Tauranga's Signalised Roundabouts Exposed

2024

Tauranga City

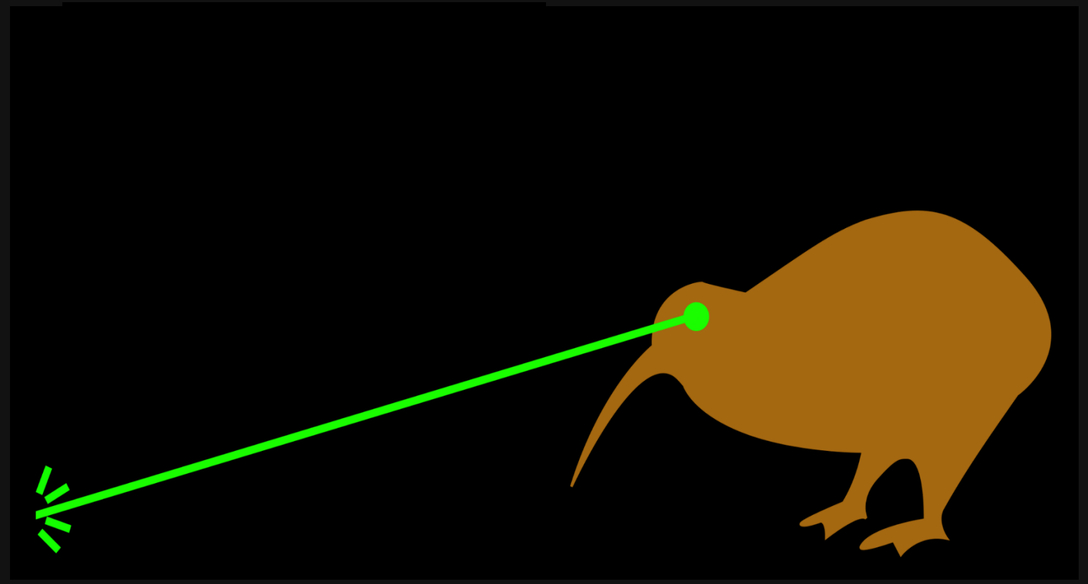
Roundabouts are Great!

PROS

- Simple to Use
- Physical geometry that minimises >90º impact angle crashes
- Safe and Efficient for vehicle occupants when operating under capacity

CONS

- Large Footprint
- Expensive to Build
- Multi-lane do not provide as safe and pleasant facility for peds and cyclists
- Capacity issues lead to inequitable delay & queuing



What Can Signals Offer?

- Wont make it smaller or cheaper!
- Improve provisions for cyclists pedestrians and less confident motorists
- Can add capacity
- Manipulate queues / delays
- Ideally combine the geometric benefits of a roundabout with the operational control of signals

Metered Roundabout

- Not a signalised roundabout but a useful tool
- Signals used to hold traffic back from accessing the roundabout
- Ideal for the situation where one approach develops peak period queuing as the result of the entry flow on the approach immediately to the right being moderately high flow

Morning operation to aid Pyes Pah Rd

Marshall Avenue

Cameron Road

Pyes Pa Road

State Highway 29A

Metered flow is a high volume largely unimpeded flow.

Afternoon / evening operation to aid SH29

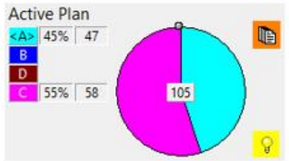
Marshall Avenue

Cameron Road

Pyes Pa Road

State Highway 29A

Metered flow is a moderate flow with a moderate conflict flow



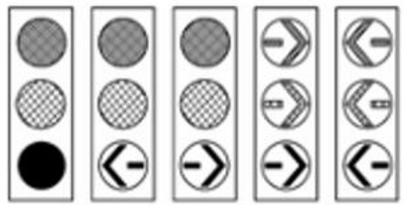
Metered Roundabout Lessons

- Tinker with your timings to get the right balance for the subtleties of your site
- Don’t put Green Aspects in your Metering Lanterns!

Roundabout metering signals

6.4(13) Roundabout metering signals, with displays complying with one of the displays in *Schedule 3*, may be used to control the traffic from one or more of the approaches to a roundabout, if:

S4-3 Single-column 3-aspect



The Real Deal

Entry into the roundabout is controlled by traffic signals at one or more approaches

Circulating carriageway also has one or more signal controlled stoplines

Three quite different Tauranga examples to show and tell

A KISS Classic - SH29 Maungatapu

Large - Plenty of Circulating Storage Space and Separation

No Pedestrian Facilities

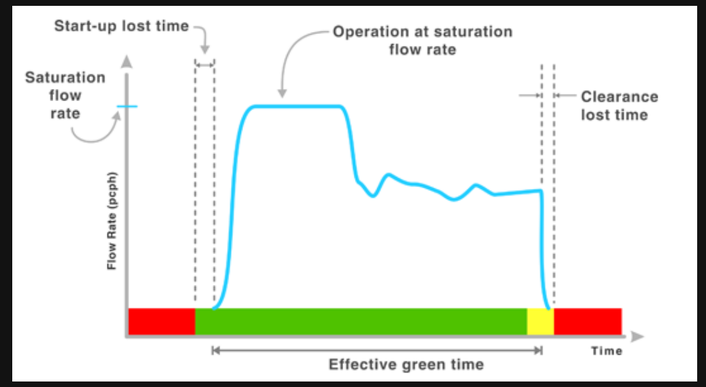
Three Nodes Signalised

One Give-way Controlled

- Low Flow
- Good queuing Space at first stopline
- Close Upstream Signals - Create Gaps

Operating Concepts

Think of each node as a separate junction that is coordinated with the other nodes



