

Aura *Precincts 3-5* Traffic Modelling Refresh

Stockland

*Aura P3-5 Traffic
Modelling Refresh*

August 2023

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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 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 planning for Precinct 3-5 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 Application:

- Updates the Aura Visum Model to ensure it is reflective of the latest planning assumptions within Precincts 3-5.
- A Precinct Traffic Analysis to be completed for Precincts 3-5.

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 July 2022, with planning assumptions for Precincts 3-5 reviewed as part of this process. Figure 1 highlights Precincts 3-5 of the Aura development.

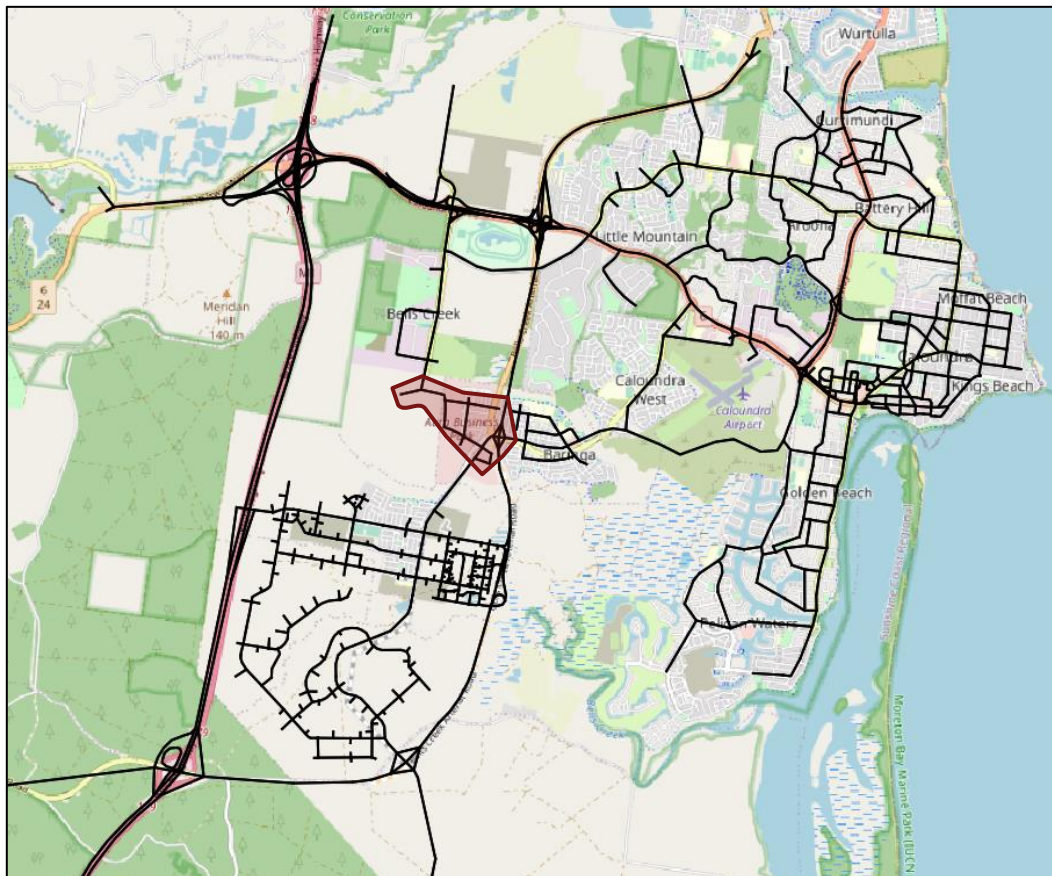


Figure 1: Study area

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 Precincts 3-5. Table 1 provides a high-level comparison of the updated land use assumptions to those from the most recent assessment (Aura Town Centre Traffic Modelling Refresh, July 2022).

