

## **Appendix 6**

**Response to PCC issues on traffic  
prepared by  
WSP**



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By email  
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1 August 2018

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Dear Sean

**Response to Penrith City Council Submission, Proposed Amendments to Sydney Regional Environmental Plan No. 30 - St Marys- Internal Road and Intersection Assessment**

The following submission responses were received from Penrith City Council upon review of the the *Jordan Springs East - Internal Road and Intersection Assessment with Rezoning report, Revision C (7 November 2017)* prepared WSP.

Councils comments are provided below in **bold** and *italics* with the WSP response following the comments.

It is important to note that the abovementioned report has been prepared without the consideration of public transport (bus servicing) during peak hour periods and therefore vehicle demands are conservative. By including bus servicing into the assessment during peak hours, this will reduce vehicle demand with shifts to public transport.

There are currently three bus services incoming and three bus services outgoing to Jordan Springs in both the AM and PM peak between Jordan Springs and Penrith. This is the Busways Route 783 service.

There are currently three bus services incoming and three bus services outgoing to Ropes Crossing in both the AM and PM peak between Ropes Crossing and St Marys and Mt Druitt. This is the Busways Route 759 service.

There are currently three bus services incoming and three bus services outgoing to Ropes Crossing in both the AM and PM peak between Ropes Crossing and Penrith and Mt Druitt. This is the Busways Route 780 service.

Bus routes would need to be revised due to the completion of Jordan Springs and Jordan Springs East development. Bus routes have been planned within the Jordan Springs East development through the Precinct Plan and nominated road hierarchy. Planned increases in bus servicing within Jordan Springs and Jordan Springs East would reduce vehicle demand.

It is also further reiterated that the assessment is a worse case and consider peak flows in a one hour travel period. This does not consider any peak spreading of vehicle demand. Given that peak vehicle

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demands occur during the weekday PM peak (critical peak), it is highly unlikely that vehicle demand will occur in a single one hour peak rather be spread over a at least a two-hour period. This is due to people finishing their work and different times of the day. Applying this peak spreading factor will further reduce the peak hour vehicle demands forecast during the weekday PM peak.

***1. The modelling supporting this study has been undertaken to a 2021 horizon year; it should be modelled to 2026, allowing 5 years post development traffic impacts to be assessed. For reference, the external network has been modelled to 2036 being a 10- year horizon.***

The traffic modelling undertaken for the abovementioned report was based upon ultimate development in the year 2021. As previously stated and discussed with Council, internal traffic volumes within the St Marys Development Site should not be subject to any traffic growth post ultimate development in the year 2021. A traffic growth of more than 2% per annum as stated by Council may be achieved on the external road network within the Penrith LGA. This traffic growth rate is however considered an inappropriate assumption for the internal St Marys Development Site road network including the East West Connector Road given that development is planned to occur by Lendlease to its maximum potential in 2021 based on relevant planning controls and finite developable area.

Having said that, WSP have undertaken further sensitivity analyses of road and intersection performance utilising varying traffic growth rates of 5% and 10% post 2021. That is 1% per annum over a 5-year period (5% increase) and 2% per annum over a 5-year period (10% increase). These sensitivity analyses indicate that the road network and intersections analysed in the report in their entirety would continue to operate and perform within capacity (within road mid-block capacity) and at good levels of service at intersections (ranging from a LoS A to a LoS C) during peak weekday AM and PM periods.

This also includes the proposed lane configurations and intersection control changes within Stage 3B2 of Jordan Springs East. These are discussed further below.

