DevelopmentWA

Cockburn Central West

Traffic Impact Assessment - June 2020 Update

June 2020

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1. Introduction

GHD has been commissioned by DevelopmentWA[1] to develop an updated traffic impact assessment (TIA) of the Cockburn Central West (CCW) structure plan area. This work builds upon previous TIAs of the CCW precinct that were prepared by GHD in 2013 and Urbsol in 2014, and includes consideration of recent changes to projected land uses within CCW, as well as upcoming road projects such as the Armadale to North Lake Road Bridge that will alter traffic flow patterns through the area.

Since the previous TIAs were completed, a number of development proposals have gone through to the City of Cockburn's Design Review Panel (DRP) for their consideration. The scale of these proposals have surpassed the assumptions contained in the previous TIAs, particularly in relation to Stage 2 of the CCW precinct. This is a matter of concern for the City of Cockburn as the traffic generation of these larger developments may be greater than that originally forecast in the previous TIAs, potentially leading to unforeseen capacity issues on the local and arterial road network.

As such, the City of Cockburn is particularly interested in tracking the cumulative effects of current and future development proposals at the CCW precinct, and has requested that DevelopmentWA prepare an update of the previous TIAs in order to account for the development proposals currently before the DRP, as well as the actual traffic generation of the now-completed Cockburn ARC. Subsequently, DevelopmentWA has engaged GHD to undertake the CCW TIA update, which will incorporate updated traffic modelling from Urbsol that was previously used in their 2014 TIA.

This TIA update, in addition to incorporating the latest available information with respect to the current development proposals for the CCW precinct, will analyse whether the additional traffic from these proposals are likely to be accommodated by the internal and surrounding road networks, whilst also accounting for likely future upgrades and connections. It is envisaged that this TIA (and the associated traffic modelling) will continue to be updated on a regular basis as additional development proposals are submitted to the DRP and existing ones are updated. All information in this TIA (Rev 0) is current as of June 2020.

[1] LandCorp and the Metropolitan Redevelopment Authority merged to form DevelopmentWA in September 2019, with LandCorp being responsible for the development of Cockburn Central West prior to the merger.

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2. Background

This section provides a high-level summary of the CCW precinct, including land uses and yields, previous TIAs and structure plans, current development proposals, as well as current and future transport networks in the vicinity of the precinct.

2.1 Precinct description

Located 19 km south of the Perth CBD in the suburb of Cockburn Central, the CCW precinct will accommodate a variety of residential, commercial and retail land uses, anchored by the Cockburn ARC (Aquatic and Recreation Centre) alongside the Fremantle Dockers' training and administration facilities. The CCW precinct is bounded by the regional roads of Beeliar Drive, Midgegooroo Avenue, North Lake Road and Poletti Road, and is located around 500 m to the west of Cockburn Central railway station. Cockburn Gateway Shopping City is also conveniently located around 700 m to the south-east of CCW and has developed into a major shopping precinct for the local region. A locality map of the CCW precinct is presented in Figure 1.

Under current land use and yield projections, the residential component of CCW will constitute the majority of the precinct's development and is envisaged to take the form of medium-density apartments and townhouses. This will be complemented by the provision of retail, commercial and office space. When completed, around 2,000 people are expected to reside within CCW.

To date, the CCW precinct has only one completed development to date, with the Cockburn ARC (inclusive of the Fremantle Dockers' facilities) opening in 2017. Aside from a playground that adjoins Midgegooroo Avenue between Signal Terrace and Stockton Bend, the balance of land in CCW remains undeveloped.

2.2 Previous TIAs

Two TIAs have been previously prepared for the CCW structure plan area:

- *Cockburn Central West – Transport Assessment*, GHD, May 2013
- *Cockburn Central West – Traffic Impact Analysis*, Urbsol, November 2014

The 2013 GHD TIA analysed the original CCW structure plan, which had a slightly different internal road network layout and lot distribution on the east side of the precinct (refer Figure 2). LinSig modelling for the 2031 AM and PM peak periods of key intersections was also undertaken, which did not identify any capacity issues, subject to planned road network upgrades taking place.

Following this, the 2014 Urbsol TIA was prepared as an update and addendum to the 2013 GHD TIA, examining a revised structure plan whose modified internal road network has been largely implemented to the present day (refer Figure 3). Revised land use yields were also considered, with around 1000 dwellings, 6500 m^2 of office space and 1000 m^2 of retail now allowed for alongside the planned recreation centre. Traffic generated by the revised structure plan was estimated and the resulting road network and intersection performance modelled in VISSIM for the 2031 AM and PM peak periods. The analysis found that intersections on the regional road network were likely to operate within acceptable limits (i.e. LOS D or less).

The latest approved TIA for CCW is dated December 2016 and is substantially similar in road network layout and permitted land uses to the version used as part of the 2014 Urbsol TIA update (refer Figure 4).

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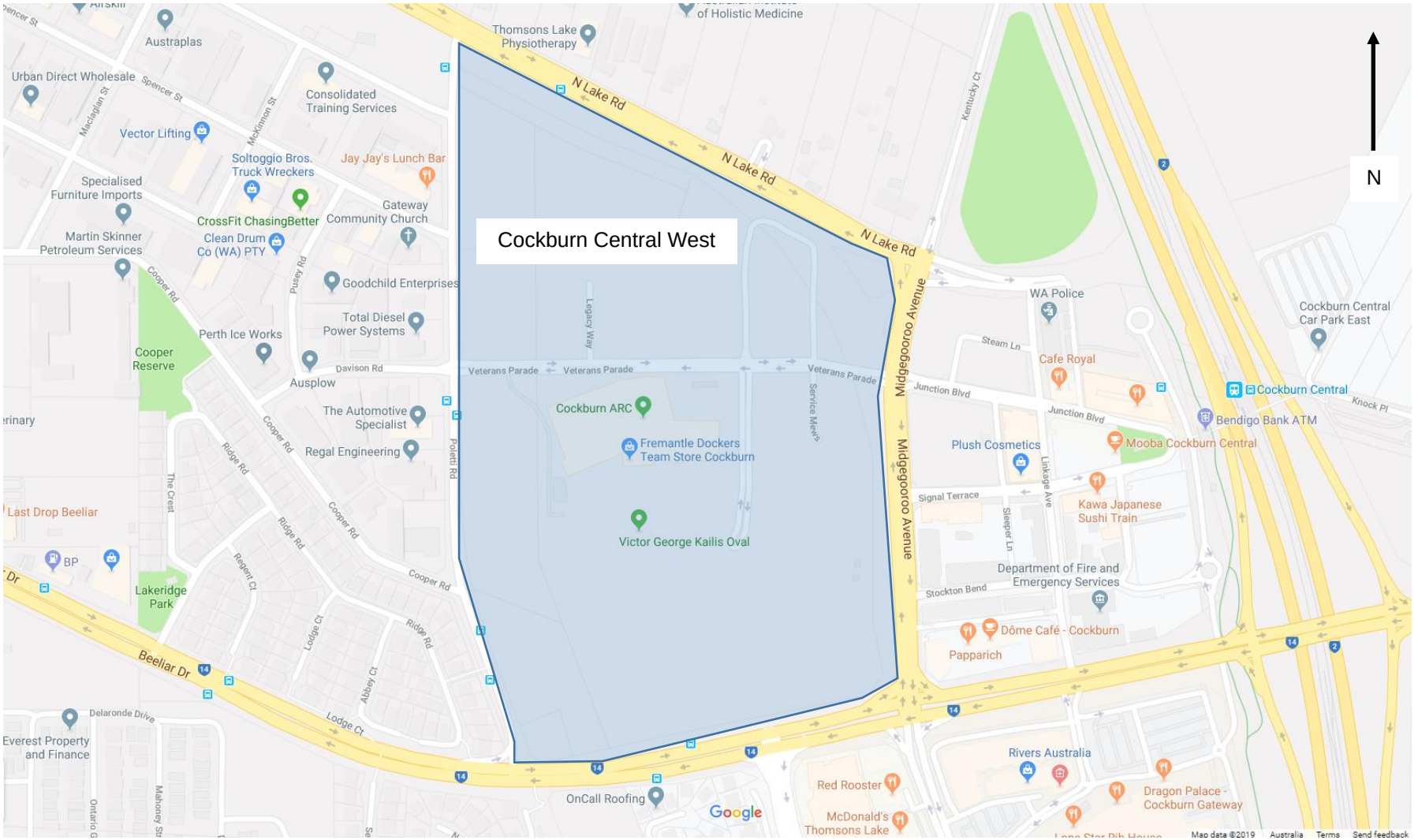

Figure 1 Cockburn Central West Locality Map[2]

[2] Image source: Google Maps. Annotations by GHD.

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Figure 2 CCW Structure Plan assessed by 2013 GHD TIA[3]

[3] Source: GHD / Cardno.

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Figure 3 CCW Structure Plan assessed by 2014 Urbsol TIA[4]

[4] Source: Urbsol / Cardno.

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Figure 4 Current CCW Structure Plan (2016)[5]

[5] Source: City of Cockburn / Taylor Burrell Barnett. Available at: http://maps.cockburn.wa.gov.au/public80/hyperlinks/StructurePlans/23C_CockburnCentralWest-Amendment1-v02-Dec2016.pdf.

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2.3 Development proposals

Development proposals involving 11 of the lots within CCW have been submitted to the City of Cockburn's Design Review Panel (DRP) by potential developers.[6]

One such proposal in relation to Lots 112-114 would see the site anchored by a 10-screen cinema complex, along with a variety of supporting retail and commercial land uses. Another recent proposal involves the City of Cockburn relocating their headquarters and administration to CCW; early estimates by the City of Cockburn indicate that around 10,000 m^2 of office space will be provided in their new building. A third proposal for Lots 115-117 consists of a mixed use development with over 260 apartments, a 113-room hotel, child care centre, office space and retail tenancies.

When updated for currently known development proposals, the CCW precinct will house over 1100 dwellings, 14,000 m^2 of office space, 1300 m^2 commercial space, 10,000 m^2 of food and retail floor area, as well as a cinema complex and hotel. This represents a significant change both in terms of land use and scale from what has been allowed for under the 2014 Urbsol TIA.

In February 2019, the City of Cockburn requested DevelopmentWA to commission an updated TIA (i.e. this document) that accounts for all of the latest CCW development proposals. This is to ensure a consistent approach for modelling the CCW precinct's likely traffic impacts, as well as to properly assess whether the local road network can accommodate development of higher land use intensity (such as the proposed developments listed above).

2.4 Transport projects

At present, there are only two vehicular access points to CCW, with a left-in, left-out provided at the intersection of Midgegooroo Avenue and Veterans Parade, along with a full-access intersection at Poletti Road and Veterans Parade. Future accesses to CCW are planned at the intersection of North Lake Road and Legacy Way, along with the intersection of Poletti Road and Remembrance Avenue.

A number of road network upgrades that were originally identified in the 2013 GHD TIA have since been completed:

- Wentworth Avenue / Beeliar Drive intersection signalisation (2014)
- Beeliar Drive upgrade to six lanes (2014)
- Midgegooroo Avenue duplication to four lanes (2014)
- North Lake Road duplication to four lanes (2016)

The transport network around Cockburn Central is currently undergoing significant changes, with several projects currently underway or having been recently completed:

- Armadale Road Duplication: The last remaining section of single carriageway on Armadale Road between Tapper Road and Anstey Road was recently upgraded to a dual carriageway, improving capacity along this regional arterial road. New lanes opened to traffic in early 2020.
- Kwinana Freeway Northbound Widening: Additional northbound lanes are being constructed between Russell Road and Roe Highway, and include new northbound collector-distributor roads between Beeliar Drive and Berrigan Drive. Staged openings of the new lanes commenced from April 2020, with full opening expected by July.
- Armadale to North Lake Road Bridge: This bridge will connect North Lake Road to Armadale Road via a new road bridge over Kwinana Freeway, with north-facing ramps

[6] Some of these proposals will involve amalgamation of adjacent lots.

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providing additional connections between the freeway and local road network. The North Lake Road / Midgegooroo Avenue / Kentucky Court intersection is one of several that will be upgraded as part of this project, with additional turning lanes to be installed on all approaches (illustrated in Figure 5). On-site construction works began in late 2019, with project completion expected by late 2021.

- Thornlie-Cockburn Link: A 14.5 km extension of the existing Thornlie passenger railway line to Cockburn Central is planned to commence construction in mid 2020, forming Perth's first east-west rail link. First trains on the new extension are expected to run in 2023.

Of note is that there are no immediate plans to upgrade Poletti Road from its current single carriageway configuration to a dual carriageway. The City of Cockburn has stated that their legal agreement with DevelopmentWA outlines a number of prerequisites for the upgrading of Poletti Road:

"5.3 [DevelopmentWA] and the City acknowledge and agree that the City will only undertake the Poletti Road Works if it is satisfied that:

5.3,1 access to the Development Land from Poletti Road is unreasonably restricted (having regard to accepted traffic management standards);

5.3.2 there are consistent volumes of 15,000 vehicles per day travelling on Poletti Road; or

5.3.3 the development of the Development Land is likely to generate sufficient traffic to exceed the 15,000 vehicles per day threshold, as referred to in clause 5.3.2."

A 2017 traffic count on Poletti Road (north of Beeliar Drive) recorded an average weekday traffic volume of 6500 vehicles per day. As such, the City of Cockburn suggests that Poletti Road will not be upgraded for the foreseeable future. However, some funding was allowed for in the City of Cockburn's 2019/20 budget for further design and investigative works in relation to this project. The City of Cockburn has also raised the prospect of traffic signals at the Poletti Road / Veterans Parade / Davison Road intersection in the longer term, and may be included in the aforementioned investigative works.

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Figure 5 Future North Lake Road / Midgegooroo Avenue / Kentucky Court intersection facing west[7]

[7] Source: Main Roads WA / YouTube.

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3. Traffic Generation

This section describes the proposed development land uses and yields that have been used to develop the forecast traffic generation for CCW through 2031, as well as the methodology associated with this forecast.

3.1 Standard Trip Rates

To ensure that the traffic impact of each development within the CCW precinct is assessed in a fair and equitable manner, standard vehicular trip rates for the most common land uses have been developed for this analysis.[8] Where available, relevant information from TIAs prepared or submitted by the developer (such as land uses, yields, trip rates and/or traffic forecasts) has been assessed and incorporated into this analysis. All traffic generation in this analysis relates to development that is likely to be completed by the year 2031.

In general, the standard trip rates were applied to each land use discussed in this analysis, except where noted otherwise. It should be noted that the standard trip rates are base trip rates. Reduction factors applicable as a result of proximity to public transport, multi-purpose trips, etc. are discussed in section 3.2.

The following sources were consulted in determining the standard trip rates for this analysis:

- Western Australian Planning Commission (WAPC) *Transport Impact Assessment Guidelines, Volume 2 – Planning Schemes, Structure Plans and Activity Centre Plans* (August 2016), herein referred to as the WAPC TIA Guidelines;
- New South Wales Roads & Maritime Services (RMS, formerly the Roads and Traffic Authority) Guide to Traffic Generating Developments (Issue 2.2, October 2002), herein referred to as the 2002 RMS Guide;
- New South Wales Roads & Maritime Services *Guide to Traffic Generating Developments – Updated traffic surveys* (TDT 2013/04a, August 2013), herein referred to as the 2013 RMS Guide Update; and
- Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition* (September 2017), herein referred to as the ITE 10th Edition.

In this analysis, trip rates were determined for each of a typical weekday (i.e. daily), the weekday AM peak hour and weekday PM peak hour. For the AM and PM peak hours, this refers to the peak hour of the road network (generally the busiest one hour period of traffic between 7:00 – 9:00 AM and 4:00 – 6:00 PM), which may or may not coincide with the peak hour of the land use in question. This is because each land use has varying arrival and departure profiles.

Standard trip rates for the following land uses were determined:

- Residential
- Retail (Non-food)
- Retail (Food)
- Commercial
- Office
- Restaurant / Café

[8] All trip rates in this report refer to vehicular trip rates unless noted otherwise.

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The following sections outline the methodology used to determine standard trip rates for the above land uses. Trip rates for proposed land uses that are not listed above are addressed later in this section as part of the discussion relating to individual developments.

3.1.1 Residential

All stages in the CCW precinct are slated to include some residential development, and is expected to be primarily in the form of medium-density apartments. Dwelling sizes are likely to range from one to three bedrooms, with the exact provision of each to be ultimately determined by market demand.

In this analysis, the trip rates for residential land uses is based on both the number of dwellings provided and the number of bedrooms in each dwelling. Where the number of bedrooms has not been specified, it is assumed that two bedrooms are provided on average for each dwelling.

Trip rates for residential developments were sourced from the 2002 RMS Guide and are summarised below. The "Medium density residential flat building" is considered the best fit in terms of the likely form of residential development at CCW.

- Smaller units and flats (up to two bedrooms):
  - Daily vehicle trips = 4-5 per dwelling
  - Weekday peak hour vehicle trips = 0.4-0.5 per dwelling
- Larger units and town houses (three or more bedrooms):
  - Daily vehicle trips = 5.0-6.5 per dwelling
  - Weekday peak hour vehicle trips = 0.5-0.65 per dwelling

Based on selecting the upper limit of the ranges specified above, the standard trip rates below have been adopted for this analysis:

- One and two bedroom apartments/units[9]
  - AM Peak trips = 0.50 per apartment
  - PM Peak trips = 0.50 per apartment
  - Weekday trips = 5.00 per apartment
- Three bedroom apartments/units
  - AM Peak trips = 0.65 per apartment
  - PM Peak trips = 0.65 per apartment
  - Weekday trips = 6.50 per apartment

3.1.2 Retail (Non-food)

This land use category represents retail outlets that do not primarily sell food. Refer to section 3.1.3 for discussion of trip rates for food retailers, including supermarkets and grocery stores.

The retail trip rate is based on the "Shopping centres" land use category from the 2002 RMS Guide, which provides a formula for estimating vehicle trips during the PM peak hour on a Thursday (generally the busiest shopping period on a weekday).

- V(P) = 2.0 A(S) + 5.1 A(F) + 15.5 A(SM) + 4.6 A(SS) + 2.2 A (OM), where:
  - V(P) = vehicle trips in the PM peak hour (per 100 m^2 gross leaseable floor area - GLFA)

[9] The terms "apartment" and "unit" are interchangeable in this TIA.

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- A(S) = slow trade GLFA (m^2), including major department stores (e.g. Myer, David Jones), furniture electrical and whitegoods retailers.
- A(F) = faster trade GLFA (m^2), including discount department stores (e.g. Kmart, Target).
- A(SM) = supermarket GLFA (m^2) (e.g. Coles, Woolworths)
- A(SS) = specialty shops and secondary retail GLFA (m^2), essentially any retailer that is not likely to be a shopping centre's primary attractor (cf. slow trade, faster trade and supermarket examples above).
- A(OM) = office, medical GLFA (m^2) (e.g. medical centres and general business offices). [10]

Given that no actual shopping centres are currently planned for development within CCW (except for Lots 112-114, refer section 3.7.3 for more information), retail stores in CCW will likely take the form of specialty shops and smaller retailers. As such, this analysis will adopt a retail PM peak hour trip rate of 4.6 trips per 100 m^2 GLFA.

No trip rates for the entire weekday or AM peak hour are provided in the 2002 RMS Guide. For the purposes of this analysis, the weekday trip rate was derived based on the PM peak hour trip rate representing 10% of daily traffic. This assumption is based on comparing the trip rates of the ITE 10th Edition land use code 820 (Shopping Centre) for the PM peak hour (3.81 trips per 1000 ft^2) and weekday (37.75 trips per 1000 ft^2), as well as the 2002 RMS Guide Thursday PM peak hour (12.3 trips per 100 m^2) and Thursday daily (121 trips per 100 m^2) traffic generation rates for shopping centres less than 10,000 m^2 GLFA.

As retail outlets are generally much busier during the PM peak when compared to the AM peak, the trip rate for the AM peak hour was determined based on an adjustment factor to the PM peak hour trip rate. This factor was determined to be 25% using the ITE 10th Edition, comparing the AM and PM peak hour trip rates of land use code 820 (Shopping Centre), giving an AM peak hour trip rate of 1.15 per 100 m^2 GFA.

Noting the inclusion of office and medical GLFA in the formula above, for the purposes of this analysis, it is assumed that trips generated by any office or medical space associated with such a retail development would be either captured within the overall specialty shop trip rate, or separated from the retail component and into their own separate land uses / trip rates.

The following is a summary of the standard trip rates adopted for the Retail land use:

- Retail (Non-food)
  - AM Peak trips = 1.15 per 100 m^2 GFA (gross floor area)[11]
  - PM Peak trips = 4.60 per 100 m^2 GFA
  - Weekday trips = 46.00 per 100 m^2 GFA [12]

3.1.3 Retail (Food)

Supermarkets, grocery stores and retailers that primarily sell food will typically see a higher rate of traffic generation by floor area compared to specialty shops, department stores and other non-food retailers. For such tenancies and developments, the AM and PM peak hour trip rates were sourced from the WAPC TIA Guidelines, and have been adopted directly for use in this analysis. The Weekday trip rate was derived based on the PM peak hour trip rate representing 8.5% of daily traffic. This assumption is based on comparing the trip rates of the ITE 10th Edition

[10] Adapted from section 3.6.1 of the 2002 RMS Guide.
[11] Assumed to be equal to 25% of PM peak.
[12] Based on PM peak = 10% of weekday traffic.

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land use code 850 (Supermarket) for the PM peak hour (9.24 trips per 1000 ft^2) and weekday (106.78 trips per 1000 ft^2).

The following is a summary of the standard trip rates adopted for the Retail (Food) land use:

- Retail (Food)
  - AM Peak trips = 2.50 per 100 m^2 GFA
  - PM Peak trips = 10.00 per 100 m^2 GFA
  - Weekday trips = 117.65 per 100 m^2 GFA [13]

3.1.4 Commercial

AM and PM peak hour trip rates for commercial developments were sourced from the WAPC TIA Guidelines, and have been adopted directly for use in this analysis. The Weekday trip rate was derived from the 2002 RMS Guide, which specifies the same trip rate for both commercial and office land uses.

- Commercial
  - AM Peak trips = 2.00 per 100 m^2 GFA
  - PM Peak trips = 2.00 per 100 m^2 GFA
  - Weekday trips = 10.00 per 100 m^2 GFA

3.1.5 Office

At the City of Cockburn's request and for the purposes of generating traffic as part of this TIA, trip rates for office land uses within the CCW precinct are assumed to be the same as the Commercial trip rates.

- Office
  - AM Peak trips = 2.00 per 100 m^2 GFA
  - PM Peak trips = 2.00 per 100 m^2 GFA
  - Weekday trips = 10.00 per 100 m^2 GFA

3.1.6 Restaurant / Café

Restaurant / café trip rates for an average weekday as well as the PM peak hour were sourced from the 2002 RMS Guide, and have been adopted directly for use in this analysis. The AM peak hour trip rate was derived assuming that this land use is likely to generate a similar volume of traffic to the PM peak hour.

- Restaurants
  - AM Peak trips = 5.00 per 100 m^2 GFA [14]
  - PM Peak trips = 5.00 per 100 m^2 GFA
  - Weekday trips = 60.00 per 100 m^2 GFA

It should be noted that traffic generated by restaurants and cafes can vary significantly based on a number of factors, including (but not limited to) its operating hours and rate of customer turnover (quick service cafes and restaurants are likely to generate higher traffic volumes compared to slower dine-in eateries). With limited information about these factors as they pertain to potential developments in CCW, the trip rates listed above are considered suitable at a structure plan level. However, it is expected that a Traffic Impact Assessment with more

[13] Based on PM peak = 8.5% of weekday traffic.
[14] Assumed to be equal to 100% of PM peak.

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accurate traffic forecasts (based around likely operating hours and customer turnover) would be prepared and submitted to the relevant approving authorities as part of any development proposal involving these land uses.

3.1.7 Summary

Table 1 summarises the standard trip rates for each of the land uses described in the preceding sections.

