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Queensland Government

Aura Precinct 15 Traffic Modelling Report

Stockland

Aura P15 Traffic Modelling Report

October 2021

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Contents

1 Introduction

The Caloundra South Priority Development Area (PDA) is one of the largest master planned communities in Australia, set to house a population of approximately 50,000 persons and provide 20,000 dwellings over the next 30 years.

The site, which is located to the south of the Caloundra Urban Area on the Sunshine Coast is set to become one of the largest greenfield developments across Australia. The Caloundra South PDA has 19 precincts with a broad range of land uses including residential dwellings, retail developments, commercial/showroom precincts, an industrial precinct, integrated sports uses, schools and numerous active transport pathways.

To assess the traffic demand from this development significant transport modelling has been undertaken, the history of model developed for the Caloundra South PDA is summarised below.

1.1 Model history

This report represents the latest step in the transport modelling undertaken for the Caloundra South PDA. The history of the modelling work is summarised in Figure 1 and outlined in detail below[1].

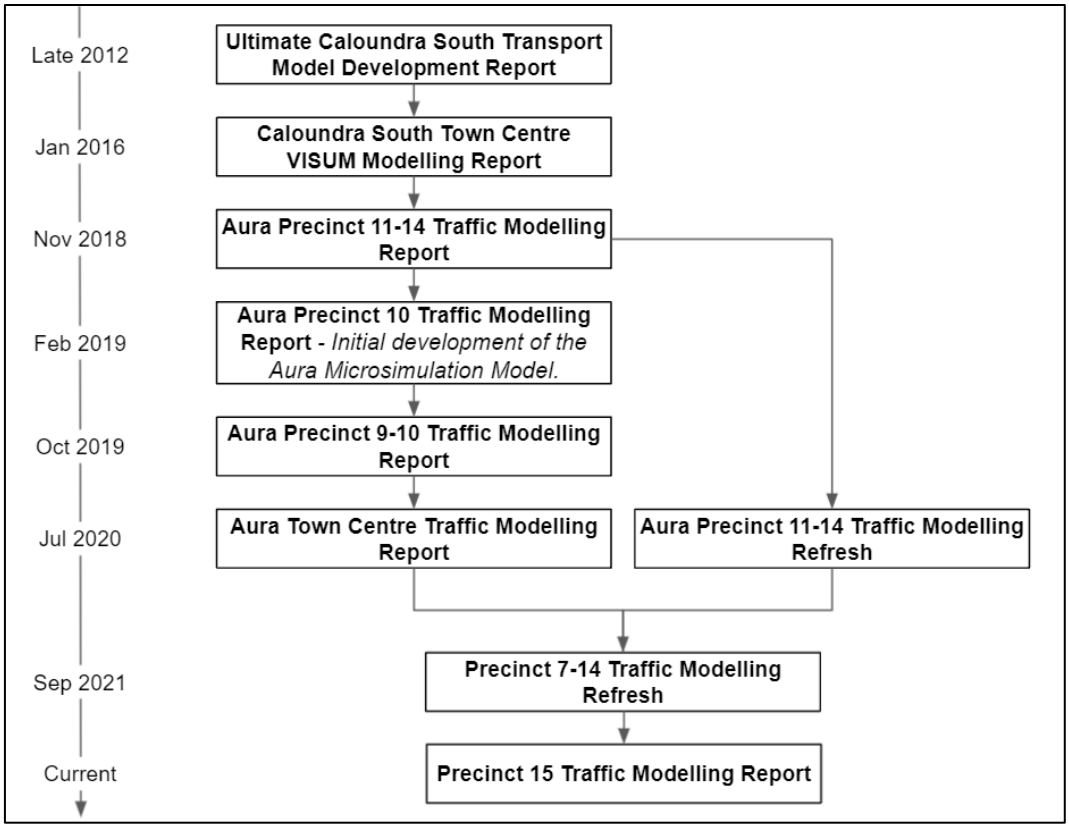

Figure 1: Aura traffic modelling history

[1] Further details on model history are provided in MWH Australia (2016), *Caloundra South Town Centre Visum Modelling Report*.

- **Late 2012 (*Ultimate Caloundra South Transport Model Development Report*):** An initial model was developed late 2012 with a report released for comment in February 2013. This model was based on data from SCTFM v3.5.
- **June 2013 (*No documentation*):** Following the release of SCTFMv5, the model was refined and released to Department of Transport and Main Roads (TMR) and Sunshine Coast Regional Council (SCRC) for comment in June 2013. No documentation accompanied the model at this time.
- **October 2013 (*UCTSM Revised Model Development Report Rev 7*):** A report was released in October which was based on the June 2013 release of the model. There were some minor network changes to the model to remove some route choice issues. The modifications included removing u-turns.
- **November 2013 (*UCTSM Revised Model Development Report Rev 7.11*):** Further modifications were made to the model and associated reporting documents.
- **January 2016 (*Caloundra South Town Centre Visum Modelling Report*):** Additional modifications were made to the model approved in November 2013 as part of the Caloundra South Town Centre project based on the discussions with TMR, SCRC, Department of Infrastructure, Local Government and Planning (DILGP) and Stockland. These updates focussed on the Town Centre, refining the model within Precincts 7 and 8. The updated model was submitted in October 2015 for approval to all stakeholders. Based on the comments received in December 2015 and January 2016 by SCRC and TMR, the model was revised and re-submitted in March 2016. The final model was approved by SCRC on 8th April 2016 and TMR on 7th April 2016.
- **November 2018 (*Aura Precinct 11-14 Traffic Modelling Report*):** This transport assessment was completed for Aura Precincts 11-14 as part of the approvals process for the Caloundra South PDA. It provided an update to the January 2016 report and associated Visum model to represent changes in Stockland's planning assumptions.
- **February 2019 (*Aura Precinct 10 Traffic Modelling Report*):** This report outlined a transport assessment as part of Condition 12 in the PDA decision notice requiring a simulation model developed prior to the first stage of the Town Centre. This model is referred to as the Aura Vissim Model and focussed on Precinct 10. In February 2019 this report and associated models were endorsed by EDQ.
- **October 2019 (*Aura Precinct 9-10 Traffic Modelling Report*):** This report was completed as part of Stockland's development approval process. The modelling undertaken as part of this report included the latest planning assumptions from Stockland. This report summarises the latest modelling of the Aura development to be undertaken (both from the Aura Visum Model and the Aura Vissim Model). This report and associated models were endorsed by EDQ on 15 April 2020 as part of DEV2013/469.
- **July 2020 (*Aura Town Centre Traffic Modelling Report*):** This report was commissioned by Stockland to form part of the ROL application. The report summarised the modelling results (both from the Aura Visum Model and the Aura Vissim Model) due to changes in Stockland's planning assumptions in the Town Centre (Precincts 7-8).
- **July 2020 (*Aura Precinct 11-14 Traffic Modelling Refresh*):** This report provided a refresh to the November 2018 traffic assessment for Precinct 11-14 to ensure the traffic assessment aligned with the latest Stockland planning assumptions.
- **September 2021 (*Aura Precinct 7-14 Traffic Modelling Refresh*):** This report provided a refresh to previous traffic assessments across Precincts 7-14 to ensure alignment with the latest Stockland planning assumptions. This report and associated models represent the latest version and underpin this Precinct 15 assessment.

