Presented by: David Maritz
Co-Author: Gansen Govender

Part Time Single Metered Signal at Ngongotaha Roundabout - Rotorua

MWH
BUILDING A BETTER WORLD

Short term solution for unbalanced roundabout entries during the AM peak

Ngongotaha Roundabout

- 25m Radius, single lane roundabout
- Intersection with SH5 & SH36, 5km North of Rotorua
- Located on the urban fringe on flat terrain
- Capacity is generally acceptable

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Layout

- Speed limits
  - Ngongotaha Leg 50km/h
  - Rotorua Leg 80km/h
  - SH5 Leg 100km/h
- SH5 leg (North Bound) – Left turn slip lane
- Rotorua Leg (West Bound) – Left turn slip lane

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Problem Description

- Single lane, three legged roundabout
- Exhibits unbalanced flow patterns during morning peak
- Causes undesirable queues on SH36 (Ngongotaha leg)

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Existing Data

- Traffic Volumes

Table 2 – Annual Daily Traffic

Location	2007	Growth
SH 5 – Rotorua Leg (2km South)	25,269	3%
SH 5 – West of Roundabout	5,389	2.7%
SH 36 – North of Roundabout	7,412	7%

- AM Peak Traffic Volumes during trial

Table 1 - Traffic volume data

Loop Location	SH36 Southbound 70m North of Roundabout	SH5 Southbound 70m West of Roundabout	SH5 NorthWest bound (Un-split) 130m South of Roundabout
Weekday ADT	6296	3144	9103
Morning (6am - 10am)	2018	693	1454

- 1/3 Southbound flow occurs during AM peak

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Traffic Flow per leg

- 15min Traffic flow intervals
- SH36 - Southbound approach
- SH5 – North & West Bound approach
- SH5 – Southbound approach

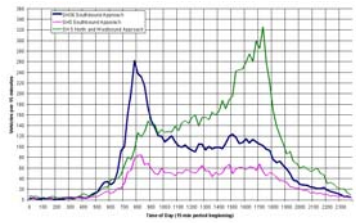

Figure 3: Average weekday 15 minute traffic volumes recorded on each approach to the roundabout

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Signal Trial

- Signal is a short term, low cost solution
- Key Focus is to create gaps for SH36 traffic south towards Rotorua
- Reduce SH36 queue lengths during the AM peak

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Methodology

- Trial over 3 days (AM - actual tests, PM – observation only)
- Low cost with immediate results
- Installation of single manually operated temporary traffic signal
- Signal operated between 7:30 – 9:00 AM

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Layout

- Temp Traffic Management of 30km/h on SH5 East & West bound
- SH36 uncontrolled to ensure normal performance
- Signal installed 96m from Roundabout hold line
- Signal operated in 2 phases:
  - Amber/Orange (Prepare to stop)
  - Red (Stop)

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Operation & Measurements

- Queue survey conducted with 3 stationary observers
- Stationary queues on SH5 were recorded during the red phase
- Stationary queues on SH36 were recorded during the blank phase
- Phase timing during trial:
  - Blank Phase – 40 sec
  - Amber – 5 sec
  - Red Phase – 20 sec (min) to 60 sec (max)

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Results

- Red Phase at 20 to 35 seconds provided minimal change
- 40 sec on Red provided some relief for queues on SH36 (lower bound)
- 60 sec on Red was used as a upper bound maximum for the trial

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Results - SH 5 Leg

- Max stationary queue – 14 vehicles
- Average delay of 20 seconds per vehicle with maximum of 48 seconds delay
- One occasion where 2 cars were forced to queue a second time (Queue overflow)

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Results - SH 36 Leg

- General flow rolling, with isolated static queues
- Max stationary queue – 28 vehicles (compared to 74 previously recorded)

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Conclusion

- Relatively simple trial
- Low cost at approximately $20,000
- Trial produced a queue reduction of between 30 to 40% with little delay to the SH5 leg
- Signage extremely important prior to intersection
- Final design is required to address how the signal will operate and how it will fit in with the local SCATS system

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Concerns

- Enforcement of the signal (STOP on red)
- Isolated nature of signal – prone for vandalism
- Education is very important
  - Pamphlets distributed during red phase on SH5 leg
  - Advertising in local papers to encourage local, southbound users to revert back to using the SH36 leg

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Summary

- Complex modeling is not always the answer
- Practical application or simulation provided an easy, understandable solution

The satisfied look on many of the faces of the locals involved in the study, is worth more than any answer of a modeling package

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