Pakenham East PSP 1210

Victorian Planning Authority

Traffic and Transport: Expert Witness Statement

Final | C

May 28, 2018

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1. Qualifications and Expertise

In accordance with the Guide to Expert Witness Evidence prepared by Planning Panel Victoria, my qualifications and expertise to undertake this work are summarised below:

Qualifications

- Bachelor of Geomatic Engineering (1st class honours), The University of Melbourne, 2000-2004
- Bachelor of Science (Mathematics), The University of Melbourne, 2000-2004
- Masters of Business Administration, University of the South Pacific 2014-2016

Experience

John has 15 years' professional experience as a transport planner, modeller and project manager, with skills in, choice modelling, survey design, survey analysis, transport strategy development, stated preference and demand forecasting. He has worked as technical leader on projects that have encompassed road, public transport, heavy vehicles, motorcycle and aviation planning, model reviews, performance monitoring, road user pricing and economic evaluation.

John has a strong background in demand forecasting having worked on a range of studies including toll roads, airports, high speed rail, general public transport and ferries. He has reviewed intersection designs for numerous projects including the Minta Farm PSP, Barwon Heads Road Duplication and the Proposed Geelong Ring Road Extension.

John has extensive Cube modelling experience in the UK and Australia. He has worked on many projects using the Victorian Integrated Transport Model (VITM) for government and private clients, including the development of Growth Area Corridor Models. He has previously been called upon as an expert witness for the Sunbury South, Mount Atkinson and Minta Farm PSPs.

Areas of Expertise

- Strategic transport plans
- Choice modelling and model estimation
- VITM / Cube Voyager
- Demand forecasting

Other contributors

John Richardson was assisted in the preparation of this report Matthew De Marco and Jamie Schulz (both of Jacobs), they have the following qualifications and experience:

Matthew De Marco (SIDRA)

- Bachelor of Engineering (Civil) (Honours), Monash University, 2004
- Matthew has over thirteen years of experience in project managing the delivery of transport planning projects, traffic signal corridor reviews, traffic engineering assessments, traffic modelling projects, road safety assessments, urban development projects and liaising with clients and stakeholders.
- Matthew is fluent with SCATS and was previously part of VicRoads Traffic Signal Operations team responsible for the design, implementation and optimisation of congestion management and wayfinding strategies in Metropolitan Melbourne.

Jamie Schulz (SIDRA and document review)

- Bachelor of Engineering (Civil & Structural) with Bachelor of Economics (University of Adelaide), 2011
- Jamie Schulz is a transport planner with more than six years' experience, he has worked on various traffic and pedestrian modelling simulation projects and traffic impact assessments across Victoria, South Australia and Northern Territory.

Scope of the report

Jacobs was commissioned by the Victoria Planning Authority (VPA) to undertake a critical review of documents related to the Pakenham East PSP, review previous transport modelling and update the intersection analysis, taking into account land use assumptions. This is to assist in gaining a better understanding of the implications of the PSP on the broader network and to determine whether the proposed intersection configurations are appropriate to cater for the projected vehicle trips generated by the full development of the PSP.

Reference to other documents

- Exhibited Pakenham East Precinct Structure Plan (VPA, December 2017)
- Traffic Analysis Report, Pakenham East PSP (TfV/VicRoads, August 2017)
- Pakenham East Interchange Comparative Traffic Modelling Assessment (SMEC on behalf of Cardinia Shire Council, July 2014)
- Submission 36 (Plans in Motion on behalf of Azemi Landholdings, February 2018)
- Submission 50 (Mesh Planning on behalf of Parklea Developments, February 2018),
- Submission 71 (Cardinia Shire Council, March 2018)
- Submission 52 (Transport for Victoria, March 2018)
- Pakenham East and South PSP – Ultimate Midblock Traffic Volume Estimates (SMEC on behalf of Cardinia Shire Council, October 2015)
- Draft Pakenham East Precinct Structure Plan, Traffic Impact Assessment Report (Trafficworks on behalf on Cardinia Shire Council, 18/05/2018)

1. Introduction

The Precinct Structure Plan for Pakenham East (PSP 120) was exhibited in December 2017. It included in Appendix C a number of intersection layouts where the main PSP roads would connect with the Princes Highway. Since these layouts were prepared, the amount of developable area assigned to residential lots has increased, adding approximately 1,100 additional dwellings to the site.

This report reviews the previous modelling work undertaken and provides an update on the intersection layouts given the change in lots planned for the site. A number of submissions that relate to traffic have also been reviewed on behalf of VPA.

2. Peer review findings

A peer review was undertaken of previous transport modelling, including raw SIDRA files and trip generation spreadsheets, and submissions by submitters that were relevant to traffic and transport.

The issues identified by the peer review are classified using a three colour 'traffic light' system to represent three levels of concern, namely:

- **Green (note)** – a point to note but no action required, this may simply be to recognise a point of view but is not a concern to the analysis
- **Amber (minor concern)** – an issue of concern but it either does not have a material impact on the results or the effort or work required to resolve it would not be warranted. Amber can also include where further clarification is required to evaluate the issue more thoroughly.
- **Red (major concern)** – failure to resolve the issue would have the potential to have a material impact on the conclusions of the work undertaken and need to be resolved before they are accepted.

Where relevant, a recommended course of action has been provided.

2.1 Traffic Reports and SIDRA Files

This section provides a review of the Traffic Analysis Report, supporting SIDRA files and trip generation spreadsheet.

Table 1: Peer review findings

Section	Key findings	Issues rating
Traffic Analysis Report, Pakenham East PSP (TfV/VicRoads, August 2017)		
Chapter 3 – Traffic volumes	Adopting a trip generation rate of 9 vehicle trips/ dwelling (standard and low density lots) is considered reasonable. This rate is given in the RTA *Guide to Traffic Generating Developments 2002*, and a similar rate of 9.11 is given in the DPTI *Trip generation rates for assessment of development proposals (SA, 2014)* which looks at multiple sources of data for trip rates.	

