

# Appendix D: Additional Traffic Analysis

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Subject	Pacific Highway HW10 and Wyong Road MR35 Intersection and Approaches Upgrade – One left turning lane into the Pacific Highway southbound

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## 1. Introduction

Sinclair Knight Merz (SKM) was previously engaged by the Roads and Maritime Services (RMS) to develop a Paramics models for the Base Case and Concept Design (CD) to upgrade the Pacific Highway and Wyong Road intersection in Tuggerah. The performance of each scenario was assessed for the 2011 base year and the 2025 and 2035 modelled years, to determine the immediate and long term impact on the performance of the network. The critical outputs from the simulation runs were extracted to assess the performance of the intersection for each scenario. The results and key findings were summarised accordingly in the report **“Traffic and Transport Assessment – NB11462-ECC-RP-0004 – Rev C”**, which was submitted to the Roads and Maritime Services (RMS) on the 22<sup>nd</sup> of October 2012.

Subsequent to this assessment, SKM was appointed by RMS to develop Paramics models with an option for one left turning from Wyong Road westbound into the Pacific Highway (Option: “1-left lane”). This technical note describes the impact of the proposed “1-left lane” and original CD, which consisted of two left turning lanes from Wyong Road westbound into the Pacific Highway (Option: “2-left lanes”). The performance of the intersection for the future years (2025 and 2035) under both low growth (without proposed Tuggerah Town Centre Development) and high growth scenario (including proposed Tuggerah Town Centre Development).

## 2. Model assumptions and stability

The following assumptions have been made for the Paramics modelling:

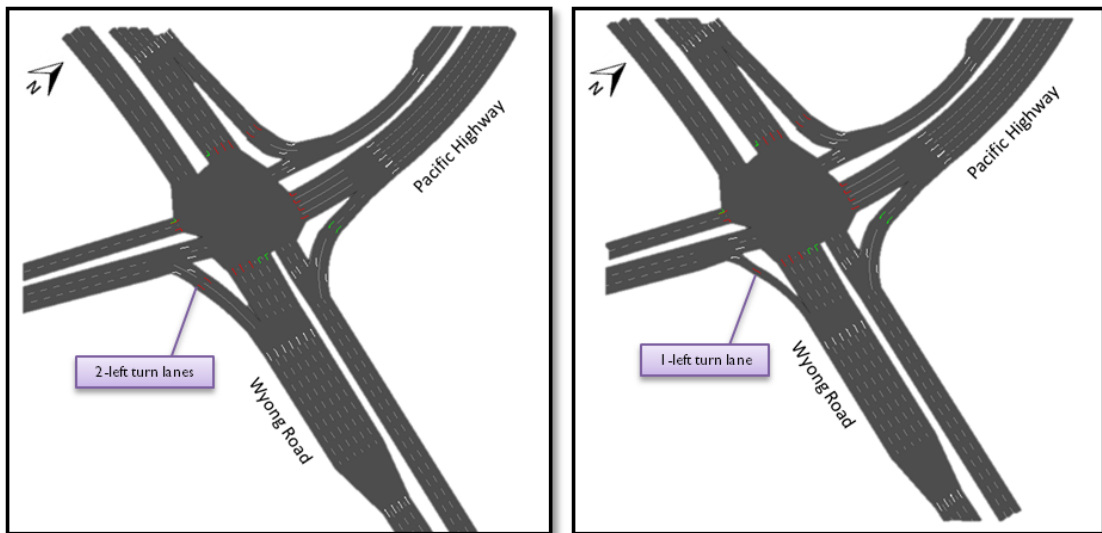
- Demand matrices which are developed for the previous study and models (2025 and 2035, AM & PM peaks) were incorporated into this assessment.
- The light and heavy vehicles proportions for each origin/destination remain unchanged from the previous study.
- Wyong Road and Pacific Highway intersection operates as a single diamond phasing (i.e. there is no opposing right turn for traffic heading north/south along the Pacific Highway).

To ensure the robustness of the AM and PM peak models, five different seed values were run for analysing purposes. The seed values incorporated in the AM and PM peak models were 560, 28, 7771, 86524 and 2849. These five seeds are also settings defined by the RMS standards for Paramics.

