

To	Daniell Abrahamse, City of Busselton	From	Andreas Wang, Cardno
CC	Oliver Darby, City of Busselton Ray Cook, Cardno	Date	14 September 2020
Project	CW1140900 - Proposed Petrol Station Access Modelling	Location	Perth
Subject	Results from Modelled Access Scenarios		
Action Required	NA	Attachments	NA

1 Introduction

Cardno has been engaged by the City of Busselton to undertake a traffic modelling exercise to evaluate the performance of the intersection of West Street / Peel Terrace under a number of different access scenarios for the proposed petrol filling station at the south-eastern corner of West Street / Peel Terrace.

The site, and associated access locations, is shown in **Figure 1-1**.

Figure 1-1 Study Area



2 Scenarios Modelled

The following scenarios have been modelled as part of this modelling exercise:

- > **Scenario 1:** existing AM and PM peak hour volumes (i.e. no petrol station).
- > **Scenario 2:** as per Scenario 1, with the additional traffic generated by the proposed petrol station.
- > **Scenario 3:** as per Scenario 2 but with Access 2 limited to left-in, left-out turn movements.
- > **Scenario 4:** as per Scenario 3 but with a roundabout at the intersection of West Street / Peel Terrace.

2.1 Data Sources

2.1.1 Intersection Traffic Volumes

The traffic turn volumes for the intersection of West Street / Peel Terrace for existing AM and PM traffic volumes were sourced from Section 7.3 of the Revised Transport Impact Assessment (Transcore, Rev r01f, dated July 2020).

2.1.2 Development Traffic Generation

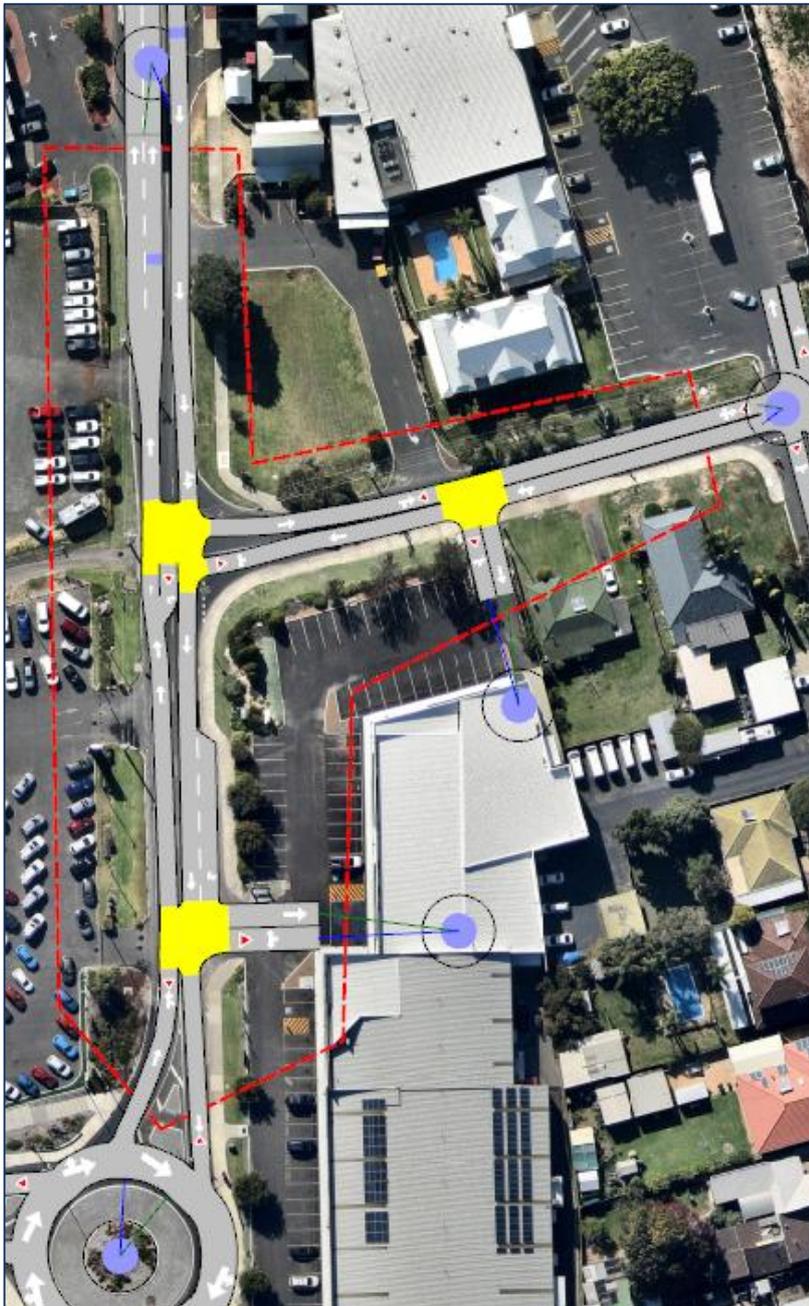
The traffic generation for the proposed development was sourced from Section 7.0 of the Revised Transport Impact Assessment (Transcore, Rev r01f, dated July 2020).

