

Case Study Project: Roundabout Metering

Client: Main Roads Western Australia

Overview

Demand imbalance on roundabout approaches can present significant operational challenges.

The use of metered signals at roundabouts can be a cost-effective measure to avoid a fully-signalised intersection treatment and is usually applied for low capacity approaches at selected legs during peak demand flow conditions.

Two roundabouts believed to be good candidates for roundabout metering were selected in the Perth metro area by Main Roads for further investigation.

The Study

The locations identified were:

- o Nicholson Rd/Yale Rd/Garden St roundabout in Canning Vale
- o Marmion Ave/Hester Ave/Anchorage Dr in Mindarie

Simulation based analysis was required to better understand the implications of roundabout metering in these complex areas of the road network.



Candidate roundabout with nearby at-grade rail crossing

Closely spaced at grade rail crossing and the proximity of neighbouring signalised intersections meant there would be high levels of network interaction that needed to be properly understood and analysed in a common problem space.



Simulation of roundabout metering in Canning Vale

Simulation

Urbsol used VISSIM microsimulation software to assess the appropriateness and effectiveness of metering treatments to identify potential operational issues.

The simulation based approach allowed for the true system dynamic to be accounted for.

The simulator proved indispensable for modelling various metering scenarios for the two roundabouts and successfully applied the SCATSIM interface for realistic modelling of traffic signal operation.

Detailed traffic video turning surveys and aerial helicopter surveys were conducted to determine traffic demands for the models. 3 minute interval queue lengths (average, max) were also observed for the entire model period and used to validate model performance against field observation.



Helicopter survey footage

VISSIM was chosen as the most suitable tool for this work for a number of reasons:

- o SCATSIM interface.
- o Proper modelling of priority rules and drivers' behaviour at roundabouts.
- o Flexibility in applying roundabout metering signal logic using detector loops and common parameters (minimum red and off times).
- o Accuracy of delay per vehicle modelling.
- o Robust data collection and extraction.

It was demonstrated that for complex congestion problems involving the interaction of queues between adjacent intersections traditional methods using deterministic methods (SIDRA) fall short as they do not reliably capture the dynamic nature of queue development coupled with irregular boom gates closures from nearby rail crossings and interaction with neighbouring signal sites.