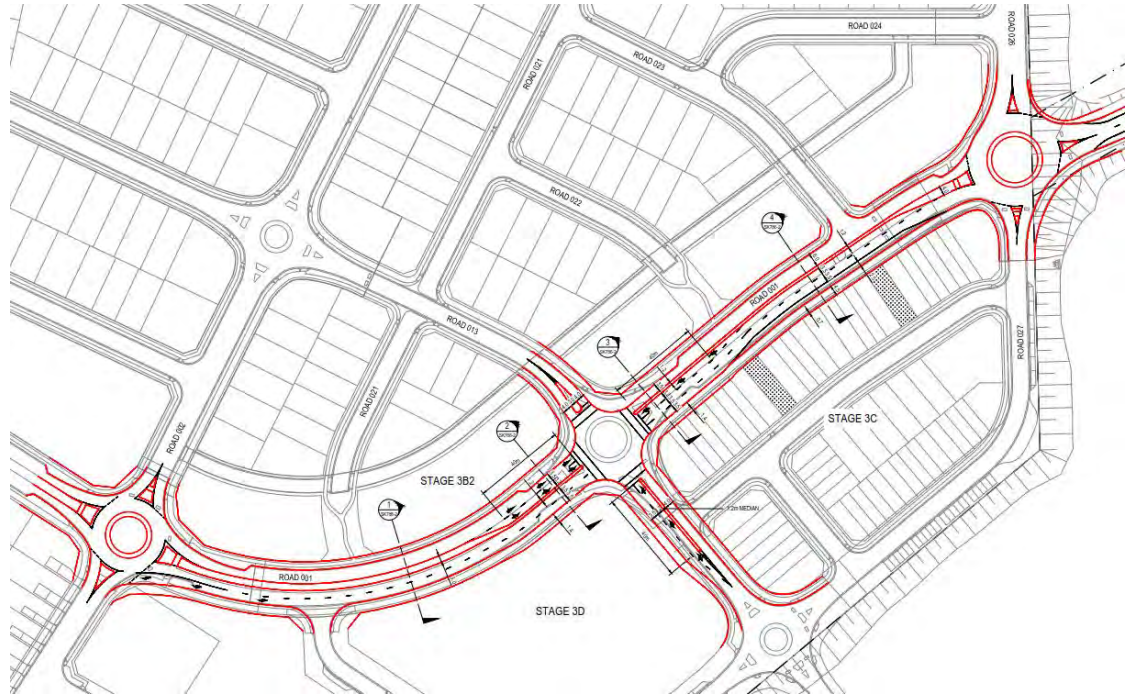
The original DA submission proposed the following lane configurations and intersection types:

- A single lane in either direction on Road No 1 between Road No 2 and Road No 13 with roundabouts at the intersections with Road No 2 and Road No 13
- A single lane in either direction on Road No 1 between Road No 13 and Road No 26 / Road No 27 with a roundabout at intersection with Road No 26 / Road No 27.

To accommodate additional vehicle capacity and improved safety adjacent the Village Centre the following lane configurations and intersection types are now proposed and are discussed further below:

- One lane in the eastbound direction and two lanes in the westbound direction on Road No 1 between Road No 2 and Road No 13 with a roundabout at the intersection with Road No 2 and traffic signals at Road No 13.
- One lane in the eastbound direction and two lanes in the westbound direction on Road No 1 between Road No 13 and Road No 26 / Road No 27 with a roundabout at the intersection with Road No 26 / Road No 27.

These lane configurations and associated intersection controls and layouts are shown in Figure 1 below and are further described below with corresponding intersection performance summaries.



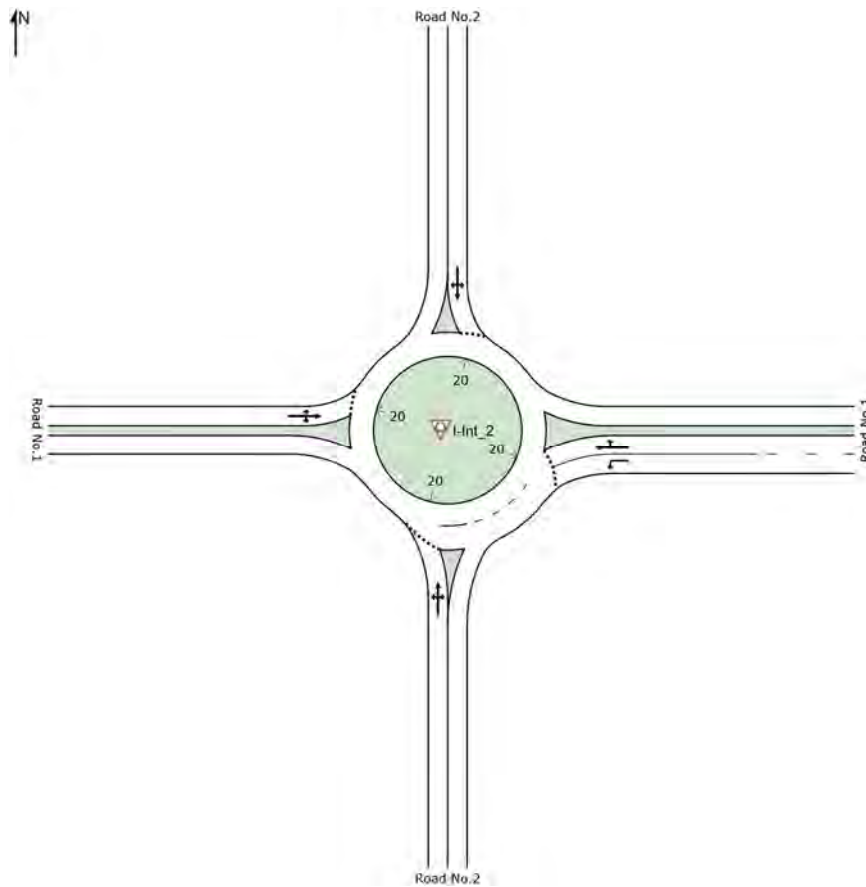
**Figure 1 – Proposed Lane Configuration and Intersection Layouts in Stage 3B2**

