Monitoring Walking and Cycling

Webinar: Tue 13th Aug 2019

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

Welcome!

Session Outline (90 mins approx.)

- Housekeeping – Glen Koorey (ViaStrada)
  - *Survey – Who are You?*
- Introduction – Claire Pascoe (NZ Transport Agency)
- 1) Measuring Walking – Bridget Burdett (MRCagney)
- 2) Cycle Monitoring – Courtney Groundwater (Abley)
- 3) Monitoring Technology – John Lieswyn (ViaStrada)
- Questions
  - *Evaluation Survey*

Housekeeping

How will this webinar operate?

- You will see a Presentation on screen
  - Various presenters will speak to it
  - Your own microphones/cameras are **off**
- At any time you can type in a question about what you see/hear
  - We may address them after each session or at the end
- If you have any technical problems, contact Leanne Asher (EngNZ)
  - leanne.asher@engineeringnz.org 021-070-4195
- But first: a simple survey that we would like you to complete…
  - *Who are you?*

Introduction

Claire Pascoe

Lead Advisor – Urban Mobility, NZ Transport Agency

- Why this webinar topic?
- Expectations from NZTA, MoT and Govt
- Future walk/cycle industry training plans

Survey – Who are You?

Results of our audience survey…

- Thanks for your feedback!

MRCagney

BETTER TRANSPORT • BETTER PLACES • BETTER CHOICES

Measuring Walking

12 August 2019

Bridget Burdett

Outline

Why do we measure anything?

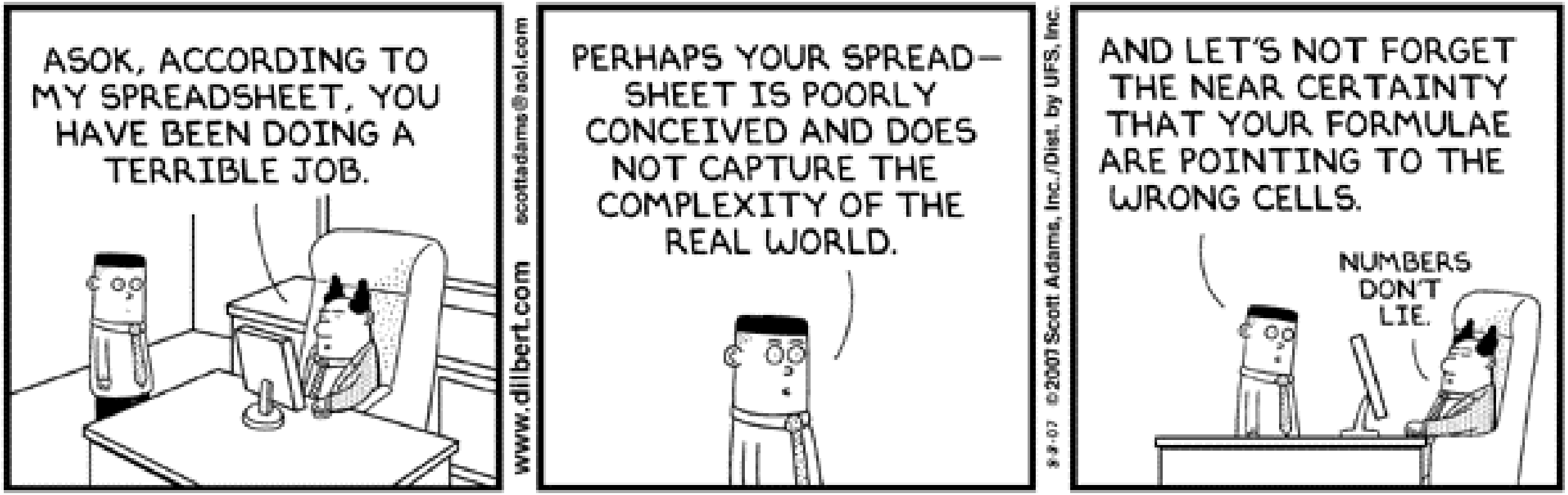
Why measure walking?

Different ways to measure walking

Walking and inclusive access

Summary and references

Why do we measure anything?



Why do we measure anything? To get better at everything.

Why measure walking?

For ‘mode neutral’ investment decisions: we measure traffic and count crashes. Equivalents for walking are to count people everywhere, and to identify *trips not made*.

See Burdett (2017) Understanding pedestrian safety in New Zealand

Why measure walking?

Because walking is the most complex mode to understand:

- Variety of people
- Variety of devices
- Variety in nature of trips and their purpose
- Most common connection to other modes
- Most wide-ranging benefits
- Transport efficiency → Health, social inclusion, wellbeing, connection with nature

Ways to measure walking

- Ask people (stated preference)
- Observe / Count people (revealed preference)

Ways to measure walking: Asking people

- Perceptions (how people feel about walking; attitudes to safety)
- Intentions and recalled behaviour (predictions about future travel and recollections of actual travel)

Purpose:

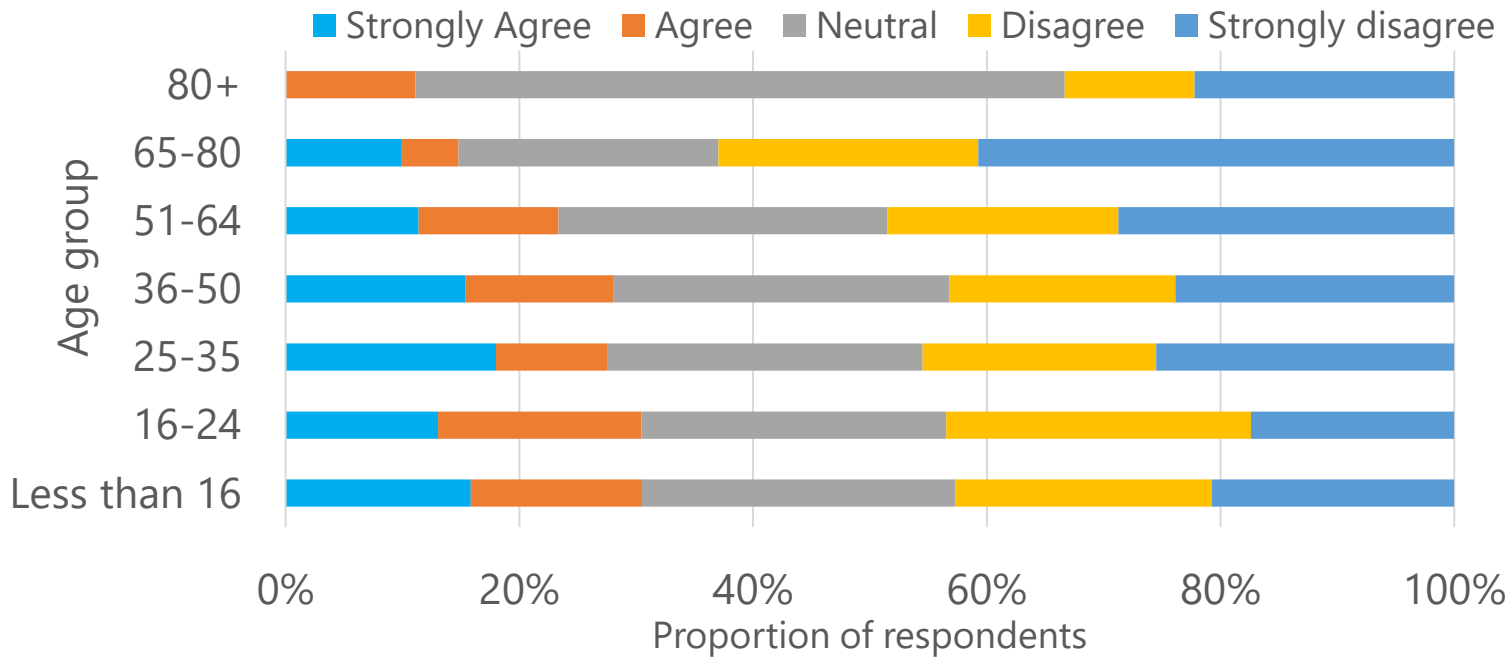
- **Monitor target attitudes and behaviours**
- **Compare mode choices at population level to prioritise *overall* investment, and target to specific groups whose walking could be improved**

Ways to measure walking: Asking people

- Perceptions (how people feel about walking; attitudes to safety)
- E.g. Attitudes to monitor

Survey responses: "I would walk more often if it were easier to cross the road" by respondent age

Source: Hamilton City Transport Choices and Attitudes Survey, 2019. N = 931



MRCagney

Ways to measure walking: Asking people

- Intentions and recalled behaviour (predictions about future travel and recollections of actual travel)
- Eg Travel diaries: Household Travel Survey, New Zealand Disability Survey, NZ Census

First travel day:

Where	When	
I began the day at…		I left at…
I went to…	I arrived at…	I left at…
Then I went to…	I arrived at…	I left at…
Then I went to…	I arrived at…	I left at…
Then I went to…	I arrived at…	I left at…
Then I went to…	I arrived at…	I left at…

Ways to measure walking: Count people

- Manual observation
- Automated technologies

Purpose:

- **Monitor actual behaviour**
- **Compare mode choices at *location* level to prioritise investment in infrastructure**
- **Analyse to understand realised benefits**

Ways to measure walking: Count people

- Manual observation
- Technology

How often, when and where to count?

- As much as possible!
- See Page 7 of International Walking Data Standard http://files.designer.hoststar.ch/hoststar10546/file/1-international_walking_data_standard_version_aug_2016.pdf
- If resource is limited, count 'typical' peak and off-peak times across typical weekdays.

Ways to measure walking: Count people

Example: Auckland City Business Case for Walking

Walking and Inclusive Access

The interaction of access and safety is complex.

Some people are more sensitive to infrastructure accessibility and perceived safety than other people.

"I often go places with my friend who uses a wheelchair and lives in town.The footpaths are not well designed for her - there are some very steep gradients between the road and footpath."

Female aged 65-74, Wellington Source: 'Views on Transport in New Zealand' CCS Disability Action Waikato 'Measuring Accessible Journeys' project, Think Differently fund, Ministry of Social Development, New Zealand

Walking and Inclusive Access

To demonstrate differences in participation:

1) Count diversity (gender, age, ability)
2) Compare revealed diversity on the street, to catchment variation

Catchment variation =

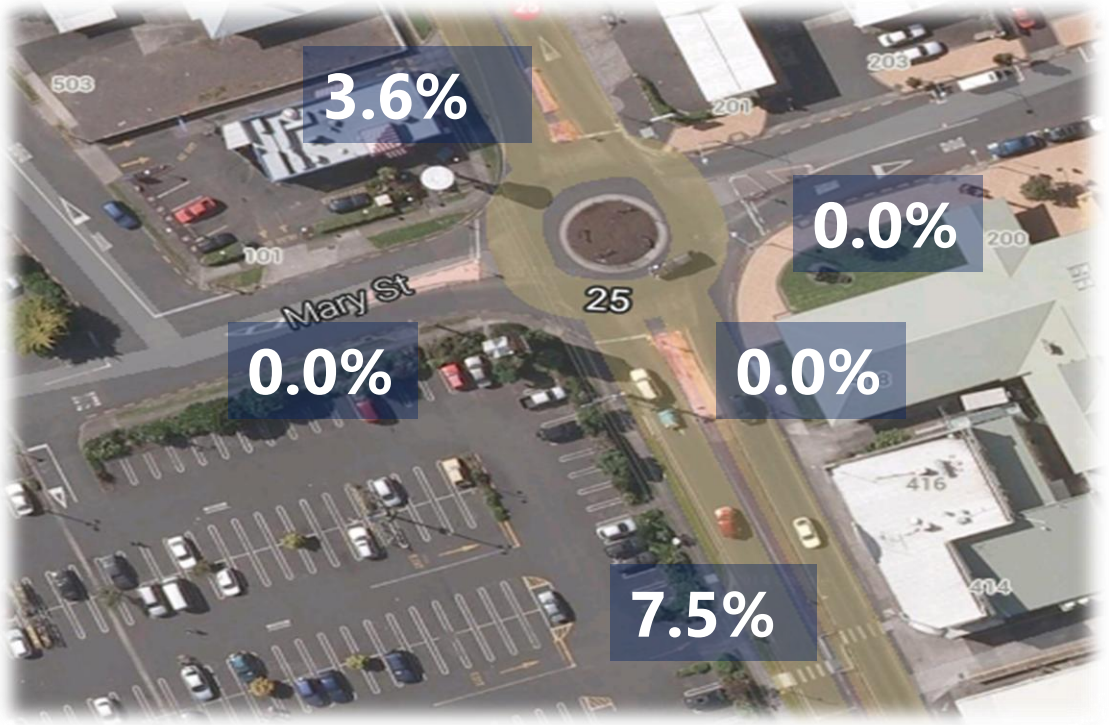
- the diversity of people who *reside* within a community = who lives here
- the diversity of people present at different places within a community = who is participating

Walking and Inclusive Access

1) Count diversity (gender, age, ability)

Example: Mary and Queen Street, Thames. Count of mobility aid users as proportion of people crossing the road

Different accessibility and perceived safety of different crossings results in different use



