Next generation driveway design for urban cycleways

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Study location and driveway trials

Hutt Road

- 2-directional cycleway and walkway
- Multiple commercial driveways

Intuitive design solutions

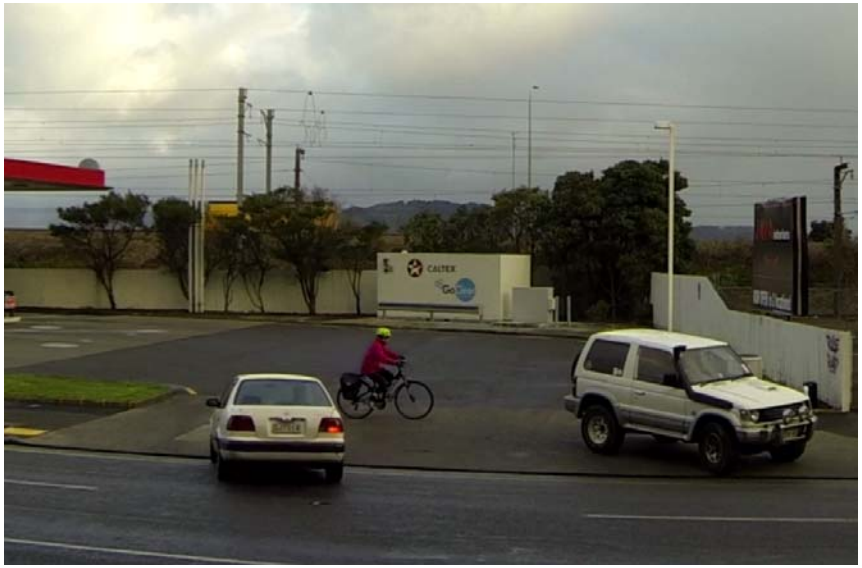
Behavioural success framework

Base → Visual → Physical → ITS

Example challenging behaviours

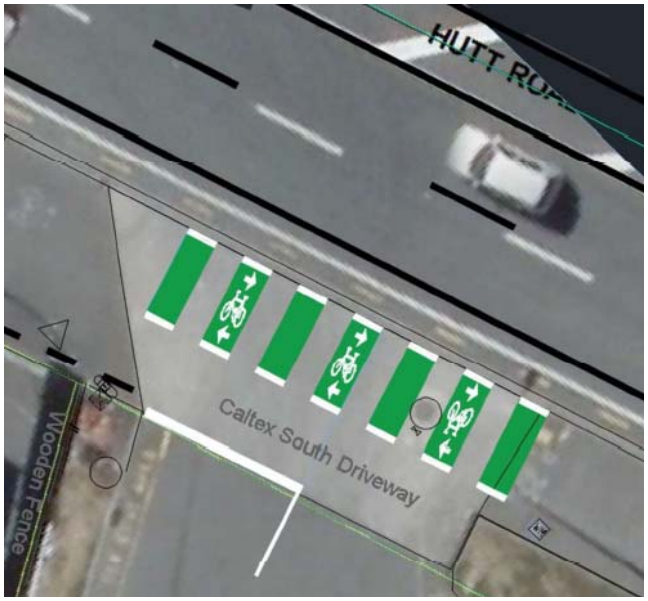
- Avoidance example

Near miss example



Example – Focussed on gap in motorist traffic

Intervention 1: Pavement Markings

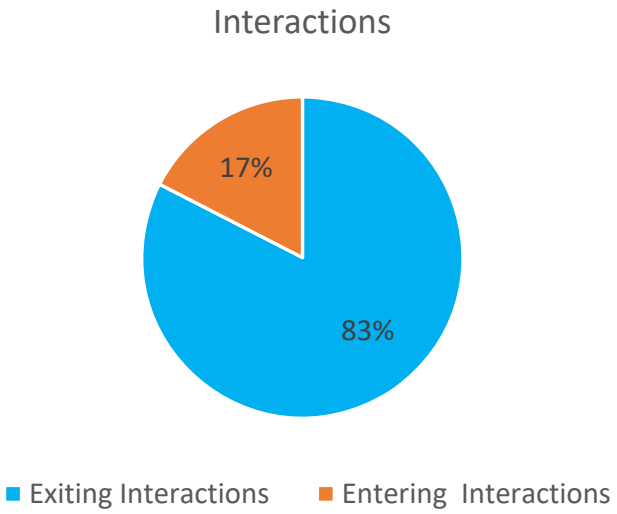


