# City of Cockburn

# 2018 District Traffic Study

Final | 29 November 2018

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 259590-00

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# 1 Introduction

Arup was engaged by the City of Cockburn to undertake an update of the 2013 District Traffic Study (DTS). The study involves updating the forecast traffic volumes throughout the City to assist decision making for future road network improvements and management of the local government controlled road network. This report summarises the process of updating and enhancing the Cockburn District Traffic Model (CDTM) and provides the main outputs from the model.

Our analysis covers three forecast year scenarios; base year (2016), medium term (2021) and long term (2031). The outputs from this study will inform the preparation of a road network work program by outlining short, medium and long-term upgrades and actions.

## 1.1 Background and scope

In 2006 the City undertook a District Traffic Study aimed at developing traffic forecasts for the years 2016 and 2031. This District Traffic Study was then updated in 2013 to consider future transport conditions in years 2020 and 2031 based on anticipated growth in land use, employment and population but additionally through traffic trips as forecast by the Main Roads Regional Operations Model (ROM). The CDTM took into account forecasted trips from significant development including Cockburn Central area, Murdoch Activity Centre, Jandakot Airport Development, Latitude 32, Australian Marine Complex and Cockburn Coast development. The CDTM was used to test future possible road network upgrades such as the North Lake Road Bridge across Kwinana Freeway, Bartram Road overpass of Kwinana Freeway and Roe Highway Stage 8 extension.

The 2013 CDTM uses the CUBE Voyager which is the same platform as the current Main Roads Regional Operations Model (ROM). Since this time, ROM has been upgraded to include peak period modelling and produces these outputs. This updated version of ROM is known as ROM24.

The 2018 CDTM uses the Aimsun software which gives more flexibility in order to transition from strategic model to microsimulation model if more detailed analysis might be required in the future.

The specific scope of this current commission is as follows:

- Update CDTM completed in 2013 to facilitate the Council's current major road planning identified in the City of Cockburn Regional and Major Roadworks Plan using Aimsun software.
- Prepare traffic forecasts for 2021 and 2031 including the development plans for all areas
- Adjust traffic generation and attractions due to review of demographic data

- Include scenarios with / without road network upgrades such as:
    - Stock Road Widening
    - Cockburn Road Widening

## 1.2 Glossary

The following terms and abbreviations have been used throughout this document:

| | |
|---|---|
| Cockburn District Traffic Model | CDTM |
| Traffic Modelling Software | Aimsun |
| District Traffic Study | DTS |
| Integrated Transport Strategy | ITS |
| Main Roads Western Australia | Main Roads |
| Metropolitan Region Scheme | MRS |
| Passenger Car Units | PCU |
| Regional Operations Model (Main Roads Traffic Model) | ROM24 (current)<br>ROM (previous version) |
| Town Planning Scheme | TPS |
| Volume Capacity Ratio | VCR |
| Assigned Volumes | AV |
| Roads and Martie Services | RMS |

# 2 Modelling methodology and enhancements

Cockburn District Traffic Model has been built as a strategic model in order to capture the vast area of City of Cockburn. In order to build a feasible strategic model a subarea network and matrices have been extracted from the ROM24 model owned by Main Roads. Both network and matrices were utilised and updated in the Aimsun software. Aimsun is a modelling tool capable of modelling a single intersection to the whole transport network of large cities. The software allows to build both static and dynamic simulations of the environment. It also has a capability to transfer from strategic model into a microsimulation model for more detailed analysis if required in the future. The Cockburn District Traffic model has been modelled using the static assignment method and is considered a strategic model due to the size of the modelled area.

## 2.1 Modelled area and zoning system

A map showing the modelled area and zoning system used in CDTM is provided in Figure 1. This zoning system is adapted from the zoning system used for the Main Roads Western Australia's ROM24 as shown in Figure 2. The zoning structure from the current ROM24 was refined with some zones split to better reflect land use based on current land use data and future land use changes as reflected in the approved structure plans, Main Roads WA Infrastructure Delivery Plan and City of Cockburn Regional and Major Roadworks Plan and the City Town Planning Scheme. Final zone system used for City of Cockburn District Study has been shown on Figure 3.