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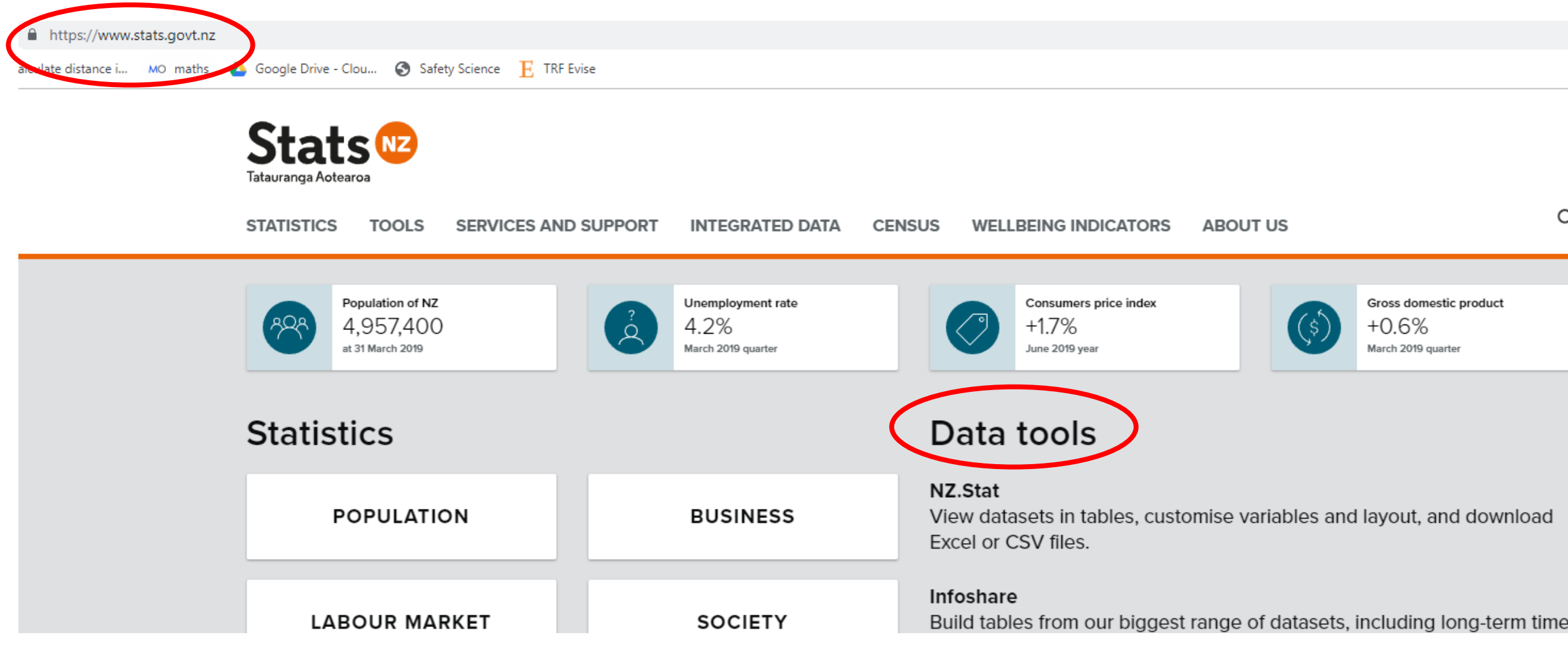
Walking and Inclusive Access

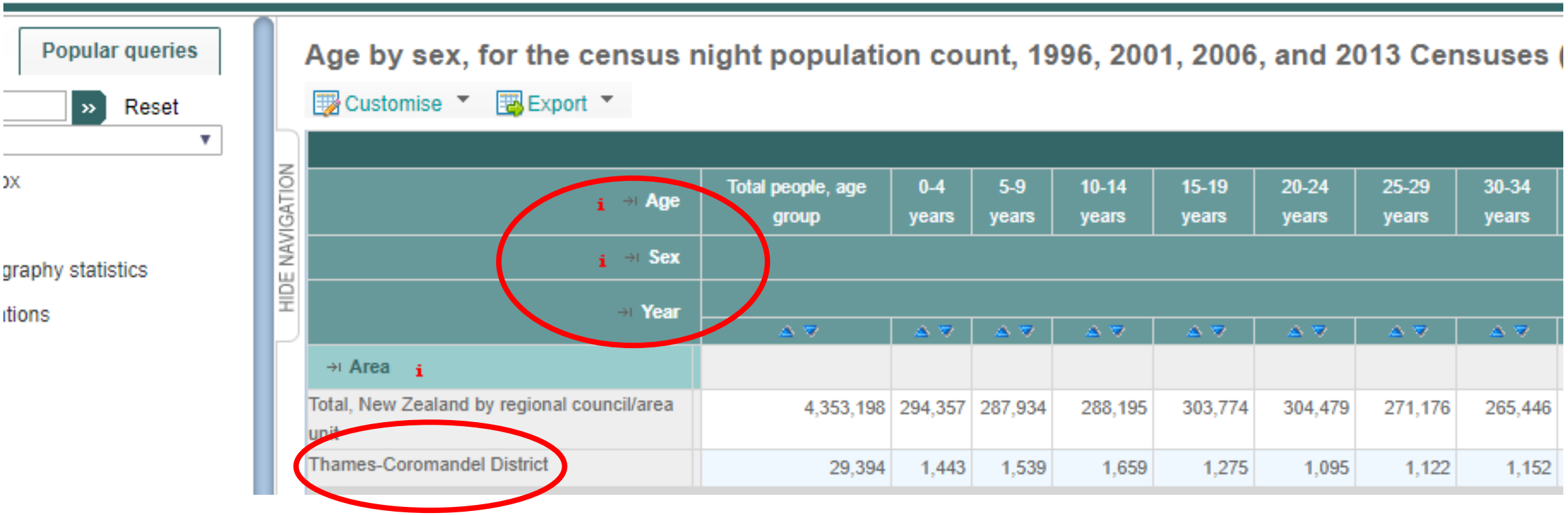
2) Compare revealed diversity on the street, to catchment variation



Walking and Inclusive Access

2) Compare revealed diversity on the street, to catchment variation

NZ.Stat



Walking and Inclusive Access

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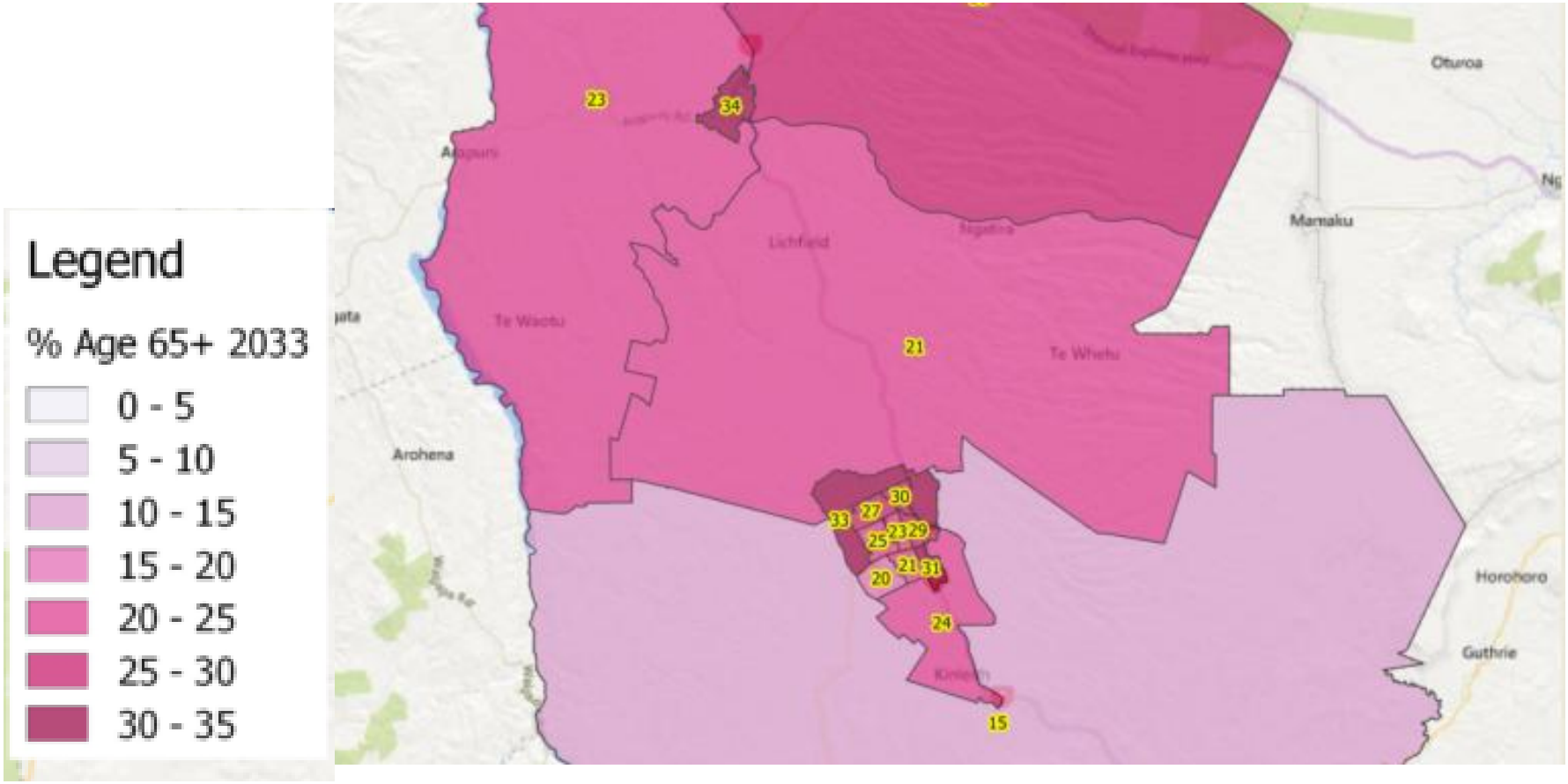


Summary: how to measure walking for different reasons

Regional and local strategies and plans

- Ask people how they behave, what mode choices they use, how often and for what trips.
- Include walking for exercise/recreation.
- Count people at different destinations to measure equity of participation.
- Analyse data to understand broad benefits of walking.

Prioritising infrastructure investment within a District, Town or City

- Compare count data with community population and demographics to establish unmet need for better infrastructure.

Summary: how to measure walking for different reasons

Concept/scheme design

- Count people using paths and crossing roads.
- Compare to local populations to estimate latent demand for walking.
- Use walking data to prioritise investment in better paths and crossings.

Resource management / Transport impact assessment

- Count people using paths and crossing roads to estimate the impact of land use change on local walkability.
- Use local population data to promote good walking infrastructure in public and private development (e.g. walkways through carparks and improved road crossings).
- Include walking and cycling data in trip generation calculations.

References

- Auckland City Business Case for Walking http://infocouncil.aucklandcouncil.govt.nz/Open/2017/08/CEN_20170823_AGN_7016_AT_files/CEN_20170823_AGN_7016_AT_Attachment_55166_1.PDF
- Burdett (2017) Understanding pedestrian safety in New Zealand https://www.yumpu.com/en/document/view/57937913/understanding-pedestrian-safety-in-new-zealand
- International Walking Data Standard http://files.designer.hoststar.ch/hoststar10546/file/1-international_walking_data_standard_version_aug_2016.pdf
- Measuring Accessible Journeys: Journal paper https://www.icevirtuallibrary.com/doi/abs/10.1680/muen.14.00004
- Ministry of Transport Household Travel Survey https://www.transport.govt.nz/mot-resources/household-travel-survey/
- Sport and Recreation New Zealand 'Active New Zealand' Survey https://sportnz.org.nz/managing-sport/search-for-a-resource/research/active-nz-survey-2017
- NZ Transport Agency Pedestrian Planning and Design Guide https://www.nzta.govt.nz/assets/resources/pedestrian-planning-guide/docs/pedestrian-planning-guide.pdf
- Statistics NZ data tables (NZ.Stat) http://nzdotstat.stats.govt.nz/wbos/Index.aspx
- Statistics NZ Journey to Work http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7432
- Statistics NZ Commuter transport modes https://www.stats.govt.nz/tools/commuter-view

bburdett@mrcagney.com

Cycle Monitoring

Aabley

Overview

- What can we measure? and Why?
- National guidance
  - Throughput monitoring
  - Baseline Data
- Case Studies

What can we measure?

- Volume
- Location (on-road, footpath and site location)
- Age
- Gender
- Trip/user type (e.g. recreational, utility, school, commute)
- ‘Bicycle’ type (e.g. e-bike, road bike, scooter etc.)
- Group size
- Perceptions/ attitudes (*requires interview/online surveys*)
- Crashes and near misses

Why measure?

- Communicate success
- Justify further investment
- Inform design, understand our users
- Assess progress towards our goals
- Identify under-representation in who is cycling
- Understand the health of our towns and cities

Developing your plan

National Guidance


Source: TfL

- Developed for the UCP
- Focus on throughput
- Include costs in project budgets (for new infrastructure)
- Available online: https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/cycle-network-and-route-planning-guide/process/monitoring-and-reporting/

4-steps for Throughput monitoring:

Data collection purpose

Number of count stations

Location of count stations

Count duration and method

Data collection purpose

- What are you going to use the data for?
- Who is your network/facility targeted at?
  - Commuters into CBD
  - School trips
  - Other utility trips
  - Linking to recreational facilities
  - Tourists
  - A mix?

