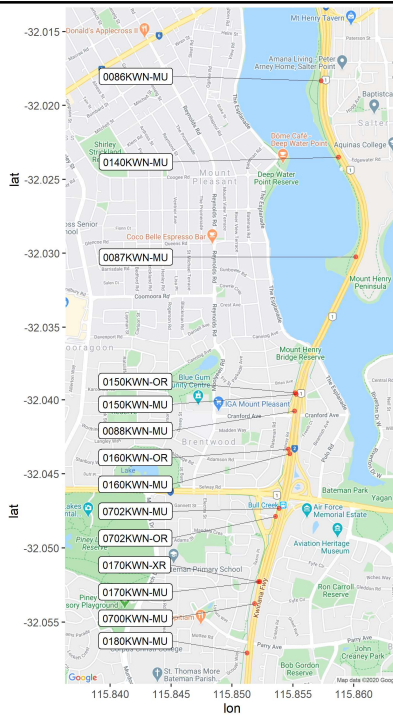
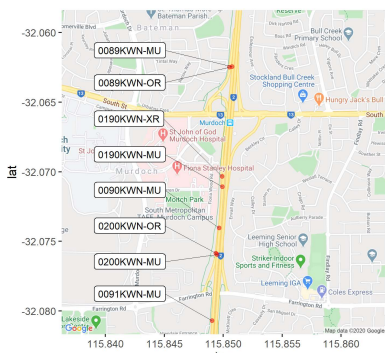


## Progress from last PSG meeting

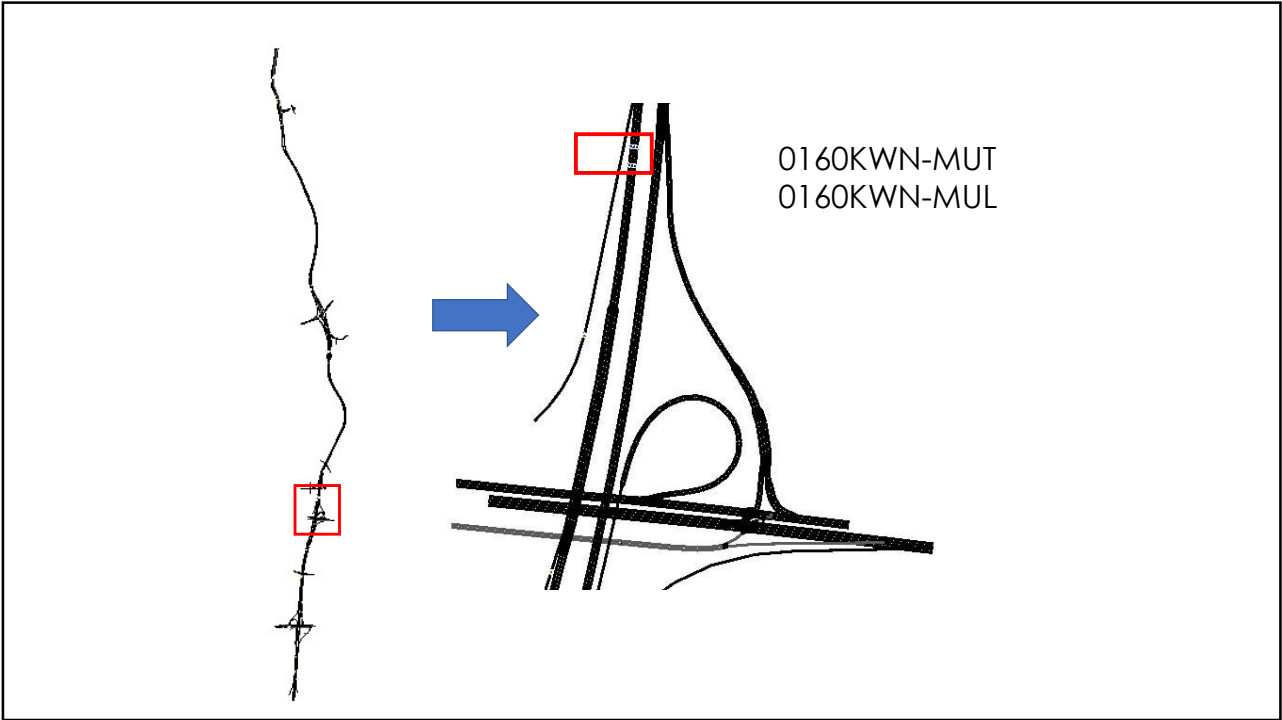
- Extend the computer network model to include all the 156 detectors based on data of the detectors locations
- Extend the traffic flow model based on lane data of the detectors
- Expand validation variables to include velocity field
- Some progress on Optimization of freeway traffic flow with uncertainty in traffic demand via Ramp Metering by cell transmission model
- Further Data analysis

1

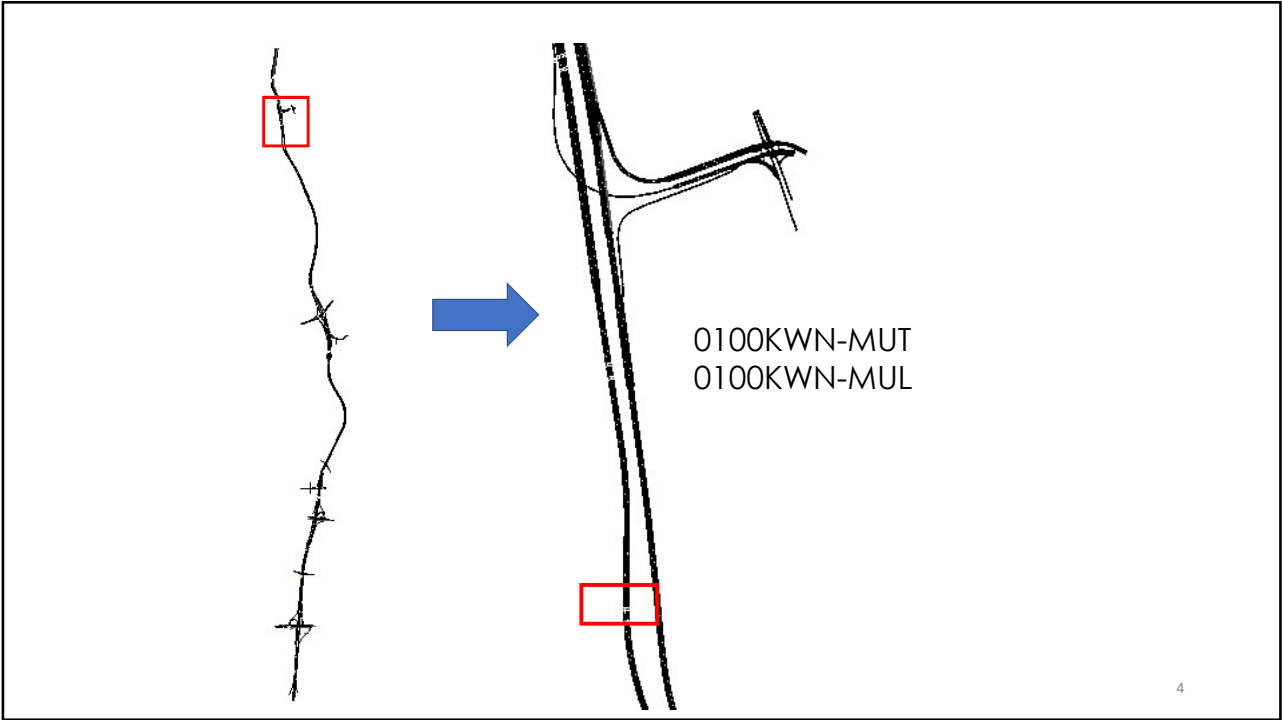
### 1. Updated computer network model : Kwinana Freeway Network with 156 Detectors