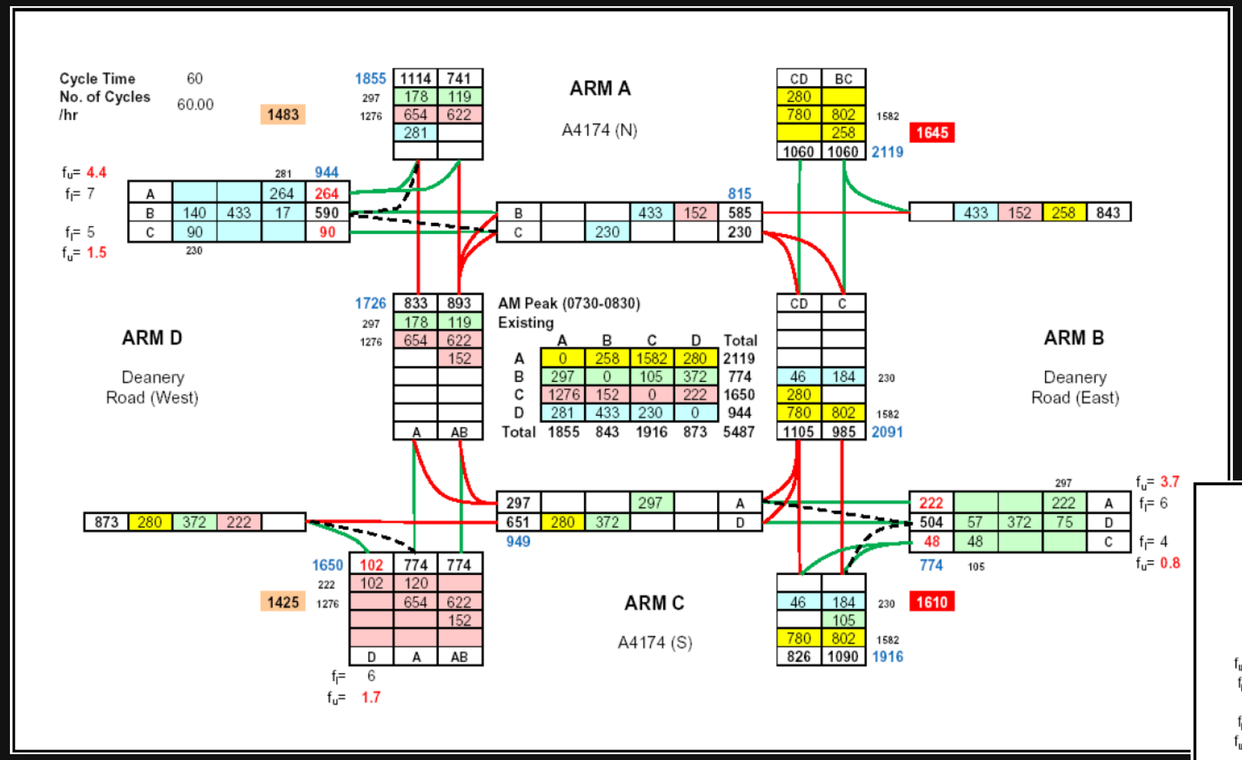
Two Phase operation at each node

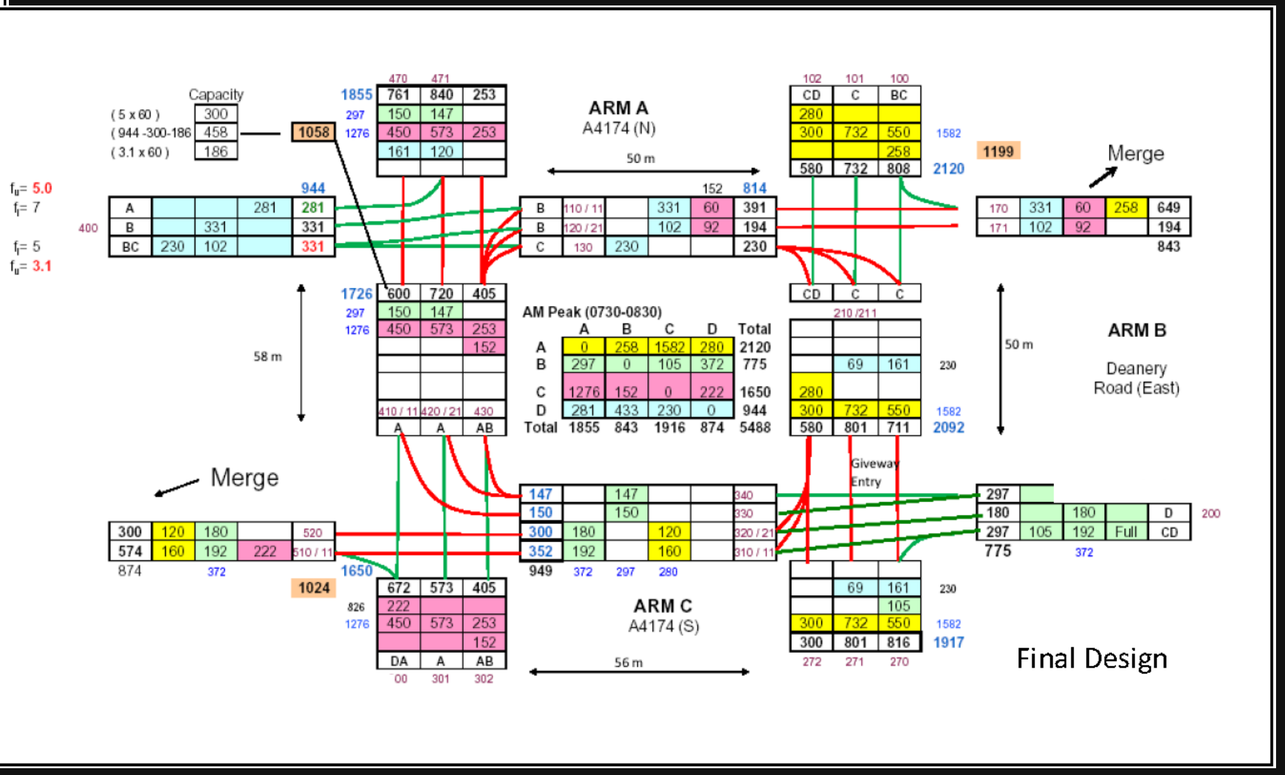
Short CL- frequent short bursts of traffic in and out