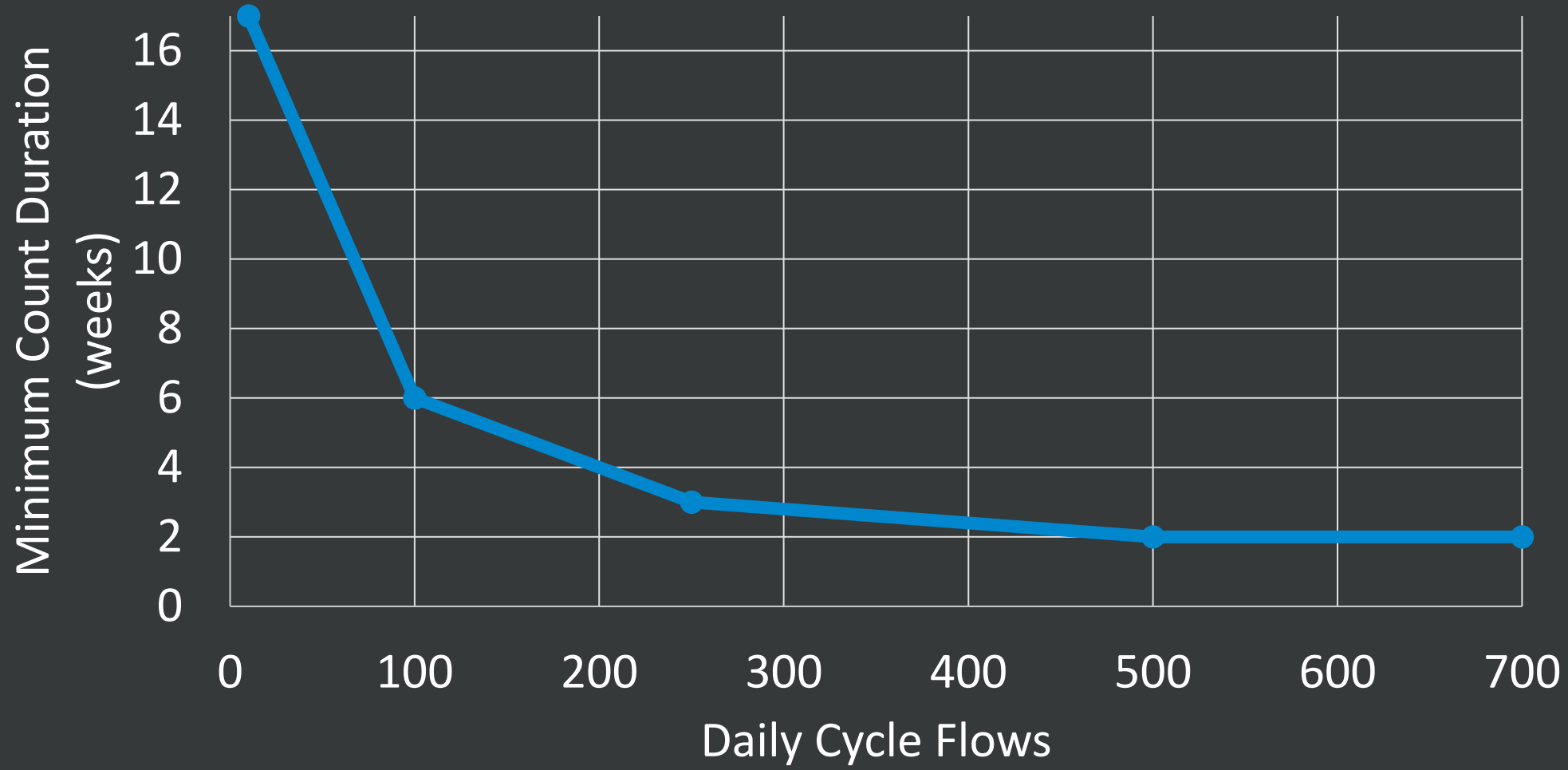
Population of discrete settlement	Suggested number of automatic count stations
<25,000	2–3
25,000–50,000	3–4
50,000–100,000	4–6
100,000–150,000	6–9
150,000–200,000	8–12
200,000–250,000	11–15
250,000–300,000	14–17
300,000–400,000	17–20
400,000+	City-specific plan required

The location of count stations is not an exact science….knowledge of local cycling is required.

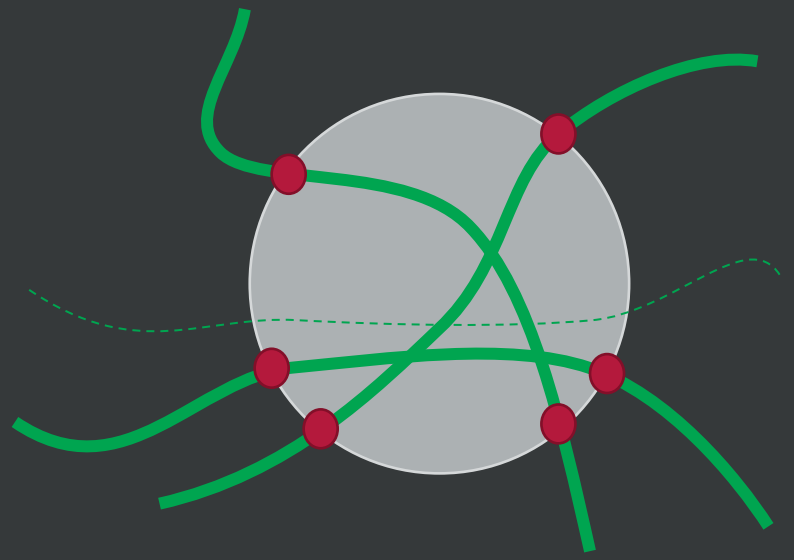
Location Principles

Source: TfL

	Principle
1	**Include key routes**
2	**Cover the range of broad facility types included in the network**
3	**Cover the range of user types and trip purposes on the network**
4	**Cover various adjacent land uses**
5	**Locate count stations where cycle flows are highest**
6	Ensure that there is some spatial separation between count stations
7	A mixture of tidal directions
8	Locate count stations at various distances from major trip attractors or along key routes
9	Prioritise identified count stations

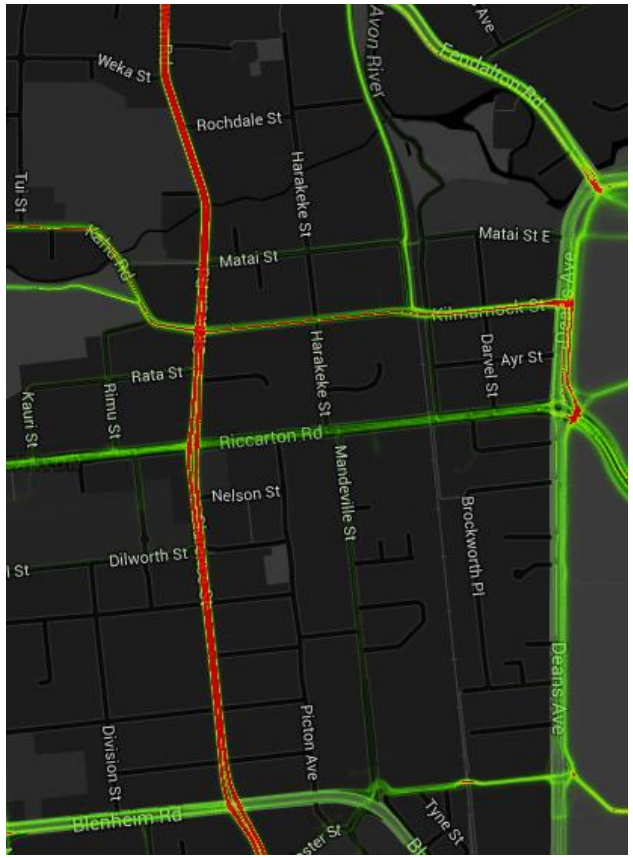

Minimum Count Duration (weeks)
16
14
12
10
8
6
4
2
0
0
100
200
300
400
500
600
700
Daily Cycle Flows

Count method



- Permanent counter
- Temporary automatic counter (minimum 2 weeks per year)
- Manual counts
  - Screenline and cordon counts
  - Allows supplementary information to be collected

Baseline Data



- ‘Before’ data – allows impact of investment to be measured
- Measure in similar locations to proposed future count stations
- Use existing data e.g. Strava to assist with choosing location
- Consider parallel routes

Case Studies

Whanganui

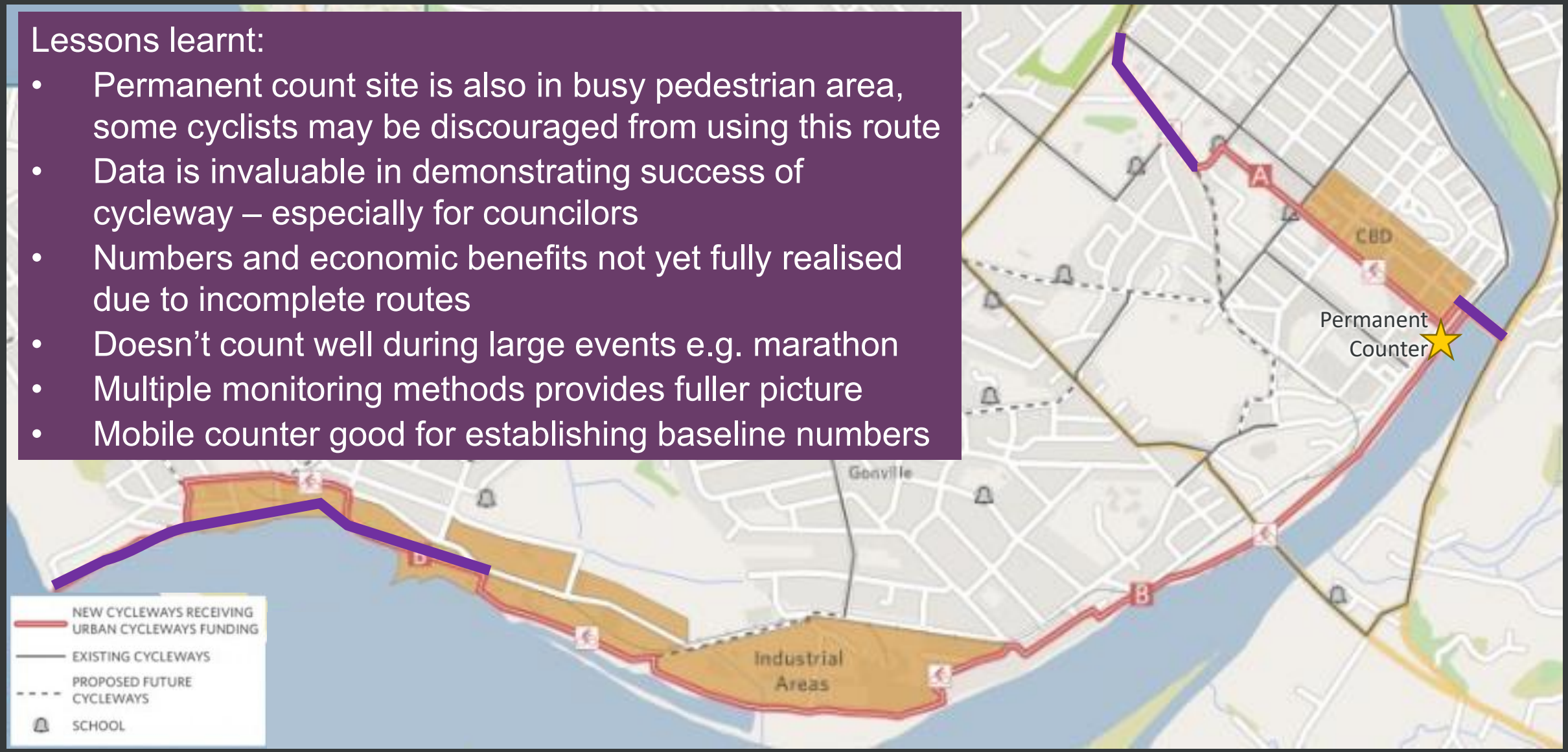
Monitoring plan:

- 1 permanent count site
- Recently purchased portable counter
- 2 further permanent sites to be installed once routes complete
- Annual manual cordon count
- School travel planning and surveys
- Supplemented by council survey

Ableyy

Lessons learnt:

- Permanent count site is also in busy pedestrian area, some cyclists may be discouraged from using this route
- Data is invaluable in demonstrating success of cycleway – especially for councilors
- Numbers and economic benefits not yet fully realised due to incomplete routes
- Doesn't count well during large events e.g. marathon
- Multiple monitoring methods provides fuller picture
- Mobile counter good for establishing baseline numbers



ably

Rotorua

Monitoring plan:

- 4 permanent count sites
- 2 portable counters (invaluable)
- Annual manual cordon count
  - Supplemented with further categories to understand: Type of wheeled device e.g. scooters, e-bikes and further disaggregation of age groups
- Initial monitoring plan was focused on cyclists only, but focus on shared path infrastructure means recording all wheeled user counts important too

Ableyy

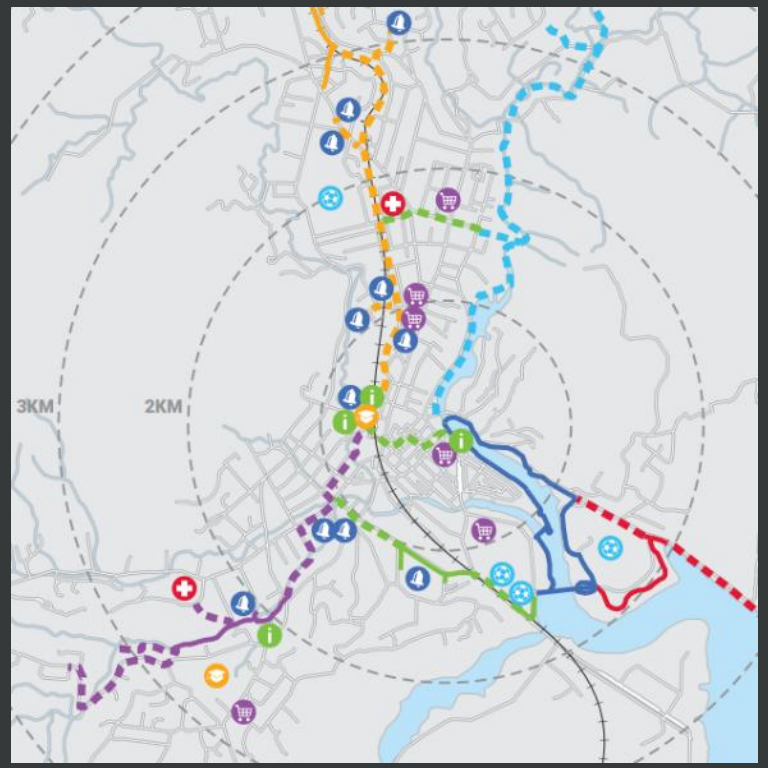
Lessons learnt:

- Monitoring plan provides a good snapshot for cycling to CBD but not other destinations e.g. schools and recreation
- Splitting age group further provides an understanding of use by primary vs. high schools
- The people used to undertake manual cordon count has a big impact on data quality
- Seasonality due to tourism and events (e.g. Crankworx) means large peaks and troughs in recorded counts
- Portable counter used to justify additional cycle facilities and respond to resident requests – some limitations on where this can be placed

AWAY FROM CBD						
Number of pedestrians:						
(C`)yclist, (S)cooter, (SK)ateboard, (E`)bike, (M)obility scooter, (O)ther	(R`)oad, (S)hared path, (F)ootpath	(M)ale of (F)emale	(C`)hild / (T)eenager / (A)dult	(S)chool, (W)ork, (M)t biker, (R`)oad cyclist, (O)ther	(G)roup or (I)ndividual G/I	Notes
EXAMPLE:						
C	R	F	A	R	I	

