Understanding Vulnerable Road User Crash Risk
On High Risk Routes in Auckland

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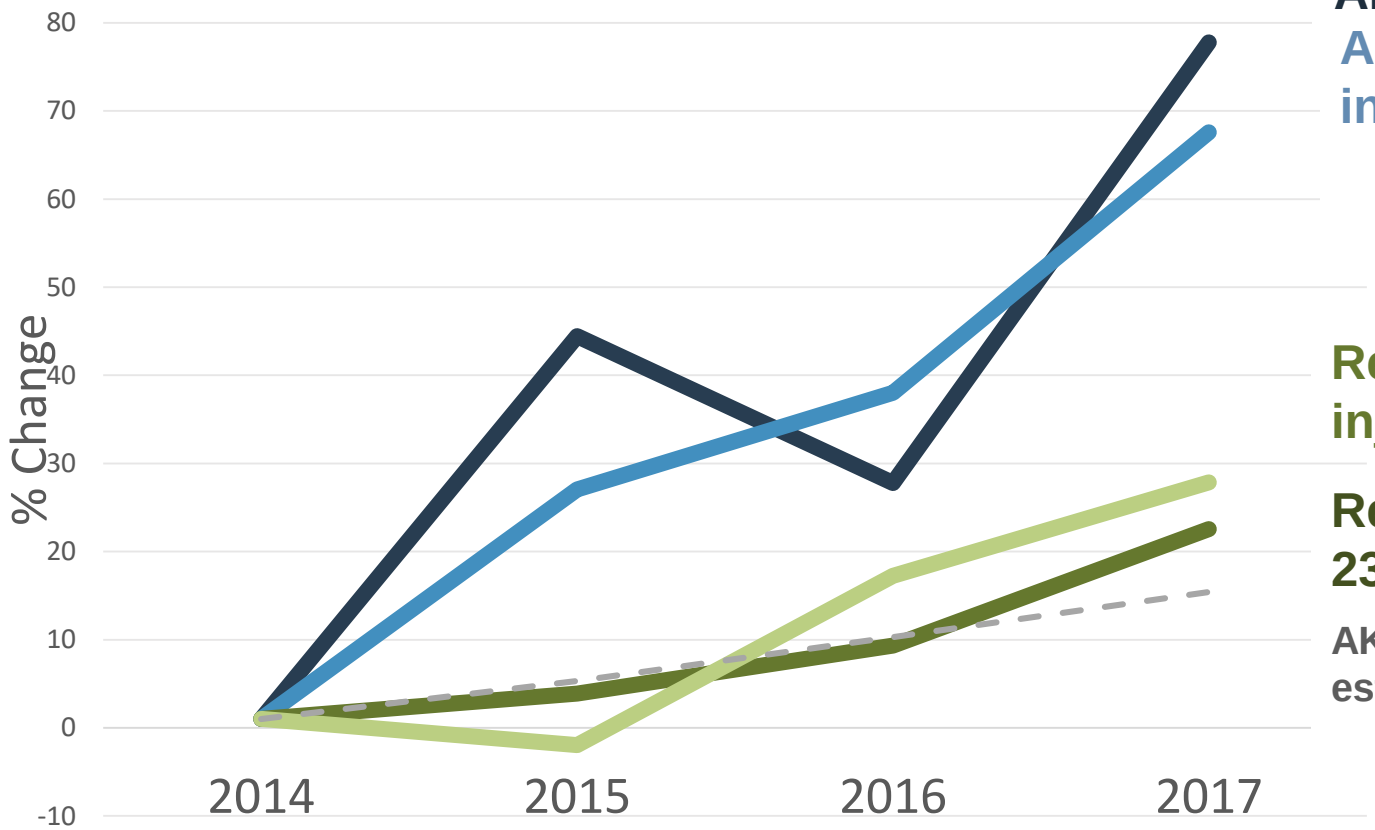
‘Designing with the community in mind’ Stantec