Coordinate nodes so entry traffic gets a “greenwave” as they proceed to the first circulating stopline

Give spare capacity to the circulating stoplines

Design


Cycle Time 60
No. of Cycles /hr 60.00
1483
ARM A
A4174 (N)
ARM D
Deanery Road (West)
ARM B
Deanery Road (East)
ARM C
A4174 (S)
AM Peak (0730-0830)
Existing
A B C D Total
A 0 258 1582 280 2119
B 297 0 105 372 774
C 1276 152 0 222 1650
D 281 433 230 0 944
Total 1855 843 1916 873 5487
1645
1610
1425
949
774
1024


Capacity
(5 x 60) 300
(944 -300-186) 458
(3.1 x 60) 186
ARM A
A4174 (N)
50 m
ARM B
Deanery Road (East)
50 m
Merge
Merge
AM Peak (0730-0830)
A B C D Total
A 0 258 1582 280 2120
B 297 0 105 372 775
C 1276 152 0 222 1650
D 281 433 230 0 944
Total 1855 843 1916 874 5488
ARM C
A4174 (S)
56 m
58 m
Giveway Entry
Final Design

Operating Control

- Can’t use traditional A-B Phase operation in a single controller.
  E.g. A-Phase at each node will be of independent duration and start time within the cycle

- Could use three controllers and coordinate the sites in Masterlink and or Flexilink

- Single controller operation requires a SG or movement-based approach rather than the usual phase-based

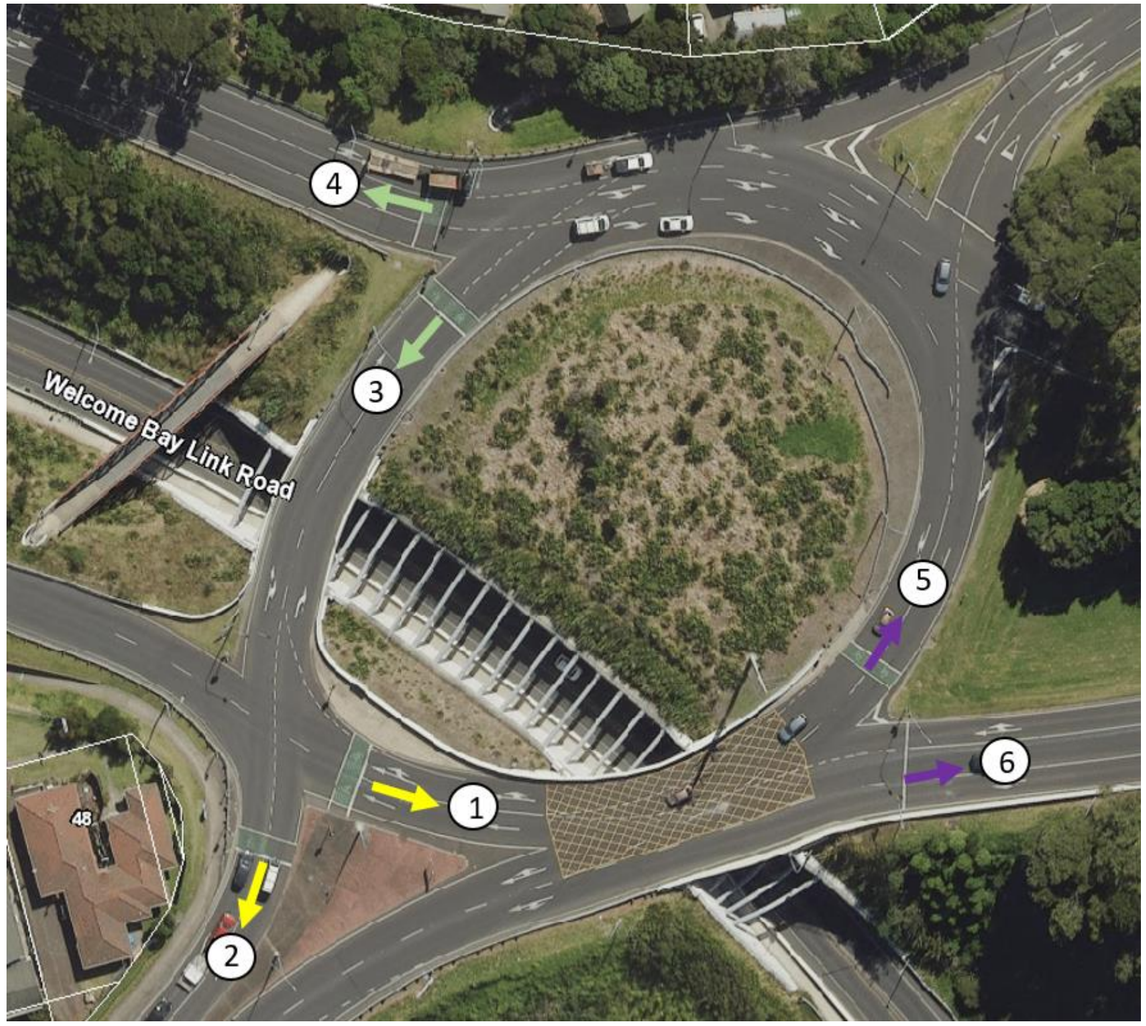
- In 2008 the challenge of working out how to operate a Signalised Roundabout with a single SCATS controller was given to two wise heads in the industry – Ross Thomson and Bill Sissons. They landed on a modified Flexilink operation.