*Source: Cardno*

**Proposed Intersection Treatments within Stage 3B2**

Road No 1/Road No 2

This intersection would perform at good levels of service (LoS A in both AM and PM peaks) as a roundabout intersection as shown in Figure 2 below. This layout would continue to operate at good levels of service with the addition of 10% and 20% traffic growth post ultimate development in 2021. Maximum queues of 15 metres would occur on the northbound (NB) approach in the AM peak and 51 metres on the eastbound (EB) approach in the PM peak under 2021 volumes. These queues are relatively short during peak traffic demand and do not impact adjacent intersection performance or operation. SIDRA intersection performance results are provided in Table 1 below.



**Figure 2 – Road No 1 and Road No 2 Proposed Intersection Layout**

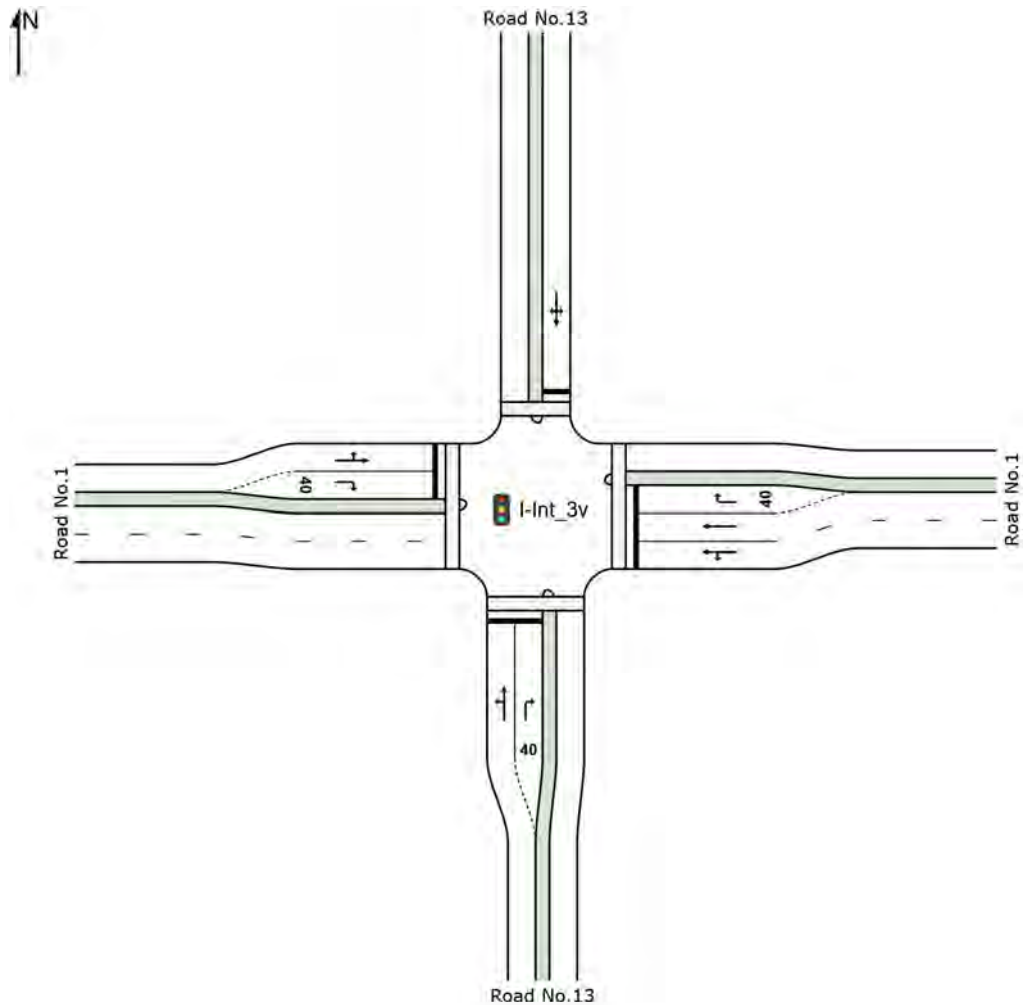
**Table 1 – Road No 1 and Road No 2 Intersection Performance Summary**

