# Objective

Investigate the extent of the relationship (if any) between congestion on specific road segments and delays accrued by buses travelling across those segments. The results of the analysis could be utilised to identify segments and/or time periods that might benefit from actions which help to reduce congestion and/or bus delays.

# Factors to be Analysed

To arrive at the objective, the following areas will be investigated for a particular road segment:

1. What is the relationship between congestion and delays during both the morning peak (6am to 10am) and evening peak (3pm to 7pm)?
2. Examine the relationship both to and from the CBD (when possible. If not, the relationship on the road as a whole will be examined)
3. Do bus lanes play a significant role in reducing delay?
4. Do specific sections within the segment display significantly higher congestions/delays?
5. Do certain days exhibit bigger than usual congestions/delays?
6. Do bus stops with primarily no delays still exhibit a lack of delay despite a significant increase in time taken to reach that stop at times? If so, does this indicate that the schedule can be made more efficient?

# Scope

Segments of roads of interest. Possible candidates:

* South Road
* Main North Road
* Port Wakefield Road
* Glen Osmond Road
* Princes Highway
* North East Road
* Marion Road
* Port Road
* Payneham Road
* Other roads suggested

# Data Sources

* GTFS-R: for bus stop delays updates
* GTFS: for bus routes and stops information
* DIT Addinsights: for sites and links, and their congestion stats

# Methodology

For both delays and congestion calculations:

* Choose a time period (for example March 2022, quarter ending June 2022,…)
* Disregard weekends and public holidays
* Aggregate delay and congestion data by the same period (for example 10-minute aggregates of 7:00am to 7:10am)

## Delays

1. For each trip, remove delays accumulated from stops prior to the segment examined to isolate the delays to the stops on that segment only
2. Remove idle time (recode negative delays to zero delay)
3. Calculate delay per stop (for identifying bottlenecks and outliers)
4. Calculate average delay per stop per aggregated time across the month. For example, stop 4916 from 7:00am to 7:10am across the whole month (for identifying bottlenecks)
5. Calculate average delay on the road per aggregated time per direction (if comparing against links) across the month. For example, from 7:00am to 7:10am, towards the city, across the whole month

## Congestion (using links)

1. Identify sequence of non-overlapping links for each direction of the road
2. Calculate average congestion per link per aggregated time per direction (for examining congestion on specific parts of a road)
3. Calculate average congestion of all links per aggregated time per direction across the month, for each direction

## Congestion (using sites)

Same as links but without splitting the road into directions. Uses the probecount identified per site to measure congestion.

## Comparison

Use a line chart to examine the relationship between the delay and congestion per time on both directions of the road (when using links), with the morning and evening rush hours highlighted

# Example

As an example, the analysis will be implemented on South Road between Ayliffes Road and Richmond Road for the month of March 2022

Map

Description automatically generated

Below is the final comparison between delays and congestion using link stats. The highlighted areas are the morning and evening peaks. The data were aggregated using 15-minute intervals

Chart, bar chart, histogram

Description automatically generated

Below is the final comparison using sites stats

Chart, line chart

Description automatically generated

The figures show that delays increase along with congestion during the evening peak when leaving the city. Delays also increase in the evening towards the city.

# Estimated Completion Date

October 7, 2022

# The Lynxx Advantage

As part of our ongoing strategic relationship with DIT and the familiarity we have gained of your organisation, this proposal seeks the continuation of the provision of value-add insights through our expertise in the field and advanced technical acumen.