Table 1: Land use modelling assumptions

Area	Aura Town Centre Traffic Modelling Refresh				Updated Inputs			
	Population	Dwellings	Floorspace (m ²)	Enrolments	Population	Dwellings	Floorspace (m ²)	Enrolments
3	0	0	238,310	0	0	0	192,000	0
4	0	0	77,859	0	0	0	103,600	0
5	0	0	62,639	0	0	0	43,000	0
Total	0	0	378,808	0	0 (0%)	0 (0%)	338,600 (-11%)	0 (0%)

Source: URBIS, Stockland

The key changes to land use across Precincts 3-5 include:

- Decreased industry and business floorspace across Precincts 3 and 4 to reflect actual and revised forecast.
- Decreased showroom floorspace in Precinct 5 to align with approved GFA limit.
- Addition of Fast Food Outlet, Service Station and Carwash in Precinct 5.
 - These are treated as special generators as per Appendix A.
- 30,000m² industry and business in Precinct 4.1 converted to 30,000m² commercial.
- Addition of Fast Food Outlet and Service Station in Precinct 4.
 - These are treated as special generators as per Appendix A.

All other precincts maintained the same land use assumptions as per the existing model version, Table 2 provides zone level land use assumptions for Precincts 3-5.

Table 2: Detailed land use assumptions

Area	Model Zone	Land Use Yield	Model Zone	Land Use Yield
3	1044	55,000m ² industry and business	1046	137,000m ² industry and business
4	1069	57,000 m ² industry and business	1019	30,000m ² commercial & Fast Food Outlet (with drive-thru) & Service Station
	1200	16,600m ² industry and business		
5	1082	26,000m ² showroom & Fast Food Outlet (with drive-thru) & Service Station (with Carwash)	1084	17,000m ² showroom & Fast Food Outlet

Source: URBIS, Stockland

2.3 Road network

The Aura Visum Model network was reviewed to ensure it represents the latest Stockland planning assumptions within Precincts 3-5. This section outlines the road network updates that have been incorporated within the Aura Visum Model. Figure 2 summarises the Precincts 3-5 road network, updated to align with Stockland's latest planning assumptions. This includes updates and refinements to:

- Improve the representation of the proposed road network, including:
 - Signalised intersections on Graf Drive at Packer Road and Hancock Way.
 - Additional 'left-in left-out only' access egress for Zones 1084, 1200, 1019 and 1082.
 - Additional signalised intersection on Aura Blvd.
 - Additional left turning lane on Graf Drive at Aura Blvd signalised intersection.
- Zone access/egress to better reflect fine grained road network connections.
- Other minor network assumptions.