Table 1 Standard trip rates

Land Use	Units	AM Peak	PM Peak	Weekday
Residential apartment[15]	Apartment	0.50	0.50	5.00
One bedroom unit	Apartment	0.50	0.50	5.00
Two bedroom unit	Apartment	0.50	0.50	5.00
Three bedroom unit	Apartment	0.65	0.65	6.50
Retail (Non-food)	100 m^2 GFA	1.15	4.60	46.00
Retail (Food)	100 m^2 GFA	2.50	10.00	117.65
Commercial	100 m^2 GFA	2.00	2.00	10.00
Office	100 m^2 GFA	2.00	2.00	10.00
Restaurant / Café	100 m^2 GFA	5.00	5.00	60.00

3.2 Standard Reduction Factors

The CCW precinct has excellent access to public transport, with the Cockburn Central railway station forecourt around a 5-10 minute walk and there being multiple bus services departing the station as well as stopping on North Lake Road, Poletti Road and Beeliar Drive. In addition, there is the potential for some trips within CCW to be made without using a vehicle, given the mixed-use nature of the CCW structure plan area. Due to these factors, developments within CCW have the potential to generate a lower amount of vehicle trips, as trip rates sourced from the publications in section 3.1 are generally based on there being a relatively high car mode share (i.e. few, if any trips being made by walking, cycling or public transport). To account for this, reduction factors will be applied to the number of vehicle trips generated during the weekday, AM and PM peak periods for each development.

It is recognised that the magnitude of such reduction factors is also dependent on a number of factors specific to each development, such as (but not limited to) the mix of proposed land use types and yields, the proposed operation of the development and the likelihood of multi-purpose trips within the development. As such, where a developer-submitted TIA is available for a particular development, the developer's proposed reduction factors for generated trips will be adopted if the associated justification is satisfactory. Where the developer's proposed reduction factors are not considered reasonable or have otherwise been insufficiently justified, appropriate adjustments will be made to the developer's reduction factors for the purposes of the CCW TIA.

For lots that do not propose any reduction factors (or where this information is otherwise unavailable), a 10-15% reduction factor will generally be applied to the number of vehicle trips generated during the weekday, AM and PM peak periods as per the below (unless noted otherwise). The reduction factor for each lot is based on the stage it is located within, and is higher for those stages located closer to Cockburn Central railway station. Refer to section 3.4 for the location of each stage.

- Stage 1A: 10% reduction (excluding Cockburn ARC, refer section 3.5)
- Stage 1B: 10% reduction

[15] Used for residential developments where the number of bedrooms per apartment is not specified.

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- Stage 2: 15% reduction (excluding Lots 112-114 and Lots 115-117, refer section 3.7.3 and 3.7.4 respectively)
- Stages 3A & 3B: 10% reduction
- Stage 3C: 15% reduction

3.3 Standard Trip Directionality

Following the generation of vehicle trips (and application of relevant reduction factors), these are then allocated as arriving or departing trips using In/Out splits sourced from ITE 10th Edition (with the exception of the Commercial land use whose In/Out splits are based on the WAPC TIA Guidelines), for both the AM and PM peak hour periods.

The following ITE land use codes were applicable to the below land uses:

- Residential (all types): 221 | Multifamily Housing (Mid-Rise)
- Retail (Non-food): 820 | Shopping Centre
- Retail (Food): 850 | Supermarket
- Office: 710 | General Office Building
- Commercial: As per In/Out trip rates in WAPC TIA Guidelines
- Restaurant / Café: 936 | Coffee/Donut Shop without Drive-Through Window

Table 2 summarises the standard In/Out splits for this analysis. Trip directionality for land uses not listed in Table 2 are discussed in the section pertaining to the relevant stage. In general, the standard In/Out splits were applied to each land use listed, except where noted otherwise.

Table 2 Standard trip directionality

Land Use	ITE Land Use	AM In / Out	PM In / Out	WD In / Out[16]
Residential apartment	221	26% / 74%	61% / 39%	50% / 50%
One bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Two bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Three bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Retail (Non-food)	820	62% / 38%	48% / 52%	50% / 50%
Retail (Food)	850	60% / 40%	51% / 49%	50% / 50%
Office	710	86% / 14%	16% / 84%	50% / 50%
Commercial	WAPC TIA	80% / 20%	20% / 80%	50% / 50%
Restaurant / Café	936	51% / 49%	50% / 50%	50% / 50%

3.4 Stage Overview

For consistency, the same stages referenced in Urbsol's 2014 modelling was adopted in this analysis, which divides CCW into the following Project Stage Locations (illustrated in Figure 6):

- Stage 1A
- Stage 1B
- Stage 2
- Stage 3A & 3B
- Stage 3C

[16] 50/50 split assumed for weekday trip generation across all land uses.

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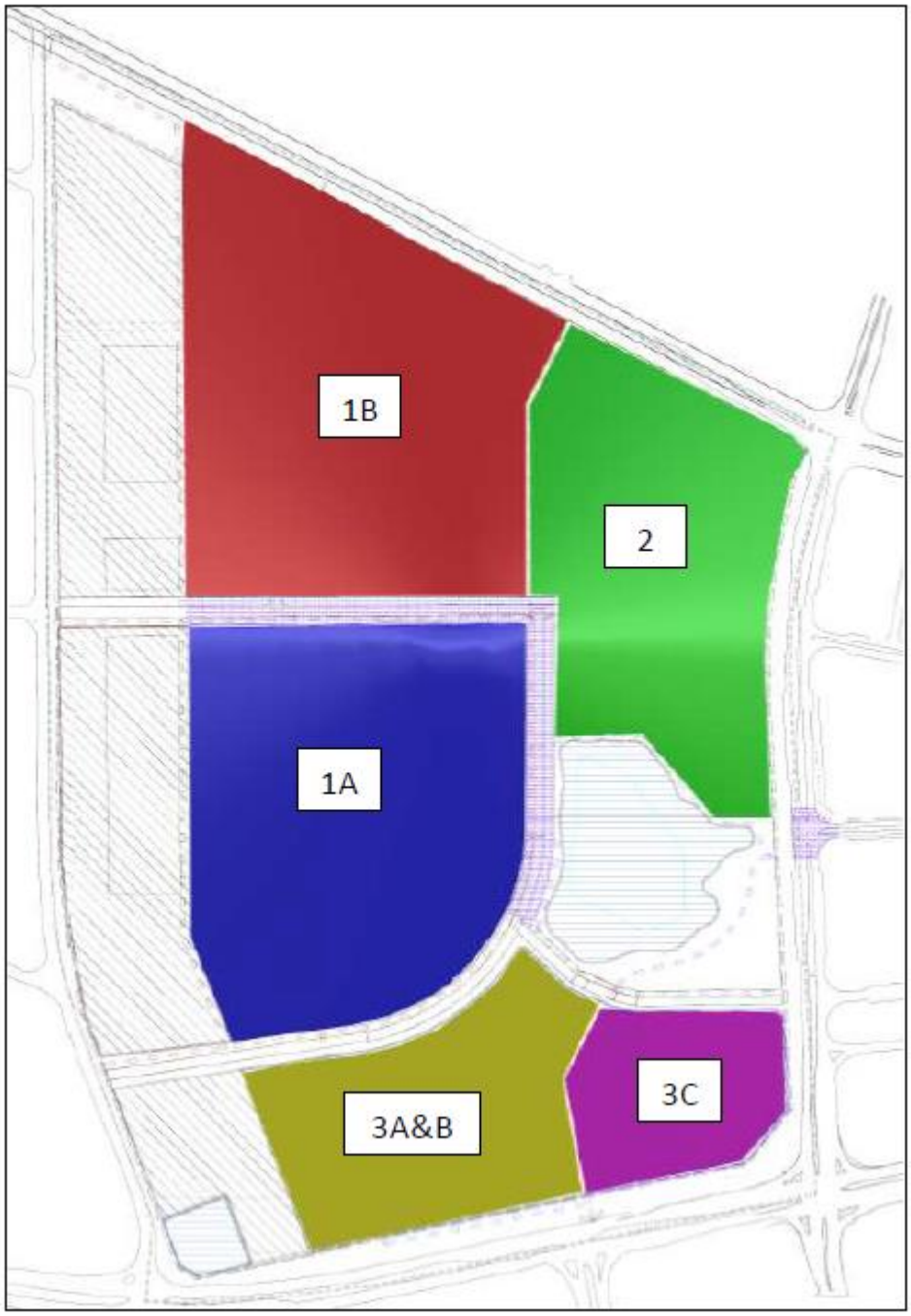

Figure 6 CCW Development Stage locations[17]

The following sections describe the likely land uses and yields for each stage in more detail. Where available, land use and yield information specific to one or more lots has been incorporated into the analysis, with these contributing to the yield totals of the stage they are located within. However for many lots, there is minimal (if any) information available regarding their future land use and yields. In such cases, appropriate assumptions are made regarding the likely land use and yields for the relevant stages.

3.5 Stage 1A

Stage 1A consists of the existing Cockburn ARC, inclusive of the Fremantle Dockers' training oval and headquarters. Around 64 residential apartments are earmarked for future development

[17] Source: Urbsol (2014).

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to the south-west of the Cockburn ARC. An explanation of the methodology used to generate traffic forecasts for each of these developments is provided in the following sections.

3.5.1 Cockburn ARC

As of September 2019, the Cockburn ARC is the only completed development within the CCW precinct, with the balance of land vacant. Currently, access to the CCW precinct is only possible via Veterans Parade using Poletti Road to the west and Midgegooroo Avenue to the east.

Given that there are no other access points to CCW on the road network, traffic volumes along Veterans Parade are assumed to represent the current traffic generation of Cockburn ARC. It is noted that Veterans Parade has the potential to be used by through traffic (i.e. vehicles not stopping at Cockburn ARC). However, this is unlikely to be a preferred through route given the left-in, left-out configuration of the Veterans Parade / Midgegooroo Avenue intersection, the localised street environment along Veterans Parade, as well as the predominantly industrial area to the west of CCW likely being accessed via Poletti Road and other alternative routes. As such, traffic entering and exiting Veterans Parade at either end of CCW is assumed to be travelling to/originating from Cockburn ARC.

To determine the current traffic generation of Cockburn ARC, automated mid-block traffic counts were commissioned by the City of Cockburn on Veterans Parade at two locations:

- Veterans Parade West (VP West): 20 m east of Poletti Road (i.e. west of the westernmost car park access)
- Veterans Parade East (VP East): Between Centenary Lane / Service Mews and Midgegooroo Avenue.

Each of these counts took place simultaneously over a period of one week, beginning Thursday 27th June 2019 and ending Thursday 4th July 2019. Table 3 summarises the traffic count results at both locations during an average weekday, as well as in the AM peak and PM peak. Full traffic count results are included in Appendix A.

Table 3 2019 Average weekday traffic volume - Veterans Parade[18]

Time / Location	VP West + VP East	VP West	VP East
AM peak (8:00-9:00)	327	231	96
PM peak (5:00-6:00)	609	446	163
Weekday average	5492	3959	1533

From these counts, it can be seen that the Cockburn ARC traffic generation during the PM peak hour is around 85% higher than the AM peak, which is likely due to increased sporting activity at Cockburn ARC during the late afternoon and evening hours. In terms of overall traffic distribution on Veterans Parade, around 70% was counted at the west end. The vast majority of off-street parking being located on the west end of CCW, along with Poletti Road providing full access to and from the CCW precinct (together with onward connections to North Lake Road and Beeliar Drive; conversely only left-in, left-out access is available at Midgegooroo Avenue) are likely contributors towards this uneven distribution of traffic.

To determine the directionality of trips generated by Cockburn ARC, for each of the AM and PM peak periods the directional traffic counts at each location were used, as per the following:

- In: Veterans Parade West (eastbound), Veterans Parade East (westbound)
- Out: Veterans Parade West (westbound), Veterans Parade East (eastbound)

[18] Traffic counts in this table are for both directions (eastbound and westbound).

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Table 4 summarises the volumes in each direction as well as the resulting trip directionality for Cockburn ARC during the AM and PM peak periods. From this, most traffic in the AM peak is entering the facility, whilst a more even split of departures and arrivals takes place during the PM peak. A 50/50 split has been assumed for traffic across an average weekday, in line with all other land uses.

Table 4 2019 Average weekday directional flow and trip directionality[19]

Time / Location	VP West + VP East	VP West	VP East
AM in peak (8:00-9:00)	243 (74%)	165 (EB)	78 (WB)
AM out peak (8:00-9:00)	84 (26%)	66 (WB)	18 (EB)
PM in peak (5:00-6:00)	278 (46%)	181 (EB)	98 (WB)
PM out peak (5:00-6:00)	331 (54%)	266 (WB)	65 (EB)

The City has noted that the traffic counts were undertaken during winter, however visitor numbers to Cockburn ARC are generally higher during the summer. A comparison of weekly attendance figures at Cockburn ARC found that attendance in January 2020 was about 46% higher than in July 2019 (with the latter partially overlapping the traffic count period). Furthermore, the City appointed a consultant in mid-2020 to investigate options for expanding the health and fitness facilities within the Cockburn ARC, and to develop a concept plan to improve the size of the gym and group fitness studios.

Given the above factors, the City has recommended that the Cockburn ARC trip generation should be equal to twice the sum of traffic counted at Veterans Parade West and Veterans Parade East in both directions. This is intended to account for the increased traffic volumes that would likely be generated by Cockburn ARC during summer, as well as any potential future expansions of the facility prior to 2031.

As the total trip generation of Cockburn ARC is based on vehicular traffic counts, no reduction factor has been applied. Trip directionality is assumed to remain the same from 2019 to 2031 in this analysis, despite the forecast increase in traffic volumes.

3.5.2 Balance of Stage 1A

No information is available regarding the proposed development site to the south-west of the Cockburn ARC. Therefore, the yield for the remainder of Stage 1A is based on that previously modelled by Urbsol, which assumed a total of 64 residential dwellings.

Traffic generation for the balance of Stage 1A was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

3.5.3 Total Generation of Stage 1A

The traffic generation for Stage 1A is summarised in Table 15 (page 35).

3.6 Stage 1B

The City of Cockburn has advised that their offices will be relocated to Lot 104 (opposite Cockburn ARC) in the future. Assumptions have been made for the balance of Stage 1B with respect to future land uses and yields. Further details are provided in the following sections.

3.6.1 Lot 104

Situated on the corner of Legacy Way and Veterans Parade, Lot 104 is currently occupied by an at-grade car park that mainly serves patrons of Cockburn ARC. However, the City of Cockburn proposes to relocate their headquarters to Lot 104 from their current location in Spearwood in

[19] EB = eastbound, WB = westbound.

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the short to medium term. At present, there are minimal details around the timing of this move as well as the floor space that will be provided. For the purposes of this analysis, the City of Cockburn has agreed to adopt a nominal office floor area of 10,000 m^2.

The existing at-grade car park at Lot 104 has around 150 bays. It is not known whether the City of Cockburn plans to replace these parking bays as part of their new headquarters. This analysis does not consider the impacts of parking provision on generated traffic, therefore it is assumed that future parking provisions will not have any effect on the volume of traffic likely to be generated by Cockburn ARC.

Traffic generation for Lot 104 was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

3.6.2 Balance of Stage 1B

No information for the balance of Stage 1B was available at the time of writing, however the Urbsol TIA assumed a yield of 2300 m^2 office, 1000 m^2 retail and 145 dwellings across the whole stage. As the office component is accounted for by the City's proposed headquarters on Lot 104, the balance of Stage 1B is assumed to comprise of 1000 m^2 retail and 145 dwellings.

Traffic generation for the balance of Stage 1B was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

3.6.3 Total Generation of Stage 1B

The traffic generation for Stage 1B is summarised in Table 16 (page 35).

3.7 Stage 2

Proposed land use and yield information was available for the majority of lots in Stage 2 at the time of writing. Developers of the following lots have submitted plans to the CCW Design Review Panel (DRP), from which land use and yield information was incorporated into this analysis:

- Lots 107 & 108 (mixed use)
- Lot 110 (residential)
- Lots 112-114 (cinema and retail)
- Lots 115-117

Land uses and yields for the balance of lots in Stage 2 (Lots 109 and 111) were determined based on information from other sources for the purposes of traffic generation in this analysis.

The land uses and yields adopted for each lot is discussed in the following sections.

3.7.1 Lots 107 & 108

Lot 107 is bounded by Remembrance Avenue, Veterans Parade and Service Mews, whilst Lot 108 is located adjacent to the southern boundary of Lot 107. The developer of Lots 107 & 108 propose to build one five-storey and three six-storey buildings, with a common tenant carpark spanning across both lots. A total of 97 apartments will be provided across the development, with the ground floor of three buildings being earmarked for café and/or commercial use which will front onto Remembrance Avenue and Veterans Parade. Vehicular access to the development's car park will be via Service Mews.

Plans submitted to the DRP by the developer show the following breakdown of apartments and commercial space by lot:

- Lot 107

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  - 9 one-bedroom units
  - 31 two-bedroom units
  - 5 three-bedroom units
  - 298 m^2 commercial
  - 124 m^2 commercial / potential café
- Lot 108
  - 10 one-bedroom units
  - 37 two-bedroom units
  - 5 three-bedroom units
  - 141 m^2 commercial
  - 116 m^2 commercial / potential café

A TIA in relation to Lots 107 & 108 was also submitted to the DRP by the developer, which nominated their own trip rates and trip directionality. These are discussed in more detail below with respect to each land use.

One, two and three-bedroom units

The developer's TIA used a trip rate of 0.80 per dwelling (regardless of dwelling type) for both AM and PM peak hour trip rates, and was sourced from the WAPC TIA Guidelines. This is similar to the 2002 RMS Guide's peak hour trip rate of 0.85 per dwelling for residential dwelling houses. However, as the residential component of this development is to be provided in the form of medium-density apartments, the standard peak hour trip rates of 0.50 per dwelling (one and two bedroom units) and 0.65 per dwelling (three bedroom units) are considered to be more appropriate for this analysis.

For the daily trip rates, the developer's TIA cited a series of studies conducted by the WA Department of Planning and Infrastructure (DPI) in the late 1990s and early 2000s, which found that the average trip rate of higher density dwellings was about 5.50 trips per day. Whilst the developer's TIA mentions that the 2002 RMS guide suggests that similar developments in Sydney generate around 4 to 5 trips per day, it nonetheless has adopted the DPI-derived trip rate of 5.50 trips per day (regardless of dwelling type), noting that "this rate is conservative for this type of development in Cockburn Central." To maintain a consistent approach with similar residential developments in this study, the standard daily trip rate of 5.00 trips per dwelling (one and two bedroom units) and 6.50 trips per dwelling (three bedroom units) was used for the residential components of Lots 107 and 108. For comparison, the proportion of one, two and three bedroom units results in an average daily trip rate of 5.17 per dwelling across all residential units in Lot 107, and 5.15 per dwelling across all residential units in Lot 108.

The developer's TIA used a 25%/75% AM In/Out split and a 67%/33% PM In/Out split. However to ensure a consistent process in which generated trips are apportioned onto the road network in each direction, the standard In/Out splits of 26%/74% (AM) and 61%/39% (PM) were used in this analysis.

Commercial

For commercial land uses, the trip rates and In/Out splits used in the developer's TIA are the same as the standard trip rates and In/Out splits, and were therefore used in this analysis.

Commercial / Potential Café

This analysis assumes that a café will be provided for this land use, as a café's trip rates are typically higher than that of commercial land uses.

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The developer's TIA has specified a PM peak hour trip rate of 5 trips per 100 m^2, which is the same as the standard trip rate in this analysis. In relation to the AM peak, the developer's TIA has assumed the trip rate is equal to 50% of the PM peak (i.e. 2.50 trips per 100 m^2). As the operating hours of the café are not yet confirmed (noting that the developer's TIA has nominally suggested that it would be open between 8:00 AM and 11:00 PM), the standard AM peak hour trip rate of 5.00 trips per 100 m^2 has been adopted instead of the developer's TIA trip rate. It is expected that these AM and PM peak hour trip rates would be further refined once the likely opening hours and rate of customer turnover of the café are established (as noted in section 3.1.6).

The daily trip rate for the café in the developer's TIA is the same as the standard trip rates.

No In/Out splits were provided in the developer's TIA for the café land use. As such, the standard In/Out splits were used in this analysis.

Summary

The trip rates for Lots 107 & 108 that were adopted in this analysis are summarised in Table 5. As the developer's TIA does not specify any reduction factors for the development, the standard reduction factors in section 3.2 have been applied to these trip rates. Table 6 summarises the In/Out splits.

Table 5 Trip rates for Lots 107 & 108

Land Use	Units	AM Peak	PM Peak	Weekday
One bedroom unit	Apartment	0.50	0.50	5.00
Two bedroom unit	Apartment	0.50	0.50	5.00
Three bedroom unit	Apartment	0.65	0.65	6.50
Commercial	100 m^2 GFA	2.00	2.00	10.00
Potential Café	100 m^2 GFA	5.00	5.00	60.00

Table 6 Trip directionality for Lots 107 & 108

Land Use	ITE Land Use	AM In / Out	PM In / Out	WD In / Out[16]
One bedroom unit	WAPC TIA	25% / 75%	67% / 33%	50% / 50%
Two bedroom unit	WAPC TIA	25% / 75%	67% / 33%	50% / 50%
Three bedroom unit	WAPC TIA	25% / 75%	67% / 33%	50% / 50%
Commercial	WAPC TIA	80% / 20%	20% / 80%	50% / 50%
Potential Café	936	51% / 49%	50% / 50%	50% / 50%

3.7.2 Lot 110

Lot 110 is situated on the south-western corner of the Veterans Parade / Midgegooroo Avenue intersection. Based on plans submitted to the DRP by the developer, a nine-storey residential building (plus one basement parking level) containing a total of 96 apartments is proposed to be built on Lot 110. This is broken down into the following apartment types:

- 23 one-bedroom units
- 69 two-bedroom units
- 4 dual-key units[20]

[20] Dual-key units are two-bedroom units with two separate entrance doors. For the purposes of traffic generation, dual-key units are treated as standard two-bedroom units.

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Vehicular access to the basement car park will be via Veterans Parade.

Traffic generation for Lot 110 was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

3.7.3 Lots 112-114

DevelopmentWA is currently considering a proposal from a prospective developer in relation to Lots 112-114, which would see the site anchored by a 10-screen cinema complex, along with a variety of supporting retail and commercial land uses. Bounded by Centenary Lane, Veterans Parade, Midgegooroo Avenue and North Lake Road, the proposed five-storey (plus two basement parking levels) development consists of the following components:

- 4937 m^2 specialty shops and take-away stores (across multiple tenancies)
- 276 m^2 fast-food restaurant with drive-through window (one tenancy)
- 2311 seat cinema (across 10 screens)
- 1115 m^2 gym
- 2574 m^2 bowling alley (fun fair)

Vehicular access to the development (including basement car parking) will be via Centenary Lane.

Given that the current development proposal for Lots 112-114 is unique in the context of the CCW precinct (which is predominantly residential with minor commercial and office components), most of the development's land uses are not covered by the standard trip rates outlined in section 3.1. In lieu of these, the latest trip rates proposed by the developer have therefore been adopted for use in this analysis. This is considered to be a suitable approach as the trip rates and associated assumptions proposed in the developer's TIA have been previously scrutinised by GHD as part of a separate peer review that was commissioned by DevelopmentWA in 2019.

It is noted that the developer's TIA focused on the Thursday (afternoon) and Saturday (midday) peak hour periods only, as these are the projected peak operating periods of the development. Appropriate weekday and AM peak hour trip rates were also determined for the purposes of this analysis, as discussed below. The Thursday afternoon trip rate in the developer's TIA is assumed to be representative of the PM peak hour in this analysis, and will be denoted as such in the following sections.

A 15% reduction factor was assumed by the developer to account for the proximity of public transport services as well as nearby residences to Lots 112-114, which aligns with the standard reduction factors discussed in section 3.2. The In/Out splits were sourced from the ITE 10th Edition in a similar manner to the standard trip directionality discussed in section 3.3.

With the mixed-use nature of the proposed development, there is potential for some visits to serve multiple purposes (e.g. seeing a movie and also visiting the bowling alley (fun fair) in the same trip). Through a benchmarking process that compared trip generation forecasts to surveyed volumes at an existing development in Perth with similar land uses (Innaloo Event Cinema Centre), the developer's TIA nominates an additional reduction factor that is applicable to each component of the proposed development. These additional reduction factors are discussed in relation to each component of the development below.