Mobley

Whangarei

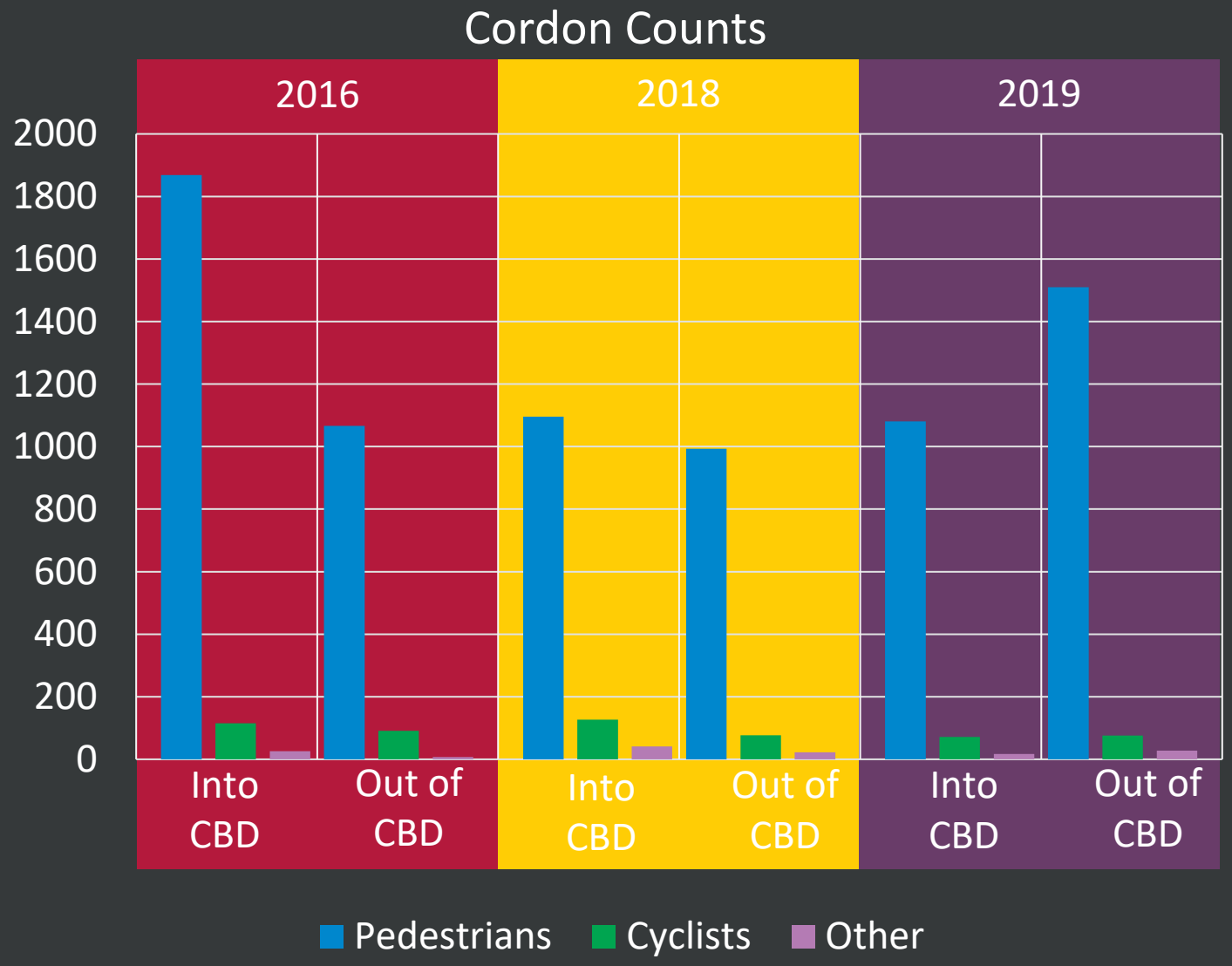


Monitoring plan:

- Currently annual manual cordon count only around CBD – uses CCTV in some locations
- Electronic counter with sign displaying pedestrian and cyclist numbers has been ordered
- SCATS data at signals will also be used to supplement cycle count data

Lessons learnt:

- Highest use of network has been recorded near schools, this is where electronic counter will be installed
- Cordon count good for measuring snapshot of how many people travelling into CBD but doesn't allow understanding of uptake on routes
- Many people use short segments of routes but do not travel from end to end
- Using SCATS data has been more difficult than initially anticipated



Kia ora koutou!

Contact:
Courtney Groundwater
Courtney.groundwater@abley.com

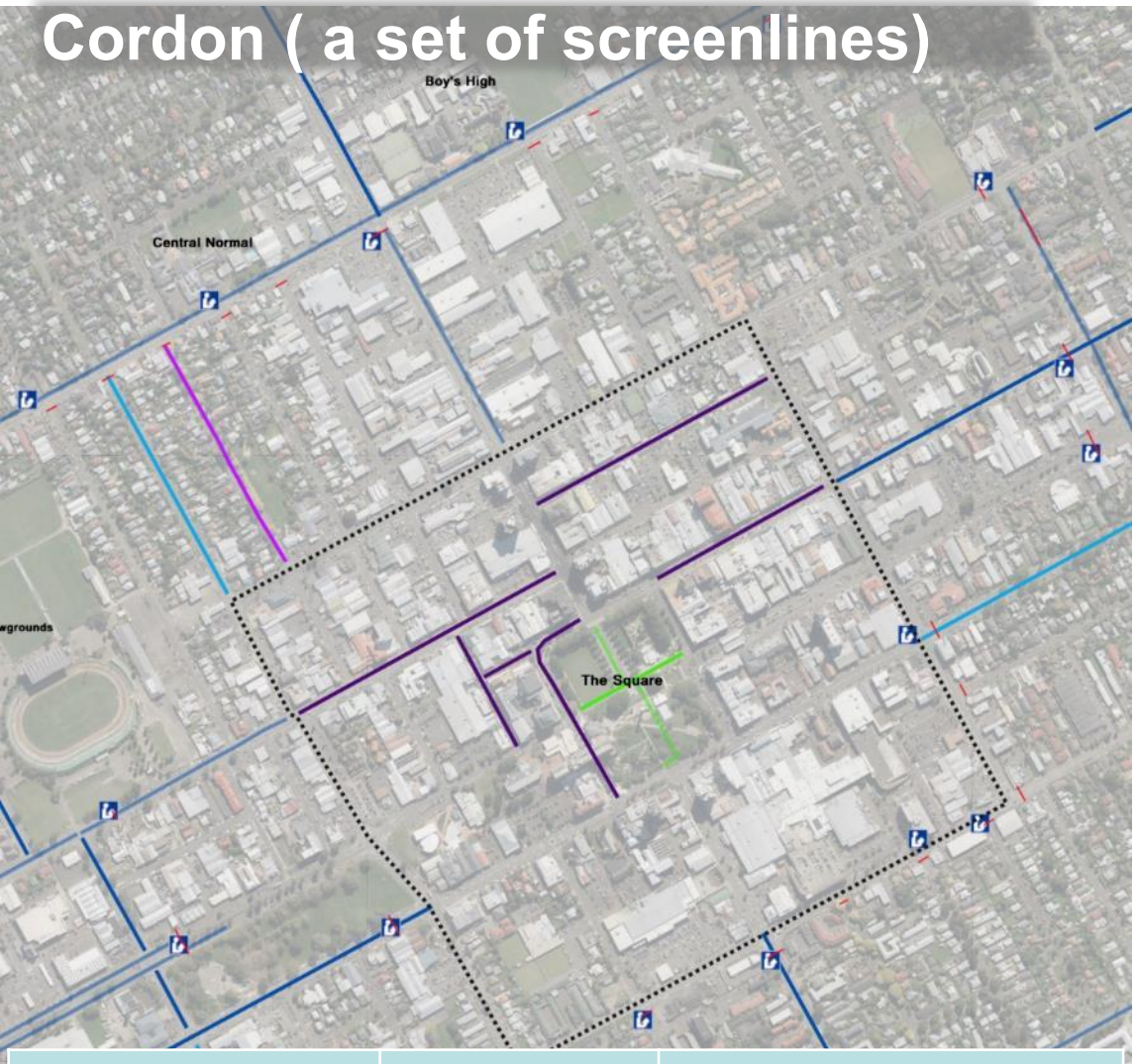
Non-motorised user monitoring technology

John Lieswyn, MET, PTP
Director, Senior Transport Planner
ViaStrada

Technologies session overview

Manual counts: WHERE

Cordon (a set of screenlines)



Female	Adults	Footpath riding
17%	59%	8%

Intersection

National Bicycle and Pedestrian Documentation Project: Forms

INTERSECTION

Name: _____ Location: _____

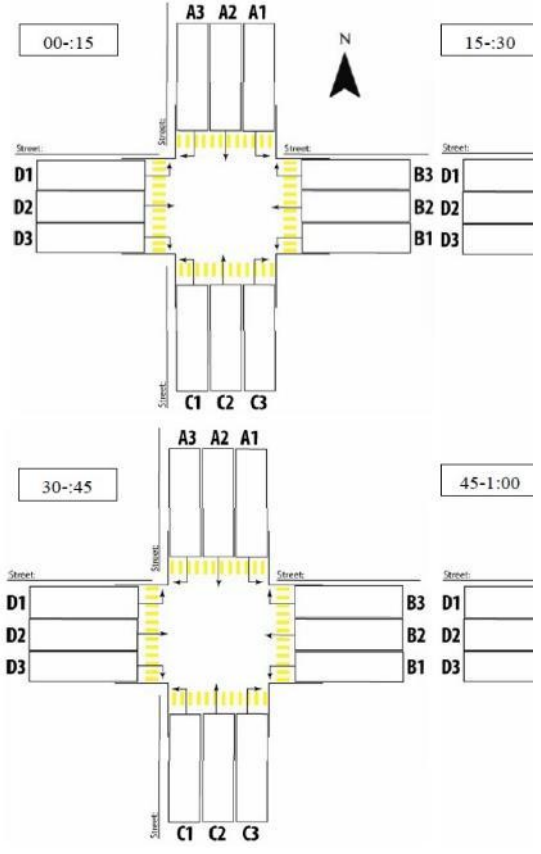
Date: _____ Start Time: _____

Weather: _____

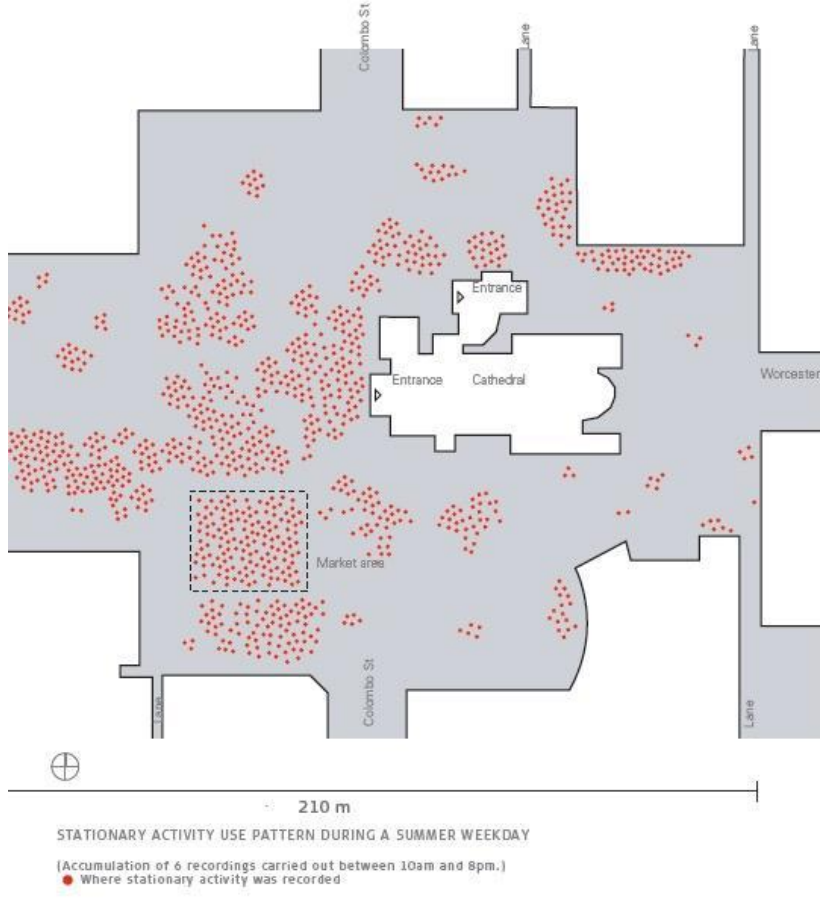
Please fill in your name, count location, date, time period, and w

Count all bicyclists crossing through the intersection under the appropriate ca

- Count for two hours in 15-minute increments.
- Count bicyclists who ride on the sidewalk.
- Count the number of people on the bicycle, not the number of bicycles.
- Use one intersection graphic per 15-minute interval.