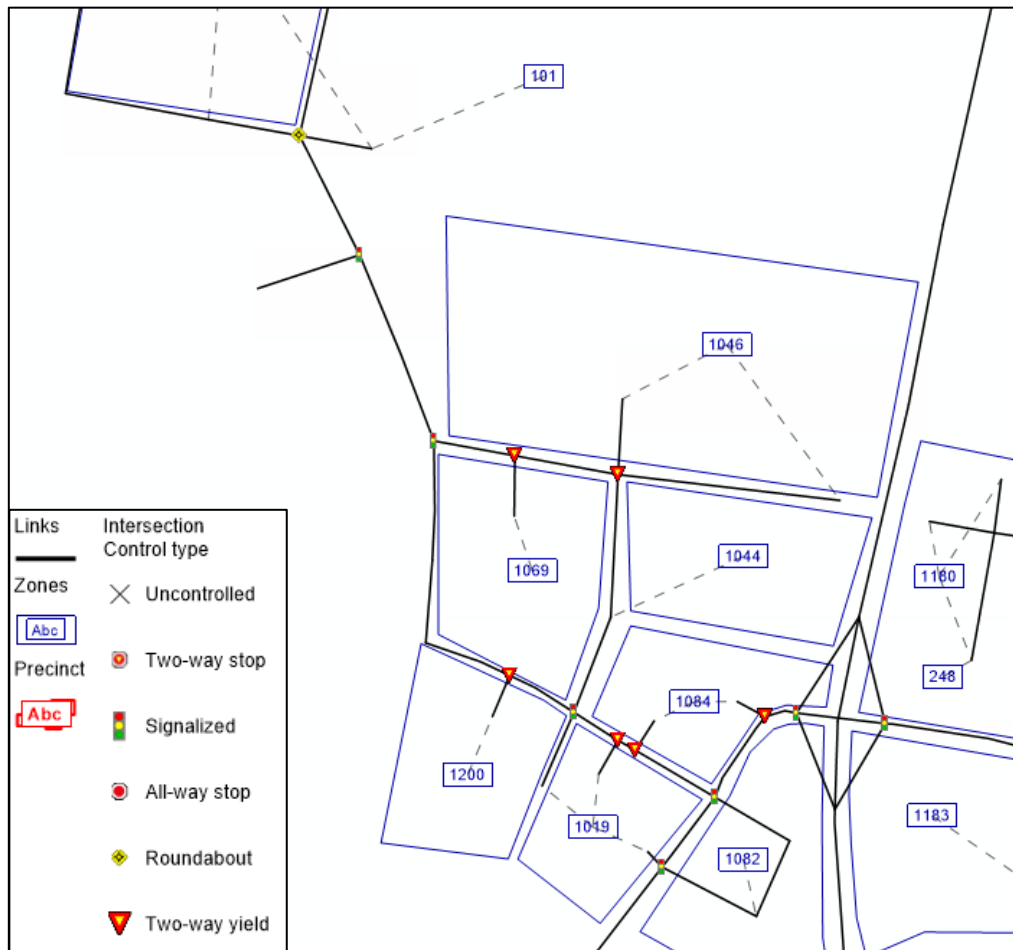


Figure 2: Road network summary

Source: Stockland

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 modelling³ 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	2.89 x 10 ⁻⁶	✓	0.427	✗	0.095	✗
2	8.53 x 10 ⁻⁶	✓	0.306	✗	0.499	✗
3	3.53 x 10 ⁻⁶	✓	0.483	✗	0.617	✗
4	1.07 x 10 ⁻⁶	✓	0.825	✗	0.751	✗
5	7.06 x 10 ⁻⁶	✓	0.925	✗	0.875	✗
6	8.43 x 10 ⁻⁶	✓	0.966	✓	0.962	✓

Source: Model outputs

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

Table 4: PM peak period model convergence summary

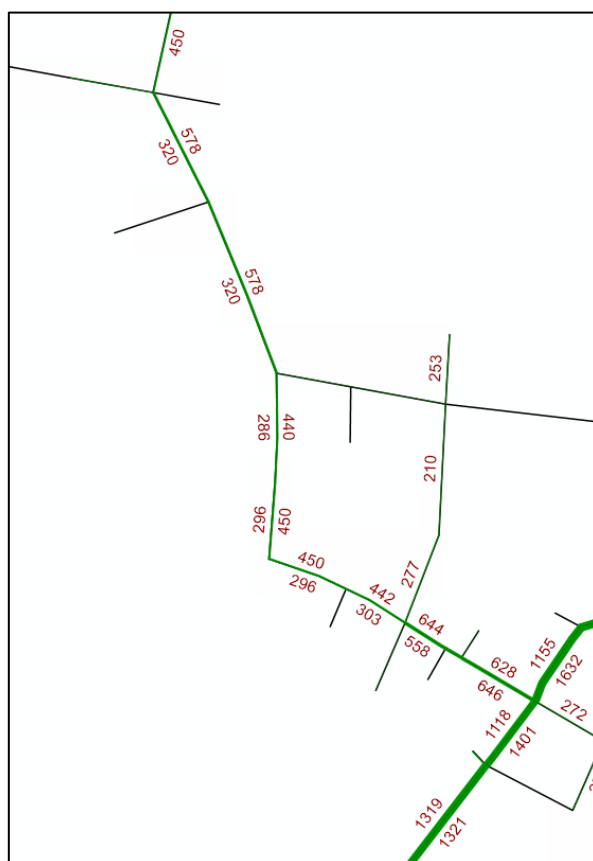
Iteration	Criteria 1		Criteria 2		Criteria 3	
	Value	Achieved	Value	Achieved	Value	Achieved
1	4.84×10^{-6}	✓	0.458	✗	0.098	✗
2	9.06×10^{-6}	✓	0.318	✗	0.514	✗
3	9.93×10^{-6}	✓	0.465	✗	0.609	✗
4	4.11×10^{-6}	✓	0.849	✗	0.755	✗
5	4.66×10^{-6}	✓	0.942	✗	0.881	✗
6	5.12×10^{-6}	✓	0.963	✓	0.958	✓

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 3 and Figure 4 outline the link volumes for the AM and PM peak period models respectively⁴.

**Figure 3: AM peak hour link volumes**

Source: Model outputs

⁴ Links with Volume < 200 vph have been excluded for clarity.