Auckland faces a road safety crisis



AKLD deaths 78%

AKLD serious injuries 68%

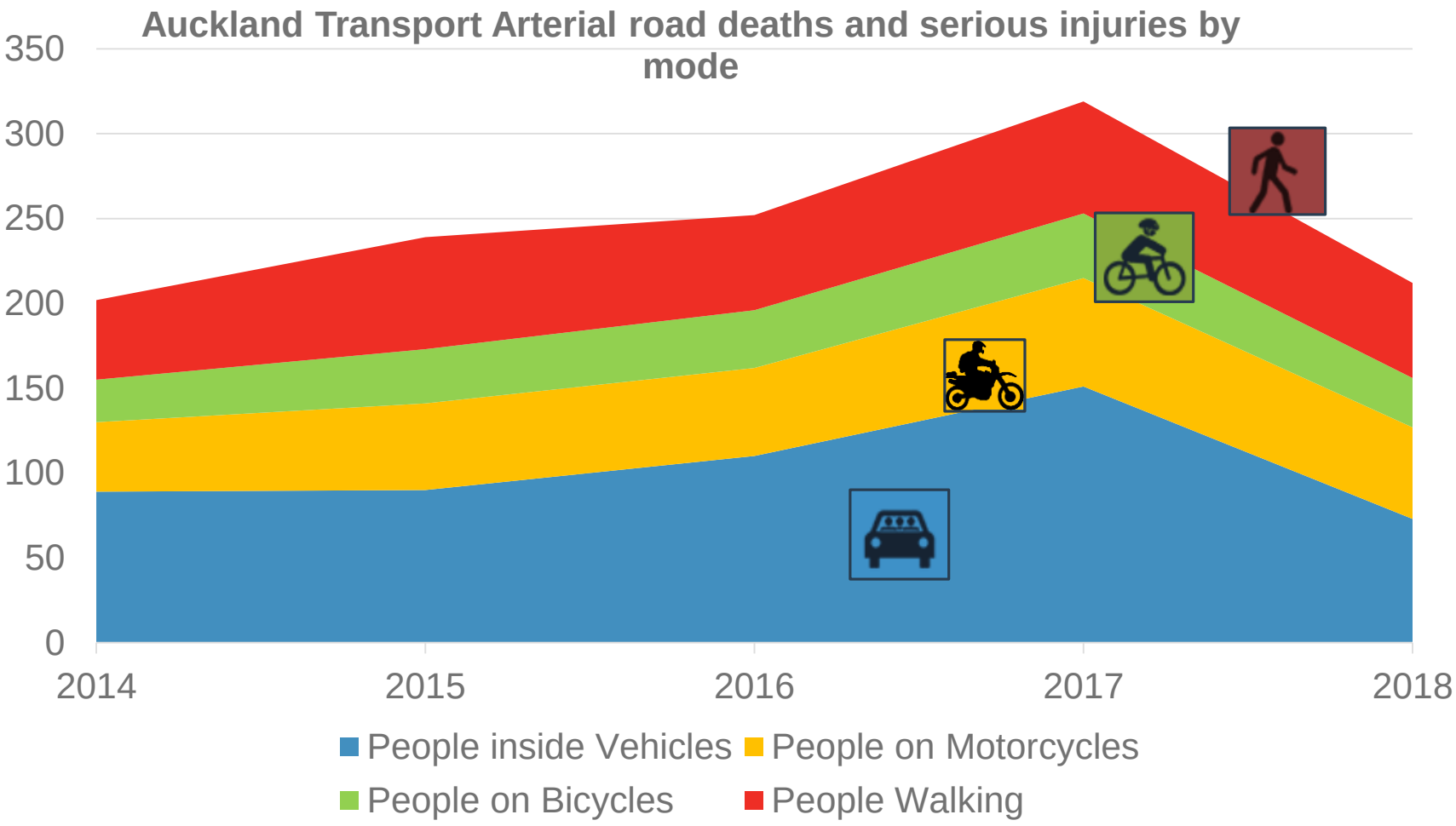
Rest of NZ serious injuries 28%

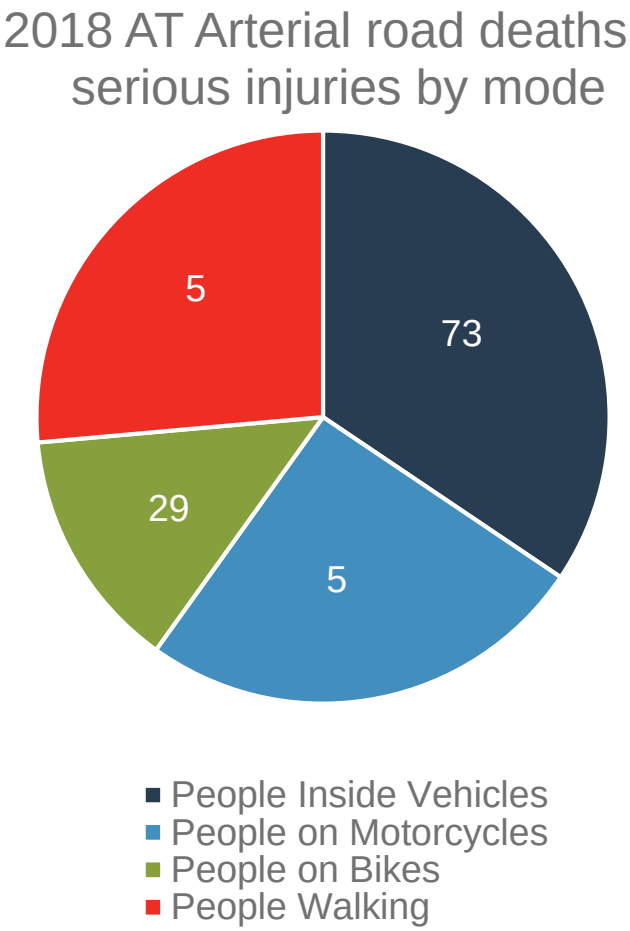
Rest of NZ deaths 23%

AKLD travel growth est. 15%

Auckland Transport
An Auckland Council Organisation

Auckland Transport Arterial road deaths and serious injuries have increased for people walking and motorcycling





People Walking, Cycling & Motorcycling made up **56%** of road deaths and serious injuries on Auckland Transport Arterial Roads in 2018

Purpose of Study

- **To develop a process for identifying high risk sections of urban arterials for vulnerable road users**

- **Development of improvement options that will lead to safer system outcomes**

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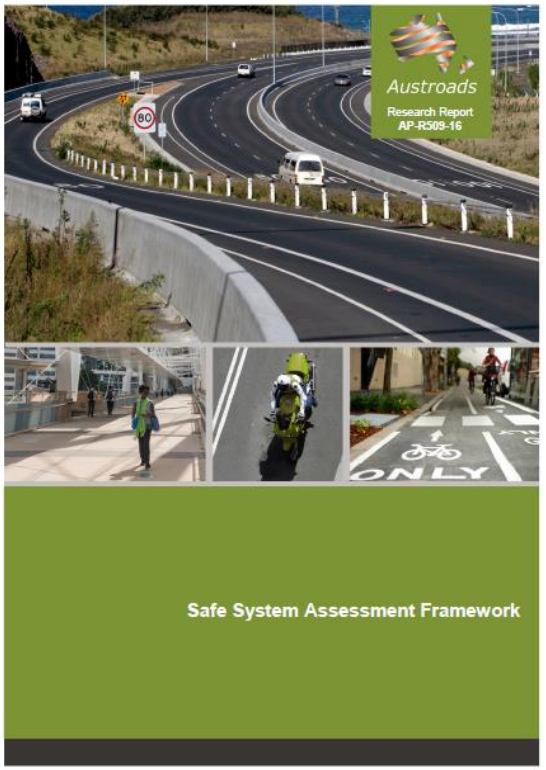
Safe System Assessment Framework

- Uses Austroads tool to estimate risk reduction
- Crash types that result in death and serious injury:
  - Run-off-road
  - Head-on
  - Intersection
  - Rear end and other
  - Pedestrian
  - Cyclist
  - Motorcycle



Safe System Assessment

- Three components to risk:
  - Exposure
  - Likelihood
  - Severity

- 0 to 4 rating scale
  - 0 = minimal contribution
  - 4 = high impact on poor safety outcome

