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Issued via email: **michael.stramandinoli@colliers.com**

Dear Michael

St Mary's Rainbow Preschool – Access Arrangements

Amber Organisation has been engaged to provide a technical response to comments raised by Wagga Wagga City Council with respect to the proposed access arrangements for the proposed St Mary's Rainbow Preschool.

This assessment provides an overview of the updated turn treatment warrants and u-turn opportunities along Farrer Road in support of a left-in left-out access arrangement for the site.

1. Turn Treatments

AS/NZS 2890.1:2004 specifies the requirements for accessways to off-street car parking facilities. A review of the proposed access arrangements indicates the car parking facility is considered a User Class 3 (short-term parking) and connects to a local road with fewer than 25 spaces provided. Accordingly, the proposed driveway is a Category 1 access facility.

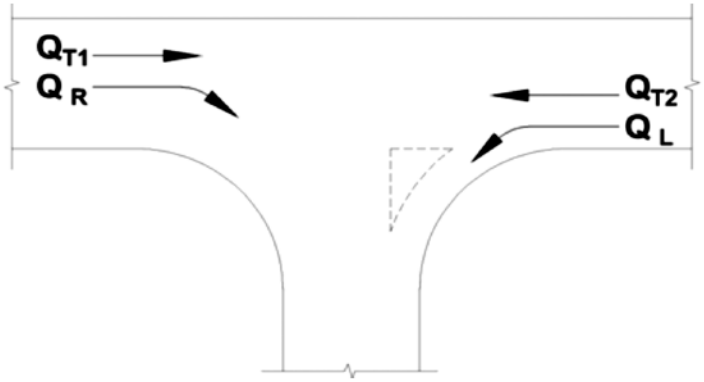
It is noted that there are five access facility categories defined within AS2890.1, with Category 5 facilities to be provided as intersections (i.e. with turn treatments where required) and Category 3 and 4 facilities also considered for provision as intersections. In accordance with the Australian Standard, the proposed Category 1 facility can be suitably provided along Farrer Road as an access driveway without any formal requirement to construct it as an intersection with turn treatments.

Nevertheless, in light of the concerns raised by Council, an assessment has been undertaken against Austroads Guide to Traffic Management Part 6: Intersections, Interchanges, and Crossings which specifies the turn treatments required at intersections. The assessment considers the left turn movement into the site from Farrer Road only due to the proposed left-in left-out arrangement.

Page 57 of the Austroads Guide indicates that *"Figure 3.26 is to be used to calculate the value of the major road traffic volume parameter (QM)"* with an extract of the relevant figure provided below (Figure 1). The figure indicates that the QM parameter for the left turn movement on a two-lane two-way road is equal to the QT2 value only, which represents the through traffic in the same direction as the left turn movement.

Figure 1: Extract from Figure 3.26 of Austroads Guide

Figure 3.26: Calculation of the major road traffic volume Q_M



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes or no	= Q_{T2}

However, it is understood that Council have interpreted the text highlighted in yellow below (Figure 2) to indicate that the QM parameter for the left turn should equal the sum of QT1 and QT2. While it is acknowledged that this section of the Austroads Guide is poorly worded, it is suggested that the intention behind the bullet points below is to distinguish between two-lane two-way roads which do not apply a reduction factor for multiple traffic lanes, in comparison to four or six-lane roads which consider traffic in the relevant lanes (leftmost) lane only. This is supported by the text highlighted in green below which clarifies that the left turn QM parameter uses only the traffic flow in the leftmost through lane of the following flow QT2.

Figure 2: Extract from Section 3.3.6 of Austroads Guide

- Figure 3.26 is to be used to calculate the value of the major road traffic volume parameter (Q_M):
  - on two-lane two-way roads: the value of the major road traffic volume parameter (QM) is the total through traffic flow in both directions (QT1 + QT2).
  - on four- or six-lane two-way roads: the major road traffic volume parameter (QM) for right turns uses the full opposing flow QT2 and only the traffic flow in the nearest lane of the following flow QT1. For left turns, the major road traffic volume parameter (QM) uses only the traffic flow in the leftmost through lane of the following flow QT2.