1.2 Purpose of this report

PwC have been engaged by Stockland to assist in the transport assessment and associated approvals process for the Caloundra South PDA. As part of Stockland's ROL Application for Aura Precinct 15 the following requirements must be met under the Local Government Infrastructure Agreement (LGIA):

Clause 2.8: *At the time of lodging the first application for an ROL Approval for a Precinct, the Developer must provide to MEDQ and Council, a Precinct Traffic Analysis.*

"Precinct Traffic Analysis" means an analysis of the transport network for a Precinct, where that analysis identifies:

a) The volume and capacity of road links; and

b) The capacity and operation of key intersections,

For road Classifications of Neighbourhood Connector, Centre Connector, Industrial Connector, Trunk Collector, Sub-Arterial and above.

This report and the accompanying transport models meet the following tasks as part of Stockland's ROL Application:

1. Updates made to the MWH Aura Visum Model to ensure it is reflective of the latest planning assumptions within Precinct 15.
2. A Precinct Traffic Analysis to be completed for Precinct 15.

2 Modelling approach and assumptions

The modelling approach used for this assessment is based on the following process:

1. Update model inputs with latest Stockland planning assumptions.
2. Update demand matrices.
3. Perform traffic assignment in updated model.

The key assumptions used within this process are further outlined in the following sections.

2.1 Study area

This assessment uses the Aura Visum Model as last updated in September 2021, with planning assumptions for Precinct 15 reviewed as part of this process. Figure 2 highlights Precinct 15 of the Aura development.

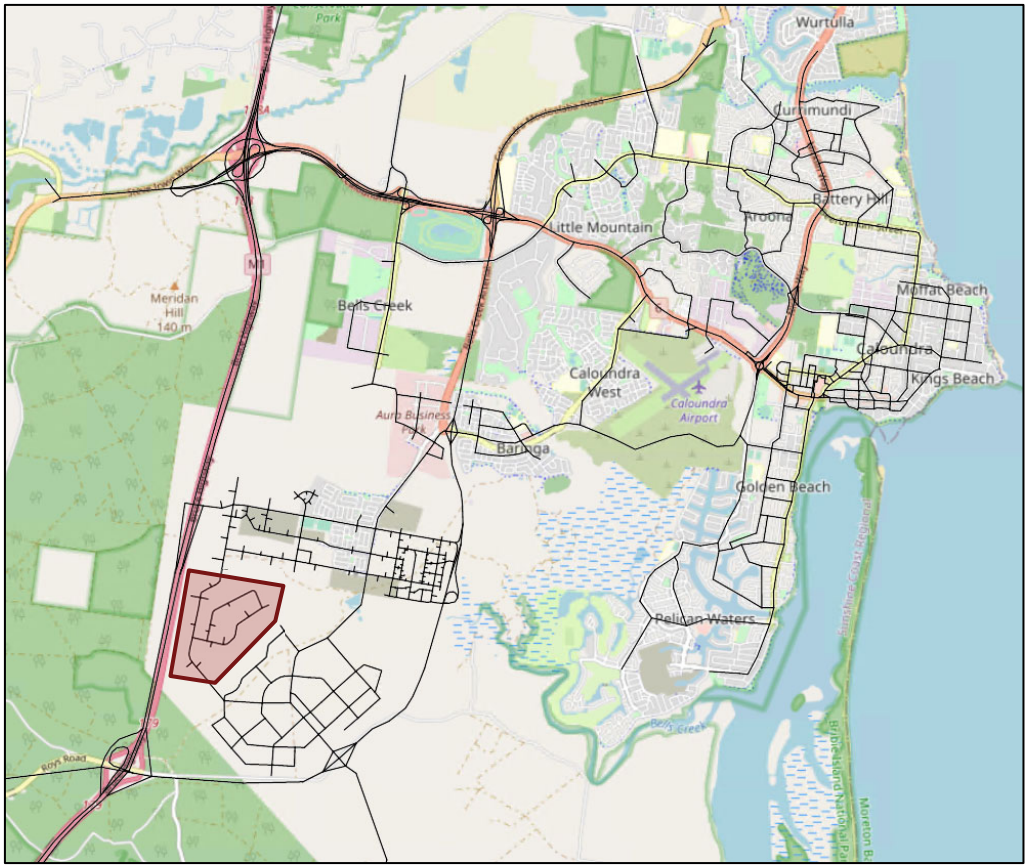

Figure 2: Study area
Source: Aura Visum Model, Bing Maps

2.2 Land use assumptions

To reflect Stockland's latest land use planning assumptions, updates have been made to the existing model for Precinct 15. Table 1 provides a high-level comparison of the land use assumptions between the Aura Precinct 7-14 Traffic Modelling Refresh (September 2021) and the updated model inputs based on the areas defined in Figure 3.

Table 1: Land use modelling assumptions

Area	Aura Precinct 7-14 Traffic Modelling Refresh				Updated Inputs			
	Population	Dwellings	Floorspace (m²)	Enrolments	Population	Dwellings	Floorspace (m²)	Enrolments
Eastern	1,846	667	10,120	0	2,524	905	0	1,500
LLC	1,211	435	0	0	900	500	0	0
Western	1,885	676	0	549	1,024	367	12,400	0
Total	**4,943**	**1,778**	**10,120**	**549**	**4,449** (-10%)	**1,773** (-0.3%)	**12,400** (+23%)	**1,500** (x 2.7)