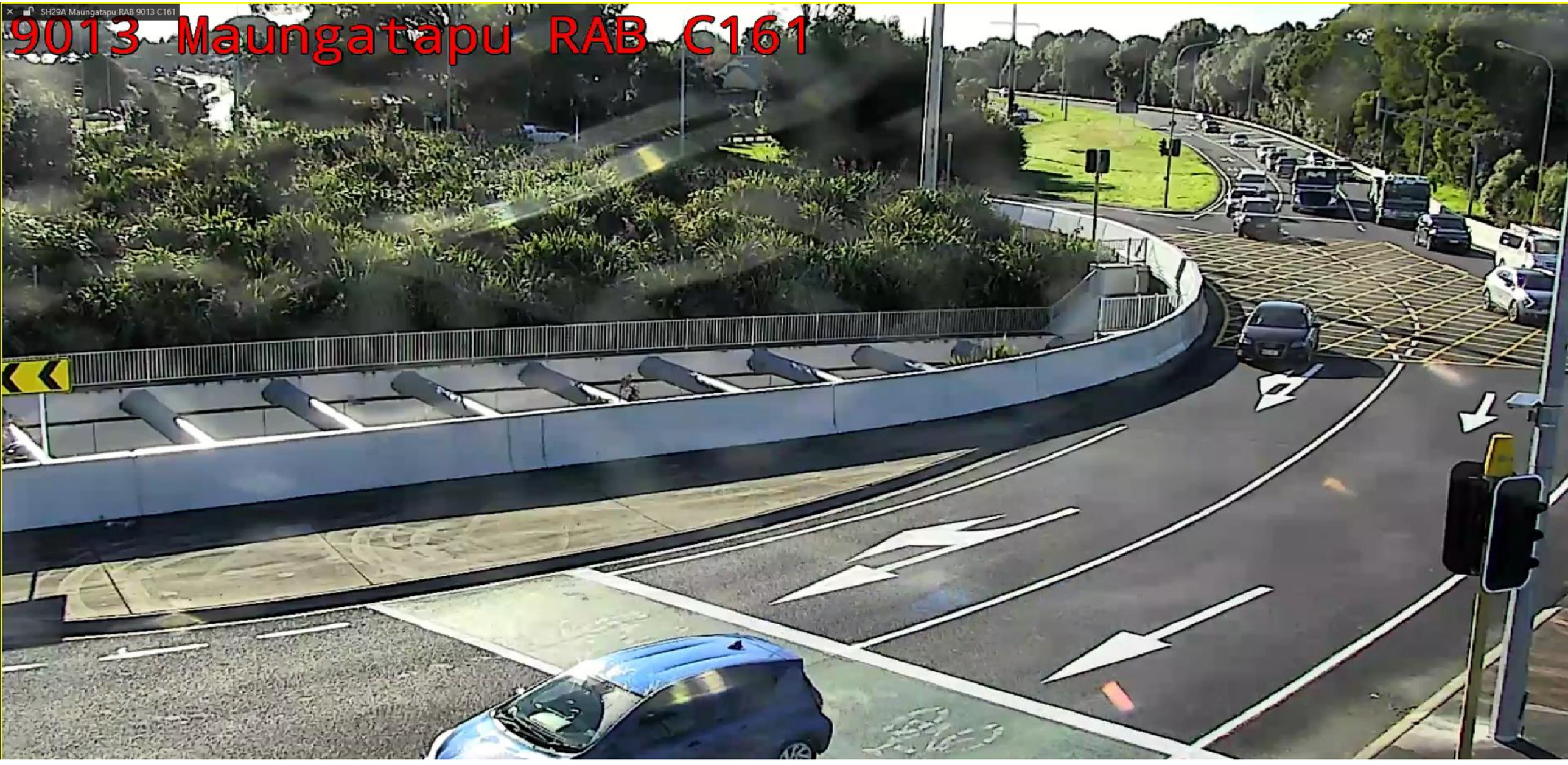
	PL	CL	A	B	R-	R+	Y-	Y+	Z-	Z+	Q-	Q+	XSF
Plan Description	Closing SG		2	1					3	4	5	6	
	Mvmnt		B	A					C	D	E	F	
	0	50	0	28			CT		12	36	48	21	2
Pre AM	1	50	0	29			CT		14	34	48	23	2
AM	2	50	0	29			CT		15	35	49	22	2
Post AM	3	50	0	28			CT		11	36	48	20	2
60s AM	4	60	0	35			24		21	42	58	27	2
Pre-PM	5	50	0	30			CT		11	38	48	20	2
PMa	6	60	0	38			24		13	46	55	20	2
PM b	7	56	0	37			CT		12	45	1	22	2
Post PM	8	50	0	30			CT		9	38	0	18	2
Overnight	9	33	0	18			CT		7	19	32	11	2
Sat Peak	10	52	0	28			CT		13	36	50	21	2
Post Sat Peak	11												

Modified Flexilink Operation

- Traditional Flexilink operation uses Call Pulses and Release Pulses to start and end phases.
- For the roundabout each operating plan simply* requires a CL and a terminate to amber pulse for each SG.
- The terminate pulse for a given SG defines the start time of its conflict partner , i.e terminate pulse + the intergeen time.

*plus all the usual features like conflict matrix, and time settings - min green, amber , all red etc operating in the software



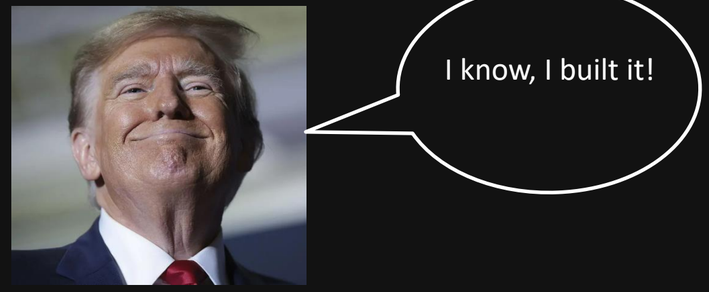

SH29A Maungatapu RAB 9013 C161
9013 Maungatapu RAB C161

SH29 / Maungatapu Summary

This roundabout has no detectors, no ability to adjust dynamically and runs fixed Flexilink plans 24/7.

Sounds a bit dog, but it is great!

