2018

Review of King Street Pilot Project Metrics – January/February Update

MARCH 23, 2018

INTRODUCTION

This brief report offers a review of the City of Toronto's (hereafter City) monitoring of the King Street Pilot Project. The City has released four updates to date on the status of the Pilot Project. This review is based on a subset of metrics reported by the City for the month of January and February 2018.[1]

BACKGROUND

The City of Toronto initiated a Pilot Project on November 12, 2017 on King Street in downtown Toronto. The Pilot project was motivated by the City's desire to improve transit operations along the King Street, which is the busiest surface transit route operating on a shared right-of-way in Toronto.

The Pilot Project enforced several restrictions on automobile traffic. All changes and restrictions were implemented simultaneously. Following is a list of the most relevant interventions.

1. The Pilot Project ran on King Street in a corridor bounded by Bathurst Street in the West and Jarvis Street in the East (Figure 1).
2. Through automobile traffic was restricted such that except for a couple of intersections, private automobiles and other commercial vehicles are prevented from driving through an intersection.
3. No left turns are allowed in the corridor.
4. Automobiles are required to make a right turn at all intersections except a couple where through traffic is permitted because of heavy pedestrian volumes raise safety concerns for possible pedestrian collisions with right-tuning vehicles.
5. All parking spots for private automobiles have been eliminated on King Street.
6. Parking exceptions have been made for taxicabs at select locations.
7. Transit stops have been relocated from the near end of the intersection to the far end.
    a. Temporary transit stops have been erected at the far end of the intersection. This requires placing ramps in the curb lane to assist with boarding and alighting from streetcars.
    b. As a result, curb lanes are not available for uninterrupted use by motorized or non-motorized vehicles.
8. While it was not initially planned, the City of Toronto and the TTC decided to increase transit passenger capacity by 41% by adding additional streetcars on the King Street routes.

[1] King Street Transit Pilot. January Update and King Street Transit Pilot. February Update.

FIGURE 1: A MAP OF THE KING STREET PILOT CORRIDOR

REVIEW OF THE CITY METRICS

In its January and February 2018 updates, the City has reported on transit travel times, reliability, and ridership, automobile travel times and volumes, and electronic financial transactions. This report reviews a subset of City's Metrics and comments on their accuracy and implications.

Based on the independent assessments of transit travel times before and during the Pilot Project, we conclude that the City's reporting of these metrics is accurate and comparable to the estimates generated independently by academics and others.

We are not able to confirm the veracity of automobile travel times in the Pilot area. Measuring travel times for automobiles depends upon the methodology and tools used and hence there may be variation in the estimates depending upon the source of the data.

Whereas we are not able to verify independently the changes in transit ridership estimates, however based on the anecdotal evidence and spot assessments made during the peak periods along the transit route, we believe that the City's assessment of increased transit ridership in the corridor is accurate and reflective of the ground realities.

We do not have the means to validate metrics reported for financial transactions by the City.

We begin our review by determining the scope and scale of the changes in transit travel times.

TRANSIT TRAVEL TIMES

Since this review is based on the data provided by the City of Toronto, we have therefore reproduced graphics from the City's reports to avoid any confusion about the source of the data.

The City reports transit travel times for pre-pilot and during pilot periods. TTC collected the pre-pilot data from September 21 to October 14, 2017 and later from October 30 to November 4, 2017. The data corresponding to the pilot implementation phase was collected from December 31, 2017 to February 3, 2018, as reported in the January update and from February 4 to March 3, 2018 in the February update. Figure 2 presents the difference in transit travel times before

and during the pilot project from January update and Figure 3 presents the same from February update.