Specialty shops and take-away stores

A trip rate of 4.6 trips per 100 m^2 in the PM peak hour is proposed by the developer for the specialty shops and take-away stores, which aligns with the 2002 RMS Guide as well as this

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analysis' standard trip rate for retail land uses. For the AM peak hour and weekday periods, the standard trip rate for retail land uses of 1.15 and 46 trips per 100 m^2 was adopted.

The developer has agreed on a reduction factor of 30% for the specialty shops and take-away stores component of the development, which includes the 15% standard reduction factor discussed in section 3.2. This recognises the likelihood for these stores to be frequented by cinema and/or bowling alley customers. In/Out splits for this land use were as per the retail land use standard trip directionality specified in Table 2.

Fast-food restaurant with drive-through window

The developer's TIA proposes a total trip rate of 70 trips per 100 m^2 for the fast-food restaurant with drive-through window for the PM peak hour, citing a 2015 RMS guidelines update that provided trip generation rates for surveyed McDonald's sites around Sydney. Additionally, the same update also provided a percentage of pass-by trips (i.e. motorists who enter the restaurant, then exit continuing in the same direction of travel) – based on this, the developer's TIA proposes a breakdown of 40 trips per 100 m^2 as pass-by trips, with the remaining 30 trips per 100 m^2 entering the restaurant from one direction before departing in the opposite direction.

With respect to the daily trip generation of a fast-food restaurant (and by extension, the AM peak hour trip generation), the 2002 RMS guide notes that "daily vehicle trips depend largely on the hours of operation", with "sites open for breakfast... [generating] more daily traffic than sites open only from lunch to dinner." As the opening hours of the fast-food restaurant are not yet confirmed, a 24-hour operation similar to McDonald's is assumed for the purposes of this analysis.

On this basis, the AM peak hour trip rate is assumed to be equal to the PM peak hour (i.e. 70 trips per 100 m^2 of which 40 trips per 100 m^2 are pass-by trips). The daily trip rate was derived from the PM trip rate as a proportion of the daily trip rate given in the ITE 10th Edition for land use code 934 (Fast-food restaurant with drive-through window), which was approximately 11%. This results in a total daily trip rate of 636.4 trips per 100 m^2, of which 363.6 trips per 100 m^2 are pass-by trips.

Given the inherent vehicle-based nature of the fast-food restaurant, no reduction factors have been applied to the trip generation of this land use. In/Out splits for this land use were sourced from ITE 10th Edition using land use code 934.

Cinema

The developer's PM trip rate for the cinema component of this development is 0.080 trips per seat, which aligns with the ITE 10th Edition, using land use code 445 (Multiplex Movie Theatre).

No AM peak hour trip rates for cinemas were available from the ITE 10th Edition. As cinemas are generally not open during the AM peak hour, it was assumed that any trips generated by this component of the development would be as a result of staff arrivals only. For the purposes of this analysis, the AM peak hour trip rate was assumed to be equal to just 10% of the PM peak hour trip rate (i.e. 0.008 trips per seat).

For the daily trip rate, no information was available for land use code 445 in terms of the number of daily trips per seat. However, based on a comparison of the PM and weekday trip rates for land use code 444 (Movie Theatre)[21], the PM trip rate is approximately 5% of weekday traffic. Applying this proportion to the PM peak hour trip rate of 0.080 trips per seat, the daily trip rate for the cinema component is 1.60 trips per seat.

[21] The ITE 10th Edition specifically defines land use code 444 (Movie Theatre) as those which have less than 10 screens, whilst land use code 445 (Multiplex Movie Theatre) includes those with a minimum of 10 screens.

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Based on the benchmarking process, the developer proposes a total reduction factor of 45% for the cinema component of the development, which is inclusive of the 15% standard reduction factor discussed in section 3.2.

The In/Out splits for the PM peak and weekday were based on ITE 10th Edition for land use code 444. For the AM peak, no information was available. As such, it is assumed that 90% of trips are incoming to the cinema (i.e. arriving staff), whilst the remaining 10% are departures.

Gym

The 2002 RMS guide provides two PM trip rates for gyms:

- "Metropolitan Regional (CBD) Centres" at 3.0 trips per 100 m^2, for areas with limited parking and a relatively high active transport (i.e. walking/cycling) mode share, and
- "Metropolitan Sub Regional Areas" at 9.0 trips per 100 m^2, which is applicable to outer suburban locations that are more car dependent.

As the development is in a location that will likely still attract a reasonable number of vehicle trips, yet has potential for other visits to be made via active transport modes, a compromise trip rate of 6.0 trips per 100 m^2 has been agreed upon by the developer as part of the TIA peer review.

For the AM peak hour, no trip rates were given in the 2002 RMS guide. Examining the ITE 10th Edition under land use code 492 (Health/Fitness Club) found that the AM peak hour trip rate is around 40% of the PM peak hour trip rate; this proportion was therefore adopted as the AM peak hour trip rate (i.e. 2.4 trips per 100 m^2.).

The daily trip rate was derived in a similar manner to the PM peak hour trip rate, with the 2002 RMS guide specifying a daily trip rate for "Metropolitan Regional (CBD) Centres" of 20 trips per 100 m^2, and 45 trips per 100 m^2 for "Metropolitan Sub Regional Areas". As such, the daily trip rate is assumed to be halfway between these categorisations (i.e. 32.5 trips per 100 m^2).

The standard 15% reduction factor applies to the gym, with no additional reduction factors proposed by the developer. In/Out splits were sourced from the ITE 10th Edition, using land use code 492.

Bowling Alley (Fun Fair)

The developer's TIA proposes a PM trip rate of 1.80 trips per 100 m^2, citing the ITE 9th Edition (which precedes the ITE 10th Edition). This compares with the ITE 10th Edition trip rate of 1.25 trips per 100 m^2 for the PM peak, using land use code 437 (Bowling Alley). In the interests of providing a conservative analysis, the developer's TIA trip rate for the PM peak of 1.80 trips per 100 m^2 was adopted.

ITE 10th Edition specifies an AM peak hour trip rate of 0.87 trips per 100 m^2, which is approximately half of the PM peak hour trip rate adopted for this analysis. However, it should be noted that bowling alleys (and amusement centres that are similar in concept to the development proposal) in Perth are typically open after 9:00 AM on weekdays at the earliest, which falls outside the AM road network peak hour of 7:00 – 9:00 AM. As such, trips into the bowling alley will largely consist of arriving employees, and so the ITE 10th Edition AM peak hour trip rate is not considered to be an accurate representation. In lieu of this, the AM trip rate is assumed to be equal to 10% of PM Trip Rate.

No information was available in the ITE 10th Edition regarding daily trip rates for bowling alleys, so a related land use (Amusement Park, land use code 480) was used to derive the daily trip rate. Comparing the PM trip rate (3.95 trips per acre) to the weekday trip rate (53.41 trips per acre), the PM peak represents around 7.5% of weekday traffic. Therefore, the daily trip rate is

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assumed to be 24.0 trips per 100 m^2, based on applying a similar proportion to the PM trip rate adopted for this analysis.

The developer has nominated a reduction factor of 30% for the bowling alley component of the development, which includes the 15% standard reduction factor discussed in section 3.2. This reflects the likelihood that some customers will have also visited the cinema and/or other stores within the development during the same trip.

In/Out splits were sourced from the ITE 10th Edition, using land use code 437.

Summary

The trip rates for Lots 112-114 that were adopted in this analysis are summarised in Table 7, while the In/Out splits are summarised in Table 8.

Table 7 Trip rates for Lots 112-114

Land Use	Units	AM Peak	PM Peak	Weekday
Specialty / take-away	100 m^2 GFA	1.15	4.60	46.00
Fast-food	100 m^2 GFA	30.00	30.00	272.70
Fast-food (pass-by trips)	100 m^2 GFA	40.00	40.00	363.60
Cinema	Seat	0.008	0.080	1.60
Gym	100 m^2 GFA	2.40	6.00	32.50
Bowling Alley (Fun Fair)	100 m^2 GFA	0.18	1.80	24.00

Table 8 Trip directionality for Lots 112-114

Land Use	ITE Land Use	AM In / Out	PM In / Out	WD In / Out[16]
Specialty / take-away	820	62% / 38%	48% / 52%	50% / 50%
Fast-food	934	51% / 49%	52% / 48%	50% / 50%
Fast-food (pass-by trips)	934	51% / 49%	52% / 48%	50% / 50%
Cinema	444	90% / 10%	60% / 40%	50% / 50%
Gym	492	51% / 49%	57% / 43%	50% / 50%
Bowling Alley (Fun Fair)	437	95% / 5%	65% / 35%	50% / 50%

The reduction factors applicable to the trip generation for each component of Lots 112-114 are summarised below:

- Specialty shops and take-away stores: 30% reduction
- Fast food restaurant with drive-through window: No reduction
- Cinema: 45% reduction
- Gym: 15% reduction
- Bowling Alley (Fun Fair): 30% reduction

3.7.4 Lots 115-117

Lots 115-117 are bounded by Veterans Parade, Centenary Lane and Remembrance Avenue. Plans for these lots were submitted to the DRP by the developer in December 2019 and consist of four nine-storey towers with a podium connecting the towers across the first three storeys. A hotel will occupy one of the towers, with residential units (varying in size from one to three bedrooms) taking up the remaining three towers. The podium houses a number of commercial tenancies and the hotel lobby on the ground floor, parking bays on the ground and first floors, as well as residential units and a communal area on the second floor. A child care centre will

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also occupy part of the podium on the second floor, being directly accessible from the ground floor and separated from the residential and hotel components of the development.

The development is proposed to be constructed in three stages, with the proposed land uses and yields for each stage listed below. For the purposes of the CCW TIA, it is assumed that Lots 115-117 will be fully developed by 2031.

- Stage 1 (Lot 117)
  - 43 one-bedroom units
  - 25 two-bedroom units
  - 28 three-bedroom units
  - 610 m^2 supermarket + 68 m^2 storage (Tenancy 1)
  - 210 m^2 commercial / potential café (Tenancy 2)
  - 109 m^2 commercial (Tenancy 3)
  - 509 m^2 office (Tenancy 11)
- Stage 2 (Lot 116)
  - 42 one-bedroom units
  - 28 two-bedroom units
  - 26 three-bedroom units
  - 302 m^2 commercial (Tenancies 4-7)
- Stage 3 (Lot 115)
  - 14 studio apartments
  - 14 one-bedroom units
  - 42 two-bedroom units
  - 101 m^2 potential pharmacy (Tenancy 8)
  - 105 m^2 potential consulting room (Tenancy 9)
  - 340 m^2 banquet restaurant + 145 m^2 kitchen (Tenancy 10)
  - 546 m^2 childcare centre (Tenancy 12)
  - 113 hotel rooms
  - 169 m^2 hotel restaurant + 58 m^2 kitchen
  - 1232 m^2 other hotel facilities

Some of the development's land uses are unique to the CCW precinct and are therefore not addressed by the standard trip rates outlined in section 3.1. In lieu of these, the trip rates and assumptions proposed by the developer have been reviewed and adopted for use in this analysis where deemed suitable (or appropriate justification given where a different trip rate or assumption has been selected for this analysis). The following sections separately address each of the land uses proposed for Lots 115-117.

Studio, one, two and three-bedroom units[22]

The developer's TIA used a trip rate of 0.80 per dwelling (regardless of dwelling type) for both AM and PM peak hour trip rates, and was sourced from the WAPC TIA Guidelines. This is similar to the 2002 RMS Guide's peak hour trip rate of 0.85 per dwelling for residential dwelling houses. However, as the residential component of this development is to be provided in the form of medium-density apartments, the standard peak hour trip rates of 0.50 per dwelling (one

[22] Studio apartments are considered functionally equivalent to one-bedroom units for the purposes of this analysis.

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and two bedroom units) and 0.65 per dwelling (three bedroom units) are considered to be more appropriate for this analysis.

For the daily trip rates, the developer's TIA cited a series of studies conducted by the WA Department of Planning and Infrastructure (DPI) in the late 1990s and early 2000s, which found that the average trip rate of higher density dwellings was about 5.50 trips per day. Whilst the developer's TIA mentions that the 2002 RMS guide suggests that similar developments in Sydney generate around 4 to 5 trips per day, it nonetheless has adopted the DPI-derived trip rate of 5.50 trips per day (regardless of dwelling type), noting that "this rate is applicable for the proposed development due to its strategic location within Cockburn Central…and the proximity of Cockburn Central train and bus station". To maintain a consistent approach with similar residential developments in this study, the standard daily trip rate of 5.00 trips per dwelling (one and two bedroom units) and 6.50 trips per dwelling (three bedroom units) was used for the residential components of Lots 115-117. For comparison, the proportion of one, two and three bedroom units results in an average daily trip rate of 5.44 per dwelling across all residential units in Stage 1, 5.41 per dwelling across all residential units in Stage 2 and 5.00 per dwelling across all residential units in Stage 3.

The developer's TIA used a 25%/75% AM In/Out split and a 67%/33% PM In/Out split. However, the standard In/Out splits of 26%/74% (AM) and 61%/39% (PM) were used in this analysis, to ensure a consistent process in which generated trips are apportioned onto the road network in each direction.

Supermarket (Tenancy 1)

For the AM and PM peak hour periods, the trip rates used in the developer's TIA in relation to the supermarket are the same as the standard trip rates for the Retail (Food) land use, and were therefore used in this analysis. It is noted that the developer has used the 2002 RMS Guide's Thursday daily traffic generation rate of 121 trips per 100 m^2 for shopping centres less than 10,000 m^2 GLFA, however for the purposes of this analysis the Retail (Food) standard trip rate of 117.65 trips per 100 m^2 is considered to be more appropriate as this rate is being applied to a single food retail tenancy.

The developer's TIA has based the supermarket's AM and PM peak hour trip generation on a GFA of 610 m^2, and the weekday trip generation on a net leasable area (NLA) of 458 m^2 (approximately 75% of GFA). However, the developer's plans also show a 68 m^2 storage area adjacent to, and for use exclusively by the supermarket. This storage area is not included in the 610 m^2 GFA used in the developer's TIA. For the purposes of this analysis, the GFA of the supermarket will be inclusive of the storage area (i.e. 678 m^2 total). Furthermore, the GFA will be used to calculate the weekday trip generation of the supermarket, as the weekday standard trip rate for Food (Retail) is based on GFA (and not NLA).

In/Out splits nominated by the developer's TIA were based on the In and Out trip rates specified in the WAPC Guidelines for the Retail (Food) land use (being 80% In / 20% Out for the AM peak and 50% In / 50% Out for the PM peak). However, the standard In/Out splits of 60%/40% (AM) and 51%/49% (PM) were used in this analysis, to ensure a consistent process in which generated trips are apportioned onto the road network in each direction.

Commercial / Potential Café (Tenancy 2)

This analysis assumes that a café will be provided for this land use, as a café's trip rates are typically higher than that of commercial land uses.

The trip rates used in the developer's TIA for the café land use are the same as the standard trip rates, and were therefore used in this analysis. However, it is expected that these AM and

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PM peak hour trip rates would be further refined once the likely opening hours and rate of customer turnover of the café are established (as noted in section 3.1.6).

No In/Out splits were provided in the developer's TIA for the café land use. As such, the standard In/Out splits were used in this analysis.

Commercial (Tenancies 3-7)

For commercial land uses, the trip rates and In/Out splits used in the developer's TIA is the same as the standard trip rates and In/Out splits, and were therefore used in this analysis.

Office (Tenancy 11)

The trip rates used in the developer's TIA for the office land use are the same as the standard trip rates, and were therefore used in this analysis.

No In/Out splits were provided in the developer's TIA for the office land use. As such, the standard In/Out splits were used in this analysis.

Commercial / Potential Pharmacy (Tenancy 8)

The developer's TIA has derived trip rates for the pharmacy from the ITE *Trip Generation Manual*, though it is unclear which edition was used. A comparison between the ITE-sourced trip rates from the developer's TIA and the ITE 10th Edition (based on land use code 880 – Pharmacy/Drugstore without Drive-Through Window) is presented in Table 9. From this it can be seen that there is negligible difference between these trip rates. However, to align with the other ITE-derived trip rates in this CCW TIA, the ITE 10th Edition trip rates will be applied to the pharmacy in Lot 115-117.

Table 9 Comparison of Lot 115-117 pharmacy trip rates

Source	AM Peak	PM Peak	Weekday
Developer TIA (ITE) – per 1000 ft^2	2.94	8.40	90.06
CCW TIA (ITE 10th Edition) – per 1000 ft^2	2.94	8.51	90.08
Developer TIA (ITE) – per 100 m^2	3.16	9.04	96.94
CCW TIA (ITE 10th Edition) – per 100 m^2	**3.16**	**9.16**	**96.96**

No In/Out splits were provided in the developer's TIA for the pharmacy. In lieu of these, the In/Out splits from the same land use in the ITE 10th Edition were used for the pharmacy (being 65% In / 35% Out for the AM Peak and 49% In / 51% Out for the PM Peak).

Commercial / Potential Consulting Room (Tenancy 9)

The developer's TIA has derived the trip generation for a consulting room using first principles:

- Based on the size of the tenancy, two medical practitioners have been assumed to work out of the premises.
- A maximum of 36 clients visiting each practitioner per day has been assumed based on the opening hours of the consulting room and an average length of 10-15 minutes per consultation.
- In addition, all clients are assumed to drive to/from the consulting room (i.e. 100% vehicular mode share) and peak hour trip generation (for each of AM and PM) is estimated at 20% of weekday trip generation.

According to the developer's TIA, this methodology results in a total weekday trip generation of 144 trips, with 14 of these trips taking place during each of the AM and PM peak hour period. It is noted that the AM and PM peak hour generation each equates to only 10% of the weekday trip generation instead of 20%, however this is considered to be reasonable given that

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consultations are likely to be distributed evenly across the day. Additionally, the developer's TIA does not include the trips generated by employees (no information about staff numbers additional to the practitioners is provided in the developer's TIA). Assuming that the consulting room has one additional staff member (along with the two practitioners for a total of three employees) and that each employee drives to and from the consulting room once a day, six additional weekday trips are generated, bringing the total to 150 trips, with 15 of these taking place during each of the AM and PM peak hour period.

To confirm if the traffic generation forecast in the developer's TIA is reasonable, trip rates based on floor area were sourced from both the 2002 RMS Guide and the ITE 10th Edition. The 2002 RMS Guide has data for extended hours medical centres; with the mean peak hour vehicle trip generation rate in the morning being 10.4 trips per 100 m^2. An average vehicle mode share of 66% was also noted in the 2002 RMS Guide; adjusting the morning mean peak vehicle trip generation rate to reflect a 100% vehicular mode share gives a rate of 15.8 trips per 100 m^2. No information for weekday or afternoon peak vehicle trip generation rates are available, however in the absence of further information, it can be assumed that the afternoon peak traffic generation is the same as the morning and that 10% of the weekday traffic generation falls within each of the morning and afternoon peak hour. Based on the trip rates from the 2002 RMS Guide, the 105 m^2 consulting room is forecast to generate a total of 166 trips on a weekday, with 17 of these trips taking place during each of the AM and PM peak hour period.

A comparison was also made with the trip rates from the ITE 10th Edition, using land use code 720 (Medical-Dental Office Building). The traffic generation is significantly lower than that of the developer's TIA and the 2002 RMS Guide, with the AM and PM peak hour trip rates in the order of around 3-4 trips per 100 m^2. The ITE 10th Edition however does somewhat validate the assumption of 10% of weekday trips occurring in the AM and PM peak hour, with a weekday trip rate of around 37.5 trips per 100 m^2.

Table 10 compares the total trip generation of the weekday, AM peak hour and PM peak hour periods using the methodology in the developer's TIA and the trip rates in the 2002 RMS Guide and ITE 10th Edition. Given that there is relatively minimal difference between the traffic generation of the developer's TIA and the 2002 RMS Guide, the developer's trip generation has been adopted for use in this analysis, albeit with the addition of six employee trips to the weekday total.

Table 10 Comparison of Lot 115-117 consulting room trip generation[23]

Source	AM Peak	PM Peak	Weekday
Developer's TIA	14	14	144
Developer's TIA (plus employee trips)	**15**	**15**	**150**
2002 RMS Guide (after adjustments)	17	17	166
ITE 10th Edition	3	4	39

No In/Out splits were provided in the developer's TIA for the consulting room. In lieu of these, the In/Out splits from the Medical-Dental Office Building land use in the ITE 10th Edition were adopted (being 78% In / 22% Out for the AM Peak and 28% In / 72% Out for the PM Peak).

Banquet Restaurant (Tenancy 10)

It is noted in the developer's TIA that although the banquet restaurant would be expected to attract traffic for special events and on weekends outside of the development's peak hours, the maximum theoretical impact of the restaurant has been accounted for. To ensure a conservative analysis, this approach has been adopted in the CCW TIA.

[23] Does not include any applicable reduction factors.

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The trip rates used in the developer's TIA for the banquet restaurant are the same as the standard trip rates for the Restaurant / Café land use, and were therefore used in this analysis.

It is noted that the developer has based the banquet restaurant's trip generation on a GFA of 340 m^2, however this does not include the kitchen floor area of 145 m^2. For the purposes of this analysis, the GFA of the banquet restaurant will be inclusive of the kitchen area (i.e. 485 m^2 total).

No In/Out splits were provided in the developer's TIA for the banquet restaurant. As such, the standard In/Out splits for the Restaurant / Café land use were used in this analysis.

Childcare centre (Tenancy 12)

The developer's TIA has derived the trip generation for a childcare centre using trip rates from the 2002 RMS Guide in relation to the AM and PM peak hour periods, and from first principles for the weekday trip rates. A number of assumptions have been made in the developer's TIA around the trip rates and how many children and employees are likely to be based in the child care centre:

- Operates as a "Long-day care" centre;
- Centre to accommodate 70 children and seven employees;
- AM and PM peak hour trip rates are equal to 60% of the Peak Vehicle Trips per Child given in Table 3.6 of the 2002 RMS Guide (being 0.8 and 0.7 trips per child in the morning and afternoon respectively – these have been considered to be applicable to a given two-hour period in the morning and afternoon respectively);
- Weekday trip rates are based on four trips per child (i.e. one arrival and departure in the morning to drop off the child, and again in the afternoon to pick up the child) and two trips per employee (i.e. one arrival to work in the morning and one departure from work in the evening).

The developer's AM and PM peak hour trip rates of 0.48 and 0.49 trips per child was compared to trip rates sourced from the ITE 10th Edition using land use code 565 (Day Care Centre). Similar to the trip rates from the 2002 RMS Guide, the ITE 10th Edition trip rates are based on the number of children in the centre. The AM and PM peak hour trip rates are equal to 0.78 and 0.79 trips respectively, which are somewhat higher than the developer's trip rates. Weekday trip rates from the ITE 10th Edition are similar to that derived from first principles at 4.09 trips per child (which would be inclusive of trips made by employees).

On the basis that each vehicle arriving and departing the centre is carrying only one child (i.e. no car pooling of children), the AM and PM peak hour trip rates used in the developer's TIA suggest that around 25% of children attending the centre are being dropped off during the AM peak hour (and picked up during the PM peak hour), compared to around 40% using the ITE 10th Edition trip rates. Given that it is likely most parents or guardians using the child care centre would be dropping off/picking up their kids before and after business hours, the AM and PM peak hour trip rates from the ITE 10th Edition are considered to be representative of this visitation pattern, whilst the developer's TIA trip rates seem to be somewhat low. For these reasons and to ensure a conservative analysis, the ITE 10th Edition trip rates will be used in the CCW TIA as the AM and PM peak hour trip generation is more conservative.

A comparison of the resulting trip generation from each source is provided in Table 11.

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Table 11 Comparison of Lot 115-117 child care centre trip generation[23]

Source	AM Peak	PM Peak	Weekday
Developer's TIA	34	35	294
ITE 10th Edition	**55**	**55**	**286**

No In/Out splits were provided in the developer's TIA for the child care centre. In lieu of these, the In/Out splits from the same land use in the ITE 10th Edition were used for the pharmacy (being 53% In / 47% Out for the AM Peak and 47% In / 53% Out for the PM Peak).