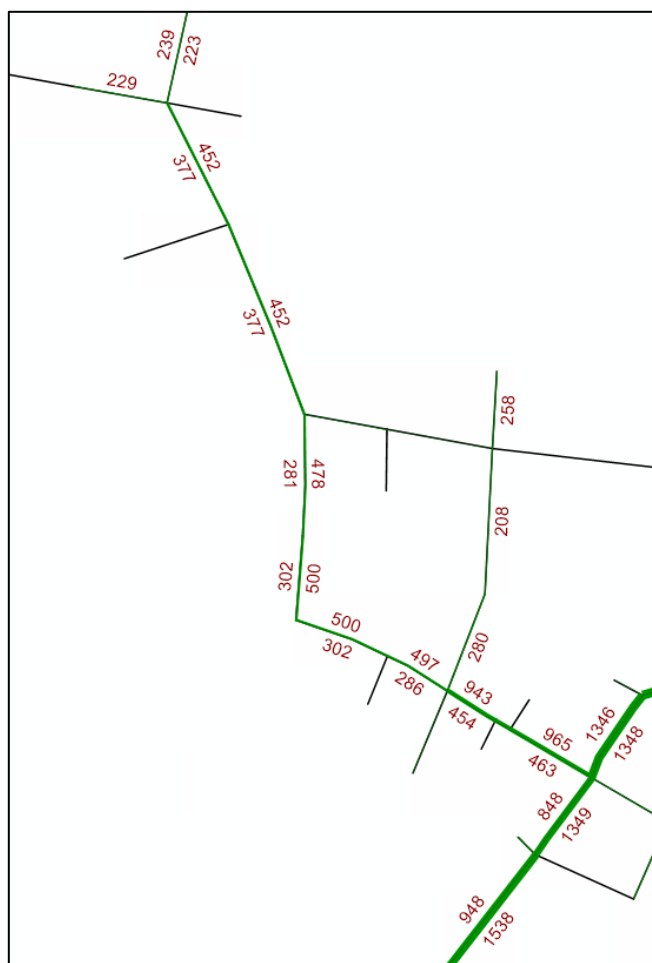


Figure 4: PM peak hour link volumes

Source: Model outputs

3.3 Link level of service

The link LOS thresholds are based on Austroads⁶ and Transport Research Board⁷ 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	$\leq 35\%$
B	$35\% \leq 55\%$
C	$55\% \leq 80\%$
D	$80\% \leq 95\%$
E	$95\% \leq 100\%$
F	$> 100\%$

Source: Highway Capacity Manual, Austroads

⁶ Austroads (2017), *Guide to Traffic Management Part 3: Traffic Studies and Analysis*.

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

Figure 5 and Figure 6 show that links in Precincts 3-5 and surrounds operate at LOS C or better during the AM and PM peak period.