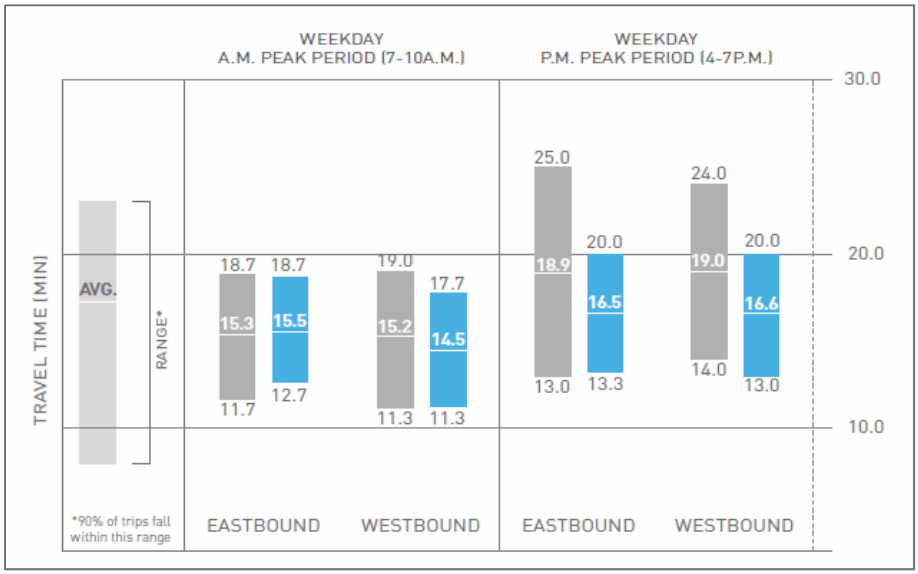

FIGURE 2: STREETCAR TRAVEL TIME COMPARISONS FOR THE PILOT CORRIDOR (JANUARY UPDATE)

Source: City of Toronto

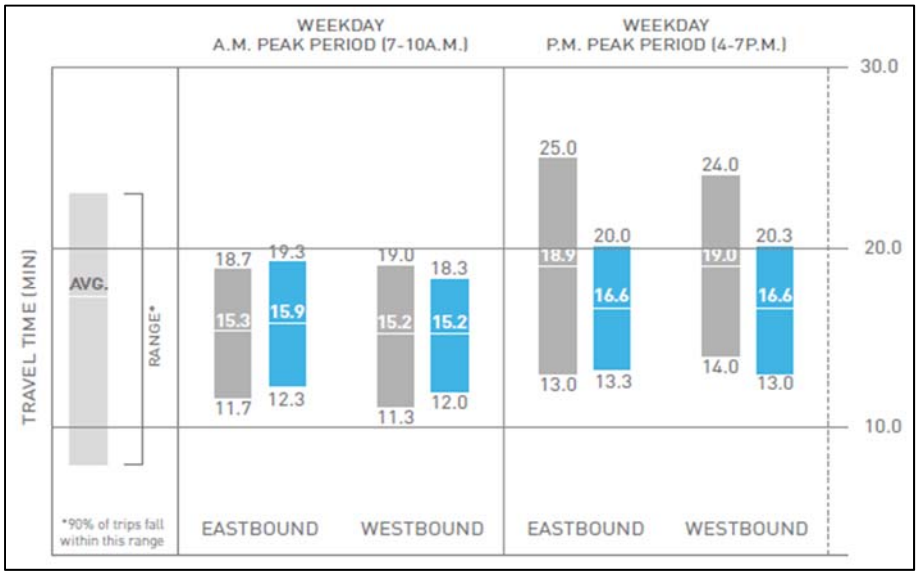

FIGURE 3: STREETCAR TRAVEL TIME COMPARISONS FOR THE PILOT CORRIDOR (FEBRUARY UPDATE)

Source: City of Toronto

The data are reported for the morning peak hours from 7 AM to 10 AM and the afternoon/evening peak hours from 4 PM to 7 PM. The average travel time from Bathurst to Jarvis on King Streetcar during morning rush hours was 15.3 minutes before the implementation of the Pilot Project. However, the average travel time inched slightly upwards to 15.5 minutes in January and 15.9 minutes in February during the implementation phase.

For westbound transit commutes from Jarvis to Bathurst, the pre-pilot average travel time was 15.2 minutes that reduced by less than a minute to 14.5 minutes in January but increased to 15.2 minutes during the implementation of the Pilot Project. Therefore, based on the data reported by the City of Toronto, for the morning hours one does not see any meaningful change in average transit travel times because of the Pilot Project.

In comparison, the afternoon/evening peak hour transit travel times on King Street corridor demonstrate a greater decline. The average transit travel time from Bathurst to Jarvis declined from 18.9 minutes to 16.5 minutes in January and 16.6 minutes in February. Similarly, the westbound average travel times declined from 19 minutes to 16.6 minutes in both January and February. Thus, one could see that the corridor average travel times declined by more than two minutes for the afternoon/evening peak hours.

Another key difference in transit travel times between morning hours and afternoon hours is that the longest duration commutes in the afternoon peak periods declined from 25 minutes in the eastbound direction to 20 minutes for both January and February. Thus, one could see that the real difference in transit travel times is essentially the reduction in very congested commutes in the afternoon peak periods.