Key activity centre



Manual counts: WHO

Resource	Pros	Cons
Council staff	• Easy to organise	• May not have enough people
Volunteers	• Free	• Organisation & training intensive • Requires audits to ensure quality
Contractor	• Professional	• High cost • Limited availability esp. in smaller centres
Public (crowd-sourcing)	• Free	• Not necessarily where you need the counts

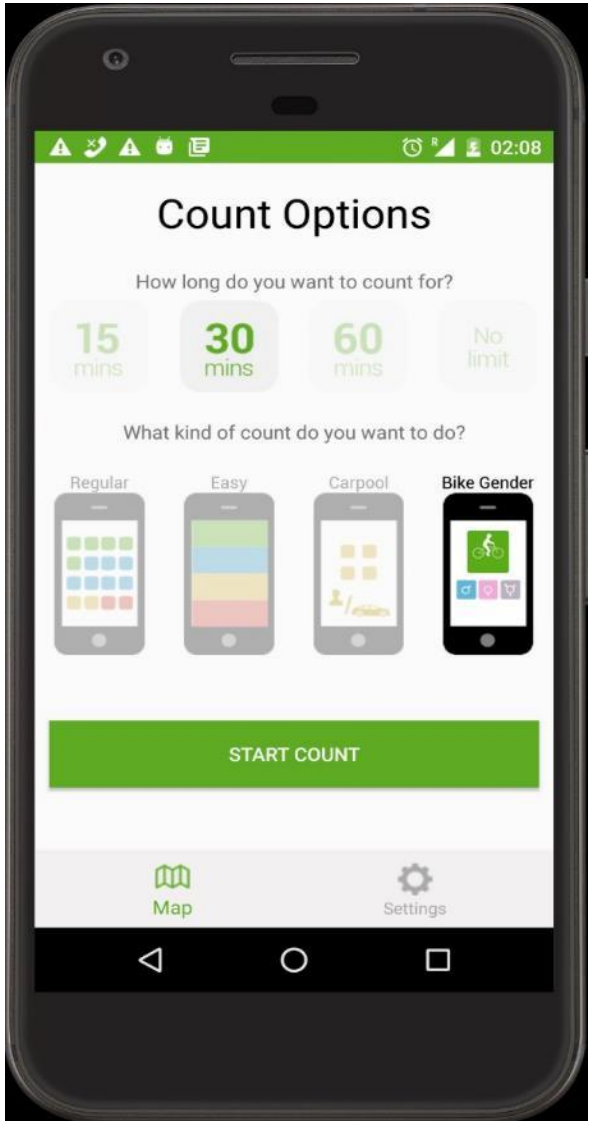
Training & logistics

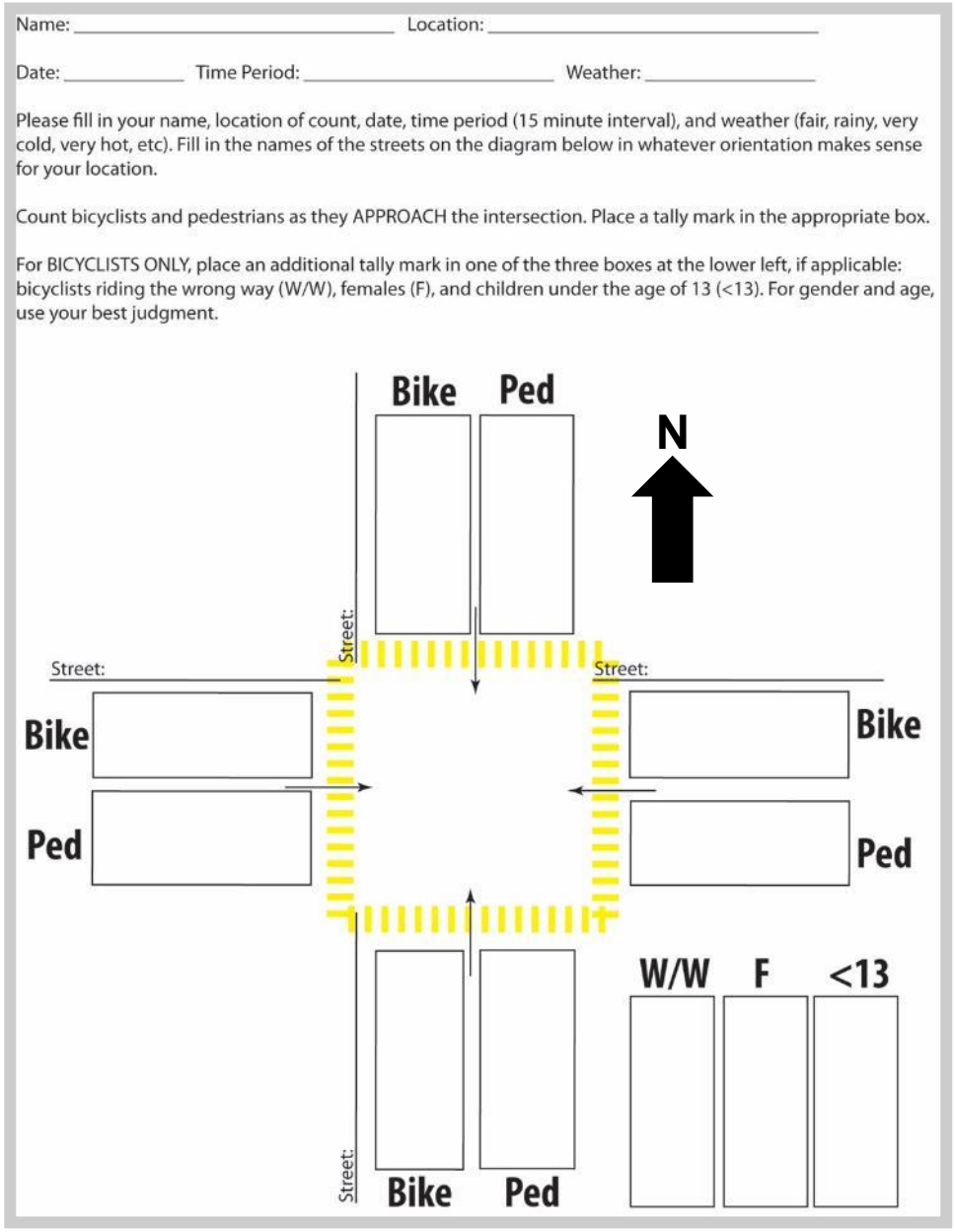
Arrive 15 min early to scope out vantage point. Bring:

- ❑ Count forms & instructions
- ❑ Location map
- ❑ Clipboard
- ❑ Pen or pencil and a spare
- ❑ Watch or cell phone countdown timer set to15 minute intervals
- ❑ Safety vest
- ❑ Optional: hat, sunscreen, jacket, folding chair, snacks, water
- ❑ **WHO TO CONTACT – name and number**

VIASTRADA

Manual counts: HOW





Manual counts: how do you count this?

3 cyclists

Count people, not bicycles

And “tick”
- 3 females
- 2 children (under 12)

VIASTRADA

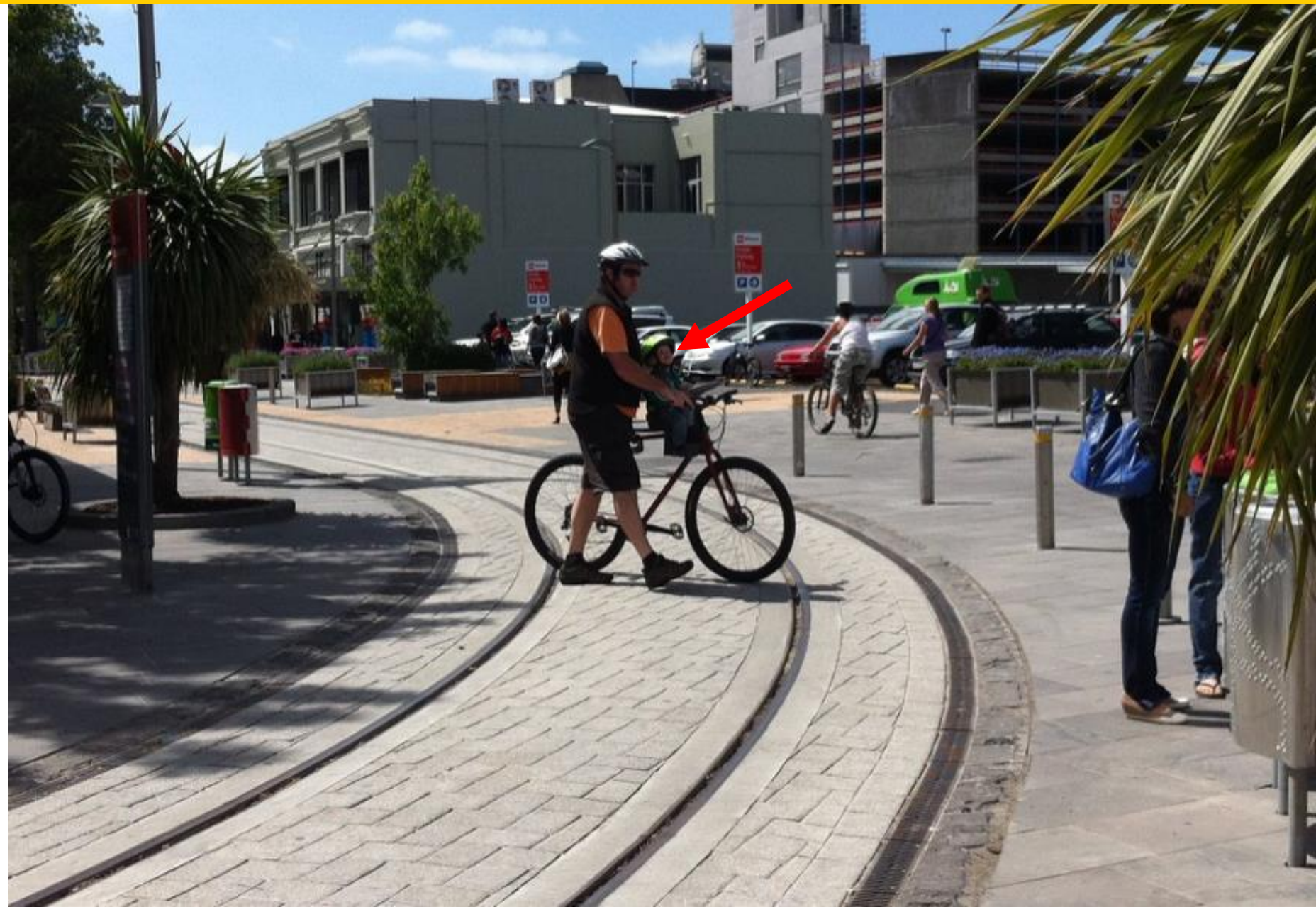
How do you count this?

2 peds

Count based on current mode

And tick:

- 2 males
- 1 child



VIASTRADA

Automatic counters CNG Guidance – Table 10

RADAR DETECTOR	RadioBeam Bicycle Counter (Chambers Electronics)		✓	✓			?			✓	?
	SDR Bike (datacollect)	✓	✓	✓			✓				✓
IN-GROUND PRESSURE DETECTOR	MC5720 (MetroCount)		✓	✓	✓	✓	✓	?	?	✓	
INDUCTIVE LOOP DETECTOR	Bicycle Recorder (Counters and Accessories)		✓	✓			✓			✓	
	ZELT (Eco-Counter)		✓	✓	✓	✓	✓	✓	✓	✓	
PASSIVE INFRARED DETECTOR[2]	PYRO (Eco-Counter)	✓	✓	✓							✓
PNEUMATIC TUBE DETECTOR	MC5620] (MetroCount)	✓	?		✓	✓	✓			✓	
	TUBE (Eco-Counter)	✓	?		✓	✓	✓	✓	✓	✓	
ABOVE-GROUND PRESSURE DETECTOR	eTube bike (datacollect)	✓	?		?	✓	✓			✓	
VIDEO IMAGING PROCESSING[3]	Mio-Vision[4]	✓			✓	✓		✓			
	Signal Cameras in local Transport Operations Centre – may require special technology.	✓[5]	✓	✓	✓	✓		✓			

NOTES

1 May not be an exhaustive list, focuses on known technology used currently or trialled in New Zealand.

2 Does not differentiate between cyclists and pedestrians therefore must be used in conjunction with other cycle count technology, eg ZELT loops can be integrated.

3 Generally at intersections only.

4 12–72 hours only (eg instead of manual counts). Also has high data processing costs unless used as part of a wider count programme.

5 May also be able to use signals cameras for manual/cordon

https://www.nzta.govt.nz/assets/Walking-Cycling-and-Public-Transport/img/cycle-network-guidance/illlustrations/summary-of-cycle-counting-technologies.jpg

Types of sensors

Code	Type of sensor	Code	Type of sensor
9	Multiple	S	Sonic/acoustic
H	Human observation	T	Tape switch
I	Passive infrared	3	Pressure sensor/mat
2	Active infrared	U	Ultrasonic
K	Laser/lidar	V	Video (automatic processing)
L	Inductive loop	1	Video (manual processing)
M	Magnetometer	W	Microwave (radar)
P	Piezoelectric	X	Radio wave (radar)
Q	Quartz piezoelectric	Z	Other
R	Pneumatic air tube		

VIASTRADA

Source: FHWA (2016) Coding Nonmotorized Station Location in the 2016 Traffic Monitoring Guide Format

Metrocount RidePod

- Cycle specific algorithms and tubes
- Cycle lanes and pathways

VIASTRADA

Wrong tool and/or incorrect installation

Bicycle Counting with RidePod® BT

About RidePod BT

This bicycle counter is designed for off-road cycleways, shared-paths, and on-road segregated bicycle lanes. Although related to the original RoadPod® VT tube counter, RidePod BT is optimised for detecting cyclists and only in certain circumstances can it be used in mixed traffic.

Any version of the MTE® software from v4.08 onwards is suitable for dealing with this device.

Short-term bike surveys should last a few weeks at least so they take into account discretionary travel, weather dependence and the (non-) regularity of commuter vs recreational travel.