Safe System matrix

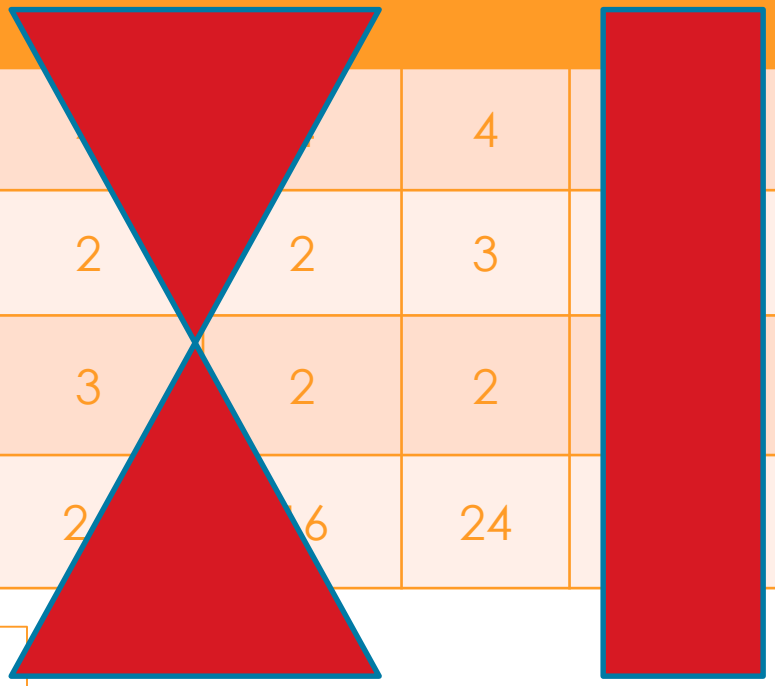
Table 4.2: Safe System assessment framework for infrastructure projects

	Run-off-road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclist
Exposure	AADT; length of road segment	AADT; length of road segment	AADT for each approach; intersection size	AADT; length of road segment	AADT; pedestrian numbers; crossing width; length of road segment	AADT; cyclist numbers; pedestrians	AADT; motorcycle numbers; length of road segment
Likelihood	Speed; geometry; shoulders; barriers; hazard offset; guidance and delineation	Geometry; separation; guidance and delineation; speed	Type of control; speed; design, visibility; conflict points	Speed; sight distance; number of lanes; surface friction	Design of facilities; separation; number of conflicting directions; speed	Design of facilities; separation; speed	Design of facilities; separation; speed
Severity	Speed; roadside features and design (e.g. flexible barriers)	Speed	Impact angles; speed	Speed	Speed	Speed	Speed

Safe System Assessment Framework

	Run-off-road	Head-on	Inter	Rear end /	Ped	Cyclist	M/C
Exposure			4		4	4	4
Likelihood	2	2	3		3	4	3
Severity	3	2	2		4	4	3
Total	2	6	24		48	64	36

Total = 236



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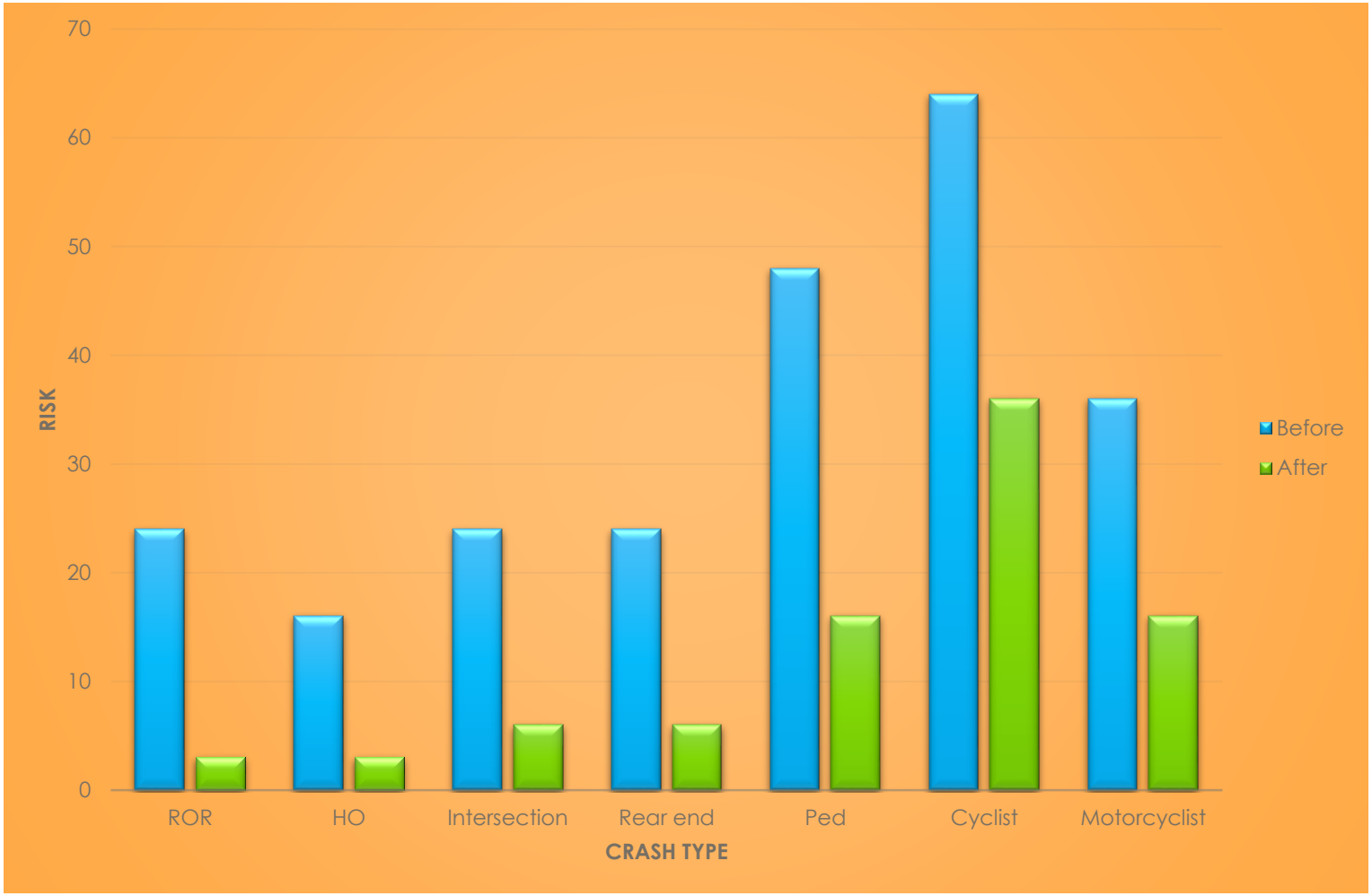
Comparison