It’s Simple, Safe, Efficient, Reliable and Complaint Free



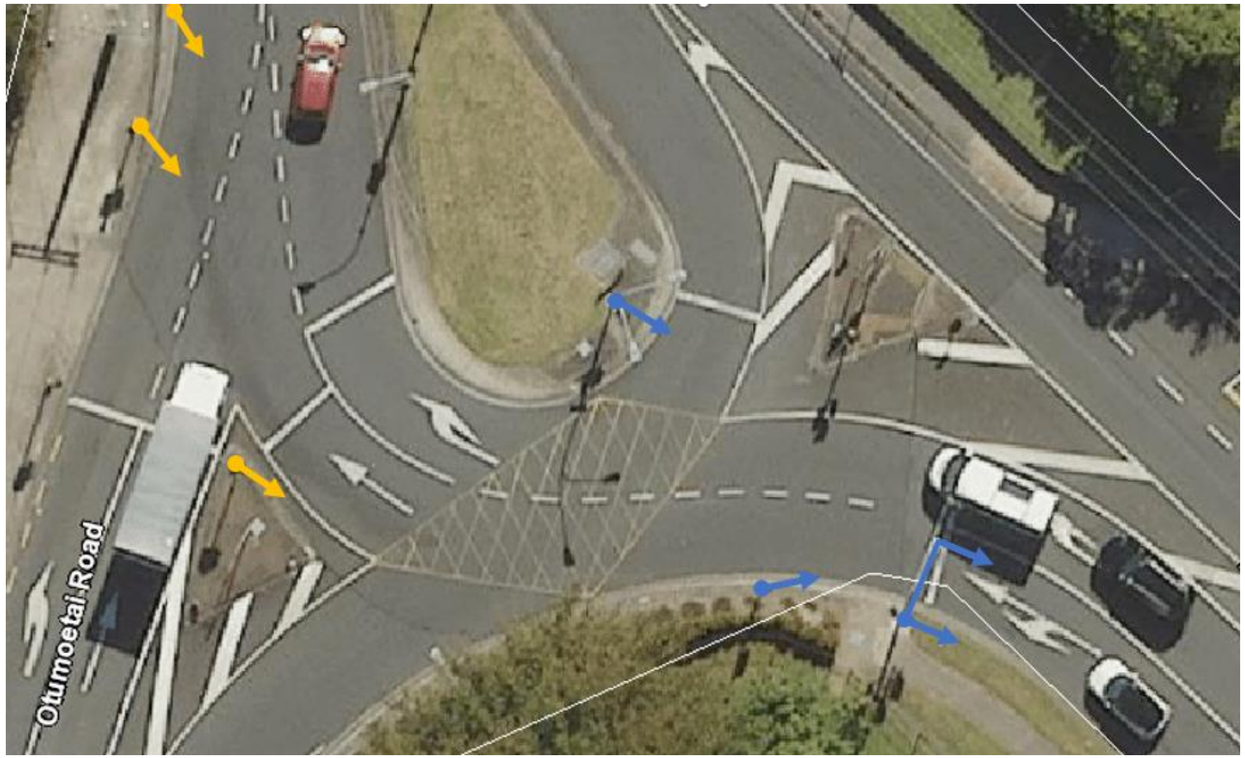
A Dumbbell- Brookfield Rbt

Different Environment

Urban near shops, a school and immediately adjacent to a Tee intersection to spice it up a bit

