Stantec

Memo

Project:	Silverdale West Private Plan Change	**Project No:**	310205431
To:	Ross Cooper (Tattico) Karl Cook (Barker Associates) Don McKenzie (DM Consulting) Maddie Dillon (Fletcher Industrial)	**Date:**	27 March 2024
From:	Trevor Lee-Joe		

RE: Derivation of Triggers for the Plan Change Assessment

This memorandum summarises the assessment undertaken to derive the transport triggers for the mitigation measures proposed for the Silverdale West plan Change application. The memorandum should be read in conjunction with the Integrated Transportation Assessment (**ITA**) produced for the Plan Change dated 27 March 2024.

Upgrade 2 (Table IX.6.7.1 (b) of the Precinct Provisions)

Upgrade of the Pine Valley Road / Dairy Flat Highway intersection to include a second right turn short bay from the east.

The trigger for Upgrade 2 was derived from an assessment of queues at the Pine Valley Road / Dairy Flat intersection, and primarily related to the evening (**PM**) peak period. The principal driver was the extent of queuing on the eastern approach to the intersection where queues were observed in the model to extend to the Silverdale interchange, affecting traffic on the northbound offramp, southbound on ramp and extending along Hibiscus Coast Highway. The queuing pattern on the eastern approach at the Pine Valley Road / Dairy Flat intersection for the PM period is illustrated in **Figure 1**.

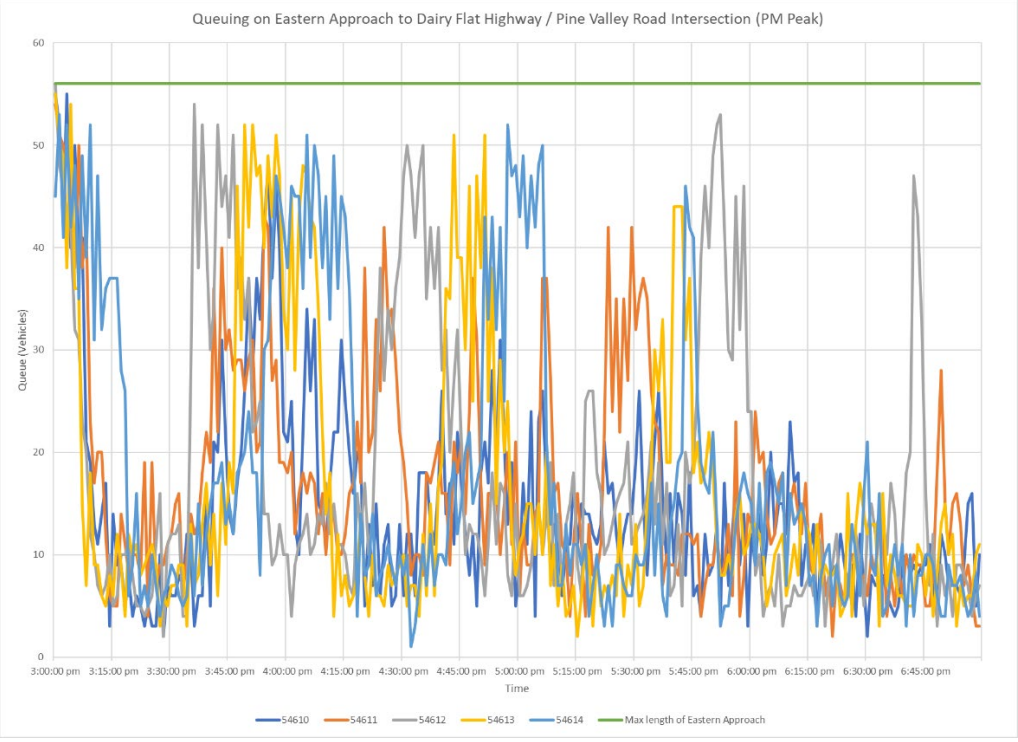

Figure 1: Queue Pattern (eastern approach to the Dairy Flat / Pine Valley Road intersection) – PM Peak

The green line in Figure 1 represents the distance from the Dairy Flat Highway / Pine Valley Road intersection to the Silverdale Interchange. Whilst the graph appears to show that the eastern approach queuing capacity is never fully exceeded, it however, does not show the queuing on the other links leading to the eastern approach, such as the northbound off-ramp and the Silverdale overbridge which are affected by the queuing on the eastern approach.

