methodology may have significant effects on the data.

**Implementation Options**
The City is considering three implementation options for a continuous household activity survey program in Calgary. The first is an entirely internally operated program. This would be funded through city operating funds and would use City staff as telephone interviewers, data analysts and supervisors. This option would ensure staff expertise is maintained and preserved, the security of the data is protected, and would represent the most stable funding arrangements. However, operating funds are difficult to increase and can be prone to cuts during downturns in the economy. In addition, there is a significant amount of overhead that The City would have to fund to proceed with the project.

The second option is to use an external contractor to collect and clean the data with City Staff being responsible for the data analysis. An external contractor would have call centre resources in place and expertise in conducting survey that is not currently available at The City. A contractor could be funded through capital funds that are easier to obtain; however, those funds are not as stable as operating funds do and there is a potential that the program would not be renewed. In addition, changing contractors could result in increased overhead costs, discontinuities in the dataset or changes in methodology that would impact the quality of the data collected.

The last option is a hybrid of the internal and contractor options. The City could use capital funds for two or three years to fund a contractor to operate the continuous program. During that time, it would allow The City to evaluate the effectiveness of the continuous survey program and determine whether it is something to pursue further. It also gives The City time to prepare the internal resources to manage the program; if it was determined that operating the program internally was the best option.

At the time of this paper, the Feasibility Study was not complete and The City has not made a decision regarding the implementation of a continuous program. It is likely that should the program move forward it would initially be through a contractor operation with the intention to transition to an internal program when the resources are available.

**Implications of Continuous Household Activity Surveys**
The implications of a continuous household activity survey are many, both to the CTP Monitoring Program and to the transportation model development program. In addition, there are implications to the understanding of travel behaviour in general.

A continuous household activity survey program would provide the information needed by the CTP Monitoring Program to report on the mode share indicators; however, there are other implications. A continuous set of travel behaviour information would allow The City to monitor alternative work locations options, and the mode share by specific geography or by trip purpose, depending on the final sample size. The implication is that not only would the CTP Monitoring program be able to report progress on a specific target, it would be able to report how travel behaviour in the region is changing
over time and whether those changes are happening at a rate that would allow The City to achieve the targets identified in the CTP.

The travel model development programs would also benefit from an up-to-date source of travel behaviour data. A continuous household activity survey would enable an on-going, agile model development program and allow for more frequent updates of the base data in the model. This would ensure the forecasts from the model are based on updated travel behaviour data.

In addition, a continuous household activity survey would allow for a variety of studies related to travel behaviour. This would include studies on seasonal variation, before and after studies from a travel behaviour perspective, and studies to evaluate the impacts of a specific event such as a labour disruption. Continuous data would also allow for trend analysis and provide planners with information on how travel behaviour varies with the economy.

A continuous household activity survey is a significant change in process and has the potential to realize some significant benefits; however it does come with significant risks that need to be addressed before a project can move forward. The City of Calgary expects to make a final decision regarding a continuous survey program in early 2012.
References