Section	Key findings	Issues rating
	Medium density trip generation of 5 trips/ dwelling does not match the *Pakenham East PSP Traffic Calculation* spreadsheet which utilises a trip generation rate of 7 trips/ dwelling. **Recommendation: Ensure the trip generation rate is consistent between supporting material. Seven is the more conservative figure to adopt.**	
	There is no explanation of how the 500 trips to/ from the arterial road network for retail trips was calculated. This may have an impact on the total number of vehicle trips utilising the four intersections along Princes Highway accessing the PSP area. **Recommendation: Provide further explanation for how the estimate of 500 daily retail trips was derived.**	
	There is no explanation of how the estimated traffic volumes for the four intersections along Princes Highway were derived, particularly: • What is the base line traffic on Princes Highway (non PSP related traffic)? • Trip distribution – what is the directional distribution of trips entering/ exiting the PSP development? **Recommendation: Provide background assumptions on traffic volumes and trip distribution**	
SIDRA files (supplied by TfV / VicRoads)		
Lane geometry	It is noted that a left turn slip lanes is included on Collector Road A / Princess Highway. Recommendations regarding the provision of left turn slip lanes is provided in *VicRoads Guidance for Planning Road Networks in Growth Areas* (working document November 2015). In summary: • Left turn slip lanes are not required for Primary Arterial/ Connector Road intersections • However, it also states that *"where there are high volumes of left turners in peak hour which could reduce the level of service for the connector, a slip lane for the relevant left turn could be provided"* Both Ryan Road and Collector A are projected to have large numbers of left turning vehicles and the inclusion of left hand slip lanes will improve traffic flow. However, other design considerations make left hand slip lanes undesirable, such as the impact that have on pedestrian and cyclist convenience and safety. **Recommendation: Considering the large proportion of left turn trips generated by the PSP development (particularly south of Princes Highway), consideration should be given for the inclusion of left turn slip lanes into the design of new intersections where required. If the decision is made to not include slip lanes, then it is recommended to replace them with exclusive left turn lanes rather than shared lanes.**	
Traffic volumes	The heavy vehicle proportions are considered excessive, particularly given the level of non-residential development occurring within the PSP. It is expected that majority of heavy vehicles would be utilising the Pakenham Bypass. For all intersections, the following heavy vehicle proportions were adopted: • Princes Highway (east and west) - 10%	

Section	Key findings	Issues rating
	• Intersecting roads (north and south) - 4% **Recommendation: If models are re-run, reduce the heavy vehicle proportions to better reflect the projected traffic flows. We suggest 95% light vehicles and 5% heavy vehicles along Princes Highway and 98% light vehicles and 2% heavy vehicles along the intersecting road.**	
Phasing and timing	The intergreen times are set to the default values (4.0 seconds - yellow and 2.0 seconds – red). The intergreen periods should be amended to reflect the proposed speed limit along each approach (for the yellow time) and the expected conflict distance (for the all-red time), source *Austroads Guide to Traffic Management, Part 9* **Recommendation: If models are re-run, the intergreen times should be amended to meet the requirements of Austroads.**	
Phasing and timing	For all intersections, the *cycle time control* is specified by *user given phase times*. This approach is only considered appropriate when the actual phase times are known i.e. for existing signalised intersections. As the analysis is for the future design year 2046, the phase times will be unknown. The intersection performance should be calculated on the *optimum cycle time* setting, to allow SIDRA to equalise the intersection delay. Furthermore, the cycle times vary between each intersection. Based on the proposed signalised intersection spacing along Princes Highway, it would be expected that there would be some level of signal coordination configured in SCATS. As such, all intersections would be need to run off a common cycle time in each of the peak periods. **Recommendation: Re-run the SIDRA analysis using *optimum cycle time* setting to find the highest cycle time of the corridor and apply this cycle time to all intersections**	
Phasing and timing	Within the *phase sequence* for each intersection, the right turn diamond overlap phase (i.e. concurrent right turn movements on Princes Highway) does not include sub-phases. This may lead to inefficient intersection results, particularly when the concurrent right turn movements are not balanced. **Recommendation: Alter the *phase sequence* and re-run the SIDRA analysis.**	
Vehicle movement data	The impacts of traffic signal coordination have not been incorporated. Based on the proposed signalised intersection spacing along Princes Highway, it would be expected that there would be some level of signal coordination configured in SCATS. In the *signals* tab, the *arrival type* in the should be set to 4 (favourable) or 5 (highly favourable) to model vehicle platoons due to signal coordination. **Recommendation: Alter the *arrival type* parameter and rerun the SIDRA analysis.**	
Vehicle movement data	The input *approach and exit cruise speeds* are set to the default 60km/h for all vehicle movements. It would be expected that the desired speed would be 80km/h along Princes Highway. **Recommendation: Alter the *approach and exit cruise speeds* parameter and rerun the SIDRA analysis.**	

Section	Key findings	Issues rating
Pedestrians	The *pedestrian volumes* across all approaches has been significantly increased from 50 peds/hour to 300 peds/hour. This increase is considered excessive particularly given the level of non-residential development occurring within the PSP. Based on the proposed PSP layout, it would be expected that the pedestrian volumes at Princes Highway/ Collector Road B would be the highest, as it abuts the town centre. **Recommendation: Reconsider the pedestrian volumes at all intersections and re-run the SIDRA analysis.**	
Pakenham East PSP Traffic Calculations (Cardinia Shire Council, August 2017) - spreadsheet		
Trip generation	The total number of dwellings is significantly different from what is detailed in the exhibited PSP i.e. 6,089 in the spreadsheet versus 7,148 in the exhibited PSP. **Recommendation: Recalculate the total number of daily trips based on the total number of dwellings detailed in the exhibited PSP.**	
Medium density residential	Adopting a trip generation rate of 7 vehicle trips/ dwelling (medium density) is considered reasonable. A review of RTA *Guide to Traffic Generating Developments* 2002 (medium density not in the 2013 version) and DPTI *Trip generation rates for assessment of development proposals (SA, 2014)* suggests that this trip generation rate may be slightly high (guides suggest between 4-6.5 daily trips/ dwelling). While the adopted trip generation rate of 7vpd is on the higher side of the suggested range, the proposed average lot size of 318m^2 is likely to portray similar trip generation patterns to standard dwellings (average lot size of 412m^2), rather than a substantial reduction (from 9 to 5 trips per day). **Recommendation: A trip generation rate of 7 daily trips/ dwelling for medium density is considered appropriate.**	
Retail trip generation	There is no explanation of how the 500 trips to/ from the arterial road network for retail trips was calculated. A review of RTA *Guide to Traffic Generating Developments* 2002 (daily trips to shopping centres not included in 2013 version) DPTI *Trip generation rates for assessment of development proposals (SA, 2014)* suggest this trip generation should be in the order of 900-1,500 daily trips, based on the gross floor area identified in the exhibited PSP. This includes all trips for the retail area and could be reduced for trips passing through the Princes Highway intersections only. **Recommendation: Provide justification for 500 trips generated, or reconsider trips generation rates for retail areas.**	
Reduction factor on residential trips	Section 3.1.1 of the RTA Guide to Traffic Generating Developments, regarding residential dwelling trip generating states: *"Note that not all trips are external trips. As a guide, about 25% of trips are internal to the subdivision, involving local shopping, schools and local social visits. When reviewing the impact of the traffic generated on sub-regional and regional roads, some adjustment is necessary, depending on the location of shops, schools and recreation facilities."*	

Section	Key findings	Issues rating
	A reduction factor of 25% on residential trips to account for local trips appears excessive as there is to be a population of approximately 20,000 to 22,000, but only 1,313 jobs (VPA PSP, December 2017). There is however sufficient school provisions and a substantial amount of retail floor space. A reduction factor in the range 15-25% may be more appropriate. **Recommendation: Consider a lower local trip reduction factor of 20%**	

2.2 Other traffic reports

No specific comments have been made with regards to the *SMEC Strategic Modelling Report* - this was undertaken for another purpose and does not provide granular detail about turning movements at the major intersections along the Princes Highway.