In order to illustrate the flow-on effects, some screenshots from the simulation model are provided in the following series of diagrams (**Figure 2** to **Figure 5**)

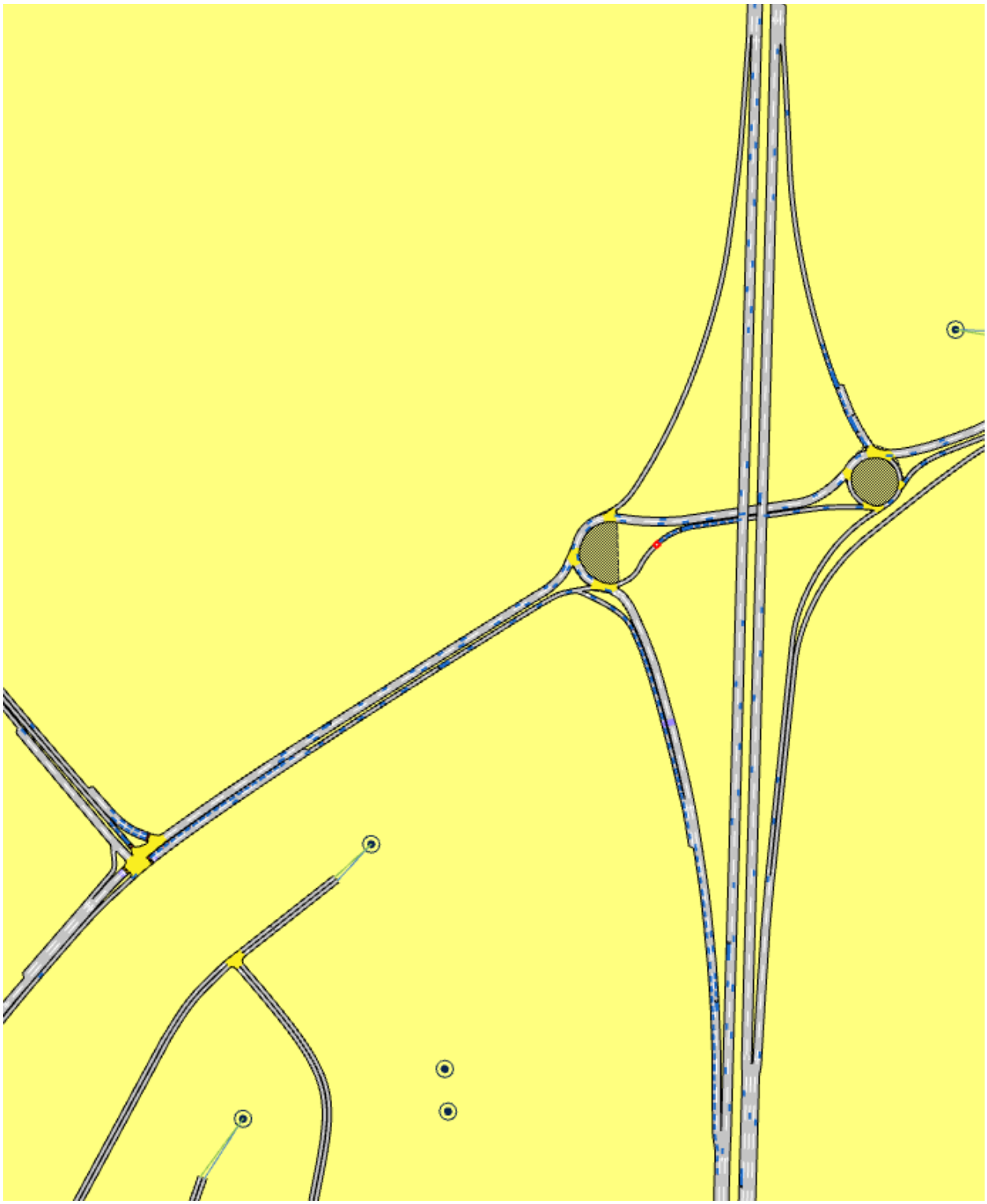

Figure 2: Screenshot at 3pm

Figure 2 indicates noticeable queuing on the northbound off-ramp, extending back to the motorway. The queuing is caused primarily by the right turn demand into Pine Valley Road at the Pine Valley Road / Dairy Flat intersection. The queues activate the ramp meter and this in turn, stops traffic heading westbound across the Silverdale overbridge.