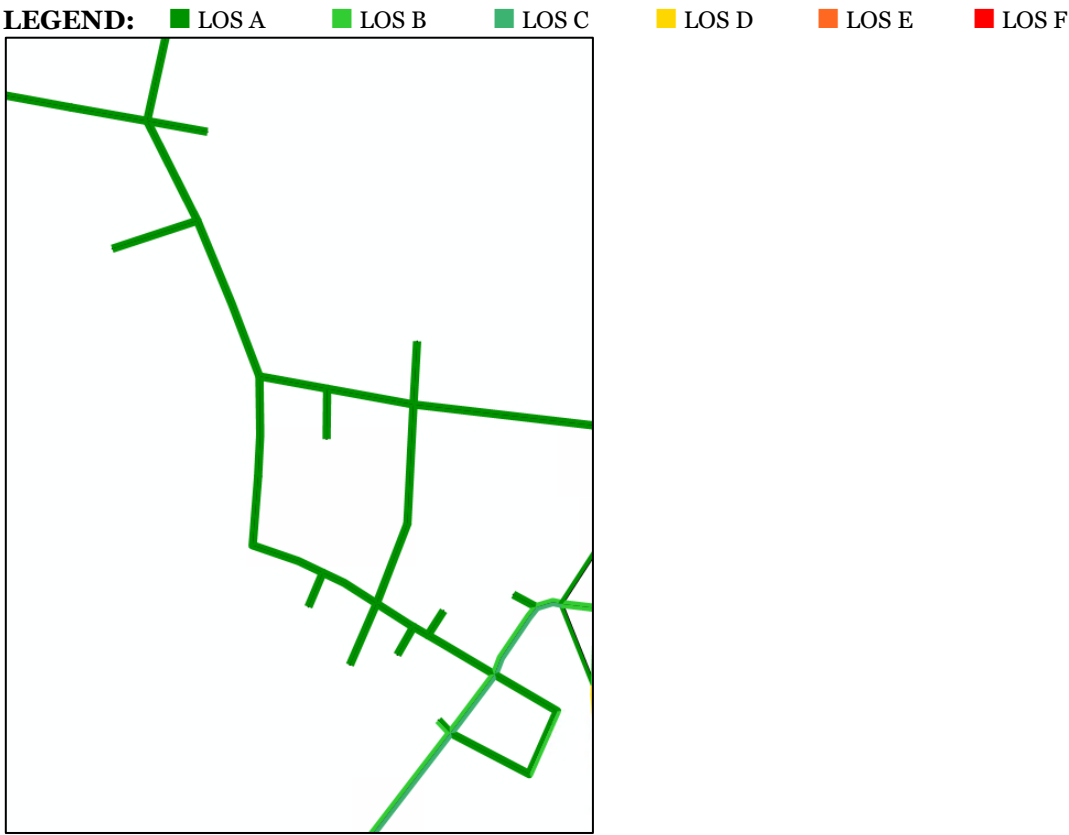


Figure 5: AM peak link LOS
Source: Model outputs

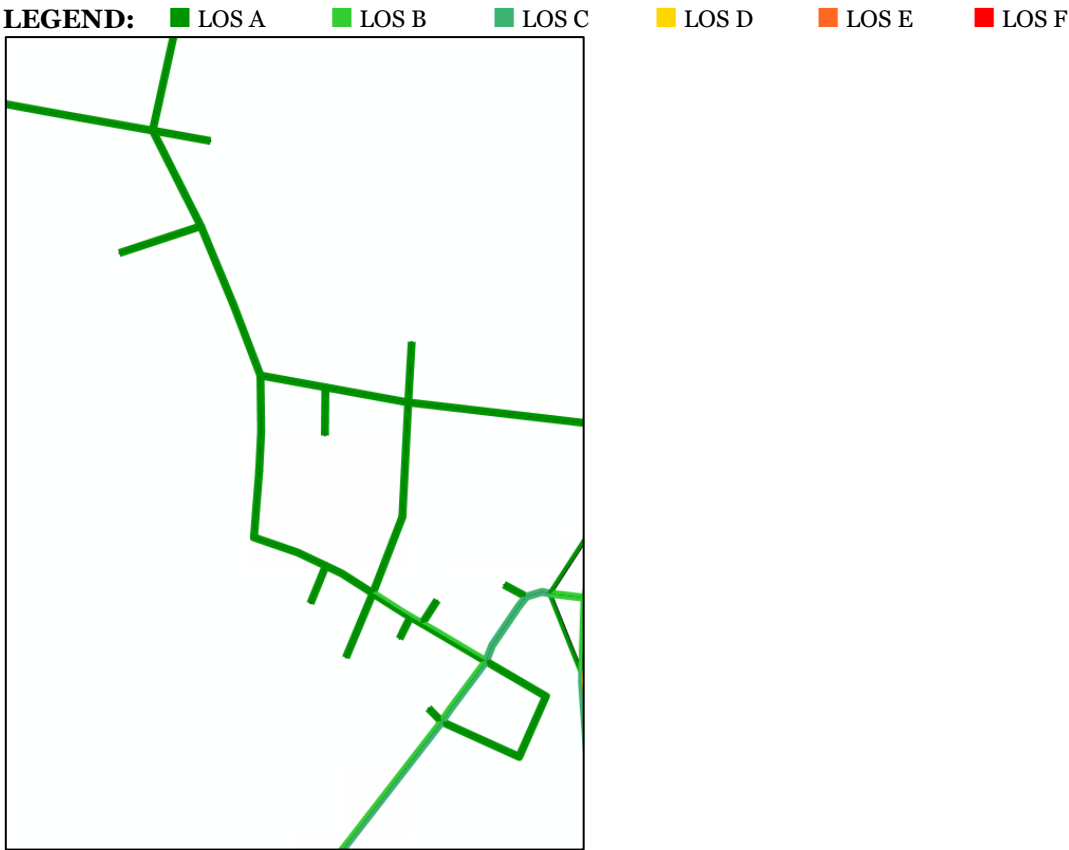


Figure 6: PM peak link LOS
Source: Model outputs

3.4 Intersection level of service

Table 6 provides intersection LOS thresholds which are based on the Highway Capacity Manual⁸.