All nodes signalised

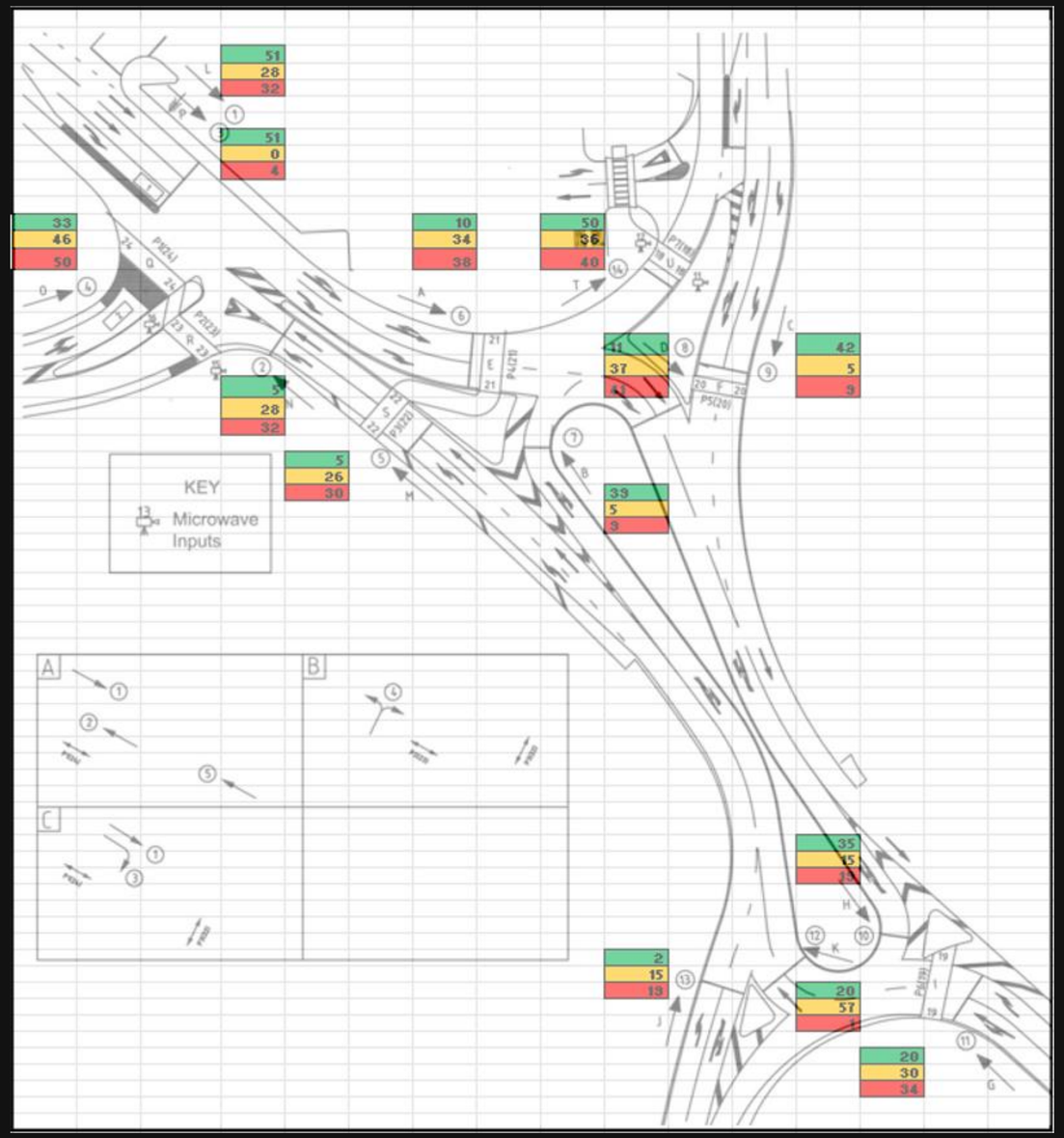
Some nodes very close together



- Safety Consideration regarding Lantern See-Through requires some SGs from different nodes to be linked together.
- The Blue SG and Yellow SG both always go green at the same time

- However, they aren't required to terminate at the same time
- The coordination between these nodes is fixed but the phase split % at each node can be adjusted independently

How to make sense of it if you're not operating in the MATRIX

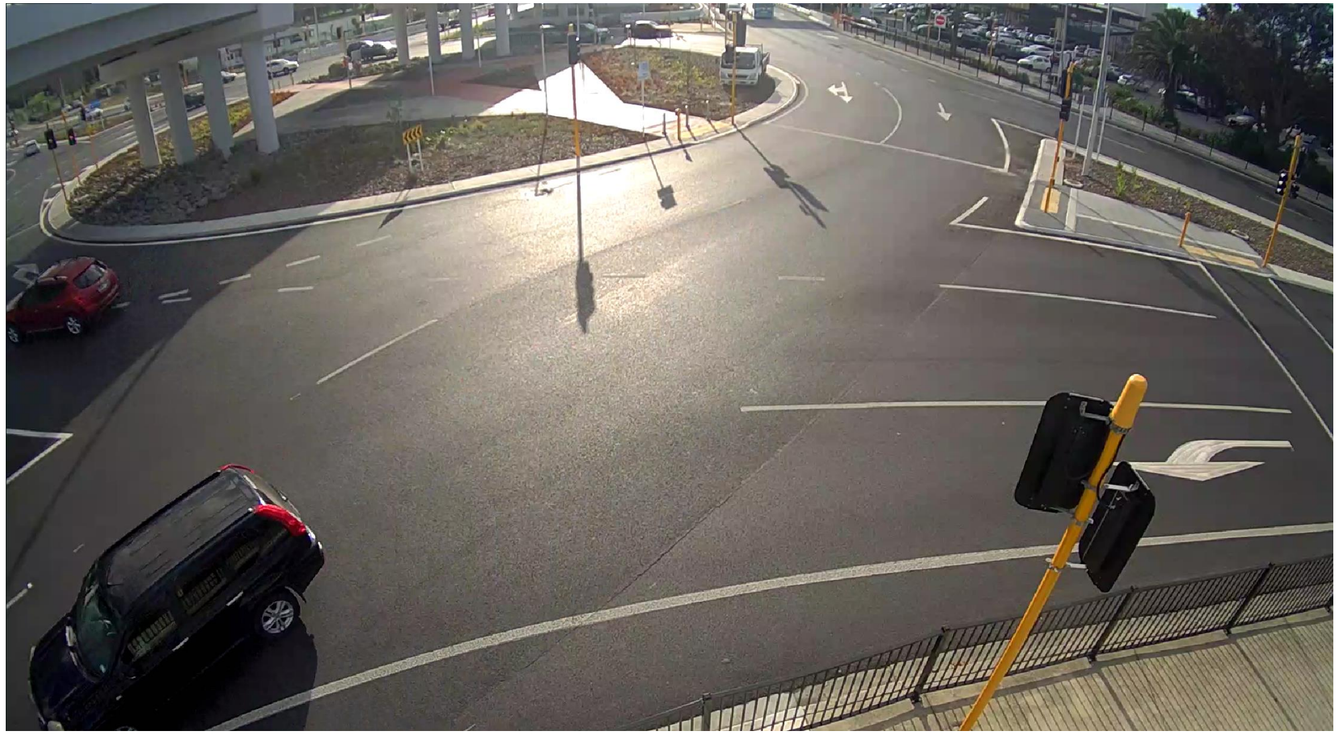


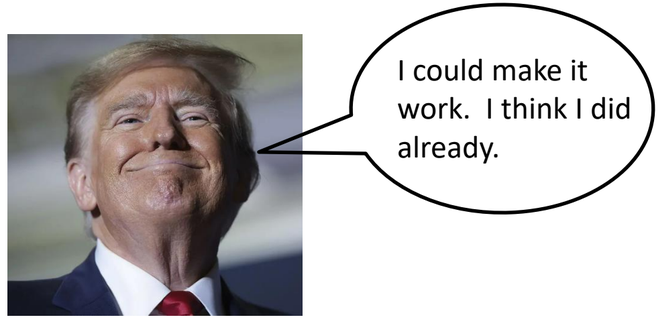
				Go To Phase FLEXI Data		Not in Flexilink data		Go To Phase	Release SG FLEXI Data								
				A	B	B	B	C	R-	R+	Y-	Y+	Z-	Z+	Q-	Q+	XSF
Plan Description		Closing SG =		3	5 (ECG)	2 ECG A+ SPT 2	1	4	6	7,9		14	10,13	11	8	12	
Week	Weekend	Mvmnt =		P	M	N	L	O	A	B,C		T	H,J	G	D	K	
		PL	CL														
DO NOT USE PL0		0	60	0	30	32	32	48	37	7	NU	10	15	30	40	45	
Pre-AM		1	42	0	16	18	18	30	8	31	CT	6	15	27	11	2	$0200
AM		2	60	0	27	29	29	48	3	34	CT	4	19	34	6	1	$0200
Post-AM 1		3	50	0	21	23	23	38	3	28	CT	4	13	28	6	44	$0200
Midday	Day *	4	60	0	28	30	30	48	9	44	CT	10	8	28	12	39	$0200
Pre-PM		5	60	0	28	30	30	48	7	41	CT	8	8	28	10	40	$0200
PM		6	60	0	32	34	34	48	21	3	CT	21	12	35	24	45	$0200
Post Peak		7	50	0	23	25	25	38	14	48	CT	14	5	26	17	31	$0200
Post AM2	Afternoon	8	50	0	21	23	23	38	2	30	CT	4	4	19	5	31	$0200
		9															
Overnight	Overnight	10	40	0	13	15	15	28	3	20	CT	3	12	25	6	39	$0200