The approach to consider the left turn QM parameter equal to QT2 only is considered to be logical in the context of turn treatments / auxiliary lanes which are primarily intended to maintain operational efficiency and minimise the risk of a rear-end collision with vehicles which may be following a turning vehicle (refer Figure 3 below extracted from the Austroads Guide). The opposing traffic flow (QT1) does not impact vehicles turning left into the site (QL) and accordingly is not relevant for the purposes of determining the QM parameter.

Figure 3: Extract from Section 3.3.6 of the Austroads Guide

Where practicable a CH treatment should be used in preference to non-channelised turn treatments. It should be noted that in some circumstances, while adding auxiliary turn lanes will reduce the risk of rear end crashes, the risk of other high severity crash types may increase (such as right-angle crashes). Consideration of this issue should be taken into account when selecting appropriate turn treatments.

In comparison, the QM value for the right turn uses the sum of the through movements (QT1 and QT2) as the following vehicles (QT1) pose a direct rear-end crash risk, and the opposing vehicles (QT2) also impact the likelihood of a rear-end crash by delaying right turning vehicles which increases the length of time that a right turning vehicle is stationary in the middle of the carriageway.

This is further supported by Commentary 9 in the Austroads Guide with an extract provided in Figure 4. The commentary indicates that the right turn movement poses a greater rear-end crash risk which is why the turn treatments are warranted at lower traffic volumes (hence the right turn QM value includes QT1 and QT2).

Furthermore, the commentary clarifies that "the major road traffic volume on the X-axis of the warrants (i.e. the QM value) is based on all relevant major road traffic flows". The use of the word relevant is fundamental in understanding the difference in the QM value between the left and right turn movements.

Figure 4: Extract from Commentary 9 of Austroads Guide

- ensure that higher-order right-turn treatments are provided at lower traffic volumes than for higher-order left-turn treatments, as lower-order right-turn treatments record far more rear-end-major vehicle crashes than lower-order left-turn treatments

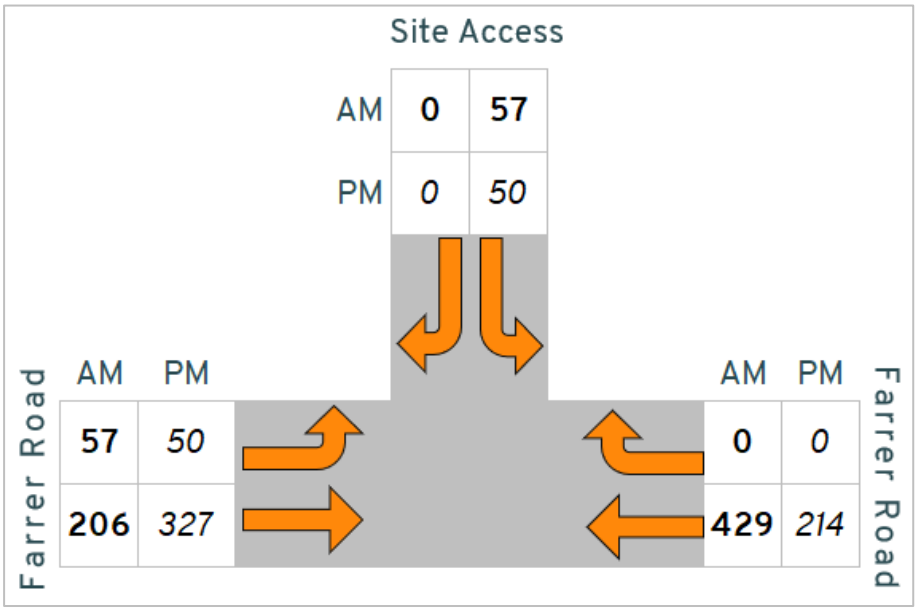
For the left-turn warrants, the curves produced for the right-turn treatments are adopted. As the major road traffic volume on the X-axis of the warrants is based on all relevant major road traffic flows, higher-order right-turn treatments are required at lower traffic volumes than for higher-order left-turn treatments. This process ensures that these warrants reasonably match driver expectations set through the previous warrants.