INTERSECTION	PEAK PERIOD	LOS	AVG VEHICLE DELAY (SECS)	DOS	QUEUE (M)
Road No 1 and Road No 2 (Roundabout)	2021 AM	A	12.2	0.335	15
	2021 PM	A	13.4	0.141	6
	2021 AM + 10% Traffic Growth	A	12.8	0.565	30
	2021 PM + 10% Traffic Growth	A	14.3	0.175	8

# Level of Service (LOS), Average Vehicle Delay, Degree of Saturation (DoS) and Queue are based upon the worst performing vehicle movement for a priority controlled intersection.

Road No 1/Road No 13

This intersection would perform at good levels of service (LoS A or B in both the AM and PM peaks) as a signalised intersection as shown in Figure 3 below. This layout would continue to operate at good levels of service with the addition of 10% and 20% traffic growth post ultimate development in 2021. Maximum queues of 45 metres would occur on the eastbound (EB) approach in the AM peak and 61 metres on the westbound (WB) approach in the PM peak under 2021 volumes. These queues are relatively short during peak traffic demand and do not impact adjacent intersection performance or operation. SIDRA intersection performance results are provided in Table 2 below.



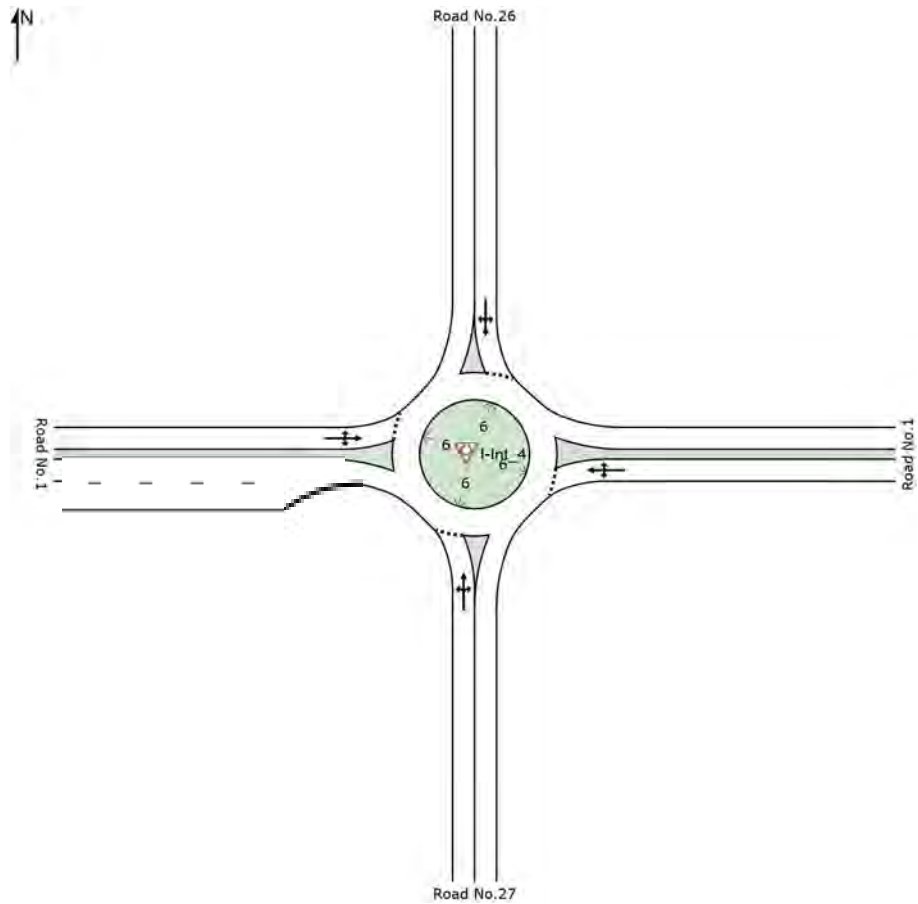
**Figure 3 – Road No 1 and Road No 13 Proposed Intersection Layout**