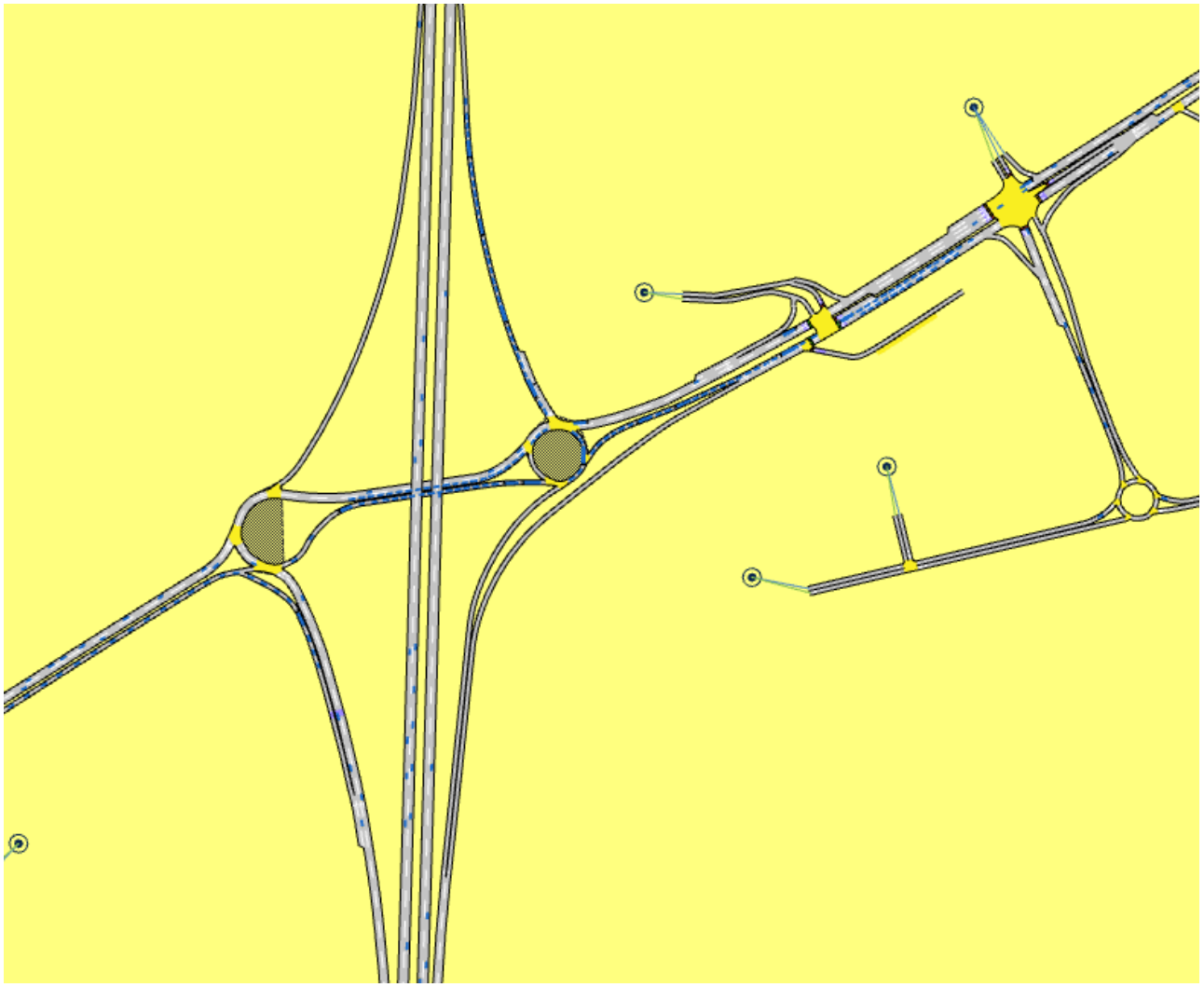

Figure 3: Screenshot at 3:03pm

Figure 3 illustrates the queues building up on the Silverdale Overbridge and having a flow on effect on Hibiscus Coast Highway, with queues extending back to the Painton Road / Hibiscus Coast Highway intersection which serves the Park and Ride station. Queues are also observed to build up on the southbound off-ramp.

