Finding an appropriate methodology for measuring travel time reliability in the City of Calgary

**By S.Tahmasseby and E. Kok- Transportation Planning**

BACKGROUND AND STUDY MOTIVATION

I.   Calgary in the province of Alberta, Canada is an intersection of two major transportation corridors:

  i.   The Trans-Canada Highway

  ii.   The Queen Elizabeth II Highway (known as Deerfoot Trail in Calgary)

II. Calgary is a key distribution centre of Asia-Pacific related imports and exports

III. Truck shipment accounts for 46% of imports and 64% of exports

IV. Between 2005 and 2007, the number of registered commercial vehicles in Calgary increased from 88,386 to 110,500, (25 %), while Calgary's population increased by 7%
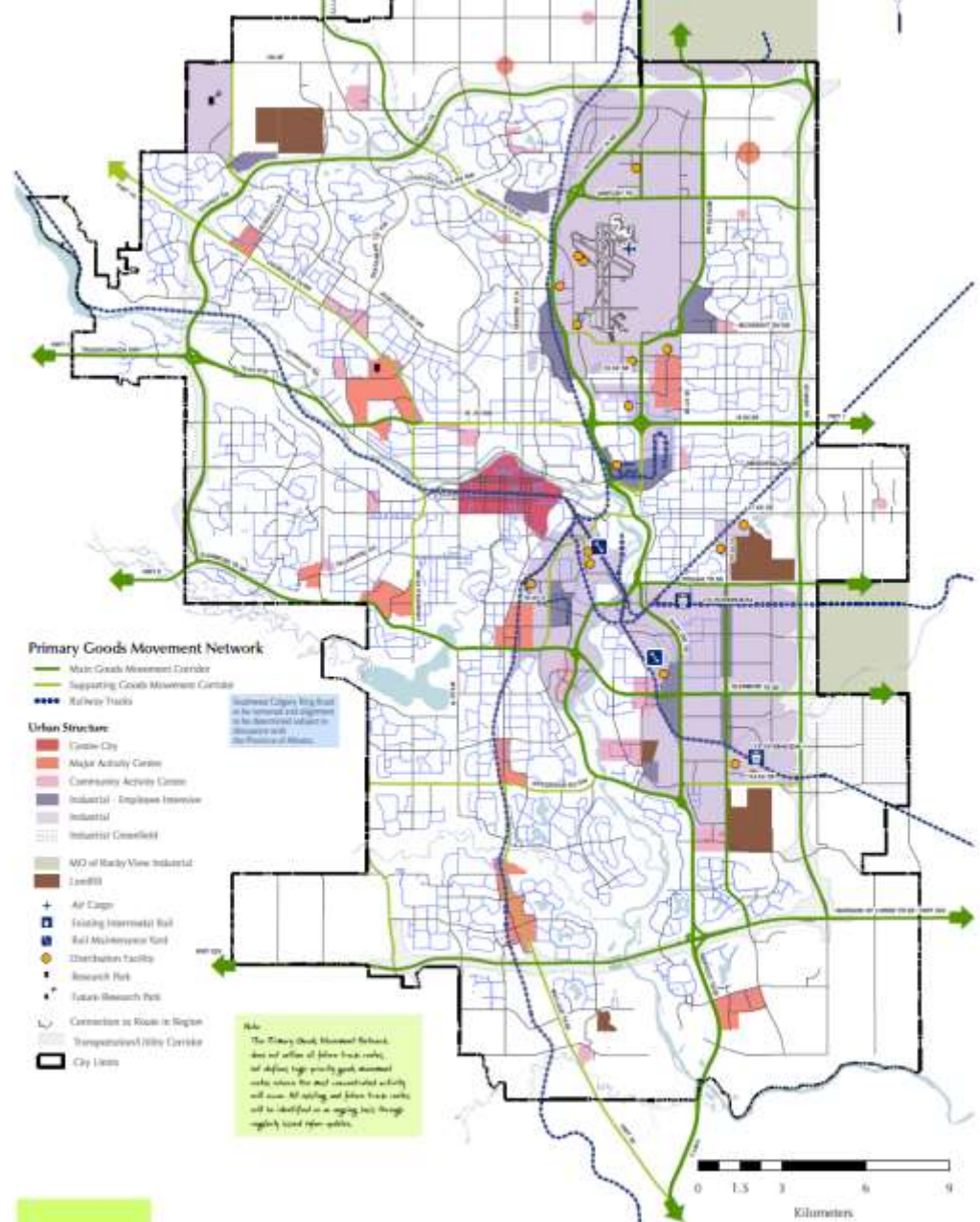
The Nationwide Trans-Canada Highway (in Red) and the provincial Queen Elizabeth II Highway in Alberta (in Green)
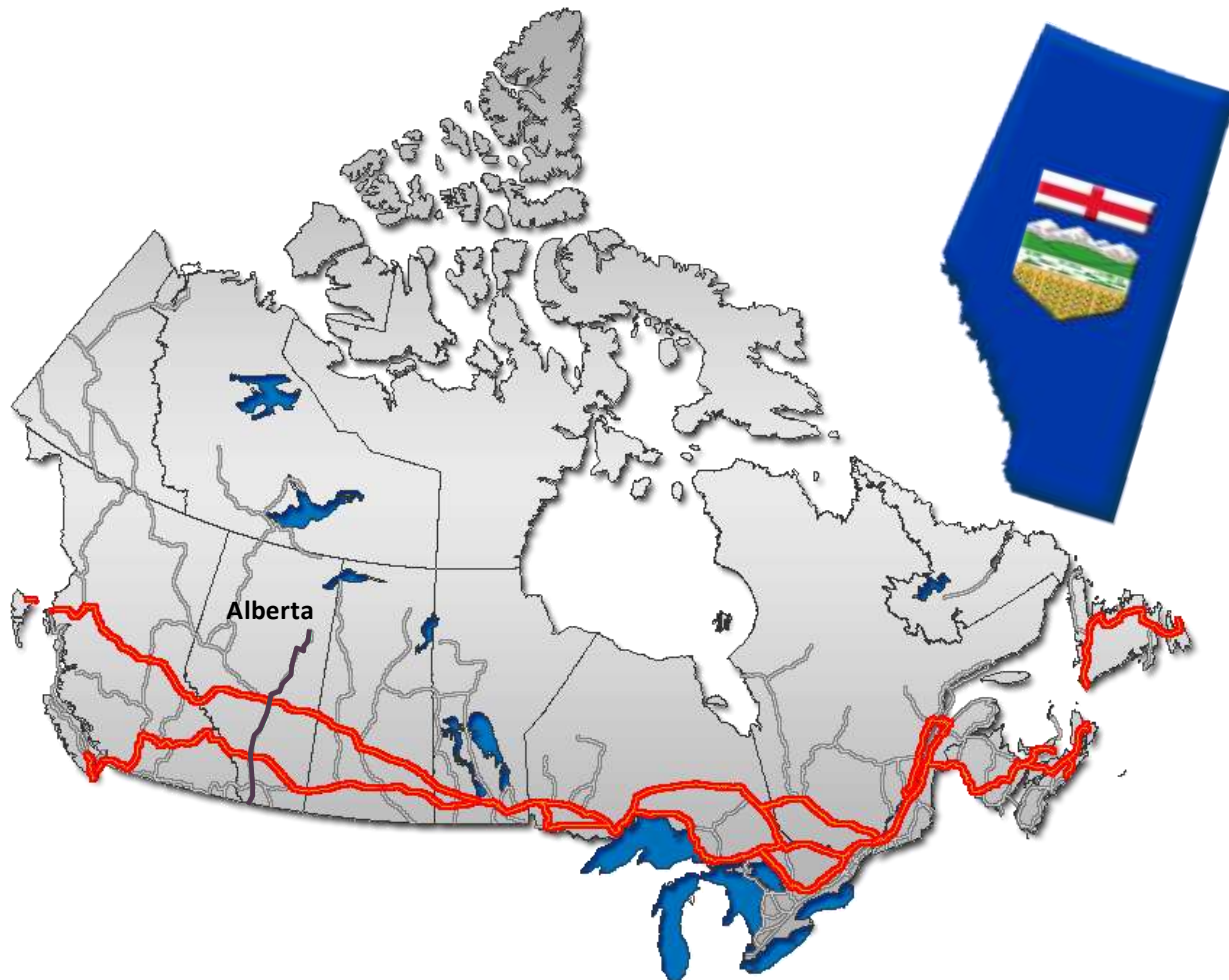
Alberta

Goods movement corridors

Goods movement corridors in Calgary

- Glenmore Tr.