2

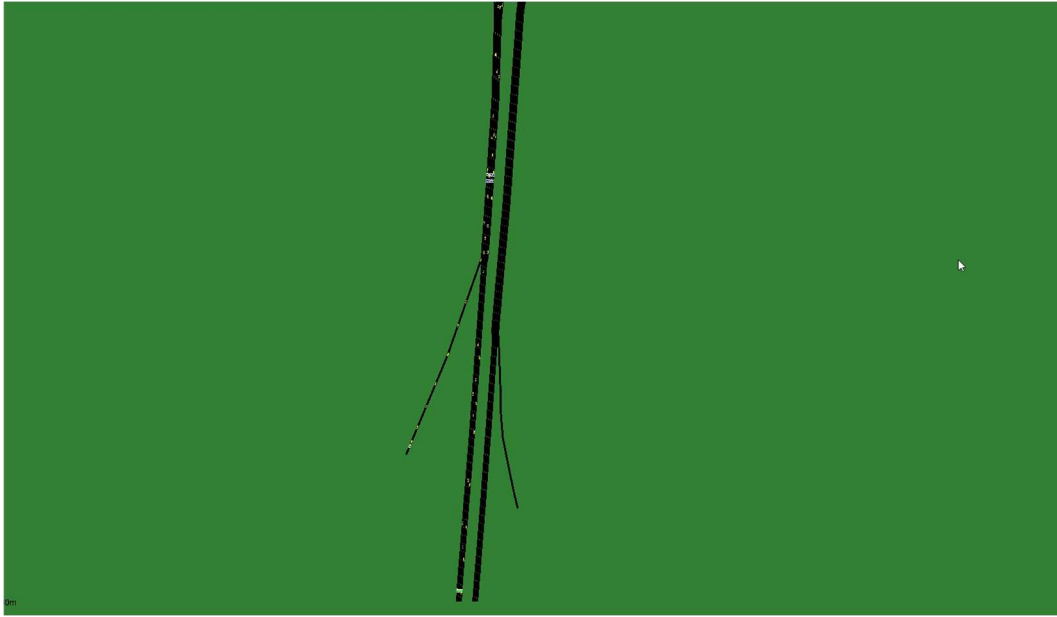


3



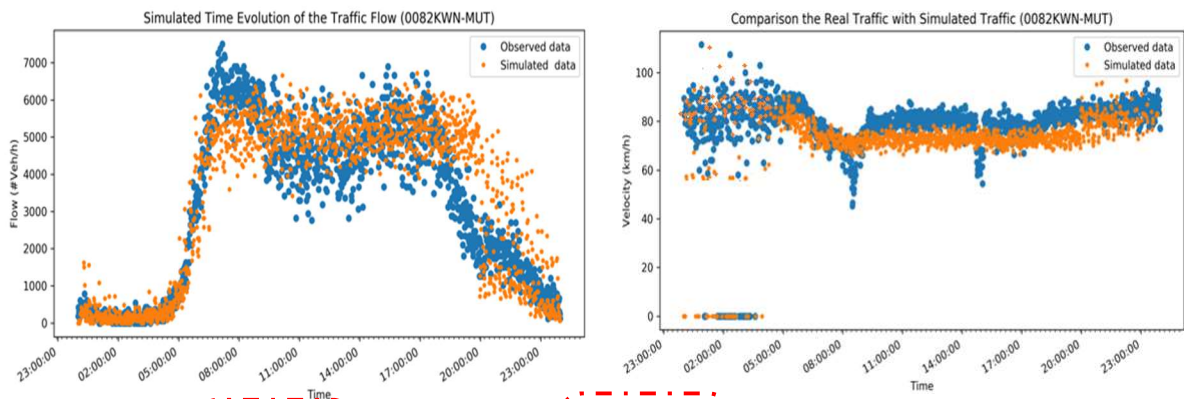
4

## 2. Traffic flow simulation using Lane data



5

## 3 Calibration of Speed and Flow Rate



Remark: 1-min data of Main road & 15-min data of on-ramps and off-ramp

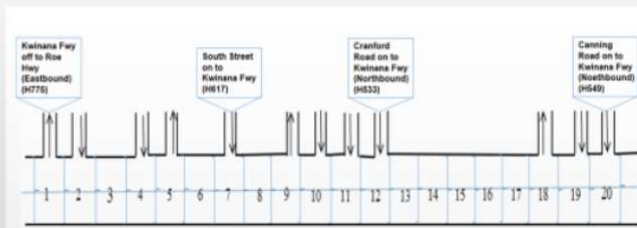
6

## 4. Optimisation of freeway traffic flow with uncertainty in traffic demand via Ramp Metering by cell transmission model

Test example – 06 June 2018

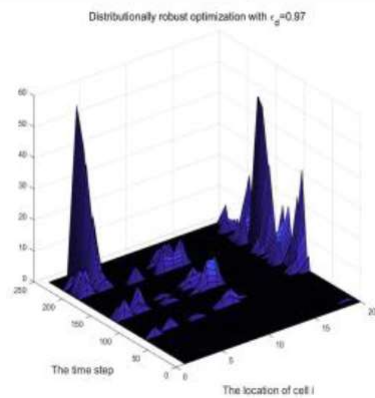
10 km  
20 cells  
8 on-ramps  
4 off-ramps