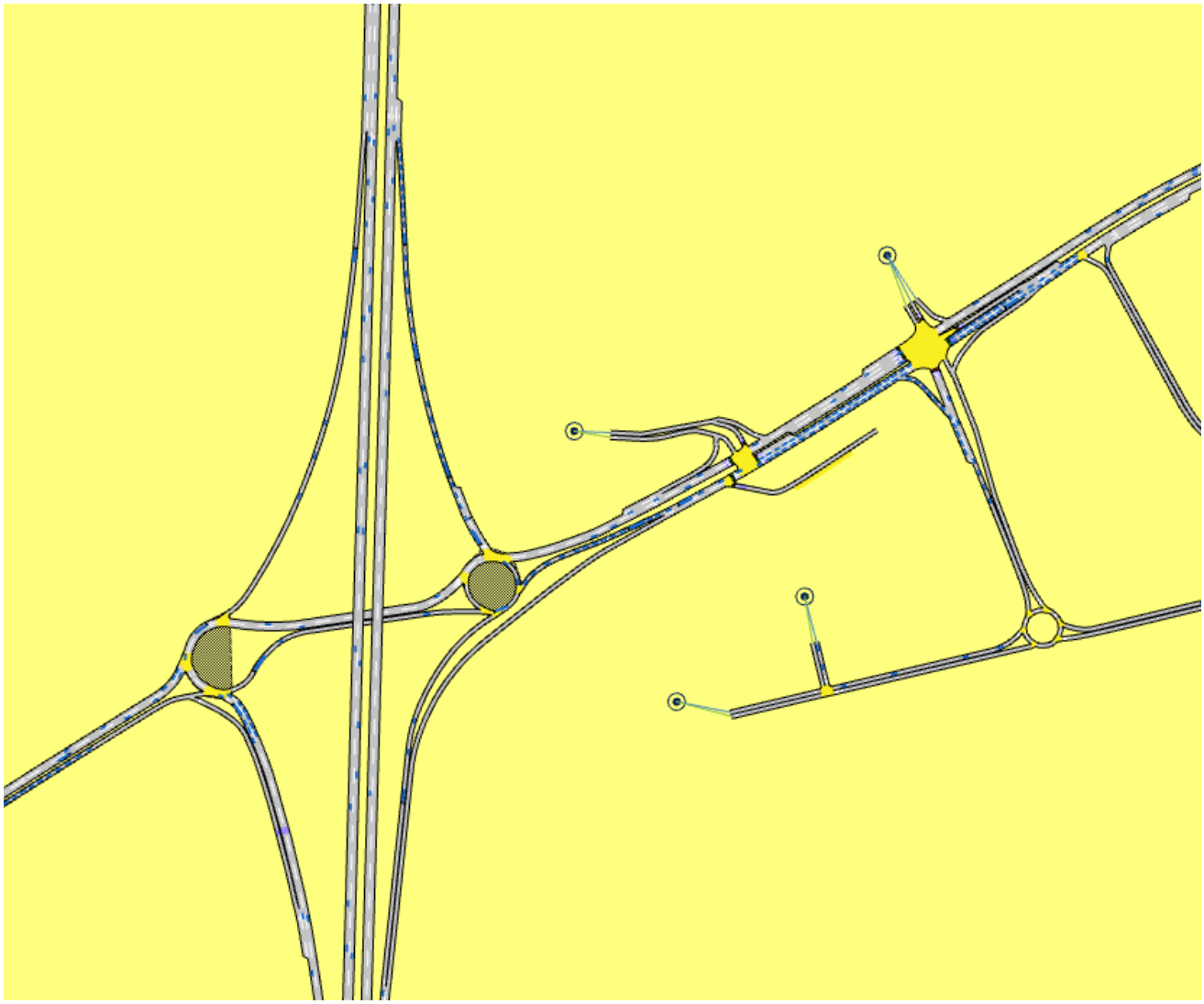

Figure 4: Screenshot at 3:07pm

Figure 4 indicates a queue which extends to the motorway at the southbound off-ramp and queuing past the Painton Road / Hibiscus Coast Highway intersection on Hibiscus Coast Highway, as well as queues on Painton Road.