Source: URBIS, Stockland

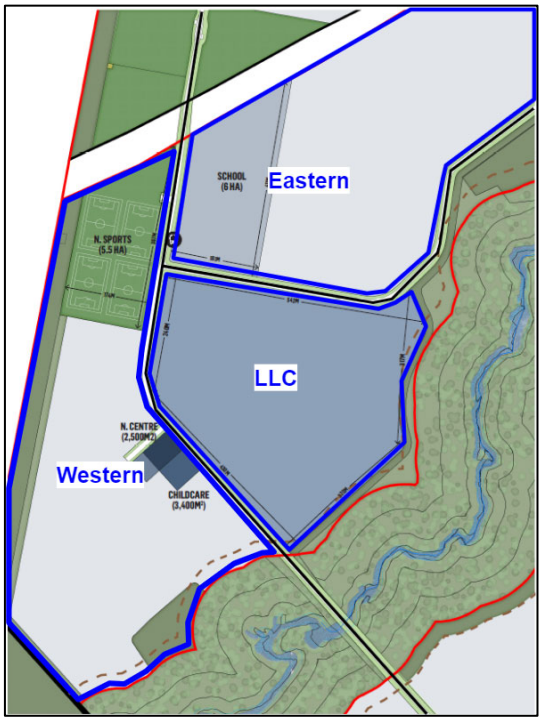

Figure 3: Precinct 15 land use summary
Source: URBIS, Stockland

The key changes to land use across Precinct 15 include:

- Redistribution of dwellings across the site, resulting in no material change in dwellings and a net decrease in population[2].
- Significant increase in school site enrolments and moving the site to the other side of the main north-south link.
- Increase in floorspace and moving the site to the other side of the main north-south link.

[2] Decrease in population driven by the LLC site which assumes a lower population per dwelling than the rest of the precinct (1.8 compared to 2.8).

All other precincts maintained the same land use assumptions as per the existing model version, Table 2 provides zone level land use assumptions for Precinct 15.

Table 2: Detailed land use assumptions

Precinct	Area	Model Zone	Land Use Description	Land Use Yield
15	Eastern	1065	School (Private)	1,500 students
		1155	Residential	266 dwellings
		1017	Residential	266 dwellings
		1157	Residential	374 dwellings
	LLC	1156	Residential	175 dwellings
		1169	Residential	325 dwellings
	Western	1158	Residential	367 dwellings
		1054	Neighbourhood Centre	6,650m²
		1053	Community Centre & Sports Field	5,750m² Sports Field

Source: URBIS, Stockland

2.3 Road network

The Aura Visum Model network was reviewed to ensure it represents the latest Stockland planning assumptions within Precinct 15. This section outlines the updates that have been incorporated within the Aura Visum Model.

Figure 4 summarises the Precinct 15 road network, updated to align with Stockland's latest planning assumptions. This includes updates and refinements to:

- Additional east-west network servicing the eastern zones of Precinct 15.
- Zone access/egress to better reflect actual vehicle movement, this includes updating the zone 1157 connector from Precinct 15 (to the west) to Precinct 17 (to the south).
- Intersection form to include a proposed signalised intersection.
- Other minor network assumptions.

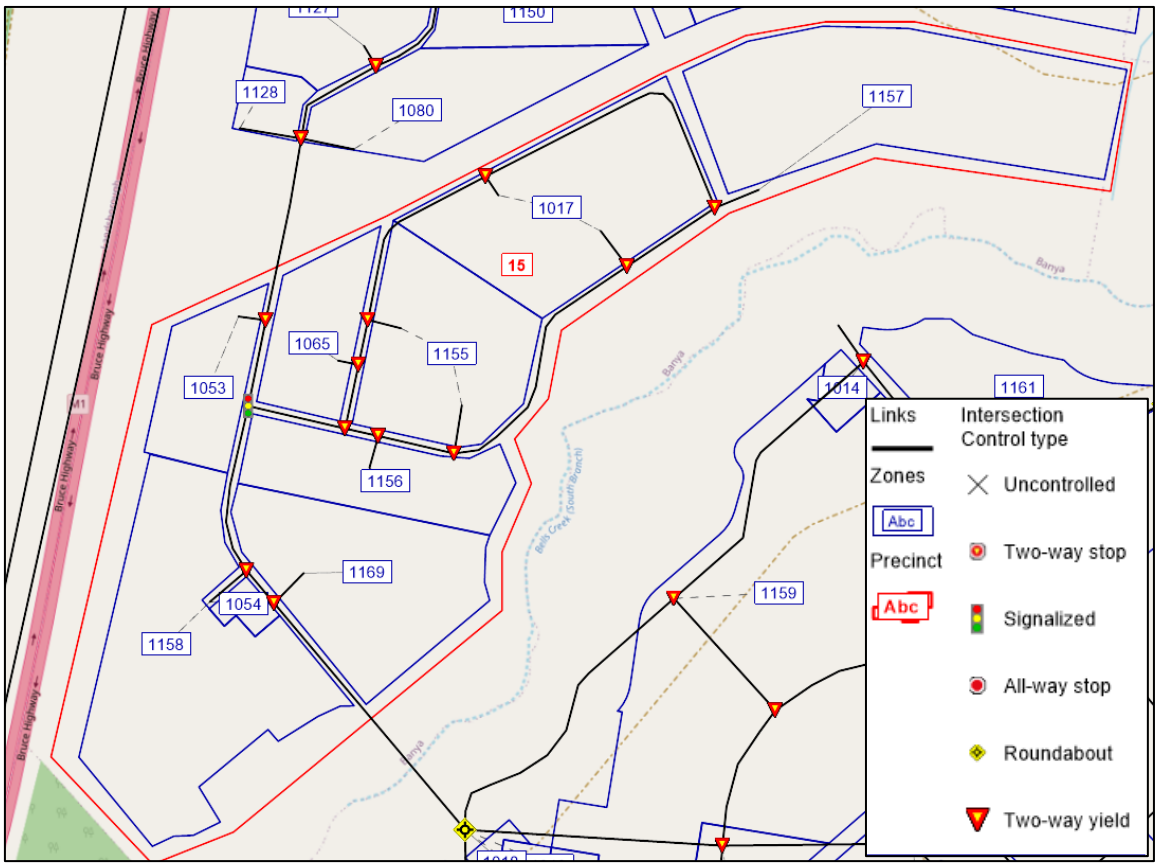

Figure 4: Road network summary
Source: Stockland

Other key road network assumptions include:

- Intersection Form: One signalised intersection within P15, the remainder are either two-way yield or uncontrolled intersections (see Figure 4 for details).
- Number of lanes: 1 lane (each direction) for all roads within P15.
- Posted Speed: 60km/hr for all roads within P15 except for zone access/egress links which are 40km/hr.

3 Modelling results

The demand modelling process has remained consistent with the process used for the MWH Aura Visum Model. This was based on the 2031+ UCSTM modelling which utilises an ultimate demographic dataset for the Aura Development. This represents a 'full build' scenario as the most likely representation of the ultimate scenario, AM and PM peak periods in the 2031+ forecast year. For this assessment, the 2031+ forecast scenario was modified to incorporate the most up to date land use data (as outlined in Section 2.3).