Hotel

Trip rates for the hotel in the developer's TIA were sourced from the ITE *Trip Generation Manual*, though it is unclear which edition was used. A comparison between the ITE-sourced trip rates from the developer's TIA and the ITE 10th Edition (based on land use code 310 – Hotel) is presented in Table 9. From this it can be seen that there is negligible difference between these trip rates. However, to align with the other ITE-derived trip rates in this CCW TIA, the ITE 10th Edition trip rates will be applied to the hotel in Lot 115-117.

Table 12 Comparison of Lot 115-117 hotel trip rates

Source	AM Peak	PM Peak	Weekday
Developer TIA (ITE) – per room	0.53	0.60	8.17
CCW TIA (ITE 10th Edition) – per room	**0.47**	**0.60**	**8.36**

In/Out splits from the hotel land use in the ITE 10th Edition were used in this analysis (being 59% In / 41% Out for the AM Peak and 51% In / 49% Out for the PM Peak), and are similar to those used in the developer's TIA.

Hotel Restaurant

Co-located within the hotel's lobby on the ground floor will be an all-day dining restaurant. It should be noted that this hotel restaurant is distinct from the banquet restaurant (Tenancy 10), which is located adjacent to (but separate from) the hotel lobby.

The trip rates used in the developer's TIA for the hotel restaurant are the same as the standard trip rates for the Restaurant / Café land use, and were therefore used in this analysis.

In a similar manner to the banquet restaurant, it is noted that the developer has based the hotel restaurant's trip generation on a GFA of 169 m^2, however this does not include the kitchen floor area of 58 m^2. For the purposes of this analysis, the GFA of the hotel restaurant will be inclusive of the kitchen area (i.e. 227 m^2 total).

No In/Out splits were provided in the developer's TIA for the hotel restaurant. As such, the standard In/Out splits for the Restaurant / Café land use were used in this analysis.

Other Hotel Facilities

The hotel will also include a number of supporting and ancillary facilities that are required for operational purposes, as well as for use by hotel guests and visitors:

- 221 m^2 Hotel Lobby
- 453 m^2 Function Room 1
- 113 m^2 Breakout Area
- 172 m^2 Function Room 2
- 190 m^2 Hotel Management Office
- 83 m^2 Staff Rooms

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The developer's TIA has not generated any additional trips specifically for these facilities, presumably because they would be used primarily by hotel guests and staff already on site.

ITE describes the Hotel Land Use (310) as "a place of lodging that provides sleeping accommodations and supporting facilities such as restaurants, cocktail lounges, meeting and banquet rooms or convention facilities, limited recreational facilities (pool, fitness room), and/or other retail and service shops." Based on this description, it can be presumed that the ITE Hotel Land Use trip rates are inclusive of a reasonable number of outside trips that would likely be generated by these ancillary facilities, and as such no additional trip generation specifically for these facilities are necessary.

Reduction Factors

As a result of the development's mixed-use nature, the developer's TIA proposes a number of reduction factors that are applicable to the trip generation of selected land uses. These are based primarily on the likelihood that residents both from and outside the development will use the supermarket, commercial tenancies and childcare centre, as well as the potential for multi-purpose trips to be made by employees and visitors of the development. The following is a summary of the developer's reduction factors and the associated justification:

- Supermarket (Tenancy 1): 70%
  - Based on no more than 30% of customers driving to Lots 115-117 specifically for the supermarket.
  - The remainder of customers (70%) are likely to be residents, employees or visitors to the proposed development as well as adjacent developments.
- Commercial / Potential Café (Tenancy 2): 80%
  - Based on no more than 20% of customers driving to Lots 115-117 specifically for the café.
  - The remainder of customers (80%) are likely to be employees or visitors to the commercial tenancies within the development.
- Commercial / Potential Pharmacy (Tenancy 8): 70%
  - Based on no more than 30% of customers driving to Lots 115-117 specifically for the pharmacy.
  - The remainder of customers (70%) are likely to be residents or patients from the consulting room.
- Childcare centre (Tenancy 12): 50%
  - Based on no more than 50% of customers being outside the development and not within walking distance of the centre.
  - The remainder of customers (50%) are likely to be residents, as well as employees of commercial tenancies within the development.
- Hotel Restaurant: 90%
  - Based on the vast majority of customers being hotel guests or employees of commercial tenancies within the development.
- All other land uses: 0%(i.e. no reduction factor)

Given the proximity of other residential developments to Lots 115-117, as well as the significant residential component of the proposed development, the developer's reduction factors above are considered satisfactory and have therefore been adopted for use in the CCW TIA. No other reduction factors (including the standard reduction factors for CCW Zone 2) will be applied to Lots 115-117 for the purposes of this analysis.

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Summary

The trip rates for Lots 115-117 that were adopted in this analysis (prior to the application of the reduction factors above) are summarised in Table 13, while the In/Out splits are summarised in Table 14.

Table 13 Trip rates for Lots 115-117

Land Use	Units	AM Peak	PM Peak	Weekday
Studio unit	Apartment	0.50	0.50	5.00
One bedroom unit	Apartment	0.50	0.50	5.00
Two bedroom unit	Apartment	0.50	0.50	5.00
Three bedroom unit	Apartment	0.65	0.65	6.50
Supermarket (T1)	100 m^2 GFA	2.50	10.00	117.65
Café (T2)	100 m^2 GFA	5.00	5.00	60.00
Commercial (T3-7)	100 m^2 GFA	2.00	2.00	10.00
Office (T11)	100 m^2 GFA	2.00	2.00	10.00
Pharmacy (T8)	100 m^2 GFA	3.16	9.16	96.96
Consulting Room (T9)	n/a	Derived using first principles (refer Table 10)		
Banquet Restaurant (T10)	100 m^2 GFA	5.00	5.00	60.00
Childcare centre (T12)	Child	0.78	0.79	4.09
Hotel	Room	0.47	0.60	8.36
Hotel Restaurant	100 m^2 GFA	5.00	5.00	60.00
Other Hotel Facilities	n/a	Included within Hotel trip generation		

Table 14 Trip directionality for Lots 115-117

Land Use	ITE Land Use	AM In / Out	PM In / Out	WD In / Out[16]
Studio unit	221	26% / 74%	61% / 39%	50% / 50%
One bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Two bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Three bedroom unit	221	26% / 74%	61% / 39%	50% / 50%
Supermarket (T1)	850	60% / 40%	51% / 49%	50% / 50%
Café (T2)	936	51% / 49%	50% / 50%	50% / 50%
Commercial (T3-7)	WAPC TIA	80% / 20%	20% / 80%	50% / 50%
Office (T11)	710	86% / 14%	16% / 84%	50% / 50%
Pharmacy (T8)	880	65% / 35%	49% / 51%	50% / 50%
Consulting Room (T9)	720	78% / 22%	28% / 72%	50% / 50%
Banquet Restaurant (T10)	936	51% / 49%	50% / 50%	50% / 50%
Childcare centre (T12)	565	53% / 47%	47% / 53%	50% / 50%
Hotel	310	59% / 41%	51% / 49%	50% / 50%
Hotel Restaurant	936	51% / 49%	50% / 50%	50% / 50%
Other Hotel Facilities	n/a	As per Hotel land use		

3.7.5 Balance of Stage 2 (Lots 109 and 111)

Lots 109 and 111 are the only lots within Stage 2 for which no land use and yield information was available at the time of writing.

In 2013, Urbis provided DevelopmentWA with land use and yield advice for the CCW precinct. As part of this advice, a total of 197 dwellings were estimated for “Block J”, which includes Lots 109, 110 and 111. As there are a total of 96 apartments proposed for Lot 110 (refer section

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3.7.2), for the purposes of this analysis it is assumed that the balance of the proposed 197 dwellings will be provided on Lots 109 and 111 – a total of 101 residential apartments.

Traffic generation for the balance of Stage 2 was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

3.7.6 Total Generation of Stage 2

The traffic generation for Stage 2 is summarised in Table 17 (page 36).

3.8 Stages 3A & 3B

No information was available regarding future development plans for Stages 3A & 3B at the time of writing. Therefore, the land uses and yields previously modelled by Urbsol have been adopted for this analysis – specifically, the provision of 216 residential apartments.

Traffic generation for Stages 3A & 3B was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

The traffic generation for Stages 3A & 3B is summarised in Table 18 (page 38).

3.9 Stage 3C

Similar to Stages 3A & 3B, there is no information available regarding future development of Stage 3C. The previously modelled Urbsol land uses and yields of 152 residential apartments and 4225 m^2 of office space have therefore been adopted for this analysis.

Traffic generation for Stage 3C was based on the standard trip rates, reduction factors and trip directionality described in sections 3.1, 3.2 and 3.3 respectively.

The traffic generation for Stage 3C is summarised in Table 19 (page 38).

3.10 Summary

The traffic generation for each stage, as well as CCW collectively is summarised in Table 20 (page 38). Appendix B outlines the full traffic generation calculations used in this analysis.

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Table 15 Stage 1A vehicle traffic generation forecast[24]

Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
121	Cockburn ARC	Existing	654	1218	10984	486	168	557	661	5492	5492
Balance	Residential Apartments	64 apt	29	29	288	7	21	18	11	144	144
Stage 1A Total Traffic Generation			**683**	**1246**	**11272**	**493**	**190**	**574**	**672**	**5636**	**5636**

Table 16 Stage 1B vehicle traffic generation forecast[24]

Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
104	Office	10000 m^2	180	180	900	155	25	29	151	450	450
Balance	Residential Apartments	145 apt	65	65	653	17	48	40	25	326	326
	Retail	1000 m^2	10	41	414	6	4	20	22	207	207
Stage 1B Total Traffic Generation			**256**	**287**	**1967**	**178**	**77**	**88**	**198**	**983**	**983**

[24] WD = weekday average. The sum of each row may not exactly equal the total row due to rounding.

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Table 17 Stage 2 vehicle traffic generation forecast[24]

Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
107	One Bedroom Unit	9 apt	4	4	38	1	3	2	1	19	19
	Two Bedroom Unit	31 apt	13	13	132	3	10	8	5	66	66
	Three Bedroom Unit	5 apt	3	3	28	1	2	2	1	14	14
	Commercial	298 m^2	5	5	25	4	1	1	4	13	13
	Commercial / Potential Café	124 m^2	5	5	63	3	3	3	3	32	32
108	One Bedroom Unit	10 apt	4	4	43	1	3	3	2	21	21
	Two Bedroom Unit	37 apt	16	16	157	4	12	10	6	79	79
	Three Bedroom Unit	5 apt	3	3	28	1	2	2	1	14	14
	Commercial	141 m^2	2	2	12	2	0	0	2	6	6
	Commercial / Potential Café	116 m^2	5	5	59	3	2	2	2	30	30
109/111	Residential Apartments	101 apt	43	43	429	11	32	26	17	215	215
110	One Bedroom Unit	23 apt	10	10	98	3	7	6	4	49	49
	Two Bedroom Units	69 apt	29	29	293	8	22	18	11	147	147
	Dual Key Units (Two Bed)	4 apt	2	2	17	0	1	1	1	9	9
112-114	Specialty shops / take-away	4937 m^2	40	159	1590	25	15	76	83	795	795
	Fast-food	276 m^2	83	83	753	42	41	43	40	376	376
	Fast-food (pass-by trips)	276 m^2	110	110	1004	56	54	57	53	502	502
	Cinema	2311 seat	10	102	2034	9	1	61	41	1017	1017
	Gym	1115 m^2	23	57	308	12	11	32	24	154	154
	Bowling Alley (Fun Fair)	2574 m^2	3	32	432	3	0	21	11	216	216
117	One Bedroom Unit	43 apt	22	22	215	6	16	13	8	108	108
	Two Bedroom Unit	25 apt	13	13	125	3	9	8	5	63	63
	Three Bedroom Unit	28 apt	18	18	182	5	13	11	7	91	91
	Supermarket (T1)	678 m^2	5	20	239	3	2	10	10	120	120
	Potential Café (T2)	210 m^2	2	2	25	1	1	1	1	13	13
	Commercial (T3)	109 m^2	2	2	11	2	0	0	2	5	5
	Office (T11)	509 m^2	10	10	51	9	1	2	9	25	25
116	One Bedroom Unit	42 apt	21	21	210	5	16	13	8	105	105
	Two Bedroom Unit	28 apt	14	14	140	4	10	9	5	70	70
	Three Bedroom Unit	26 apt	17	17	169	4	13	10	7	85	85
	Commercial (T4-T7)	302 m^2	6	6	30	5	1	1	5	15	15

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Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
115	Studio Unit	14 apt	7	7	70	2	5	4	3	35	35
	One Bedroom Unit	14 apt	7	7	70	2	5	4	3	35	35
	Two Bedroom Unit	42 apt	21	21	210	5	16	13	8	105	105
	Pharmacy (T8)	101 m^2	1	3	29	1	0	1	1	15	15
	Consulting Room (T9)	105 m^2	15	15	150	12	3	4	11	75	75
	Banquet Restaurant (T10)	485 m^2	24	24	291	12	12	12	12	146	146
	Childcare (T12)	70 child	27	28	143	14	13	13	15	72	72
	Hotel	113 room	53	68	945	31	22	35	33	472	472
	Hotel Restaurant	227 m^2	1	1	14	1	1	1	1	7	7
	Other Hotel Facilities[25]	1232 m^2	0	0	0	0	0	0	0	0	0
Stage 2 Total Traffic Generation			**699**	**1006**	**10861**	**318**	**382**	**540**	**465**	**5431**	**5431**

[25] Trip generation assumed to be included in the “Hotel” land use of lot 115 (refer section 3.7.4).

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Table 18 Stage 3A & 3B vehicle traffic generation forecast[24]

Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
Balance	Residential Apartments	216 apt	97	97	972	25	72	59	38	486	486
Stage 3A & 3B Total Traffic Generation			**97**	**97**	**972**	**25**	**72**	**59**	**38**	**486**	**486**

Table 19 Stage 3C vehicle traffic generation forecast[24]

Lot No.	Land Use	Yield	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
Balance	Residential Apartments	152 apt	65	65	646	17	48	39	25	323	323
	Office	4225 m^2	72	72	718	62	10	11	60	359	359
Stage 3C Total Traffic Generation			**136**	**136**	**1364**	**79**	**58**	**51**	**86**	**682**	**682**

Table 20 Cockburn Central West total vehicle traffic generation forecast[24]

Stage	AM Gen	PM Gen	WD Gen	AM In	AM Out	PM In	PM Out	WD In	WD Out
Stage 1A Total Traffic Generation	683	1246	11272	493	190	574	672	5636	5636
Stage 1B Total Traffic Generation	256	287	1967	178	77	88	198	983	983
Stage 2 Total Trip Generation	699	1006	10861	318	382	540	465	5431	5431
Stage 3A & 3B Total Traffic Generation	97	97	972	25	72	59	38	486	486
Stage 3C Total Traffic Generation	136	136	1364	79	58	51	86	682	682
Cockburn Central West Total Traffic Generation	**1871**	**2772**	**26436**	**1093**	**779**	**1313**	**1459**	**13218**	**13218**

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4. Traffic Modelling

This section discusses the traffic modelling of the CCW precinct, including the forecast turning volumes for the 2031 AM and PM peak hours, projected intersection performance, and the contribution of traffic to the road network by each zone.

For this analysis, the VISSIM model used in the 2014 Urbsol TIA was updated by Urbsol with the latest CCW trip generation forecasts (refer section 3.10). Since the publication of the 2014 Urbsol TIA, this VISSIM model has been progressively updated by Urbsol, and has been used recently on a separate transport project for Main Roads WA. The internal CCW road network was also coded into the model, reflecting the projected configuration of the road network by 2031. Vehicular access points to individual lots were also included in the model where known.

4.1 Turning Volumes

Forecast turning volumes for the 2031 AM peak hour are summarised in Figure 7 (north) and Figure 8 (south), with the 2031 PM peak hour turning volumes presented in Figure 9 (north) and Figure 10 (south). These figures also illustrate the extents of the VISSIM model, the configuration of the internal road network, as well as the loading points of each lot/zone onto the road network.

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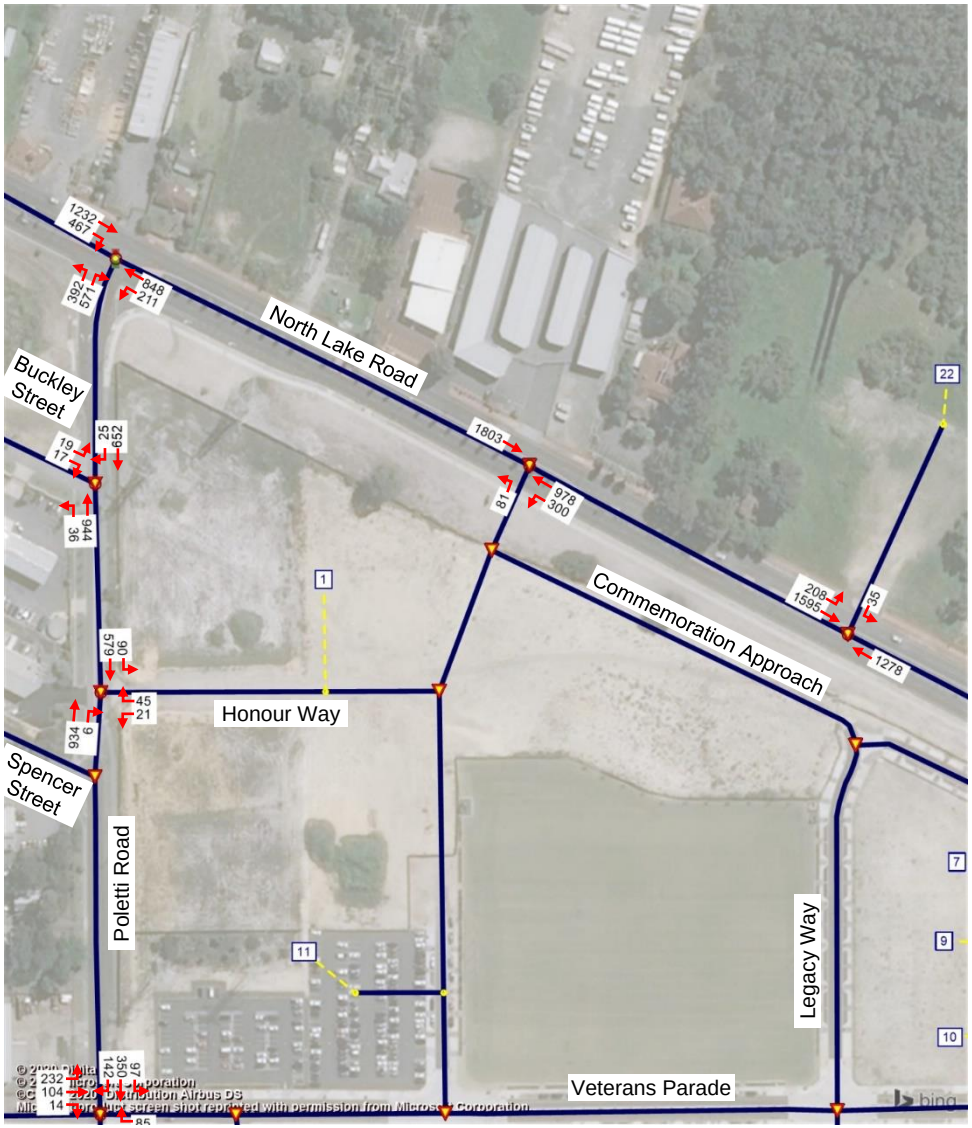

Figure 7 2031 AM Peak Hour Turning Volumes (north)

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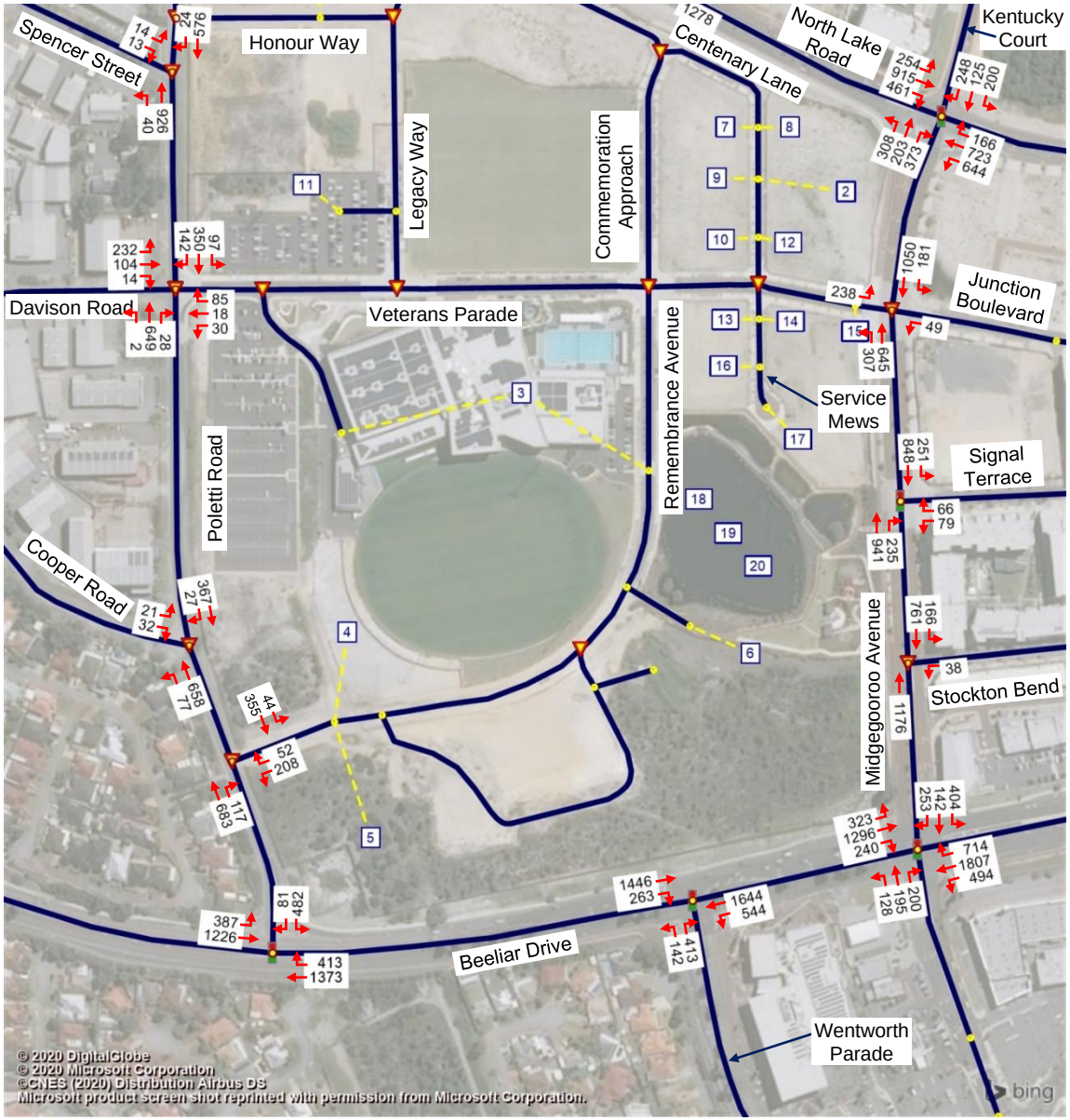

Figure 8 2031 AM Peak Hour Turning Volumes (south)