No specific comments have been made with regards to the *SMEC Pakenham East and South PSP Ultimate Midblock Traffic Volume Estimates Technical Note* – this has considerably different traffic distribution, (i.e. Ryan Road has almost double the traffic and the other roads considerably less). The Technical Note does provide any information on how many dwellings and their location, which we cannot provide any comments on.

No specific comments have been made with regards to the *Trafficworks Draft Traffic Impact Assessment Report* – this was provided after this report was drafted and was not part of the original scope of this report. It has however been reviewed and we note that it contains slightly different assumptions about traffic generation and distribution, the most significant is that residential trip rates have not been reduced to account for internal trip making. This means that trip generation rates are overstated by 20% compared to the volumes used in this report. It is noted that a left hand slip lane has been included at both Ryan Road and Collector Road A.

2.3 Stakeholder submissions

Four submissions from stakeholders were reviewed and the following responses are provided to their key traffic and transport matters raised.

Table 2: Stakeholder submission responses

Section	Key findings	Issues rating
Submission 36: Plans in Motion – Urban Planning		
Bridges BR-01 and BR02	No major traffic and transport concerns raised with the exception of the timing of the construction of two bridges (BR-01 and BR02). They are currently designated as long term timing and Plans in Motion believe they should be incorporated in the short to medium term to provide sufficient connection from developed land to developing land. **Response**: The timing of the construction of these bridges is not anticipated to cause major traffic issues (i.e. vehicles using the bridge would only be local trips to/ from the nearby sports area and potentially further away schools). As this has no direct impact on the proposed intersection function layout plans for the PSP, we have made no recommendation on this matter	
Funding of Ryan Road intersection	The submission suggests that the ICP should include 100% of all costs. **Response:** SIDRA modelling has been undertaken (see Appendix A) that shows the difference between a T-intersection and a 4-leg intersection at Ryan Road. It would be reasonable that the developer responsible for the parcel of land to the north of Ryan Road contribute at least the additional land and construction component required to connect into their site.	
Submission 50: Mesh – Urban Planning and Design		
Non-Government Primary School	Mesh raised concerns about the location of the non-government primary school, due to traffic and other impacts on the local town centre, and to maximise the developable area for medium density housing in closest proximity to the retail and other activities. They propose a site on the other side of the drainage line which is still close to the retail area. **Response:** The location of school will not significantly impact on the proposed intersection function layout plans for the PSP.	
Mt Ararat Road	Mesh states: *"The PSP requires properties to address Mt Ararat Rd South, construct the road and provide a left-in left-out intersection at the Princes Highway. This is very poor traffic management and planning, as the intersection is dangerous and any upgrade extremely expensive. The PSP offers the opportunity to provide access to Mt Ararat Road via the internal access street system and closure of Mt Ararat Road at the time of construction/connection."* **Response:** It is understood that left in / left out turns would be allowed in the interim until IN-04 and the internal road network connecting to Mt Ararat Road are constructed. At this time the left in / left-out intersection could be closed or retained provided sufficient spacing (approx. 200m from a signalised intersection) is provided. No mention can be found in the PSP of upgrading Mt Ararat Road.	

Section	Key findings	Issues rating
Specific Plan Based Comments	*Plan 7 – Signalised intersection at Ryan Road should be deleted.* **Response**: There will be significant traffic passing through this intersection once the PSP is built out. Intersection traffic modelling shows that a signalised intersection is required. *Plan 7 – Ryan Road north of Canty Lane should be deleted* **Response:** This link forms a crucial link to the PSP, it will require upgrades to support the traffic volumes project at ultimate build out. *Plan 7 – Cross-section 7 is not appropriate for Ryan Road or Mt Ararat Road South* **Response:** it is unclear what the justification for this is *Plan 7 – Cross-section 3 does not fit Ryan Road* **Response:** Further information on the road reserve width would be required to determine if the cross section fits Ryan Road. *Plan 8 – The PSP is adequately covered by a bus service that does not include Ryan Road. Delete bus-capable requirement for Ryan Road and Canty Lane west of the north-south connector street.* **Response:** All the collector streets (including Ryan Road) are bus capable. It is reasonable to retain the bus capable requirement for Ryan Road, to provide a permeable and well connected internal bus network. *Plan 8 - The shared path (Pakenham station link) should be deleted as it is not strategically justified and the bicycle network of the Pakenham Golf Course redevelopment is not addressed. There is no evidence of the deliverability of the path on VicTrack land.* No comment can be provided on the deliverability, however this link would create a shared path that is only 2.5km from the south west corner of the PSP area to Pakenham Station, compared to 6km by road. This shared path to the station would assist in increasing active transport in the area. *Plan 11 – Delete IN-01 and RD-01* **Response:** As significant traffic volumes will be passing through from the PSP area this intersection should stay in, however the funding split should be reviewed. Significant traffic volumes generated by the PSP area will be added to this road (from the southern area of Ryan Road). It should stay in.	
Specific Table Based Comments	*Table 8 – Delete RD-01* **Response:** Significant traffic volumes generated by the PSP area will be added to this road (from the southern end of Ryan Road), widening is required to support future growth. *Table 8 – Delete IN-01* **Response:** Significant traffic volumes will be passing through from the PSP area through this intersection, redistributing the traffic to IN-02 would cause it to fail.	
Submission 52 – Transport for Victoria		
Intersection layouts	Acknowledges that they agree to the intersection layouts shown in Appendix C. **Response**: These intersection layouts are based on old land use numbers and need to be reviewed.	

Section	Key findings	Issues rating
	Ryan Road / Princes Highway intersection works are apportioned 50% to the ICP with no indication of how the remaining 50% will be apportioned. **Response**: Modelling has been undertaken of the intersection without the northern leg to guide the discussion on fair apportionment of costs.	
Submission 71: Cardinia Shire Council		
Traffic volumes	Cardinia Shire Council Submission states they have commissioned a traffic impact assessment (TIA) for the exhibited amendment road hierarchy and council's preferred road hierarchy. Councils main concern relates to the funding of the Ryan Road intersection. Multiple community members had raised expressed concern about increased traffic along Ryan Road. The submission also contains a summary of the VPA response to the other two submissions. **Response:** Traffic volumes contained in this report, can be used to quantify the impact to residents on Ryan Road. We will wait until the TIA is submitted to make further comment.	