The following four step approach was undertaken:

1. Trip Generation.
2. Mode Share.
3. Trip Distribution.
4. Assignment.

The following section outlines key results of the modelling process.

3.1 Model convergence

To test the stability of the model, convergence tests were performed on both peak period models. Model convergence criteria remains as per previous modelling[3] which states that:

1. The last batch of equilibrium assignment iterations has reached a gap of 0.001.
2. 95% of assigned turn flows between two successive loop iterations have converged within 1%.
3. 90% of turn delays from calibrated turn volume delay functions are within 5% of turn delays calculated from the junction capacity analysis module.

The model convergence results are shown below in Table 3 and Table 4.

Table 3: AM peak period model convergence summary

Iteration	Criteria 1		Criteria 2		Criteria 3	
	Value	Achieved	Value	Achieved	Value	Achieved
1	1.54×10^{-6}	✓	0	✗	0	✗
2	8.98×10^{-6}	✓	0.303	✗	0.522	✗
3	3.51×10^{-6}	✓	0.482	✗	0.626	✗
4	4.84×10^{-6}	✓	0.798	✗	0.754	✗
5	1.95×10^{-6}	✓	0.934	✗	0.876	✗
6	2.79×10^{-6}	✓	0.959	✓	0.956	✓

Source: Model outputs

[3] MWH Australia (2016), *Caloundra South Town Centre VISUM Modelling Report*.

Table 4: PM peak period model convergence summary

Iteration	Criteria 1		Criteria 2		Criteria 3	
	Value	Achieved	Value	Achieved	Value	Achieved
1	8.39 x 10^{-7}	✓	0	✗	0	✗
2	8.07 x 10^{-6}	✓	0.325	✗	0.532	✗
3	2.74 x 10^{-6}	✓	0.468	✗	0.629	✗
4	2.49 x 10^{-6}	✓	0.827	✗	0.763	✗
5	5.79 x 10^{-6}	✓	0.935	✗	0.877	✗
6	2.77 x 10^{-6}	✓	0.967	✓	0.962	✓

Source: Model outputs

The model convergence results outlined above suggest that the updated models have converged to an appropriate level of granularity.

3.2 Link volumes

Figure 5 and Figure 6 outlines the link volumes for the AM and PM peak period models respectively.

