Delivering New Zealand’s first Smart Motorway

REAAA Roadshow 2016

NZ Transport Agency and 41South
Predictable Journeys for Urban Customers

Journey time predictability can be improved by a focussed effort in number of areas:

- Operate more effectively
- Plan better
- Get more out of our network
- Modify user behaviour
- Reduce demand

- Improve incident response time
- Improve FWV and TMP processes
- On-going corridor optimisation
- Educate drives for congested conditions
- Make PT more compelling

Traveller information

Improve information and insight

Ngauranga to Aotea Quay Upgrade
Getting the most from our Transport Network

Activities where Journey Management can improve customer outcomes
Getting the most from our Transport Network

- Strategy
  - Improvements / Mitigation Plan
  - Network Operating Plan
    - Analysis and Network Intelligent
      - Implementation
      - Performance
  - Reporting
Getting the most from our Transport Network

Interventions

- **Signal Optimisation**
- **Corridor optimisation**
- **Behavioural interventions**
- **Speed Management Strategies**
- **Bottleneck utilisation and management**
- **Dynamic lane control**
- **Ramp Signals**
- **Variable Speed control**
Smart Motorway Project Objectives

Delivering an Operational Outcome

- Consistent Travel Times
- Fewer Crashes
- Less Congestion
- Less Stressful
- Happy Drivers
- Lower CO2
- Lowered Value

Ngauranga to Aotea Quay Upgrade

Making our Motorways Smarter
Ngauranga to Aotea Quay - Root Causes

- Traffic merging from Hutt Road to SH2 - traffic merging causes queue on motorway
- Merging 2 x 2 lanes into 3 lanes
- Traffic backing up at off-ramp from traffic signals
- Confusing traffic management signals in both directions
- Position of Ferry Terminal restricts motorway widening
- Poor geometry of Aotea Quay off ramp
- Capacity of Aotea Quay
- Level crossing - 4 crossings at peak hours, increasing to 8 - trains stop across the road
- Capacity of city roading network
- Traffic merging at Aotea Quay on ramp

Key
Root Causes

- Evenings
- Mornings
- Constraints
- Queue Areas

Ngauranga to Aotea Quay Upgrade

NZ TRANSPORT AGENCY
WAKA KOTahi
MAKING OUR MOTORWAYS SMARTER
Our Customer Survey Said

40% of drivers don’t understand the signs

30% of drivers won’t do anything

Ngauranga to Aotea Quay Upgrade
Best Use of Existing Asset

A focus on outcomes not more physical assets

• Staged Project Delivery

• Use of available road corridor

• Use existing infrastructure

• Consider low cost treatments
Available Road Corridor

What can we fit between existing barriers

Ngauranga to Thorndon Overbridge
- Three 3.5m Lanes with reduced Shoulder widths
- Wide Central Barrier
- Motorway Spec Shoulders

Thorndon Overbridge
- Three 3.3m Lanes with 0.5m Shoulders
- Additional capacity realised by widening structure
Smart Motorway Summary

Where our journey took us

- Project scope refined to Terrace Tunnel through to Johnsonville and Ngauranga
- Four lanes northbound between Aotea On-Ramp and Ngauranga
- Provision of a managed motorway environment
- Provision of Automated congestion and speed management
- Provision of supporting elements; Ramp metering and optimisation of ramps
Low Cost treatment Options

*Early Works*

Hyperlink Early Works video clip
Central Median Barrier Replacement

Buildability Challenges

Lane closed off peak to enable safe access / egress.
Thorndon Viaduct Widening

- Demolition of respective parapets
- Removal and reconfiguration of concrete sub-structure
- Segmented deck into a series of sections
- Realigned structure to suit adjacent mainline
- Cast in-situ stitch pour, abutments and substructure
Delivering an Operational Project

One Network

Managed Motorway Concept – Alignment of Strategy, Objectives and Operating Practices

Stakeholders

Customers

Ngauranga to Aotea Quay Upgrade
Delivering an Operational Project

Operating Principles

Managed Motorway Concept - Alignment of Strategy, Objectives and Operating Practices
Delivering an Operational Project

Concept of Operation

Managed Motorway Concept - Alignment of Strategy, Objectives and Operating Practices