3. SIDRA results summary

Following the peer review of the SIDRA analysis undertaken to inform the intersection layouts presented in the exhibited Precinct Structure Plan (December 2017), the SIDRA models were re-run with:

- Modifications to the input parameters as suggested in the peer review (see Table 1)
- Revised 2046 traffic volumes for the fully developed PSP (see Section 3.1)
- Revised 2046 traffic volumes for Princes Highway (see Section 3.2)
- Modified intersection layouts to improve performance (see Section 3.4)

3.1 Traffic generation assumptions

Based on a lot yield plan presented in the exhibited Draft PSP, the anticipated number of daily trips generated at full build has been calculated as shown in Figure 1, these are based on the following trip generation rates (per lot) and assumptions:

- Standard density: 9 trips per day / 0.9 trips per peak hour
- Low density: 9 trips per day / 0.9 trips per peak hour
- Large lots: 9 trips per day / 0.9 trips per peak hour
- 2Ha lots: 9 trips per day / 0.9 trips per peak hour
- Town center residential: 7 trips per day / 0.7 trips per peak hour
- Medium density: 7 trips per day / 0.7 trips per peak hour
- Passing shop trade: 500 trips per day / 50 trips per peak hour
- Assumed development north of Ryan Road / Princes Highway intersection: 500 medium density lots
- 20% discount for local trips

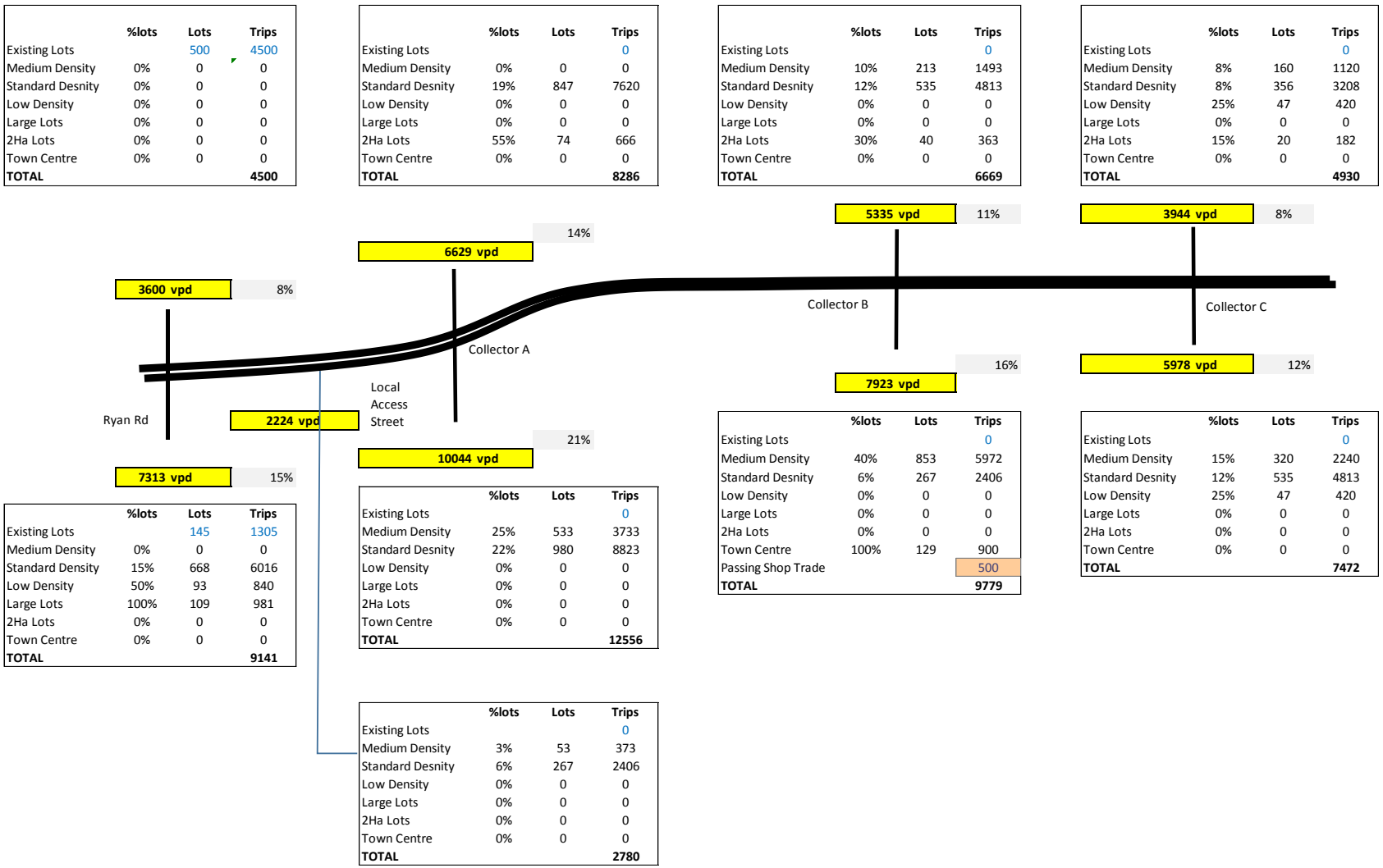

Figure 1: Trip Generation Calculations (yellow numbers indicate volumes after internal trip reduction)

The trips at each intersection have been distributed as shown in Table 3, it is assumed that traffic from either side of the Princes Highway (north or south) will be distributed in the same fashion. As the intersections move further east, it is anticipated that more traffic will make use of the Pakenham Bypass to avoid congestion in Pakenham.

Table 3: Trip distribution per intersection

Intersection	East	West	Straight
PHE/ Ryan Road	10%	80%	10%
PHE/ Collector Road A	15%	75%	10%
PHE/ Collector Road B	45%	50%	5%
PHE/ Collector Road C	65%	30%	5%

Peak hour traffic is assumed to be distributed as shown in Table 4.

Table 4: Trip distribution by peak period

Intersection	AM – leaving the precinct	AM – entering the precinct	PM – leaving the precinct	PM – entering the precinct
Residential	75%	25%	37%	63%
Retail	38%	62%	50%	50%
Other (e.g. school staff)	13%	87%	87%	13%

3.2 Background traffic volumes – Princes Highway

Peak hour traffic volumes at the intersection of Princes Highway and Windermere Boulevard were extracted from SCATS for three days in March 2018. Taking into account assumed traffic volumes at Ryan Road (residential and child care) the SCATS volumes were adjusted to represent through traffic on Princes Highway, east of Ryan Road. A small growth rate of 10% was applied and the following through traffic volumes were assumed in the SIDRA modelling:

- AM peak: 400 vehicles westbound, 300 vehicles eastbound
- PM peak: 400 vehicles westbound, 400 vehicles eastbound

These volumes were compared with the traffic volumes used in the SMEC Strategic Modelling Report (VITM) and found to be consistent.