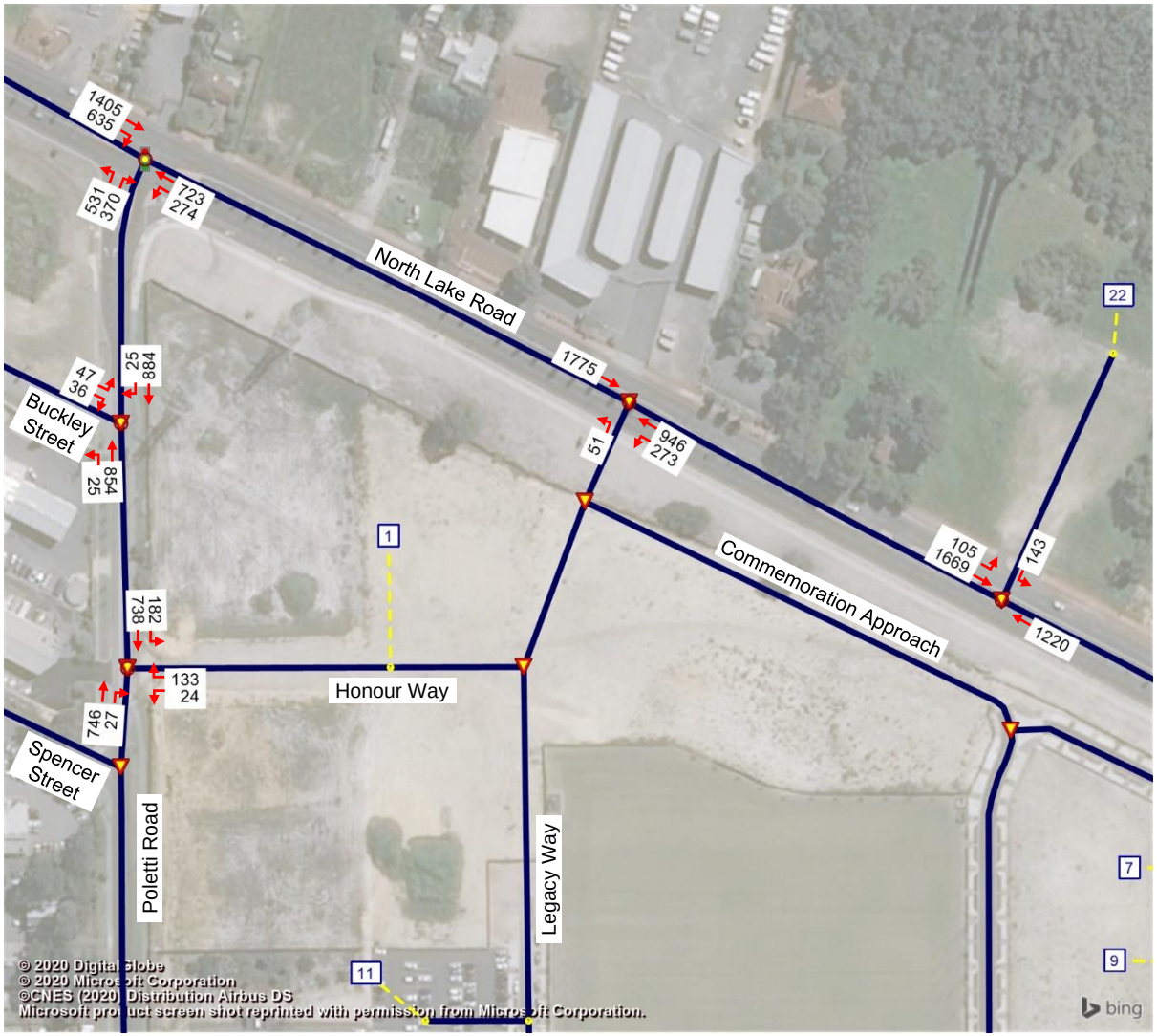

Figure 9 2031 PM Peak Hour Turning Volumes (north)

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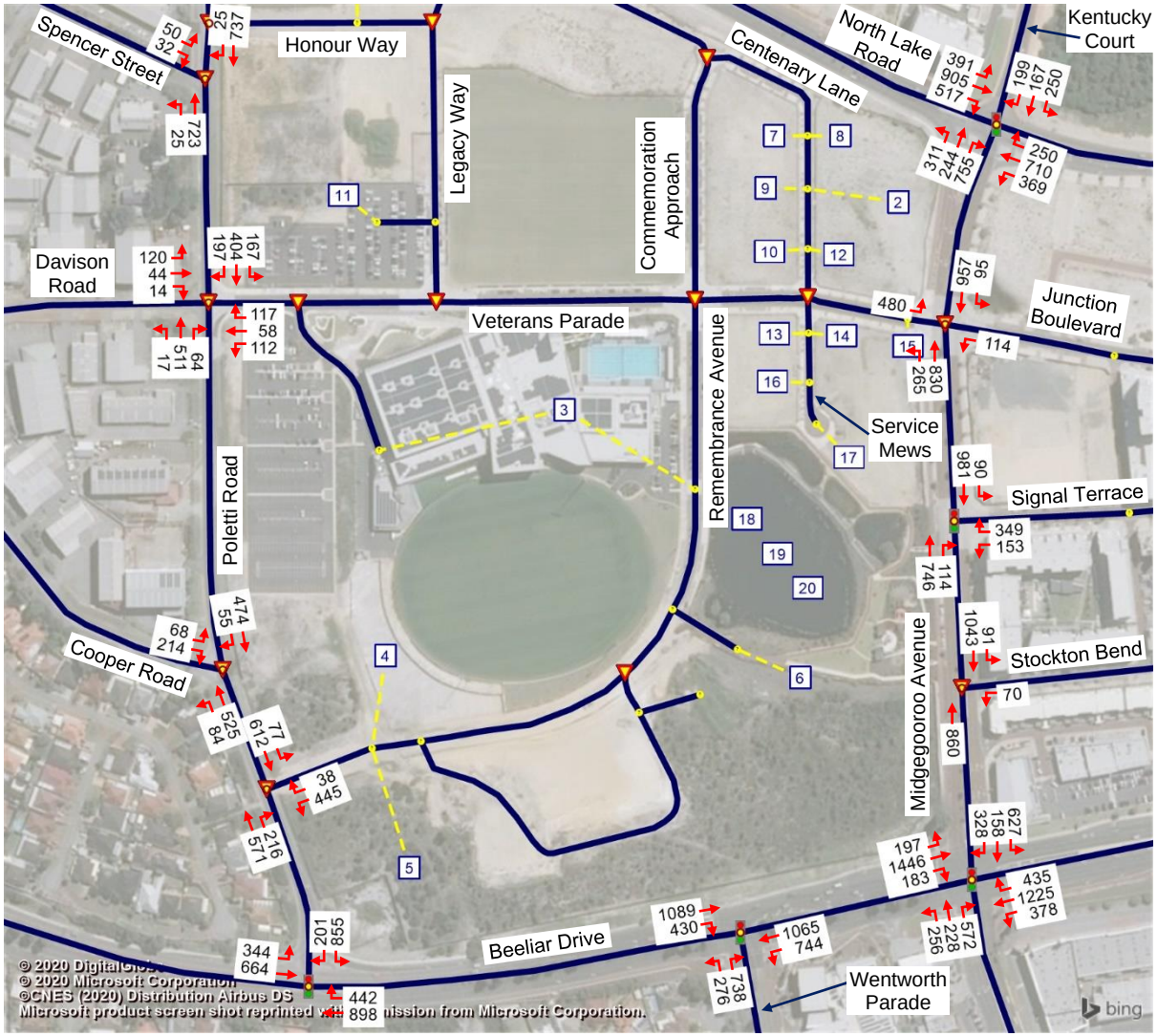

Figure 10 2031 PM Peak Hour Turning Volumes (south)

4.2 Intersection Level of Service

Table 21 summarises the Level of Service (LOS) and average delay of each intersection in the vicinity of the CCW Precinct during the 2031 AM and PM peak hour periods. These results are visually depicted by location in Figure 11 and Figure 12 for the 2031 AM and PM peak hour periods respectively. In general, a LOS of D or better is considered to represent satisfactory intersection performance.

Intersections that are most likely to approach their capacity by 2031 include the Poletti Road / Veterans Parade, Beeliar Drive / Midgegooroo Avenue and North Lake Road / Midgegooroo Avenue intersections, all of which are forecast to operate at LOS D or worse during the 2031 AM and PM peak hour periods. The unsignalised Poletti Road / Veterans Parade intersection is forecast to operate at LOS F, with turning movements out of the side roads being opposed by relatively high volumes of through traffic along Poletti Road. Approximately 25% (AM) to 40% (PM) of traffic travelling through this intersection is forecast to be generated by CCW. Intersection performance could be improved through either signalisation or conversion to a roundabout.

Conversely, the vast majority of traffic travelling through the Beeliar Drive / Midgegooroo Avenue and North Lake Road / Midgegooroo Avenue intersections is regional. At the Beeliar Drive / Midgegooroo Avenue intersection, CCW only accounts for around 7% of all traffic, whilst at the North Lake Road / Midgegooroo Avenue intersection, around 12-15% of traffic is generated by CCW. Further discussion of the traffic contribution by each development site within CCW can be found in section 4.3. The Beeliar Drive / Midgegooroo Avenue intersection is marginally forecast to operate at an LOS of E, with the threshold of LOS D (at 55 seconds) being only one second less than the forecast delay of 56 seconds during both peak periods.

In addition, the turning movements out of Honour Way are forecast to operate at LOS F during the PM peak, despite the intersection being forecast to operate at LOS A overall. This is due to the high delay, low volumes on Honour Way (approximately 150 vehicles) being opposed by the high volumes of through traffic on Poletti Road (approximately 1500 vehicles) which are not opposed and thus encounter no delays. In practice, vehicles turning out of Honour Way have alternative routes for leaving CCW (via Remembrance Avenue, Legacy Way and Veterans parade) in the event that motorists experience unreasonable delays.

Based on the LOS and average delay results, intersection performance in and around CCW is likely to be satisfactory through 2031, subject to the Poletti Road / Veterans Parade intersection being modified to accommodate the forecast traffic volumes. This outcome is subject to change, particularly as the land uses and yields of lots within CCW are further refined.

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Table 21 Intersection LOS and Average Delay - 2031 AM & PM Peak[26]

Node	Intersection	AM LOS	AM Delay	PM LOS	PM Delay
1	North Lake Rd / Poletti Rd	C	34 s	C	30 s
2	Poletti Rd / Buckley St	A	0 s	A	1 s
3	Poletti Rd / Honour Wy	A	1 s	A	8 s
4	Poletti Rd / Spencer St	A	0 s	A	1 s
5	Poletti Rd / Veterans Pde	F	129 s	F	92 s
6	Poletti Rd / Cooper Rd	A	1 s	A	8 s
7	Poletti Rd / Remembrance Ave	A	2 s	A	6 s
8	Beeliar Dr / Poletti Rd	B	16 s	C	22 s
9	Beeliar Dr / Wentworth Pde	C	22 s	C	34 s
10	Beeliar Dr / Midgegooroo Ave	E	56 s	E	56 s
16	North Lake Rd / Midgegooroo Ave	D	42 s	D	53 s
17	Midgegooroo Ave / Veterans Pde	A	1 s	A	6 s
18	Midgegooroo Ave / Signal Tce	B	20 s	C	29 s
21	Midgegooroo Ave / Stockton Bnd	A	0 s	A	0 s
42	North Lake Rd / Legacy Wy	A	0 s	A	0 s

[26] Node numbers and intersections are discussed in section 4.3.

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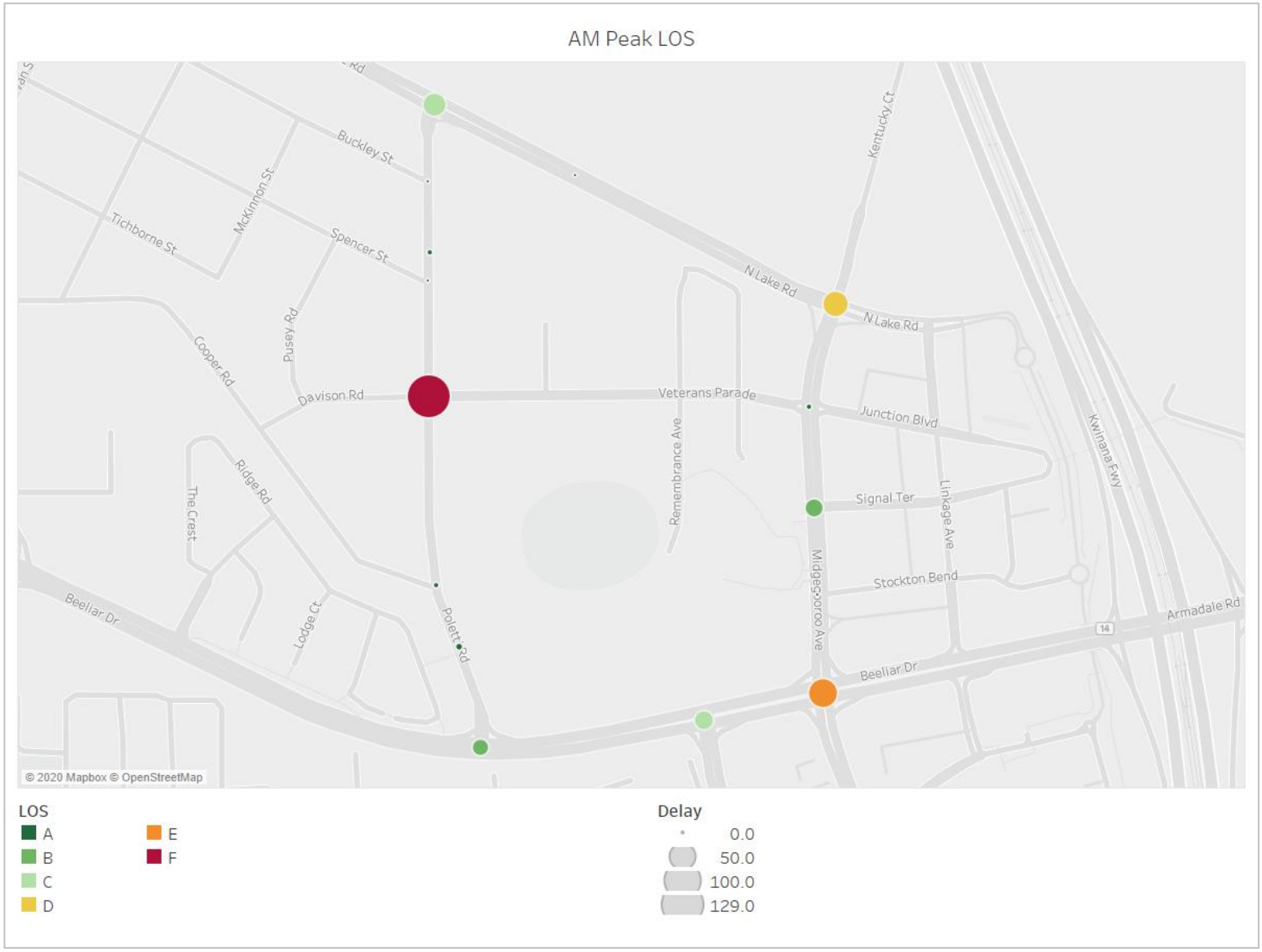

Figure 11 LOS - 2031 AM Peak

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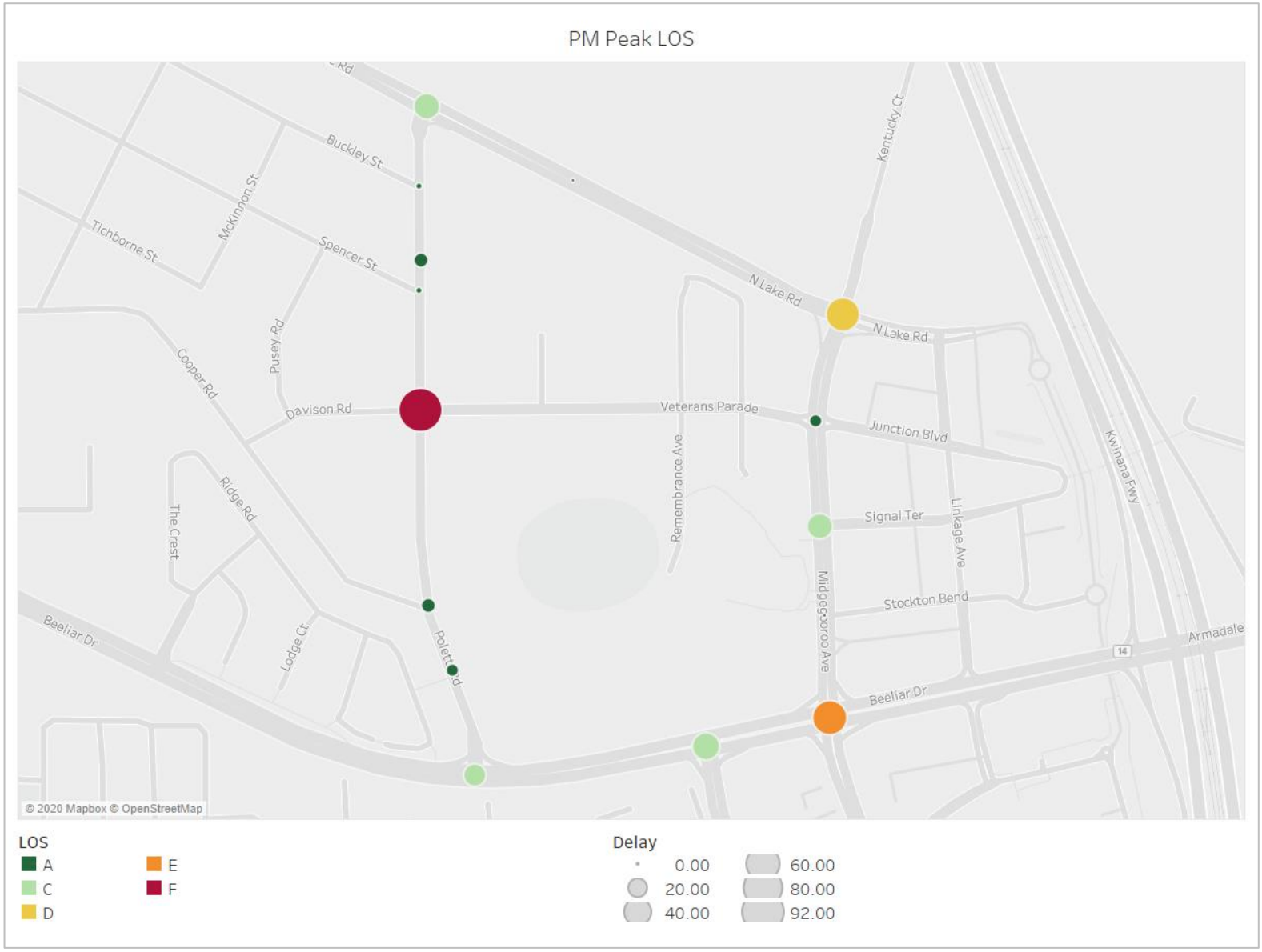

Figure 12 LOS - 2031 PM Peak

4.3 Site contribution to volumes

This section identifies the extents to which each development/zone contributes to overall traffic volumes through each intersection in the vicinity of the CCW precinct, as well as along Poletti Road and Midgegooroo Avenue.

4.3.1 Intersection Contributions

The 15 intersections (and associated node numbers) included in this assessment are identified in Figure 13, and are the same as those whose results for LOS and delay were presented in Table 21 (page 45).

Proportional traffic contributions to each intersection by lot/zone are presented in Table 22 (2031 AM peak) and Table 23 (2031 PM peak). The average contributions across both of these peak hour periods is summarised in Table 24.

From these results, it can be seen that regional traffic accounts for the vast majority of traffic passing through each intersection, ranging from 69% to 95% in the AM and 56% to 93% in the PM peak. The highest CCW precinct (i.e. lowest regional traffic) contribution proportion occurs at node 7 (Poletti Road / Remembrance Avenue), which will be located around 130 m north of Beeliar Drive. Nodes 3 (Poletti Road / Honour Way) and 5 (Poletti Road / Veterans Parade) have the next highest CCW precinct contribution proportions, with the former intersection to be located around 180 m and south of North Lake Road.

Figure 14 illustrates the proportional traffic contributions at each intersection by generator type (i.e. regional traffic, Cockburn ARC and the remaining development in the CCW precinct). From this, the remaining development within CCW will collectively generate more traffic than Cockburn ARC at the vast majority of intersections during the AM and PM peak hour periods.

4.3.2 Poletti Road and Midgegooroo Avenue Contributions

Table 25 and Table 26 summarise the proportional traffic contributions to Poletti Road and Midgegooroo Avenue by each lot/zone.

In the AM peak, the lowest regional traffic contributions occur at the southbound carriageway of Poletti Road, with just 59% and 66% on the southern and northern sections respectively. The northbound carriageways of Poletti Road and Midgegooroo Avenue are forecast to accommodate somewhat higher regional traffic contributions, ranging from around 73% to 84%. Almost no traffic from CCW is expected to use the southbound carriageway of Midgegooroo Avenue as close to 100% of traffic is regional. This is likely due to there being no right turn access onto Midgegooroo Avenue from Veterans Parade, with CCW traffic requiring access to the Cockburn Central station precinct likely using alternative routes such as Remembrance Avenue, Poletti Road and Beeliar Drive.

Similar trends are observed in the PM peak, albeit with lower proportions of regional traffic being modelled. Around 53% of traffic on Poletti Road southbound is expected to be regional, whilst around 65-75% of traffic on the northbound carriageways of Poletti Road and Midgegooroo Avenue is forecast to be regional. Almost all traffic on Midgegooroo Avenue southbound is likely to be regional during the PM peak as well.

Figure 15 illustrates the proportional traffic contributions on Poletti Road and Midgegooroo Avenue by generator type (i.e. regional traffic, Cockburn ARC and the remaining development in the CCW precinct). The remaining development within CCW will collectively generate more traffic than Cockburn ARC along Poletti Road and Midgegooroo Avenue during both the AM and PM peak hour periods, except for the southern section of Poletti Road southbound during the PM peak hour.