We hypothesize that the complete elimination of on-street parking in the corridor, which was permitted for limited hours during the day before implementation of the pilot project, is partly responsible for higher travel time savings during the afternoon peak periods. Even though parking regulations restricted on-street parking in the evening peak hours, it is possible that vehicles remained parked beyond the permissible hours.

Hence, the lack of any significant difference in the average transit travel times in the morning peak periods and the presence of higher travel time savings in the afternoon peak periods suggest to us that the difference in travel times is influenced more by parking restrictions than by through traffic restrictions.

FULL-ROUTE TRAVEL TIMES

The full route for the King streetcar runs from Dundas West Station to Broadview Station. The City reported a two-minute decline in average travel times for eastbound trips for the entire route in the morning peak hours in January. However, the average travel time was slightly higher for the entire route for westbound trips in the morning peak hours. Similar trends were evident for comparison with February data.

In comparison, average travel times for the entire route were faster by five minutes on average in the afternoon peak hours in January. The February transit travel times showed a significant reduction in travel time gains such that the average travel times were three minutes faster in February. Hence the afternoon/evening peak travel times were shorter by transit in January for the entire route than they were in February.

We would like to point out that the odds of one travelling from Dundas West Station (on the subway line) to Broadview Station (on the subway line) on the King Street route are highly unlikely given the significantly faster travel times offered by the direct subway service for the same origin and destination pair. Still, the metrics reported by the City indicate no meaningful difference in average travel times during the morning peak hours along the entire route. The noticeable decline (albeit small in relative terms given the duration of the entire trip) in average transit travel times is mostly for the afternoon/evening peak hours.

SOCIAL MEDIA HYPE ABOUT FASTER TRANSIT COMMUTES

Whereas one sees only moderate travel time savings reported by the City of Toronto, the social media, especially Twitter, was abuzz with unfounded claims of much higher travel time savings. Some transit enthusiasts and other proponents of the Pilot Project made unfounded claims about travel time savings in the corridor of 13 minutes or higher.

Independent evaluation of transit travel times by academics as well as the numbers reported by the City suggests that the social media chatter about travel time savings resulting from the King Street Pilot Project was highly misleading and lacked facts and data.

FIGURE 4: SOCIAL MEDIA CLAIMS OF TRANSIT TRAVEL TIME SAVINGS

TRANSIT RIDERSHIP

The City reported a large increase in streetcar ridership during the initial implementation of the Pilot Project. For the morning peak period, transit ridership reported an increase of 25% for eastbound streetcars at Spadina Avenue. Similarly, transit ridership was up by 27% in the afternoon/evening peak periods for westbound service at University Avenue. For the entire day and the full route, King streetcar ridership was up by 16%. The February update did not include updated ridership stats.

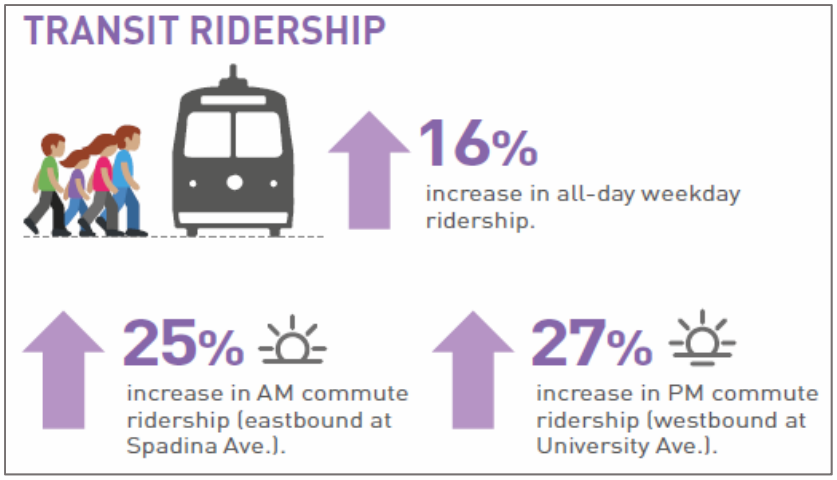

FIGURE 5: TRANSIT RIDERSHIP INCREASED POST PILOT (JANUARY UPDATE)

The media coverage of the increase in streetcar ridership attributes it to the King Street Pilot Project. On the face of it, the argument may appear to hold. However, it is missing an important test that would help one establish the causal relationship between the implementation of the Pilot Project and the change in transit ridership.