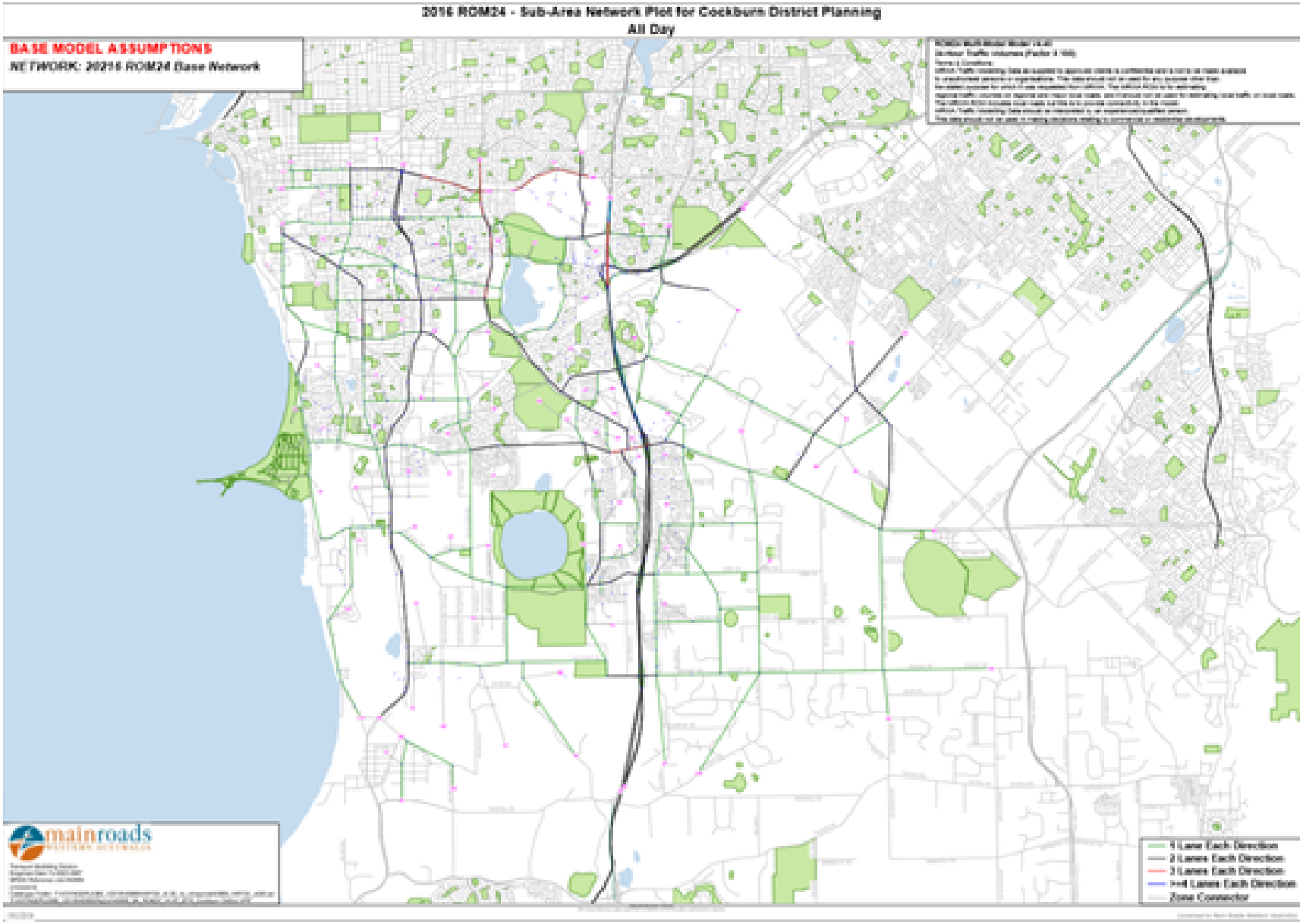



Figure 1 - Cockburn ROM24 Sub-Area Zone System

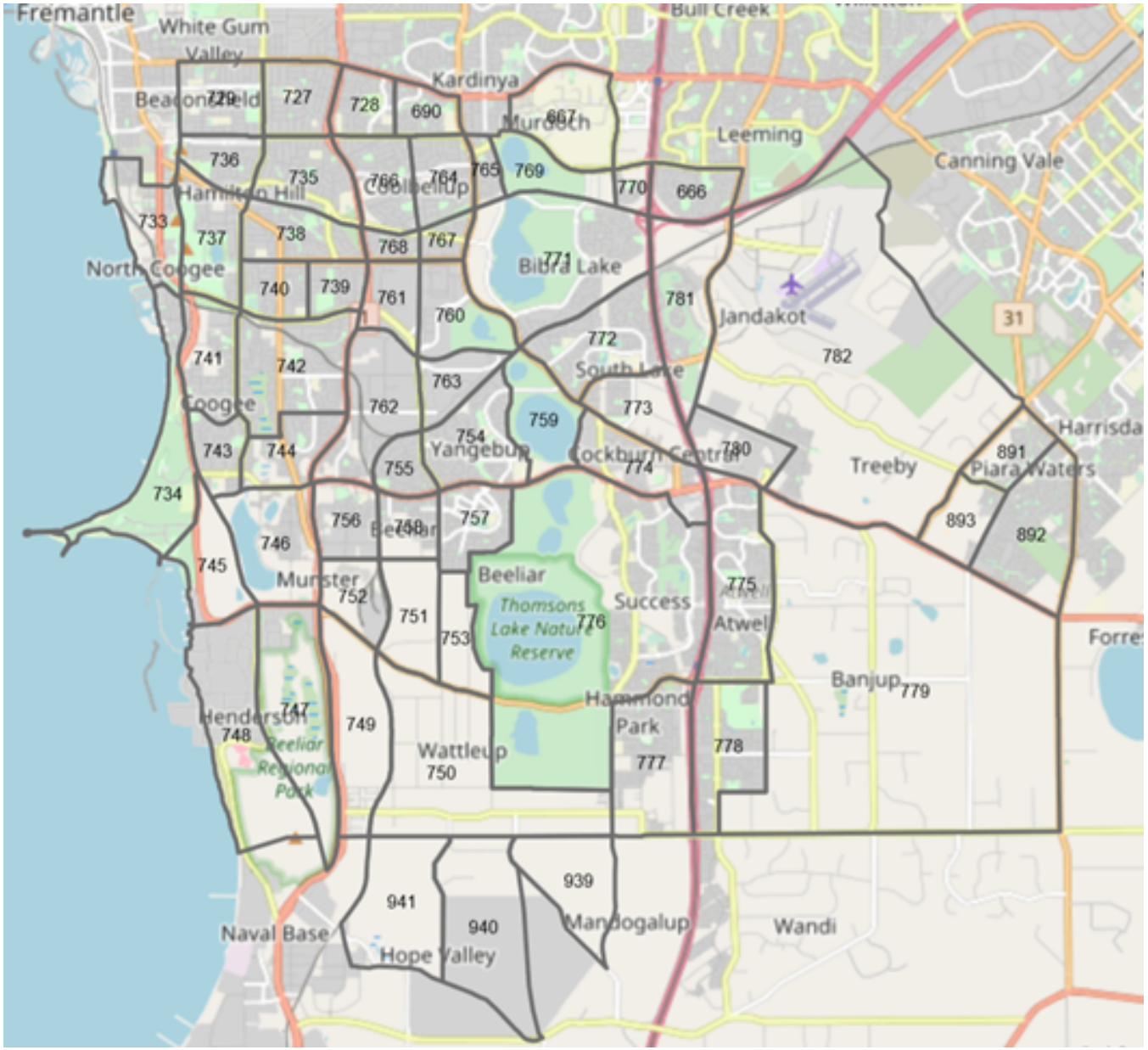



Figure 2 – ROM24 zones for demographic data

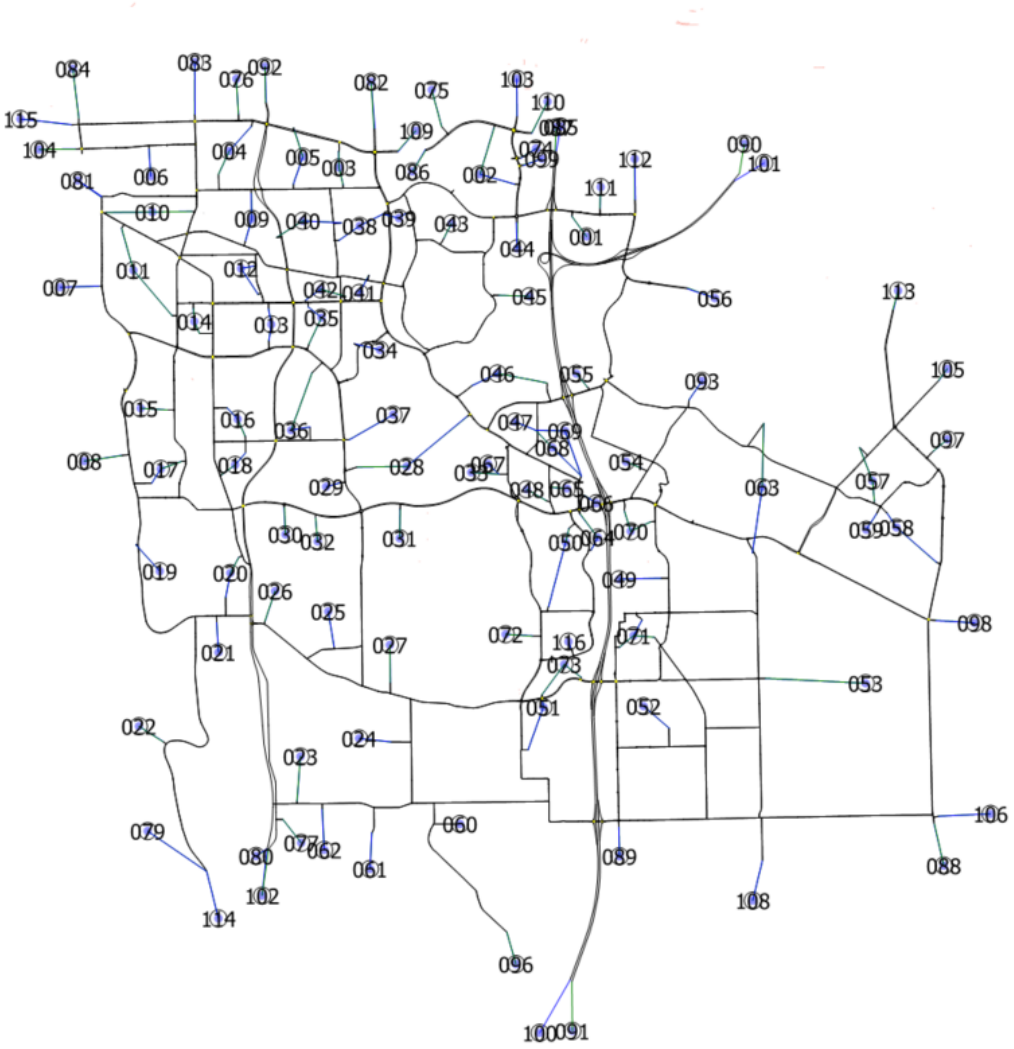



Figure 3 – Modelled Aimsun zone layout

The relationship between the original supplied ROM24 data and the updated data is summarised in Table 1.

Table 1 - Zone breakdown between ROM24 and CDTM

| Zone Set | 2011 | 2016 | 2020 | 2021 | 2031 |
|---|---|---|---|---|---|
| **Previous CDTM Internal Zones** | 77 | | 77 | | 77 |
| **Previous CDTM External Zones** | 23 | | 25 | | 27 |
| **Previous CDTM Dummy Zones for Growth** | 13 | | 13 | | 13 |

| Zone Set | 2011 | 2016 | 2020 | 2021 | 2031 |
|---|---|---|---|---|---|
| **Previous CDTM Total Zones** | 113 | | 115 | | 117 |
| **ROM24 Internal Zones** | | 59 | | 59 | 59 |
| **ROM24 External Zones** | | 48 | | 50 | 52 |
| **ROM24 Total Zones** | | 107 | | 109 | 111 |
| **CDTM Internal Zones** | | 60 | | 60 | 60 |
| **CDTM External Zones** | | 48 | | 50 | 52 |
| **CDTM Total Zones** | | 108 | | 110 | 112 |

The final CDTM has one more zone representing the City of Cockburn area than the ROM24. This slight increase has been made to enhance the accuracy of the forecast around the Wentworth Parade area. The increase in CDTM external zones between 2016, 2021 and 2031 are as a result of additional links from the external network as new corridors in and out of the City of Cockburn area are constructed. The zone system is different to the previous study completed as the zones were reflective of the years 2011, 2020 and 2031.

## 2.2 Demand matrix

The traffic demand matrix was derived using a sub-matrix from ROM24, with similar parameters to what was used for the existing Cockburn District Traffic Model such as demographics and trip generation confirmed with the city. Table 2 indicates the matrix totals used in the 2016, 2021 and 2031 models.

Table 2 - Demand Matrix Totals

| Vehicle | 2016 | | 2021 | | 2031 | |
|---|---|---|---|---|---|---|
| | AM | PM | AM | PM | AM | PM |
| **Cars** | 113,632 | 131,721 | 135,410 | 164,271 | 170,974 | 201,322 |
| **Trucks** | 12,369 | 12,835 | 15,011 | 18,178 | 18,959 | 22,292 |
| **Total** | 126,001 | 144,556 | 150,421 | 182,449 | 189,933 | 223,614 |

## 2.3 Review of Main Roads zoning, network and key developments

The review of the number of zones was undertaken to understand the detailed development areas along with a review of centroid connectors to better reflect access locations. Zones internal to the Cockburn sub-model were reviewed. This method ensures that road improvements such as roads identified or planned in Structure Plans, the City's future major road works and Main Roads WA planning for the projects such as Armadale Road, North LakeRoad Bridge, southern connection road to the Murdoch Activity Centre, Kwinana Freeway Widening, Karel Avenue Projects and other improvements within the State road network are taken into consideration.

The development of the model demographics, based on those supplied by Main Roads as part of the ROM24 model, was guided by the City of Cockburn officers. Figure 4 shows the major development areas as outlined by the City of Cockburn Regional and Major Roadworks diagram, version 9, dated March 2017.

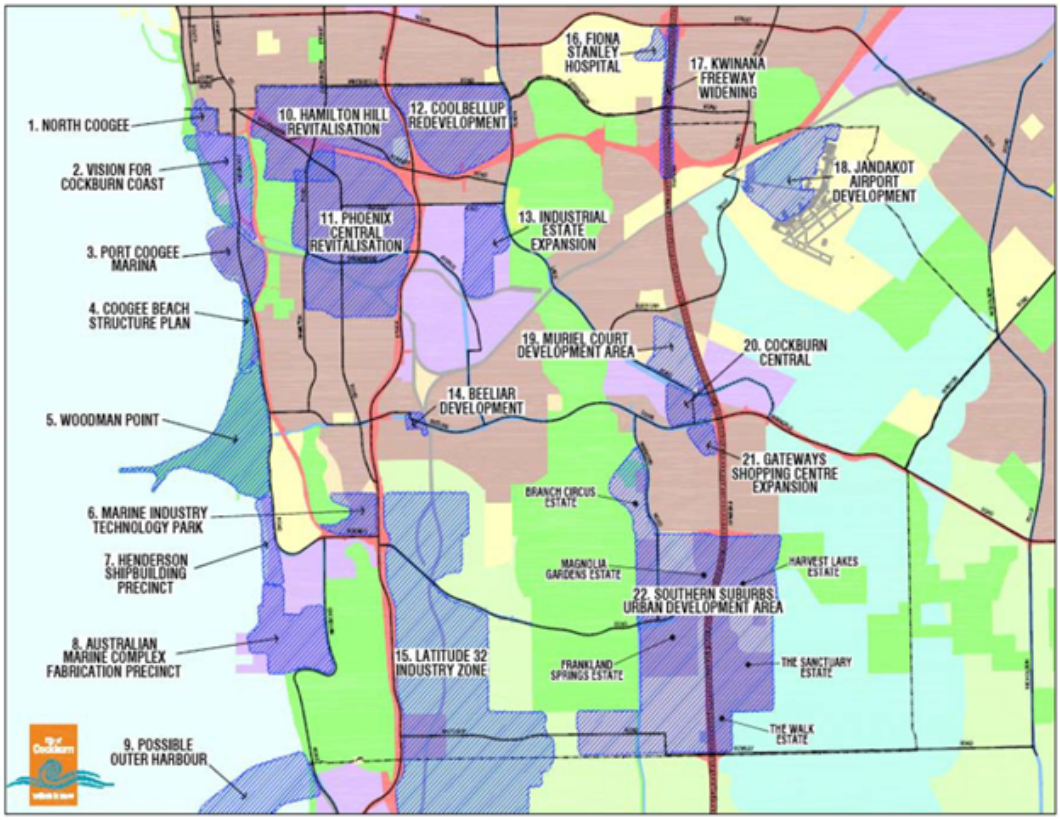



Figure 4 - Major development areas

Source: A Plan for the District 2010 - 2020, City of Cockburn

## 2.4 Demographic data review

Demographic data was obtained from the City of Cockburn, the Department of Planning, Lands and Heritage, and the Department of Education to review the ROM matrix outputs for the year 2016 for suitability. The three key demographic attributes used to validate the matrices were dwellings, employment and education as they were deemed to be significant factors impacting trip generation.

Total dwellings by zone was sourced from the City of Cockburn 2016 census data, and was adjusted to match the ROM24 zones to directly compare the total dwelling count from both data sets. Appendix D displays the ROM24 numbers and the City of Cockburn census numbers, and the final revised dwelling numbers.

Total local workers by zone was sourced from the City of Cockburn 2016 census data, and was adjusted to match the ROM24 zones to directly compare the total employment numbers from both data sets. These data sets were then compared against survey data retrieved from the Department of Planning, Lands and Heritage which identify the key “complexes” within the City of Cockburn and the levels of employment they generate accordingly. The survey is of all commercial, industrial, public purpose and recreation/open space land uses, with key data including how many people work at each activity centre.