- Deerfoot Tr.

- Stoney Tr.

- Metis Tr.

- Airport Tr.

- Peigan Tr.

- Beddington Tr.

- 16th Ave (TransCanada Highway)

- Barlow Tr.

- 52nd St.

- Sarcee Tr.

- 50 Ave SE-Ogden Rd.

In total : 465 KMs

How to improve mobility on the goods movement corridors?

I. Using travel time reliability as one of the citywide benchmarks, which is monitored continually

II. Monitoring travel time reliability on goods movement corridors over time to appraise:

<< the effects of network improvements/ rehab programmes on traffic congestion and delay >>

Travel time reliability indicators

- The 95 percentile travel time;
- The buffer time index;
- The planning time index.

Traditional methods to measure travel time have drawbacks

I. Installation and maintenance costs can be excessive

II. Incapability to precisely measure travel time

III. In case of camera systems, lack of measuring speed variations between two camera locations

IV. The reliability of camera and loop systems depends on calibration and validation

Alternative technologies for measuring travel time and speed being used by Transportation Planning in the City of Calgary

- Stationary Sensors Data e.g. BluFAX System *(Bluetooth Technology)*
- Crowdsourcing Technology

Bluetooth technology

- Sensors continually detect and record Bluetooth signals as they come in range

- Each signal's unique Media Access Control (MAC) address is recorded alongside date and time of the day

- By comparing the records from different sensors, travel time for MAC addresses detected at multiple sensors will be computed
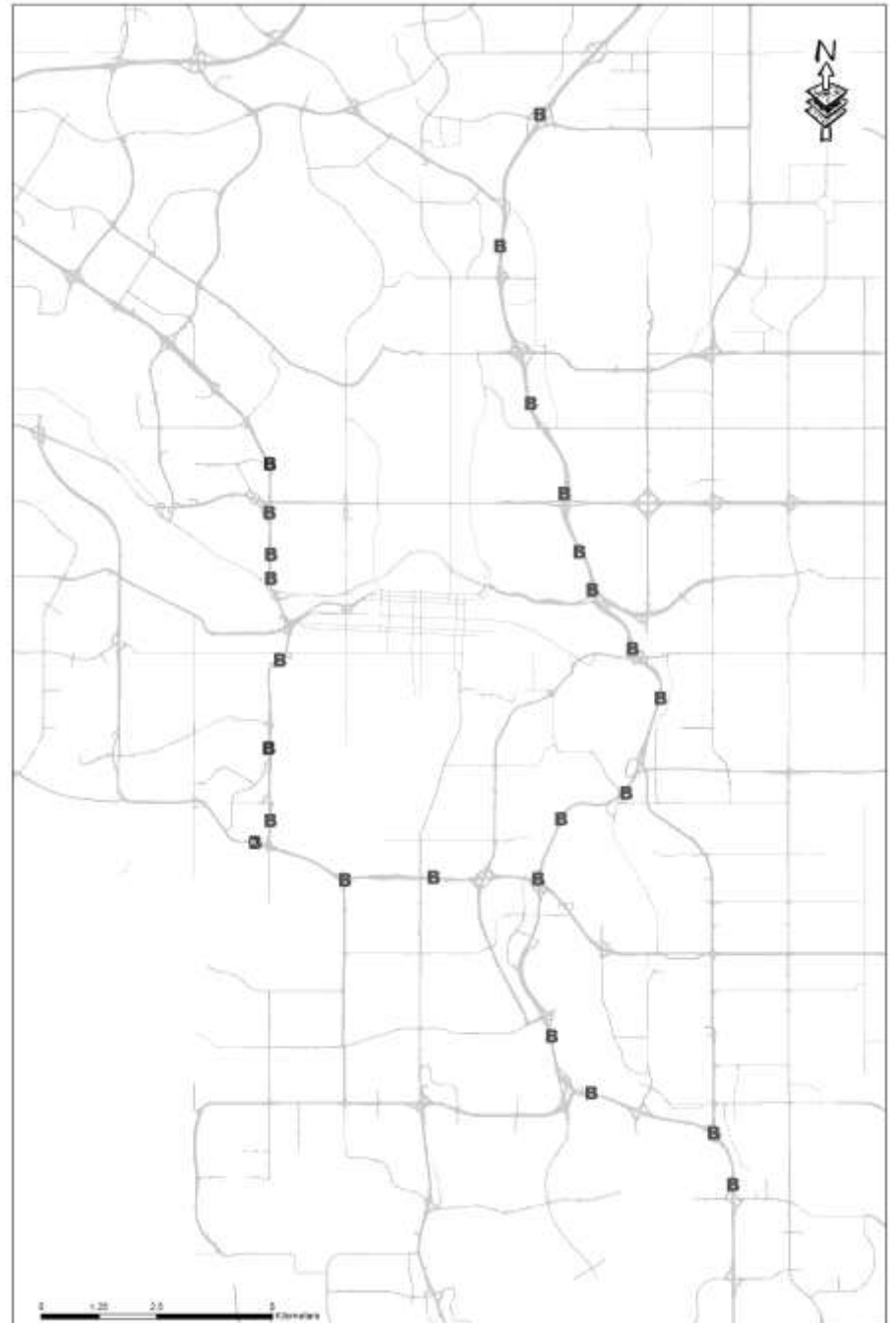
Bluetooth Detector 1