**Table 2 – Road No 1 and Road No 13 Intersection Performance Summary**

INTERSECTION	PEAK PERIOD	LOS	AVG VEHICLE DELAY (SECS)	DOS	QUEUE (M)
Road No 1 and Road No 13 (Signals)	2021 AM	A	14.0	0.677	45
	2021 PM	B	17.3	0.792	61
	2021 AM + 10% Traffic Growth	B	14.9	0.745	54
	2021 PM + 10% Traffic Growth	B	19.0	0.814	76

Road No 1/Road No 26/Road No 27

This intersection would perform at good levels of service (LoS A in the AM peak and LoS B in the PM peak) as a roundabout as shown in Figure 4 below. This layout would continue to operate at good levels of service with the addition of 10% and 20% traffic growth post ultimate development in 2021. Maximum queues of 28 metres would occur on the eastbound (EB) approach in the AM peak and 63 metres on the westbound (WB) approach in the PM peak under 2021 volumes. These queues are relatively short during peak traffic demand and do not impact adjacent intersection performance or operation. SIDRA intersection performance results are provided in Table 3 below.



**Figure 4 – Road No 1, Road No 26 and Road No 27 Proposed Intersection Layout**

**Table 3 – Road No 1, Road No 26 and Road No 27 Intersection Performance Summary**

INTERSECTION	PEAK PERIOD	LOS	AVG VEHICLE DELAY (SECS)	DOS	QUEUE (M)
Road No 1, Road No 26 and Road No 27 (Roundabout)	2021 AM	A	12.3	0.118	5
	2021 PM	B	16.8	0.016	1
	2021 AM + 10% Traffic Growth	A	13.1	0.140	6
	2021 PM + 10% Traffic Growth	B	19.3	0.019	1

# Level of Service (LOS), Average Vehicle Delay, Degree of Saturation (DoS) and Queue are based upon the worst performing vehicle movement for a priority controlled intersection.



### Stage 3B2 Mid-Block Road Capacity

Mid-block road capacities from section 4.2.3 of the *RTA Guide to Traffic Generating Developments* have been adopted.

#### Road No 1 between Road No 2 and Road No 13

- Two lanes westbound and one lane eastbound.
- Indented parking bays located on the northern side of the road only.

**Table 4 – Mid-Block Road Capacity – Road No 1 between Road No 2 and Road No 13**

YEAR	TRAFFIC VOLUMES (V/H)	ONE LANE CAPACITY (V/H)	TWO LANE CAPACITY (V/H)
<b>AM PEAK (PEAK FLOW DIRECTION EASTBOUND)</b>			
2021	682 EB	900	N/A
	359 WB	N/A	2,000
2021 plus 10% traffic growth	750 EB	900	N/A
	395 WB	N/A	2,000
<b>PM PEAK (PEAK FLOW DIRECTION WESTBOUND)</b>			
2021	588 EB	900	N/A
	933 WB	N/A	2,000
2021 plus 10% traffic growth	647 EB	900	N/A
	1,026 WB	N/A	2,000

**Based on the information in Table 4 above, ample road mid-block capacity is provided.**

#### Road No 1 between Road No 13 and Road No 26 / Road No 27

- Two lanes westbound and one lane eastbound.
- Indented parking bays located on both the northern and southern sides of the road.