If the increase in streetcar ridership resulted without any change in transit capacity before and during the Project, one would attribute a stronger relationship between the Pilot and the subsequent increase in transit ridership. However, the change is equally enabled by a significant increase in the passenger carrying capacity made possible by the introduction of additional streetcars along the route.

MISSED OPPORTUNITY FOR EMPIRICAL EVIDENCE

The passenger carrying capacity of 2,047 passengers per hour on the King streetcar routes before the pilot got a significant boost to a higher passenger carrying capacity of 2892 passengers per hour during the Pilot. The 41% increase in passenger carrying capacity was made possible, in part, by the improved streetcar operations that resulted from the Pilot Project.

However, to establish a causal relationship between the Pilot Project and the increase in transit ridership, one would have to observe the impact of an increase in transit capacity before the Pilot Project was implemented.

The standard practice of identifying a *counterfactual* is therefore missing in the King Street Pilot Project. The counterfactual would have addressed the argument that an increase in transit ridership could have realized by increasing the passenger capacity by 40% before the Pilot project.

We therefore recognize the missed opportunity of a stronger evidence that supports the linkage between transit ridership and the Pilot Project.

AUTOMOBILE TRAVEL TIMES AND VOLUMES

The January update was the first time the City reported on automobile travel times and volumes. City data revealed that automobile traffic volumes on King Street in the corridor plummeted post-implementation. For instance, in the morning peak hours, eastbound automobile traffic at King and Bathurst declined from 1450 vehicles to just 100 vehicles (Figure

6). Similar reductions in automobile traffic volumes were observed at other intersections along King Street in the morning and evening peak hours. Furthermore, the data released for traffic volumes on King Street in February are quite similar to the one reported for January.

It is quite possible that some of the pre-Pilot King Street automobile traffic diverted to other streets that run parallel to King Street. Therefore, Adelaide and Wellington are expected to have accommodated some of the diverted traffic along with other streets.

At the same time, one expects a diversion to other modes of travel. For discretionary trips where the destination could be substituted by other locations, one would also expect some loss in traffic volumes where commuters would have chosen destinations located elsewhere.

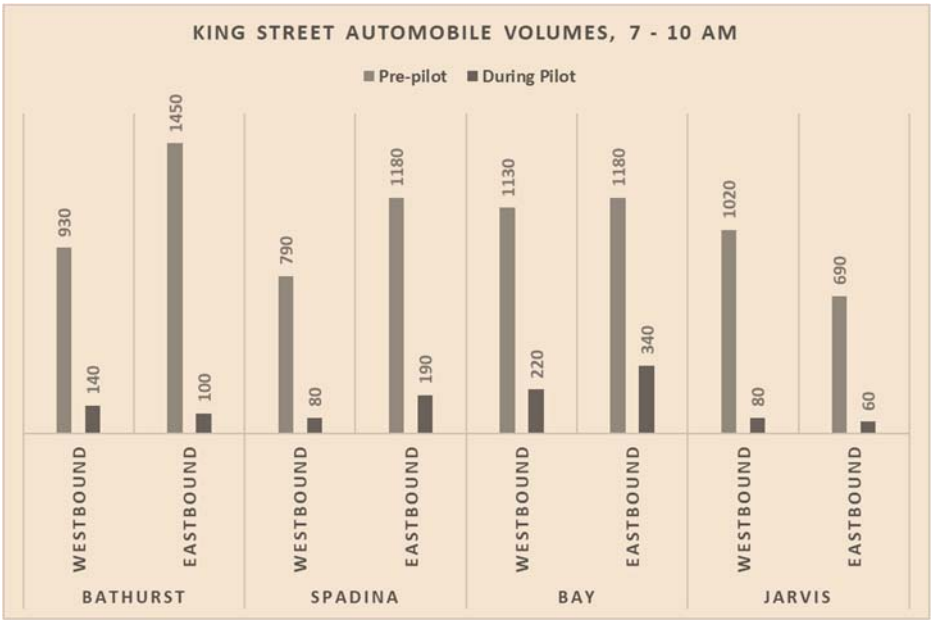

FIGURE 6: AUTOMOBILE TRAFFIC VOLUMES ON KING STREET IN THE PILOT CORRIDOR (JANUARY UPDATE)

A review of traffic volumes on other streets near the King Street corridor presents some interesting findings. The post-implementation travel times appear to have increased only slightly in January from the levels observed before the implementation of the pilot project (Figure 7). For instance, the average travel time eastbound from Bathurst to Jarvis Street in the morning peak hours along Dundas Street appears to have increased by 0.5 minutes after the implementation of the Pilot Project.