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

Level of Service	Signalised Intersection	Unsignalised Intersection ⁹
A	≤ 10	≤ 10
B	$10 \leq 20$	$10 \leq 15$
C	$20 \leq 35$	$15 \leq 25$
D	$35 \leq 55$	$25 \leq 35$
E	$55 \leq 80$	$35 \leq 50$
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 7 and Figure 8 summarise the signalised intersections LOS in the AM and PM peak period models respectively.

LEGEND: ■ LOS A ■ LOS B ■ LOS C ■ LOS D ■ LOS E ■ LOS F

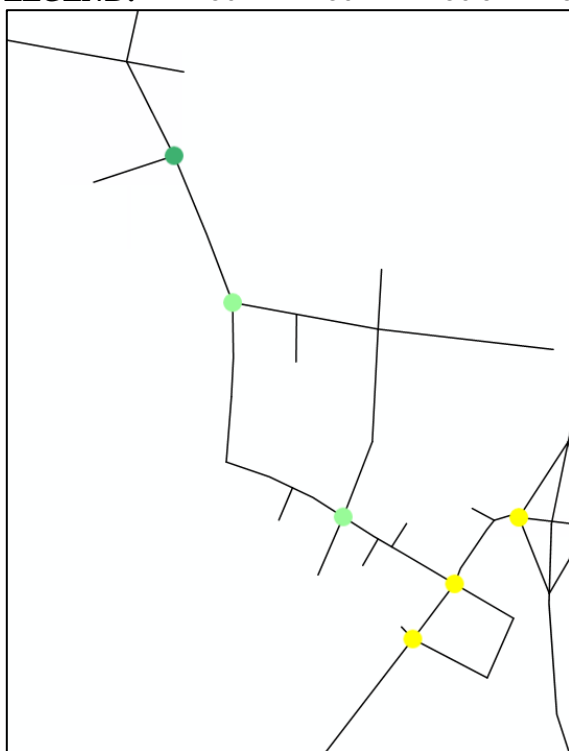


Figure 7: AM peak signalised intersection LOS

Source: Model outputs

⁸ Transport Research Board (2010), *Highway Capacity Manual*.

⁹ Includes roundabouts and priority intersections.

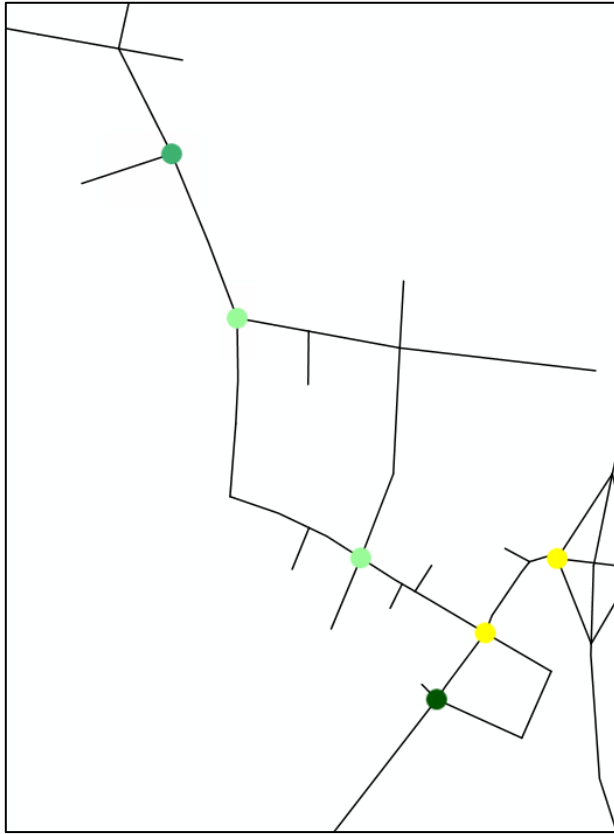


Figure 8: PM peak signalised intersection LOS

Source: Model outputs

Figure 9 and Figure 10 summarise the unsignalised intersections LOS in the AM and PM peak period models respectively.

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: $V/C \leq 90\%$.
- Roundabouts: $V/C \leq 85\%$.
- Other priority intersections: $V/C \leq 80\%$.

Figure 11 and Figure 12 show DOS of intersections within Precincts 3-5 in both the AM and PM peak period¹⁰.