3 Traffic Modelling

3.1 Model Area

The model area is shown in **Figure 3-1** and comprises of a section of West Street, a section of Peel Terrace, and Accesses 1 and 2.

Figure 3-1 Model Area

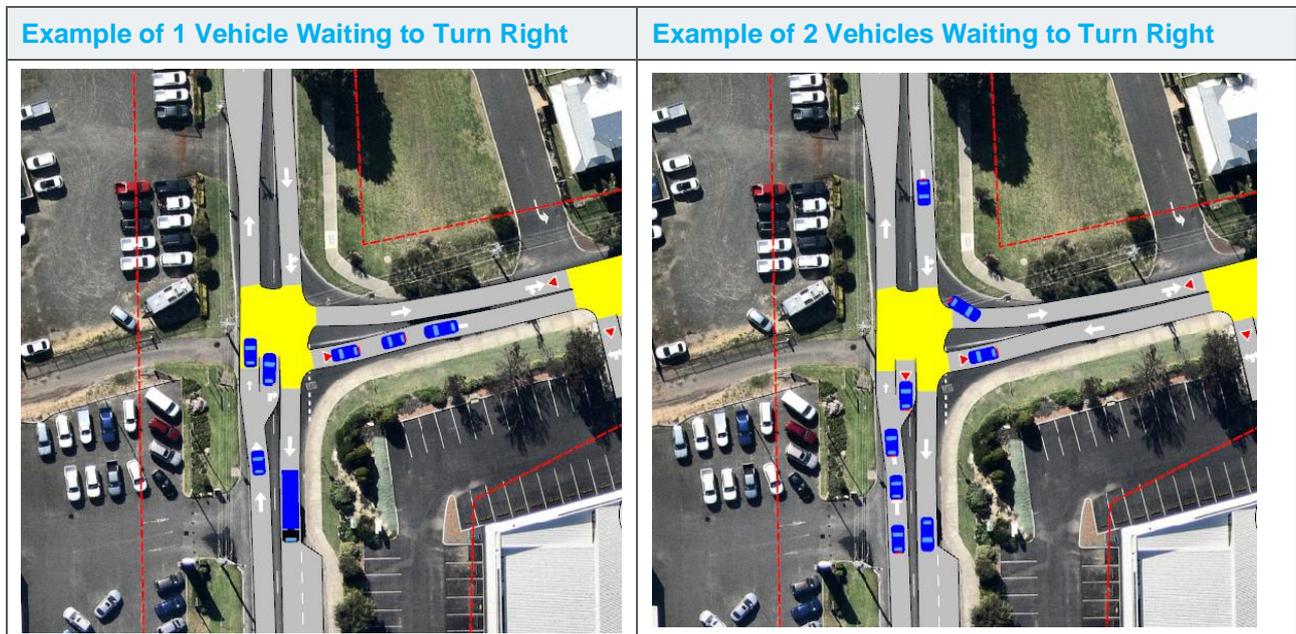


3.2 Vehicle Parameters and Behaviour

The vehicle and model parameters were set up in accordance with the Main Roads Western Australia Operational Modelling Guidelines.