3.3 Intersection performance

A summary of the intersection performance (intersection degree of saturation) is provided in Table 5, the intersection layouts are described in Section 3.4 and the layout diagrams included in Appendix A. Four different intersections layouts were tested for Princes Highway and Ryan Road (IN-01).

Table 5: SIDRA modelling summary (intersection degree of saturation)

Intersection	Degree of Saturation	
	AM peak	PM peak
PHE/ Ryan Road (T-intersection)	0.87	0.64
PHE/ Ryan Road (full development, 500 lots – Double left turn from Ryan Road and no pedestrian crossing on the western approach	0.96	0.79
PHE/ Collector Road A	0.90	0.75
PHE/ Collector Road B	0.80	0.68
PHE/ Collector Road C	0.76	0.57

3.4 SIDRA intersection layouts

In order to achieve an acceptable degree of saturation, the intersection layouts have been modified from the layouts in the exhibited PSP. Refer to Appendix A for intersection layouts. A summary of the key intersection modifications is summarised below:

Princes Highway/ Ryan Road – operating as T-intersection

Modifications of the lane configuration of the south approach

- Left turn slip lane converted to an exclusive left turn lane (100m)
- Through and right lane converted to an exclusive left turn lane
- Right turn lane extended to 75m

Princes Highway/ Ryan Road – operating as cross intersection

Modifications of the lane configuration at this intersection include:

- Double left turn from the south approach
- Double right turn lanes from the north approach

A left turn slip lane from the south approach is not preferred given the likely impact on the Childcare Centre on the South-West corner and impacts on pedestrians and cyclists. Instead double left turns from the south are included and all pedestrian crossings retained. This results in an intersection degree of saturation marginally above 0.95 (absolute maximum). Given the number of assumptions made in estimating future trip generation and distribution this is an acceptable outcome.

It is also noted that there is some uncertainty about the inclusion of the residential lots between Deep Creek and Ryan Road in the PSP. The removal of these lots from the PSP would reduce the volume of traffic assumed on Ryan Road and its intersection with the Princes Highway.

Princes Highway/ Collector Road A

Modification of the lane configuration on the north and south approaches

- Right turn lanes increased to 100m for the south approach and 110m for the north approach

Due to the high volumes of left turners in peak hour, a left turn slip lane is proposed on the south approach to reduce the level of service for entire intersection. This is in line with the intersection layout proposed in the exhibited PSP.

Princes Highway/ Collector Road B

Modifications of the lane configuration on the south approach

- Left turn slip lane converted to an exclusive left turn lane (130m)
- Right turn lane extended to 75m

Modifications of the lane configuration on the north approach

- Exclusive right turn lane extended to 85m

Princes Highway/ Collector Road C

Modifications of the lane configuration of the north approach

- Right turn lane increased to 40m

Modifications of the lane configuration on the west approach

- Second right turn lane removed

Modifications of the lane configuration on the south approach

- Short exit lane removed
- Right turn lane increased to110m

3.5 Option testing

Three options were tested in SIDRA, based on suggestions from submissions made to VPA. The results are described below.

3.5.1 Converting Princes Highway/ Ryan Road signalised intersection to left in/ left out

The removal of the signalised intersection of Princes Highway/ Ryan Road and conversion to left in/left out only was reviewed, with the following comments made on the impacts to restricted vehicular movements at the intersection.

Impacts to left turn out vehicles

The results indicate that the intersection performs unsatisfactorily in the AM peak, with a degree of saturation of 1.53. The intersection however does perform satisfactorily in the PM peak, with a degree of saturation of 0.46.

The AM peak fails due to the high volume of left turning vehicles exiting Ryan Road (approximately 600 vph) on the south approach, which is opposed to heavy flows on Princes Highway travelling west (approximately 2,300

vph). This results in unacceptable delays of over 8 minutes for vehicles to exit Ryan Road.

Impacts to right turn into Collector A

Restricting right turning vehicles into Ryan Road has a greater impact on the surrounding road network. Right turning traffic from the west approach will be displaced to Collector Road A intersection, which is already estimated to have around 530 right turning vehicles in the PM peak hour. This would increase by approximately 520 vehicles to 1,050. This movement is expected to have a degree of saturation of 0.70 prior to the addition of these extra vehicles, and degree of saturation of 1.02 once these vehicles are added, this is above the maximum allowed.

In the AM peak, an additional 230 vehicles are added to the right turn movement into Collector A from the west approach. This results in a degree of saturation of 0.90 with the additional right turn in vehicles.

Impacts to right turn out of Collector A

Once the right turn movements out of Ryan Road have been reassigned to the Collector A intersection, the degree of saturation results are 0.97 for the AM peak (with 140 additional movements added) and 1.07 for the PM peak (with 60 vehicles added) – both above the maximum degree of saturation allowed.

The total daily traffic volumes on Collector A (south) would increase from 10,000 vehicles per day (vpd) to 14,300 vpd, well above the preferred daily volume on a collector road.

3.5.2 Truncation of Canty Lane east of Ryan Road

The truncation of Canty Lane east of Ryan Road is not expected to create a significant change in the directional distribution of trips within the south-west corner of the PSP area to/ from the Princes Highway as there would remain two other local east-west roads that connect to Ryan Road. It is anticipated that 1,300 vpd would be diverted from Ryan Road to Collector A. This would increase daily volumes on Collector A to 10,300 vpd and put increased strain on the local road network south of Canty Lane. It would also restrict access to planned convenience store on the corner of Canty Lane and Collector A. For these reasons, this option is not supported.

If all other east-west local connections south of Canty Lane were also truncated east of Ryan Road, this would shift up to 5,100 vpd to Collector A, pushing it well over the threshold for a collector road and reducing connectivity for many households in the PSP.

3.5.3 Truncation of Ryan Road north Canty Lane

It is expected that Ryan Road left in/ left out would perform satisfactorily if Ryan Road is truncated north of Canty Lane, as this access point would only service a small residential catchment plus existing land uses (i.e. childcare centre) generating around 1,100 vpd.

However, as a result of the truncation, most vehicle movements to/ from the road network south of Canty Lane would be displaced onto Collector A to access Princes Highway. Collector A is projected to have a daily midblock traffic volume of 10,000 vpd without truncation – this would significantly increase to 16,500 vpd with the truncation of Ryan Road.

These additional vehicle trips would ultimately cause the intersection of Princes Highway/ Collector A to fail, especially as it is operating close to its theoretical capacity with Ryan Road not truncated. The function of Collector Road A would need to altered and upgraded to an arterial road.