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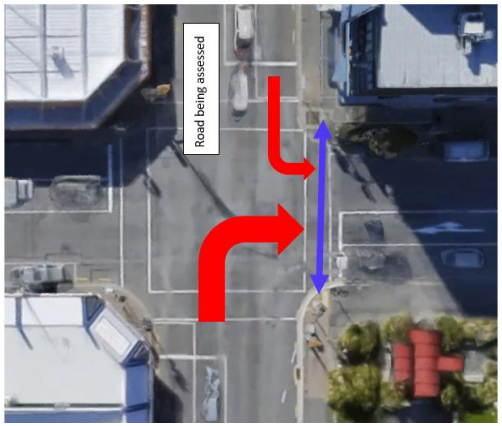
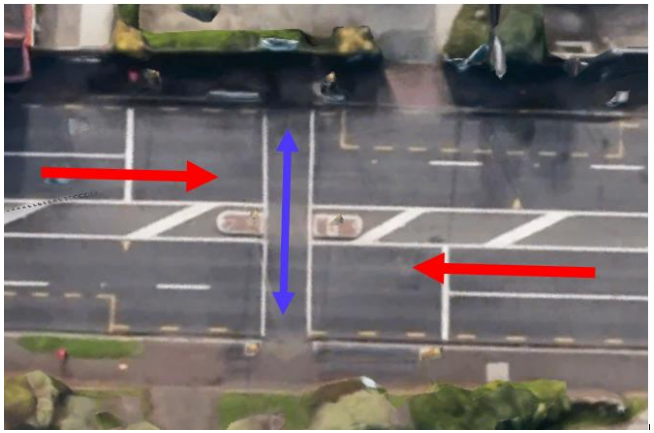
CRAF - General Crash Types Assessed

Pedestrian

- P1 – Intersection/Access (veh turning)
- P2 – Midblock/90 degree crossing (veh straight)
- P3 – Intersection (veh straight)
- P4 – Cyclists and Pedestrian conflict

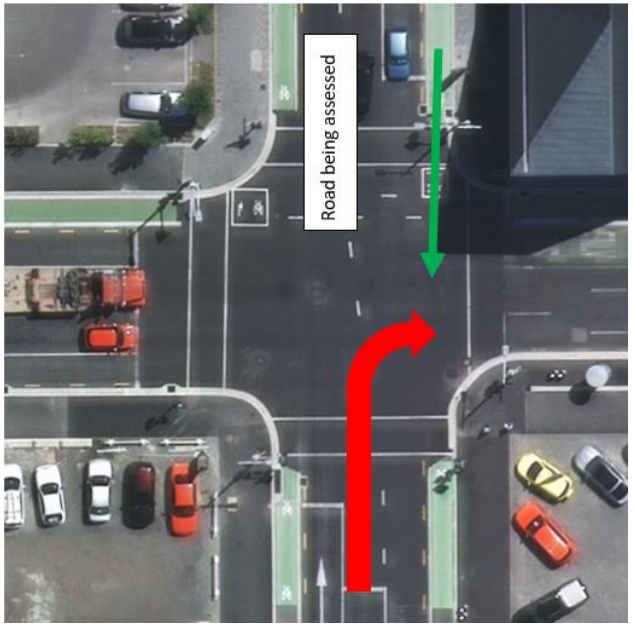




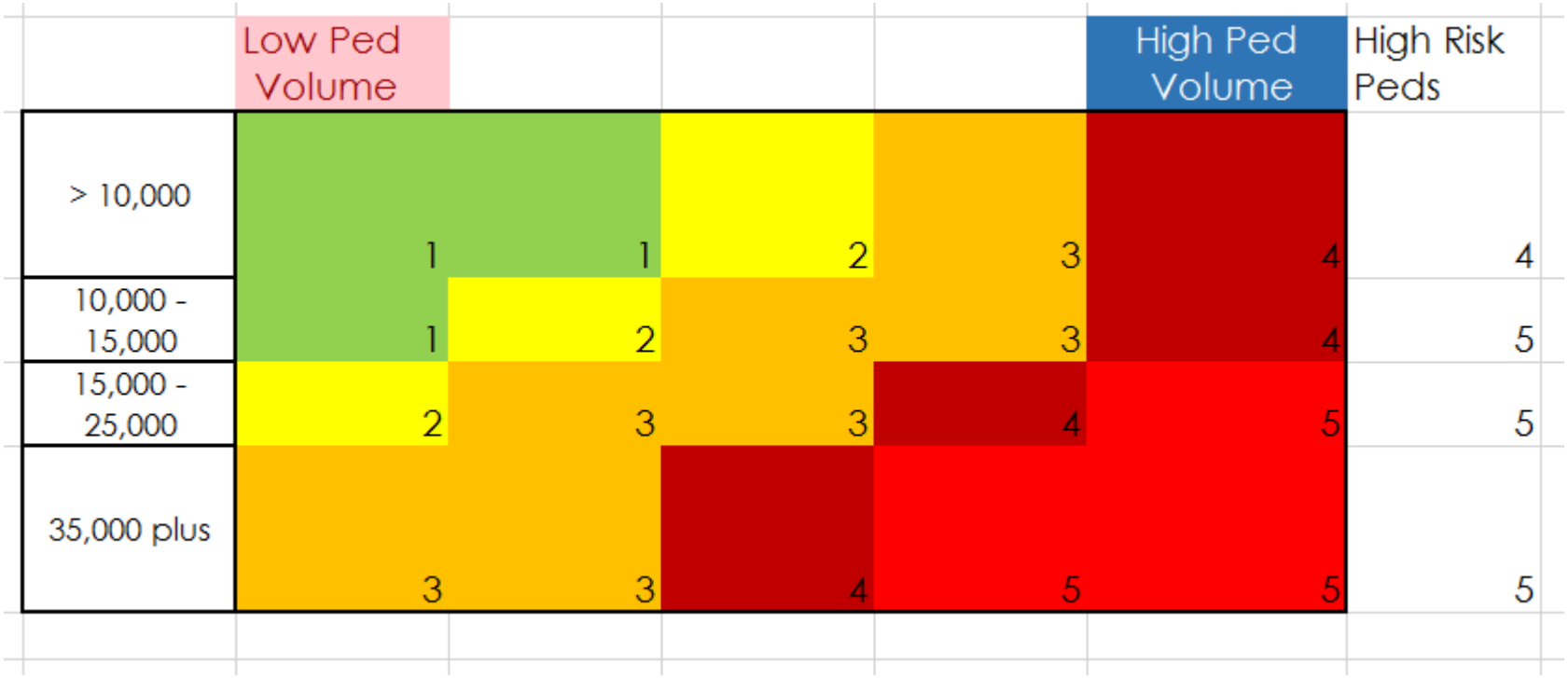
CRAF - General Crash Types Assessed

Cyclist

- C1 – Midblock sideswipe crash
- C2 – Intersection/Access (veh turning)
- C3 – Intersection sideswipe crash
- C4 – Intersection (veh straight)