As they are survey results, they were used to validate findings rather than in calibrating the initial ROM24 and City of Cockburn datasets. Once the 2016 employment rates were determined, the 2021 and 2031 predicted employment levels were determined using the growth rates determined from the ROM24 land use data. Appendix D displays the ROM24 input employment numbers, the City of Cockburn census data and the final revised employment numbers.

The total amount of students by zone was validated using student enrolment numbers sourced from the Department of Education, for schools within the City of Cockburn. Once the 2016 employment levels were validated, the ROM growth factors were used to determine 2021 and 2031 education levels. This is also shown in Appendix D.

Table 3 - Key development area yield assumptions in the supplied ROM24 land use files (source: Main Roads)

| Development Area | ROM Zone Nos | ROM Demographic Zones (2016) | Dwellings | | | Employment | | | Education | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2016 | 2021 | 2031 | 2016 | 2021 | 2031 | 2016 | 2021 | 2031 |
| **Cockburn Central** | 774 | 48 | 123 | 414 | 352 | 300 | 1181 | 836 | 0 | 0 | 0 |
| **Fiona Stanley Precinct** | External to model 667 | 2 | 287 | 270 | 385 | 2703 | 10904 | 19257 | 12876 | 14039 | 16504 |
| **Jandakot Airport Development** | 782 | 56 | 143 | 196 | 198 | 1605 | 1705 | 1741 | 29 | 14 | 0 |
| **Latitude 32** | 749, 750, 751, 752, 753, 939, 940 & 941 | 23, 24, 25, 26, 27, 60, 61 & 62 | 416 | 432 | 468 | 686 | 5139 | 16820 | 138 | 135 | 135 |
| **Australian Marine Complex** | 748 | 22 | 7 | 7 | 6 | 3953 | 4054 | 4315 | 457 | 487 | 513 |
| **Cockburn Coast Development** | 733 | 47 | 255 | 2510 | 4849 | 364 | 1642 | 2791 | 0 | 250 | 500 |

Table 4 - Key development area yield assumptions in the revised CDTM

| Development Area | ROM Zone Nos | ROM Demographic Zones (2016) | Dwellings | | | Employment | | | Education | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2016 | 2021 | 2031 | 2016 | 2021 | 2031 | 2016 | 2021 | 2031 |
| **Cockburn Central** | 774 | 48 | 144 | 476 | 634 | 3305 | 13008 | 9205 | 0 | 0 | 0 |
| **Fiona Stanley Precinct** | External to model 667 | 2 | 287 | 270 | 385 | 2703 | 10904 | 19257 | 12876 | 14039 | 16504 |
| **Jandakot Airport Development** | 782 | 56 | 151 | 1593 | 2743 | 5112 | 5431 | 5544 | 29 | 14 | 0 |
| **Latitude 32** | 749, 750, 751, 752, 753, 939, 940 & 941 | 23, 24, 25, 26, 27, 60, 61 & 62 | 343 | 990 | 1612 | 614 | 3936 | 13744 | 138 | 135 | 135 |
| **Australian Marine Complex** | 748 | 22 | 5 | 6 | 7 | 5439 | 5578 | 5937 | 457 | 487 | 513 |
| **Cockburn Coast Development** | 733 | 47 | 269 | 1250 | 3751 | 516 | 2328 | 3958 | 0 | 200 | 500 |

Table 3 summarises demographic data from ROM 24 in key development areas within City of Cockburn and Table 4 shows demographic data after review. Both demographic data assumes similar growth in a number of the key development areas as shown in Table 3 and 4. In terms of employment growth, Fiona Stanley Precinct, Latitude 32 area and Cockburn Coast Development show the most significant growth compared

to 2016 employment levels. The Jandakot Airport Development area and Cockburn Coast Development show the most significant dwelling growth from 2016 dwelling levels.

From the demographic review process, no employment forecasts for 2021 and 2031 were provided within the city of Cockburn, so the 2016 values were determined for each zone and factored up using the ROM24 forecasted increases.

Latitude 32 is identified as an industrial development area which reflects the significant job growth, however due to the nature of the ROM24 zoning boundaries, some of the surrounding residential areas to the north were captured within this area. This accounts for the dwelling growth identified in Latitude 32 the area.

## 2.5 Trip generation

Revised trip generation equations were applied to match previous work (City of Cockburn District Traffic Study, 2013) and latest available trip generation information. Research into trip generation trends was also undertaken to review how these may change into the future. The updated 'internal to internal' trip matrices were combined with the 'external to internal'; 'internal to external'; and 'external to external' trip matrices from the ROM24 to produce overall demand matrices for light and heavy vehicles for 2021 and 2031. Interpolation was used for years that do not align with ROM24 forecast years.

Trip generation rates are applied to the yields for each zone in order to establish the quantum of traffic generated by each zone. Trip generation rates were determined for both households and for employment based on a review of first principles data and similar transport model parameters. The trip generation rates for employment were based on a review of modelling practice in Western Australia and within Australia. Employment was divided into three categories:

- Retail
- Commercial
- Industry

Some adjustments were made based on the more detailed breakdown of these categories to adjust the trip rates so they were more relevant to the modelled area. Despite the adjustment residential trip generation rates are conservative and consistent with rates that are traditionally accepted by the Western Australian Planning Commission when assessing new development applications and structure plans.

The trip rates are vehicular trips and are as follows:

- 7 trips per household
- 1 trip per school student
- 9.3 trips per retail employee
- 3.0 trips per commercial employee
- 2.6 trips per industrial employee.

Additionally, trip generation rates were calibrated against total vehicle trips generated in the ROM24 on a zone by zone basis.

## 2.6 Time period

In a difference to the 2013 DTS, the model was updated to reflect that ROM24 can now provide a breakdown of matrices into peak periods (not available in 2013). This means that the time period splits were undertaken in ROM24 rather than the CDTM. As a result, two time periods have been modelled, morning peak (between 07:00-09:00) and evening peak (between 16:00-18:00). Modelling results are presented for 2 hour peaks throughout the report.

## 2.7 Mode split

Matrices have been developed based on ROM24 to reflect the mode split to allow for assessment of car/light and heavy vehicle impacts on the network. These rates have been validated against the traffic counts collected from the Main Roads traffic counts mapping tool and traffic counts provided by the City of Cockburn.

It is envisaged that some sensitivity testing on modal share factors may need to be undertaken by the City to mimic greater non-car mode share if a more detailed traffic assessment is required; currently outside of this scope.

## 2.8 Trip assignment

A key advantage of the Aimsun platform is its ability to undertake the assignment of matrix demand to the road network in a simple robust manner.

A multiclass volume static origin-destination matrix adjustment assignment was undertaken with car/light and heavy vehicles. This approach provided the following:

- Better modelling of the impact of heavy vehicles on road capacity given the mix of freight and non-freight routes in the study area
- Ability to better model the mix of heavy vehicle types and their impact on road capacity
- Volume averaging approach consistent with future upgrade of explicit modelling of intersection operations
- Converges to a stable and consistent result more readily than other assignment techniques

Model network and initial matrices have been extracted from ROM24 and therefore major parameters have been brought from ROM24 into Aimsun. That allowed DTS model consistency with Main Roads strategic modelling.

# 3 Cockburn district traffic model

The CDTM is a macroscopic Aimsun model derived from ROM24 demand matrices and validated against available count data. Mode share is divided into car/light and heavy vehicles based off the ROM24 matrices and 'furnessed' to count data to accurately represent existing situation. According to Main Roads Operational Modelling Guidelines furnessing is defined as follow:

*"The Furness method of matrix updating is an iterative process to derive matrices that result in the best match to trip end count data. Trip end totals for each zone should be formed from external link survey data, internal link survey data and other filler zones with the values based on surveys, surrounding land use or the number of individual households. Within this, individual OD pairs should be fixed to known survey values or established during the calibration process."*

The public transport data has not been included at this stage of the modelling. Figure 5 and Figure 6 depict the process of the base model development and future model development.

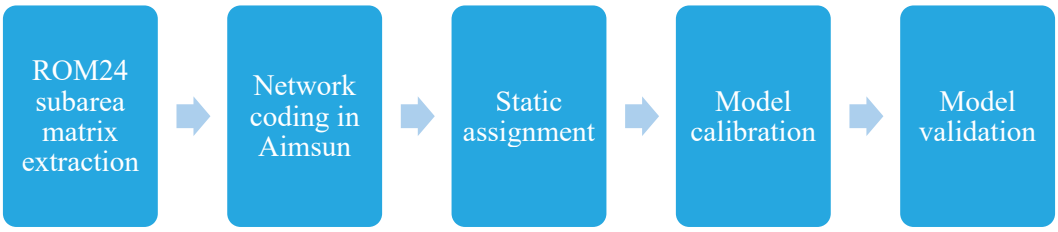



Figure 5 - Base model development

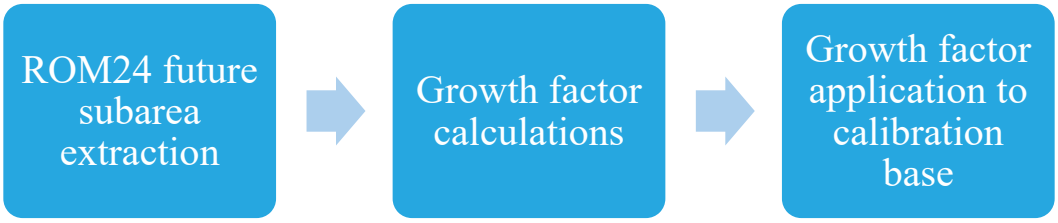



Figure 6 - Future model development

## 3.1 2016 base year

A 2016 base year model was developed and calibrated with parameters using existing traffic count information to confirm that the model is fit for purpose. Once calibrated and validated the model was used to forecast future changes to traffic volumes associated with changes to land use.

Based on the traffic data available for the study and correlation with the ROM24 data to observed daily traffic counts within the City of Cockburn, the CDTM calibrates to well within industry accepted standards at a daily level and satisfactory for peak periods.

The desirable industry standards extracted from NSW Road and Maritime Services Traffic Modelling Guidelines version 1 and Main Roads OMeGA guidelines are contained in Table 5.

Table 5 - Link Validation Measures

| Link Calibration Measure | Desirable Value |
|---|---|
| **GEH < 5** | 85% |
| **Link Validation Measure** | **Desirable Value** |
| **Coefficient of Determination ($R^2$)** | >0.90 |

Source: "Traffic Modelling Guidelines" Version 1, NSW Road and Marine Services

Additional measures such as GEH have been included as these are required for the Aimsun strategic modelling based on the local Main Roads modelling guidelines.

### 3.1.1 Base model calibration – GEH statistic

The criteria from Roads and Martie Services (RMS) guidelines for model calibration are based on statistics formula called GEH. As RMS states:

*"the formula is a form of Chi-square statistic that is designed to be tolerant of largest errors in low flows. The reason for introducing such a statistic is the inability of either the absolute difference or the relative difference to cope over a wide range of flows."*

The GEH equation is as follows:

$$GEH = \sqrt{\frac{(V_o - V_m)^2}{0.5\,(V_o + V_m)}}$$

Where:

$V_o$ is the observed flow in vehicles per hour

$V_m$ is the modelled flow in vehicles per hour

According to RMS, turn volumes calibration is achieved when" 85 per cent of individual turn volumes to have a GEH ≤ 5.0".