Furthermore, existing residents south of Canty Lane would be significantly disadvantaged by the reduction of connectivity and further distance required to travel to access Princes Highway.

3.6 Daily midblock traffic volumes

Clause 56.06 of the Cardinia Shire Planning Scheme, provides a road hierarchy based on the anticipated traffic volumes and proposed function of the road network. The road hierarchy is categorised by the volume thresholds shown in Table 6, these are compared against the cross sections presented in Appendix C of the Draft PSP.

The design volumes for the VPA cross sections are taken from the *Engineering Design and Construction Manual (VPA).*

Table 6: Road hierarchy and expected traffic volumes, Cardinia Shire Council and VPA

Design volume	Cardinia Shire Planning Scheme	VPA cross sections
< 2,000 vpd	Access Street Level 1	Local Access Street (Level 1)
2,000 – 3,000 vpd	Access Street Level 2	Local Access Street (Level 2)
3,000 vpd	Access Street Level 2	
3,000 – 7,000 vpd	Connector Street Level 2	Connector Street
7,000 – 12,000 vpd		Boulevard Connector Street
> 7,000 vpd	Arterial Road	

All of the assessed northern approaches to the Princes Highway fit into the category of Connector Street. Collector C south of Princes Highway also fits into this category. The remainder of the roads would classify as Boulevard Connector Streets (7,000 – 12,000 vpd). A summary of the projected 2046 daily traffic volumes is provided in Table 7.

All roads are within their nominated capacity except for Ryan Road and Collector B (south of Princes Highway), both of which exceed their nominated daily capacity of 7,000 vpd. The exceed by a small amount (<1,000 vpd) and this is not seen as a major concern.

Boulevard Connector Streets are not defined within the Cardinia Shire Council Planning Scheme, the main difference to a standard collector street is the addition of 3-6m wide central median. This provides easier crossing opportunities for pedestrians and opportunities for additional right hand turning lanes, enabling higher volumes to be carried.

Table 7: Projected 2046 midblock volumes (assuming the intersection layouts proposed in this report)

Road	Daily Traffic Volume (vehicles)	
	South of Princes Highway	North of Princes Highway
Ryan Road	7,300	3,600*
Collector A	10,000	6,600
Collector B	7,900	5,300
Collector C	6,000	3,900

*500 medium density dwellings are assumed on vacant land parcel north of Princes Highway

4. Opinion of the expert

Following a review of related traffic and transport reports and the conduct of additional transport modelling, the following assessment is made:

1. The total trip generation for the PSP needs to be updated based on the increased total number of dwelling detailed in the exhibited PSP. The revised trip generation calculations show an increase of approximately 7,500 daily vehicle trips, compared to those that the exhibited PSP is based on. The trip generation rates adopted are generally conservative.
2. The projected 2046 intersection volumes need to be updated based on the updated trip generation. This includes alterations to the baseline traffic on Princes Highway and alterations to the trip distribution for the PSP area, based on information contained with the exhibited PSP document. These assumptions have been provided to TfV for review.
3. There are some critical input errors/ assumptions in the SIDRA models prepared by TfV for the exhibited PSP. These have been rectified in the revised modelling.
4. It is recognised that left turn slip lanes are not required for Primary Arterial / Connector Road intersections as recommended in *VicRoads Guidance for Planning Road Networks in Growth Areas*. However, where there are high volumes of left turners in the peak hour which will reduce the level of service for the Connector Road and there is land available, a slip lane for the relevant left turn can be considered to improve the efficiency of the intersection.
5. Alterations are required for the south approach at Ryan Road (IN-01) to cater for the increased traffic volumes since the intersection layouts were prepared for the exhibited draft PSP. In order to retain all pedestrian crossings and avoid the addition of a left hand slip lane, double left hand turns are required. The intersection marginally exceeds the preferred threshold degree of saturation, but given the uncertainty in modelling the ultimate traffic generation and distribution this is an acceptable outcome.
6. The intersection layouts shown in the draft PSP have been modified based on the revised 2046 intersection volumes. The major change is the inclusion of double left turn lanes at Ryan Road intersection (IN-01) to accommodate higher turning volumes and a reduction in turning lanes at Collector Road C (IN-04). There are also minor changes to the need for and length of turning lanes at all intersection.
7. If the land to the north of IN-01 is not developed, a T-intersection design with double left turns out of Ryan Road, and double right turns into Ryan Road can be implemented as well as including the pedestrian crossing on the western side of the intersection.
8. A signalised intersection at Ryan Road and the Princes Highway is required to evenly distribute traffic at full PSP build out. The intersection does not operate satisfactorily if converted to a left in/ left out access and also causes IN-02 to fail.
9. The projected daily midblock volumes on Ryan Road and Collector Road B exceed the volume threshold for a Collector Road (3,000 - 7,000 vpd) however they exceed the threshold by at most 1,000 vpd which can be accommodated within the road design.
10. The truncation of Canty Lane (east of Ryan Road) or Ryan Road (north of Canty Lane) would create significant impact on Princess Highway/ Collector Road A and reduce connectivity between households and services within the PSP.

Declaration

I have made all enquiries that I believe are desirable and appropriate and no matters of significant which I regard as relevant to my knowledge been withheld from the Panel.