### 3. Option assessment

This section documents the model results for the 2025 and 2035 traffic volume scenarios for both “2-left lanes” and “1-left lane” model scenarios. **Figure 1** shows the Wyong Road / Pacific Highway intersection with both the double and single slip lane configurations.

- Figure 1: Wyong Road / Pacific Highway Intersection



For the comparative assessment of proposed option, the Paramics outputs focused on the following results:

- Intersection performance
- Queue lengths

#### 3.1 Intersection performance

The RMS Guide to Traffic Generating Development specifies intersection Level of Service (LoS) as the primary criteria for the assessment of signalised intersections. The LoS determined for signalised intersections is the weighted average delay for all movements in the intersection. Generally, intersection operation of LoS C or better is considered acceptable. However in many future development situations, LoS D is considered acceptable. Intersections operating LoS E or LoS F indicate unstable operation, resulting in excessive delays and require further investigation.

It is advised that these results be assessed in conjunction with the performance from the Paramics models. The SIDRA results are only based on the extracted turning volumes from models output results. These turning volume outputs reflect the traffic that arrives at the intersection as opposed to the total demand flow. Upstream queued flow not arriving at the various intersections may be significant when the network experiences severe congestion. This impact is not considered by the SIDRA modelling.



The results of the analysis for intersection Pacific Highway / Wyong Road 2025 and 2035 are summarised in **Table 1** and **Table 2**.

- Table 1: Intersection results summary – 2025  
(Intersection Pacific Highway / Wyong Road)

Scenario	Low Growth Scenario			High Growth Scenario		
	Ave Delay (seconds)	LoS	Degree of Saturation (DoS)	Ave Delay (seconds)	LoS	Degree of Saturation (DoS)
<b>AM Peak</b>						
2-left lanes	40.7	C	0.74	40.5	C	0.67
1-left lane	41.9	C	0.85	43.4	D	0.86
<b>PM Peak</b>						
2-left lanes	42.0	C	0.74	41.9	C	0.75
1-left lane	42.3	C	0.75	43.4	D	0.76

- Table 2: Intersection results summary – 2035  
(Intersection Pacific Highway / Wyong Road)

Scenario	Low Growth Scenario			High Growth Scenario		
	Ave Delay (seconds)	LoS	Degree of Saturation (DoS)	Ave Delay (seconds)	LoS	Degree of Saturation (DoS)
<b>AM Peak</b>						
2-left lanes	38.9	C	0.67	42.4	C	0.72
1-left lane	41.3	C	0.84	45.6	D	0.88
<b>PM Peak</b>						
2-left lanes	43.5	D	0.78	43.7	D	0.79
1-left lane	43.5	D	0.81	43.7	D	0.81

The intersection LoS has been evaluated using SIDRA to allow for a comparison of performance between the “2-left lanes” and “1-left lane” configurations. These results are assessed in conjunction with the performance from the Paramics models. The SIDRA results for all future demand scenarios reveal the following:

**2025 models:**

- The “1-left lane” model performs comparably to the “2-left lanes” model for the AM period. Whilst LoS drops from C to D for the high growth scenario, the average delay is increased by less than 3 seconds, indicating only a minimal decline in performance.
- The PM peak results are very similar between both scenarios. Performance of the scenarios assessed under the low growth models is almost identical. The high growth scenario experiences an increase in average delay of less than 2 seconds and the LoS increases from LoS C to LoS D.



### 2035 Models:

- The “1-left lane” AM models experience a minimal increase in average delay of approximately 3 seconds when compared to the “2-left lanes” model scenario. Similarly to the 2025 models, the intersection LoS drops from C to D under high growth scenario.
- The “1-left lane” PM peak models perform identically to “2-left lanes” model with the average delay and LoS remaining consistent for the both the low and high growth scenarios.

The “1-left lane” and the 2-left lane” options operate similar under all future demand scenarios. Traffic volumes which perform the left turning movement from Wyong Road westbound into the Pacific Highway are relatively low and the results indicate that a single left turning lane is sufficient for future traffic demands in the Wyong area for both AM and PM peak periods.