### The distribution of road

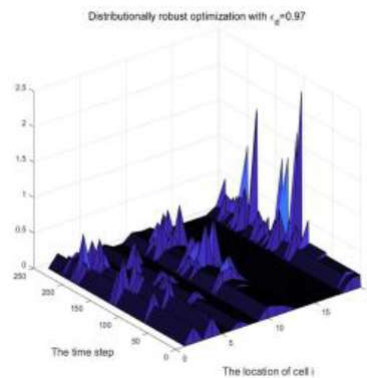


7

### The evolution of queue



### The ramp metering



8

### The total delay and ramp delay

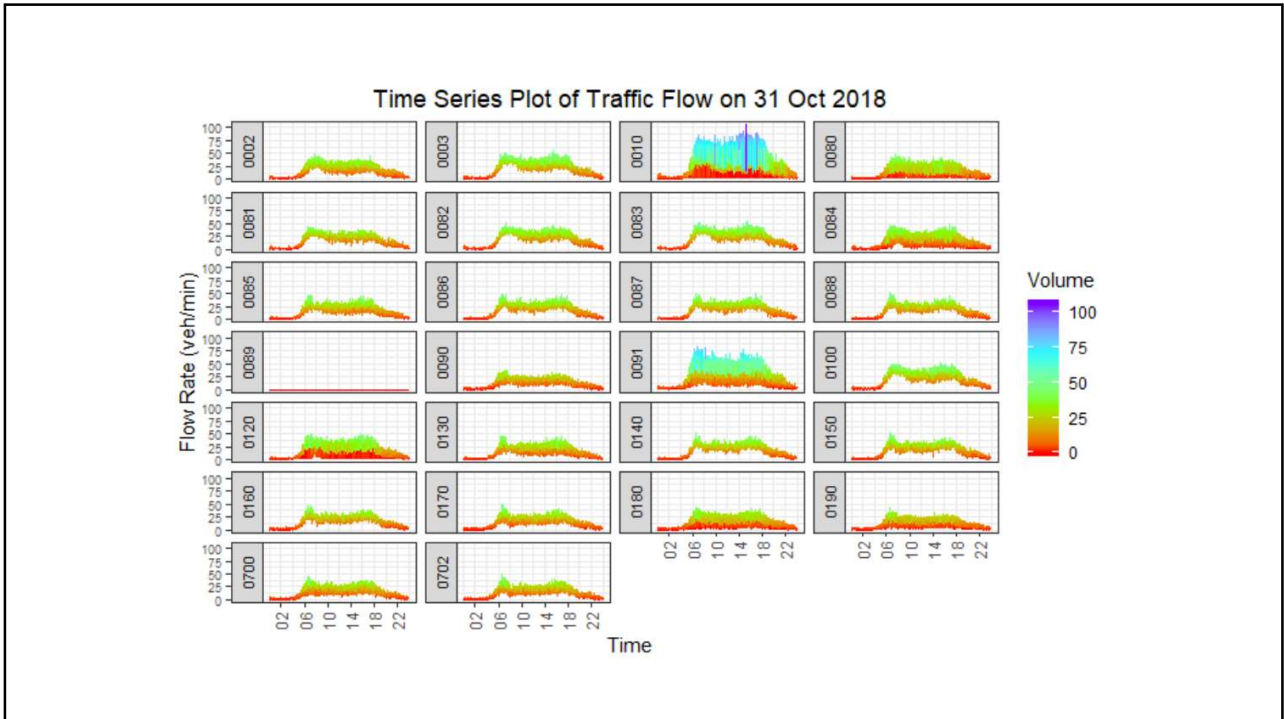
	Total delay	Ramp delay
No control	29.2093 h	0
Deterministic optimization	27.910 h	10.839 h
Robust optimization	27.456 h	12.586 h
Distributionally robust optimization with $\alpha_r = 0.9$	27.437 h	13.458 h
Distributionally robust optimization with $\alpha_r = 0.95$	27.454 h	12.363 h
Distributionally robust optimization with $\alpha_r = 0.97$	27.458 h	14.510 h