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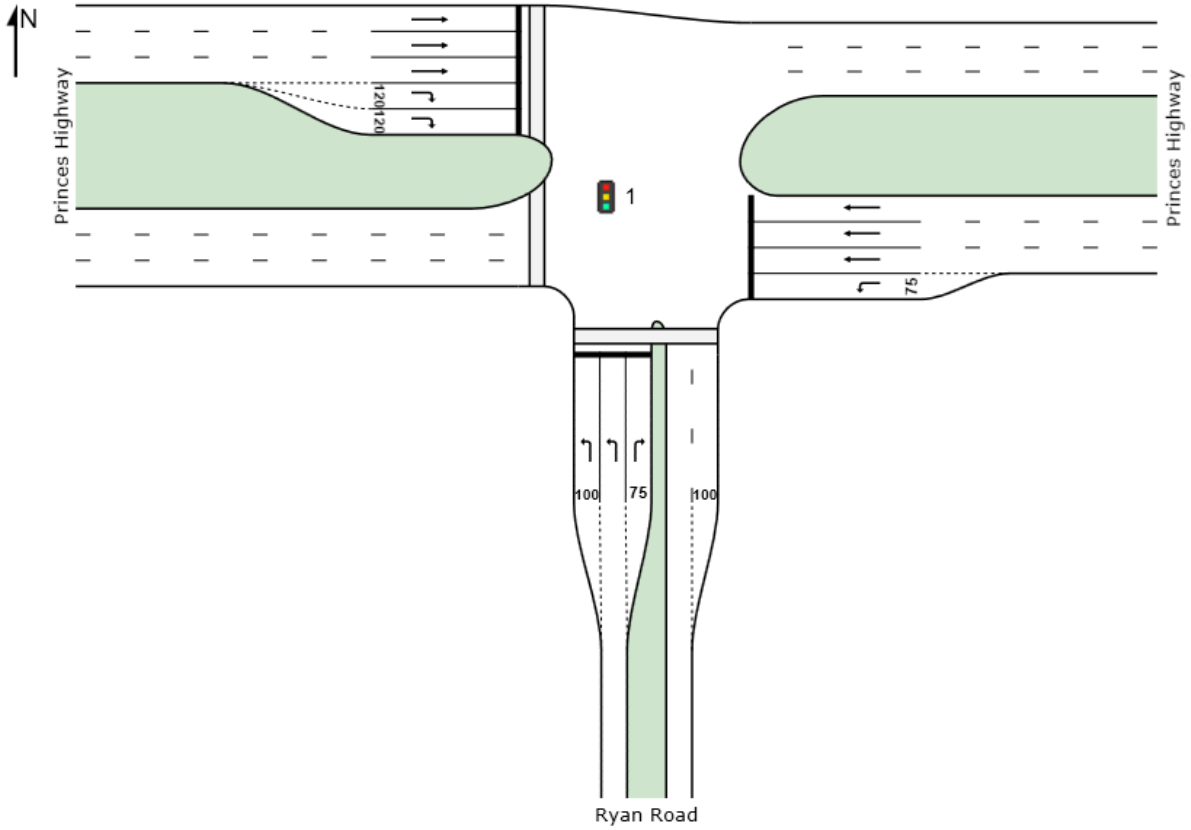
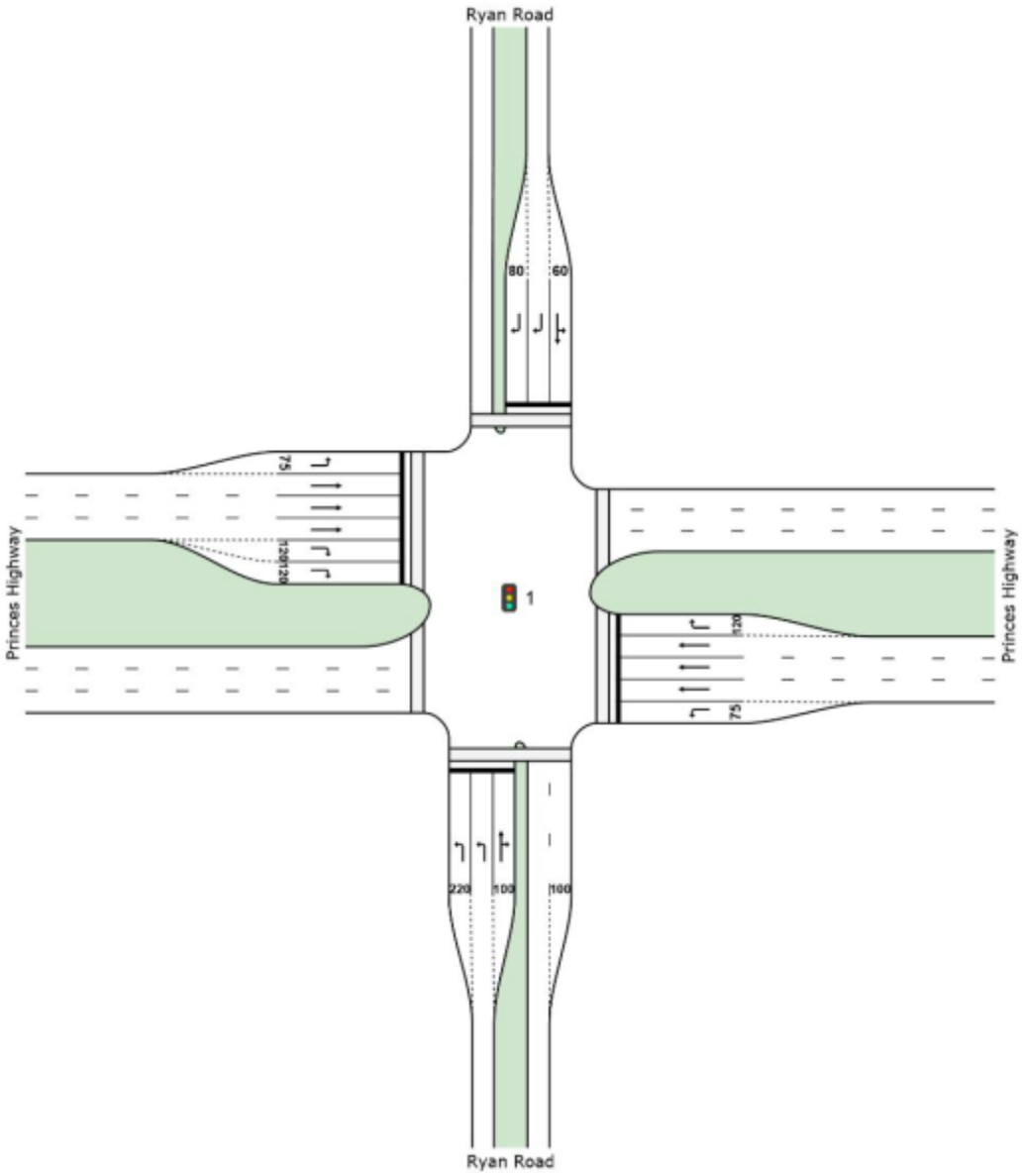
Appendix A. SIDRA Intersection Layouts