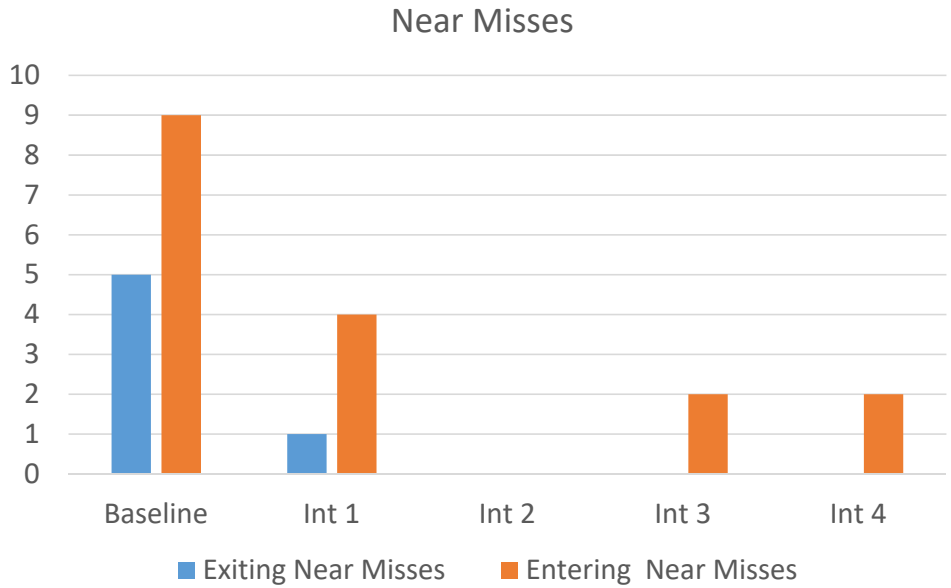
Intervention 2: Speed Hump

Intervention 3: Relocated Speed Hump

Intervention 4: ITS Solution

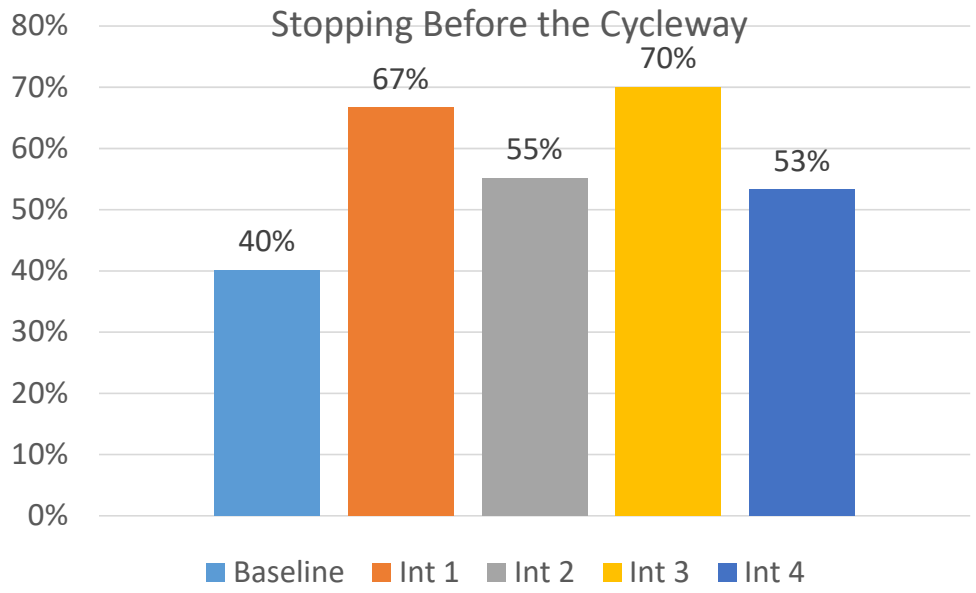
Overview of Interactions and Near Misses





39% of all exiting vehicles encounter a cyclist
18% of all entering motorists encounter a cyclist

Exiting Motorists Stopping Behaviour (when interacting with a cyclist)



Stopping before cycleway + Stay there = No conflict or Avoidance

Int 1 Pavement Markings: 77% also *stay there (out of the cyclist pathway)*

Int 3 Speed hump by cycleway: 89% also *stay* there (*out of the cyclist pathway)*