Bluetooth Detector 2

3 KMs

Time: 9:13:26 AM

Time: 9:15:58 AM
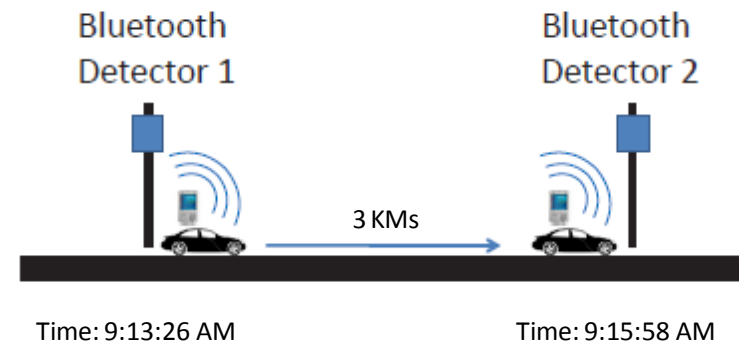
Travel time: 2:32 Min
Speed: 71 Km/hr

BLUETOOTH TECHNOLOGY WIDELY USED BY THE CITY OF CALGARY

BluFAX Units Placement

1. Simple and easy to understand
2. Cost-effective data collection
3. Easily and reliably measured data
4. Always feasible given the regions' prolonged and harsh winters
5. Adequacy in terms of sample size
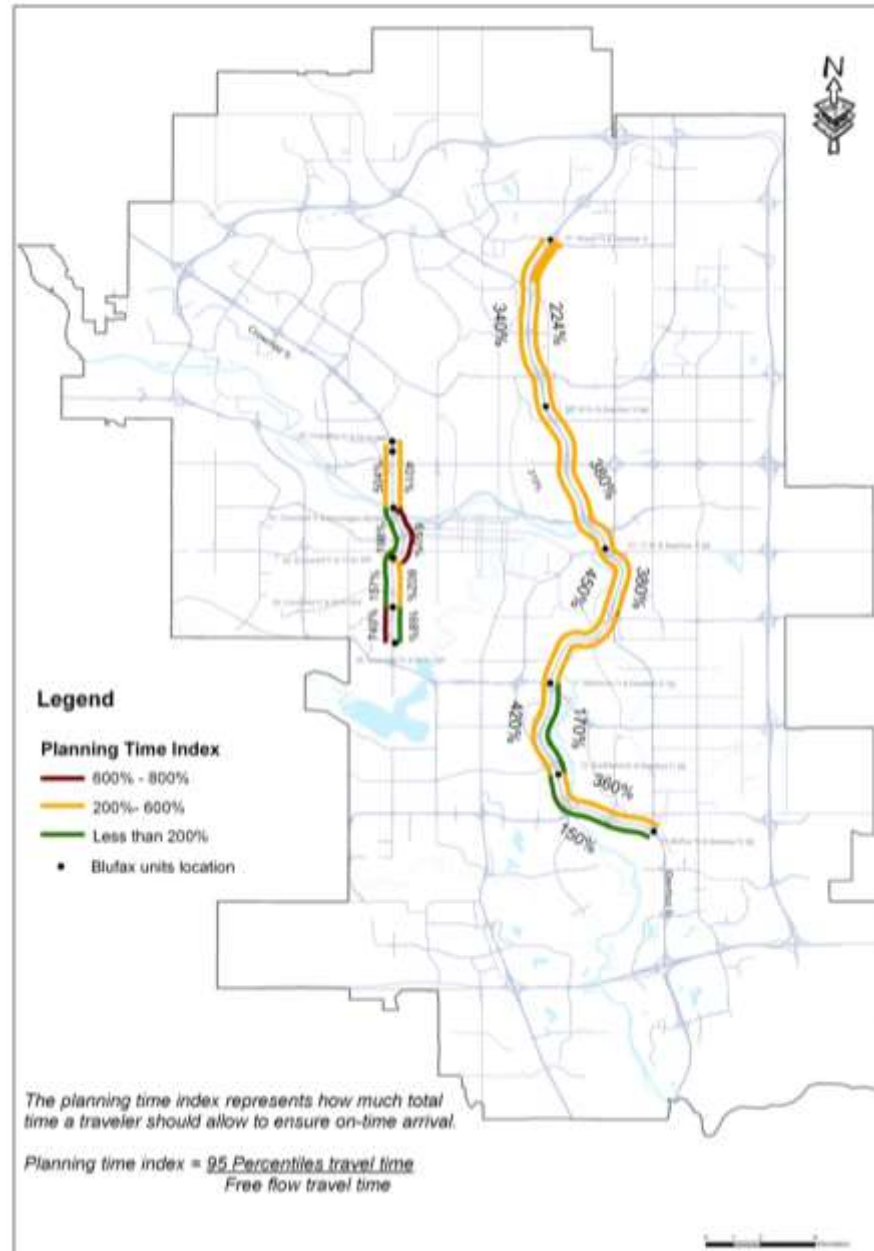6. Verified accuracy through multiple studies