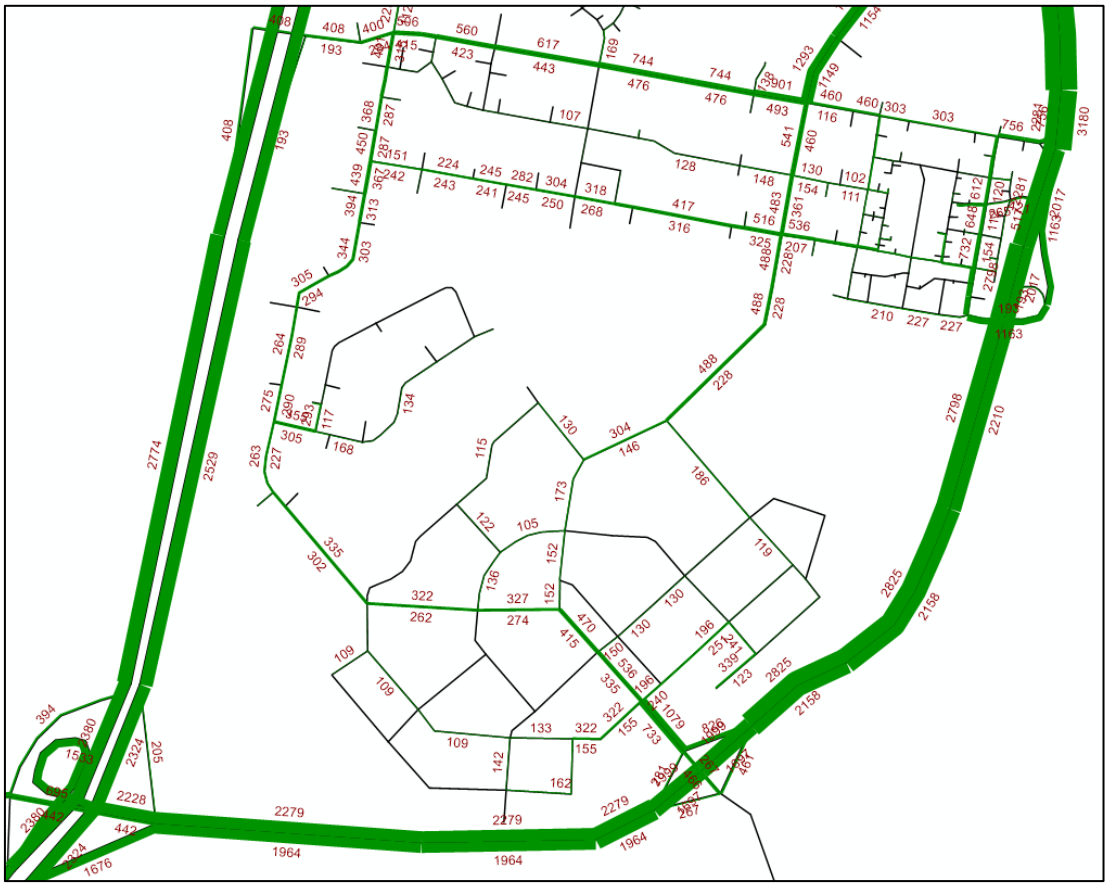

Figure 5: AM peak hour link volumes
Source: Model outputs

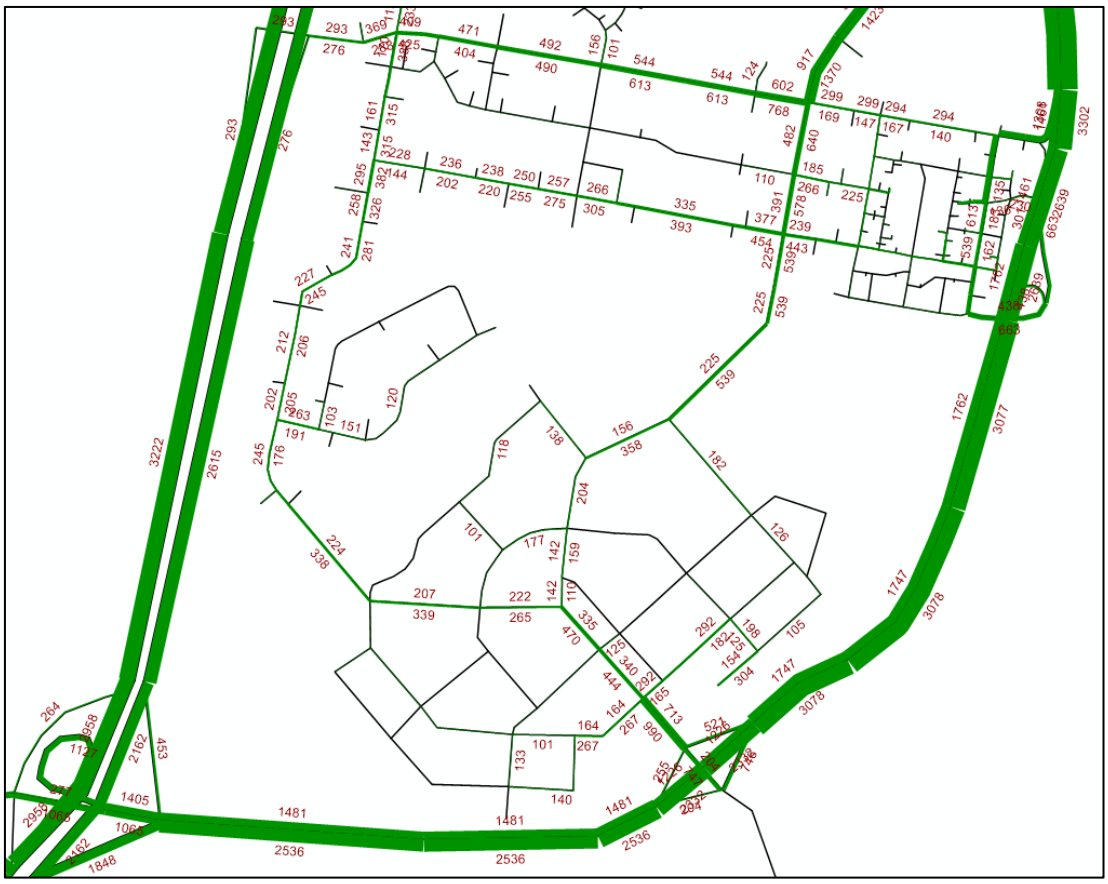

Figure 6: PM peak hour link volumes
Source: Model outputs

A comparison of link volumes has been undertaken to show the effect of the changes in assumptions on the forecasted network traffic volumes. Figure 7 and Figure 8 show the link volume difference plots[4] where the following key changes in demand across the network can be seen:

- A significant increase in the AM peak demand heading towards the Precinct 15 school site, reflecting the increase in enrolment capacity. This is not evident in the PM peak as the school peak does not directly align with the broader network peak.
- A decrease in demand in the northern part of Precinct 17, where the connector to zone 1157 has been reallocated to access through Precinct 15.
- Minor redistribution across the Aura traffic network, reflecting better representation of traffic within Precinct 15 and its subsequent impact on route choice.

[4] Green bars represent updated model > original model, red bars represent updated model < original model, grey links are only in the updated model.