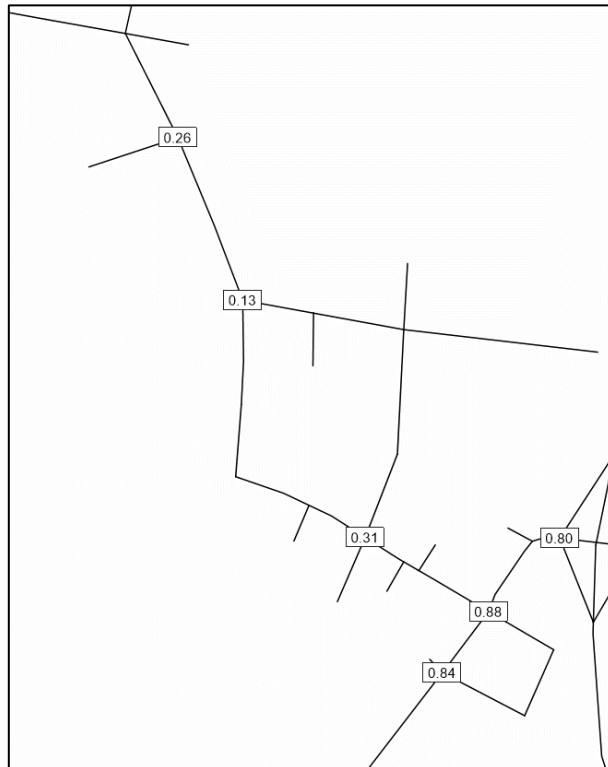


Figure 11: AM peak intersection DOS

Source: Model outputs

¹⁰ Intersections with DOS < 10% have been excluded for clarity.

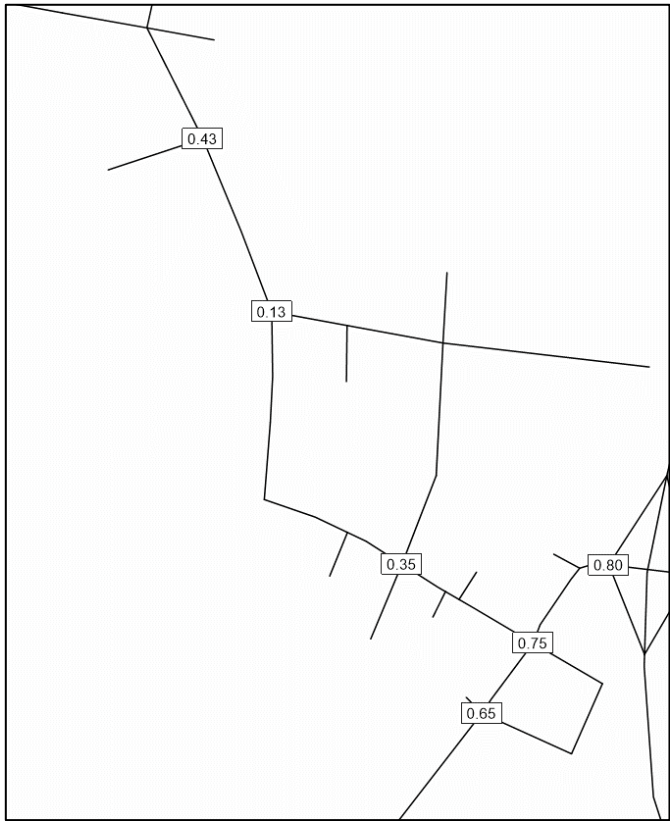


Figure 12: PM peak intersection DOS
Source: Model outputs

4 Conclusion

The Aura Visum Model has been updated within Precincts 3-5 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, Precincts 3-5 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 Precincts 3-5 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.