### 3.1.2 Base model calibration results

The calibration has shown a very good model performance against observed flows. All time periods were calibrated above the required 85% margin as shown in Table 6.

Table 6 - GEH results

| GEH Results | GEH Range | Car | Heavy Vehicles |
|---|---|---|---|
| AM Peak Hour | =<5 | 86% | 93% |
| | 5 to 10 | 10% | 7% |
| | >10 | 4% | 0% |
| PM Peak Hour | =<5 | 85% | 94% |
| | 5 to 10 | 14% | 6% |
| | >10 | 1% | 0% |

### 3.1.3 Validation plots – peak periods

The scatter plot validates well against 2016 average peak period traffic volumes with parameters meeting the industry acceptable standard. To demonstrate the model validation scatter plots of 240 traffic count locations versus 2016 CDTM volumes are shown in Figure 7 and Figure 8 for AM peak and PM peak time periods respectively.

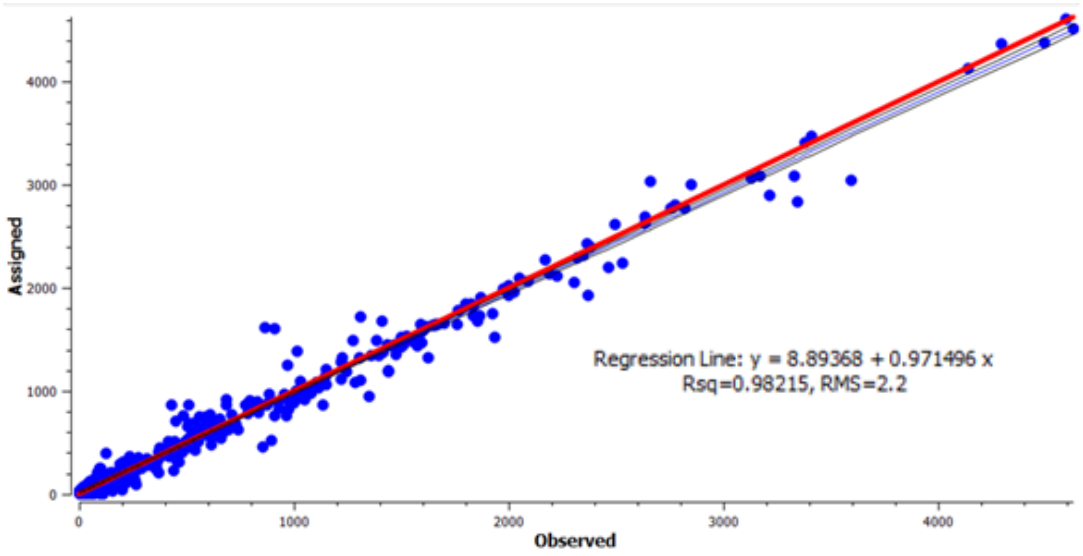



Figure 7 – AM Peak period validation plot

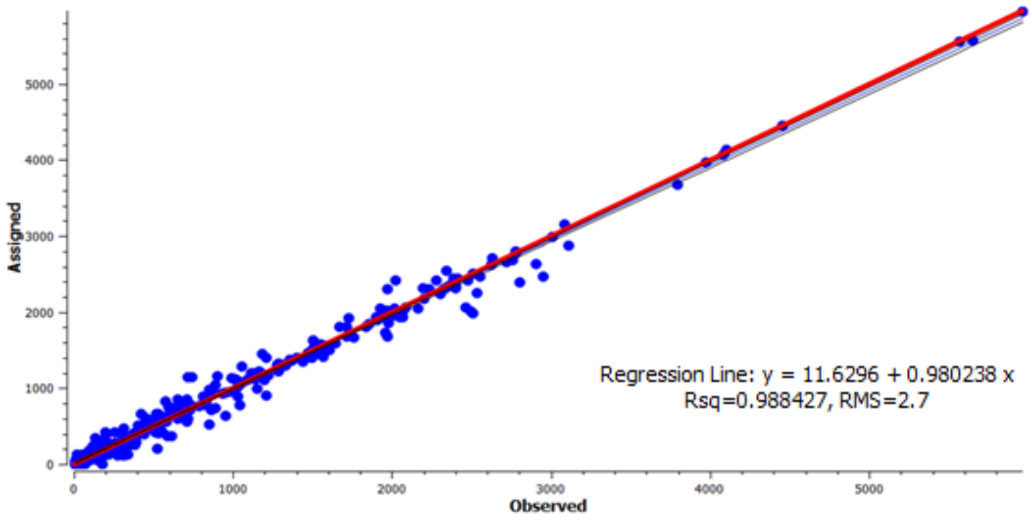



Figure 8 – PM Peak period validation plot

The AM and PM peak periods validate very well to the guideline standards which shows a very good model robustness and fit for purpose. As a result, both modelled peak periods provide a useful guide in understanding peak period traffic, operation including directional bias and traffic growth under congested conditions.

### 3.1.4 Model convergence

The 2016 base model was run with 50 iterations to ensure it converged appropriately. The AM peak had a relative gap of 3.37% and the PM peak had a relative gap of 2.05%. Model is considered converged when relative gap is lower than 5%, therefore results of both model calibrations show very good model convergence.

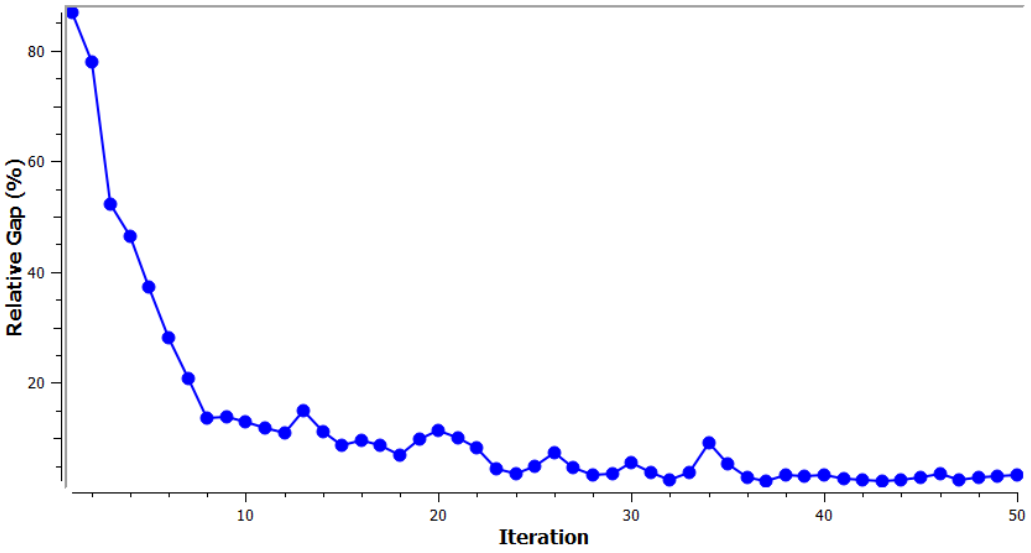



Figure 9 – AM Peak period convergence plot

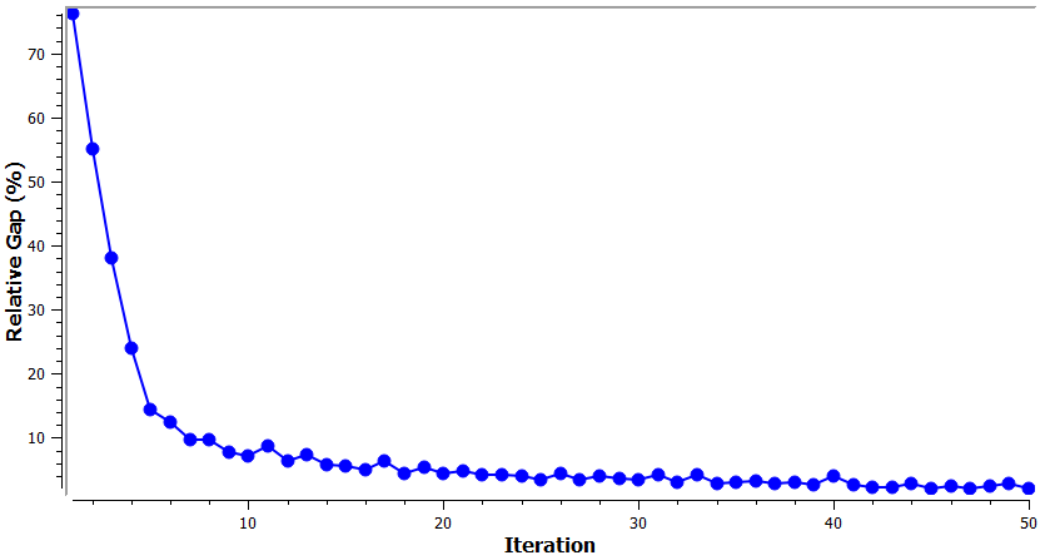



Figure 10 – PM Peak period convergence plot

### 3.1.5 Validation summary

Overall, the CDTM provides a sound basis for the future modelling of the transport network in and the City of Cockburn area. From a review of the 2016 peak traffic volumes supplied from the Main Roads and City of Cockburn, the CDTM validates very well against requires industry standards. Both coefficient of determination (r-square) are over required 0.95%. The R-Square (R2) is a

statistical measure of the correlation between the entire count data set and the predicted model volumes. Unlike the GEH statistic (which applies to individual flows and screenlines), the R-Square (R2) applies to the entire comparison data set and is expressed as a single value.

As with any transport model, the CDTM will be enhanced through project application in the future to improve performance at a detailed level. As it currently stands, the CDTM would appear to provide the best available tool to understand strategic transport flows on the majority of roads within the City of Cockburn area. A summary of the level of validation for each time period is shown in Table 7.

Table 7 - Validation summary

| Link Validation Measure | Desirable Value | AM Peak | PM Peak |
|---|---|---|---|
| **Coefficient of Determination ($R^2$)** | >0.90 | 0.98 | 0.98 |

## 3.2 Use of CDTM

The use of the CDTM output should be treated in a similar manner as other strategic models. Whilst suitable as a strategic network analysis tool, it is recommended that forecast traffic volumes used for design be verified against actual count data collected specifically to each project.

In general, the process for determining forecast traffic volumes should be as follows:

1. Obtain 2016 and forecast year traffic flows from CDTM
2. Calculate growth rate to the required design year based on the CDTM link growth data.
3. Apply traffic growth from the CDTM to existing traffic counts
4. Review the forecast volumes to ensure reasonable in the context of surrounding development and traffic growth

Where new links and intersections are under construction, unmodified CDTM output will require additional scrutiny to ensure reasonable for design purposes such as analysis at intersections.

# 4 Base modelling results

## 4.1 Volume capacity ratio

Link capacities are often referred to as the mid-block capacity and when calculated take into account the characteristics of a link between two points, usually intersections. Different methods for calculating road capacities are used for different road environments and flow characteristics.

According to AustRoads document "*Level of Service Metrics (for Network Operations Planning)* ", capacity is defined as the maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions.

In order to determine the point at which more capacity is required to allow more traffic to pass through a road or intersection, the volume to capacity ratio is used.

The levels of service are calculated based on the assigned volumes produced by strategic model and mid-bloc capacity coded in the network.