All controlled by one controller in Flexilink 24/7

Only two detectors, at the Tee intersection to demand the minor phases/movements

A Challenge - Maunganui Girven Interchange(MGI) Rbt





Small Roundabout- Minimal Circulating Queuing Space, and Lantern See Through

All Four Legs Assessed to Need Signalisation

Big Right Turn Demands on All Approaches

Classic Independent Coordinated Nodes a No-Go

The Solution

The adopted Phasing solution was first deployed in East Kilbride Scotland in 2005 after being designed by jct consultancy of the UK.

Split approach phasing – 4 Approaches 4 Phases

Not Very Exciting and Not Very Efficient

The Clever Bit

If you order the phase introductions in an anticlockwise sequence the ***next*** phase is able to introduce on commencement of amber for the ***running*** phase. ***Next*** phase traffic wont reach the circulating stopline that conflicts with the ***running*** phase until the ***running*** phase inter-green is complete. If they do get there early they meet a red signal at the circulating stopline.

I call it a spatial rather than temporal inter-green. We use them at Mar-a-Lago

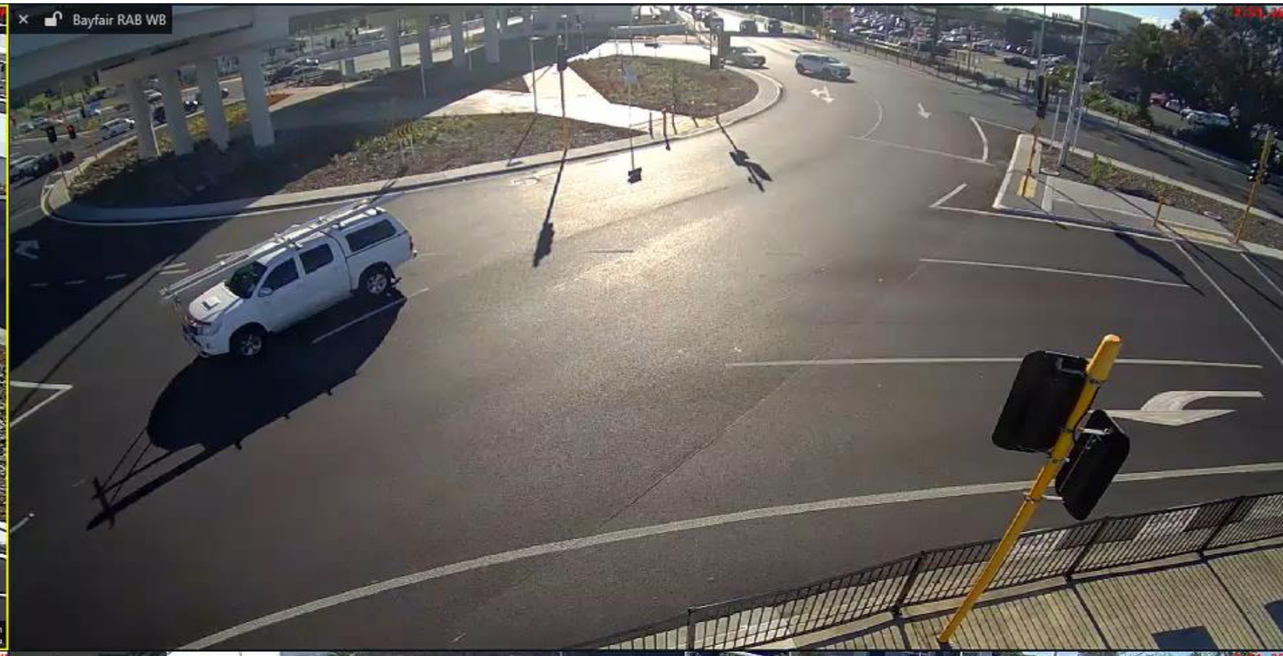
Operation and Issues

Phase Based operation enables site to operate under SCATS Master, so it dynamically changes Split Plans and CL. Also has a suite of Flexi plans for Fallback.