9

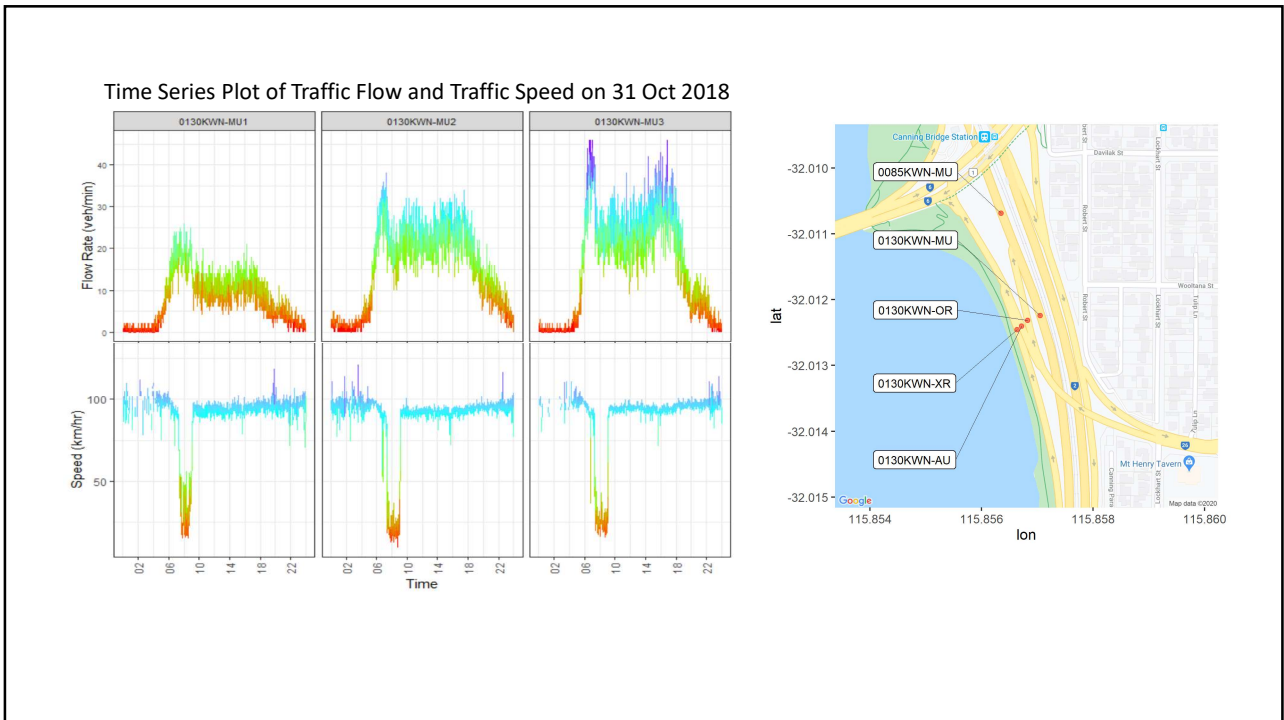
## 5. DATA ANALYSIS

1 Jan 2018 – 24 Feb 2019

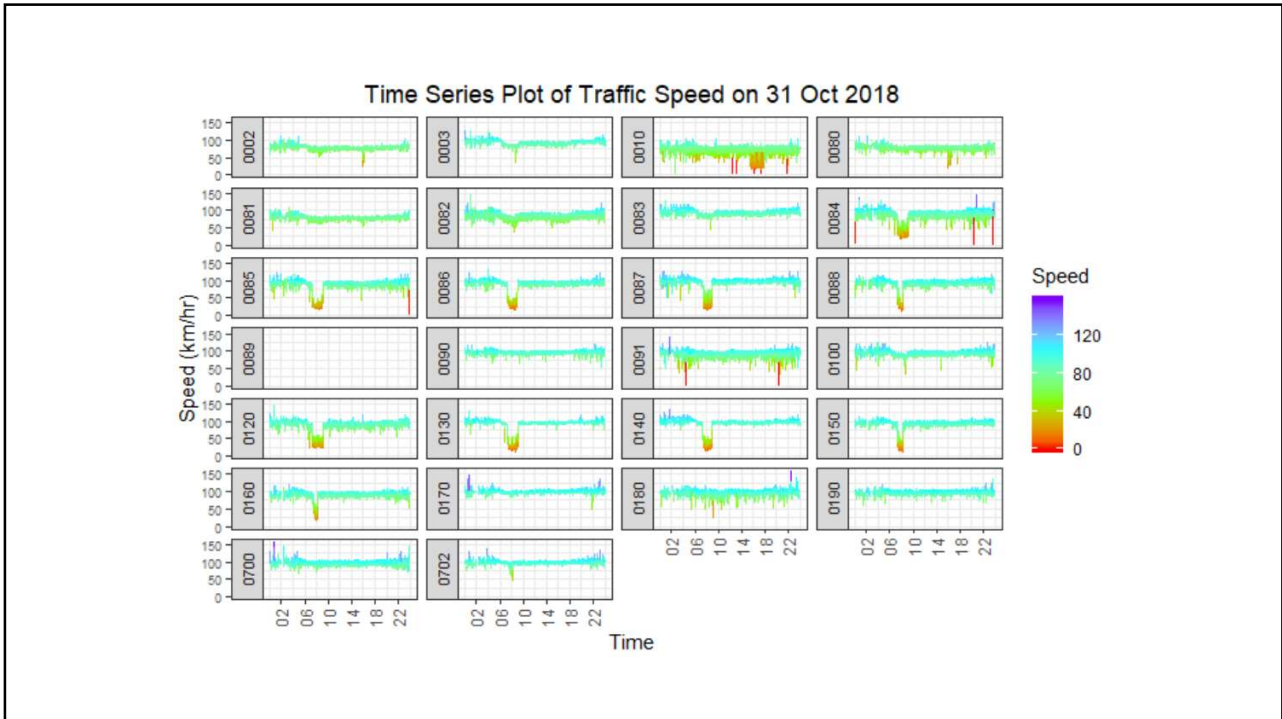
10



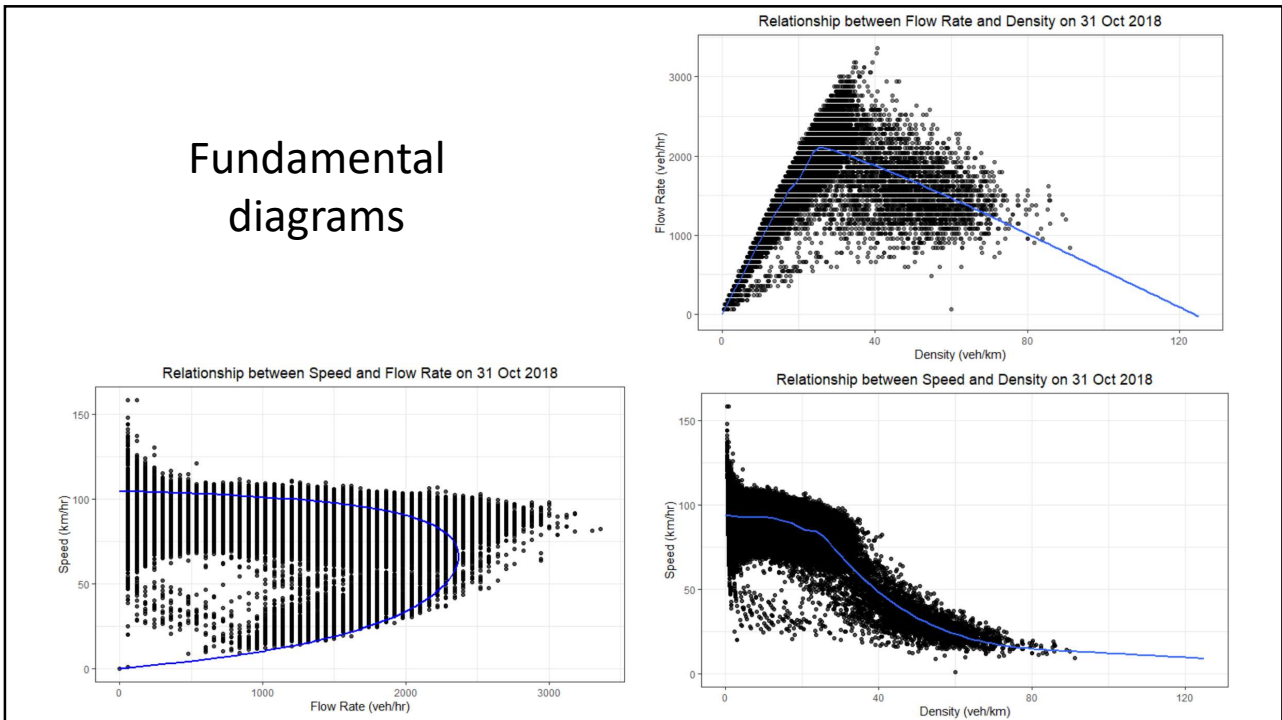
11



12



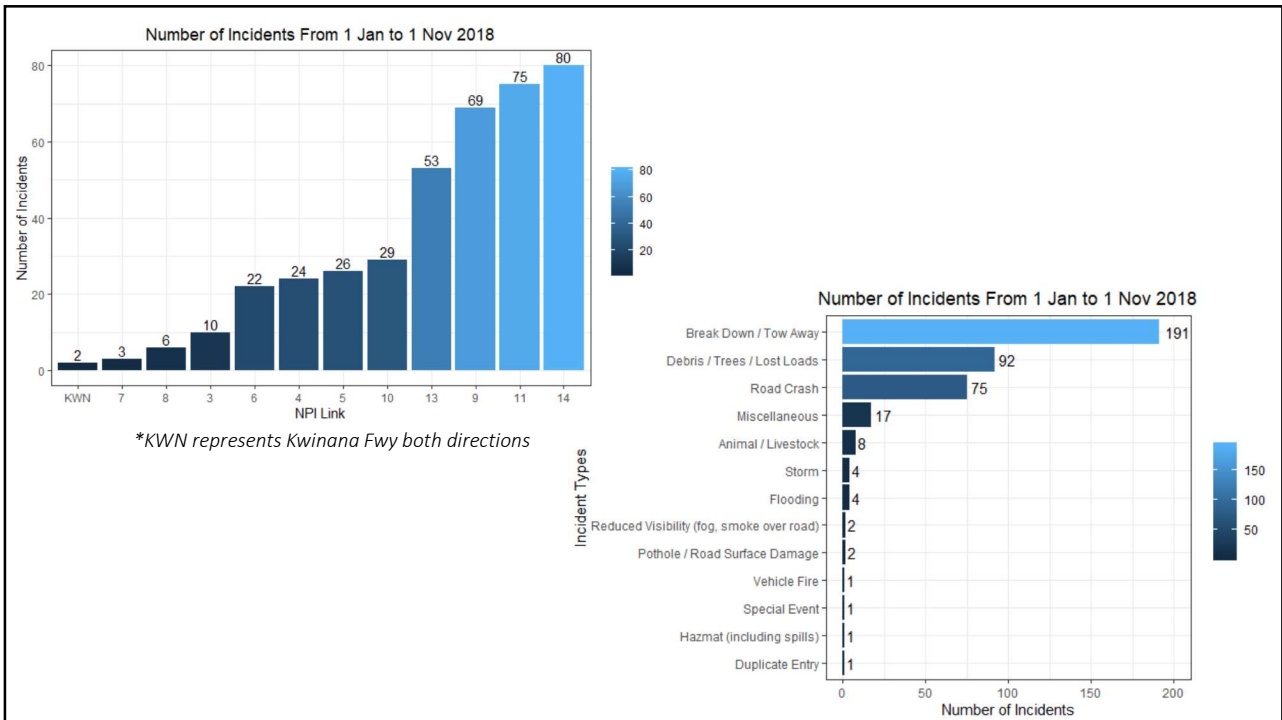
13



14

NPI LINK	NPI LINK NAME
1	Kwinana Fwy NB between Kwinana Fwy Nth Bnd H015 Nth Bnd - H018 East Bnd & Kwinana Fwy Nth Bnd H018 W
2	Kwinana Fwy NB between Farrington Rd On - H015 Nth Bo & H015 Nth Bound - South St Off
3	Kwinana Fwy NB between Kwinana Fwy Nth Bnd H018 West Bnd - H015 Nth Bnd & Farrington Rd On - H015 Nt
4	Kwinana Fwy NB between H015 Nth Bound - South St Off & South St On - H015 Nth Bound
5	Kwinana Fwy NB between South St On - H015 Nth Bound & H015 Nth Bound - Leach Hwy Off
6	Kwinana Fwy NB between H015 Nth Bound - Leach Hwy Off & Leach Hwy West Bound On - H015
7	Kwinana Fwy NB between Leach Hwy West Bound On - H015 & Leach Hwy East Bound On - H015
8	Kwinana Fwy NB between Leach Hwy East Bound On - H015 & Cranford Av On - H015 Nth Bou
9	Kwinana Fwy NB between Cranford Av On - H015 Nth Bou & H015 Sth Bound - H548
10	Kwinana Fwy NB between H015 Sth Bound - H548 & Manning Rd - H547 On Kwinana Fwy Nth Bound