The volume to capacity ratios range from A to F and are defined by qualitative measures describing operational conditions within a traffic stream and their perception by motorists and/ or passengers.

The level of service range and corresponding volume to capacity ratios used in the DTS model are indicated in Table 8.

Table 8 - Volume to capacity ratios governing midblock level of service

| **Volume Capacity Ratio** | **Level of Service** | | | | | |
|---|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** | **F** |
| 100km/h | 32% | 50% | 72% | 92% | 100% | >100% |
| 90km/h | 30% | 47% | 68% | 89% | 100% | >100% |
| 80km/h | 28% | 44% | 64% | 85% | 100% | >100% |
| 70km/h | 26% | 41% | 59% | 81% | 100% | >100% |

Source: AustRoads 2009

In order to reflect modelling results a unified LOS range has been determined for better visualisation, as shown in Table 9, and used in the peak hour volume plots for the AM and PM peak for the base year 2016, as shown in Figure 11 and Figure 12.

Table 9 – Volume to capacity ratios used in model to govern level of service

| Volume Capacity Ratio | Level of Service | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| Unified Speed Range | 29% | 46% | 60% | 80% | 100% | >100% |

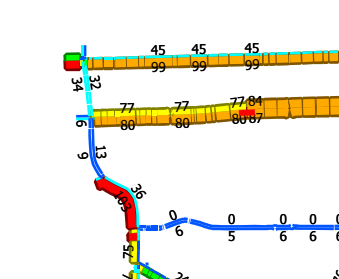



Figure 11 - Volume Capacity Ratio - AM Peak, year 2016

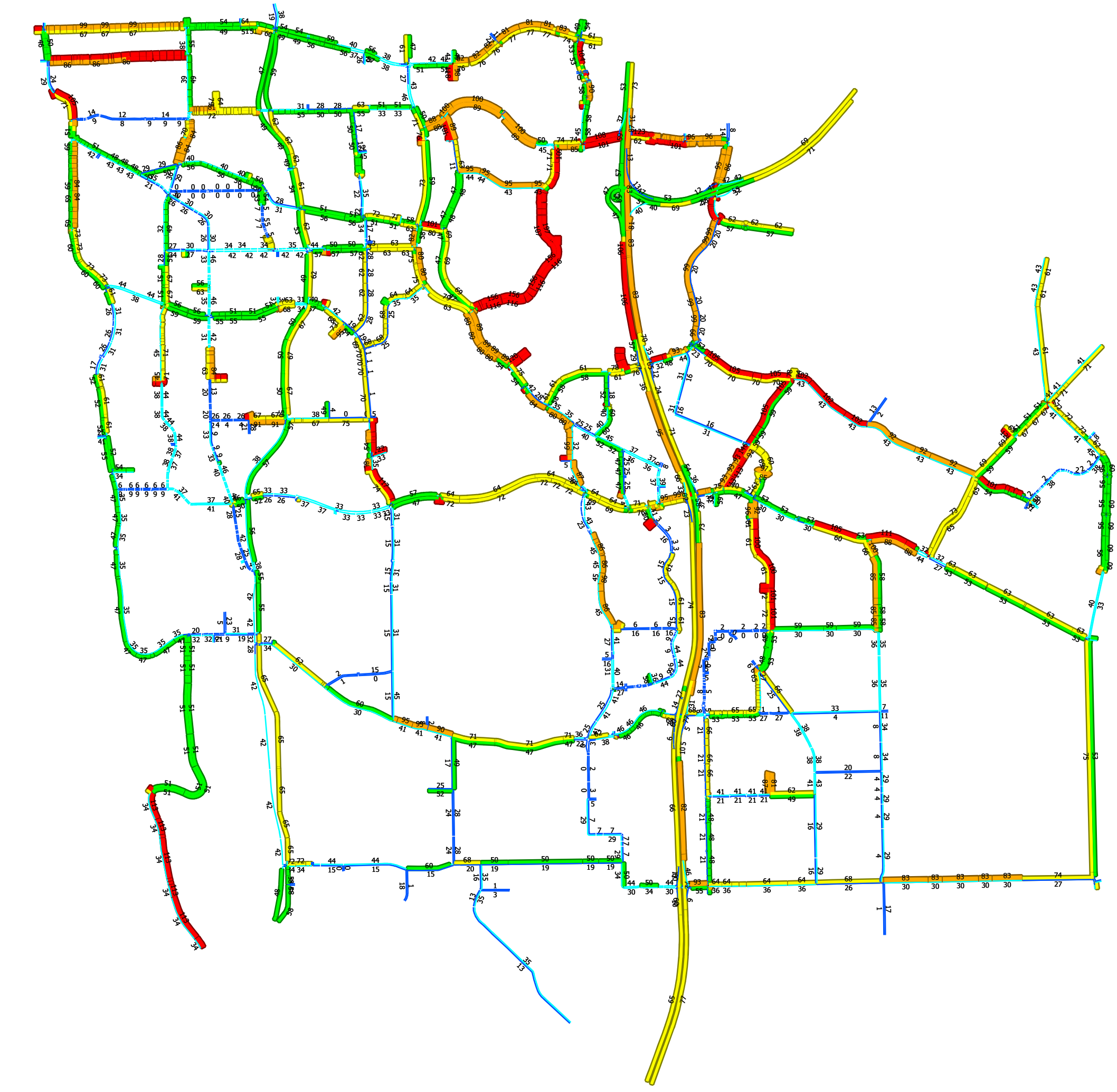



Figure 12 - Volume Capacity Ratio - PM Peak, year 2016

The 2016 model run confirms known congestion hotspots in the City where the modelled volume capacity is over 100%. Most notably sections of the following roads as displayed in Table 10 and Figure 13.

Table 10 - Roads with a volume capacity ratio exceeding 100% in both peak periods.

| Reference Number | Road Type | Road Name |
|---|---|---|
| 1 | Primary Distributor | Kwinana Freeway |
| 2 | Primary Distributor | Armadale Road |
| 3 | Primary Distributor | Farrington Road |
| 4 | Regional Distributor | Jandakot Road |
| 5 | Regional Distributor | Russell Road |
| 6 | Distributor A | Cockburn Road |
| 7 | Distributor A | Spearwood Avenue |
| 8 | Distributor A | Beeliar Drive |
| 9 | Distributor A | Berrigan Drive |
| 10 | Distributor A | Karel Avenue |
| 11 | Distributor B | Bibra Drive |
| 12 | Distributor B | Hammond Road |
| 13 | Local Distributor | Tapper Road |

Figure 13 depicts the corridor hotspots on the Cockburn network for 2016.

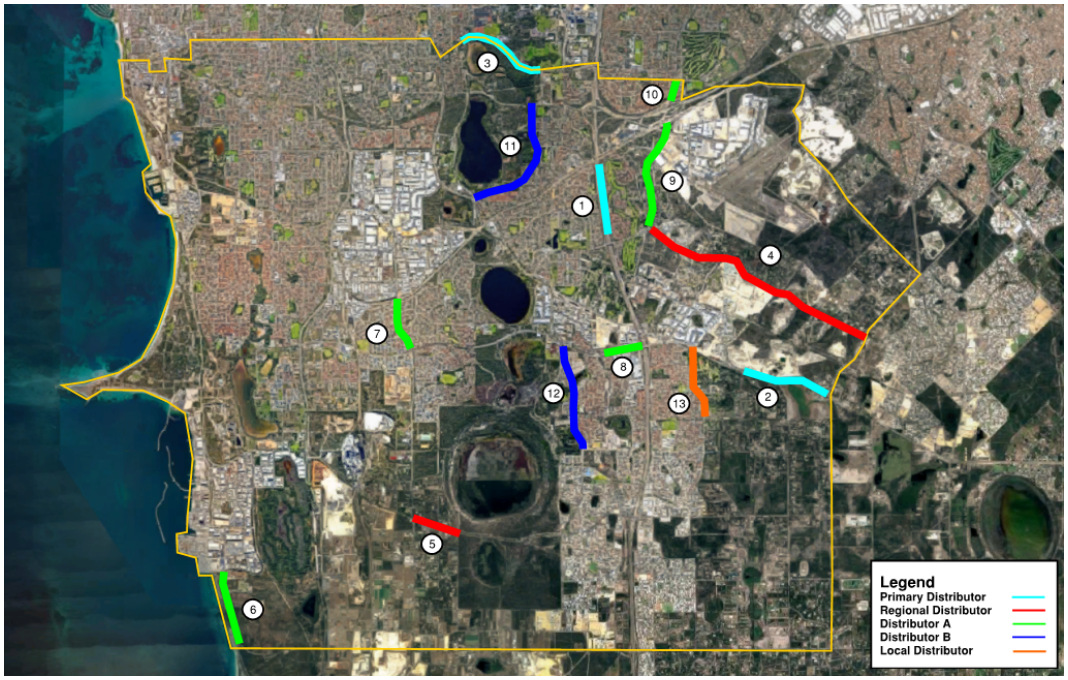



Figure 13 – 2016 corridor hotspots

Some features (eg wetlands/lakes, Jandakot Airport) restrict the permeability of the road network in locations which results in short sections of roads operating close to capacity including Farrington Rd (north of Bibra Lake) and Berrigan Drive (Jandakot Airport).

## 4.2 Assigned volumes

As part of the strategic modelling exercise model outputs assigned volumes plots. As mentioned in section 4.1 assigned volumes are an output from strategic model, often used for calculation of level of service. Figure 14 shows AM Peak plot and Figure 15 shows PM peak plots. Appendix A shows all remaining assigned volumes plots for all modelled scenarios.

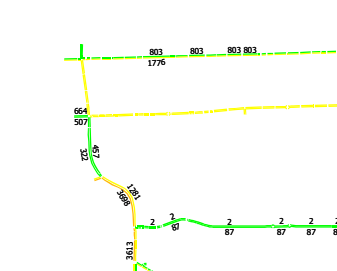



Figure 14 - Assigned Volumes - AM Peak, year 2016

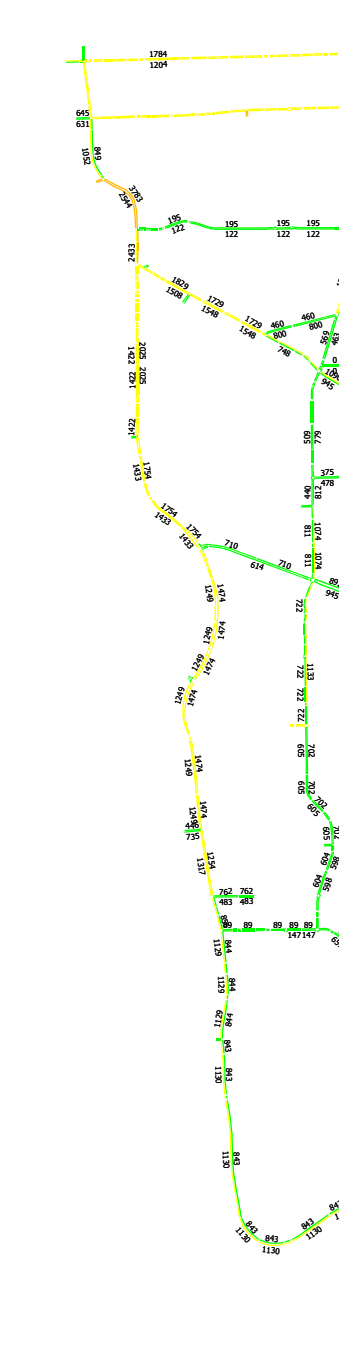



Figure 15 - Assigned Volumes - PM Peak, year 2016

## 4.3 Base traffic conditions in Cockburn

Given its location in the south-western suburbs of Perth, the City of Cockburn experiences pronounced peak traffic conditions during weekday commuter peaks and in the lead up to long weekends as people travel south along the Kwinana Freeway to the south west. Combined with this demand, is the east west heavy vehicle flows between the industrial areas in the west e.g. Henderson and Fremantle and industrial areas near Perth Airport/ Forrestfield/ Kewdale. Given the level of forecast development, it may be difficult and unsustainable to provide road infrastructure upgrades to accommodate unconstrained peak hour vehicle demand in the future. However, network planning needs to be cognisant of these peak conditions and make some allowances for appropriate traffic management measures to manage peak demand scenarios.