Lessons – The devil is in the detail
The Optimum Speed Hump Location

Relocation - Positive behaviour change

More motorists stop before the cycleway

(70%) when the speed hump is at the edge of the cyclist path

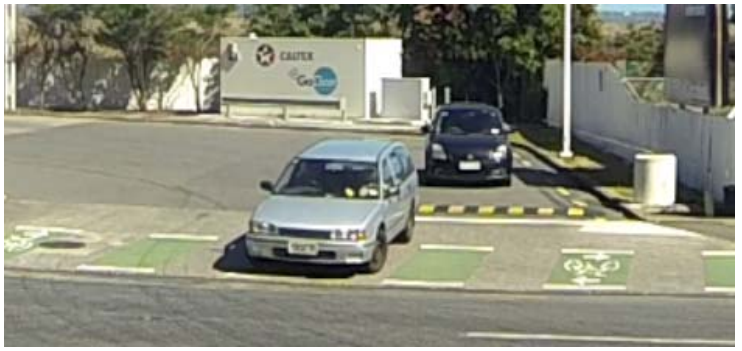
Set-back location behaviours

Fewer motorists stop before the cycleway

(55%) when the speed hump is set back

Speed hump avoidance

Detailed design considerations – sight distance



WSP Opus

ITS Solution Validation

Reliability: Reliance vs Alertness

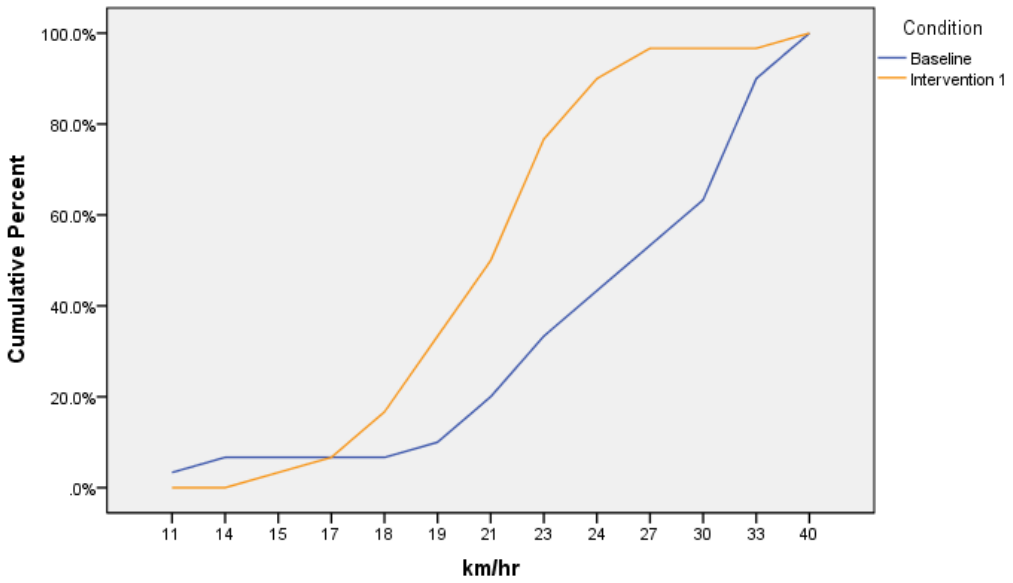
87% ‘hits’

4% ‘misses’

9% ‘false positives’

Caution around Device reliance – User expectation of 100% accuracy

Cyclists Speed Response



Cyclist speed	Baseline	Intervention 1
Average speed	27.5 kph	22.0 kph
85th percentile speed	33.0 kph	24.0 kph
Range of speed	11-40 kph	15-40 kph

Summary - Successful Behaviour Change

Success metric	Baseline	Final solution	Absolute Change	Relative change
Correct motorist stopping behaviour (prior to cycleway)	40%	70%	30%	75%
Increased motorist caution (stopping prior to cycleway when no cyclist present)	5%	16%	11%	220%
Recognition by cyclists of a change in space (85^{th} percentile speed)	33kph	24kph	-	27%
Near miss rate (although these are small frequencies, from n= 14 to n = 2)	8%	2%	6%	75%