VIASTRADA

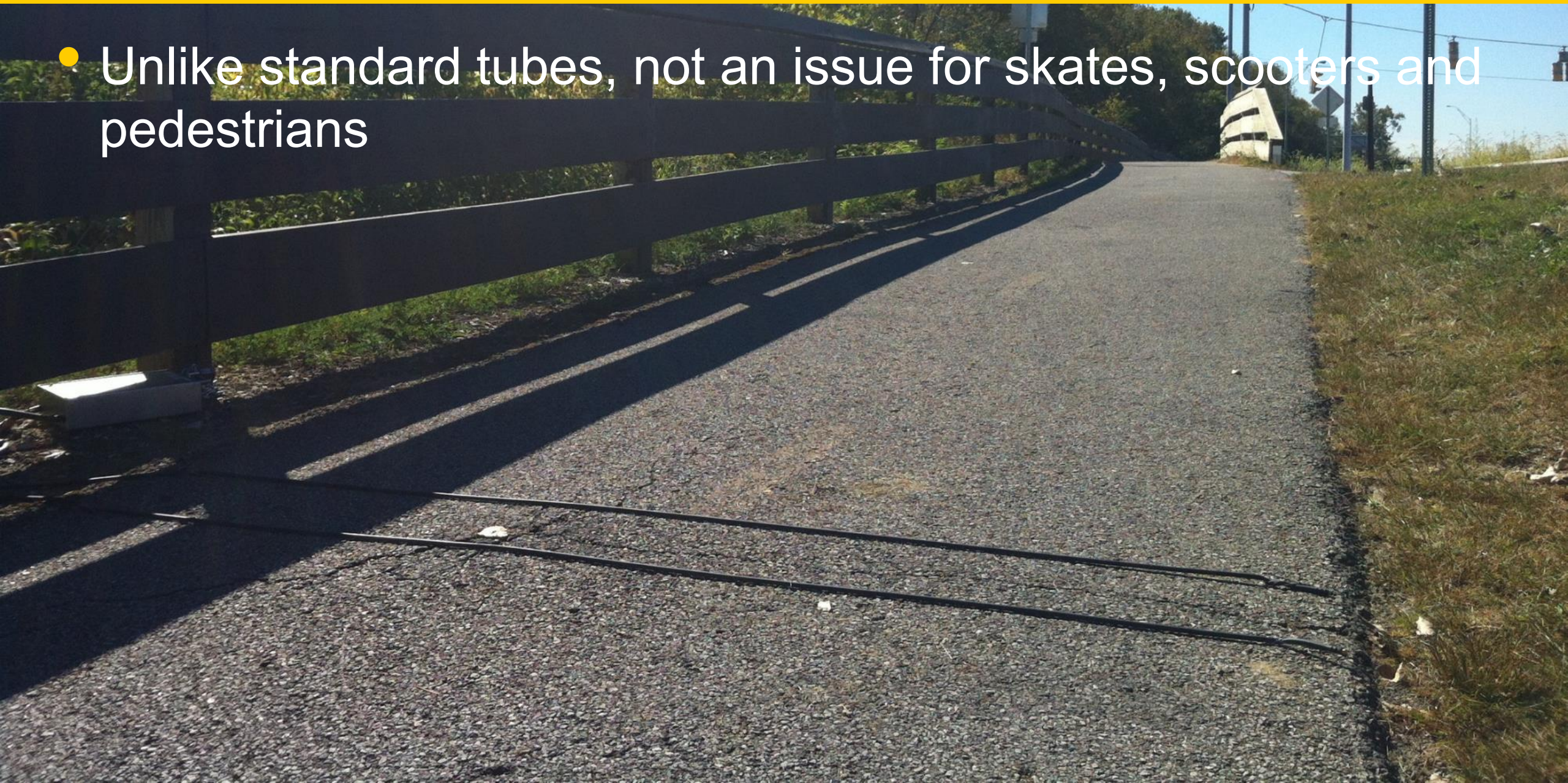
Undercount (1)

Significant undercount
Cyclists miss tubes because they are coming from a lateral position right of kerb due to car parking in previous block

Undercount (2)

Moderate undercount
Cyclists miss tubes because they are coming from a lateral position right of kerb due to car parking (background) and kerb extension

Thin tubes are not a trip hazard



- Unlike standard tubes, not an issue for skates, scooters and pedestrians

Same site – infrared counter for peds

- Simply subtract the cycle count

EcoCounter types

	Multi Nature	Multi Urban	Mobile Multi
Duration	Continuous	7 day – continuous	7 day – 2 mo
Sensor	Infrared / loops	Infrared	Infrared / tubes
Logger →	Disc style, separate	All in one, fixed post	All in one, band clamp
Facility type	Cycle lanes, paths	Cycle lanes, paths	Anything, incl. mixed traffic
			

Siting considerations

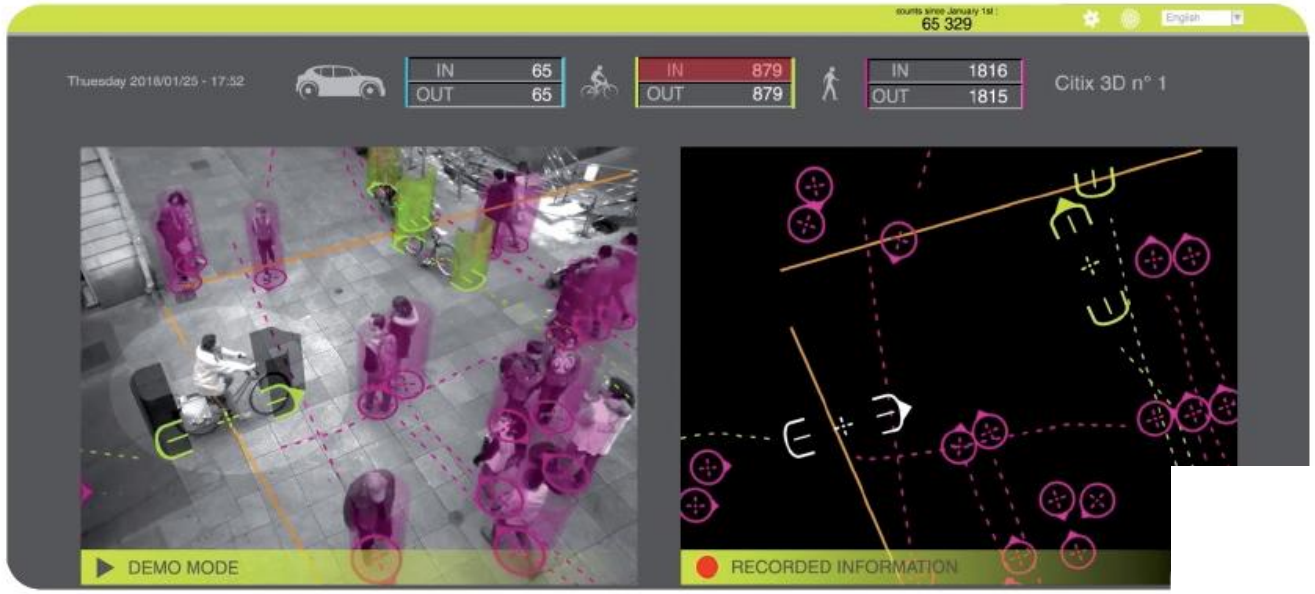
- Loading zones and bus stops
- High voltage lines
- Cellular strength
- Intersections
- Road maintenance programme

Best effort, and they ride by on the footpath…

Video example 1

- Large groups
- Low light video
- Classifies cars, bikes, peds regardless of movement direction
- Mains power

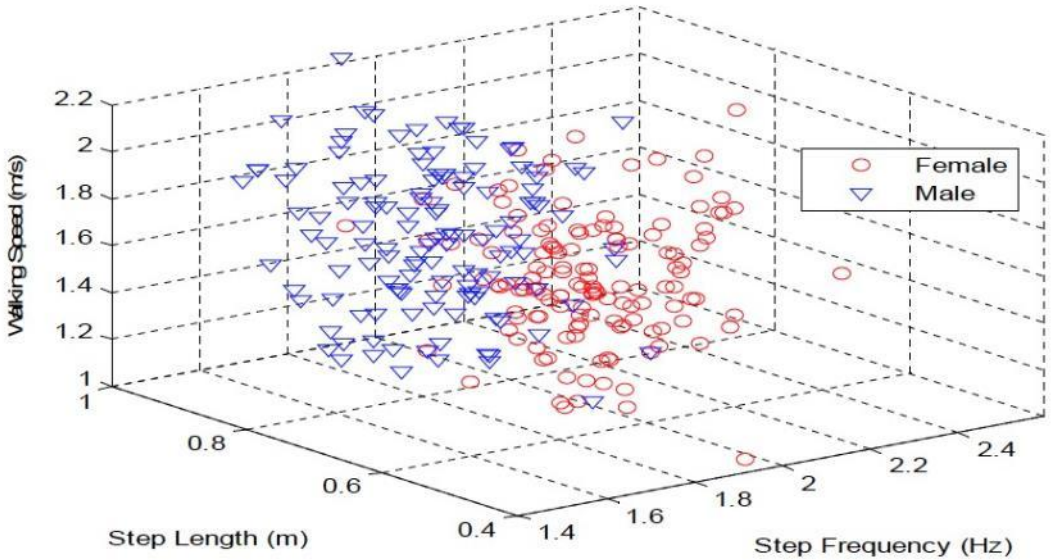
CITIX-3D Sensor
Rear view

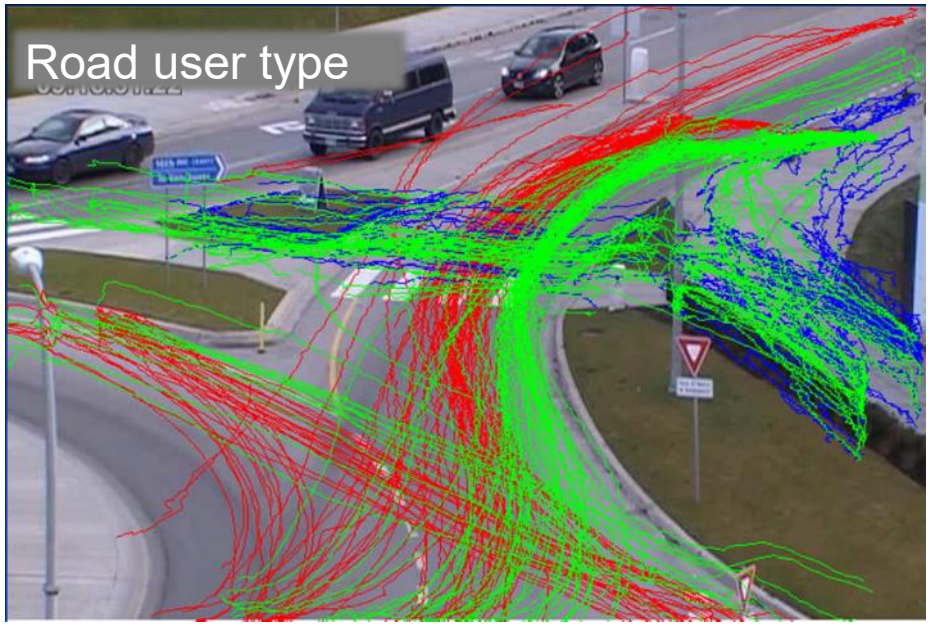


Video example 2 – software innovation

Dynamic movement mechanisms

- Pedestrians: ambulation (gait)
- Cyclists: pedalling
- Vehicles: linear movement





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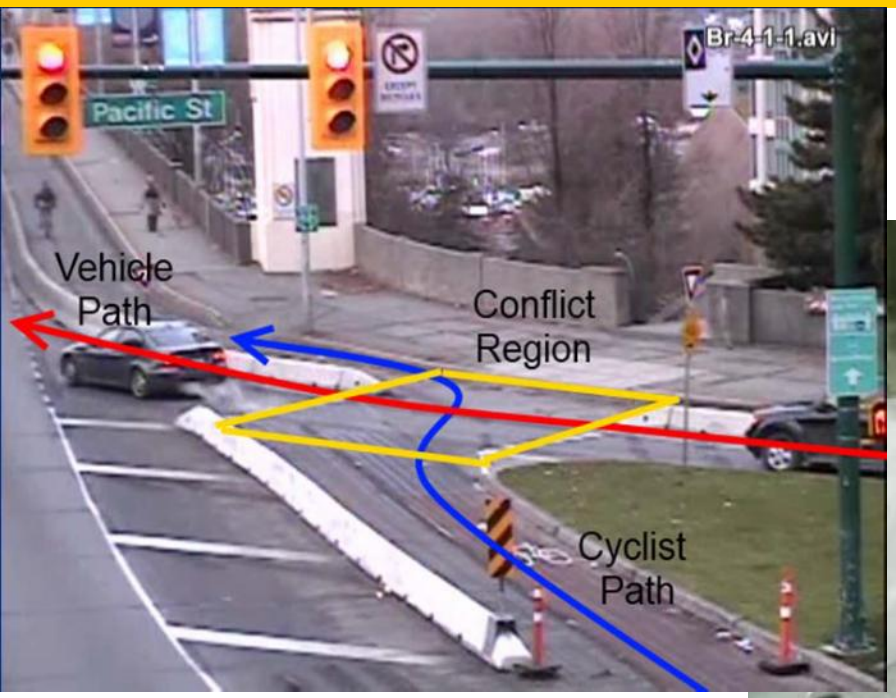
Video example 2 (cont'd): conflict study



http://docs.trb.org/prp/13-0745.pdf

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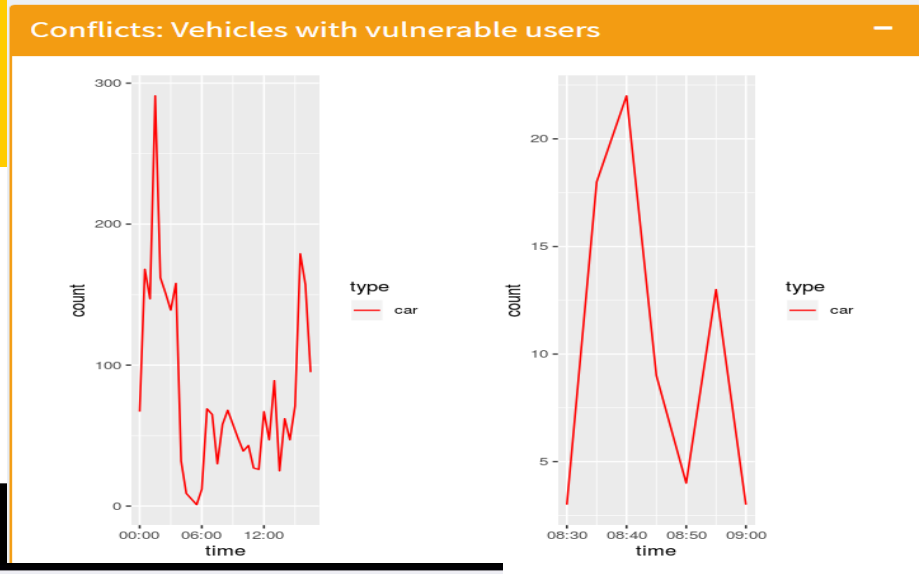
Video example 3: Nelson Trial