### 3.2 Queue lengths

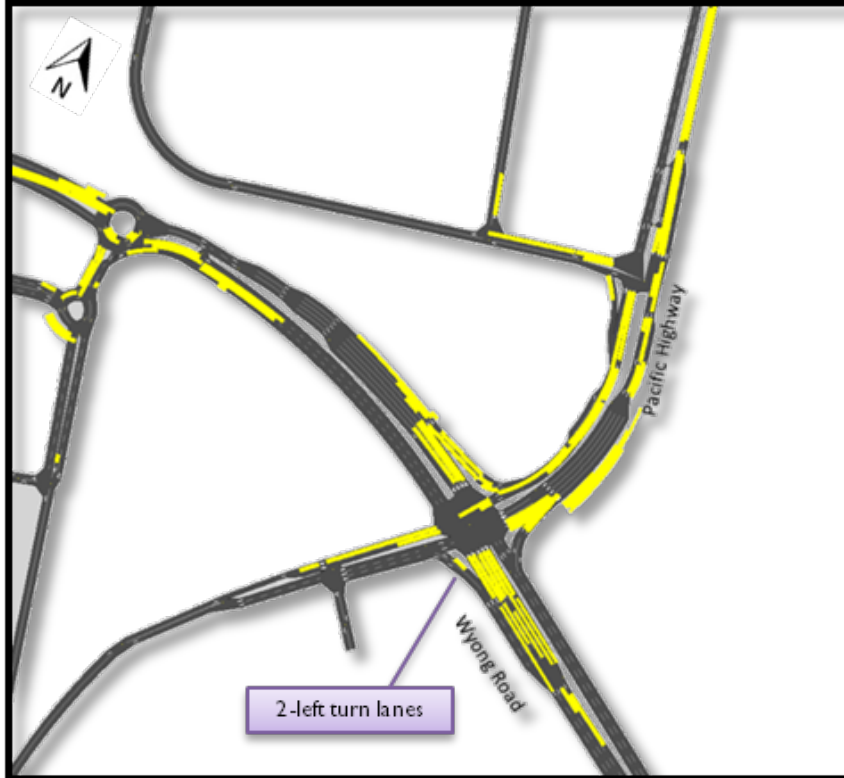
An analysis of the queue lengths across all modelled scenarios reveals that there are no significant differences between the “2-left lanes” and “1-left lane” configurations.

Queuing at the Wyong Road / Pacific Highway intersection remains stable and the intersection operates consistently with a single slip lane from Wyong Road westbound into the Pacific Highway. Queuing in the relevant left turning lane is not significant in either scenario. There is unused capacity in this lane which would allow for an increase in volume without impacting on the northbound through lanes.

**Figures 2** presents the queue lengths results for both slip lane configurations. The figure snapshot are extracted from 2035 AM with low growth scenario (8.00am – 8.30am) results but are indicative for all scenarios. Similar queue lengths were observed in both “2-left lanes” and “1-left lane” options.

Note: The highlight section shows the back of queue lengths from the average of five seeds Paramics results.

Figure 2: Back of queue length snapshots in 2035 AM with low growth (8.00am-8.30am)





#### 4. Summary of the modelling assessment

Paramics modelling has been undertaken in order to assess the impact of converting the two left slip lanes from Wyong Road westbound into the Pacific Highway into a single slip lane.

For the comparative assessment of proposed options, the intersection operation and queuing at the Wyong Road / Pacific Highway intersection were assessed. The assessment was completed for the AM and PM peak demands for 2025 and 2035, for low and high growth scenarios. Where a low growth was without the proposed Tuggerah development and the high growth scenario was with the proposed Tuggerah development.

The SIDRA level of service and average delay assessment for the intersection demonstrated that a single left turning lane was sufficient to accommodate the left turning traffic for 2025 and 2035 for the low and high growth scenarios.

The Paramics modelling showed that queuing at the Wyong Road / Pacific Highway intersection remains consistent for both options and therefore a second left turning lane is not required to reduce the queuing at the intersection and the queuing does not impede adjacent through lanes and cause delays or congestion for northbound traffic.

Overall, both Paramics and SIDRA modelling indicate that the Wyong Road / Pacific Highway intersection is not adversely affected by the removal of a left slip lane. The traffic volumes which perform this turning movement are relatively low and results indicate that a single slip lane will be sufficient for future traffic demands in the Wyong area for both peak periods.

Based on this assessment and comparison of traffic modelling analysis results, a single left turning lane is sufficient. The increase in intersection delay is nominal and has minimal impact on the Wyong Road / Pacific Highway intersection operation.

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