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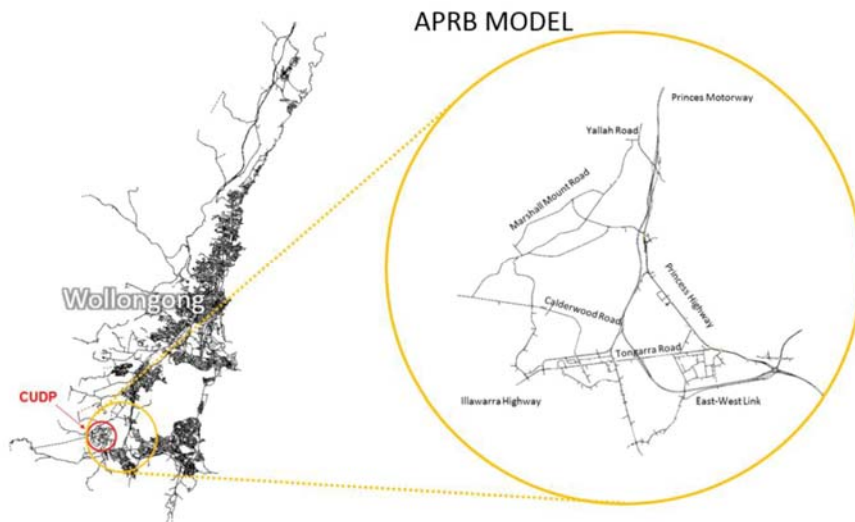
Dear Sarah,

CALDERWOOD MOD 4 APPLICATION CALDERWOOD ROAD

Further to the traffic and transport analysis undertaken as part of the Calderwood MOD 4 Application, Cardno herein provides further clarity on the status of Calderwood Road, namely the recommended number of lanes required to accommodate the traffic volumes forecasted for the corridor.

Cardno's traffic and transport assessment for the Mod 4 application (yield increase from 4,800 to 6,000 lots) is based on updated infrastructure, residential and employment land use forecasts using the APRB/WOSLH TRACKS model to forecast future traffic volumes. The methodology is consistent with the approved 2010 TMAP which also used the WOSLH TRACKS model.

The assessment of the 6,000 lots scenario includes strategic (TRACKS) and operational (Aimsun) traffic modelling. The level of detail provided by the traffic models was therefore enhanced given the inclusion of dynamic operational model (Aimsun). As agreed with RMS, Cardno adopted the same WOSLH model and Aimsun model versions as those developed by RMS as part of the Albion Park Rail Bypass project, which correspond to the most up to date and accurate traffic models available for the region.



Calderwood Road currently operates as a 2 lane rural road with narrow lane widths and no sealed shoulders. Lendlease is committed to the delivery of an upgraded 2 lane cross section along Calderwood Road by 2027/2028 (refer to letter dated 11 December 2019). This is to coincide with the delivery of the CUDP Town Centre and other road infrastructure such as Tripoli Way extension, generally consistent with the TMAP approval.

As part of the analysis undertaken for the 6,000 lots scenario, the methodology adopted to evaluate the number of lanes required on Calderwood was improved as summarised below:

Methodology Improvement	Rationale / Comments
The flows were extracted from the more detailed Aimsun model (with dynamic assignment) rather than TRACKS	TRACKS flows were adopted in a previous assessment to help quantify the increase in flows compared to 4,800 lots considered in the TMAP. However, the focus of the revised assessment was to assess if the forecasted flows (more accurately quantified in Aimsun) against the applicable criteria for avoidance of doubt.

The methodology adopted in the 6,000 lots assessment is based on the evaluation of the traffic flow efficiency and level of service criteria stated in the RMS Guide to Traffic Generating Developments and Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis. This is standard industry practice and adopted by state and local government agencies as well as consultants.

The RMS Guide to Traffic Generating Developments states the following:

"The capacity of urban roads is generally determined by the capacity of the intersections. Where major reconstruction of intersections is proposed, the ability of the approach roads to feed the intersection at appropriate flow rates may need to be reviewed.....The mid-block level of service on urban roads is assessed on a vehicle's average travel speed. Travel speed surveys may be undertaken to determine the existing level of service. Table 7.2 of AUSTROADS Guide to Traffic Engineering Practice - Part 2: Roadway Capacity, (1988) sets out levels of service for different travel speeds."