In light of the above, the assessment has been carried out using the QM value for the left turn equal to QT2.

The total traffic volumes at the site access are provided in Figure 5 and have been updated to reflect the sum of the following:

- Surveyed traffic volumes along Farrer Road undertaken in May during the school and university terms.
- Traffic generated by the proposed preschool development redistributed to reflect a left-in left-out access arrangement. This includes all vehicles arriving from the east travelling past the site, performing a u-turn at the Boorooma Street roundabout and turning left into the site from the west.
- Traffic generated by the TRAC Masterplan.

Figure 5: Total Traffic Volumes



A design speed of 70 km/hr has been adopted for Farrer Road based on the average recorded speed of 61 km/hr and 85th percentile speed of 69km/hr as recorded within the survey data.

Figure 3.25 of the Austroads Guide specifies the required turn treatments on the major road at unsignalised intersections and is provided in Figure 6 below for the AM peak hour and Figure 7 for the PM peak hour.

Figure 6: AM Peak Hour Assessment

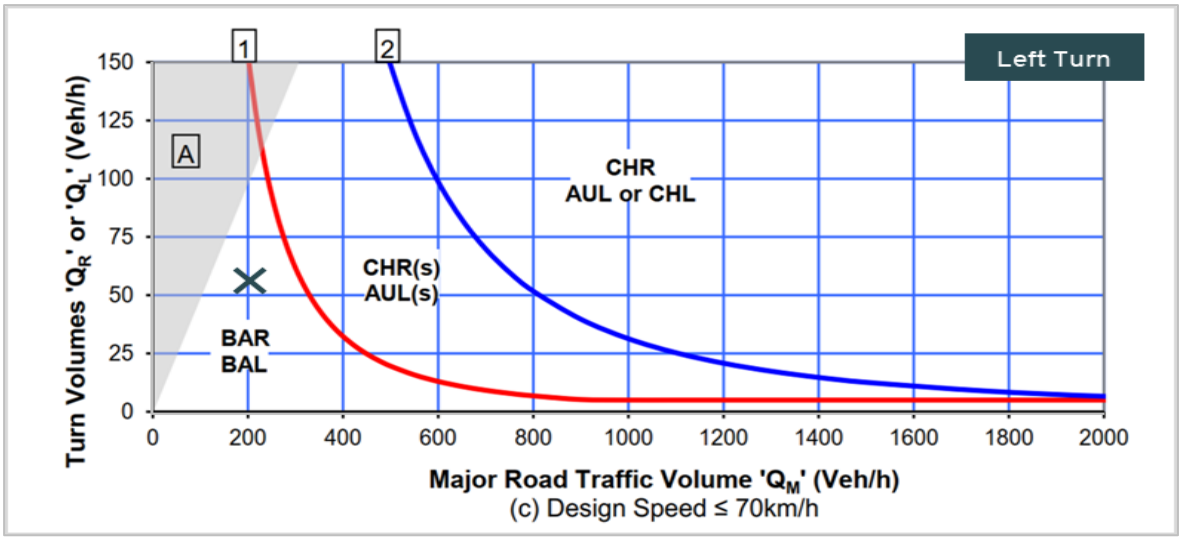
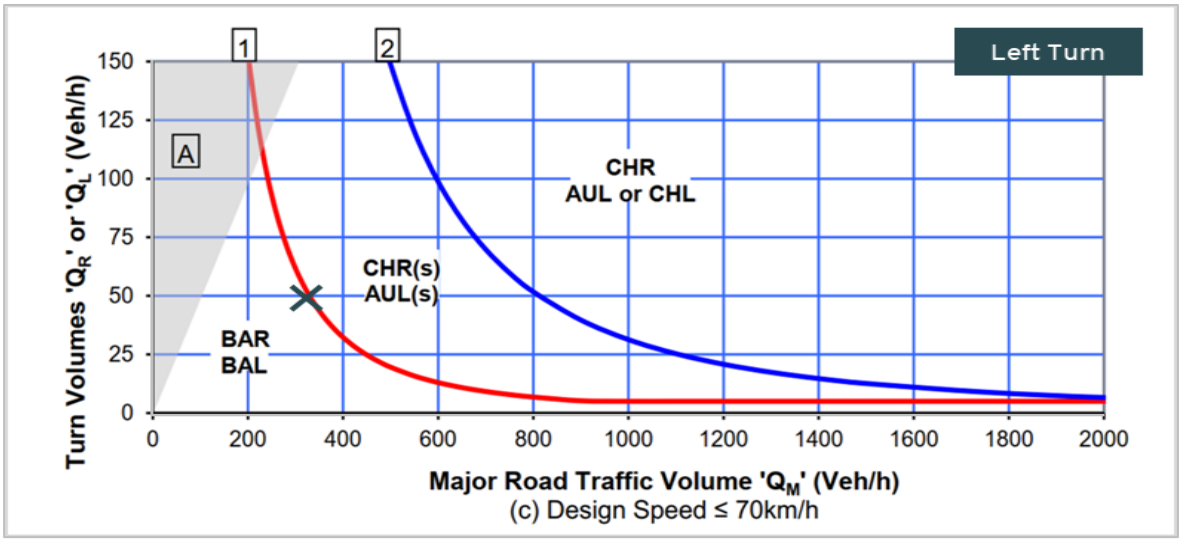