11	Kwinana Fwy NWB between Manning Rd - H547 On Kwinana Fwy Nth Bound & Canning Hwy - H549 On Kwinana F
12	Kwinana Fwy NB between Kwinana Fwy (northbound) Bus Ln From Canning Hwy: H013 On To H015 Northbound
13	Kwinana Fwy NB between Mill Pt Rd - H500 On Kwinana Fwy Nth Bound & Kwinana Fwy Nth Bound H503 Off -
14	Kwinana Fwy NB between Kwinana Fwy Nth Bound H503 Off - Mill Pt Rd & Mitchell Fwy Nth Bound

15



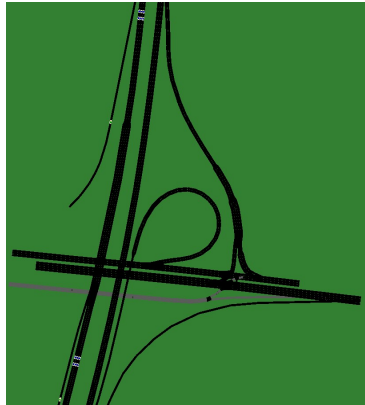
16



## Kwinana Freeway Network Update 13Km a number of road network detectors

Link 4: Kwinana Fwy NB between H015 Nth Bound - South St Off & South St On - H015 Nth Bound

Link 11: Kwinana Fwy NWB between Manning Rd - H547 On Kwinana Fwy Nth Bound & Canning Hwy - H549 On Kwinana F



Link 4

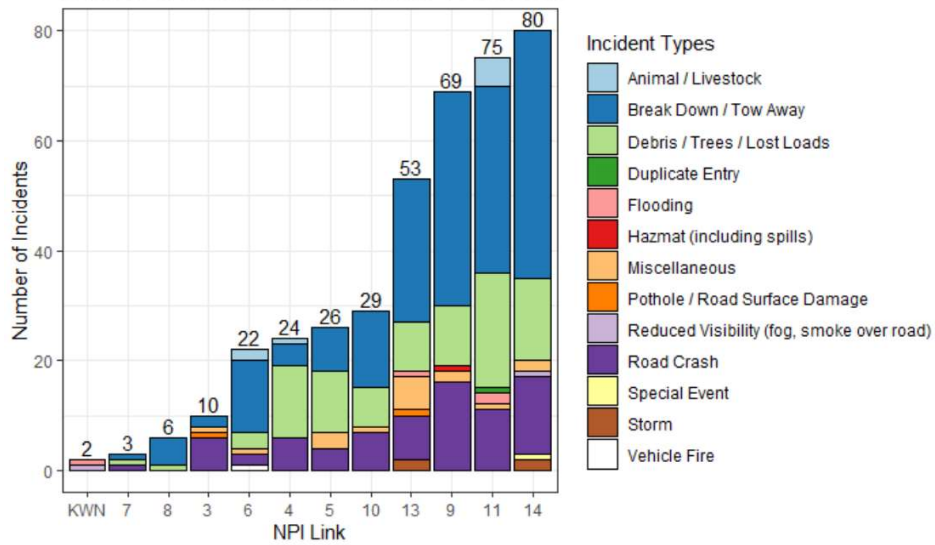


Link 11

Simulation

17

Number of Incidents From 1 Jan to 1 Nov 2018



\*KWN represents Kwinana Fwy both directions

18

## Study regions

- Link 14

(Kwinana Fwy NB between Kwinana Fwy Nth Bound H503 Off - Mill Pt Rd & Mitchell Fwy Nth Bound)

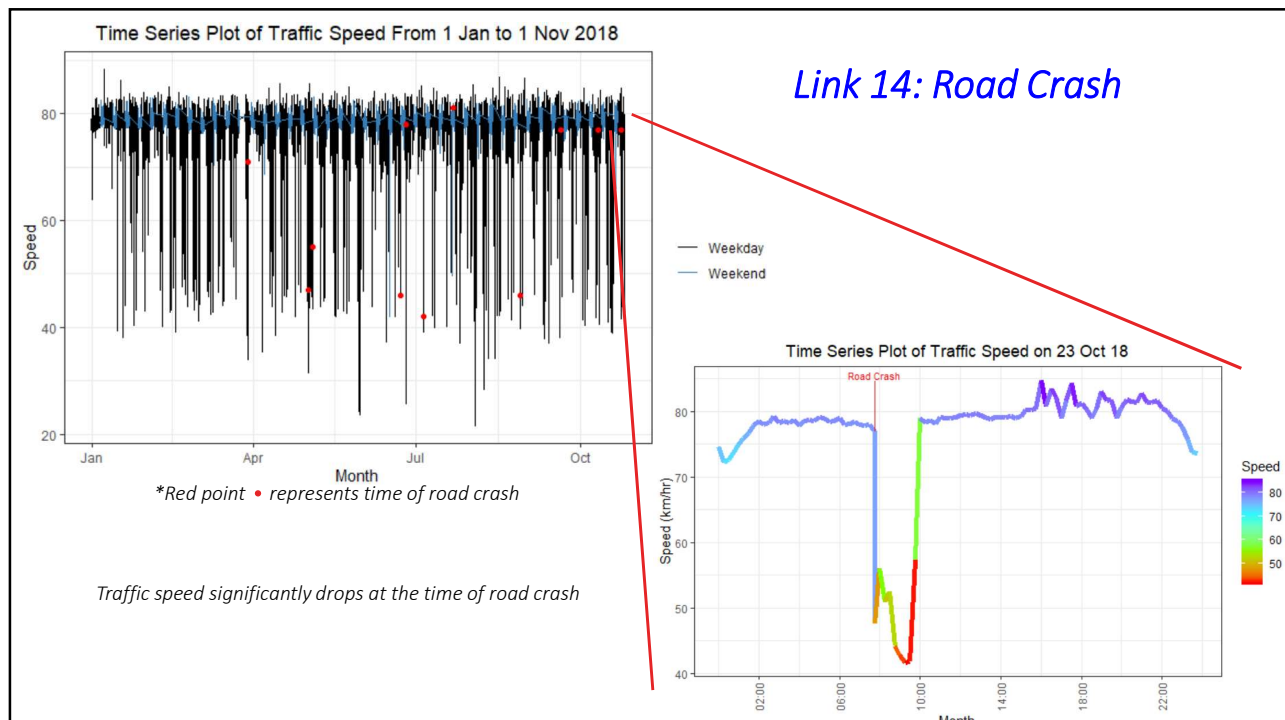
- Effects of Road Crash
- Effects of Rain
- Effects of Incidents (Overall)