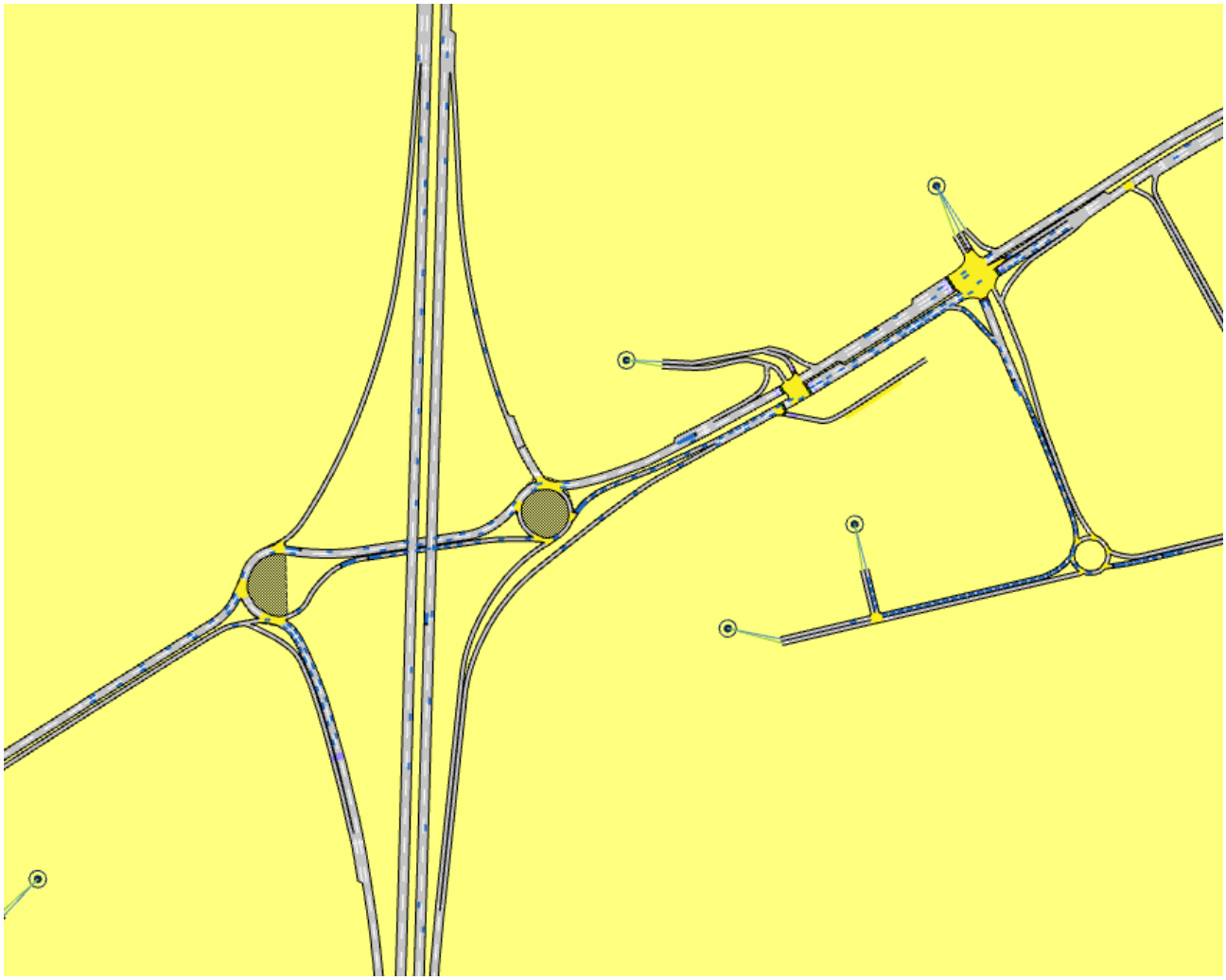

Figure 5: Screenshot at 3:11pm

Figure 5 indicates queues cleared on the on and off ramps but extending into the Park and Ride Station carpark.

From around 3:18pm, queuing issues are resolved. However, at around 4pm, similar issues arise, with queues extending back from the Pine Valley Road / Dairy Flat Highway intersection to the Silverdale interchange, although the issues are not as widespread as the 3pm period.

Nevertheless, queuing onto the mainline of the motorway is considered to be a potential safety issue and the proposed upgrade to the Pine Valley / Dairy Flat Highway intersection will help mitigate the issues.

Upgrade 3 (Table IX.6.7.1 (c) of the Precinct Provisions)

Signalisation of the Wilks Road / Dairy Flat Highway intersection

The trigger for Upgrade 3 was derived from an assessment of delays at the Wilks Road / Dairy Flat Highway intersection.

The operation of the intersection in the morning (**AM**) and PM peak hours, without the proposed signalisation of the intersection, are shown below.

AM 2031_Avg 07:45 - 08:45

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
Dairy Flat Highway & Wilks (Priority)	S Left	34	15	29	D	130	F	B
	S Thru	352	17					C
	S Right	108	29					D
	E Left	58	81	130	F			F
	E Thru	14	130					F
	E Right	80	111					F
	N Left	116	14	17	C			B
	N Thru	435	14					B
	N Right	189	17					C
	W Left	108	11	31	D			B
	W Thru	17	31					D
	W Right	32	30					D

PM 2031_Avg 16:30 - 17:30

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
Dairy Flat Highway & Wilks (Priority)	S Left	27	9	23	C	202	F	A
	S Thru	466	12					B
	S Right	79	23					C
	E Left	86	136	202	F			F
	E Thru	15	173					F
	E Right	63	202					F
	N Left	106	14	19	C			B
	N Thru	342	14					B
	N Right	150	19					C
	W Left	241	13	26	D			B
	W Thru	28	25					D
	W Right	52	26					D

As indicated, the model indicates a significant deterioration in the level of operation of the priority intersection in the forecast 2031 year. Being a priority intersection, the overall performance is determined by the worst approach and in this instance the eastern approach (Wilks Road east) was anticipated to experience delays of around 130 seconds and 200 seconds respectively for the AM and PM peak hours (or a Level of Service (**LOS**) of F). This was not considered to be sustainable and therefore signalisation of the intersection was proposed to be consistent with the signalisation proposed for the site accesses and the signals at Dairy Flat Highway / Pine Valley Road. Furthermore, the ramp metering at the Silverdale interchange also provides an ad-hoc signal arrangement for the northbound off-ramp.

Upgrade 4 (Table IX.6.7.1 (c) of the Precinct Provisions)

Signalisation of the Wilks Road / East Coast Road intersection

The trigger for Upgrade 4 was derived from an assessment of delays at the Wilks Road / East Coast Road intersection.

The operation of the intersection in the morning AM and PM peak hours, without the proposed signalisation of the intersection, are shown below.

AM 2031_Avg 07:45 - 08:45

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
East Coast Road & Wilks (Priority)	S Left	141	2	10	B	33	D	A
	S Thru	311	2					A
	S Right	4	10					B
	E Left	4	9	22	C			A
	E Thru	2	18					C
	E Right	9	22					C
	N Left	4	8	8	A			A
	N Thru	351	6					A
	N Right	54	7					A
	W Left	74	18	33	D			C
	W Thru	1	22					C
	W Right	165	33					D

PM 2031_Avg 16:30 - 17:30

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
East Coast Road & Wilks (Priority)	S Left	154	3	9	A	68	F	A
	S Thru	518	3					A
	S Right	7	9					A
	E Left	3	20	29	D			C
	E Thru	2	29					D
	E Right	7	19					C
	N Left	7	9	11	B			A
	N Thru	280	9					A
	N Right	108	11					B
	W Left	88	46	68	F			E
	W Thru	5	68					F
	W Right	173	68					F

As indicated, whilst the intersection is anticipated to operate satisfactorily for the AM peak, in the PM peak the western approach is predicted to drop to an LOS of F.