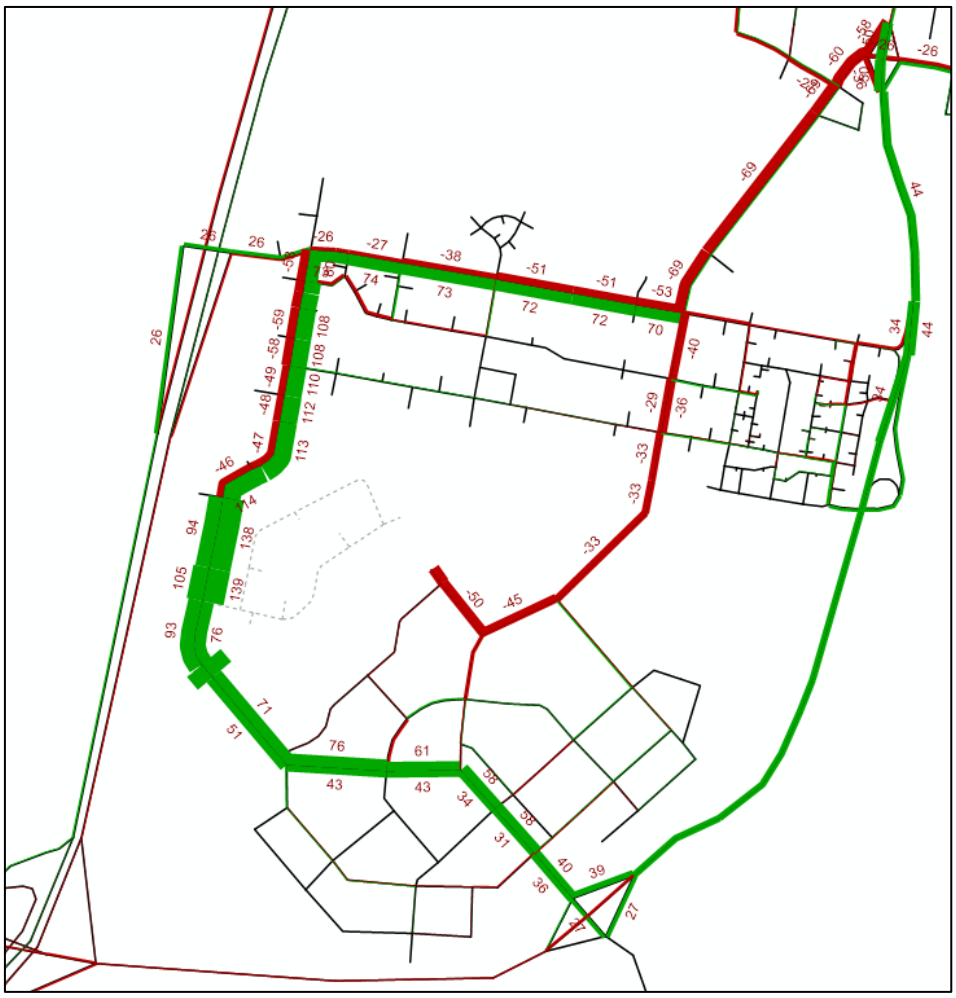

Figure 7: AM peak link volumes difference plot
Source: Model outputs

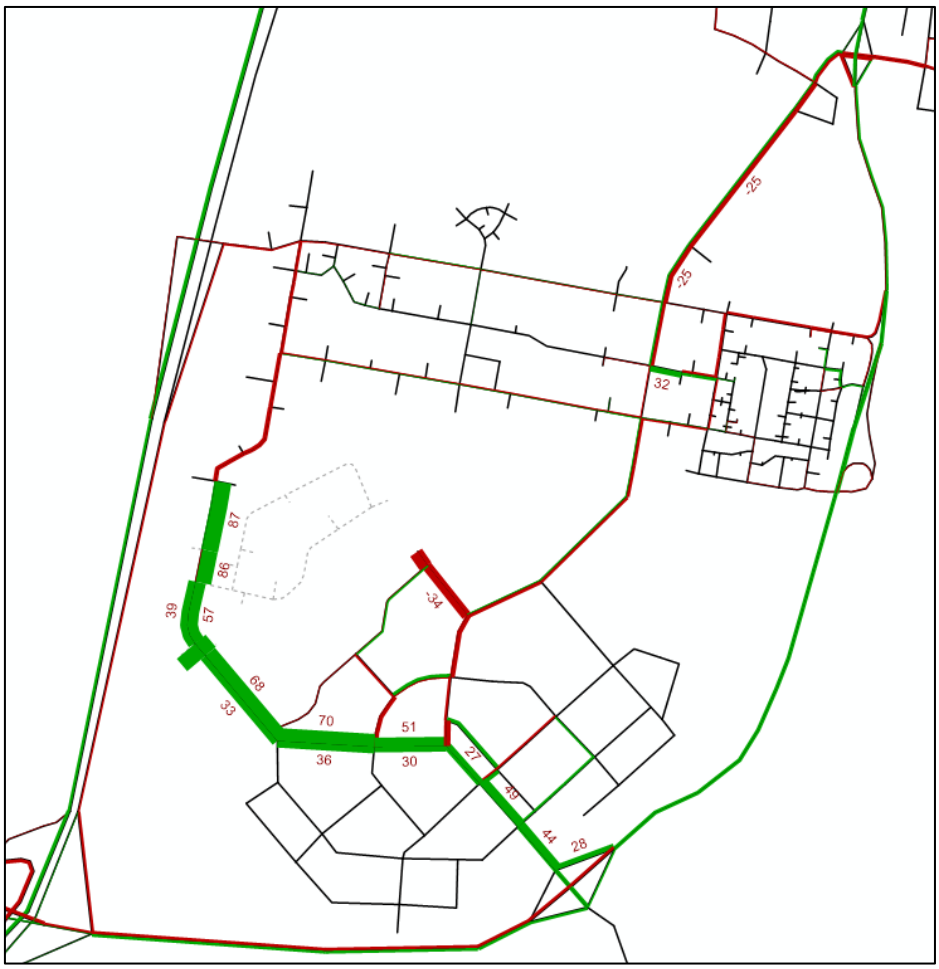

Figure 8: PM peak link volumes difference plot
Source: Model outputs

3.3 Link level of service

The link LOS thresholds are based on Austroads[5] and Transport Research Board[6] and are consistent with previous traffic assessments for the Caloundra South development. Table 5 outlines the link LOS thresholds based on the Volume on Capacity (V/C) ratio.

Table 5: Link LOS thresholds

Level of Service	V/C
A	≤35%
B	35% ≤ 55%
C	55% ≤ 80%
D	80% ≤ 95%
E	95% ≤ 100%
F	>100%

Source: Highway Capacity Manual, Austroads

[5] Austroads (2017), *Guide to Traffic Management Part 3: Traffic Studies and Analysis.*

[6] Transport Research Board (2010), *Highway Capacity Manual.*

Figure 9 and Figure 10 show that links in Precinct 15 and surrounds operate at LOS C or better during the AM and PM peak period.

Figure 9: AM peak link LOS
Source: Model outputs

Figure 10: PM peak link LOS
Source: Model outputs

3.4 Intersection level of service

Table 6 provides intersection LOS thresholds which are based on the Highway Capacity Manual[7].

Table 6: Intersection LOS thresholds (average delay, seconds)

Level of Service	Signalised Intersection	Unsignalised Intersection[8]
A	≤10	≤10
B	10 ≤ 20	10 ≤ 15
C	20 ≤ 35	15 ≤ 25
D	35 ≤ 55	25 ≤ 35
E	55 ≤ 80	35 ≤ 50
F	>80	>50

Source: Highway Capacity Manual

The following figures show that all intersections within Precinct 15 and surrounds operate at LOS D or better in both the AM and PM peak period. Figure 11 and Figure 12 summarise the signalised intersections LOS in the AM and PM peak period models respectively.

Figure 11: AM peak signalised intersection LOS
Source: Model outputs

[7] Transport Research Board (2010), *Highway Capacity Manual.*

[8] Includes roundabouts and priority intersections.

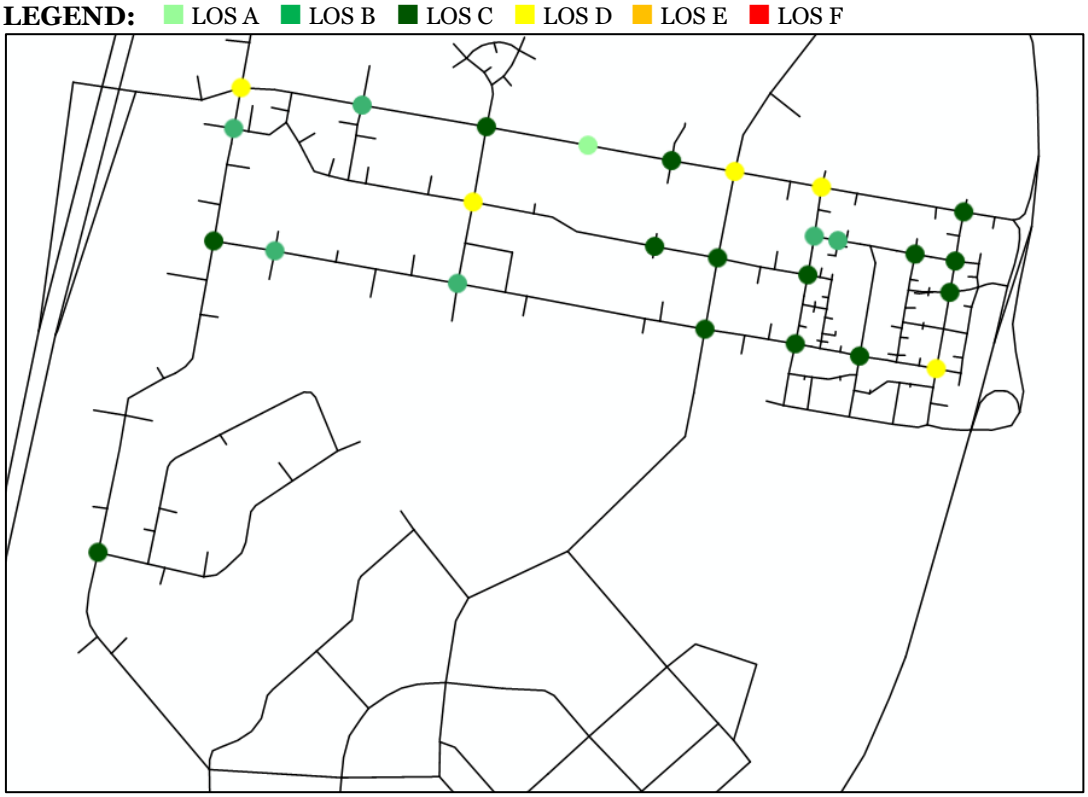

Figure 12: PM peak signalised intersection LOS
Source: Model outputs

Figure 13 and Figure 14 summarise the unsignalised intersections LOS in the AM and PM peak period models respectively.