The assessment assumes average weekday peak conditions (i.e. model output); however, it is recommended that capacity targets are kept relatively optimistic (e.g. LoS D) so at least some capacity is kept in reserve for future growth (beyond the forecast horizon of 2031) or if funding constraints result in particular projects being delayed. This desirable level of service will be more applicable to trunk routes such as Rockingham Road; a reduced LoS should generally be considered in the activity centres, where traffic management measures may be better applied and the needs of non-car modes should take greater precedence improving average speeds for motorists.

## 4.4 Impact of network capacity on non-car modes

It is noted that the adoption of target LoS (Volume Capacity Ratio) can have impacts on non-car modes of transport. Along trunk routes, increased capacity, traffic flows (e.g. added lanes) and higher speed limits generally diminish the attractiveness and safety of the route for walking and cycling trips. Pedestrian crossing movements away from controlled locations (e.g. under/ overpasses or traffic/ pedestrian signals) also become less safe and attractive. In addition, public transport services may be detrimentally affected by route upgrades when opportunities to perform turning movements and manoeuvre in and out of stops are diminished with increased traffic flows. It is important the LoS is chosen with respect to all the modes using road corridors. Further detailed analysis might be required when planning road improvements on individual locations.

Where segregated facilities for walking and cycling trips exist such as along Kwinana Freeway and selected arterial roads in the City, the level of service of the road network has less impact on the experience and safety of pedestrian and cycle movements.

Roads with a low classification within the functional road hierarchy that service activity centres, should afford a high priority to alternative modes to the car, reducing the focus of road network planning on level of service. For example, within Cockburn Central, it is recommended that a lower LoS is accepted to increase opportunities for pedestrians and cyclists to undertake trips safely and with higher amenity. This may be facilitated through:

- Appropriate signal phasing

- Limiting road capacity to one lane in each direction rather than duplication
- Avoiding installation of turning pockets slip lanes at intersections where there are high crossing demands
- Adopting posted speed limits of 50kph or less subject to Main Roads approval

It is recommended to adopt a sliding LoS scale in the first instance, based on the status of each modelled link and its location within the sub-region. The target LoS would be subject to change based on the future land use and network scenarios that are tested.

# 5 Forecast scenarios

Two future year scenarios – 2021 and 2031 have been analysed. The year 2031 is the standard horizon adopted for road network planning in Western Australia and consistent with the Main Roads strategic model, ROM24. For each year, two road network scenarios have been modelled:

- Do nothing – the road network is as per year 2016
- Do minimum – current network plus Main Roads committed road improvements
- Do Something 01 - City of Cockburn Preferred Network – Main Roads committed road improvements plus network upgrades as identified in current City of Cockburn planning
- Do Something 02 – additional widening scenarios requested to be investigated by City of Cockburn, such as Stock Road and Cockburn Road. These scenarios have been modelled as additional assessment.

The ‘do nothing’ scenario helps to support a case for road network upgrades and identify priority investment locations. This scenario needs to be considered given some of the proposed upgrade projects are unfunded and therefore there is no firm commitment to proceed with the upgrades.

Forecasting for the 2021 and 2031 scenarios was undertaken based on “furnessing” the base 2016 matrix with growth in the trip ends based on the internal zone trip generation rates.

For this commission, Arup undertook modelling of three network scenarios summarised in Table 11.

Table 11 - Scenario Matrix

| Scenario | Existing (2016) | Short Term (2021) | Long Term (2031) |
|---|---|---|---|
| **Do Nothing - Existing Network** | Existing Network | No improvements | No improvements |
| **Do Minimum** | | ROM24 road improvements | ROM24 road improvements |
| **Do Something** | | City of Cockburn identified road improvements | City of Cockburn identified road improvements |
| **Stock Road Widening** | | | City of Cockburn identified road improvements with Stock Road widened |
| **Cockburn Road Widening** | | | City of Cockburn identified road improvements with Cockburn Road widened |

## 5.1 Mode share assumptions

The City of Cockburn DTS model has been based on the Main Roads mode share in order to keep consistency with Main Roads strategic model. The adopted mode share is assumed to remain constant at 2016 levels over the modelled future years. This is a conservative approach in light of increased road network congestion.

## 5.2 Network assumptions

Arup conducted a policy review to understand the potential timings for road network upgrades within the City of Cockburn. The road network upgrades adopted in the modelling are detailed in Figure 16 and Table 12. City of Cockburn structure plans, Table 13, Main Roads projects (Table 14) were also taken into consideration to update the road network and zoning. These timings are as per the Main Roads ROM24, a review of the 2013 City of Cockburn District Traffic Study and final confirmation from the City of Cockburn. As discussed earlier, the inclusion of these projects does not infer a funding commitment to the listed upgrades.

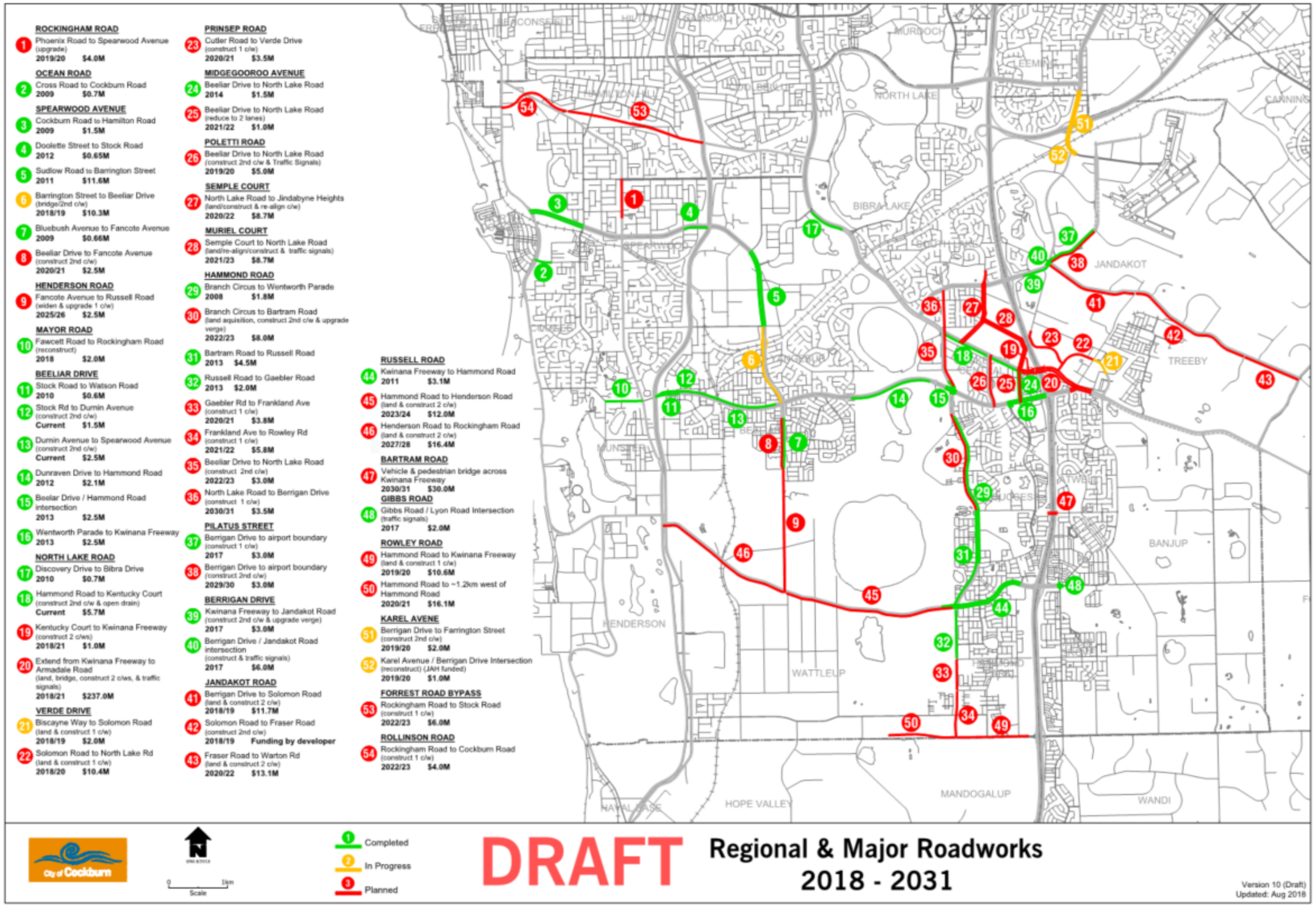



Figure 16 – City of Cockburn Regional and Major Roadworks diagram, version 10, August 2018

Table 12 - City of Cockburn Road Network Upgrades

| Road Network Upgrade | 2021 | 2031 | Comment regarding assumption basis |
|---|---|---|---|
| Rockingham Road – Phoenix Road to Spearwood Avenue reconstruction (to 1 lane each way) | | ✓ | Not reflected in ROM model |
| Spearwood Avenue - Barrington Street to Beeliar Drive (bridge / 2nd c/w) | ✓ | ✓ | Not reflected in ROM model |
| Spearwood Avenue – Beeliar Drive to Fancote Avenue (construct 2nd c/w) | ✓ | ✓ | Not reflected in ROM model |
| Henderson Road – Fancote Avenue to Russell Road (widen and upgrade 1 c/w) | | ✓ | Not applicable for strategic modelling |
| Beeliar Drive – Fawcett Road to Stock Road (reconstruction) | ✓ | ✓ | Not applicable for strategic modelling |
| North Lake Road / Discovery Drive intersection (traffic signals) | ✓ | ✓ | Not applicable for strategic modelling |
| North Lake Road – Kentucky Court to Kwinana Freeway (construct 2 c/ws) | | ✓ | In ROM 2021 & 2031 |
| North Lake Road – Extend from Kwinana Freeway to Armadale Road (land, bridge, construct 2 c/ws, & traffic signals) | | ✓ | In ROM 2021 & 2031 |
| Verde Drive – Biscayne Way to Solomon Road (land & construct 1 c/w) | ✓ | ✓ | In ROM 2021 & 2031 |
| Verve Drive – Solomon Road to North Lake Road (land & construct 1 c/w) | ✓ | ✓ | In ROM 2021 & 2031 |
| Prinsep Road – Cutler Road to Verde Drive (construct 1 c/w) | ✓ | ✓ | Not reflected in ROM model |
| Midgegooroo Avenue – Beeliar Drive to North Lake Road (reduce to 2 lanes) | | ✓ | |
| Poletti Road – Beeliar Drive to North Lake Road (construct 2nd c/w & traffic signals) | ✓ | ✓ | Not reflected in ROM model |
| Semple Court – North Lake Road to Jindabyne Heights (land / construct & re-align c/w) | | ✓ | No impact on network layout |
| Muriel Court – Semple Court to North Lake Road (land / re-align / construct & traffic signals) | | ✓ | No impact on network layout |
| Hammond Road – Branch Circus to Bartram Road (construct 2nd c/w & upgrade verge) | | ✓ | Not reflected in ROM model |
| Hammond Road – Gaebler Road to Frankland Avenue (construct 1 c/w) | ✓ | ✓ | Existing |
| Hammond Road – Frankland Avenue to Rowley Road (construct 1 c/w) | ✓ | ✓ | Not reflected in ROM model |
| Hammond Road – Beeliar Drive to North Lake Road (construct second c/w) | ✓ | ✓ | Not in ROM 2021 & in ROM 2031 |
| Hammond Road – North Lake Road to Berrigan Drive (construct 1 c/w) | ✓ | ✓ | Not reflected in ROM model |
| Pilatus Street – Berrigan Drive to airport boundary (construct 2nd c/w) | | ✓ | In ROM 2021 & 2031 |