Signalisation has been proposed to provide the most compact footprint, and enables the Jackson Way approach to be tied into the intersection within the current road reserve boundaries.

Upgrade 5 (Table IX.6.7.1 (d) of the Precinct Provisions)

Provision of a slip lane on the western approach to the Silverdale interchange which connects to the northbound on-ramp

The trigger for Upgrade 5 was derived from a combined assessment of delays and queuing on the western approach to the Silverdale Interchange, specifically for the PM peak.

The operation of the western roundabout at the Silverdale Interchange, without the proposed mitigation, is shown below.

PM 2032_Avg 16:30 - 17:30

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
Silverdale Interchange West (Roundabout)	S Left	516	12	31	C	43	D	B
	S Right	870	42					D
	E Thru	741	3	4	A			A
	E Right	333	5					A
	W Left	331	97	99	F			F
	W Thru	710	100					F

As shown, without mitigation the western approach is forecast to drop to an LOS of F, with delays being in the order of 100 seconds/vehicle for the left and through movements.

The model (five simulation runs) indicates queue lengths on the western approach as per the graph below in **Figure 6**.

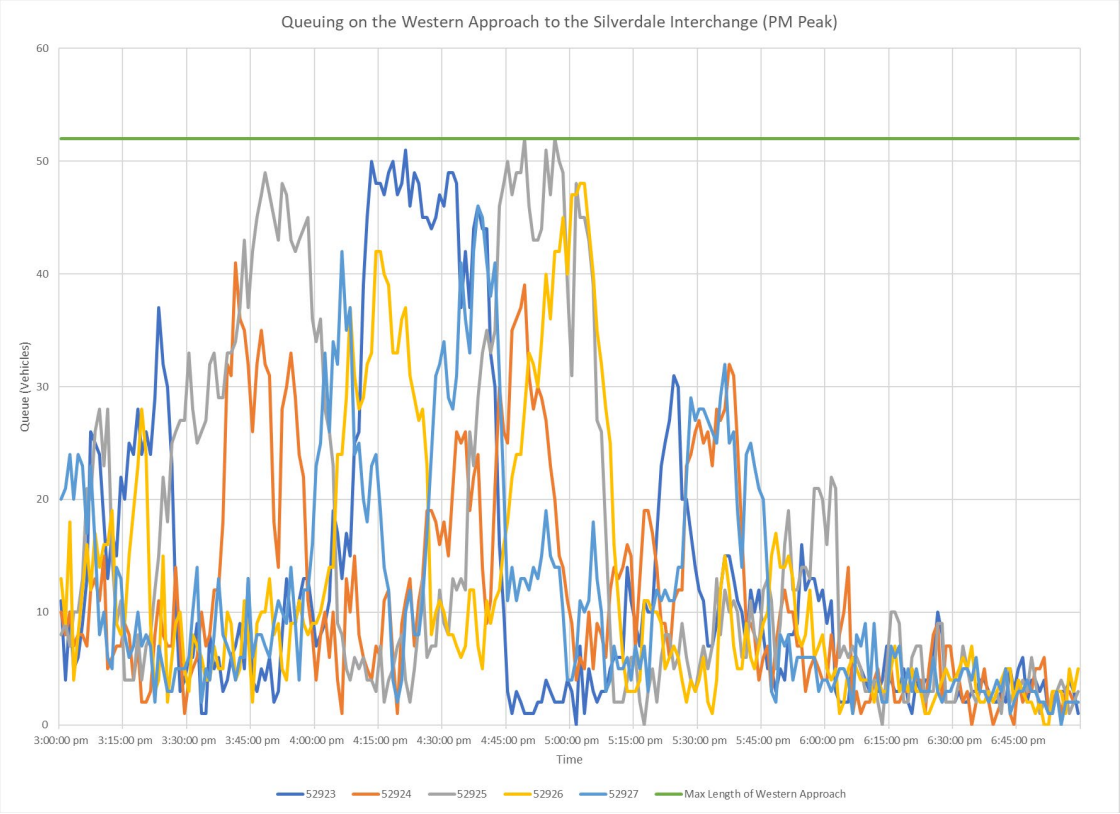

Figure 6: Queue Length on the Western Approach to the Silverdale Interchange (PM Peak) without mitigation

The horizontal green line in Figure 6 indicates the distance between the Dairy Flat Highway / Pine Valley Road intersection to the Silverdale Interchange. As shown, at peak times queues extended back to the Dairy Flat Highway / Pine Valley Road intersection from the interchange.