**Table 5 – Mid-Block Road Capacity – Road No 1 between Road No 13 and Road No 26 / Road No 27**

YEAR	TRAFFIC VOLUMES (V/H)	ONE LANE CAPACITY (V/H)	TWO LANE CAPACITY (V/H)
<b>AM PEAK (PEAK FLOW DIRECTION EASTBOUND)</b>			
2021	686 EB	900	N/A
	162 WB	N/A	1,900
2021 plus 10% traffic growth	755 EB	900	N/A
	178 WB	N/A	1,900
<b>PM PEAK (PEAK FLOW DIRECTION WESTBOUND)</b>			
2021	287 EB	900	N/A
	835 WB	N/A	1,900



YEAR	TRAFFIC VOLUMES (V/H)	ONE LANE CAPACITY (V/H)	TWO LANE CAPACITY (V/H)
2021 plus 10% traffic growth	316 EB	900	N/A
	919 WB	N/A	1,900

Based on the information in Table 5 above, ample road mid-block capacity is provided.

#### East-West Connector Mid-Block Road Capacity

East West Connector Road east of Road No 26 / Road No 27

- One lane in both the eastbound and westbound directions.
- No parking proposed on East-West Connector Road.

Consideration of Section 4.2.3 Urban Roads of the *Guide to Traffic Generating Developments (2002)*, RTA establishes that:

*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. As set out in Table 4.3 (reproduced from Table 7.1 of AUSTRROADS Guide to Traffic Engineering Practice - Part 2: Roadway Capacity, (1988)), typical one-way mid-block lane capacities on urban arterial roads under interrupted flow conditions are 900-1000 veh/hr/lane. These capacities at times may increase under ideal conditions to 1,200-1,400 veh/hr.*

The Guide further goes on to state that:

*A mid-block lane capacity of 1,400 veh/hr/lane can be achieved under normal urban interrupted flow conditions.*

Based on the above guidelines, traffic volumes of 1,200-1,400 vehicles per hour per lane can be achieved under interrupted conditions.

**Table 6 – Mid-Block Road Capacity – East-West Connector Road east of Road No 26 / Road No 27**

YEAR	TRAFFIC VOLUMES (V/H)	ONE LANE CAPACITY# (V/H)
<b>AM PEAK (PEAK FLOW DIRECTION EASTBOUND)</b>		
2021	709 EB	1,200 - 1,400
	143 WB	1,200 - 1,400
2021 plus 10% traffic growth	780 EB	1,200 - 1,400
	157WB	1,200 - 1,400
<b>PM PEAK (PEAK FLOW DIRECTION WESTBOUND)</b>		
2021	217 EB	1,200 - 1,400
	1,023 WB	1,200 - 1,400
2021 plus 10% traffic growth	239 EB	1,200 - 1,400
	1,125 WB	1,200 - 1,400

# Based upon lane capacity per lane per hour in one direction under interrupted traffic conditions as per section 4.23 of the *RTA Guide to Traffic Generating Developments*.

**Based on the information in Table 6 above, ample road mid-block capacity is provided.**

It should be noted that Penrith City Council has no formal guidelines on mid-block road capacities and refers to the Roads and Maritime Guide for Traffic Generating Development guidelines within the *Penrith Development Control Plan (2014)*.

The East West Connector Road between Dunheved Link Road and Jordan Springs East is a free-flowing straight section of road of approximately 500 metre length with good visibility, with no intersections, no fronting developments, no parking and therefore is an uninterrupted road environment prior to its entry to the eastern end of Jordan Springs East.

For these reasons, the East West Connector Road has adequate capacity to accommodate vehicle demand up to 1,200-1,400 vehicles per hour per lane (consistent with the *Guide to Traffic Generating Developments (2002)*, RTA) and there is no requirement to provide four lanes in the form of a dual carriageway on the East West Connector Road. This also pertains to the section of the East West Connector Road between Dunheved Link Road and Ropes Crossing Boulevard.

Outside of peak periods, the East-West Connector Road will have ample (excess) capacity which may lead to anti-social behavior by motorists including speeding and vehicle races. The implementation of a four-lane road section on the East-West Connector Road (two lanes in either direction) would further promote anti-social behavior.

***2. There are concerns that the mid-block capacities of 1000 vehicles per lane are too high, and the 1000 is exceeded at some sections of Lakeside Parade. The report references a divided carriageway as having a 1000 vehicle upper limit, and the proposal is not for a divided carriageway. Lower thresholds for the proposed roads of 750-900 should be adopted in line with the previous modelling undertaken for the St Marys Development Area.***

WSP have adopted mid-block capacities from the *RTA Guide to Traffic Generating Developments* guidelines. These guidelines document that for two-lane two-way roads that a road mid-block capacity of 1,000 vehicles per hour per lane in one direction can be achieved under a divided road configuration (with median separation) and 900 vehicles per hour per lane in one direction under an undivided road configuration (no median separation) under interrupted road traffic flow conditions.