Appendix A Special Generator Trip Generation Rates

Sub Component	Traffic generation category	yield (sq.m)	Traffic gen units	Unit/Measure	AM peak trip rate	AM % IN	AM % OUT	PM peak trip rate	PM % IN	PM % OUT
Motel	Motel	120	120	vph/units	0.45	0.30	0.70	0.45	0.70	0.30
Service Station & Car Wash	Service Station & Car Wash	1	1	vph/station	60.00	0.50	0.50	60.00	0.50	0.50
Food Outlet (including drive through)	Fast Food (with drive through)	1	1	vph/shop	150.00	0.55	0.45	150.00	0.45	0.55
Car Park	Car Park	100	100		0.00	0.50	0.50	0.00	0.50	0.50
Commercial Premises	Commercial	6,500	6,500	vph/sqm	2.10	0.60	0.20	2.10	0.20	0.60
Shopping Centre	Retail – Core	8,000	8,000	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Shopping Centre	Retail – Core	12,000	12,000	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Commercial Premises / Health Industry	Commercial	6,420	6,420	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
Health Care Premises	Health Care	200	200	vph/sqm	5.50	0.75	0.25	5.50	0.25	0.75
Shop	Retail – Core	200	200	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Commercial Premises / Health Industry	Commercial	5,500	5,500	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
Health Care Premises	Health Care	200	200	vph/sqm	5.50	0.75	0.25	5.50	0.25	0.75
Shop	Retail – Core	300	300	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Vehicle Hire Premises	Commercial	400	400	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
Commercial Premises / Health Industry	Commercial	22,150	22,150	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
Call centre	Call centre	2,000	2,000	vph/sqm	4.20	0.80	0.20	4.20	0.20	0.80
Health Care Premises / Hospital	Health Care	1,000	1,000	vph/sqm	5.50	0.75	0.25	5.50	0.25	0.75
Motel	Motel	160	160	vph/room	0.45	0.30	0.70	0.45	0.70	0.30
Indoor Entertainment (other e.g gym/spa)	Gym/Spa	1,000	1,000	vph/sqm	3.00	0.50	0.50	3.00	0.50	0.50
Hotel	Tavern	300	300	vph/units	1.00	0.10	0.90	4.00	0.90	0.10
Shop	Retail – Core	400	400	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Multiple Dwelling/Accommodation Building/Retirement Community	Residential – Medium/High	180	180	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
Car Park	Car Park	300	300		0.00	0.50	0.50	0.00	0.50	0.50
Shop	Retail – Core	200	200	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Commercial Premises / Health Industry	Commercial	17,935	17,935	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
Multiple Dwelling/Accommodation Building/Retirement Community	Residential – Medium/High	180	180	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
Multiple Dwelling/Accommodation Building/Retirement Community	Residential – Medium/High	270	270	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
Indoor Entertainment (cinema)	Cinema	2,500	2,500	vph/sqm	1.12	0.60	0.40	5.63	0.60	0.40
Shop	Retail – Core	400	400	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Multiple Dwelling/Accommodation Building/Retirement Community	Residential – Medium/High	418	418	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
Shop	Retail – Core	200	200	vph/sqm	2.00	0.60	0.40	8.00	0.40	0.60
Community Facilities	Community Facilities	3,500	3,500	vph/sqm	1.00	0.60	0.40	2.00	0.40	0.60
	Commercial	13,800	13,800	vph/sqm	2.10	0.80	0.20	2.10	0.20	0.80
	Retail – Convenience	600	600	vph/sqm	15.00	0.60	0.40	15.00	0.40	0.60
Child Care Centre	Child Care	1,000	1,000	vph/sqm	9.60	0.60	0.40	9.60	0.40	0.60
	Residential – Medium/High	185	185	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
	Residential – Medium/High	103	103	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
	Residential – Medium/High	113	113	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
	Residential – Medium/High	135	135	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
	Residential – Low	53	53	vph/units	0.85	0.30	0.70	0.85	0.70	0.30
Short Term Accommodation	Motel	80	80	vph/units	0.45	0.30	0.70	0.45	0.70	0.30
	Residential – Low	120	120	vph/units	0.85	0.30	0.70	0.85	0.70	0.30
	Residential – Medium/High	749	749	vph/units	0.50	0.30	0.70	0.50	0.70	0.30
Community Facility	Community Facilities	600	600	vph/sqm	1.00	0.60	0.40	2.00	0.40	0.60
Surf Life Saving Club	Tavern	3,000	3,000	vph/sqm	1.00	0.10	0.90	4.00	0.90	0.10
	Retail – Low GFA (<10,000sqm)	5,625	5,625	vph/sqm	2.30	0.60	0.40	12.20	0.40	0.60
	Residential – Low	90	90	vph/units	0.85	0.30	0.70	0.85	0.70	0.30
Public Access Club Facility	Community Facilities	2,500	2,500	vph/sqm	1.00	0.60	0.40	2.00	0.40	0.60
	Residential – Low	68	68	vph/units	0.85	0.30	0.70	0.85	0.70	0.30
Child Care Centre	Child Care	585	585	vph/sqm	9.60	0.60	0.40	9.60	0.40	0.60