Exposure Values - Pedestrians



	Low Ped Volume				High Ped Volume	High Risk Peds
> 10,000	1	1	2	3	4	4
10,000 - 15,000	1	2	3	3	4	5
15,000 - 25,000	2	3	3	4	5	5
35,000 plus	3	3	4	5	5	5

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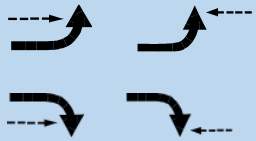
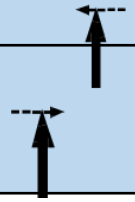
Likelihood - Cyclist

Crash Risk/Score*	Code Diagram	1	2	3	4
C1 - Mid Block side swipe		Separated cycleway	Painted cycleway	No facility and wider traffic lanes or no parking	No facility and narrow traffic lanes near parking
C2 - Intersection/Access (vehicle turning)		Separated cycleway with cycle signals and signal with arrows	Painted cycleway	No facility and wider traffic lanes or no parking	No facility and narrow traffic lanes near parking
C3 - Intersection/Access Approach side-swipe		Separated cycleway	Painted cycleway	No facility and narrow approach lanes, on access/minor intersection	No facility and narrow approach lanes, on major intersection
C4 - Intersection (vehicle straight)		Traffic signals		Minor priority crossroads	Major priority controlled cross-roads

MUAF

- **MUAF is a narrative- and evaluation-based assessment that combines the element of**
  - **network inspection (urban),**
  - **road safety auditing,**
  - **multi-modal user audit and**
  - **knowledge of risks associated with vulnerable road users.**
- **The purpose of the assessment is to collect behavioural, interaction and safety elements associated with all road users.**

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MUAF Issues – Glen Eden

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MUAF Issues
- Mt Albert
- Carrington

SPACE

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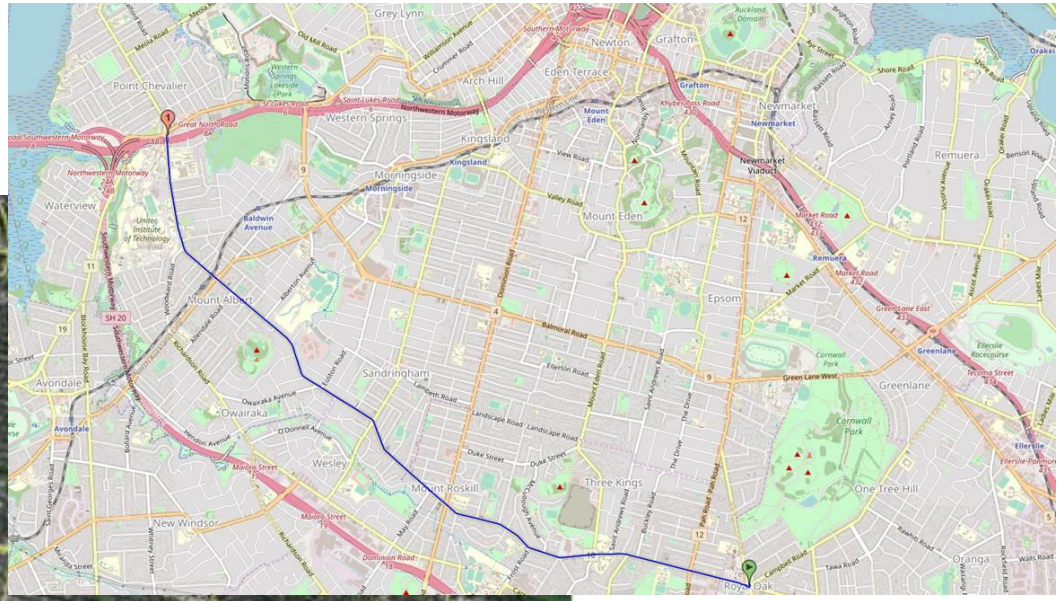
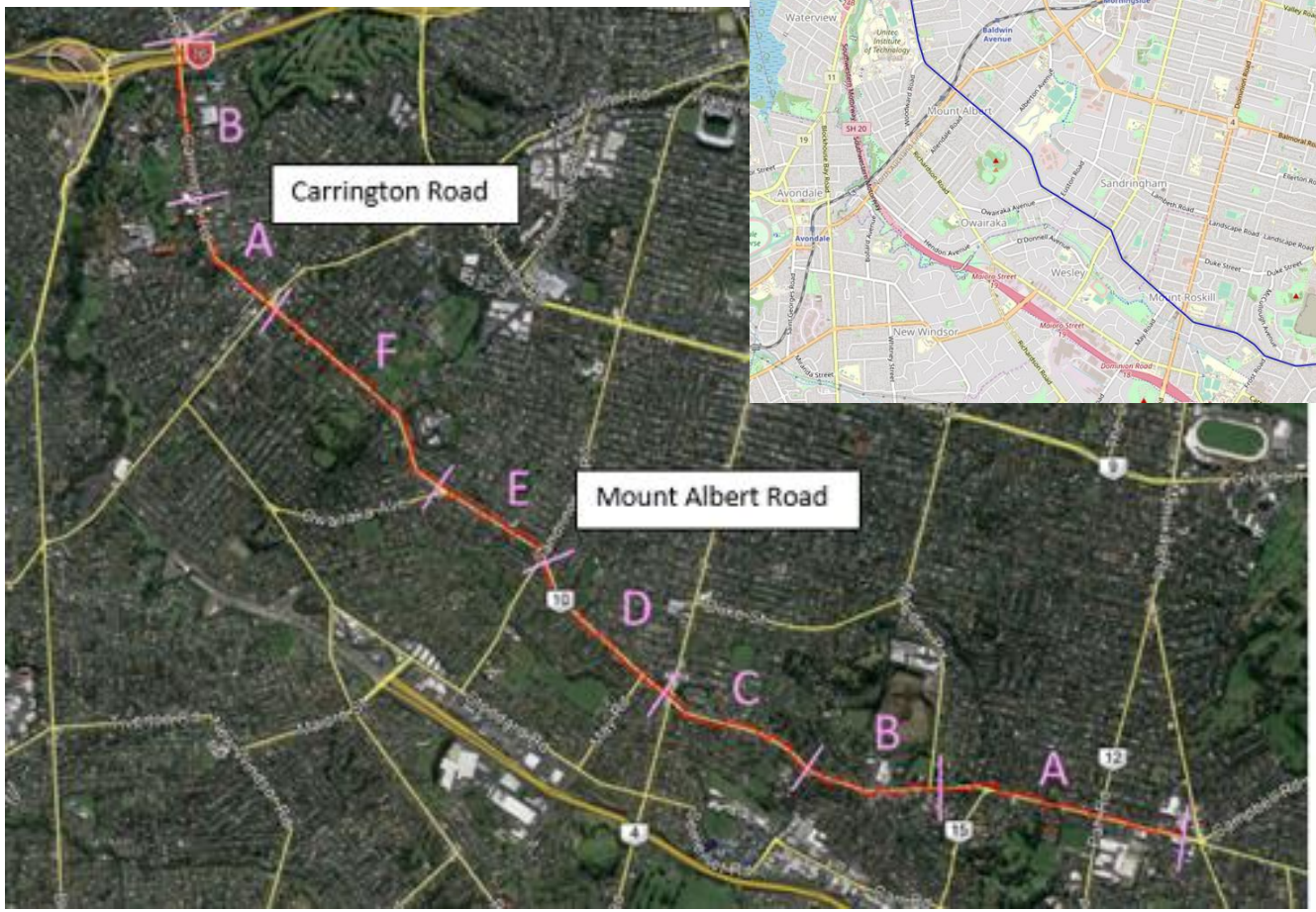
Mt Albert Rd/Carrington Rd