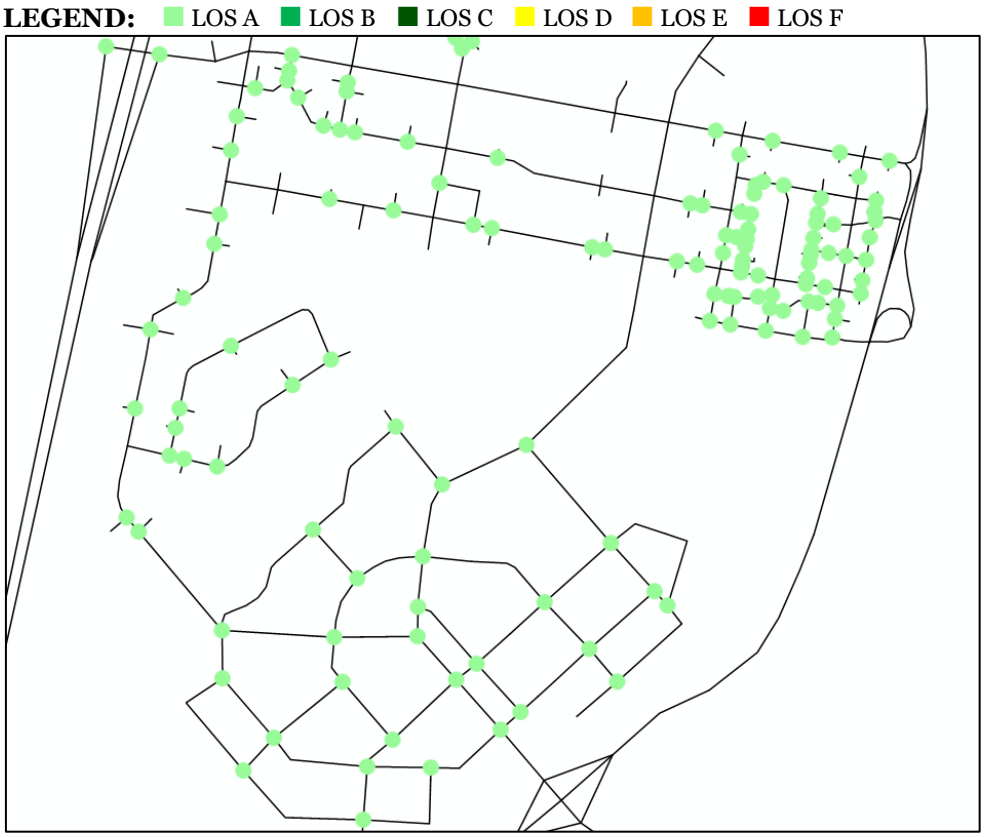

Figure 13: AM peak unsignalised intersection LOS
Source: Model outputs

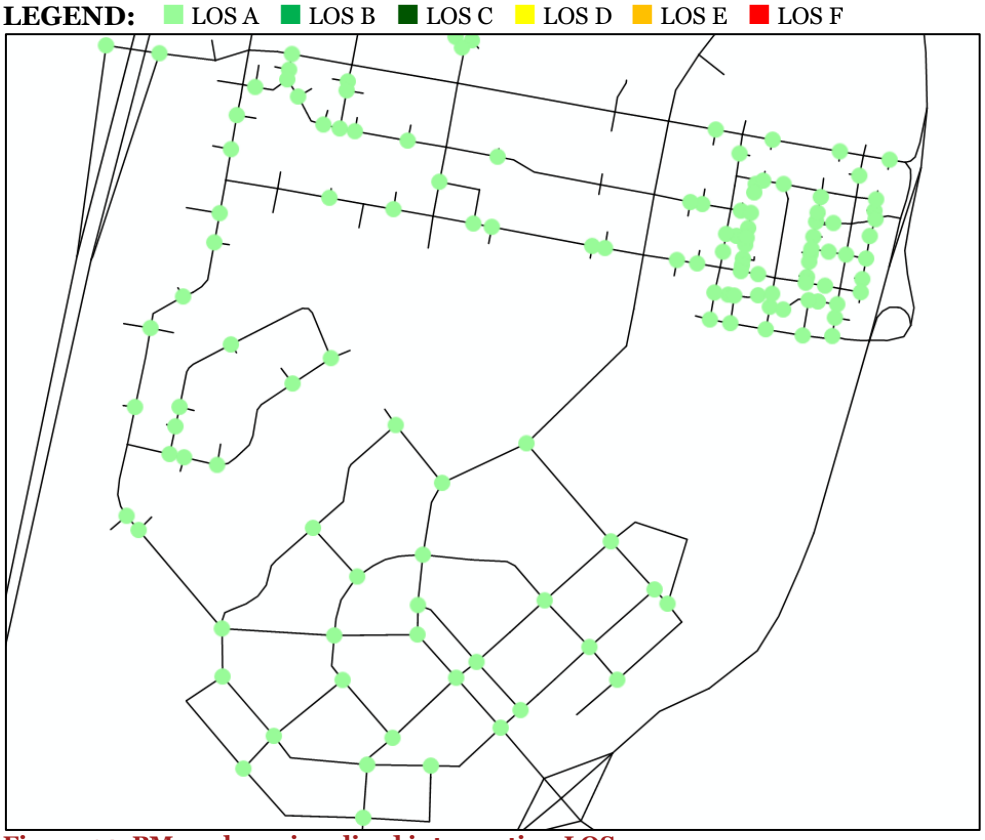

Figure 14: PM peak unsignalised intersection LOS
Source: Model outputs

3.5 Intersection degree of saturation

Intersection Degree of Saturation (DOS) thresholds were based on Volume on Capacity (V/C) values from the LGIA, which are:

- Signalised Intersections: V/C ≤ 90%.
- Roundabouts: V/C ≤ 85%.
- Other priority intersections: V/C ≤ 80%.

Figure 15 and Figure 16 show that intersections within Precinct 15 meet the DOS criteria as outlined above in both the AM and PM peak period[9].