Figure 7: PM Peak Hour Assessment



Accordingly, assessing the site access as an intersection against the Austroads Guide, an Auxiliary Left Turn Lane would not be required.

2. U-Turn Opportunities

A large proportion of the vehicles forced to turn left out of the site under the proposed left-in left-out access arrangement would be expected to continue to Coolamon Road to access Olympic Highway. However, it is acknowledged that there may be some demand for eastbound u-turns to head west along Farrer Road.

'No u-turn' signage can be installed at the TRAC access to prevent unwanted u-turn manoeuvres if desired by Council. Instead, the New South Wales Road Rules currently permits u-turns to be undertaken at nearby intersections including Sturrock Drive. The eastbound carriageway provides two lanes at this location which would service to operate as an Auxiliary Right Turn treatment allowing any eastbound through traffic to pass a vehicle waiting to perform a u-turn, thereby reducing the risk of a rear-end collision.

For clarity, the NSW Road Rules in relation to u-turns are provided within Figure 8.

Figure 8: NSW Road Rules - U-Turn Prohibited Locations

You must not make a U-turn:

- at intersections without traffic lights where there's a 'No U-turn' sign
- at intersections with traffic lights, unless there's a 'U-turn permitted' sign
- across a **single unbroken dividing line** or double unbroken dividing line
- across double dividing lines with an unbroken line closer to you
- on motorways and freeways.

Source: NSW Government (link)

3. Conclusion

Based on the above assessment, it has been determined that the proposed car park access would form a Category 1 access facility in accordance with AS2890.1 which can be suitably provided along Farrer Road as an access driveway without any formal requirement to construct it as an intersection with turn treatments.

Notwithstanding the above, assessing the site access as an intersection against the Austroads Guide indicates an Auxiliary Left Turn Lane would not be required.

A large proportion of the vehicles forced to turn left out of the site under the proposed left-in left-out access arrangement would be expected to continue to Coolamon Road to access Olympic Highway. However, it is acknowledged that there may be some demand for eastbound u-turns to head west along Farrer Road, which can be safely and legally undertaken at the Sturrock Drive intersection.

If you have any questions, please feel free to contact the undersigned.

Yours sincerely
Amber Organisation

Oliver Mihaila
Associate