Bluetooth technology shortcomings

I. Upfront costs for procurement and installation of BluFAX units

II. Maintenance and babysitting of the units

III. Reliability of the units: Occasional interruption and disconnection to the TMC server

**Study period:
PM peak in working
days**

Crowdsource Based DATA Technique

I. Crowdsource based data does not need any installation or maintenance of roadside equipment

II. It replaces a large amount of <u>fieldwork</u> with <u>office work</u>, resulting in cost savings and enabling well-organized assignment of resources on the network
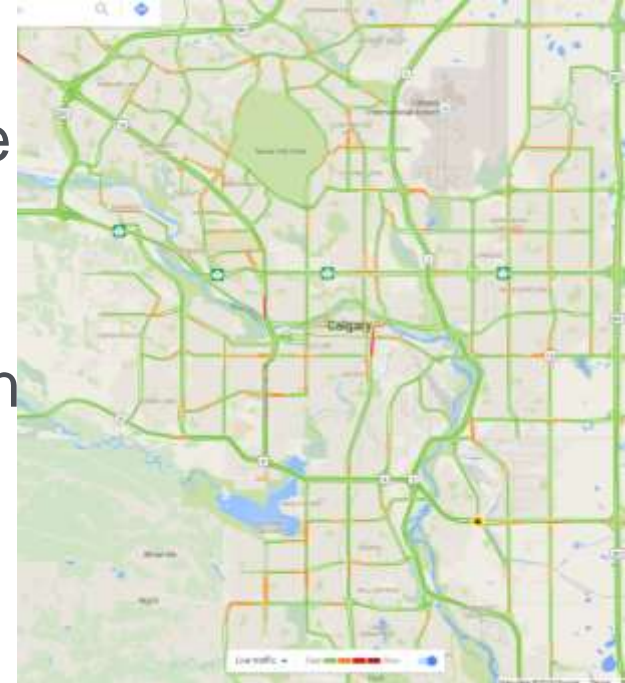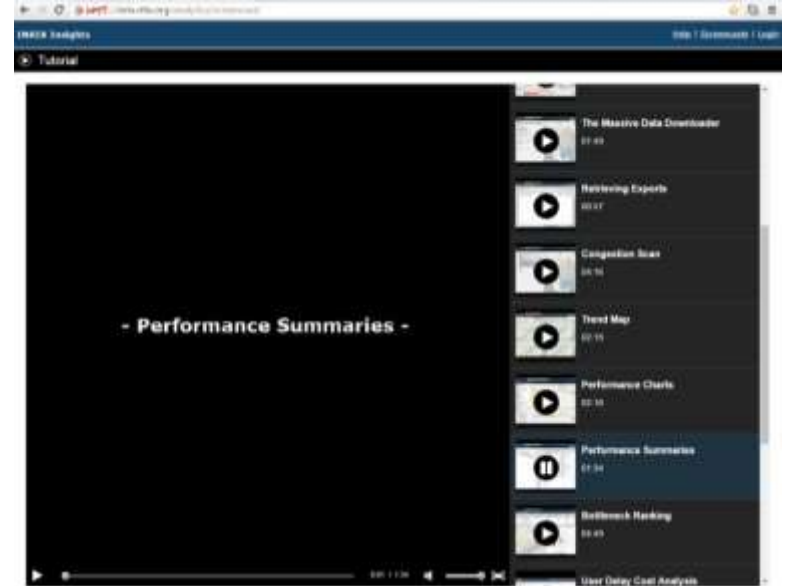
Examined Crowdsourcing Technologies

- INRIX
- TOMTOM
- CELLINT

INRIX Traffic

- Advantages:
  - Sample size: Vast database, sourced and compiled data from 500 different sources

- Disadvantages:
  - Accuracy not verified yet
  - INRIX Analytics tool is still not available in Canada
  - Need to Create an in-house program to compile the raw data
  - Demand a lot of personnel time to analyze the raw data