Stakeholders

Customers

One Network Approach

Operating Principles (under development)

Network Operating Framework

Network Operation Plan

Concept of Operation
- Delivers Operating Principles
- Captures all Operational Regimes

Ngauranga to Aotea Quay Upgrade
Delivering an Operational Project

Concept of Operation

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Managed Highways

Ngauranga to Aotea Quay Upgrade

MAKING OUR MOTORWAYS SMARTER
Delivering an Operational Project

Concept of Operation
Delivering an Operational Project

Concept of Operation

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- Rural Networks
- Managed Highways
- Ramp Signalling
- Tunnels
Delivering an Operational Project

Operational Regimes

Managed Motorway Concept – Alignment of Strategy, Objectives and Operating Practices

- Concept of Operation
  - Deliver Operating Principles
  - Captures all Operational Regimes

- Managed Highways
- Ramp Signalling
- Tunnels

- Operational Regimes
  - eg. recurrent congestion, planned and unplanned event management, normal highway operation without hard shoulders, defines roles and responsibilities, sets out procedures

Stakeholders
- Customers
- Emergency Services
Delivering an Operational Project

Operating Plans
Delivering an Operational Project

Operational Tools and Installation

Managed Motorway Concept - Alignment of Strategy, Objectives and Operating Practices

Stakeholders

Customers

Emergency Services

One Network Approach

Operating Principles (under development)

Network Operating Framework

Network Operation Plan

Concept of Operation - delivers Operating Principles - captures all Operational Regimes

Operational Regimes

Managed Highways

Rural Networks

Ramp Signalling

Tunnels

Operating Plans

set by TOC, location specific but following standard signal setting rules, implements on operational regime, controlled by the TOC

Available tools

compliance (enforcement), education, VMS, Ramp Signalling, Visual Monitoring, Traffic Detection, Lane Use Control, Driver Information and Messaging, SCADA, Tunnel Safety Systems
Full Time or Part Time Operation

Full Time Preferred:
- Less Safety Risk
- Easier for TOC to operate
- Better understanding by road users

- How will motorists notice that the shoulder is available for use and how well will this be understood?
- What potential is there for operator errors in detecting a safe lane and deciding to open it?
- How will motorists know where they are meant to stop in the event of a breakdown?
- Will there be any transition issues, firstly when the new system opens and also when the fourth lane is opened/closed on a daily basis?
- Will the different uses of the part-time lane vs general traffic lanes lead to increased lane changing conflict or will it make trips more intuitive and traffic more organised and require less lane changing?
Is it Working!!

What benefits have we actually realised?

• **Travel Time Improvements on SH1 Northbound**
• **Significantly reduced congestion at Aotea NB on Ramp**
• **Improved trip reliability**
• **Traffic shift from Hutt Road to SH1**
• **Improved flow of SB traffic with minimum changes downstream constraints**
• **Flow breakdown at Ngauranga SH2 on ramp (no change to SH2 travel times). This will improve with ramp signals**
Next Steps

Ramp Signals

- Encourage traffic to use the Aotea Quay Northbound on-ramp and SH1 to exit town (new 4th lane).
- Discourage traffic using Hutt Road to create space for walking, cycling and public transport. Allow for traffic from Hutt Road businesses and Northern Suburbs (Kaiwharawhara Road and Rangitata Avenue).
- Optimize Jordan Mile intersection traffic signals to maximize efficiency, work with ramp signals and improve safety by limiting southbound queue at the SH2 off-ramp.
- Ramp signals to optimize efficiency of the SH2 on-ramp merge. Limit queue (stacking) to the on-ramp only (approx 500m).

Encourage traffic to use the Smart Motorway to exit Wellington City - this is the most efficient route home.

Smart Motorway variable speeds and messaging to support ramp signal operation.

Ngauranga to Aotea Quay Upgrade

MAKING OUR MOTORWAYS SMARTER
Transferable Lessons

A Sustainable Project

1. Gain alignment on network purposes

2. Operational outcomes first, engineering outcomes second

3. Be scalable – incrementally adding improvements

4. Reflect on achievements and look for improvement.
Any Questions

NtAQ – New Zealand’s first Smart Motorway

33% of drivers say that congestion is a problem most or all of the time.

25% of drivers believe other drivers need education.