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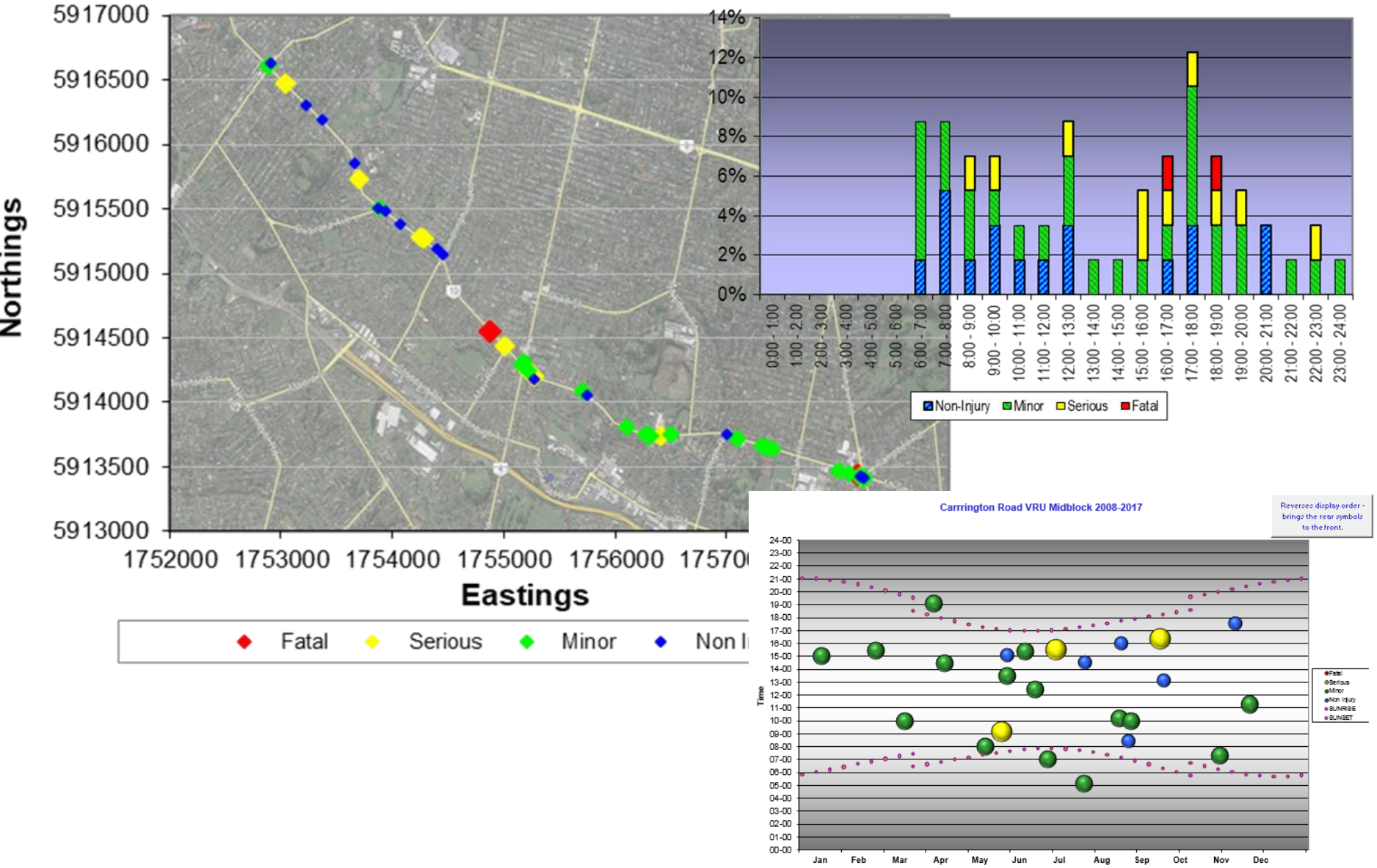
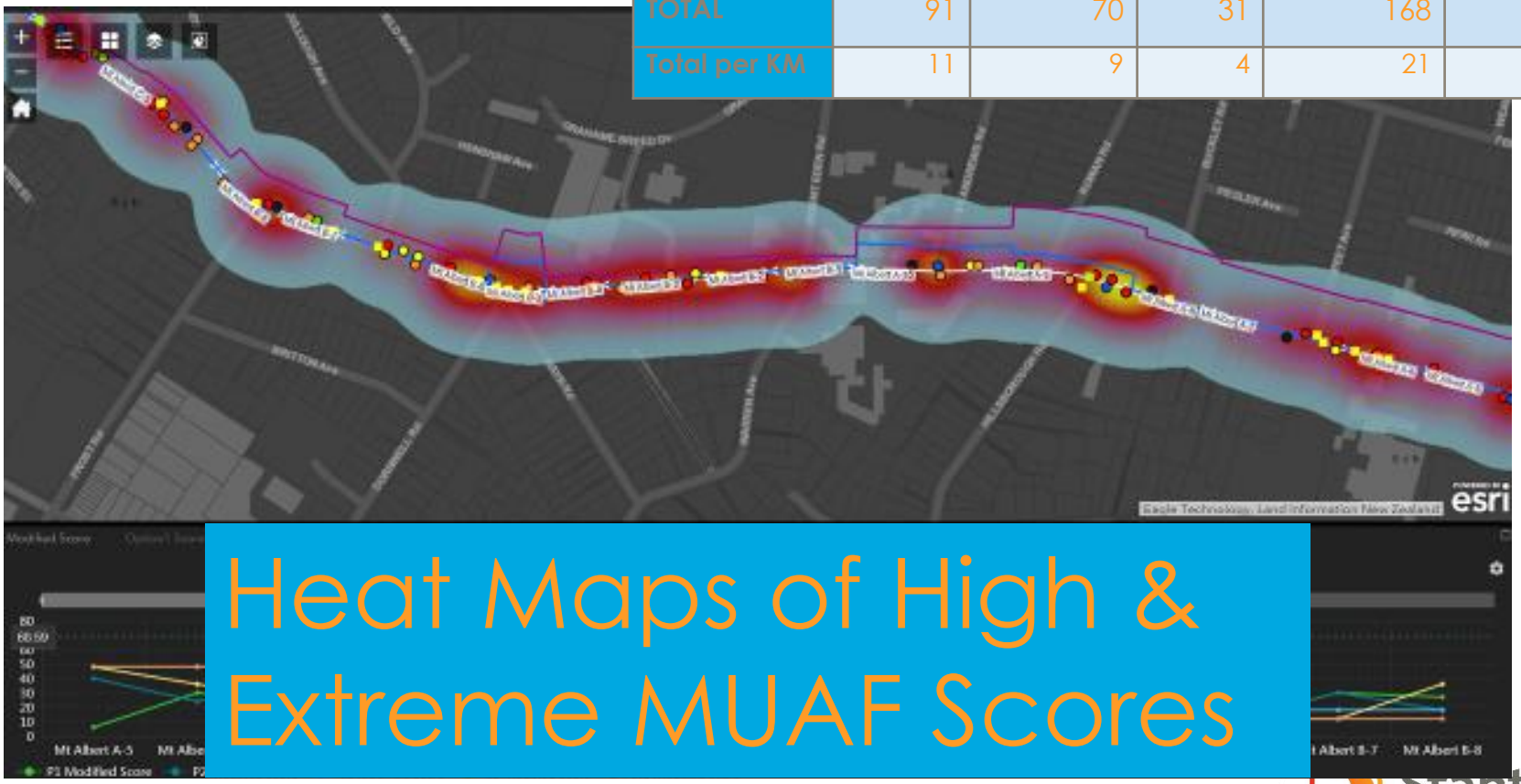
Crash Locations & Times