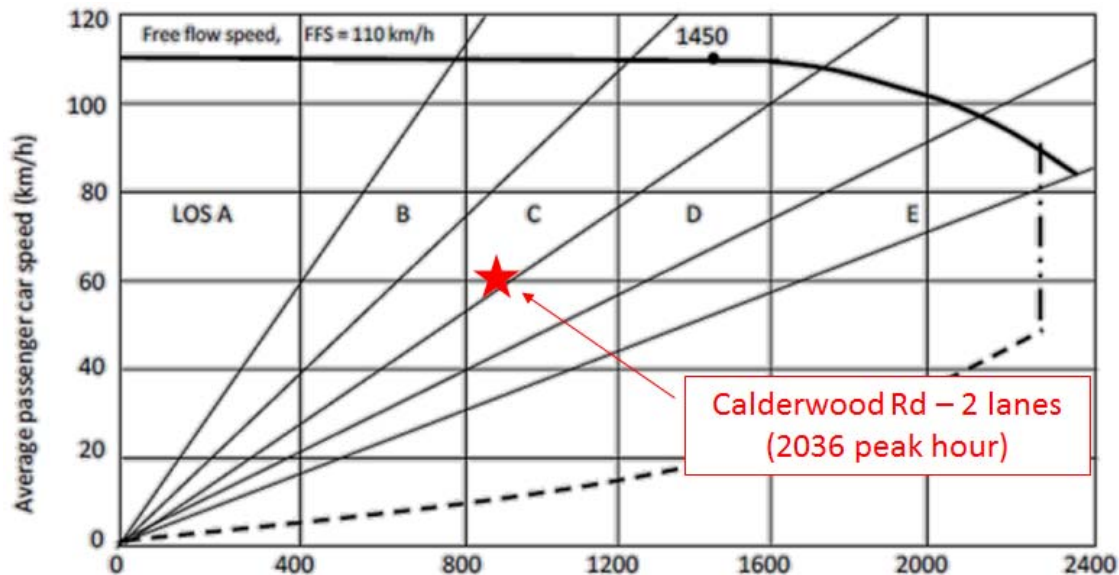
And further it states:

"When assessing the mid-block road capacity requirement in a strategic planning study, the traffic flow limits for different levels of service are of value. The figures in Table 4.4 are provided for strategic planning purposes only, and are not intended as a substitute for basic exercises in intersection analysis."

The 6,000 lots adopts the RMS Level of Service thresholds based on forecasted traffic volumes which is denoted in the RMS Guide as "strategic level" and is considered to be a conservative approach. The results indicate that LoS D would be expected in the weekday peak hours in 2036 under a 2 lane cross section. This is deemed acceptable for a long term horizon such as 2036.

To increase the confidence in the recommendation to retain 2 lanes on Calderwood Road, an additional analysis was undertaken as described below.

As the future year flows are based on microsimulation modelling, there is enough detail to allow for a more detailed assessment than the "strategic level" specified in the RMS guideline. More specifically, the posted speed and volume can be assessed against the Austroads requirements in accordance with the RMS Guide's directive stated above. The speed of Calderwood Road (assumed to be 60km/h under future conditions) combined with the peak hour flow of 832 vehicles per hour results in LoS C (consisting of relatively free-flow conditions). The corresponding graph is reproduced below.



As demonstrated above, the analysis documented in the traffic and transport report focuses on the more conservative of the two criteria and it demonstrates that LoS D in 2036 is achieved. This is acceptable for weekday peak hour operation in a long term scenario such as 2036. The more detailed evaluation of the road capacity (based on the Austroads guideline, accounting for volume and speed) demonstrates that LoS C is anticipated for the same year horizon.

Furthermore, the key performance measure for road infrastructure capacity is intersection performance, as these consist of the main constrain for vehicles to enter a road segment. The intersections of Calderwood Road / Tripoli Way Extension and Calderwood Road / Escarpment Drive were shown to adequately accommodate the proposed 6,000 dwellings with satisfactory level of service. Discussions with TfNSW around intersection performance of Calderwood Road / Tripoli Way Extension have not identified the need to modify the southbound approach single lane north of the intersection in order to improve intersection operation.

It is noted that future year modelling indicates that other 2-lane road corridors in the region such as Tongarra Road or Princes Highway are anticipated to accommodate peak hour flows of the same magnitude as Calderwood Road by 2036. It is understood that no road widening is proposed for these road corridors by that year horizon.

In summary, the following conclusions are drawn from the analysis described in this document:

- > Traffic modelling results and application of standard engineering guidelines demonstrate that Calderwood Road is forecasted to perform adequately by 2036 under a 2 lane layout.
- > Widening Calderwood Road to a 4 lane cross section would consist of a significant overprovision for a corridor which primarily services the CUDP land and no other development (i.e. Tullimbar and West Dapto development areas rely on road corridors other than Calderwood Road to travel to/from those sites).
- > The traffic volumes adopted in the analysis consist of 2036 weekday peak hour flows and were demonstrated to be within the applicable thresholds for a 2 lane road. All other periods in a typical weekday and weekends are anticipated to experience lower flows. This further demonstrates that an upgrade to 4 lanes would be a significant over provision by that horizon year.
- > The modelling is based on the conservative assumption that by 2036 all development areas in the region (including Calderwood) are completed. It is possible that some development areas may not be completed in this timeframe (or even at all in some instances).
- > The staging plan shown in the Calderwood TMAP assumed 1,500 occupied dwellings by 2020 (Table 3.1 in the TMAP). However, Lendlease's most recent count of occupied dwellings in March 2020 showed only

670 occupied dwellings. This further indicates that a delay in the delivery of dwellings is occurring when compared to future year land use assumptions and that the corresponding traffic forecasts are likely to be conservative.

- > The forecasted peak hour flows for Calderwood Road in 2036 are of the same magnitude of the flows forecasted for other 2 lane roads in the region which have no known commitment to a widening to 4 lanes.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Ivo Pais'.

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