  - Costly (USD 33K for 13 corridors)

TomTom

Custom Travel Times

- Advantages:
  - User-friendliness of Traffic Stats Portal
  - Customizable scenario-based reports generation
  - Prepared travel time indices and speed

- Disadvantages:
  - Relatively small sample size in North America
  - Inappropriate for low used routes and short period studies due to inadequate sample size and thus accuracy degradation
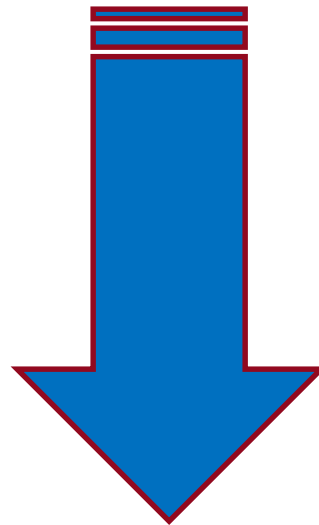
Cellint

- Advantage:
  - Real time traffic data based on Mobile Network Location and Location Information System

- Disadvantages:
  - Historical travel time data can be restored maximum for up to past 6 months
  - Costly: $ 34 K per annum for a limited data release

Based on a comparative study amongst INRIX, TOMTOM , and CELLINT with regards to our needs, budget constraint , personnel time and availability

We opted for TOMTOM

TomTom Traffic Stats Portal

The report will contain a spreadsheet with statistics on average traffic characteristics for each time period, a set of graphs and a visualization file.