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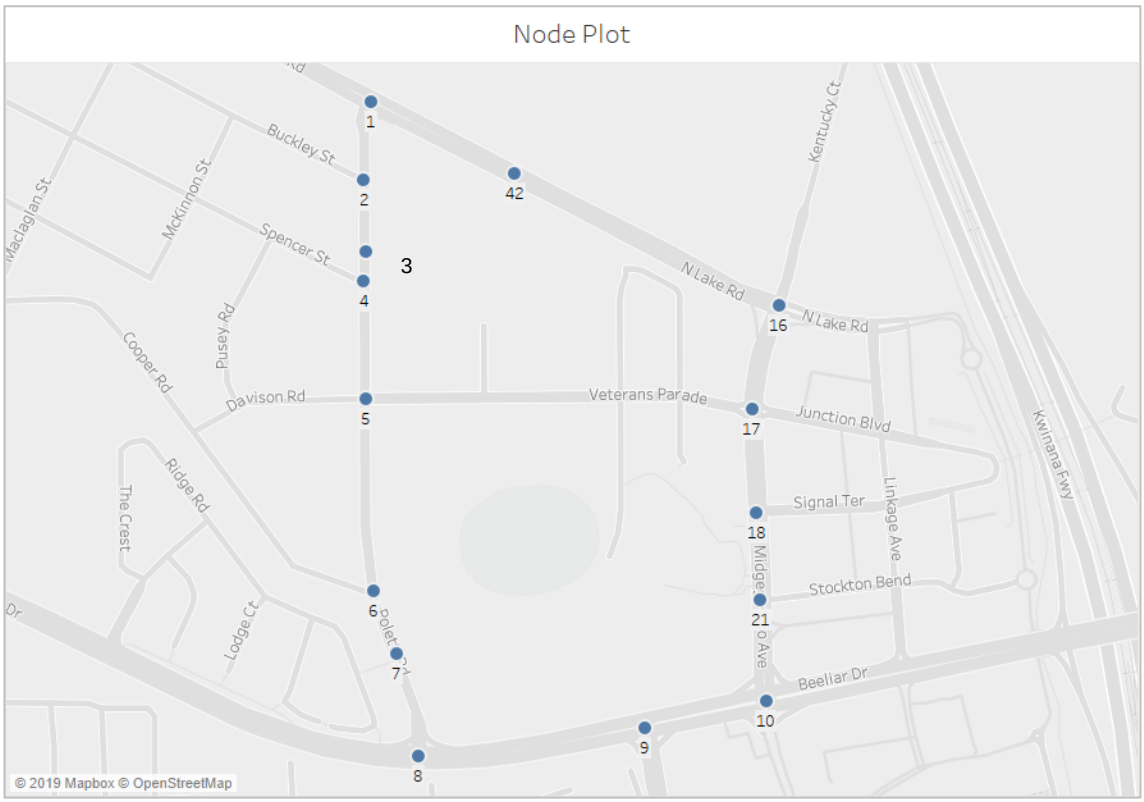

Figure 13 Intersection (node) locations

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Table 22 Intersection contribution by lot/zone - 2031 AM Peak[27]

Node[28]	ARC	Stage 1A (Bal)	Lot 104	Stage 1B (Bal)	Stage 3A/B	Stage 3C	Lots 107-108	Lots 109/111	Lot 110	Lots 112-114	Lots 115-117	Regional
1	3.7%	0.1%	1.4%	0.8%	1.3%	0.9%	0.4%	0.3%	0.3%	1.5%	1.7%	87.5%
2	8.1%	0.3%	3.1%	1.9%	2.9%	1.9%	1.0%	0.6%	0.6%	1.5%	1.4%	76.8%
3	8.2%	0.3%	3.1%	3.3%	2.9%	1.9%	0.9%	0.6%	0.6%	1.4%	1.3%	75.4%
4	8.7%	0.3%	<0.1%	1.5%	3.0%	2.0%	0.7%	0.5%	0.5%	0.2%	0.2%	82.3%
5	14.0%	0.3%	2.5%	1.3%	2.8%	2.3%	0.8%	0.6%	0.5%	0.7%	0.8%	73.5%
6	2.0%	0.5%	1.3%	1.3%	4.5%	3.2%	0.1%	0.1%	0.1%	0.6%	0.7%	85.6%
7	8.5%	1.7%	1.0%	1.1%	5.8%	4.4%	0.7%	0.6%	0.4%	3.3%	3.6%	69.0%
8	3.1%	0.5%	0.4%	0.4%	0.8%	0.7%	0.3%	0.2%	0.2%	1.7%	1.3%	90.4%
9	1.7%	0.3%	0.2%	0.3%	0.5%	0.4%	0.1%	0.1%	0.1%	1.0%	0.7%	94.6%
10	1.7%	0.2%	0.2%	0.1%	0.3%	0.3%	0.3%	0.2%	0.2%	1.8%	1.6%	93.2%
16	4.9%	<0.1%	1.6%	0.5%	0.4%	1.0%	0.4%	0.3%	0.3%	1.2%	1.6%	87.9%
17	3.7%	0.1%	0.6%	0.4%	0.5%	1.2%	1.3%	0.9%	0.9%	6.2%	6.2%	78.0%
18	2.7%	0.1%	0.4%	0.1%	0.1%	0.6%	0.7%	0.4%	0.4%	4.3%	3.7%	86.6%
21	2.7%	0.1%	0.4%	0.1%	0.2%	0.6%	0.8%	0.4%	0.4%	4.7%	4.1%	85.6%
42	6.3%	-	2.2%	0.4%	0.3%	1.0%	0.1%	<0.1%	0.1%	1.2%	1.5%	87.0%

[27] The sum of each row may not exactly equal 100.0% due to rounding.
[28] For node locations, refer to Figure 13.

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Table 23 Intersection contribution by lot/zone - 2031 PM Peak[27]

Node[28]	ARC	Stage 1A (Bal)	Lot 104	Stage 1B (Bal)	Stage 3A/B	Stage 3C	Lots 107-108	Lots 109/111	Lot 110	Lots 112-114	Lots 115-117	Regional
1	7.5%	0.4%	1.3%	0.8%	1.1%	1.0%	0.4%	0.3%	0.3%	3.4%	2.0%	81.7%
2	15.4%	0.9%	2.5%	1.6%	2.3%	1.9%	0.8%	0.6%	0.5%	6.8%	3.9%	62.9%
3	16.1%	0.9%	2.6%	3.3%	2.3%	1.9%	0.8%	0.6%	0.6%	7.1%	4.1%	59.8%
4	17.3%	1.1%	0.2%	1.9%	2.6%	2.2%	0.4%	0.3%	0.3%	0.7%	0.4%	72.6%
5	23.8%	0.9%	3.9%	1.8%	2.3%	2.3%	0.5%	0.3%	0.3%	2.0%	1.2%	60.5%
6	6.2%	1.3%	4.2%	1.8%	3.5%	2.8%	0.2%	0.1%	0.1%	1.2%	0.7%	77.9%
7	19.6%	1.3%	3.1%	1.3%	4.6%	4.7%	0.6%	0.4%	0.4%	5.1%	3.0%	56.0%
8	11.0%	0.2%	1.8%	0.8%	1.2%	1.6%	0.3%	0.2%	0.2%	3.0%	1.8%	77.9%
9	6.4%	0.1%	1.1%	0.4%	0.7%	0.8%	0.2%	0.1%	0.1%	1.5%	0.9%	87.8%
10	3.6%	<0.1%	0.5%	0.2%	0.4%	0.4%	0.2%	0.1%	0.1%	1.4%	0.8%	92.5%
16	6.2%	0.2%	1.2%	0.9%	0.4%	0.6%	0.3%	0.2%	0.2%	3.3%	2.0%	84.6%
17	6.9%	0.1%	1.6%	0.5%	0.3%	0.7%	1.0%	0.7%	0.7%	9.4%	5.5%	72.5%
18	2.8%	<0.1%	0.2%	<0.1%	0.1%	0.2%	0.6%	0.4%	0.4%	4.8%	2.7%	87.9%
21	3.0%	<0.1%	0.2%	0.1%	0.1%	0.2%	0.4%	0.3%	0.3%	3.7%	2.1%	89.6%
42	7.1%	0.2%	0.8%	1.1%	0.4%	0.5%	0.1%	0.1%	0.1%	1.0%	0.6%	88.0%

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Table 24 Intersection contribution by lot/zone - Average of 2031 AM and PM Peak[27]

Node[28]	ARC	Stage 1A (Bal)	Lot 104	Stage 1B (Bal)	Stage 3A/B	Stage 3C	Lots 107-108	Lots 109/111	Lot 110	Lots 112-114	Lots 115-117	Regional
1	5.6%	0.3%	1.4%	0.8%	1.2%	0.9%	0.4%	0.3%	0.3%	2.5%	1.9%	84.6%
2	11.7%	0.6%	2.8%	1.7%	2.6%	1.9%	0.9%	0.6%	0.6%	4.1%	2.7%	69.9%
3	12.2%	0.6%	2.9%	3.3%	2.6%	1.9%	0.9%	0.6%	0.6%	4.3%	2.7%	67.6%
4	13.0%	0.7%	0.1%	1.7%	2.8%	2.1%	0.5%	0.4%	0.4%	0.4%	0.3%	77.5%
5	18.9%	0.6%	3.2%	1.6%	2.5%	2.3%	0.6%	0.5%	0.4%	1.3%	1.0%	67.0%
6	4.1%	0.9%	2.7%	1.6%	4.0%	3.0%	0.1%	0.1%	0.1%	0.9%	0.7%	81.8%
7	14.1%	1.5%	2.0%	1.2%	5.2%	4.5%	0.6%	0.5%	0.4%	4.2%	3.3%	62.5%
8	7.1%	0.3%	1.1%	0.6%	1.0%	1.1%	0.3%	0.2%	0.2%	2.4%	1.5%	84.2%
9	4.1%	0.2%	0.7%	0.4%	0.6%	0.6%	0.2%	0.1%	0.1%	1.2%	0.8%	91.2%
10	2.7%	0.1%	0.3%	0.1%	0.3%	0.4%	0.2%	0.1%	0.1%	1.6%	1.2%	92.9%
16	5.6%	0.1%	1.4%	0.7%	0.4%	0.8%	0.4%	0.3%	0.3%	2.2%	1.8%	86.2%
17	5.3%	0.1%	1.1%	0.4%	0.4%	1.0%	1.2%	0.8%	0.8%	7.8%	5.9%	75.2%
18	2.7%	<0.1%	0.3%	0.1%	0.1%	0.4%	0.6%	0.4%	0.4%	4.5%	3.2%	87.3%
21	2.8%	0.1%	0.3%	0.1%	0.1%	0.4%	0.6%	0.4%	0.4%	4.2%	3.1%	87.6%
42	6.7%	0.2%	1.5%	0.8%	0.3%	0.7%	0.1%	0.1%	0.1%	1.1%	1.0%	87.5%

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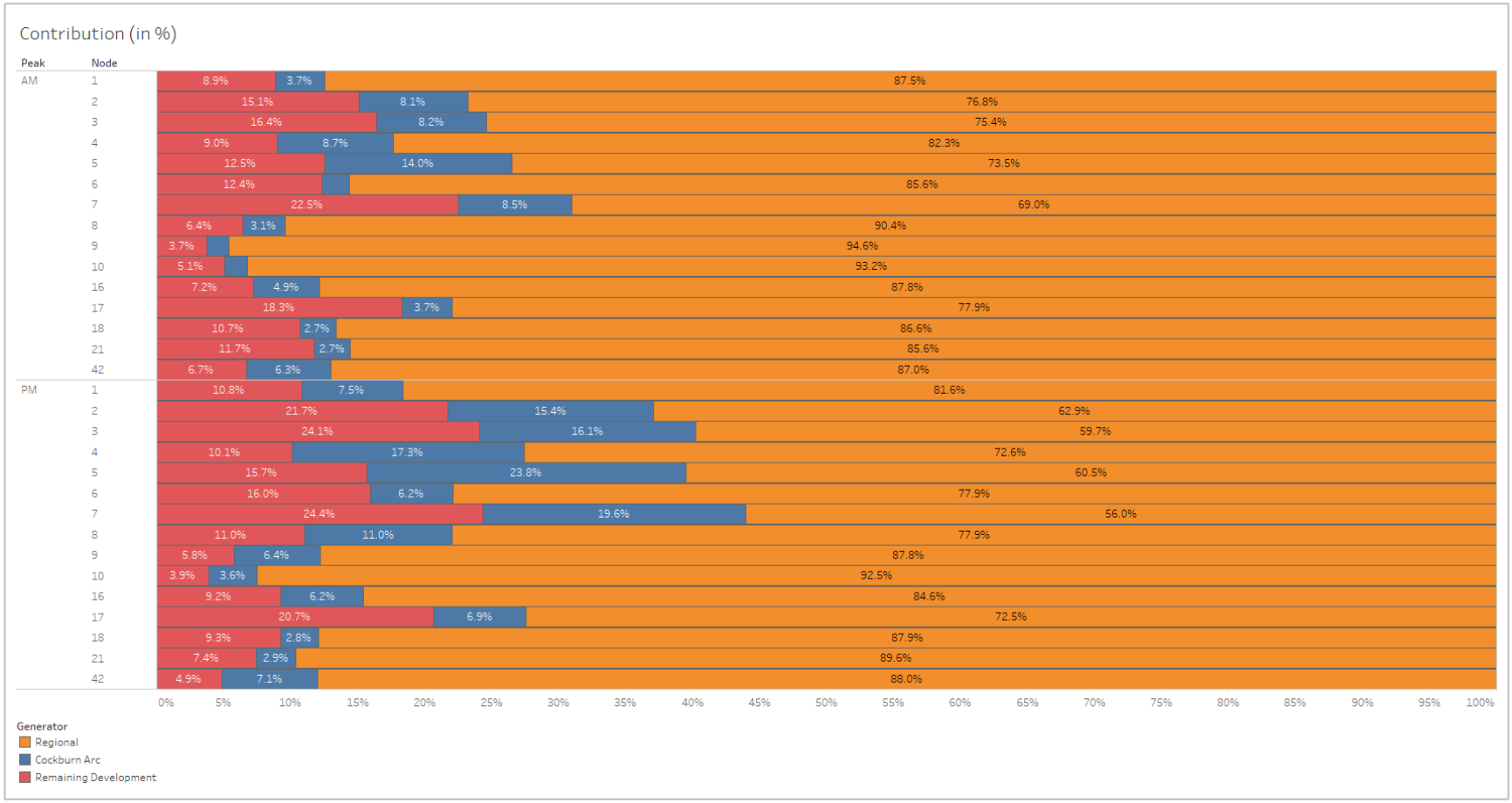

Figure 14 Intersection contribution by generator type – 2031 AM and PM peak

Table 25 Poletti Road and Midgegooroo Avenue contribution by lot/zone - 2031 AM Peak[27]

Link[29]	ARC	Stage 1A (Bal)	Lot 104	Stage 1B (Bal)	Stage 3A/B	Stage 3C	Lots 107-108	Lots 109/111	Lot 110	Lots 112-114	Lots 115-117	Regional
Mi N NB	3.4%	0.2%	0.7%	1.1%	1.2%	1.8%	1.8%	1.6%	1.5%	6.0%	7.8%	73.0%
Mi N SB	0.3%	-	<0.1%	<0.1%	<0.1%	<0.1%	0.1%	<0.1%	<0.1%	0.2%	0.2%	99.0%
Mi S NB	4.6%	0.2%	0.7%	0.1%	0.2%	1.1%	1.2%	0.7%	0.7%	8.2%	7.1%	75.1%
Mi S SB	-	-	-	-	<0.1%	-	-	-	-	-	-	100.0%
Po N NB	4.6%	0.4%	1.0%	2.6%	3.2%	1.7%	1.1%	0.9%	0.8%	0.2%	0.3%	83.3%
Po N SB	13.6%	0.2%	6.2%	0.9%	2.6%	2.4%	0.7%	0.3%	0.4%	3.4%	3.1%	66.3%
Po S NB	6.5%	0.4%	1.0%	0.2%	0.6%	1.3%	0.4%	0.2%	<0.1%	2.8%	2.4%	84.1%
Po S SB	12.9%	2.8%	1.2%	2.5%	4.6%	3.0%	1.2%	1.2%	1.1%	4.5%	5.8%	59.4%

Table 26 Poletti Road and Midgegooroo Avenue contribution by lot/zone - 2031 PM Peak[27]

Link[29]	ARC	Stage 1A (Bal)	Lot 104	Stage 1B (Bal)	Stage 3A/B	Stage 3C	Lots 107-108	Lots 109/111	Lot 110	Lots 112-114	Lots 115-117	Regional
Mi N NB	9.6%	0.3%	3.2%	1.0%	0.6%	1.3%	1.1%	0.7%	0.8%	11.2%	6.8%	63.4%
Mi N SB	0.4%	<0.1%	0.2%	0.1%	0.1%	0.2%	-	-	-	<0.1%	<0.1%	99.1%
Mi S NB	6.5%	-	0.3%	0.1%	0.1%	0.3%	1.1%	0.8%	0.8%	8.9%	5.1%	76.2%
Mi S SB	-	<0.1%	-	-	0.1%	0.2%	-	-	-	-	-	99.8%
Po N NB	14.2%	0.2%	4.0%	1.4%	0.9%	1.6%	0.4%	0.3%	0.3%	4.0%	2.5%	70.3%
Po N SB	17.0%	1.5%	1.1%	2.0%	3.8%	2.3%	1.2%	0.9%	0.8%	9.8%	5.6%	54.3%
Po S NB	9.7%	0.4%	0.4%	1.1%	2.4%	2.0%	0.8%	0.6%	0.6%	7.0%	4.0%	71.1%
Po S SB	28.4%	0.4%	5.4%	1.7%	2.0%	3.6%	0.4%	0.3%	0.3%	4.2%	2.6%	50.9%

[29] Mi N = Midgegooroo Avenue northern section (i.e. south of North Lake Road), Mi S = Midgegooroo Avenue southern section (i.e. north of Beeliar Drive), Po N = Poletti Road northern section (i.e. south of North Lake Road), Po S = Poletti Road southern section (i.e. north of Beeliar Drive). NB = northbound, SB = southbound.

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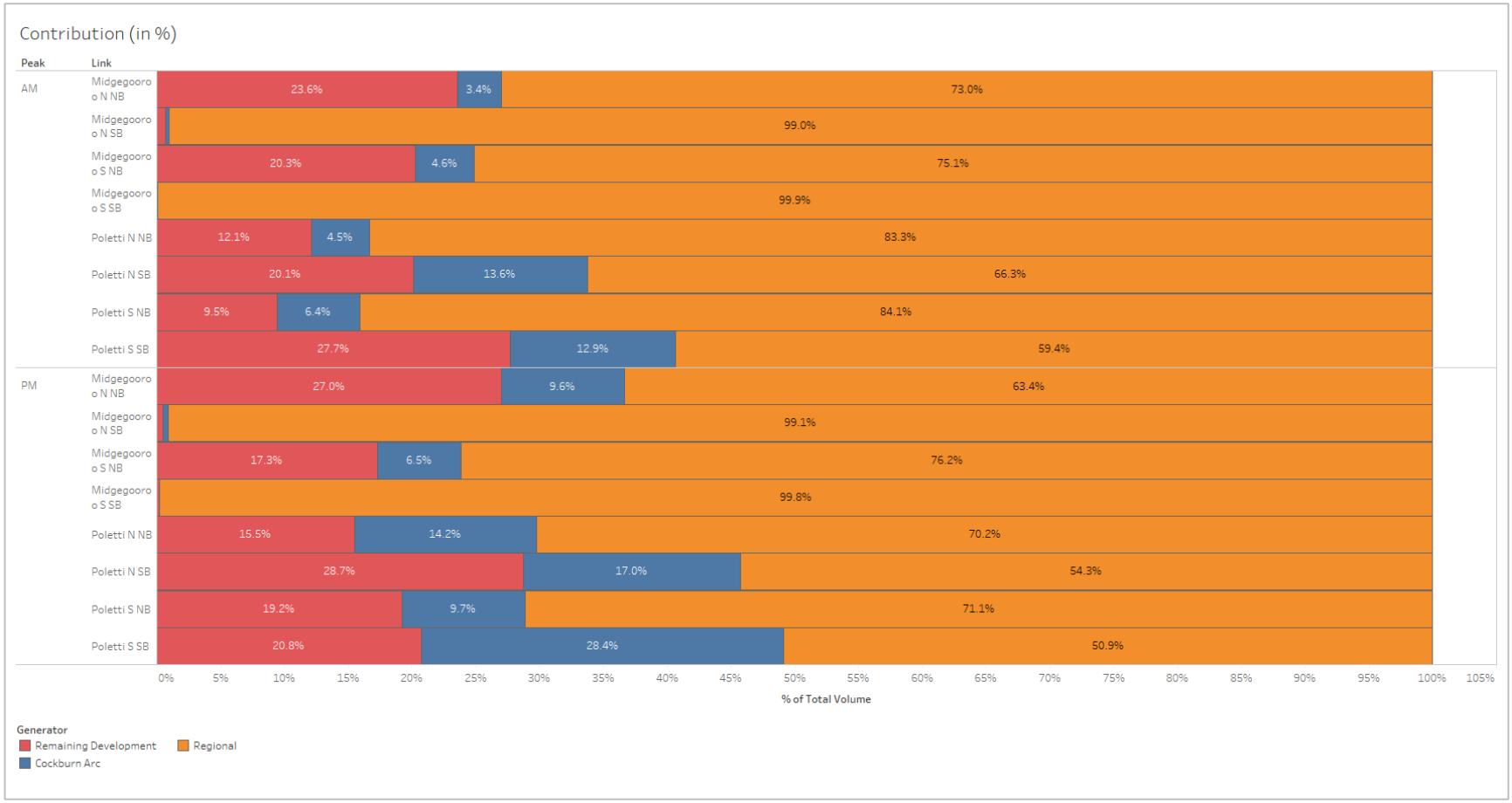

Figure 15 Poletti Road and Midgegooroo Avenue contribution by generator type – 2031 AM and PM peak

4.4 24-Hour Volume Projections

Table 27 presents the volume of traffic forecast to use Midgegooroo Avenue and Poletti Road on a typical weekday in 2031, broken down by generator type as well as direction. Based on this forecast, around 29,000 vehicles per day are projected to use Midgegooroo Avenue, whilst around 19,000 vehicles are projected to use Poletti Road on a typical weekday. This would likely trigger the legal agreement between the City of Cockburn and DevelopmentWA for the upgrading of Poletti Road as the forecast exceeds the 15,000 vehicles per day threshold (refer section 2.4).

Section 4.6 provides some high-level discussion around how pedestrian movements across Midgegooroo Avenue, Poletti Road, and through CCW can be safely managed, in consideration of the forecast traffic volumes.

Table 27 24-Hour Poletti Road and Midgegooroo Avenue Volume Projections by generator type – 2031 weekday[30]

Link	ARC	CCW (Bal)[31]	Regional	Total
Midgegooroo Ave North NB	915	3,283	9,048	13,246
Midgegooroo Ave North SB	47	76	15,768	15,891
Midgegooroo Ave South NB	663	2,481	9,704	12,848
Midgegooroo Ave South SB	0	15	13,307	13,322
Poletti Rd North NB	1,009	1,303	6,916	9,228
Poletti Rd North SB	1,450	2,202	5,392	9,043
Poletti Rd South NB	751	1,332	6,384	8,466
Poletti Rd South SB	2,189	1,962	6,410	10,562

Table 28 summarises the relative contributions of each generator to the daily forecast traffic for Midgegooroo Avenue and Poletti Road. Similar proportions are forecast to that of the AM and PM peak hours (refer Figure 15), with regional traffic accounting for around 60% of traffic on Poletti Road southbound, around 70-75% on Poletti Road and Midgegooroo Avenue northbound and nearly all traffic on Midgegooroo Avenue southbound. As was the case in the AM and PM peak hours, the remaining development within CCW will collectively generate more traffic than Cockburn ARC along Poletti Road and Midgegooroo Avenue over a typical weekday, except for the southern section of Poletti Road southbound during the PM peak hour.

Table 28 24-Hour Poletti Road and Midgegooroo Avenue contributions by generator type - 2031 weekday

Link	ARC	CCW (Bal)[31]	Regional	Total
Midgegooroo Ave North NB	6.9%	24.8%	68.3%	100.0%
Midgegooroo Ave North SB	0.3%	0.5%	99.2%	100.0%
Midgegooroo Ave South NB	5.2%	19.3%	75.5%	100.0%
Midgegooroo Ave South SB	-	0.1%	99.9%	100.0%
Poletti Rd North NB	10.9%	14.1%	74.9%	100.0%
Poletti Rd North SB	16.0%	24.4%	59.6%	100.0%
Poletti Rd South NB	8.9%	15.7%	75.4%	100.0%
Poletti Rd South SB	20.7%	18.6%	60.7%	100.0%

[30] 24 hour forecasts are established based on expanding the forecasted peak hour volumes based on current peaking characteristics at each observed site overlayed with daily site projected volumes.
[31] Remaining development within CCW (i.e. excluding Cockburn ARC)

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Table 29 presents the daily contribution of each generator as an average of each direction (i.e. northbound or southbound), then by both directions combined. Based on these results, the CCW precinct (inclusive of the Cockburn ARC) contributes around 14% of forecast daily traffic on Midgegooroo Avenue in 2031, and around one-third of forecast daily traffic on Poletti Road.

Table 29 Average daily contribution summary - 2031 weekday

Link	ARC	CCW (Bal)[31]	Regional	Total
Midgegooroo Ave NB	6.0%	22.0%	71.9%	100.0%
Midgegooroo Ave SB	0.1%	0.3%	99.6%	100.0%
Midgegooroo Ave NB+SB	**3.1%**	**11.2%**	**85.7%**	**100.0%**
Poletti Rd NB	9.9%	14.9%	75.2%	100.0%
Poletti Rd SB	18.4%	21.5%	60.2%	100.0%
Poletti Rd NB+SB	**14.1%**	**18.2%**	**67.7%**	**100.0%**

4.5 Upgrade Contribution for Poletti Road and Signal Terrace

This section summarises the suggested cost contribution from the remainder of the CCW precinct in relation to two future projects: the upgrade of Poletti Road to a dual carriageway, as well as the upgrade of the Midgegooroo Avenue / Signal Terrace intersection. These cost contributions are based on the forecast daily traffic contribution from the CCW precinct (excluding the already-completed Cockburn ARC).