Consideration of Section 4.2.3 Urban Roads of the *Guide to Traffic Generating Developments (2002)*, RTA establishes that:

*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. As set out in Table 4.3 (reproduced from Table 7.1 of AUSTRROADS Guide to Traffic Engineering Practice - Part 2: Roadway Capacity, (1988)), typical one-way mid-block lane capacities on urban arterial roads under interrupted flow conditions are 900-1000 veh/hr/lane. These capacities at times may increase under ideal conditions to 1,200-1,400 veh/hr.*

The Guide further goes on to state that:

*A mid-block lane capacity of 1,400 veh/hr/lane can be achieved under normal urban interrupted flow conditions.*

Based upon the traffic modelling undertaken for the year 2021, the following locations are where traffic volumes exceed 1,000 vehicles per lane per hour in one direction:

- Lakeside Parade between Jordan Springs Boulevard and Jubilee Drive West (in the eastbound direction in the PM peak with 1,034 vehicles).
- East-West Connector Road between Jordan Springs East and Dunheved Link Road (in the westbound direction in the PM peak with 1,023 vehicles).



The guide of 1,000 vehicles per hour per lane in one direction is slightly exceeded by some 34 vehicles. This volume (1,034) is still within RMS Guidelines under interrupted flow conditions. The extra 34 vehicles could equate to one bus carrying 34 passengers during a weekday PM peak which even at current bus servicing levels, is already achievable, let alone with increased bus servicing in the future to accommodate full development of Jordan Springs and Jordan Springs East.

The application of 2% yearly traffic growth between 2021 and 2026 (total 10% increase in traffic) would generate the following volumes:

- Lakeside Parade between Jordan Springs Boulevard and Jubilee Drive West (in the eastbound direction in the PM peak with 1,137 vehicles)
- East-West Connector Road between Jordan Springs East and Dunheved Link Road (in the westbound direction in the PM peak with 1,125 vehicles).

The guide of 1,000 vehicles per hour per lane in one direction is exceeded by some 137 vehicles. This volume (1,137) is still within RMS Guidelines under interrupted flow conditions. The extra 137 vehicles equates to three buses carrying approximately 45 passengers each during a weekday PM peak which even at current bus servicing levels, is already achievable, let alone with increased bus servicing in the future to accommodate full development of Jordan Springs and Jordan Springs East.

***3. Provision should be made for Lakeside Parade and The East-West connector road to accommodate future upgrades, including a widened bridge structure to allow for a future 4-lane road.***

As discussed in point 2 above, the traffic demands on both Lakeside Parade or the East-West Connector Road in 2021 and in 2026 (with 10% traffic growth applied from 2021) do not warrant or require a four-lane section of road to be built.

***4. The study notes that the intersection of Jordan Springs and Lakeside Parade is likely to fail once both Jordan Springs and Jordan Springs East are completed and indicates an upgraded layout (Table 8.9). However, it is unclear if any material benefits will result when the intersection is upgraded as the modelling results show an unchanged level of service and queue length. The intersection should be modelled to 2026 and must display material benefit when upgraded. The delivery of the upgrade, must be a works-in-kind offer as part of the rezoning approval.***

The upgrade proposed for the Jordan Springs Boulevard and Lakeside Parade intersection is primarily to improve intersection operation during the weekday PM peak where the dominant traffic flow is eastbound (incoming to Jordan Springs and Jordan Springs East). It is noted that the AM peak results remain largely unchanged, however, the key difference is the weekday PM peak intersection performance. Under the proposed intersection upgrade, where conceptual intersection geometries have been prepared, its performance will go from a Level of Service (LoS F) in the weekday PM peak under the existing intersection layout, to a vastly improved Level of Service (LoS B) with the proposed layout in year 2021. The material benefits of this proposed upgrades are substantial. This intersection would continue to operate at good levels of service (LoS B in the weekday AM peak and LoS C in the weekday PM peak) in the year 2026, with the application of a 10% increase in traffic growth.

Yours sincerely

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