Introduction
High-resolution archived transit data may be used to study the effect of roadway changes using collected before and after the completion of a project affecting transit. Methodologies are presented to compare percentiles and time-of-day performance measures before and after the project. Additionally, differences in travel time and travel time variability are examined over the altered route.

One case study examines a heavily used route in Portland that recently diverged onto a newly built transit line that was recently diverted onto a newly built transit land that was recently diverted onto a newly built transit land. In FIGURE 1, traffic flows on a newly completed Tilikum Crossing Bridge. The traffic flows are sharply reduced. The results of this study indicate that travel times increased for the majority of trips but travel time variability during the peak period were sharply reduced.

Two more case studies highlight the broad applicability of this approach to before-and-after studies.

Data Sources
TriMet, Portland’s public transportation provider, has been collecting and archiving stop-level, disturbance, and high-resolution data for all buses since 2013. This analysis uses several months of data from 2014 for the before cases and several months from 2015 for the after cases. Outliers were carefully removed according to the 99th percentile of each data field, which removed situations of abnormal operation, such as breakdowns or cases of malfunctioning equipment.

Bus Travel Speeds
Bus speeds are calculated using a combined data set of step level, disturbance, and high resolution data. Travel speeds are calculated independently for a before and after case. These speeds are compiled by percentile and time-of-day. Lower percentile indicate faster speeds. Travel speed differences are calculated by subtracting the after case from the before case.

For westbound travel (FIGURE 4), travel speeds increased significantly for the 10th through 25th percentiles. This decreased travel time is concentrated during the evening commute. Traffic patterns suggest that, typically, vehicles are attempting to leave the city center. For eastbound travel, travel times remained largely unaffected (within five miles per hour) of their original speed over this study area.

Bus Travel Times
Travel time percentile estimates and their associated percentile variances are used to visualize and route and route segment travel times as well as the range of typical travel times. Lower percentiles represent fast trips while higher percentiles represent slow trips. The width of each line in FIGURE 5-8 are the 95th percentile confidence interval of travel time percentile estimates. If the line is on both sides of zero, travel time changes were insignificant.

Travel time differences are the difference between the after case travel time and the before case travel time. FIGURES 5-7 cover the region shown in FIGURE 1. FIGURE 8 includes the stretch shown in FIGURE 2 and an additional four miles along Powell. Powell carries upwards of 40,000 people daily and is a heavily used route in Portland that carries people between the City of Gresham and the Downtown City Center of Portland.

Conclusions
Methodologies can quantify roadway changes for travel speeds and travel times
Wide Range of Applications
Provide insights into transit following change
Show travel time reliability changes

Tilikum Crossing
Increased travel time
Reduced range of travel times in peak period
Increased on-time performance
May assist with operational planning
May potentially save TriMet money
Ridership remained consistent

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Before and After Evaluation of Transportation Improvements Using High-Resolution Transit Data

FIGURE 1 — Route 9 diversion over the newly-completed Tilikum Crossing Bridge.

FIGURE 2 — 4500 ft. segment east of where Route 9 diverged (FIGURE 3) from previous route. This segment of Powell Blvd. experiences the highest levels of congestion experience by Route 5.

FIGURE 3 — Bus Travel Speed (Westbound) for the Before (Right) and After case (Left) in 25th increments by Percentile (Top) and Time-of-Day (Bottom). Travel Speed Percentiles (FIGURE 4) are found by subtracting before from after.

FIGURE 4 — Bus Travel Speed Differences (Westbound) by Percentile (Top) and Time-of-Day (Bottom).

FIGURE 5 — Westbound Transit Travel Time (2.2 miles).

FIGURE 6 — Eastbound Transit Travel Time (2.0 miles).

FIGURE 7 — Westbound (2.3 miles) and Eastbound (2.0 miles) PM-Peak Transit Travel Differences.

FIGURE 8 — Transit travel times and range of experienced travel times for expanded segment. Westbound (7.6 miles) range decreased by 19 minutes and Eastbound (7.4 miles) decreased by 14 minutes.