- Link 11

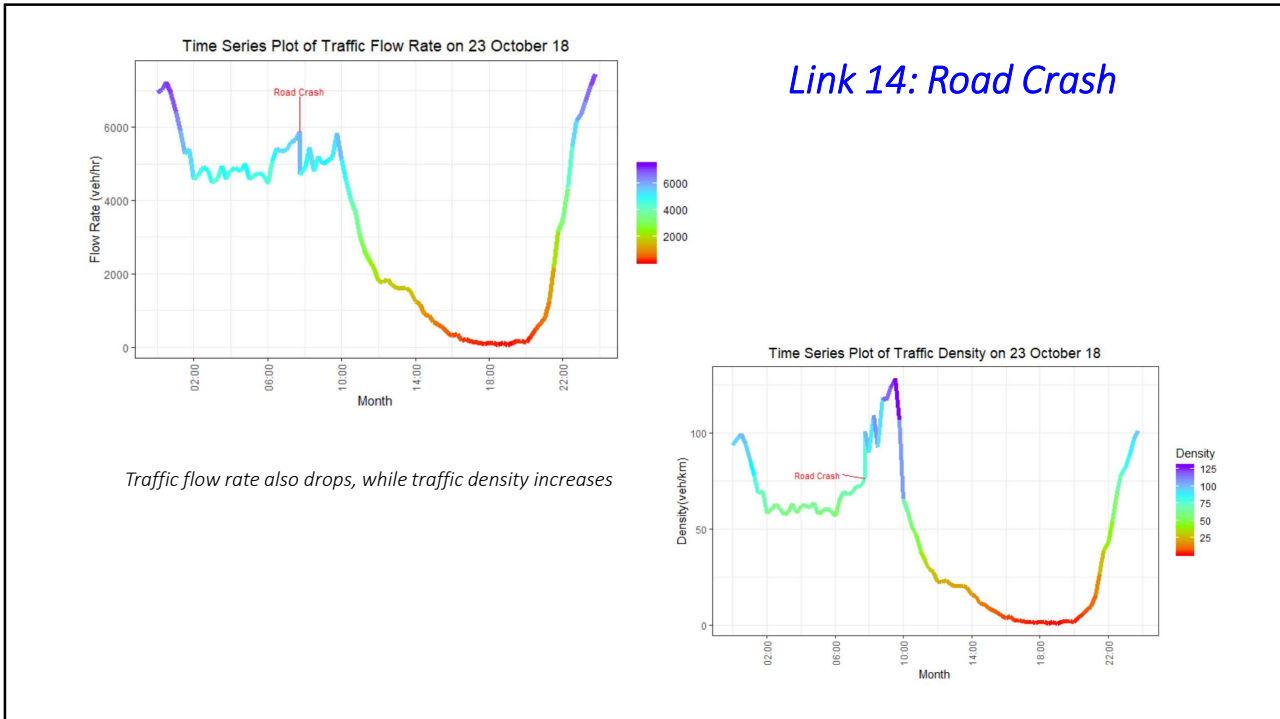
(Kwinana Fwy NWB between Manning Rd - H547 On Kwinana Fwy Nth Bound & Canning Hwy - H549 On Kwinana F)