While the existing intersection form of West Street / Peel Terrace does not include any dedicated turn lanes, the model was set up in a manner that allowed northbound vehicles to drive around a single stationary vehicle waiting to turn right from West Street to Peel Terrace as the road is considered sufficiently wide to allow for these movements. However, if more than 1 vehicle is waiting to turn right, the northbound vehicles are not able to drive around both of these vehicles. Examples of these vehicle behaviours are provided in **Figure 3-2**.

Figure 3-2 Left: Northbound vehicles driving around Stationary Vehicle waiting to Turn Right
Right: Northbound vehicles unable to drive around 2 Vehicles waiting to Turn Right



4 Model Results

The intersection performance was measured in terms of Level of Service (LOS), which is a qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table 4-1**.

Table 4-1 Level of Service (LoS) Performance Criteria

LOS	Description	Signalised Intersection	Unsignalised Intersection*
A	Free-flow operations (best condition)	≤10 sec	≤10 sec
B	Stable flows (slight delays)	10-20 sec	10-15 sec
C	Stable flows (acceptable delays)	20-35 sec	15-25 sec
D	Approaching unstable flow	35-55 sec	25-35 sec
E	Unstable flow (intolerable delays)	55-80 sec	35-50 sec
F	Forced flow (queues fail to clear)	≥80 sec	≥50 sec

* Does not include delays for through movements or left turns from major roads as per HCM2010 definitions

The model results for each of the modelled scenarios are summarised in **Table 4-2**.

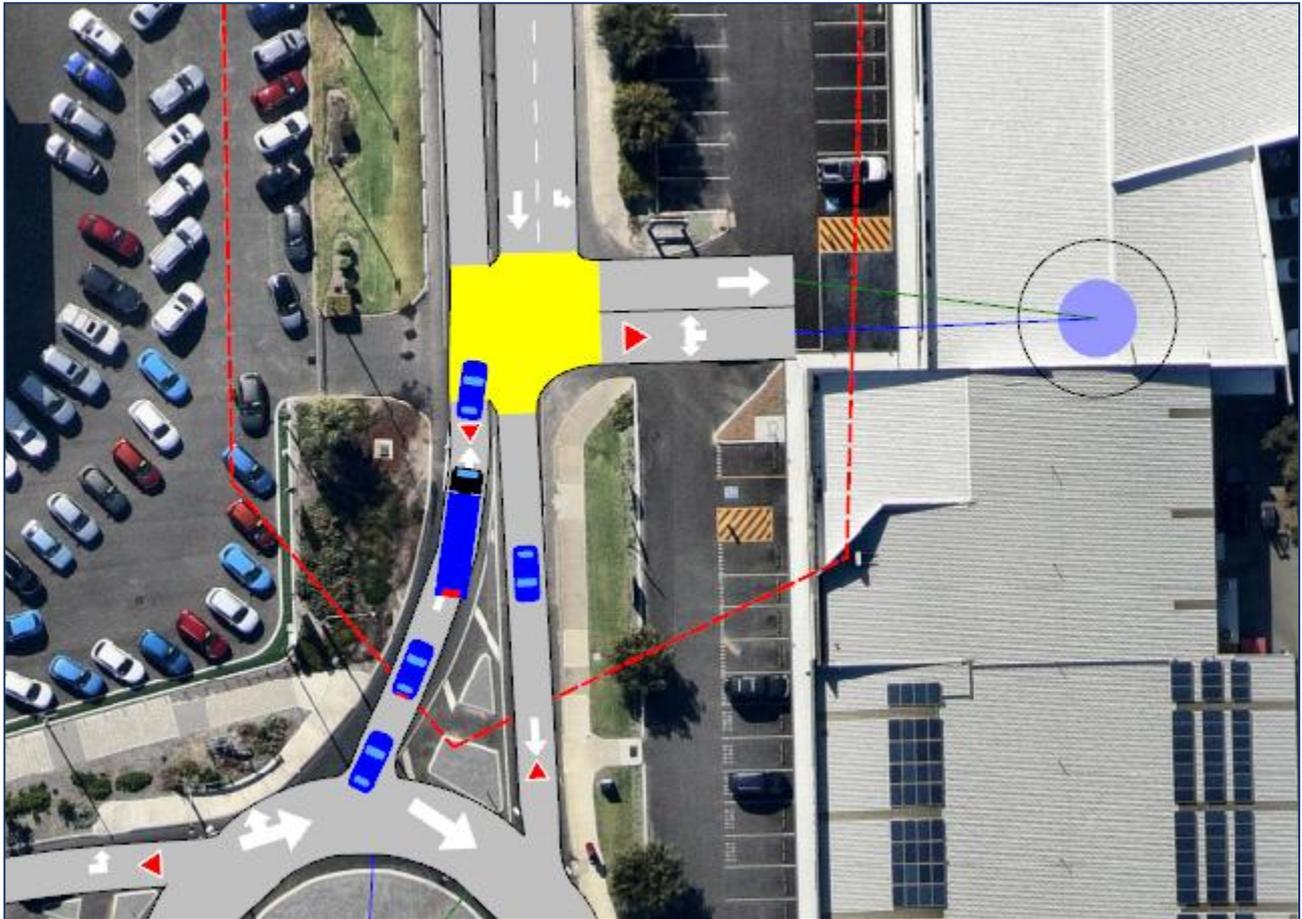
Table 4-2 West Street / Peel Terrace Intersection LOS Summary for Scenarios 1-4