Based on the delay and queuing reported by the model, an upgrade to the western roundabout of the Silverdale Interchange was considered necessary.

Upgrade 6 (Table IX.6.7.1 (d) of the Precinct Provisions)

Extending the length of the left turn slip lane on the southbound off-ramp at the Silverdale interchange to around 150m and introducing a ramp meter for the AM peak

The trigger for Upgrade 6 was derived from a combined assessment of delays and queuing on the southbound off-ramp at the Silverdale Interchange, specifically for the AM peak.

The operation of the southbound off-ramp, without the proposed mitigation, is shown below.

AM 2032_Avg 07:45 - 08:45

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
Silverdale Interchange East (Roundabout)	E Left	810	4	10	A	21	C	A
	E Thru	448	20					C
	N Left	368	81	98	F			F
	N Right	270	122					F
	W Thru	1350	2	2	A			A
	W Right	612	3					A

As shown, the AM peak hour delay on the off-ramp is predicted to be around 98 seconds/vehicle (81 seconds/vehicle for the left turn and 122 seconds/vehicle for the right turn), or a Level of Service of F for the approach and for individual movements without the proposed mitigation.

The model indicates queue lengths as per the graph below in **Figure 6**.

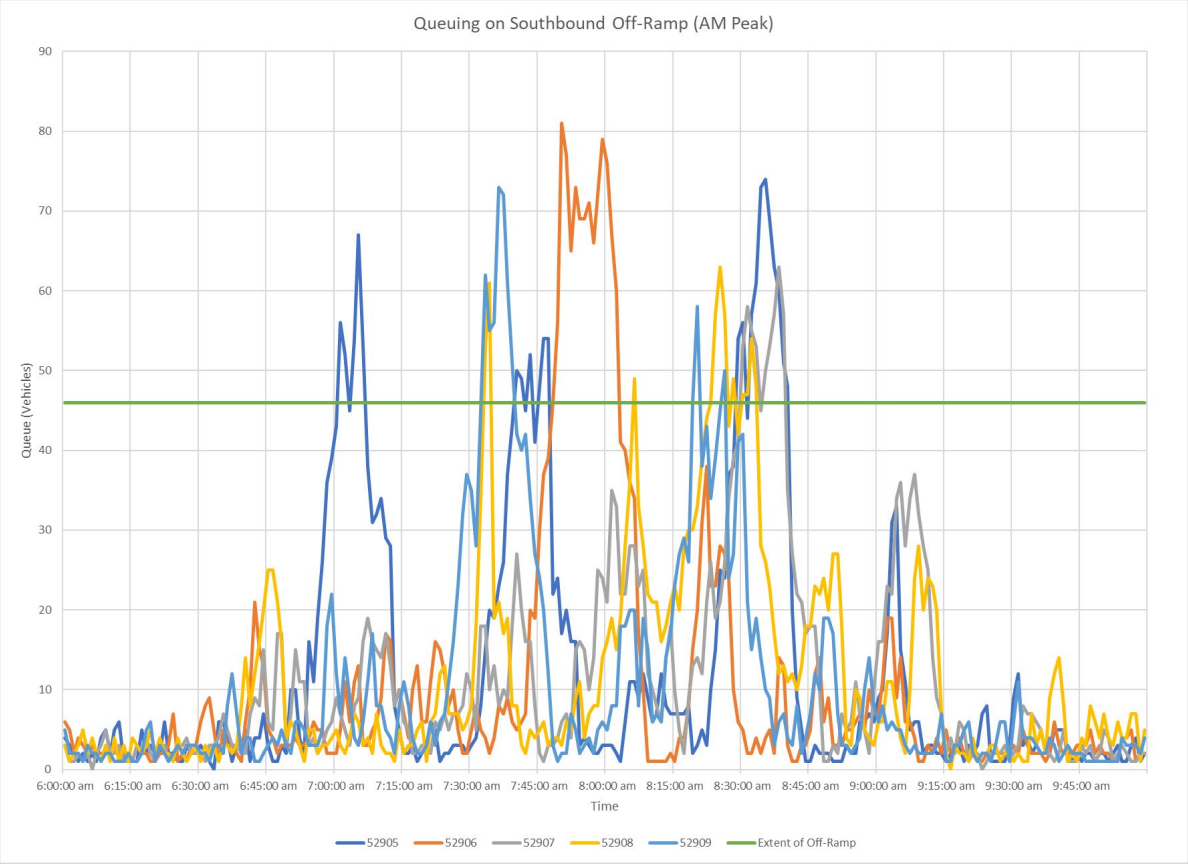

Figure 7: Queue Length on the Southbound Off-Ramp (AM Peak) without mitigation

The horizontal green line in Figure 7 indicates the maximum queue capacity of the off-ramp. As indicated, each model run predicts queues extending past the end of the off-ramp and onto the motorway.