4.5.1 Poletti Road

Of the 32.3% daily contribution to traffic on Poletti Road by the CCW precinct (refer Table 29), 18.2% is projected to come from the remaining development in CCW (i.e. excluding Cockburn ARC), accounting for over half of the overall CCW precinct traffic on Poletti Road. However, regional traffic continues to comprise the vast majority of vehicles on Poletti Road for a typical weekday at nearly two-thirds of the overall volume.

Based on these proportions, it is recommended that 18.2% of the cost of upgrading Poletti Road be split between the remaining developments in the CCW precinct.

4.5.2 Midgegooroo Avenue / Signal Terrace Intersection

From the average of the 2031 AM/PM peak contributions by lot (refer Table 24), approximately 87% of traffic forecast to pass through the Midegooroo Avenue / Signal Terrace intersection (node 18) is regional, with the remaining 13% forecast to be travelling to/from the CCW precinct. Of this 13%, Lots 112-114 is the highest proportional contributor with around 4.5% (accounting for one-third of the overall CCW precinct contribution), followed by Lots 115-117 (3.2%) and the Cockburn ARC (2.7%). All other lots/zones are forecast to contribute less than 1% to the traffic passing through the Midgegooroo Avenue / Signal Terrace intersection.

Based on these proportions, it is recommended that 10.0% of the upgrade cost relating to the Midgegooroo Avenue / Signal Terrace intersection be split between the remaining developments in the CCW precinct.

4.6 Centenary Lane Widening

The City also conducted a review of the developer's TIA for Lots 112-114 in late 2019 (separate to the peer review commissioned by DevelopmentWA and conducted by GHD; refer section 3.7.3), which confirmed the need to widen the existing carriageways on Centenary Lane. Accordingly, this will have an impact on the setback of Lots 112-114. Below is a summary of the

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City's review comments for the developer's TIA (specifically in relation to the capacity of Centenary Lane), and reflects information that was available at the time of the assessment.

Austroads' *Guidelines to Traffic Management – Part 3* suggests indicative capacities for urban roads with interrupted flow. These guidelines indicate Centenary Lane will have a lane capacity of up to 900 vehicles per hour in one direction (1,800 vehicles per hour for both directions combined). The future 2031 modelling assessment undertaken as part of the developer's TIA indicates that Centenary Lane is expected to carry 695 vehicles per hour during the Thursday PM peak and up to 939 vehicles per hour during the Saturday peak (in both directions). These volumes consist of traffic associated with Lots 112-114, as well as background traffic to/from the adjoining Lots 115-117 (west of Centenary Lane) and traffic from other lots within CCW.

On this basis, a single lane in each direction is considered adequate in terms of vehicular capacity. The City should continue to observe and monitor traffic operations along Centenary Lane as future development occurs in the area, to determine if additional capacity or local area traffic measures (LATM) are needed.

For the cross section configuration of Centenary Lane, the developer's TIA recommends widening the carriageway at Centenary Lane from the existing 5.8 m to 6.4 m (i.e. 3.2 m wide lanes), whilst maintaining the 12 m existing road reserve width. This will allow extra space for two large heavy vehicles to pass each other safely, or for a heavy vehicle to comfortably pass a stopped vehicle. An extract from the developer's TIA detailing the suggested modifications to Centenary Lane is presented in Table 30.

Table 30 Recommended cross section for Centenary Lane[32]

Cross Section Element	Existing	Proposed
Road Reserve Width	12m	12m
Carriageway Width	5.8m	6.4m (2 x 3.2m wide lanes)
Median Width	-	-
West Verge:	4.5m	4.5m
East Verge:	1.7m	1.1m
East side of Centenary Lane (proposed Cinema development):	Path (width varies) and alfresco area	Minimum 3m building setback and provision of 3m wide continuous shared path within development boundary

4.7 Recommendations

The following recommendations are made based on the findings of this analysis. It is assumed that this analysis (and the associated modelling) will be updated regularly, in line with the City of Cockburn's desire to track the cumulative effects of current and future development proposals at the CCW precinct.

- All future development proposals that are submitted to the DRP (as well as any amendments to such proposals that are currently before the DRP) should be carefully evaluated in terms of their likely traffic impact. Particular attention should be given to those proposals with yields greater than those originally allowed for in their respective zone, and/or land uses that are likely to result in significantly higher traffic generation (e.g. replacing residential with retail).

[32] Source: Aurecon.

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- The intersections of Poletti Road / Veterans Parade, Beeliar Drive / Midgegooroo Avenue and North Lake Road / Midgegooroo Avenue are forecast to operate at LOS D or worse by the 2031 AM and PM peaks, and should therefore be evaluated for any changes in performance whenever a development proposal is submitted or modified. Furthermore, upgrades to the Poletti Road / Veterans Parade intersection should be considered, as traffic exiting Veterans Parade and Davison Road are likely to encounter significant delays giving way to through traffic on Poletti Road.
- As the forecast traffic volume on Poletti Road exceeds 15,000 vehicles per day by 2031, consideration should be given towards the legal agreement between the City of Cockburn and DevelopmentWA regarding the future upgrading of Poletti Road (refer section 2.4).
- The magnitude of traffic volumes forecast for Midgegooroo Avenue and Poletti Avenue (refer section 4.4) means that suitable crossing points should be provided so that pedestrians can cross safely between CCW and Cockburn Central station. Whilst there are existing median refuges and pedestrian ramps along Midgegooroo Avenue, increasing traffic volumes may necessitate the future provision of controlled crossings (such as by signalising the Midgegooroo Avenue / Signal Terrace intersection), traffic calming and/or other LATM measures for roads in and/or around CCW. Assessment of LATM measures is beyond the scope of this TIA update, however separate investigations should be carried out to determine whether LATM should be provided, and to what extent if necessary.
- Any proposed changes to the future road network layout (including but not limited to the addition/removal of access points to/from CCW, modifications to intersection control types, changing the number of lanes available, and/or prohibiting turning movements at intersections) should be modelled in order to confirm their likely impact on traffic patterns in and around of CCW. Driver behaviour and route choice can be significantly influenced by each of these individual factors, as well as in combination with others. This could lead to significant changes in the forecast traffic volumes, and subsequently the performance of each intersection.

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5. Summary and conclusions

This TIA update of the CCW structure plan area accounts for the latest development proposals that have been submitted to the DRP, with the aim of determining whether the additional traffic from these proposals are likely to be accommodated by the internal and surrounding road networks, whilst also accounting for likely future upgrades and connections.

Overall, the CCW forecast traffic generation is higher than those in the last CCW TIA update by Urbsol (2014), increasing by around 110% for the 2031 AM peak, 200% for the 2031 PM peak and 140% over a typical weekday in 2031. Despite this increase, the forecast LOS at most intersections remained unchanged, with just four in the 2031 AM peak and two in the 2031 PM peak registering a worse LOS than the 2014 Urbsol TIA.

All but two intersections are forecast to operate at a LOS of D or above, thus indicating performance at these intersections is likely to be satisfactory through 2031 under the traffic forecast to be generated by the current development proposals. The Poletti Road / Veterans Parade is forecast to operate at LOS F and will likely require signalisation or conversion to a roundabout, whilst the Beeliar Drive / Midgegooroo Avenue intersection is marginally forecast to operate at an LOS of E, exceeding the threshold of LOS D by only one second.

The CCW precinct is forecast to contribute around 32% of daily traffic on Poletti Road, of which just over half is projected to originate from future developments. On Midgegooroo Avenue, around 13% of daily traffic is forecast to be associated with the CCW precinct, with almost all of this traffic travelling northbound. It is noted that Poletti Road will likely be used by vehicles leaving CCW to travel eastbound on Beeliar Drive, with no access available via Midgegooroo Avenue due to right turn movements being prohibited at its intersection with Veterans Parade.

It should be noted that this analysis is based on information that is current at the time of writing (including but not limited to the development proposals submitted to the DRP, as well as the projected road network configuration by the year 2031). As such, the outcomes of this analysis may change as lot yields and development proposals are subject to vary over time, depending on market conditions and commercial viability. Therefore, it is highly recommended that this analysis (along with its associated modelling) is updated on a regular basis.

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Appendices

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Appendix A – Veterans Parade Traffic Counts

Veterans Parade West: 20 m east of Poletti Road

- Both Directions
- Eastbound
- Westbound

Veterans Parade East: Between Centenary Lane / Service Mews and Midgegooroo Avenue

- Both Directions
- Eastbound
- Westbound

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MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-130 -- English (ENA)

Datasets:

Site:	**[Veterans-03] Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Attribute:	[-32.124822 +115.848713]
Direction:	2 - East bound, A trigger first. **Lane:** 1
Survey Duration:	12:46 Wednesday, 26 June 2019 => 15:17 Thursday, 4 July 2019,
Zone:	
File:	Veterans-03 0 2019-07-04 1517.EC1 (Plus)
Identifier:	AV39DSW9 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Site:	**[Veterans-03] Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Attribute:	[-32.124822 +115.848713]
Direction:	4 - West bound, A trigger first. **Lane:** 2
Survey Duration:	12:47 Wednesday, 26 June 2019 => 15:18 Thursday, 4 July 2019,
Zone:	
File:	Veterans-03 0 2019-07-04 1518.EC2 (Plus)
Identifier:	CV4389JK MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East, West (bound), P = East, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 24610 / 28819 (85.40%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-130
Site: Veterans-03.1.0E Veterans-03.2.0W
Description: **Multiple sites - See Header sheet for site descriptions.**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(EW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	3.0	2.0	1.0	0.0	2.0	3.0	0.0	1.6	1.6
0100-0200	0.0	2.0	3.0	3.0	4.0	1.0	0.0	2.4	1.9
0200-0300	0.0	1.0	2.0	0.0	0.0	2.0	2.0	0.6	1.0
0300-0400	0.0	1.0	0.0	2.0	1.0	0.0	0.0	0.8	0.6
0400-0500	10.0	9.0	20.0	12.0	12.0	3.0	3.0	12.6	9.9
0500-0600	78.0	101.0	115.0	76.0	107.0	1.0	3.0	95.4	68.7
0600-0700	123.0	126.0	154.0	111.0	101.0	44.0	22.0	123.0	97.3
0700-0800	145.0	173.0	196.0	134.0	174.0	166.0	100.0	164.4	155.4
0800-0900	236.0	231.0	228.0	241.0	221.0	245.0	190.0	231.4	227.4
0900-1000	239.0	234.0	279.0	237.0	251.0	329.0	226.0	248.0	256.4
1000-1100	**302.0**	**267.0**	**291.0**	**272.0**	**299.0**	**392.0**	**322.0**	**286.2**	**306.4**
1100-1200	273.0	212.0	274.0	266.0	257.0	309.0	250.0	256.4	263.0
1200-1300	221.0	263.0	210.0	214.0	241.0	**271.0**	**228.0**	229.8	235.4
1300-1400	201.0	164.0	185.0	172.0	202.0	177.0	161.0	184.8	180.3
1400-1500	181.0	224.0	195.0	153.0	186.0	228.0	162.0	187.8	189.9
1500-1600	237.0	300.0	213.0	193.0	239.0	178.0	145.0	236.4	215.0
1600-1700	405.0	429.0	318.0	275.0	298.0	139.0	132.0	345.0	285.1
1700-1800	**451.0**	**572.0**	**444.0**	**385.0**	**378.0**	135.0	63.0	**446.0**	**346.9**
1800-1900	423.0	454.0	331.0	348.0	260.0	66.0	72.0	363.2	279.1
1900-2000	330.0	316.0	269.0	212.0	146.0	15.0	8.0	254.6	185.1
2000-2100	264.0	265.0	202.0	180.0	61.0	5.0	2.0	194.4	139.9
2100-2200	99.0	111.0	90.0	65.0	19.0	3.0	2.0	76.8	55.6
2200-2300	25.0	17.0	18.0	9.0	3.0	4.0	2.0	14.4	11.1
2300-2400	7.0	6.0	0.0	2.0	2.0	1.0	1.0	3.4	2.7
Totals									
0700-1900	3314.0	3523.0	3164.0	2890.0	3006.0	2635.0	2051.0	3179.4	2940.4
0600-2200	4130.0	4341.0	3879.0	3458.0	3333.0	2702.0	2085.0	3828.2	3418.3
0600-0000	4162.0	4364.0	3897.0	3469.0	3338.0	2707.0	2088.0	3846.0	3432.1
0000-0000	4253.0	4480.0	4038.0	3562.0	3464.0	2717.0	2096.0	3959.4	3515.7
AM Peak	1000	1000	1000	1000	1000	1000	1000		
	302.0	267.0	291.0	272.0	299.0	392.0	322.0		
PM Peak	1700	1700	1700	1700	1700	1200	1200		
	451.0	572.0	444.0	385.0	378.0	271.0	228.0		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-131 -- English (ENA)

Datasets:

Site:	**[Veterans-03] Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Attribute:	[-32.124822 +115.848713]
Direction:	2 - East bound, A trigger first. **Lane:** 1
Survey Duration:	12:46 Wednesday, 26 June 2019 => 15:17 Thursday, 4 July 2019,
Zone:	
File:	Veterans-03 0 2019-07-04 1517.EC1 (Plus)
Identifier:	AV39DSW9 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East (bound), P = East, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 10549 / 12371 (85.27%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-131
Site: Veterans-03.1.0E
Description: **Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(E) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	1.0	0.0	1.0	0.0	1.0	1.0	0.0	0.6	0.6
0100-0200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0200-0300	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.3
0300-0400	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.6	0.4
0400-0500	8.0	9.0	15.0	10.0	11.0	0.0	1.0	10.6	7.7
0500-0600	67.0	91.0	94.0	69.0	84.0	0.0	1.0	81.0	58.0
0600-0700	55.0	48.0	61.0	42.0	37.0	39.0	17.0	48.6	42.7
0700-0800	71.0	102.0	100.0	73.0	98.0	145.0	84.0	88.8	96.1
0800-0900	**177.0**	**162.0**	**159.0**	**182.0**	146.0	139.0	**123.0**	**165.2**	**155.4**
0900-1000	152.0	130.0	155.0	146.0	**166.0**	**172.0**	114.0	149.8	147.9
1000-1100	121.0	95.0	122.0	95.0	112.0	137.0	119.0	109.0	114.4
1100-1200	84.0	73.0	82.0	83.0	82.0	104.0	88.0	80.8	85.1
1200-1300	71.0	124.0	67.0	82.0	90.0	**85.0**	**80.0**	86.8	85.6
1300-1400	84.0	67.0	90.0	60.0	94.0	72.0	56.0	79.0	74.7
1400-1500	71.0	96.0	73.0	52.0	68.0	80.0	54.0	72.0	70.6
1500-1600	143.0	182.0	118.0	108.0	138.0	53.0	37.0	137.8	111.3
1600-1700	**205.0**	221.0	176.0	141.0	**146.0**	52.0	51.0	177.8	**141.7**
1700-1800	181.0	**238.0**	**197.0**	**166.0**	121.0	29.0	11.0	**180.6**	134.7
1800-1900	187.0	167.0	149.0	122.0	62.0	10.0	9.0	137.4	100.9
1900-2000	92.0	75.0	81.0	45.0	21.0	1.0	1.0	62.8	45.1
2000-2100	57.0	54.0	38.0	40.0	11.0	2.0	0.0	40.0	28.9
2100-2200	5.0	6.0	6.0	4.0	4.0	2.0	0.0	5.0	3.9
2200-2300	0.0	2.0	0.0	1.0	0.0	0.0	1.0	0.6	0.6
2300-2400	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4
Totals									
0700-1900	1547.0	1657.0	1488.0	1310.0	1323.0	1078.0	826.0	1465.0	1318.4
0600-2200	1756.0	1840.0	1674.0	1441.0	1396.0	1122.0	844.0	1621.4	1439.0
0600-0000	1757.0	1844.0	1674.0	1442.0	1396.0	1122.0	845.0	1622.6	1440.0
0000-0000	1833.0	1945.0	1784.0	1522.0	1493.0	1124.0	848.0	1715.4	1507.0
AM Peak	0800	0800	0800	0800	0900	0900	0800		
	177.0	162.0	159.0	182.0	166.0	172.0	123.0		
PM Peak	1600	1700	1700	1700	1600	1200	1200		
	205.0	238.0	197.0	166.0	146.0	85.0	80.0		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-132 -- English (ENA)

Datasets:

Site:	**[Veterans-03] Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Attribute:	[-32.124822 +115.848713]
Direction:	4 - West bound, A trigger first. **Lane:** 2
Survey Duration:	12:47 Wednesday, 26 June 2019 => 15:18 Thursday, 4 July 2019,
Zone:	
File:	Veterans-03 0 2019-07-04 1518.EC2 (Plus)
Identifier:	CV4389JK MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	West (bound), P = West, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 14056 / 16448 (85.46%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-132
Site: Veterans-03.2.0W
Description: **Veterans Pde - 20m east of Poletti Rd (Cockburn Central)**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(W) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	2.0	2.0	0.0	0.0	1.0	2.0	0.0	1.0	1.0
0100-0200	0.0	2.0	3.0	3.0	4.0	1.0	0.0	2.4	1.9
0200-0300	0.0	1.0	2.0	0.0	0.0	1.0	1.0	0.6	0.7
0300-0400	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.2	0.1
0400-0500	2.0	0.0	5.0	2.0	1.0	3.0	2.0	2.0	2.1
0500-0600	11.0	9.0	21.0	7.0	23.0	1.0	2.0	14.2	10.6
0600-0700	68.0	78.0	93.0	69.0	64.0	5.0	5.0	74.4	54.6
0700-0800	74.0	71.0	95.0	61.0	76.0	20.0	16.0	75.4	59.0
0800-0900	59.0	69.0	69.0	59.0	75.0	106.0	67.0	66.2	72.0
0900-1000	87.0	104.0	124.0	91.0	85.0	157.0	112.0	98.2	108.6
1000-1100	181.0	**172.0**	168.0	177.0	**187.0**	**255.0**	**203.0**	**177.0**	**191.9**
1100-1200	**189.0**	139.0	**192.0**	**183.0**	175.0	205.0	162.0	175.6	177.9
1200-1300	150.0	139.0	143.0	132.0	151.0	**186.0**	**148.0**	143.0	149.9
1300-1400	117.0	97.0	95.0	112.0	108.0	105.0	105.0	105.8	105.6
1400-1500	110.0	128.0	122.0	101.0	118.0	148.0	108.0	115.8	119.3
1500-1600	94.0	118.0	95.0	85.0	101.0	125.0	108.0	98.6	103.7
1600-1700	200.0	208.0	142.0	134.0	152.0	87.0	81.0	167.2	143.4
1700-1800	**269.0**	**334.0**	**247.0**	219.0	**257.0**	106.0	52.0	**265.2**	**212.0**
1800-1900	236.0	287.0	182.0	**226.0**	198.0	56.0	63.0	225.8	178.3
1900-2000	238.0	241.0	188.0	167.0	125.0	14.0	7.0	191.8	140.0
2000-2100	207.0	211.0	164.0	140.0	50.0	3.0	2.0	154.4	111.0
2100-2200	94.0	105.0	84.0	61.0	15.0	1.0	2.0	71.8	51.7
2200-2300	25.0	15.0	18.0	8.0	3.0	4.0	1.0	13.8	10.6
2300-2400	6.0	4.0	0.0	2.0	2.0	1.0	1.0	2.8	2.3
Totals									
0700-1900	1766.0	1866.0	1674.0	1580.0	1683.0	1556.0	1225.0	1713.8	1621.4
0600-2200	2373.0	2501.0	2203.0	2017.0	1937.0	1579.0	1241.0	2206.2	1978.7
0600-0000	2404.0	2520.0	2221.0	2027.0	1942.0	1584.0	1243.0	2222.8	1991.6
0000-0000	2419.0	2534.0	2252.0	2040.0	1971.0	1592.0	1248.0	2243.2	2008.0
AM Peak	1100	1000	1100	1100	1000	1000	1000		
	189.0	172.0	192.0	183.0	187.0	255.0	203.0		
PM Peak	1700	1700	1700	1800	1700	1200	1200		
	269.0	334.0	247.0	226.0	257.0	186.0	148.0		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-135 -- English (ENA)

Datasets:

Site:	**[Veterans-04] Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Attribute:	[-32.124893 +115.853240]
Direction:	2 - East bound, A trigger first. **Lane:** 1
Survey Duration:	13:01 Wednesday, 26 June 2019 => 15:26 Thursday, 4 July 2019,
Zone:	
File:	Veterans-04 0 2019-07-04 1526.EC1 (Plus)
Identifier:	EM71RVJM MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Site:	**[Veterans-04] Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Attribute:	[-32.124893 +115.853240]
Direction:	4 - West bound, A trigger first. **Lane:** 2
Survey Duration:	13:03 Wednesday, 26 June 2019 => 15:27 Thursday, 4 July 2019,
Zone:	
File:	Veterans-04 0 2019-07-04 1527.EC2 (Plus)
Identifier:	AV68EQM3 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East, West (bound), P = East, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 10006 / 11654 (85.86%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-135
Site: Veterans-04.1.0E Veterans-04.2.0W
Description: **Multiple sites - See Header sheet for site descriptions.**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(EW) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	1.0	1.0	2.0	0.0	1.0	1.0	2.0	1.0	1.1
0100-0200	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.4	0.3
0200-0300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0300-0400	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.2	0.3
0400-0500	9.0	8.0	9.0	8.0	8.0	2.0	1.0	8.4	6.4
0500-0600	55.0	42.0	74.0	46.0	48.0	0.0	5.0	53.0	38.6
0600-0700	44.0	31.0	43.0	29.0	36.0	26.0	22.0	36.6	33.0
0700-0800	50.0	58.0	74.0	44.0	53.0	89.0	71.0	55.8	62.7
0800-0900	90.0	93.0	89.0	100.0	**106.0**	91.0	103.0	95.6	96.0
0900-1000	**128.0**	95.0	**126.0**	**104.0**	101.0	109.0	121.0	**110.8**	**112.0**
1000-1100	95.0	91.0	88.0	96.0	90.0	**183.0**	**124.0**	92.0	109.6
1100-1200	99.0	**107.0**	98.0	93.0	99.0	154.0	118.0	99.2	109.7
1200-1300	89.0	111.0	92.0	72.0	90.0	**136.0**	**108.0**	90.8	99.7
1300-1400	92.0	84.0	75.0	75.0	85.0	128.0	91.0	82.2	90.0
1400-1500	85.0	101.0	90.0	58.0	72.0	117.0	71.0	81.2	84.9
1500-1600	100.0	204.0	84.0	102.0	123.0	103.0	63.0	122.6	111.3
1600-1700	145.0	163.0	145.0	119.0	118.0	64.0	84.0	138.0	119.7
1700-1800	151.0	**214.0**	**199.0**	128.0	**123.0**	52.0	31.0	**163.0**	**128.3**
1800-1900	**168.0**	161.0	122.0	**136.0**	67.0	24.0	30.0	130.8	101.1
1900-2000	123.0	102.0	110.0	76.0	52.0	5.0	2.0	92.6	67.1
2000-2100	86.0	69.0	57.0	45.0	19.0	4.0	0.0	55.2	40.0
2100-2200	21.0	25.0	27.0	15.0	6.0	0.0	0.0	18.8	13.4
2200-2300	6.0	2.0	6.0	1.0	1.0	3.0	0.0	3.2	2.7
2300-2400	2.0	0.0	1.0	5.0	2.0	0.0	0.0	2.0	1.4
Totals									
0700-1900	1292.0	1482.0	1282.0	1127.0	1127.0	1250.0	1015.0	1262.0	1225.0
0600-2200	1566.0	1709.0	1519.0	1292.0	1240.0	1285.0	1039.0	1465.2	1378.6
0600-0000	1574.0	1711.0	1526.0	1298.0	1243.0	1288.0	1039.0	1470.4	1382.7
0000-0000	1640.0	1762.0	1612.0	1352.0	1301.0	1292.0	1047.0	1533.4	1429.4
AM Peak	0900	1100	0900	0900	0800	1000	1000		
	128.0	107.0	126.0	104.0	106.0	183.0	124.0		
PM Peak	1800	1700	1700	1800	1700	1200	1200		
	168.0	214.0	199.0	136.0	123.0	136.0	108.0		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-136 -- English (ENA)