LOS		Scenario 1		Scenario 2		Scenario 3		Scenario 4	
		Approach	Intersection	Approach	Intersection	Approach	Intersection	Approach	Intersection
AM	East	C	B	C	B	C	B	A	A
	North	A		A		A		A	
	South	A		A		A		A	
PM	East	C	C	D	C	E	D	A	A
	North	A		A		A		A	
	South	A		A		A		A	

The model results suggest that the intersection is currently performing at LOS B during the AM peak hour and LOS C during the PM peak hour.

With the introduction of the additional traffic generated by the proposed petrol station (i.e. Scenario 2), the overall intersection LOS remains unchanged, although it is noted that the LOS for the eastern approach (Peel Terrace) deteriorates from LOS C to D during the PM peak hour. It is also noted that for Scenario 2, queueing at Access 2 was occasionally observed to extend to the roundabout further south as a result of stationary vehicles waiting to turn right from West Street to Access 2 (an example of this behaviour is provided in **Figure 4-2**) which reduces the safety and efficiency of West Street. Restricting the right-in movement from West Street at this Access is considered to be required to address this safety issue (which was tested under Scenario 3).

Figure 4-2 Queueing at Access 2 Extending to West Street Roundabout



With the restrictions to the turn movements at Access 2 under Scenario 3, the overall intersection LOS deteriorated to LOS D and the eastern approach (Peel Terrace) deteriorates to LOS E during the PM peak hour, as the turn restrictions at Access 2 will result in additional right-turning traffic at the intersection of West Street / Peel Terrace.

The model results for Scenario 4 (the intersection of West Street / Peel Terrace converted to a roundabout) suggest LOS A for all approaches during both the AM and PM peak hours.

5 Summary and Conclusions

Based on the results from the traffic modelling exercise undertaken by Cardno for a number of access scenarios for the proposed petrol filling station at the south-eastern corner of West Street / Peel Terrace, the following conclusions have been reached for each of the scenarios:

- > **Scenario 1** – The intersection of West Street / Peel Terrace is currently performing satisfactorily at LOS B and LOS C during the AM and PM peak hours, respectively.
- > **Scenario 2** – With the additional traffic expected to be generated by the proposed petrol filling station, the overall intersection LOS remains unchanged, although it is noted that the LOS for the eastern approach (Peel Terrace) deteriorates from LOS C to D during the PM peak hour.
- > **Scenario 3** – If turn restrictions are imposed to Access 2 to only allow left-turn movements, the overall intersection LOS deteriorates to LOS D and the eastern approach (Peel Terrace) deteriorates to LOS E during the PM peak hour, as the turn restrictions will result in additional right-turning traffic at the intersection of West Street / Peel Terrace.
- > **Scenario 4** – The conversion of the of the intersection to a roundabout form will result in LOS A for the intersection during both the AM and PM peak hours.

Based on the above, an upgrade to the intersection of West Street / Peel Terrace (such as the roundabout modelled in Scenario 4) will be required to ensure satisfactory intersection performance. As previously noted, it is considered necessary to restrict the turn movements at Access 2 to only allow left-in and left-out turn movements, in order to mitigate the risk of queues extending from this Access to the roundabout further south.