| Road Network Upgrade | 2021 | 2031 | Comment |
|---|---|---|---|
| Jandakot Road – Berrigan Drive to Solomon Road (land & construct 2 c/w) | ✓ | ✓ | In ROM 2021 & 2031 |
| Jandakot Road – Solomon Road to Fraser Road (construct 2nd c/w) | ✓ | ✓ | In ROM 2021 & 2031 |
| Jandakot Road – Fraser Road to Warton Road (land & construct 2 c/w) | | ✓ | In ROM 2021 & 2031 |
| Russell Road - Hammond Road to Henderson Road (land & construct 2 c/w) | | ✓ | Not reflected in ROM model |
| Russell Road – Henderson Road to Rockingham Road (land & construct 2 c/w) | | ✓ | Not reflected in ROM model |
| Bartram Road – Vehicle & pedestrian bridge across Kwinana Freeway | | ✓ | Not in ROM 2021 & not in ROM 2031, potentially in 2041 |
| Rowley Road – Hammond Road to Kwinana Freeway (land & construct 1 c/w) | ✓ | ✓ | Not in ROM 2021 & in ROM 2031 |
| Rowley Road – Hammond Road to ~1.2km west of Hammond Road | ✓ | ✓ | Not in ROM 2021 & in ROM 2031 |
| Karel Avenue – Berrigan Drive to Farrington Street (construct 2nd c/w) | | ✓ | In ROM 2021 & 2031 |
| Forrest Road Bypass – Rockingham Road to Stock Road (construct 1 c/w) | ✓ | ✓ | Not Modelled |
| Rollinson Road – Rockingham Road to Cockburn Road (construct 1 c/w) | | ✓ | Not Modelled |

Source: City of Cockburn Regional and Major Roadworks diagram, version 10, August 2018

Approved City of Cockburn District Structure Plans are included in Table 13.

Table 13 - Approved City of Cockburn District Structure Plans

| Approved District Structure Plans | 2021 | 2031 |
|---|---|---|
| Southern Suburbs Stage 3 – Hammond Park west of the Freeway and south of Gaebler Road | ✓ | ✓ |
| Packham North | ✓ | ✓ |
| Branch Circus | ✓ | ✓ |
| Cockburn Coast | ✓ | ✓ |
| Treeby (released December 2017) | ✓ | ✓ |

Source: Approved Structure Plans on the City of Cockburn website

Main Roads Western Australia (Main Roads) future major works in the Main Roads Infrastructure Delivery Plan 2016-2019 are included in Table 14.

Table 14 - Main Roads WA Infrastructure Delivery Plan Projects

| Infrastructure Delivery Plan Projects | 2021 | 2031 |
|---|---|---|
| Armadale Road – Dual Carriageway – North Lake Road to Tapper Road (Commenced) | ✓ | ✓ |
| Murdoch Drive Connection to Kwinana Freeway and Roe Highway (extension of Murdoch Drive which joins onto Farrington Road) (Commenced) | ✓ | ✓ |
| Kwinana Freeway Northbound Widening – Russell Road to Roe Highway (Commenced) | ✓ | ✓ |
| Stock Road / Beeliar Drive Intersection Upgrade (Development) | ✓ | ✓ |
| Karel Avenue upgrades (Procurement) | ✓ | ✓ |

Source: Main Roads WA Infrastructure Delivery Plan last updated 22 November 2017

# 6 Future modelling results

The traffic volumes for the forecast years for key routes are represented in the network plots in Appendix A. Figure 21 to Figure 24 illustrate the volume to capacity ratio of the Do Nothing, for 2021 and 2031 network upgrades for the AM and PM peak periods.

The results of the future scenario modelling are discussed below.

## 6.1 Network statistics

The summary network statistic for each development year for the ‘do nothing’ and the upgraded network scenarios (as per Table 12) are shown in Table 15. Those statistics allow identify impact of upgrades on overall travel time and travel distance.

Table 15 - Forecast scenario assignment summary statistics

| Network Variable | Base | Do Nothing | | Do Something | |
|---|---|---|---|---|---|
| | 2016 | 2021 | 2031 | 2021 | 2031 |
| **Vehicle Hours (AM Peak)** | 96,917 | 2,126,083 | 2,521,283 | 1,876,583 | 1,028,405 |
| **Vehicle Kilometres (AM Peak)** | 763,311 | 911,291 | 1,220,820 | 912,039 | 1,244,320 |
| **Vehicle Hours (PM Peak)** | 113,826 | 1,758,417 | 2,204,200 | 1,677,867 | 1,492,047 |
| **Vehicle Kilometres (PM Peak)** | 860,180 | 1,089,200 | 1,363,730 | 1,149,940 | 1,474,940 |

The summary of network statistics has also been shown on the Figure 17 and Figure 18.

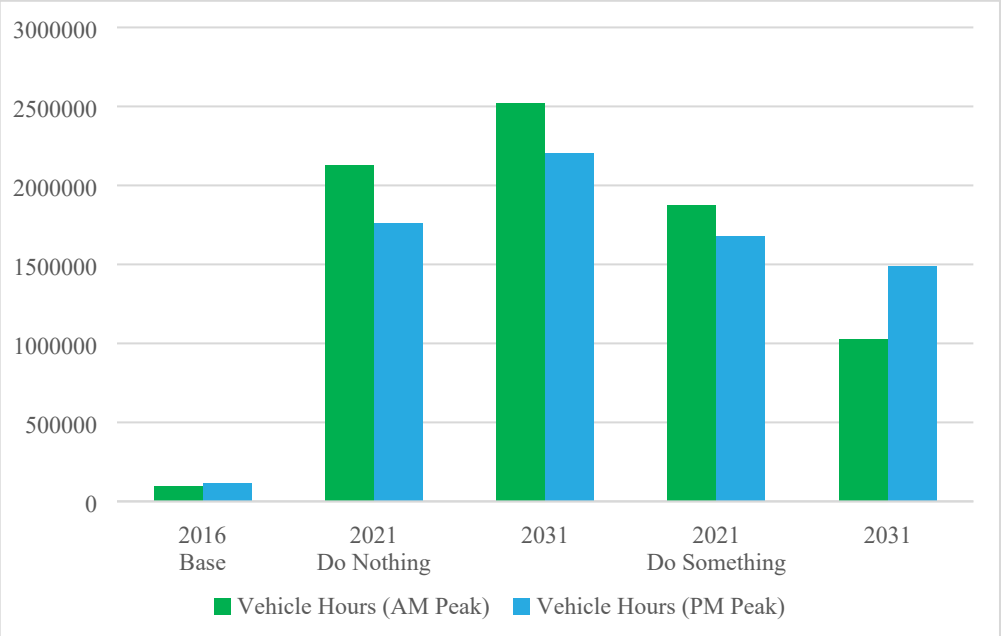



Figure 17 - Vehicle hours travelled across Cockburn road network

Figure 17 indicates significant increase in vehicle hours travelled due to decrease of accessibility to local roads which are result of increased congestion. This is a network wide statistic which includes all the roads modelled within the network. Future models show higher travel times which are result of some minor roads not performing as well. Additionally, results show significant growth in travel time if no network upgrades materialise (i.e. do nothing). However, it also shows a significant decrease in vehicle hours compared to 2021 if planned road improvements are implemented by year 2031.

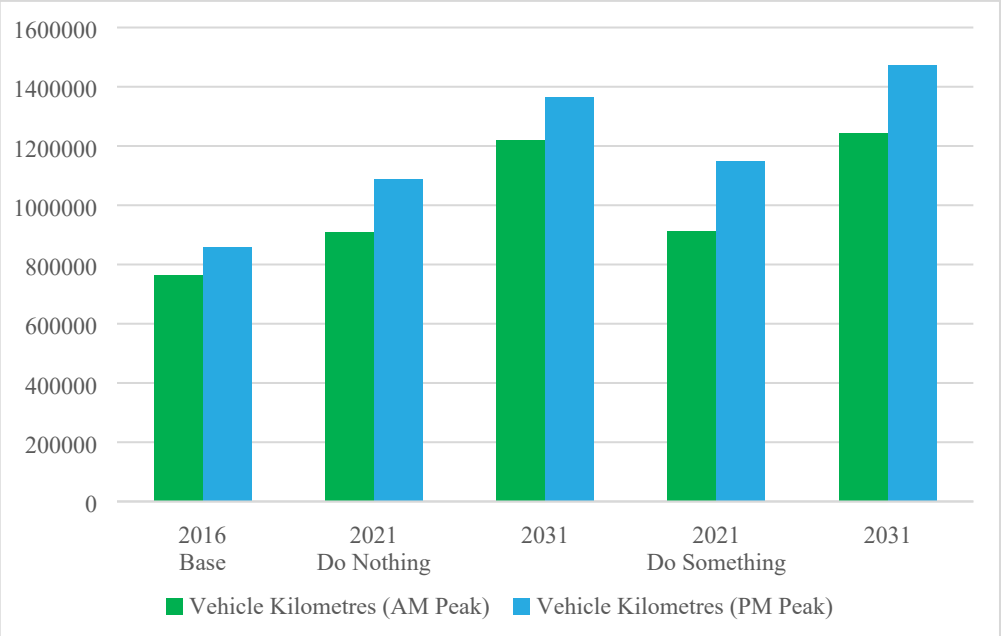



Figure 18 – Vehicle kilometres travelled across Cockburn road network

Vehicle distance travelled in kilometres further confirms need for road improvements but also shows similar pattern of growth between 2021 and 2031.

## 6.2 Road capacity results – year 2021

Without any changes to the road network, the model shows widespread congestion with many north-south and east-west links operating at a capacity of 95% or higher. The levels of congestion are expected to be similar during both the AM and PM peak periods.