These numbers suggest that the decline in the throughput capacity on King Street did not have a major adverse impact on travel times on neighbouring streets that seem to have absorbed the diverted automobile traffic.

However, results that are even more surprising emerge when one reviews the difference in average travel times for automobiles in the afternoon/evening peak hours. The City data reveals that average travel times post-implementation declined in the downtown core for evening peak hours. This may lead some to conclude that reducing automobile throughput capacity in the downtown core has resulted in faster commutes. Such conclusions will be premature if not entirely misleading.

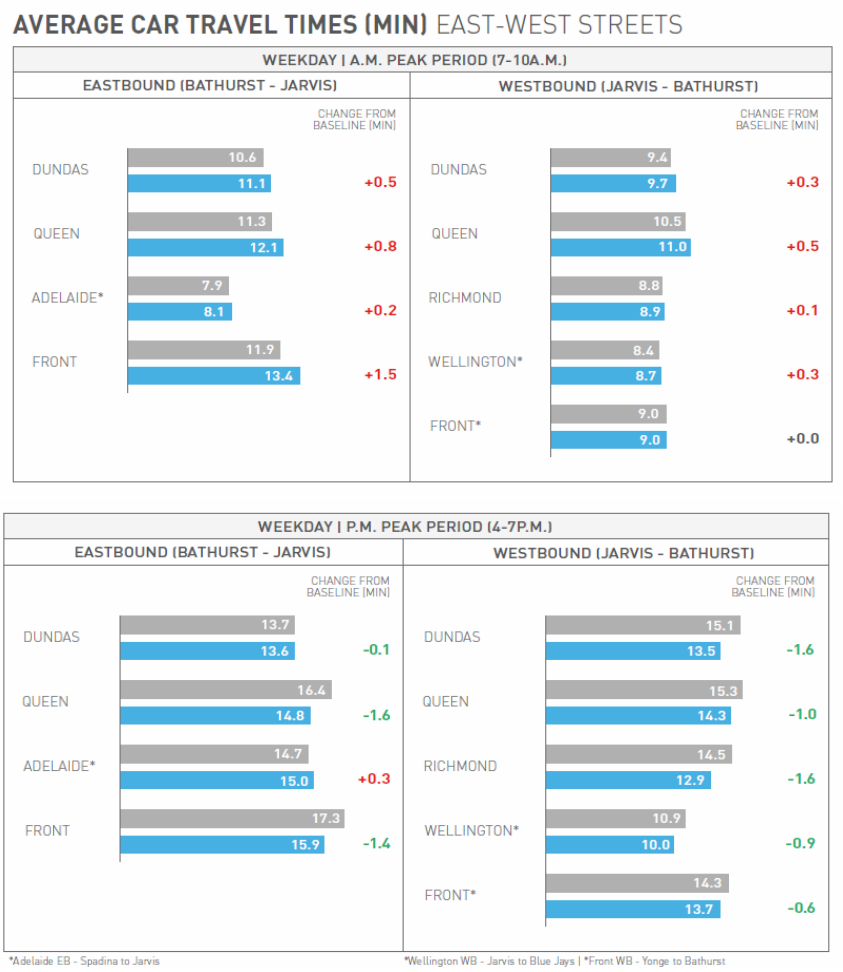

FIGURE 7: AUTOMOBILE TRAVEL TIMES IN THE DOWNTOWN CORE (JANUARY UPDATE)

COMPARING APPLES AND ORANGES

We believe that automobile travel time and volume data reported by the City is premature because post-implementation data were collected at a time when attendance in downtown Toronto and traffic volumes were significantly lower than their regular levels.

The City collected pre-implementation automobile data from September 21 to October 14, 2017 and from October 30 to November 8, 2017. However, the post-implementation data was collected from January 1 to 18, 2018. If the automobile travel times were averaged for the first three weeks of travel in January, the resulting mean values should be significantly lower than their values expected in February or March.

Given that the first few weeks of January are characterized by thin attendance because of employees being on extended vacation, traffic volumes are expected to be significantly lower. Similarly, institutes of higher learning in downtown Toronto including the University of Toronto, Ryerson University, and George Brown College were closed for approximately the first 10 days of January.

We expected to see traffic volumes and automobile travel times for February to present a significantly different picture than the one presented in the January update. However, the automobile travel times reported in the February update presented similar results. That is, one

sees not much difference in automobile travel times before the start of the Pilot and in February. The only noticeable difference is the average automobile travel time observed for westbound traffic evening peak hours on Front Street that showed a decline for January but an increase of 2.7 minutes relative to post-period travel time.