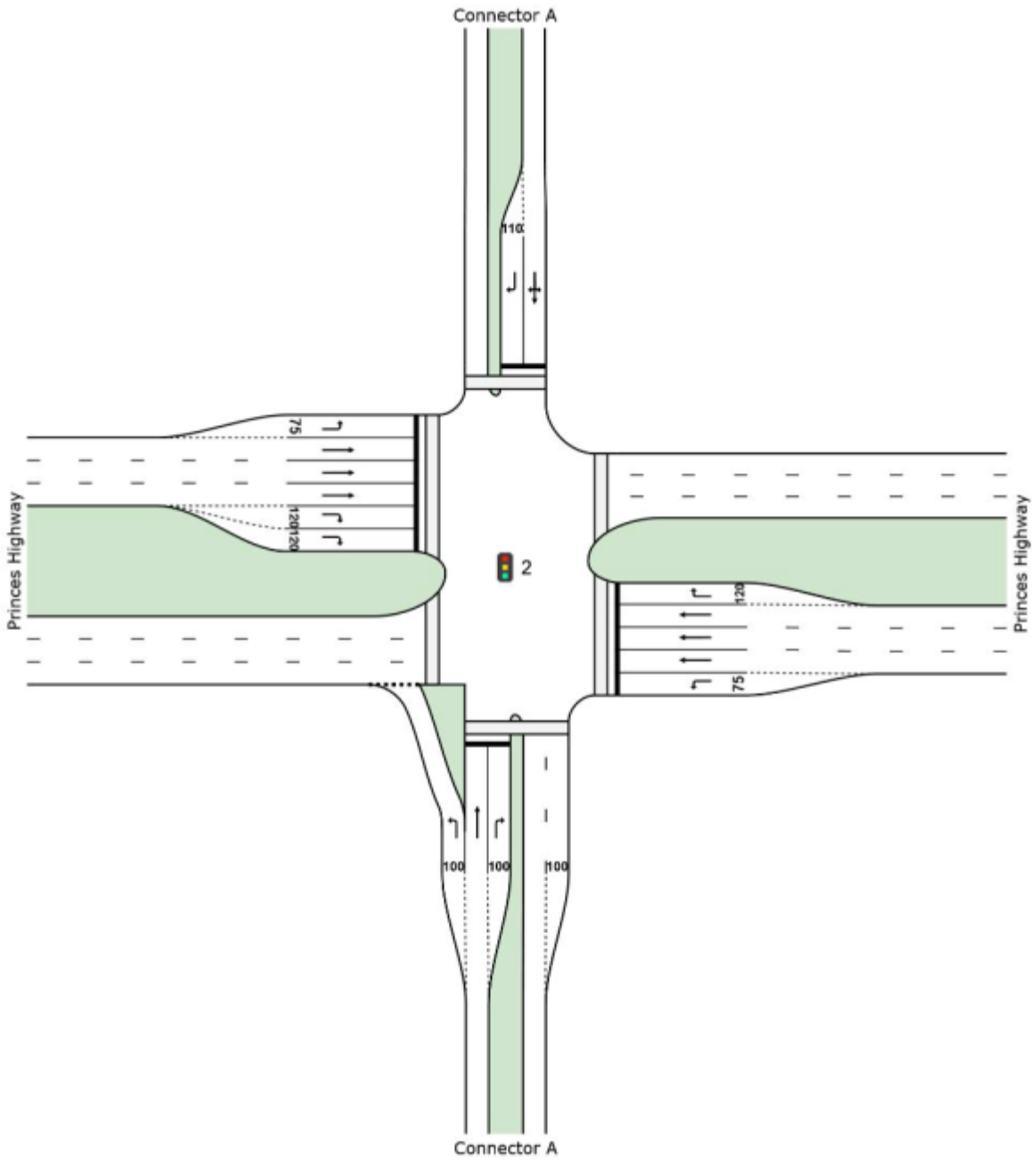
IN-01: Princes Highway / Ryan Road – T-Junction



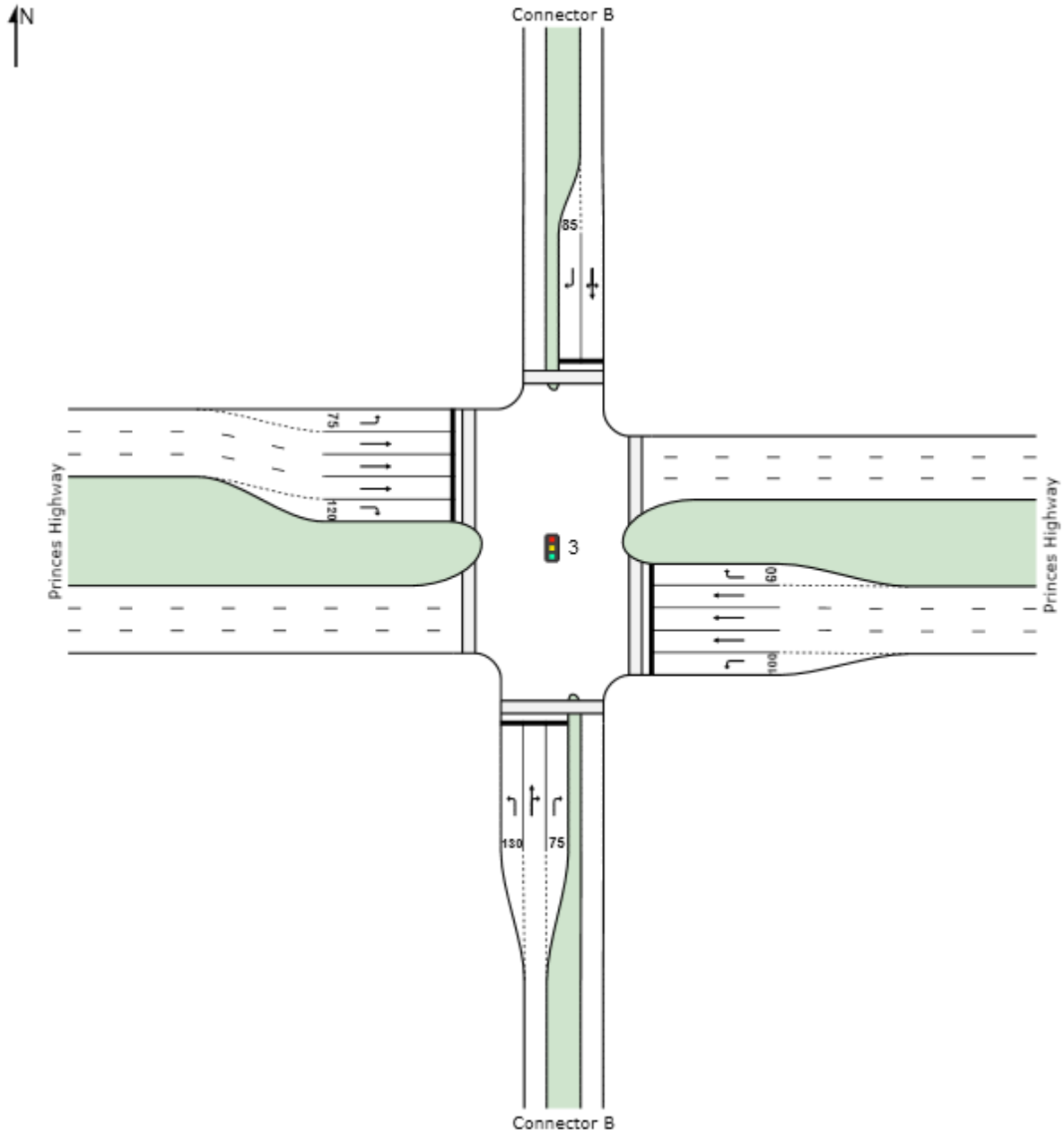
IN-01: Princes Highway / Ryan Road – with double left turns from Ryan Road



IN-02: Princes Highway / Collector A



IN-03: Princes Highway / Collector B



IN-04: Princes Highway / Collector C