MUAF Scores

Risk Category	Pedal Cyclist	Pedestrian	Both Users	Vulnerable	TOTAL
Extreme	4	7	1	15	27
High	17	11	7	47	82
Medium-high	25	17	8	49	99
Medium	23	12	9	30	74
Medium-low	19	13	5	22	59
Low	3	10	1	5	19
TOTAL	91	70	31	168	360
Total per KM	11	9	4	21	45



Heat Maps of High & Extreme MUAF Scores

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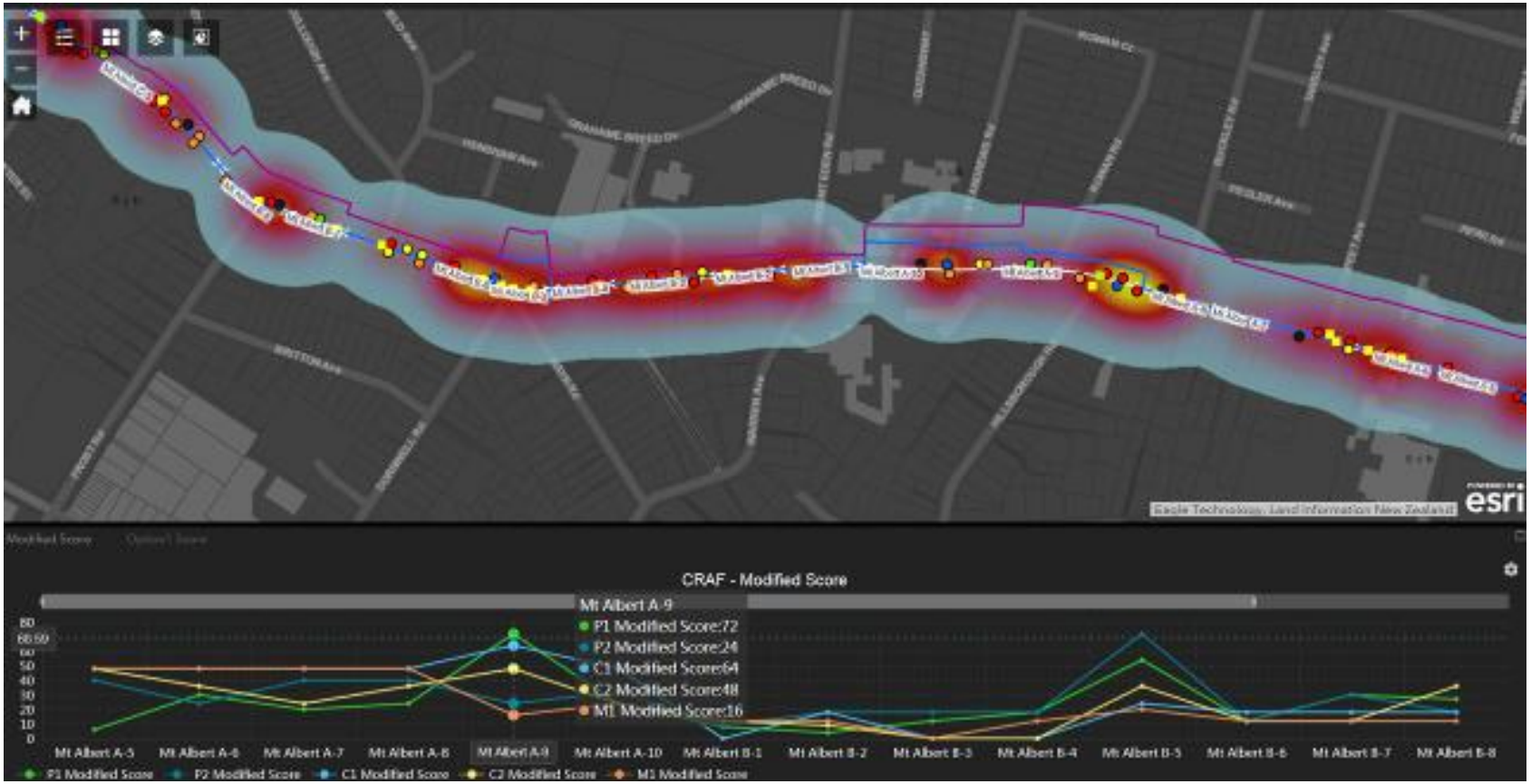
MUAF and CRAF Scoring