Since travel time data for automobiles could be collected from a variety of sources using a variety of techniques, we can only speak about these estimates once the City shares how additional details about average travel times were recorded. A preferred option is to have independent estimates of average travel times for private automobiles.

IMPACT OF TRAFFIC VOLUMES ON LOCAL BUSINESSES

Several local businesses that rely on automobile and foot traffic, such as restaurants, have complained of a significant drop in business. If the City data for travel times and traffic volumes were to be believed, it provides implicit evidence in support of the claims of a drop in revenue. The January update by the City shows that traffic volumes on King Street have plummeted. Furthermore, travel times in the post-implementation phase on adjacent streets have also reduced, which could be a proxy for less intensive commerce at the street level along the corridor. The City also mentioned a 7% to 12% overall reduction in traffic volume on streets in the vicinity of King Street, which would support the assertion of less intensive commerce taking place post-implementation.

TOP DOWN VERSUS BOTTOM UP APPROACH

The City of Toronto adopted a top-down approach in implementing the King Street pilot project. Such an approach leads to empirical constraints that prevent establishing the causality of the interventions with the observed outcomes. Furthermore, a top-down approach often results in a greater resistance from community stakeholders who are adversely impacted by such interventions.

In a recent research paper, researchers from Australia presented their analysis of top-down and bottom-up approaches as they related to interventions in the extensive tram network in Melbourne.[2] The researchers concluded that bottom-up approaches were preferable to top-down approaches for a variety of reasons including a greater participation and support from stakeholders in the community.

For the King Street Pilot project, a bottom-up approach would have likely elicited greater support from the community and at the same time assisted in establishing causal relationships between the interventions and the outcomes.

For instance, instead of implementing all interventions at the same time, the City could have incrementally implemented interventions to determine which intervention had the greatest impact on improving transit throughput capacity and the lowest adverse impact on local

[2] Reynolds, J., Currie, G., Rose, G., & Cumming, A. (2018). *Top-Down Versus Bottom-Up Perspectives on Streetcar Priority*. Retrieved from https://trid.trb.org/view/1497266.

businesses. As an example, we suggest the following incremental schedule for interventions for the King Street Pilot.

1. In the first step, restrict all left turns along King Street starting from Bathurst to Jarvis Street.
2. Reduce off-street parking charges near and along the corridor.
3. Eliminate half of the on-street parking allowed in the pre-pilot phase.
4. Eliminate later the remaining half of the pre-pilot on-street parking.
5. Require private automobiles to make right turns at most intersections between Bathurst and Jarvis Street.
    a. Permit commercial vehicles, including taxicabs, to continue travelling through intersections.
6. Require all non-transit and ambulatory response vehicles to turn right on most intersections in the corridor.

Such an approach would have allowed the City to determine which of the above listed interventions had the greatest impact on reducing average transit travel times in the King Street corridor. If for instance the data revealed that most gains in average transit travel times were realized by restricting left turns and reducing on-street parking, the need for further restrictions could have been mitigated.

CONCLUSIONS

Based on the review of data presented by the City, we conclude that the average transit travel time savings are modest at best. Furthermore, one fails to see any meaningful improvement in average transit travel times in the morning peak hours. One does observe slight improvements in average transit travel times in the afternoon/evening peak hours. Furthermore, City's post-implementation average transit travel time savings are much smaller in magnitude than the ones reported in social media.

The automobile travel times reported by the City for January are for a period that is not representative of travel activity in the downtown Toronto core. One expected to see a different trend in automobile travel times and volumes for subsequent months. However, the updated automobile travel times for February on east-west arterials in the corridor reported similar travel times as the ones seen in January. We recommend independent evaluation of automobile travel times in the corridor to validate City's auto travel times and volumes.

The increase in transit ridership in the post-implementation phase is a direct result of the increase in transit capacity where the passenger carrying capacity increased by 41%. Given that the TTC did not test the impact of an increase in transit capacity in the pre-implementation phase, one cannot readily establish a causal relationship between an increase in transit ridership and the King Street pilot project. A preferred approach for the City would have been to compare the impact of an increase in transit carrying capacity in the pre-implementation phase with the same in the post-implementation phase.

The decline in average automobile travel times in the post-implementation phase on streets running parallel to King Street suggest a decline in traffic volumes, which could serve as a proxy for reduce commercial activity along the corridor.