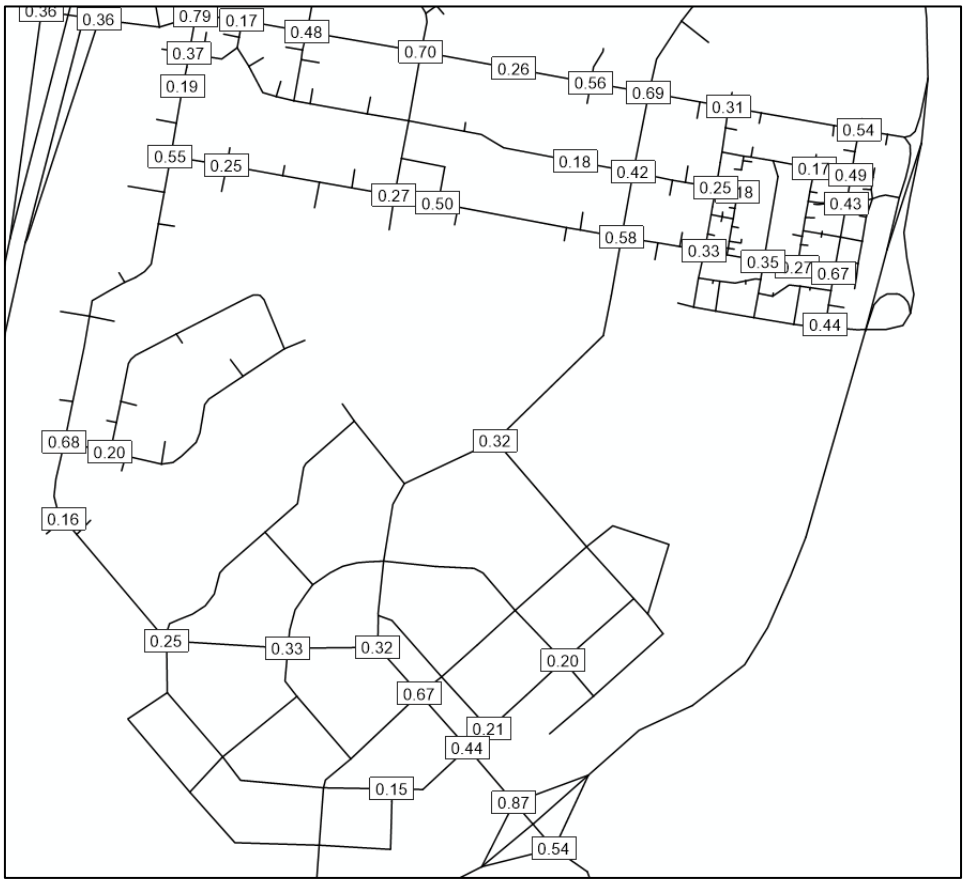

Figure 15: AM peak intersection DOS
Source: Model outputs

[9] Intersections with DOS < 15% have been excluded for clarity.

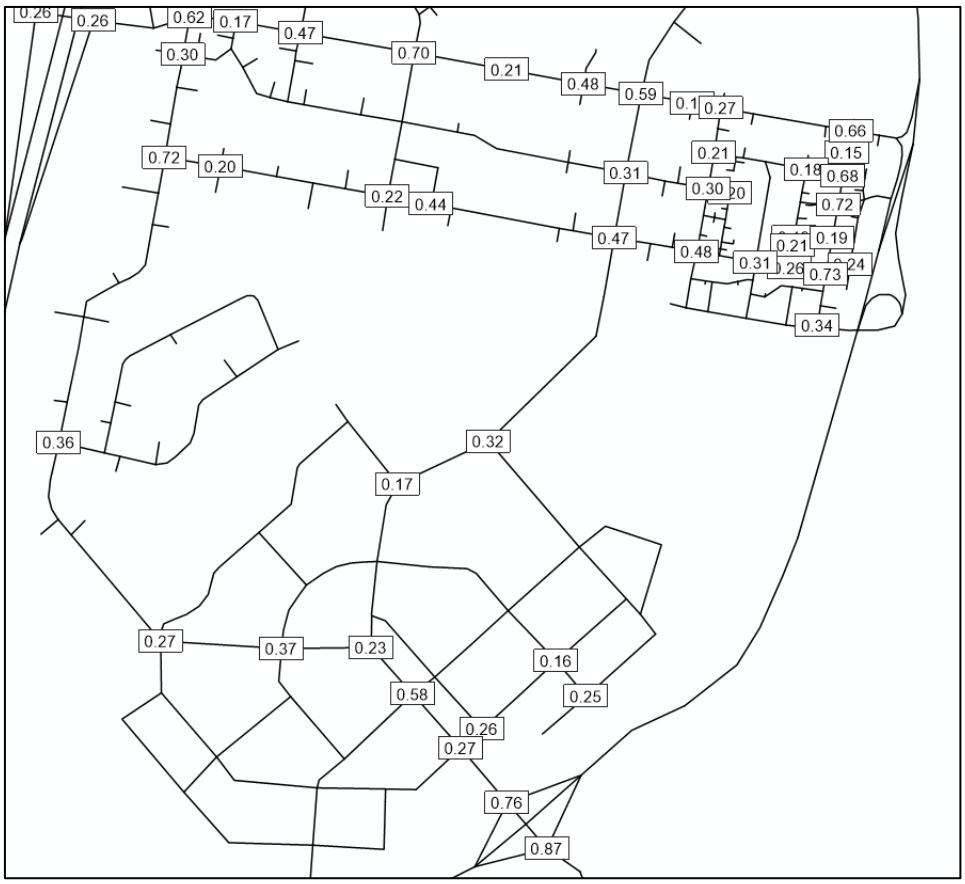

Figure 16: PM peak intersection DOS
Source: Model outputs

4 Conclusion

The Aura Visum Model has been updated within Precinct 15 for use within this study. As part of this assessment, updates have been made to the modelled assumptions to reflect Stockland's latest planning (including land use and road network). The demand modelling process (including trip generation, distribution, and mode choice parameters) has remained consistent with the previously approved approach.

For this assessment Precinct 15 and the surrounding network has been analysed in the updated model for road classifications of Neighbourhood Connector, Centre Connector, Industrial Connector, Trunk Collector, Sub-Arterial and above. The updated model results indicate that the proposed traffic network for Precinct 15 and surrounds operates efficiently with the model forecasting:

- Each link operates at LOS C or better in both peak periods.
- Each intersection operates at LOS D or better in both peak periods (with respect to average delay).
- Each intersection operates at a level that meets the benchmarks from the LGIA.

As such the proposed road infrastructure for Precinct 15 is considered appropriate to support the development's target land use.

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