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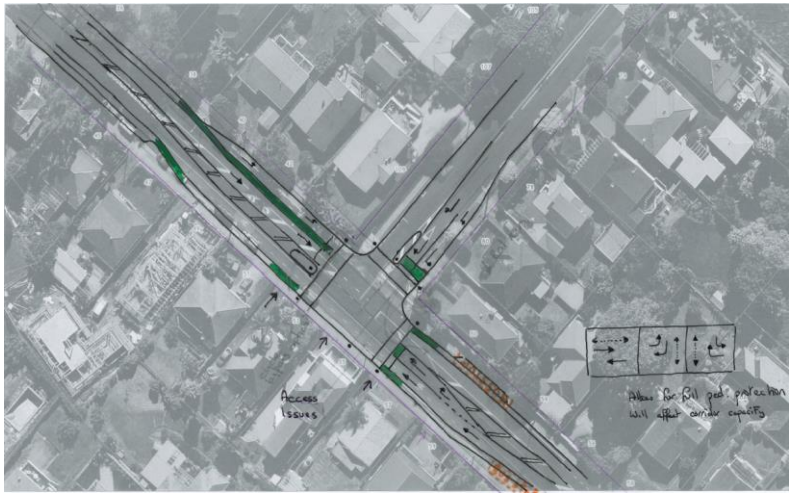
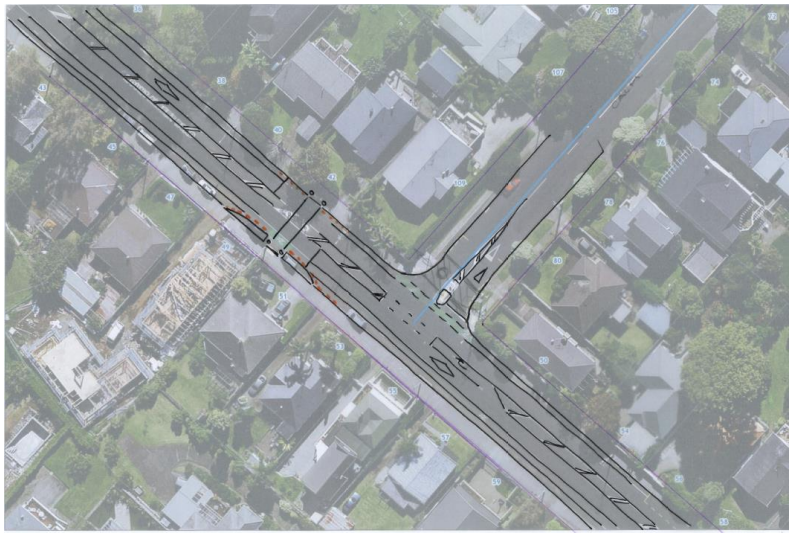
Possible Three Kings Upgrade

Mt Albert and Alberton Intersection





	Section	6 Score	5 Score	4 Score
P1 - Vehicle Turning	Existing	12	15	4
	Option 1	12	3	4
	Option 2	12	6	4
P2 - Vehicle Straight	Existing	60	60	45
	Option 1	12	4	18
	Option 2	24	6	18
C1 - Mid block SS	Existing	12	12	12
	Option 1	12	12	12
	Option 2	12	12	12
C2 - VehicleTurning	Existing	12	12	4
	Option 1	12	6	4
	Option 2	12	6	4
C3 - Side Swipe	Existing	12	8	12
	Option 1	12	8	12
	Option 2	12	8	12

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Economics – Glen Eden

Figure 7-1: Corridor Sections (For Economics Purposes)

Table 7-1: Section Treatments for Each Option

Section		Option 1	Option 1a	Option 2	Option 3
1	Janet Clews Place to Pleasant Road	40kph speed and gateway treatment			
2	Janet Clews Place to Bowers Road	40km/hr speed			
3	Bowers Road Intersection	Raised Intersection		High Friction Surfacing	
		Remove LT slip lanes. Include driveway in signals.			
4	Bowers Road to Captain Scott Road	40km/hr speed			
5	Captain Scott Road Intersection	Signalisation + raised intersections	Signalisation + raised intersections + LILO	Signalisation + HF Surfacing	Signalisation + HF Surfacing + LILO
6	Glenview Road Intersection	Raised Intersection		High Friction Surfacing	
		Remove LT slip lanes. Include filtered right turn. Ped crossing on west leg.			
7	Glenview Road to Glendale Road	40km/hr speed			
8	Glendale Road Intersection	Raised Intersection		High Friction Surfacing	
		Include driveway in intersection. Improve markings.			
9	Glendale Road to End	40km/hr speed and gateway treatment			

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Economics - Glen Eden

Table 7-4: Economic Evaluation Summary

	Option 1a	Option 1b	Option 2	Option 3
PV Net Safety Benefits	$7.4 m	$7.5 m	$6.9 m	$7.0 m
PV Net Efficiency Benefits	-$32.2 m	-$40.3 m	-$32.2 m	-$40.3 m
PV Net Benefits (Safety + Efficiency)	-$23.5 m	-$31.5 m	-$24.3 m	-$32.2 m
Cost (inc. Design + Maintenance)	$4.6 m	$4.6 m	$3.8 m	$3.8 m
Safety BCR	1.6	1.6	1.8	1.8
Safety + Efficiency BCR	Negative	Negative	Negative	Negative

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