Datasets:

Site:	**[Veterans-04] Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Attribute:	[-32.124893 +115.853240]
Direction:	2 - East bound, A trigger first. **Lane:** 1
Survey Duration:	13:01 Wednesday, 26 June 2019 => 15:26 Thursday, 4 July 2019,
Zone:	
File:	Veterans-04 0 2019-07-04 1526.EC1 (Plus)
Identifier:	EM71RVJM MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	East (bound), P = East, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 3212 / 3758 (85.47%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-136
Site: Veterans-04.1.0E
Description: **Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(E) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	1.0	1.0	2.0	0.0	1.0	1.0	1.0	1.0	1.0
0100-0200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0200-0300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0300-0400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0400-0500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0500-0600	2.0	3.0	4.0	2.0	1.0	0.0	2.0	2.4	2.0
0600-0700	15.0	12.0	17.0	11.0	10.0	0.0	0.0	13.0	9.3
0700-0800	18.0	16.0	22.0	18.0	16.0	2.0	2.0	18.0	13.4
0800-0900	16.0	15.0	20.0	22.0	17.0	13.0	14.0	18.0	16.7
0900-1000	31.0	16.0	20.0	11.0	26.0	22.0	26.0	20.8	21.7
1000-1100	31.0	27.0	32.0	28.0	22.0	48.0	32.0	28.0	31.4
1100-1200	**41.0**	**44.0**	**38.0**	**41.0**	**40.0**	**57.0**	**33.0**	**40.8**	**42.0**
1200-1300	29.0	40.0	37.0	32.0	40.0	**52.0**	**45.0**	35.6	39.3
1300-1400	26.0	29.0	30.0	27.0	22.0	40.0	34.0	26.8	29.7
1400-1500	30.0	30.0	34.0	21.0	32.0	51.0	22.0	29.4	31.4
1500-1600	28.0	50.0	29.0	23.0	38.0	39.0	25.0	33.6	33.1
1600-1700	40.0	39.0	43.0	**43.0**	26.0	24.0	41.0	38.2	36.6
1700-1800	48.0	**99.0**	**107.0**	30.0	**42.0**	38.0	22.0	**65.2**	**55.1**
1800-1900	42.0	34.0	42.0	41.0	27.0	18.0	23.0	37.2	32.4
1900-2000	51.0	48.0	43.0	23.0	34.0	2.0	1.0	39.8	28.9
2000-2100	**53.0**	34.0	30.0	24.0	13.0	1.0	0.0	30.8	22.1
2100-2200	14.0	20.0	20.0	11.0	4.0	0.0	0.0	13.8	9.9
2200-2300	4.0	2.0	3.0	1.0	1.0	2.0	0.0	2.2	1.9
2300-2400	0.0	0.0	1.0	4.0	1.0	0.0	0.0	1.2	0.9
Totals									
0700-1900	380.0	439.0	454.0	337.0	348.0	404.0	319.0	391.6	383.0
0600-2200	513.0	553.0	564.0	406.0	409.0	407.0	320.0	489.0	453.1
0600-0000	517.0	555.0	568.0	411.0	411.0	409.0	320.0	492.4	455.9
0000-0000	520.0	559.0	574.0	413.0	413.0	410.0	323.0	495.8	458.9
AM Peak	1100	1100	1100	1100	1100	1100	1100		
	41.0	44.0	38.0	41.0	40.0	57.0	33.0		
PM Peak	2000	1700	1700	1600	1700	1200	1200		
	53.0	99.0	107.0	43.0	42.0	52.0	45.0		

*** - No data.**

MetroCount Traffic Executive
Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-137 -- English (ENA)

Datasets:

Site:	**[Veterans-04] Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Attribute:	[-32.124893 +115.853240]
Direction:	4 - West bound, A trigger first. **Lane:** 2
Survey Duration:	13:03 Wednesday, 26 June 2019 => 15:27 Thursday, 4 July 2019,
Zone:	
File:	Veterans-04 0 2019-07-04 1527.EC2 (Plus)
Identifier:	AV68EQM3 MC56-L5 [MC55] (c)Microcom 19Oct04
Algorithm:	Factory default axle (v5.02)
Data type:	Axle sensors - Paired (Class/Speed/Count)

Profile:

Filter time:	**0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019 (7)**
Included classes:	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
Speed range:	10 - 160 km/h.
Direction:	West (bound), P = West, Lane = 0-16
Separation:	Headway > 0 sec, Span 0 - 100 metre
Name:	Default Profile
Scheme:	Vehicle classification (AustRoads94)
Units:	Metric (metre, kilometre, m/s, km/h, kg, tonne)
In profile:	Vehicles = 6793 / 7896 (86.03%)

Weekly Vehicle Counts (Virtual Week)

VirtWeeklyVehicle-137
Site: Veterans-04.2.0W
Description: **Veterans Pde - btw Centenary Lane & Midgegooroo Ave (Cockburn Central)**
Filter time: **0:00 Thursday, 27 June 2019 => 0:00 Thursday, 4 July 2019**
Scheme: Vehicle classification (AustRoads94)
Filter: Cls(1-12) Dir(W) Sp(10,160) Headway(>0) Span(0 - 100) Lane(0-16)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Averages 1 - 5	Averages 1 - 7
Hour									
0000-0100	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.1
0100-0200	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.4	0.3
0200-0300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0300-0400	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.2	0.3
0400-0500	9.0	8.0	9.0	8.0	8.0	2.0	1.0	8.4	6.4
0500-0600	53.0	39.0	70.0	44.0	47.0	0.0	3.0	50.6	36.6
0600-0700	29.0	19.0	26.0	18.0	26.0	26.0	22.0	23.6	23.7
0700-0800	32.0	42.0	52.0	26.0	37.0	87.0	69.0	37.8	49.3
0800-0900	74.0	78.0	69.0	78.0	**89.0**	78.0	89.0	77.6	79.3
0900-1000	**97.0**	**79.0**	**106.0**	**93.0**	75.0	87.0	**95.0**	**90.0**	**90.3**
1000-1100	64.0	64.0	56.0	68.0	68.0	**135.0**	92.0	64.0	78.1
1100-1200	58.0	63.0	60.0	52.0	59.0	97.0	85.0	58.4	67.7
1200-1300	60.0	71.0	55.0	40.0	50.0	84.0	**63.0**	55.2	60.4
1300-1400	66.0	55.0	45.0	48.0	62.0	**88.0**	57.0	55.2	60.1
1400-1500	55.0	71.0	56.0	37.0	40.0	66.0	49.0	51.8	53.4
1500-1600	72.0	**154.0**	55.0	79.0	85.0	64.0	38.0	89.0	78.1
1600-1700	105.0	124.0	**102.0**	76.0	**92.0**	40.0	43.0	**99.8**	**83.1**
1700-1800	103.0	115.0	92.0	**98.0**	81.0	14.0	9.0	97.8	73.1
1800-1900	**126.0**	127.0	80.0	95.0	40.0	6.0	7.0	93.6	68.7
1900-2000	72.0	54.0	67.0	53.0	18.0	3.0	1.0	52.8	38.3
2000-2100	33.0	35.0	27.0	21.0	6.0	3.0	0.0	24.4	17.9
2100-2200	7.0	5.0	7.0	4.0	2.0	0.0	0.0	5.0	3.6
2200-2300	2.0	0.0	3.0	0.0	0.0	1.0	0.0	1.0	0.9
2300-2400	2.0	0.0	0.0	1.0	1.0	0.0	0.0	0.8	0.6
Totals									
0700-1900	912.0	1043.0	828.0	790.0	778.0	846.0	696.0	870.2	841.9
0600-2200	1053.0	1156.0	955.0	886.0	830.0	878.0	719.0	976.0	925.3
0600-0000	1057.0	1156.0	958.0	887.0	831.0	879.0	719.0	977.8	926.7
0000-0000	1120.0	1203.0	1038.0	939.0	887.0	882.0	724.0	1037.4	970.4
AM Peak	0900	0900	0900	0900	0800	1000	0900		
	97.0	79.0	106.0	93.0	89.0	135.0	95.0		
PM Peak	1800	1500	1600	1700	1600	1300	1200		
	126.0	154.0	102.0	98.0	92.0	88.0	63.0		

*** - No data.**

Appendix B – Trip Generation Calculations

Trip Rates, Raw Generation and Adjustment Factors

Application of In/Out Splits (Proportions)

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Version: 1, Version Date: 26/06/2020

					TRIP RATES				RAW GENERATION			ADJUSTMENT FACTORS			ADJUSTED GENERATION TOTAL			
Zone	Lot No.	Land Use	Yield Qty	Yield Unit	AM TR	PM TR	Daily TR	TR Unit	AM Total	PM Total	Daily Total	AM AF	PM AF	Daily AF	AM Adj T	PM Adj T	Daily Adj T	TD Comments
1A	121	Cockburn ARC	n/a	n/a	n/a	n/a	n/a	n/a	654	1218	10984	0%	0%	0%	654	1218	10984	
1A	Balance	Residential Apartments	64	apts	0.5	0.5	5.0	/apt	32	32	320	-10%	-10%	-10%	29	29	288	
1B	104	Office	10000	sqm	2	2	10.0	/100 sqm	200	200	1000	-10%	-10%	-10%	180	180	900	
1B	Balance	Residential Apartments	145	apts	0.5	0.5	5.0	/apt	73	73	725	-10%	-10%	-10%	65	65	653	
1B	Balance	Retail	1000	sqm	1.15	4.6	46.0	/100 sqm	12	46	460	-10%	-10%	-10%	10	41	414	
2	107	One Bedroom Unit	9	apts	0.5	0.5	5.0	/apt	5	5	45	-15%	-15%	-15%	4	4	38	
2	107	Two Bedroom Unit	31	apts	0.5	0.5	5.0	/apt	16	16	155	-15%	-15%	-15%	13	13	132	
2	107	Three Bedroom Unit	5	apts	0.65	0.65	6.5	/apt	3	3	33	-15%	-15%	-15%	3	3	28	
2	107	Commercial	298	sqm	2	2	10.0	/100 sqm	6	6	30	-15%	-15%	-15%	5	5	25	
2	107	Commercial / Potential Café	124	sqm	5	5	60.0	/100 sqm	6	6	74	-15%	-15%	-15%	5	5	63	
2	108	One Bedroom Unit	10	apts	0.5	0.5	5.0	/apt	5	5	50	-15%	-15%	-15%	4	4	43	
2	108	Two Bedroom Unit	37	apts	0.5	0.5	5.0	/apt	19	19	185	-15%	-15%	-15%	16	16	157	
2	108	Three Bedroom Unit	5	apts	0.65	0.65	6.5	/apt	3	3	33	-15%	-15%	-15%	3	3	28	
2	108	Commercial	141	sqm	2	2	10.0	/100 sqm	3	3	14	-15%	-15%	-15%	2	2	12	
2	108	Commercial / Potential Café	116	sqm	5	5	60.0	/100 sqm	6	6	70	-15%	-15%	-15%	5	5	59	
2	109/111	Residential Apartments	101	apts	0.5	0.5	5.0	/apt	51	51	505	-15%	-15%	-15%	43	43	429	
2	110	One Bedroom Unit	23	apts	0.5	0.5	5.0	/apt	12	12	115	-15%	-15%	-15%	10	10	98	
2	110	Two Bedroom Units	69	apts	0.5	0.5	5.0	/apt	35	35	345	-15%	-15%	-15%	29	29	293	
2	110	Dual Key Units (Two Bedrooms)	4	apts	0.5	0.5	5.0	/apt	2	2	20	-15%	-15%	-15%	2	2	17	
2	112-114	Specialty shops and take-away stores	4937	sqm	1.15	4.6	46.0	/100 sqm	57	227	2271	-30%	-30%	-30%	40	159	1590	
2	112-114	Fast-food restaurant with drive-through window	276	sqm	30	30	272.7	/100 sqm	83	83	753	0%	0%	0%	83	83	753	
2	112-114	Fast-food restaurant with drive-through window	276	sqm	40	40	363.6	/100 sqm	110	110	1004	0%	0%	0%	110	110	1004	Pass-by trips
2	112-114	Cinema	2311	seat	0.008	0.08	1.6	/seat	18	185	3698	-45%	-45%	-45%	10	102	2034	
2	112-114	Gym	1115	sqm	2.4	6	32.5	/100 sqm	27	67	362	-15%	-15%	-15%	23	57	308	
2	112-114	Bowling Alley (Fun Fair)	2574	sqm	0.18	1.8	24.0	/100 sqm	5	46	618	-30%	-30%	-30%	3	32	432	
2	117	One Bedroom Unit	43	apts	0.5	0.5	5.0	/apt	22	22	215	0%	0%	0%	22	22	215	
2	117	Two Bedroom Unit	25	apts	0.5	0.5	5.0	/apt	13	13	125	0%	0%	0%	13	13	125	
2	117	Three Bedroom Unit	28	apts	0.65	0.65	6.5	/apt	18	18	182	0%	0%	0%	18	18	182	
2	117	Supermarket (T1)	678	sqm	2.5	10	117.6	/100 sqm	17	68	798	-70%	-70%	-70%	5	20	239	
2	117	Commercial / Potential Café (T2)	210	sqm	5	5	60	/100 sqm	11	11	126	-80%	-80%	-80%	2	2	25	
2	117	Commercial (T3)	109	sqm	2	2	10.0	/100 sqm	2	2	11	0%	0%	0%	2	2	11	
2	117	Office (T11)	509	sqm	2	2	10.0	/100 sqm	10	10	51	0%	0%	0%	10	10	51	
2	116	One Bedroom Unit	42	apts	0.5	0.5	5.0	/apt	21	21	210	0%	0%	0%	21	21	210	
2	116	Two Bedroom Unit	28	apts	0.5	0.5	5.0	/apt	14	14	140	0%	0%	0%	14	14	140	
2	116	Three Bedroom Unit	26	apts	0.65	0.65	6.5	/apt	17	17	169	0%	0%	0%	17	17	169	
2	116	Commercial (T4-T7)	302	sqm	2	2	10.0	/100 sqm	6	6	30	0%	0%	0%	6	6	30	
2	115	Studio Unit	14	apts	0.5	0.5	5.0	/apt	7	7	70	0%	0%	0%	7	7	70	
2	115	One Bedroom Unit	14	apts	0.5	0.5	5.0	/apt	7	7	70	0%	0%	0%	7	7	70	
2	115	Two Bedroom Unit	42	apts	0.5	0.5	5.0	/apt	21	21	210	0%	0%	0%	21	21	210	
2	115	Potential Pharmacy (T8)	101	sqm	3.16	9.16	97.0	/100 sqm	3	9	98	-70%	-70%	-70%	1	3	29	
2	115	Potential Consulting Room (T9)	105	sqm	n/a	n/a	n/a	n/a	15	15	150	0%	0%	0%	15	15	150	
2	115	Banquet Restaurant (T10)	485	sqm	5	5	60.0	/100 sqm	24	24	291	0%	0%	0%	24	24	291	
2	115	Childcare (T12)	70	children	0.78	0.79	4.1	/child	55	55	286	-50%	-50%	-50%	27	28	143	
2	115	Hotel	113	rooms	0.47	0.6	8.4	/room	53	68	945	0%	0%	0%	53	68	945	
2	115	Hotel Restaurant	227	sqm	5	5	60.0	/100 sqm	11	11	136	-90%	-90%	-90%	1	1	14	
2	115	Other Hotel Facilities	1232	sqm	0	0	0	/100 sqm	0	0	0	0%	0%	0%	0	0	0	
3A/B	Balance	Residential Apartments	216	apts	0.5	0.5	5.0	/apt	108	108	1080	-10%	-10%	-10%	97	97	972	
3C	Balance	Residential Apartments	152	apts	0.5	0.5	5.0	/apt	76	76	760	-15%	-15%	-15%	65	65	646	
3C	Balance	Office	4225	sqm	2	2	20.0	/100 sqm	85	85	845	-15%	-15%	-15%	72	72	718	
		TOTAL (all zones)													1871	2772	26436	
		TOTAL from 2014 Urbsol TIA (all zones)													896	915	10802	

Legend

- Assumed Standard Trip Rates, In/Out Proportions
- Assumption (case-specific)
- Provided by proponent's TIA/documentation
- Value derived from formula
- Traffic Generation Forecast

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					ADJUSTED GENERATION TOTAL				IN/OUT PROPORTIONS						IN/OUT GENERATION TOTALS					
Zone	Lot No.	Land Use	Yield Qty	Yield Unit	AM Adj T	PM Adj T	Daily Adj T	TD Comments	AM In P	AM Out P	PM In P	PM Out P	Daily In P	Daily Out P	AM In T	AM Out T	PM In T	PM Out T	Daily In T	Daily Out T
1A	121	Cockburn ARC	n/a	n/a	654	1218	10984		74%	26%	46%	54%	50%	50%	486	168	557	661	5492	5492
1A	Balance	Residential Apartments	64	apts	29	29	288		26%	74%	61%	39%	50%	50%	7	21	18	11	144	144
1B	104	Office	10000	sqm	180	180	900		86%	14%	16%	84%	50%	50%	155	25	29	151	450	450
1B	Balance	Residential Apartments	145	apts	65	65	653		26%	74%	61%	39%	50%	50%	17	48	40	25	326	326
1B	Balance	Retail	1000	sqm	10	41	414		62%	38%	48%	52%	50%	50%	6	4	20	22	207	207
2	107	One Bedroom Unit	9	apts	4	4	38		26%	74%	61%	39%	50%	50%	1	3	2	1	19	19
2	107	Two Bedroom Unit	31	apts	13	13	132		26%	74%	61%	39%	50%	50%	3	10	8	5	66	66
2	107	Three Bedroom Unit	5	apts	3	3	28		26%	74%	61%	39%	50%	50%	1	2	2	1	14	14
2	107	Commercial	298	sqm	5	5	25		80%	20%	20%	80%	50%	50%	4	1	1	4	13	13
2	107	Commercial / Potential Café	124	sqm	5	5	63		51%	49%	50%	50%	50%	50%	3	3	3	3	32	32
2	108	One Bedroom Unit	10	apts	4	4	43		26%	74%	61%	39%	50%	50%	1	3	3	2	21	21
2	108	Two Bedroom Unit	37	apts	16	16	157		26%	74%	61%	39%	50%	50%	4	12	10	6	79	79
2	108	Three Bedroom Unit	5	apts	3	3	28		26%	74%	61%	39%	50%	50%	1	2	2	1	14	14
2	108	Commercial	141	sqm	2	2	12		80%	20%	20%	80%	50%	50%	2	0	0	2	6	6
2	108	Commercial / Potential Café	116	sqm	5	5	59		51%	49%	50%	50%	50%	50%	3	2	2	2	30	30
2	109/111	Residential Apartments	101	apts	43	43	429		26%	74%	61%	39%	50%	50%	11	32	26	17	215	215
2	110	One Bedroom Unit	23	apts	10	10	98		26%	74%	61%	39%	50%	50%	3	7	6	4	49	49
2	110	Two Bedroom Units	69	apts	29	29	293		26%	74%	61%	39%	50%	50%	8	22	18	11	147	147
2	110	Dual Key Units (Two Bedrooms)	4	apts	2	2	17		26%	74%	61%	39%	50%	50%	0	1	1	1	9	9
2	112-114	Specialty shops and take-away stores	4937	sqm	40	159	1590		62%	38%	48%	52%	50%	50%	25	15	76	83	795	795
2	112-114	Fast-food restaurant with drive-through window	276	sqm	83	83	753		51%	49%	52%	48%	50%	50%	42	41	43	40	376	376
2	112-114	Fast-food restaurant with drive-through window	276	sqm	110	110	1004	Pass-by trips	51%	49%	52%	48%	50%	50%	56	54	57	53	502	502
2	112-114	Cinema	2311	seat	10	102	2034		90%	10%	60%	40%	50%	50%	9	1	61	41	1017	1017
2	112-114	Gym	1115	sqm	23	57	308		51%	49%	57%	43%	50%	50%	12	11	32	24	154	154
2	112-114	Bowling Alley (Fun Fair)	2574	sqm	3	32	432		95%	5%	65%	35%	50%	50%	3	0	21	11	216	216
2	117	One Bedroom Unit	43	apts	22	22	215		26%	74%	61%	39%	50%	50%	6	16	13	8	108	108
2	117	Two Bedroom Unit	25	apts	13	13	125		26%	74%	61%	39%	50%	50%	3	9	8	5	63	63
2	117	Three Bedroom Unit	28	apts	18	18	182		26%	74%	61%	39%	50%	50%	5	13	11	7	91	91
2	117	Supermarket (T1)	678	sqm	5	20	239		60%	40%	51%	49%	50%	50%	3	2	10	10	120	120
2	117	Commercial / Potential Café (T2)	210	sqm	2	2	25		51%	49%	50%	50%	50%	50%	1	1	1	1	13	13
2	117	Commercial (T3)	109	sqm	2	2	11		80%	20%	20%	80%	50%	50%	2	0	0	2	5	5
2	117	Office (T11)	509	sqm	10	10	51		86%	14%	16%	84%	50%	50%	9	1	2	9	25	25
2	116	One Bedroom Unit	42	apts	21	21	210		26%	74%	61%	39%	50%	50%	5	16	13	8	105	105
2	116	Two Bedroom Unit	28	apts	14	14	140		26%	74%	61%	39%	50%	50%	4	10	9	5	70	70
2	116	Three Bedroom Unit	26	apts	17	17	169		26%	74%	61%	39%	50%	50%	4	13	10	7	85	85
2	116	Commercial (T4-T7)	302	sqm	6	6	30		80%	20%	20%	80%	50%	50%	5	1	1	5	15	15
2	115	Studio Unit	14	apts	7	7	70		26%	74%	61%	39%	50%	50%	2	5	4	3	35	35
2	115	One Bedroom Unit	14	apts	7	7	70		26%	74%	61%	39%	50%	50%	2	5	4	3	35	35
2	115	Two Bedroom Unit	42	apts	21	21	210		26%	74%	61%	39%	50%	50%	5	16	13	8	105	105
2	115	Potential Pharmacy (T8)	101	sqm	1	3	29		65%	35%	49%	51%	50%	50%	1	0	1	1	15	15
2	115	Potential Consulting Room (T9)	105	sqm	15	15	150		78%	22%	28%	72%	50%	50%	12	3	4	11	75	75
2	115	Banquet Restaurant (T10)	485	sqm	24	24	291		51%	49%	50%	50%	50%	50%	12	12	12	12	146	146
2	115	Childcare (T12)	70	children	27	28	143		53%	47%	47%	53%	50%	50%	14	13	13	15	72	72
2	115	Hotel	113	rooms	53	68	945		59%	41%	51%	49%	50%	50%	31	22	35	33	472	472
2	115	Hotel Restaurant	227	sqm	1	1	14		51%	49%	50%	50%	50%	50%	1	1	1	1	7	7
2	115	Other Hotel Facilities	1232	sqm	0	0	0		59%	41%	51%	49%	50%	50%	0	0	0	0	0	0
3A/B	Balance	Residential Apartments	216	apts	97	97	972		26%	74%	61%	39%	50%	50%	25	72	59	38	486	486
3C	Balance	Residential Apartments	152	apts	65	65	646		26%	74%	61%	39%	50%	50%	17	48	39	25	323	323
3C	Balance	Office	4225	sqm	72	72	718		86%	14%	16%	84%	50%	50%	62	10	11	60	359	359
		TOTAL (all zones)			1871	2772	26436								1093	779	1313	1459	13218	13218
		TOTAL from 2014 Urbsol TIA (all zones)			896	915	10802								479	418	400	515	5401	5401

Legend

- Assumed Standard Trip Rates, In/Out Proportions
- Assumption (case-specific)
- Provided by proponent's TIA/documentation
- Value derived from formula
- Traffic Generation Forecast

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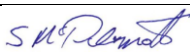
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft A	D. Tseu	S. Tan	*S. Tan*	S. McDermott	*S. McDermott*	26/9/2019
Rev 0	D. Tseu	S. Tan		S. McDermott		15/6/2020

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