Link: https://roads.net.nz/i2i/reports/waimea-road/



Stantec | Waimea Road

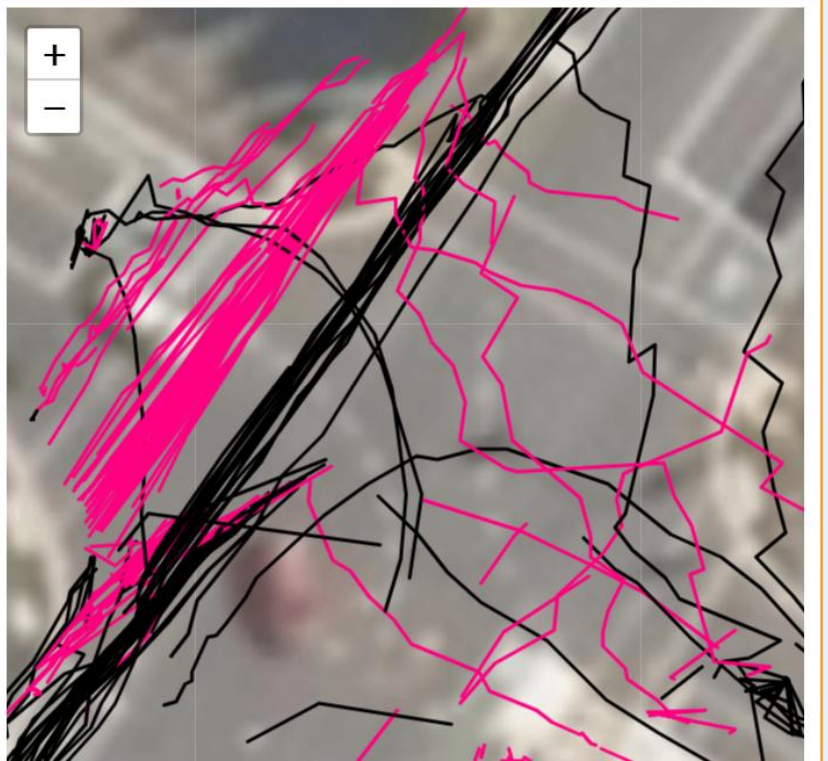
Object Types
car, cyclist

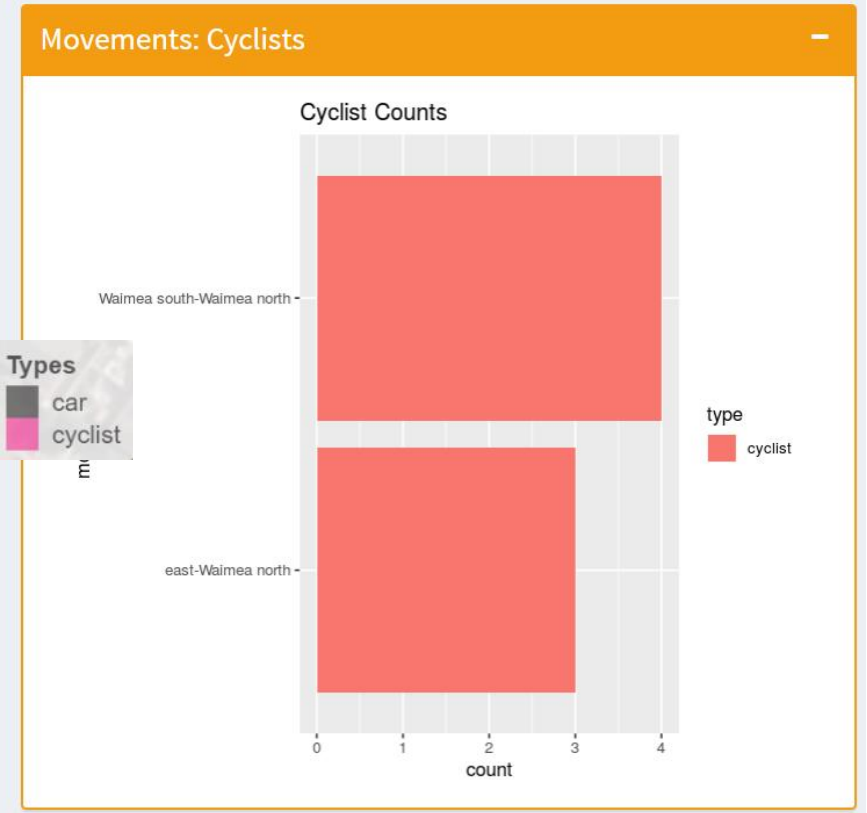
Date
12.2.2019

Start Time (HH:MM):
08 30

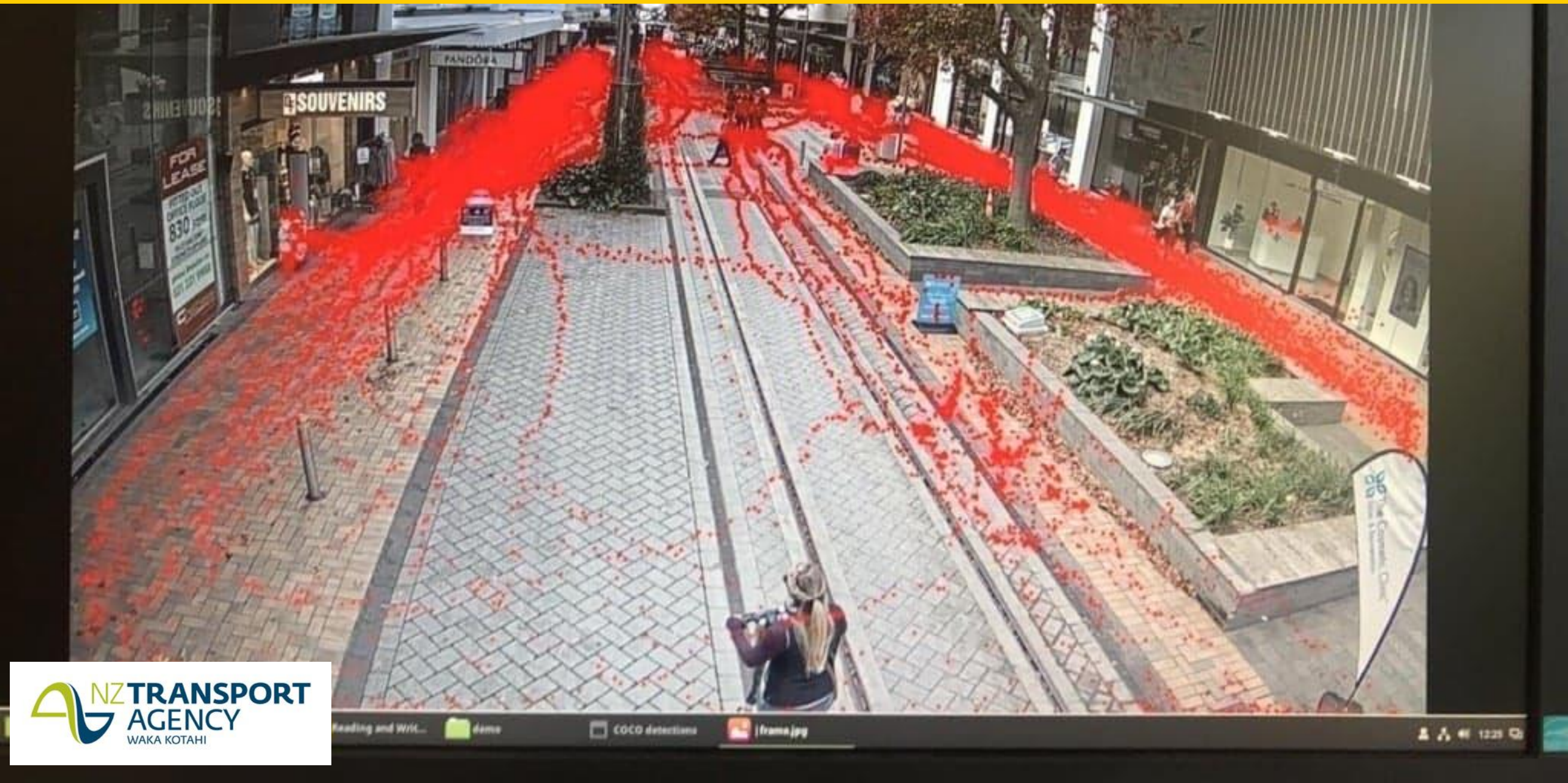
Duration (mins):
30

Display
Conflicts





Video example 4: pedestrian activity on Cashel Mall



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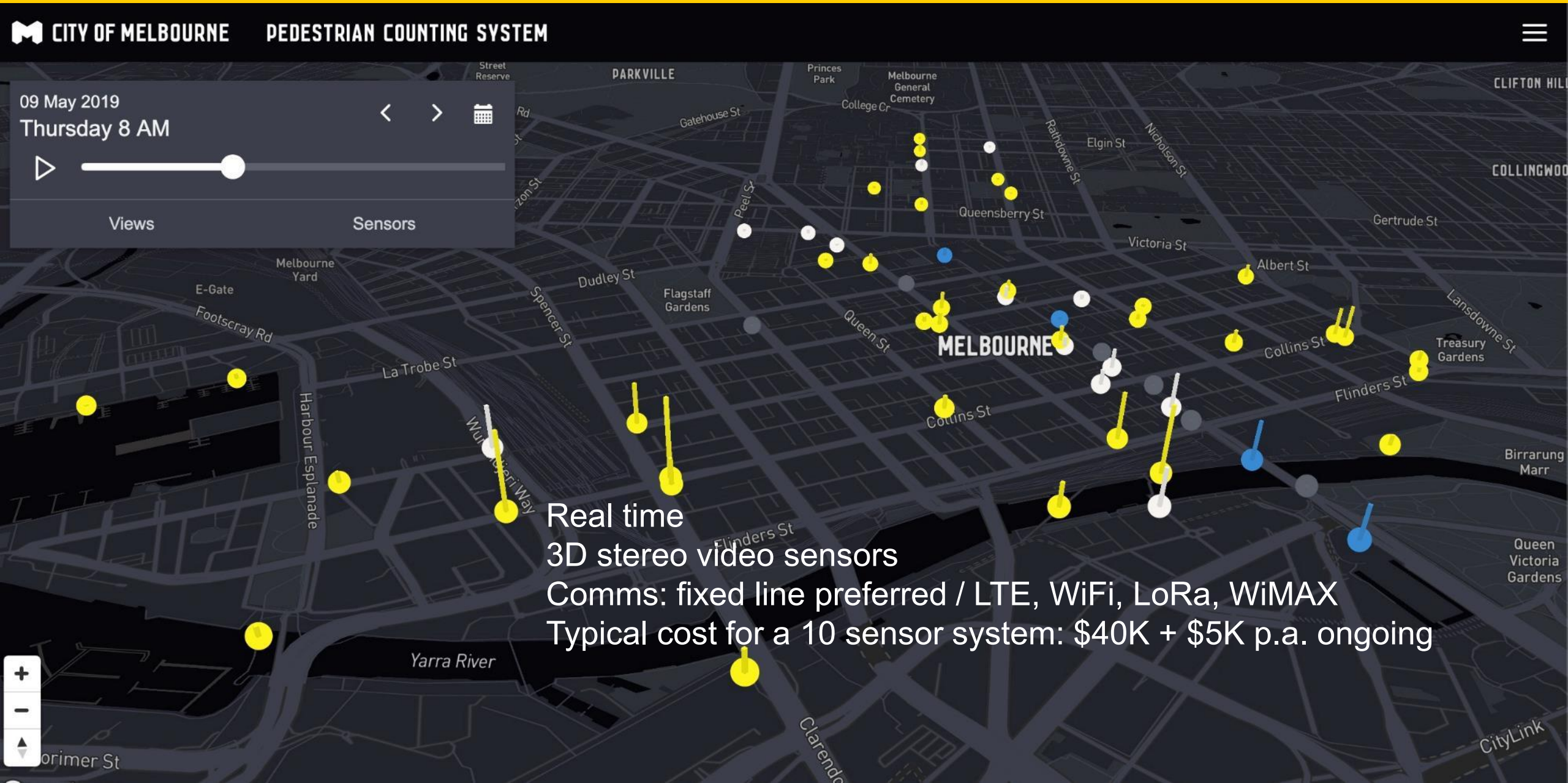
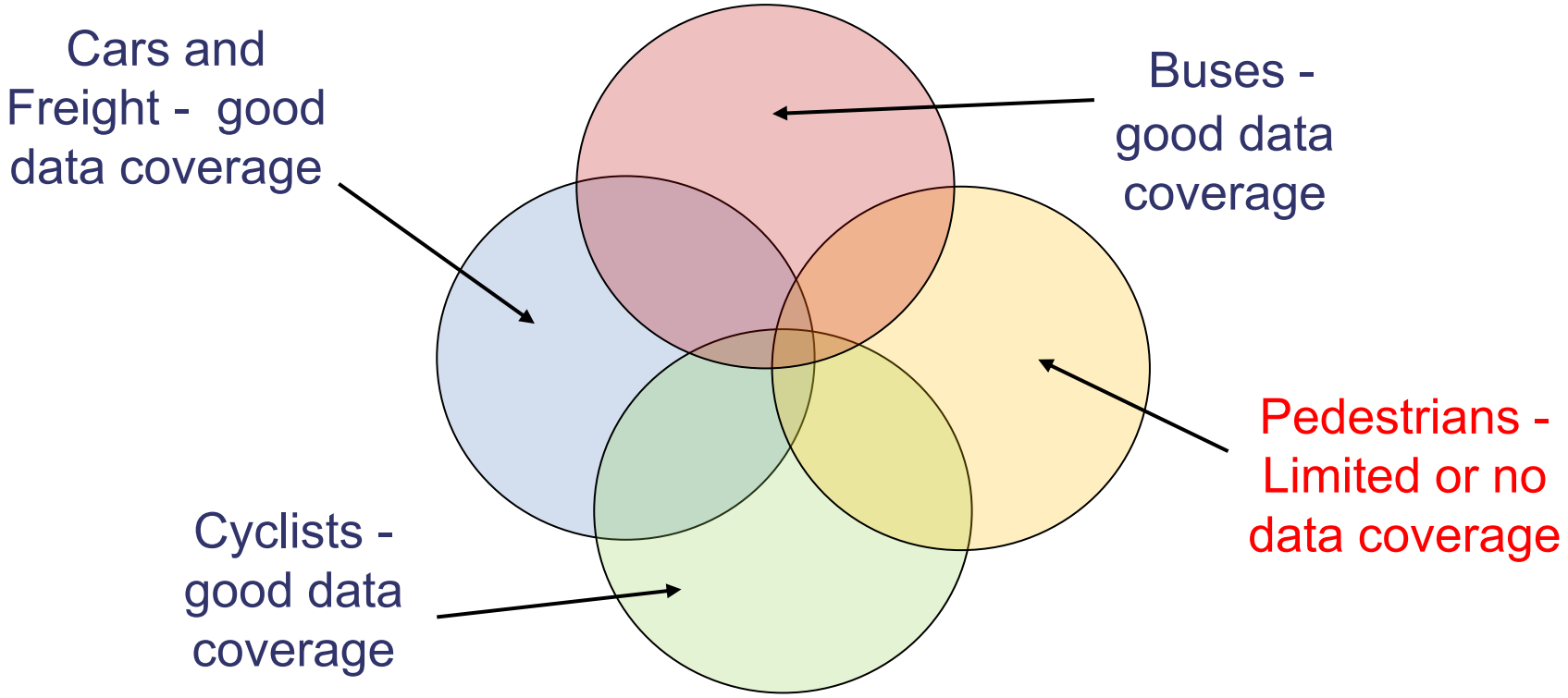
Video example 5: real-time tracking

Video example 5: output at city scale



Video example 6: Moorhouse / Brougham project

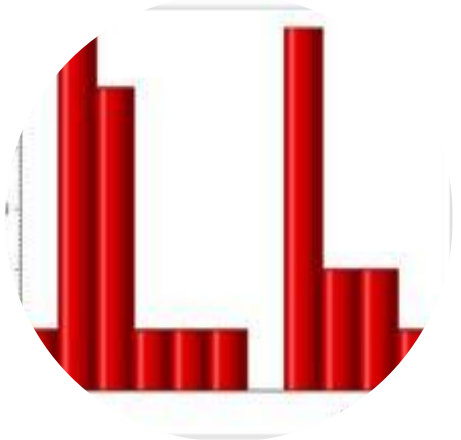


Cost per site hour for video classified turning counts is relatively high. What can we do with existing cameras?