- Effects of Flood
- Effects of Break Down / Tow Away

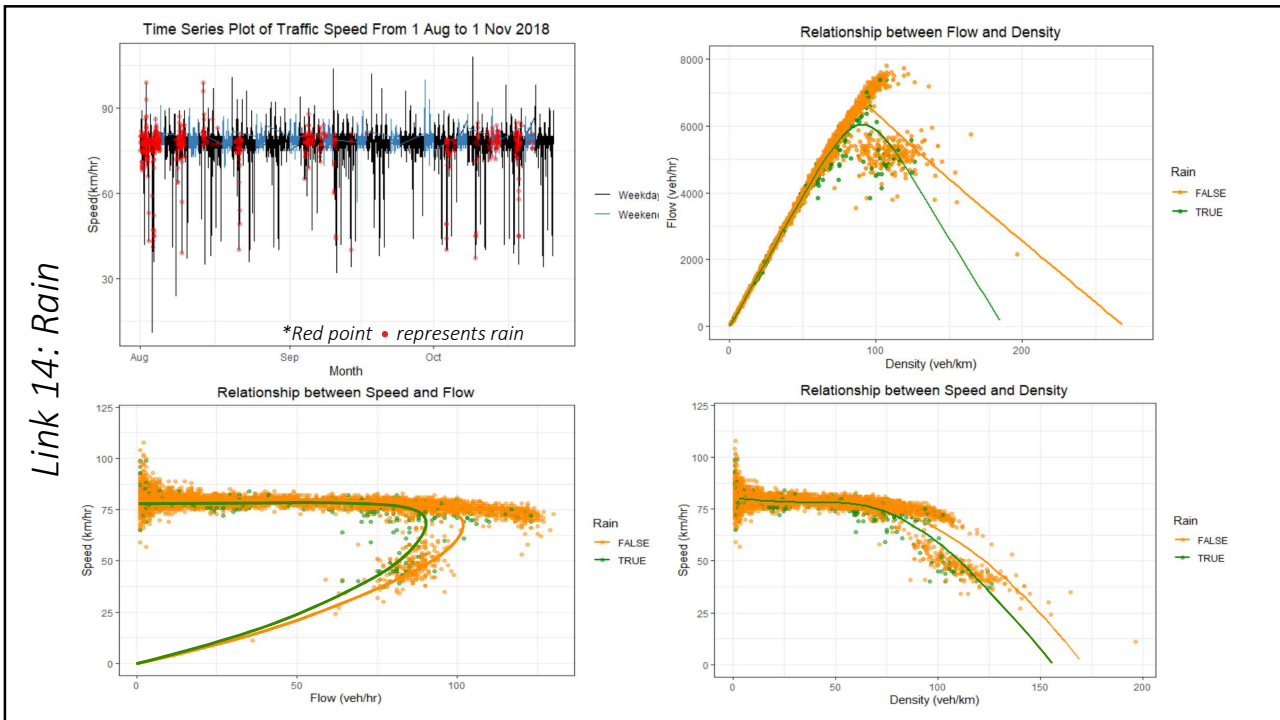
19



20

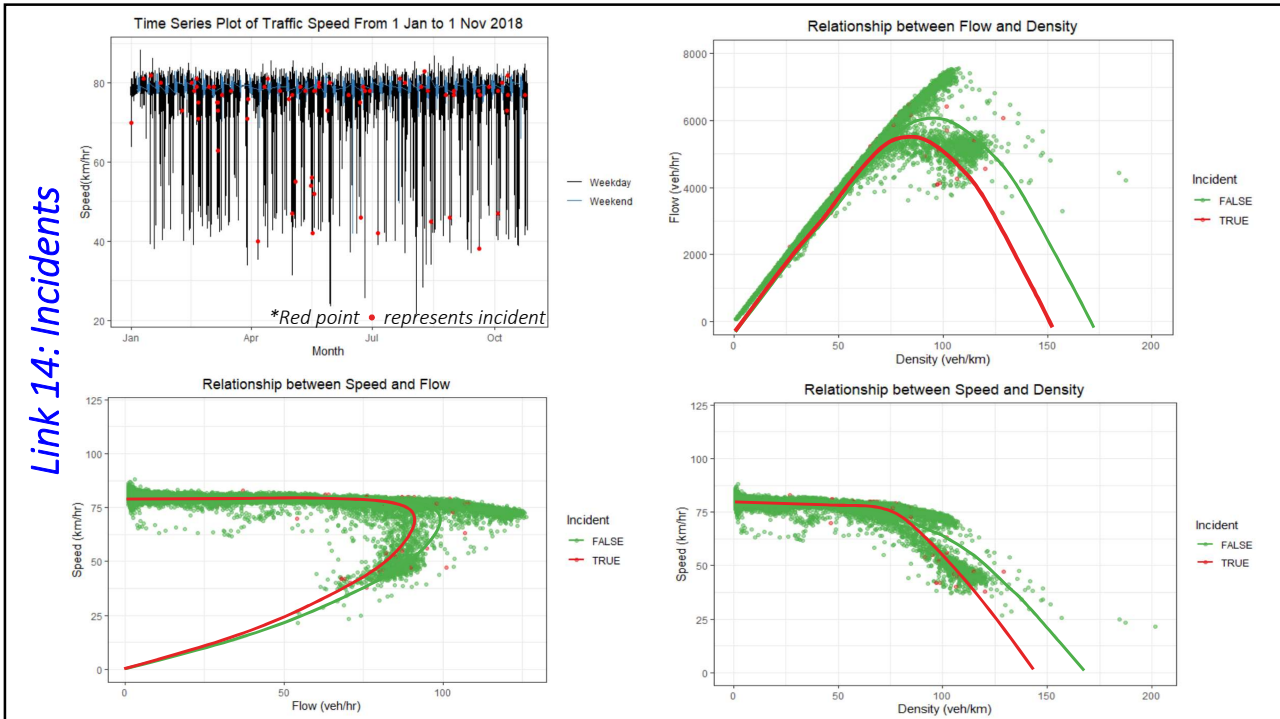


21



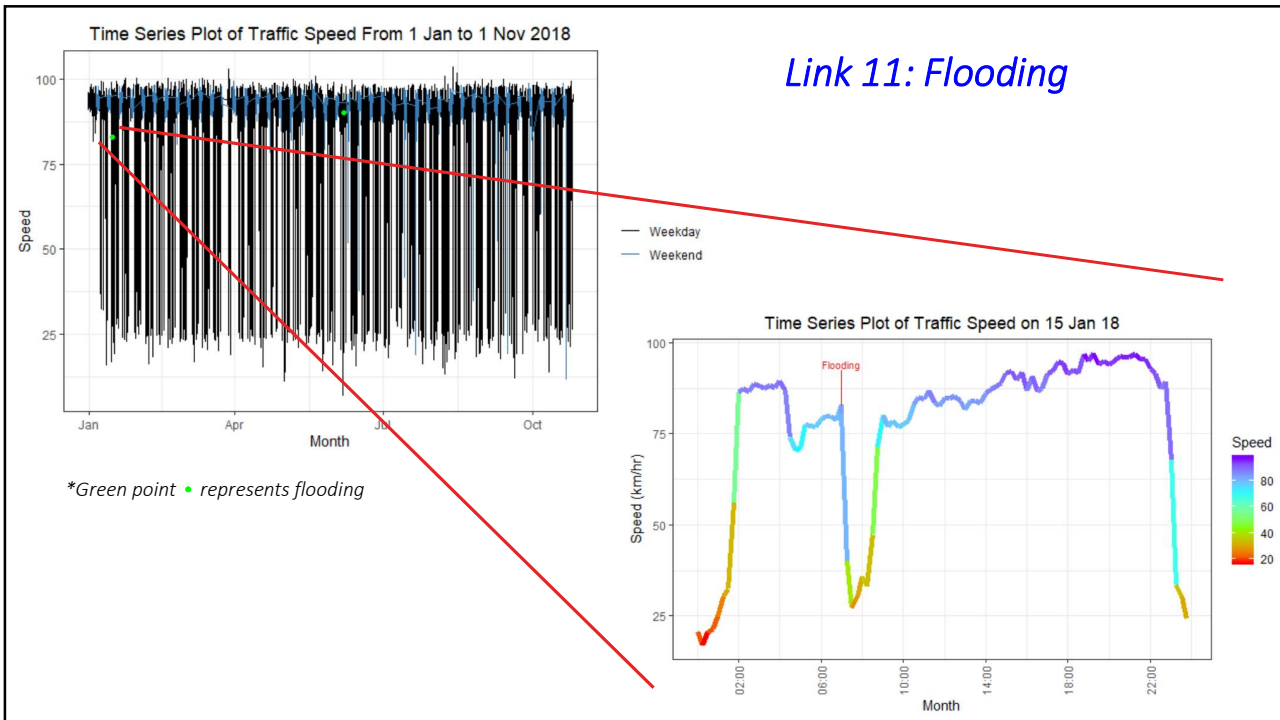
22

Link 14: Incidents

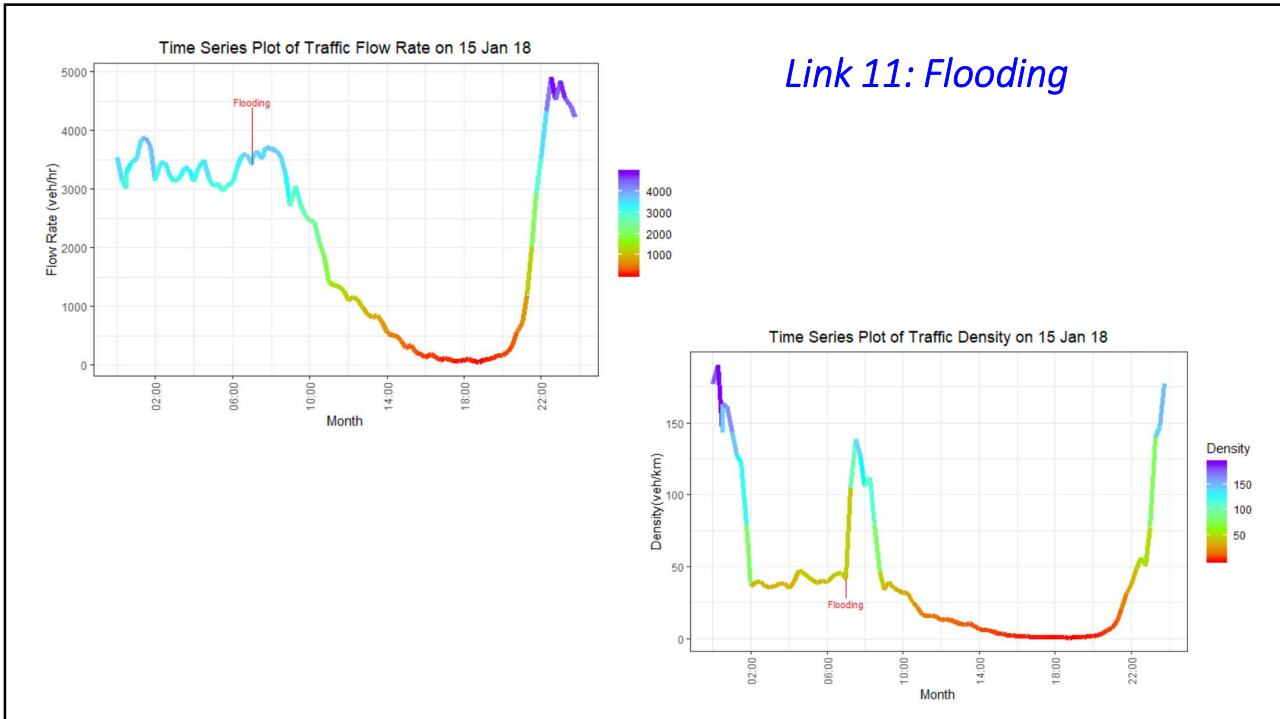


23

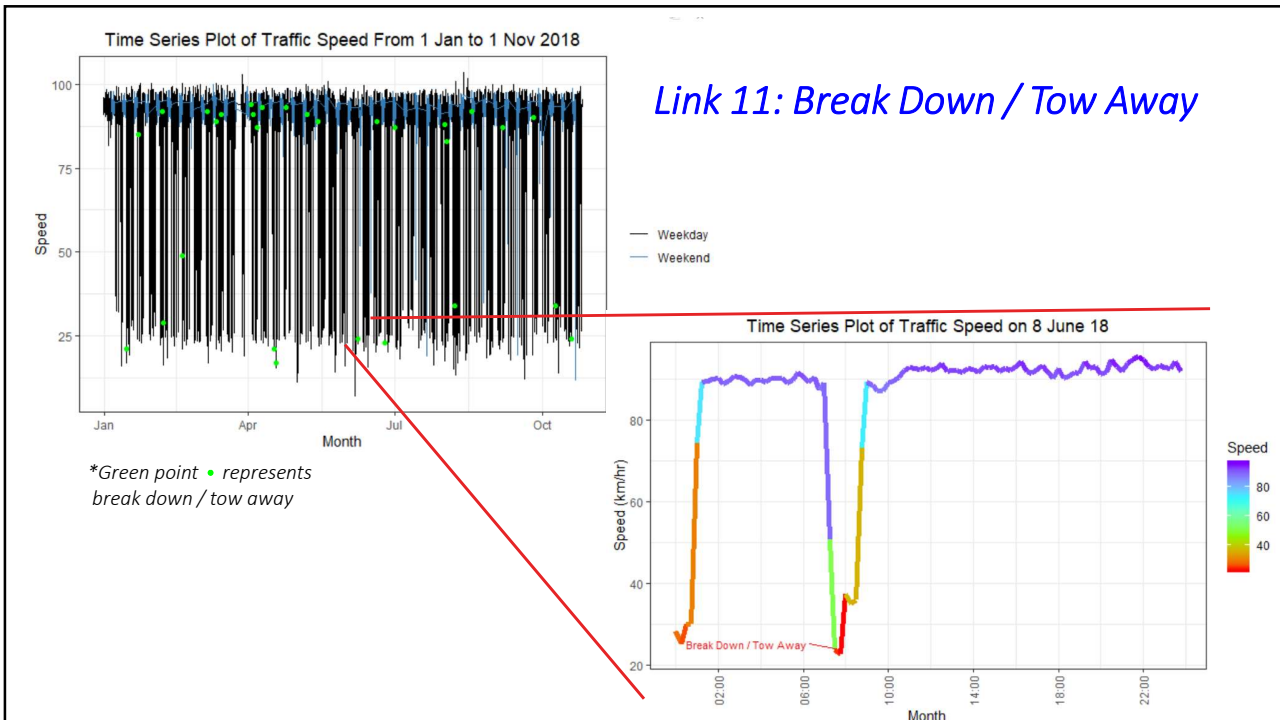
Link 11: Flooding



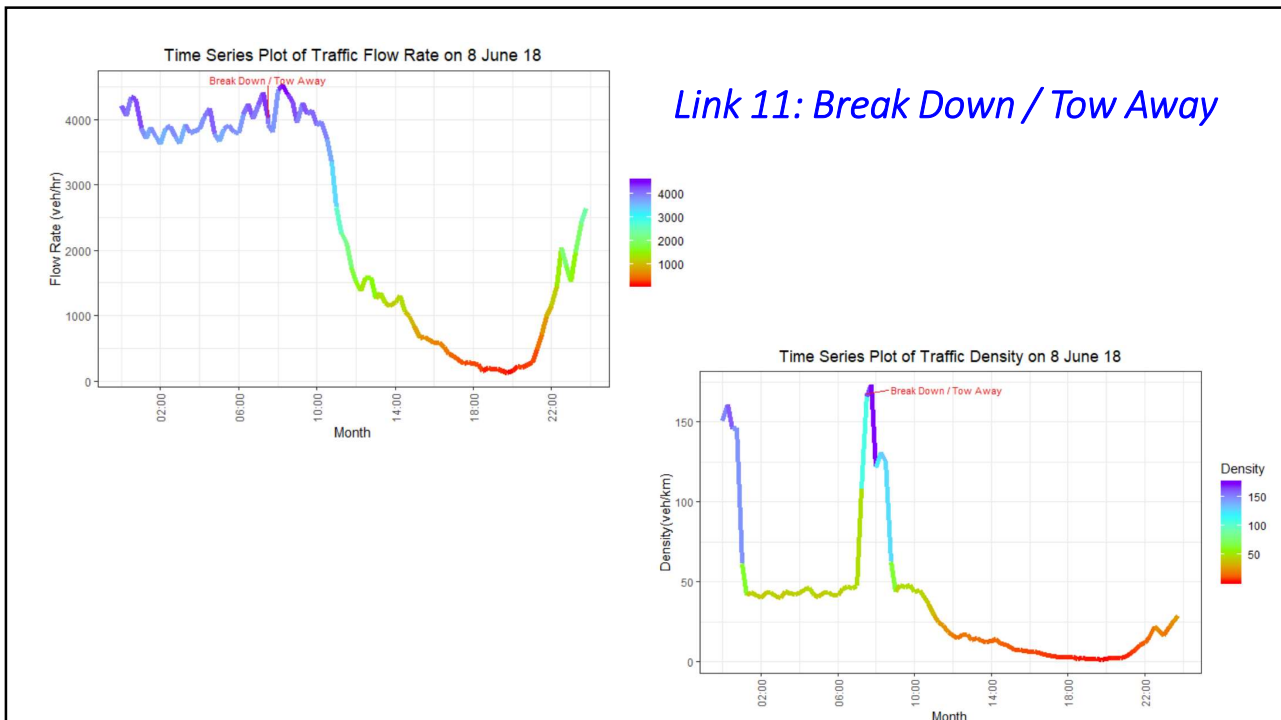
24



25



26



27

## Further Work

- ❖ Development of optimal control strategies for traffic flow under various scenarios through
  - Ramp metering
  - Variable speed limit
- ❖ Develop a computer road network model based on Freeway new layout
- ❖ Data Analysis : 2018, 2019

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