Executive Summary

Infrastructure Australia, in its 2019 report, paints a dire picture of the level of road congestion in Adelaide and its continued worsening in the coming years in line with both an increasing population and an increasing reliance on public transport in comparison to cars. The report estimated the annualised cost of road congestion for Greater Adelaide to be approximately **$1.4 billion** in **2016** and is projected to rise to **$2.6 billion** in **2031** (source).

With this backdrop in mind, the South Australia Department for Infrastructure and Transport (DIT) has in its possession a wealth of data relating to traffic information collected by way of Bluetooth probes, which take count of motor vehicle numbers in a particular area and time, therefore producing a metric for congestion. This data can be analysed in conjunction with historical real time bus trip updates collected by GTFS-R which provide the actual arrival times for each stop on a bus’s trip.

The aim of the proposed analysis is to identify road segments where bus travel times are highly correlated with road congestion and are therefore less robust to increasing levels of demand, thereby providing a pre-emptive opportunity to mitigate increasingly lengthier, more crowded, and costlier bus travel times.

Objective

We aim to find the extent of the relationship between road congestion and bus travel times for segments of interest.

Deliverables

* Detailed travel time or congestion analysis comparing public transport response to road traffic factors on selected sections of road – South Road
* Repeatable methodology to analyse public transport response to road traffic factors.
* Reusable code, functions and visuals producing detailed analysis on sections, segments, or intersections.
* Indication of what predictive modelling would be possible and with what features.

Metrics to be Analysed

* Road congestion – measurement options are:
  1. Primary – using links data, the congestion provided for a direction of traffic measured according to Bluetooth equipped vehicles
  2. Secondary – using sites data, the number of unique vehicles identified over a given period per Bluetooth probe site, and the average duration spent by a vehicle in that site during that period
* Bus travel time – the time taken between the first and last stops across the segment. This removes the possibility that we are measuring how accurately the schedule predicts and/or buffers for congestion

Scope

The proposed analysis can be performed through several possible time and location dimensions:

* Time Dimensions
  1. Per the morning peak (6am to 10am) and evening peak (3pm to 7pm)
  2. Aggregation level(s). For example, 15-minute aggregates, hourly aggregates, …
  3. By day of the week
  4. Segment of a road
  5. A link
  6. Bus stop or pair of stops
  7. Intersection
  8. o Towards or away from the city, or both
  9. o With or without bus lanes
  10. o North-South/East-West
* • Location Dimensions

The time and location dimensions lists are not exhaustive, and we are happy to examine any other perspectives of interest you may identify.

Road Segment Candidates

The selection criteria we identified for potential road segments to be analysed consist of primarily spatial overlap of bus time updates and traffic congestion information, as well as segments with historically high levels of congestions. Possible candidates are:

* • South Road
* • Main North Road
* • Port Wakefield Road
* • Glen Osmond Road
* • North East Road

We are happy to re-prioritise or expand the list of examined sections to include other areas of interest.

Data Sources

DIT Transport Analytics AWS data lake. Databases needed:

* • **addinsight\_prod**: to obtain sites and links, and their stats
* • **gtfsr\_prod**: to obtain real-time trip updates that provide stop arrival time information
* • **gtfs\_history\_prod**: to obtain routes, trips, and stops information

Proposed Methodology

* 1. • Limit analysis to a period of interest. For example, March 2022, or quarter ending June 2022 o Disregard weekends and public holidays within that period
  2. • Analysis to be conducted on time-aggregated statistics applied equally to both road congestion and bus travel time. For example, 15-minute aggregation resulting in 7am to 7:15am as one aggregate slice, followed by 7:15 to 7:30, 7:30 to 7:45, …
  3. • Limit analysis to segment(s) identified

Calculating Bus Travel Time

Data obtained from the **gtfs\_history\_prod.trip\_updates** data set

1. Identify start and end bus stops on the segment to measure travel time on