Video example 6 cont'd: methods

CTOC FLIR ThermiOne cameras capable of detecting pedestrian presence at signalised crossings

Virtual pedestrian detection zones are set up on video images to define the area where pedestrian are crossing



FLUX configured to generate pedestrian count in Excel

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Example 6 cont'd: images

Other tech

- Wireless traffic signal detection e.g. Sensys puck (pictured)
- Radio Frequency ID tags (RFID)
- Trip sampling via bluetooth / WiFi detection
- GPS data collection

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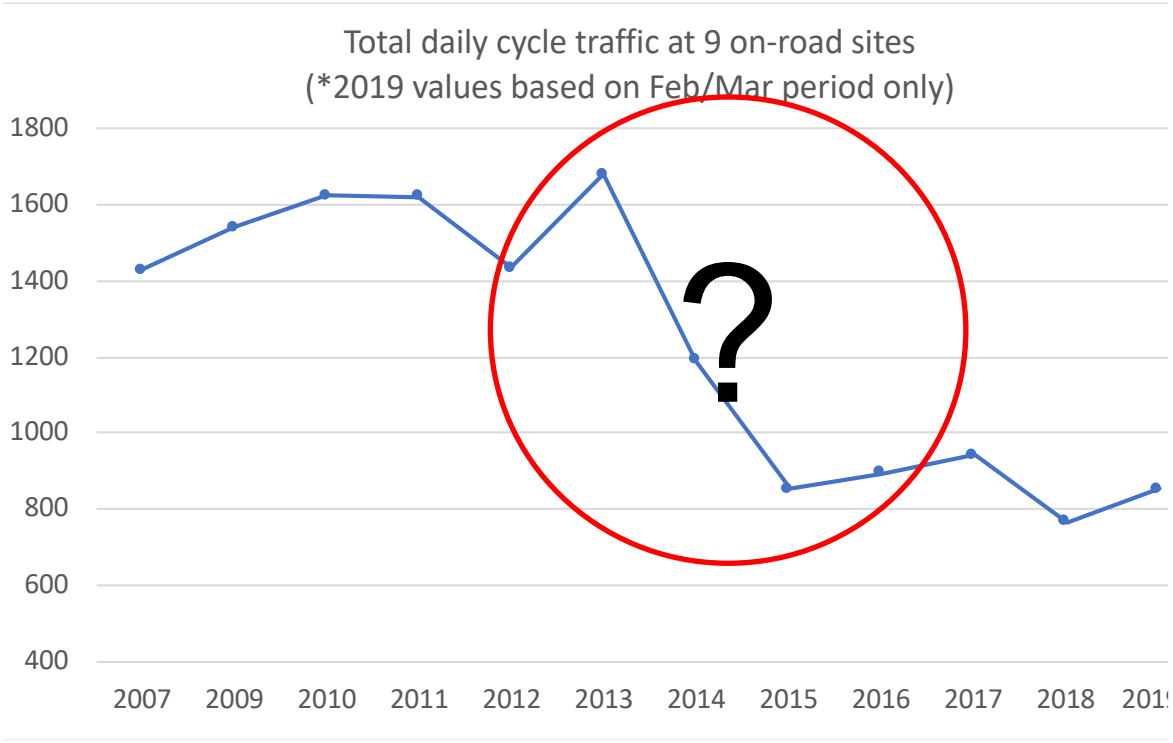
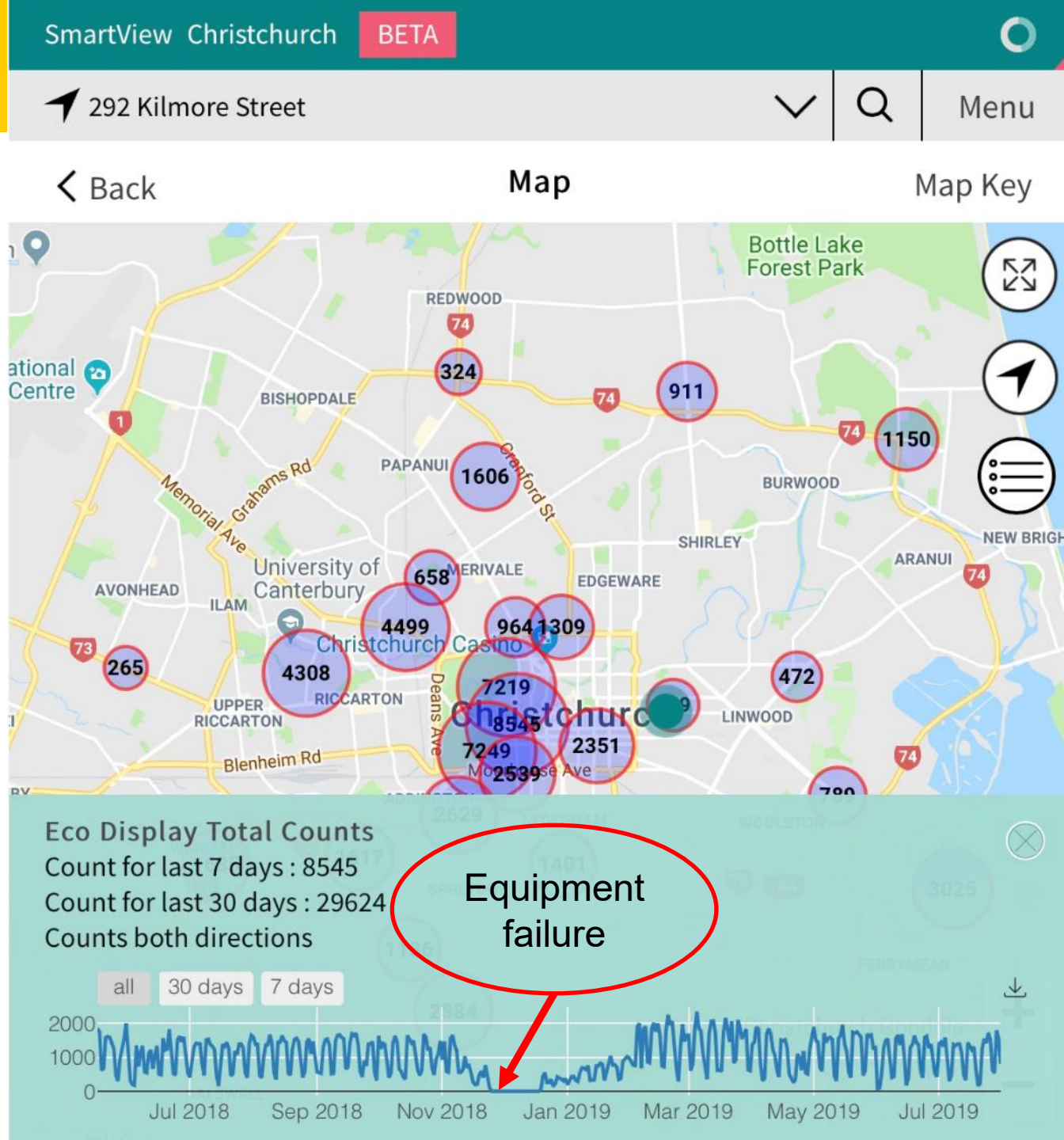
What happened?

Cycling activity really collapsed?

Sites or methods changed?





Statistical checks & reporting

- Scaling to AADTs
- Consider the Coefficient of Variation (CoV)
- For short term counts, include confidence intervals

Cycle Count Scaling Spreadsheet

Road Controlling Authority:	Example
Short term count station:	Example
Clear all cells	Long term count station: Example

Inputs

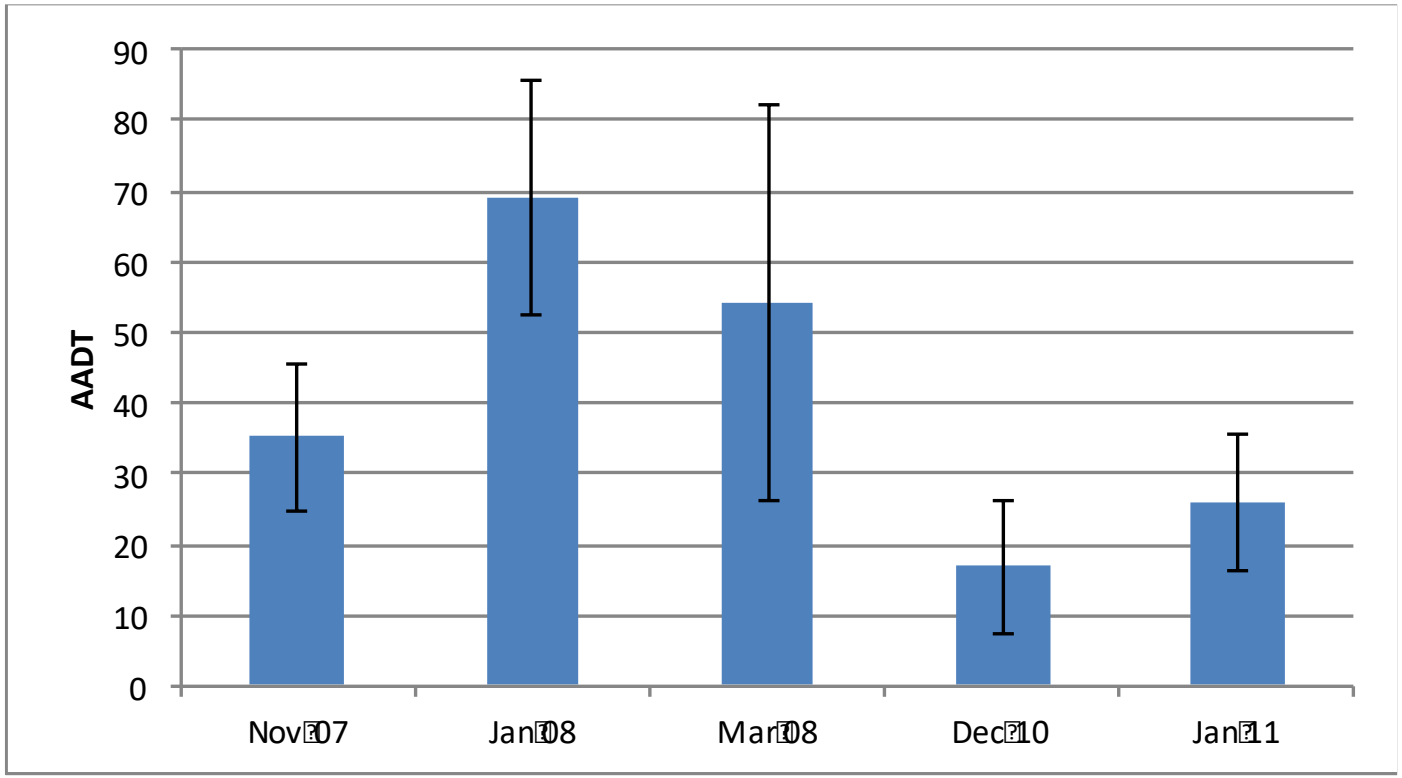
What time intervals are counts in?	15-min		
	Day	Month	Year
When is the start of your calibration count data?	1	January	
When is the end of your calibration count data?	31	December	
When do your short term counts begin?	3	July	
When do your short term counts end?	17	July	
Which day does your weekend peak occur on?	Saturday		
Which hour does your weekend four hour peak begin?	10		

Outputs

	Daily Cyclist Outputs		Weekday Peak Cyclist (7am
	Unscaled count (from short term count) (ADC-7):	89	Unscaled count (from
A	Long term count (ADC-7):	197	*A* Long te
B	Long term count (during short term period):	145	*B* Long term count (during
A/B	Scaling factor:	1.359	*A/B*
	Annual average daily cyclists (AADC-7):	121	Annual average peal
	Coefficient of determination (R^2):	0.78	

Notes

Up to one year (366 days) of short-term data can be entered into "Short Term Data Entry" tab
Up to one year (366 days) of long-term data can be entered into "Calibration Data Entry" tab
Make sure entered dates are valid. Short term count period must fall within annual count period.
Only one long-term and one short-term count can be entered at a time.
Time is in 24-hour format (e.g. 11:50 pm is 23:50).
Blue cells to be filled in by user, complete front page first before entering data. Yellow cells provide values for entry into TIO



Summary

- Manual counts: train staff to improve consistency
- Automatic counter accuracy improves with careful matching of technologies and algorithms to sites
- Rotating loggers around the network increases the quantity and quality of data
- Using standard video detection cameras for automated counting has promise but is not widely commercialised
- All data must be checked and may need cleaning / smoothing, scaling before reporting

Thank you!

More information on the CNG site

www.nzta.govt.nz/cng

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(021) 226 2929

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Question Time

Please type in any questions that you have

- Please indicate if they are for a particular speaker
- We will select ones for presenters to address

(sorry, we may not be able to get through all questions asked)

Thank You for your attendance!

Please complete our final evaluation survey before you leave

- What did you think of today's webinar?
- What topics would you like to hear about in the future?

Your feedback will be evaluated to assist future training