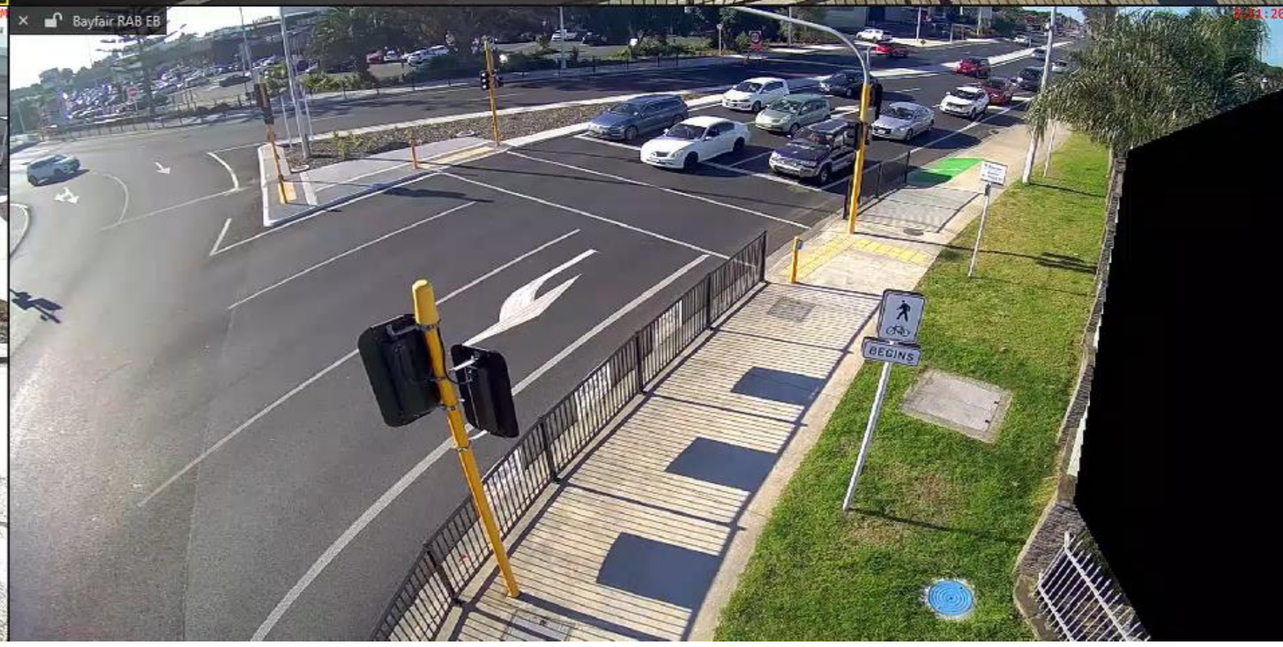
Achilles Heels

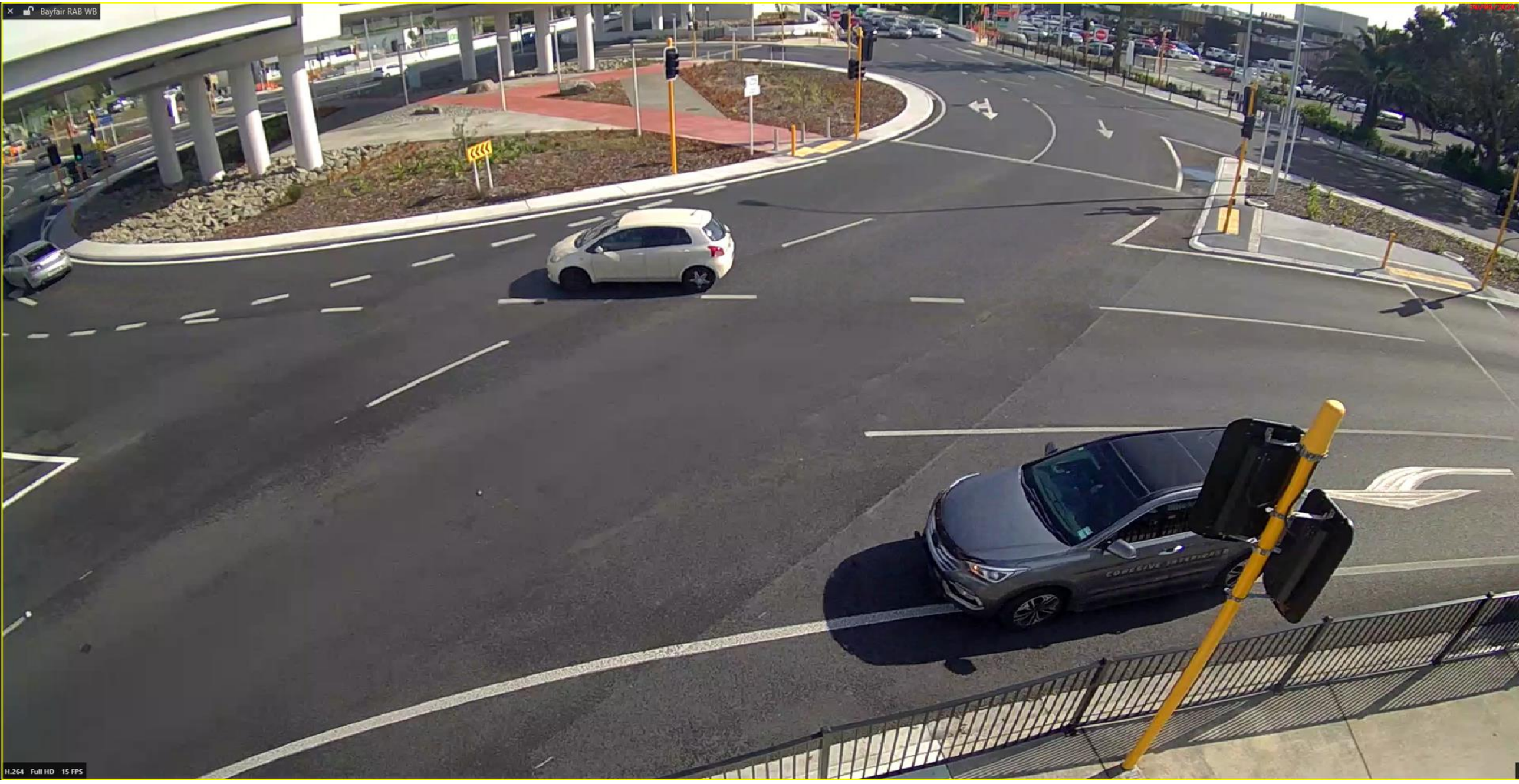
- The Pesky U-Turner
- Limited Lantern Location Options, Driver confusion and limited redundancy of displays


SH2 Bayfair RAB Flyover C2154
H.264 Full HD 25 FPS


Bayfair RAB WB


Bayfair RAB PTZ C215
2:51:20 PM


Bayfair RAB EB
BEGINS


Bayfair RAB WB
H.264 Full HD 15 FPS