As such, the mitigation measures for the southbound off-ramp were considered to be required.

Upgrade 8 (Table IX.6.7.1 (e) of the Precinct Provisions)

Double-laning of the Argent Lane / Pine Valley Road roundabout

The trigger for Upgrade 8 was derived from a combined assessment of delays and queuing on the western approach to the Pine Valey Road / Argent Lane roundabout, specifically for the PM peak period between 3pm and 4pm.

The operation of the roundabout, without the proposed mitigation, is shown below.

PM_2033_Avg 15:00 - 16:00
(Wainui FUZ - 2,540 Dwellings)

Intersection	Appr & Turn	Count	Mvmt Delay	App Delay	App LOS	Int Del	Int LOS	
Argent & Pine Valley (Roundabout)	S Left	224	19	21	C	26	C	B
	S Thru	1049	22					C
	S U-Turn	0	0					A
	N Thru	426	5	5	A			A
	N Right	93	6					A
	N U-Turn	0	0					A
	W Left	100	77	77	E			E
	W Right	242	76					E
	W U-Turn	0	0					A

As indicated, whilst the overall intersection operates at an LOS of C, the western approach suffers relatively high delays at around 77 seconds/vehicle (LOS E) and noting that this is marginally less than an LOS of F (at 80 seconds/vehicle)

In addition, the modelled queue lengths are as shown below in **Figure 8**.

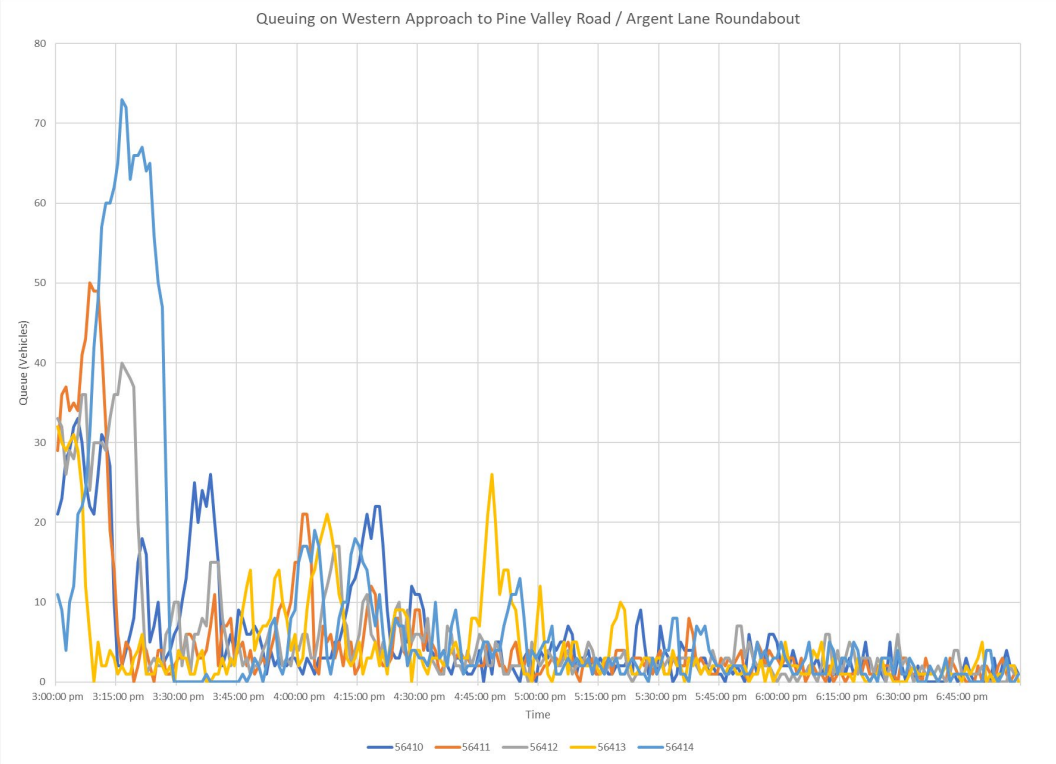

Figure 8: Queue Length on the Western Approach to the Pine Valley Road / Argent Lane Roundabout (PM Peak) - without mitigation

As shown, queues varied from around 30 to 70 vehicles (approximately 210 to 490m, assuming 7m per vehicle in a queued state) during the 3 to 4pm period.

Based on the delays and queues observed in the model, an upgrade to the roundabout was considered warranted.

In summary, as summarised in this memorandum, substantial work using the modelling tool developed for the Silverdale West Pan Change has been undertaken to derive the various mitigation measures proposed. It is our opinion that the mitigation measures are warranted to ensure that the impacts of the anticipated trip generation of the future activities within the Plan Change area will be able to be managed without affecting the performance of the surrounding transportation network.

Yours sincerely

Stantec New Zealand

Trevor Lee-Joe
Principal Transportation Engineer