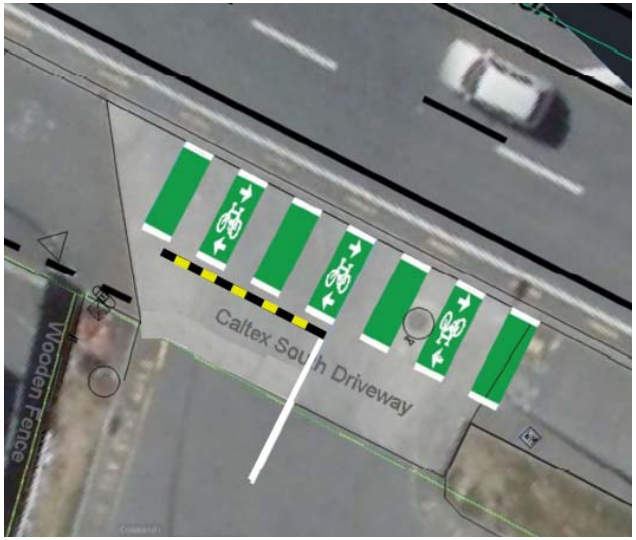
Lessons

Cost-effective pavement treatments can effectively promote safer behaviour

Multiple cues that are intuitively familiar and meaningful to motorists

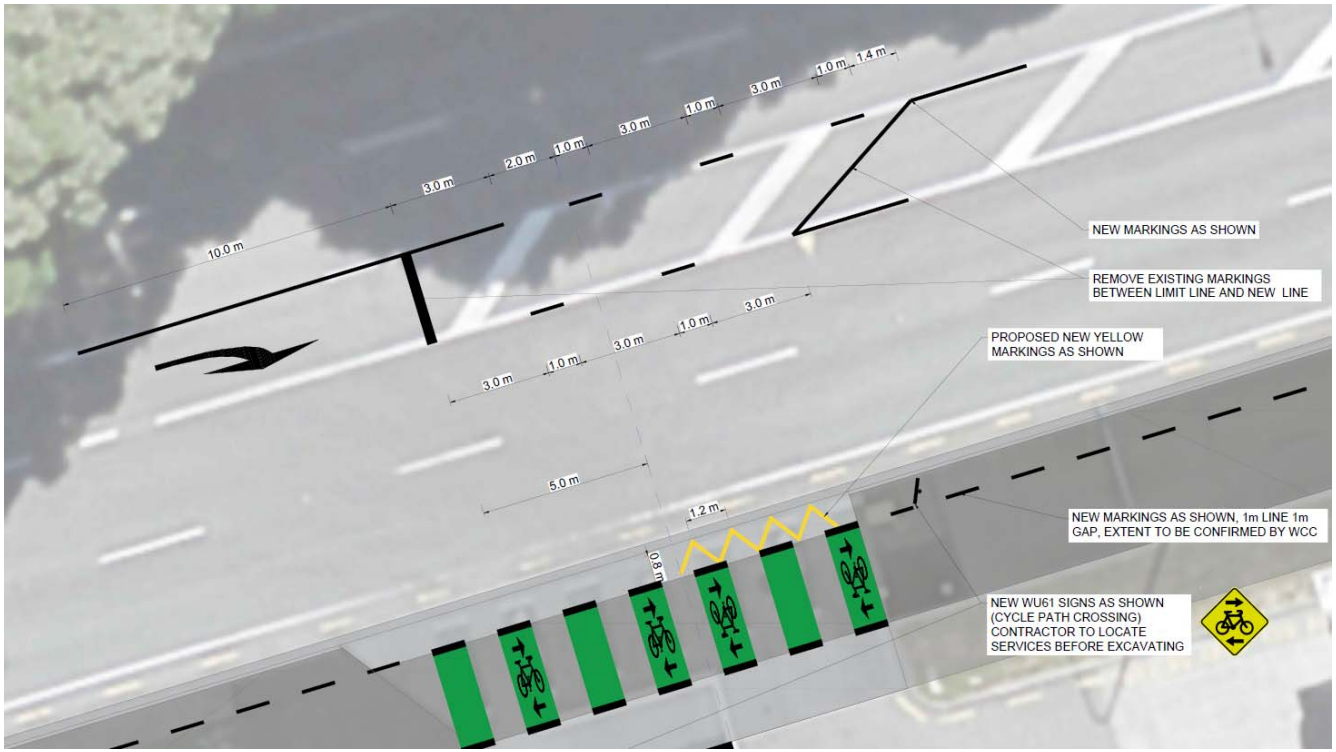
Detailed design considerations in successful implementation

Behavioural success framework approach as fast method to test success



Intuitive Feature	Cue to motorists
Zebra crossing style marking	Signal that motorist must yield
Limit line	Signal that motorist must yield and identifies ideal stopping location
Green colour	Raises expectation of a high cyclist presence
Cycle symbol	Indicates cyclist priority use of the space
Speed hump	Reinforces the need to stop at the limit line

Where to next? Entering drivers trial



Limit line to reduce “swooping”

Marking at the kerb

Cyclist movement Signage

Where to next? Wider application

Before

After

Acknowledgement

Wellington City Council
New Zealand Transport Agency