Comparative Travel Time Reliability Study On 52nd S.E.- a 2.week study (BluFAX vs. TomTom)-Accuracy Verification

| Indicator	Tech: BluFAX	Tech: TomTom	Difference
Number of observations	3434	960	N/A
Detection rate	2.3%	0.6%	N/A
Weekday Average Travel Time (min:sec)	11:18	11:54	5.25%
Weekday 95 Percentile Travel Time (min:sec)	18:18	18:36	1.38%
Weekday Buffer Index (%)	62.1%	55.7%	-11.41%
Weekday Planning Time Index (%)	264.7%	268.3%	1.34%
Weekday Average Speed (km/hr)	42.0	37.7	-11.31%

* Total traffic volume for the entire study period: 150,000

Case Study- Glenmore tr. (Discovery Ridge-Deerfoot Tr.)

Weekday peak periods buffer time index

Weekday 24 hour buffer time index
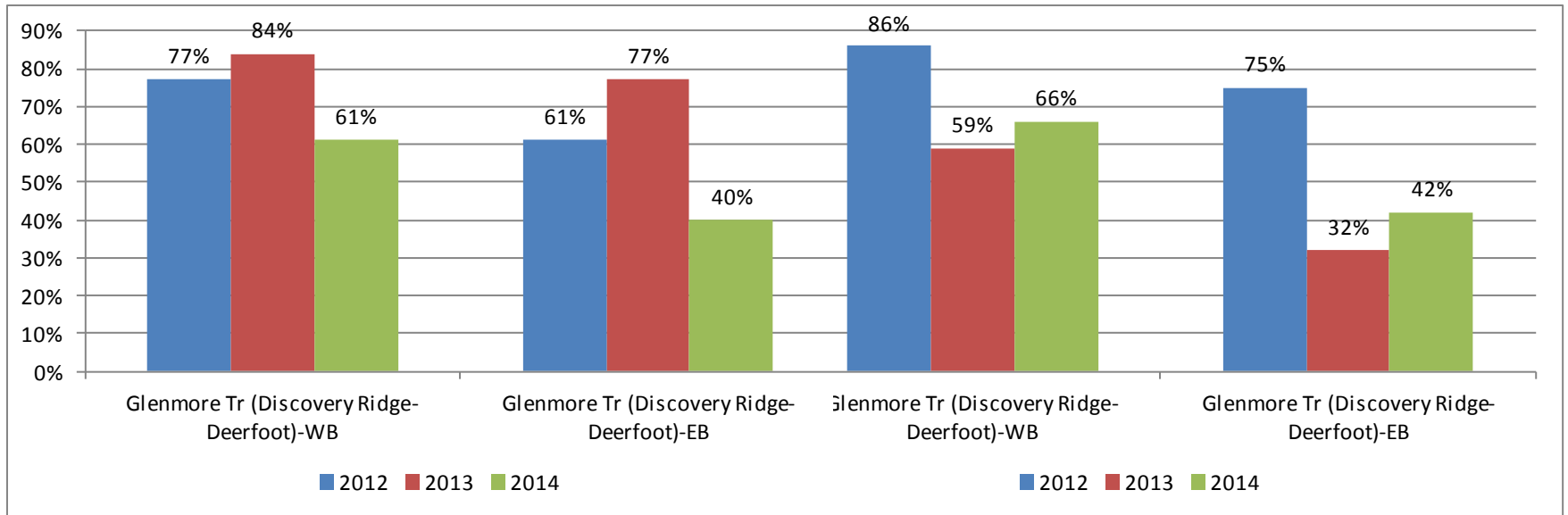
Study findings

I. Bluetooth technology could be principally considered as a benchmark to assert the performance of other data sources (e.g. TomTom, INRIX)

II. Given the TomTom Traffic Stats results, the technology might have potentiality to be used as an alternative method for travel time studies, despite the inadequacy of the number of records

III. Statistical tests demonstrated the applicability of the TomTom Traffic Stats and similar portals for travel time reliability studies

Conclusions

I. We examined three different Crowdsource based technologies and found out that TomTom would be the best appropriate one for Calgary based on our needs, budget and personnel availability

II. Crowdsourcing technologies could be used with a special caution for travel time studies and may result in significant cost savings for traffic and transportation agencies. We found that the technology was suitable for Calgary

Any question(s)

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