The model shows that many of these congestion issues would be overcome with the introduction of the planned improvements as shown on Figure 21 to Figure 24. With these improvements, Kwinana Freeway is expected to continue to experience congestion with the road operating at over 95% capacity during both peaks. This is despite the planned upgrade to three lanes in each direction north of Russell Road. Table 16 and Figure 19 shows other roads on the network that are expected to operate at over 95% capacity.

Additionally, based on the Do Nothing results of roads with VCR over 85% for roads which are expected to be upgraded (see Table 18) it was indicated that all improvements planned to be implemented before year 2021 are required.

This is a large suite of upgrade options, most of which are understood to be unfunded and there is therefore no guarantee that all upgrades will be implemented within the year 2021 timeframe. Additionally, the analysis also highlights that some of the options planned post year 2021, are warranted at an earlier stage.

Table 16 - 2021 Do nothing roads with a volume capacity exceeding 100% in both peak periods.

| Reference Number | Road Type | Road Name |
|---|---|---|
| 1 | Primary Distributor | Kwinana Freeway |
| 2 | Primary Distributor | Cockburn Road |
| 3 | Primary Distributor | Armadale Road |
| 4 | Primary Distributor | Farrington Road |
| 5 | Regional Distributor | Jandakot Road |
| 6 | Regional Distributor | Rowley Road |
| 7 | Distributor A | Cockburn Road |
| 8 | Distributor A | Russell Road |
| 9 | Distributor A | Beeliar Drive |
| 10 | Distributor A | Karel Avenue |
| 11 | Distributor A | Spearwood Avenue |
| 12 | Distributor A | Berrigan Drive |
| 13 | Distributor B | Hammond Road |
| 14 | Distributor B | Midgegooroo Avenue |
| 15 | Local Distributor | Gibbs Road |
| 16 | Local Distributor | Lyon Road |
| 17 | Local Distributor | Liddelow Road |
| 18 | Local Distributor | Wentworth Parade |
| 19 | Local Distributor | Tapper Road |

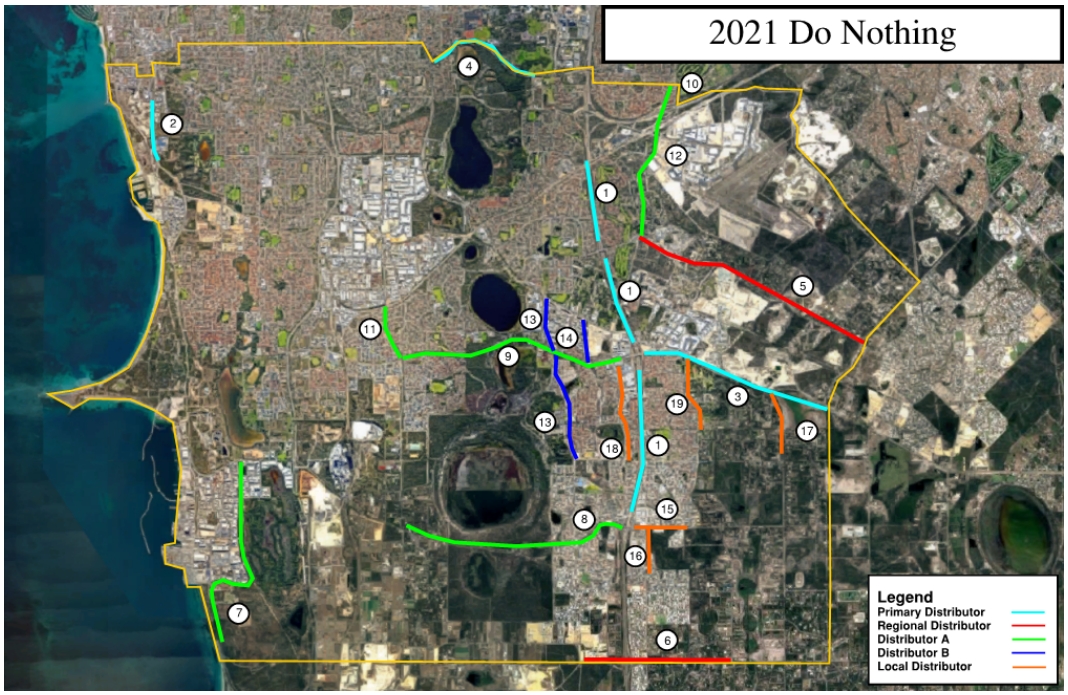



Figure 19 - Heat map of 2031 do nothing scenario of major roads with volume capacity ratios exceeding 100%

Table 17 - 2021 Do something roads with a volume capacity exceeding 100% in both peak periods.

| Reference Number | Road Type | Road Name |
|---|---|---|
| 1 | Primary Distributor | Kwinana Freeway |
| 2 | Primary Distributor | Cockburn Road |
| 3 | Primary Distributor | Farrington Road |
| 4 | Regional Distributor | Rowley Road |
| 5 | Distributor A | Cockburn Road |
| 6 | Distributor A | Russell Road |
| 7 | Distributor A | Beeliar Drive |
| 8 | Distributor B | Hammond Road |
| 9 | Distributor B | Midgegooroo Avenue |
| 10 | Local Distributor | Lyon Road |
| 11 | Local Distributor | Liddelow Road |
| 12 | Local Distributor | Wentworth Parade |
| 13 | Local Distributor | Tapper Road |

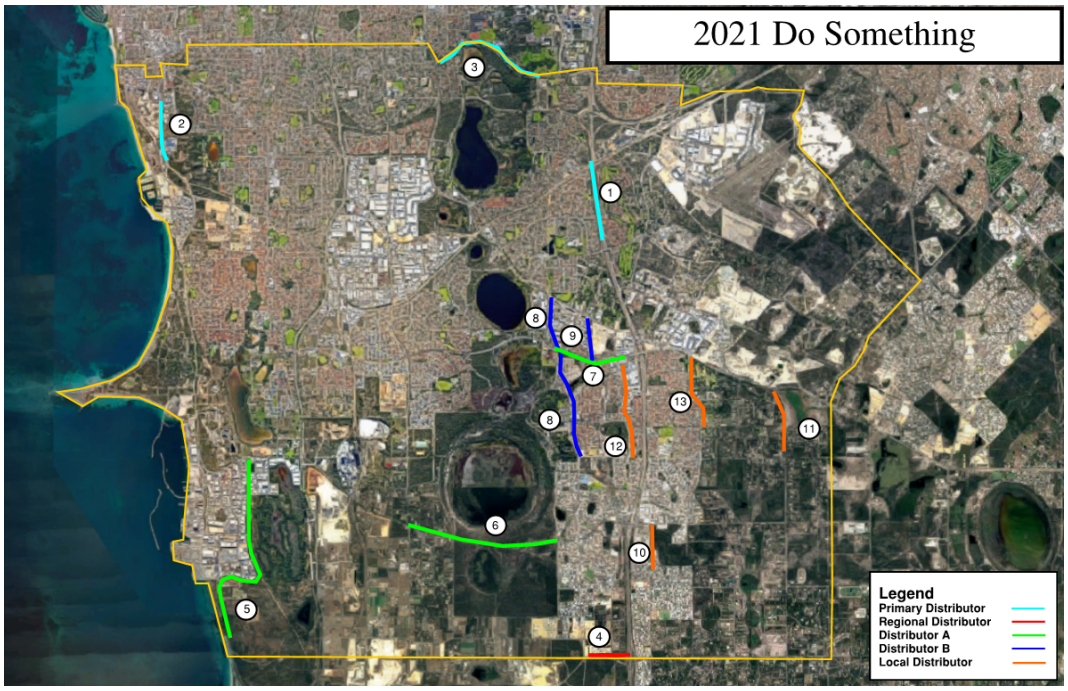



Figure 20 - 2021 Do something roads with a volume capacity exceeding 100%

Table 18 - Roads with Volume Capacity Ratio above 85% in Do Nothing (Year 2021) in both peak periods.

| Implementation Plan | Planned Upgrade | | | | Sections | Direction | Planned Upgrades Based on Modelling Results by 2021 |
|---|---|---|---|---|---|---|---|
| | City of Cockburn | | Main Roads | | | | |
| Road Network Upgrade | 2021 | 2031 | 2021 | 2031 | | | |
| Spearwood Avenue - Barrington Street to Beeliar Drive (bridge / 2nd c/w) | ✓ | ✓ | | | Beeliar Drive to Mainsail Terrace | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Mainsail Terrace to Yangebup Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Yangebup Road to Barrington Street | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Henderson Road – Fancote Avenue to Russell Road (widen and upgrade 1 c/w) | | ✓ | | | Russell Road to Holmes Road | Northbound | upgrade |
| | | | | | | Southbound | not required |
| Midgegooroo Avenue – Beeliar Drive to North Lake Road (reduce to 2 lanes) | | ✓ | | | Beeliar Drive to Signal Terrace | Northbound | upgrade |
| | | | | | | Southbound | not required |
| | | | | | Signal Terrace to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | not required |
| Poletti Road – Beeliar Drive to North Lake Road (construct 2nd c/w & traffic signals) | ✓ | ✓ | | | Beeliar Drive to Cooper Road | Northbound | not required |
| | | | | | | Southbound | upgrade |
| | | | | | Cooper Road to Davison Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Davison Road to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Semple Court – North Lake Road to Jindabyne Heights (land / construct & re-align c/w) | | ✓ | | | North Lake Road to Muriel Court | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Hammond Road – Branch Circus to Bartram Road (construct 2nd c/w & upgrade verge) | ✓ | ✓ | | | Bartram Road to Branch Circus | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Hammond Road – Frankland Avenue to Rowley Road (construct 1 c/w) | ✓ | ✓ | | | Rowley Road to Wattleup Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Hammond Road – Beeliar Drive to North Lake Road (construct second c/w) | ✓ | ✓ | | ✓ | Beeliar Drive to Blackly Row | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Blackly Row to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Jandakot Road – Berrigan Drive to Solomon Road (land & construct 2 c/w) | ✓ | ✓ | ✓ | ✓ | Solomon Road to Berrigan Drive | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Jandakot Road – Solomon Road to Fraser Road (construct 2nd c/w) | ✓ | ✓ | ✓ | ✓ | Fraser Road to Solomon Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Jandakot Road – Fraser Road to Warton Road (land & construct 2 c/w) | | ✓ | ✓ | ✓ | Warton Road to Fraser Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Russell Road - Hammond Road to Henderson Road (land & construct 2 c/w) | | ✓ | | | Henderson Road to Pearse Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| | | | | | Pearse Road to Hammond Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Rowley Road – Hammond Road to Kwinana Freeway (land & construct 1 c/w) | ✓ | ✓ | | ✓ | Hammond Road to Kwinana Freeway | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Karel Avenue – Berrigan Drive to Farrington Street (construct 2nd c/w) | | ✓ | ✓ | ✓ | Berrigan Drive to Roe Highway | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Roe Highway Bridge | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Roe Highway to Farrington Street | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Cockburn Road - Rockingham Road South to Rockingham Road North | ✓ | ✓ | | | Rockingham Road South to Nautical Drive | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Nautical Drive to Russell Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Mayor Road to Spearwood Avenue | Northbound | not required |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Spearwood Avenue to Rockingham Road North | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Stock Road - Rockingham Road to Garling Street | ✓ | ✓ | | | Rockingham Road to Beeliar Drive | Northbound | not required |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Barrington Street to Spearwood Avenue | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Spearwood Avenue to Phoenix Road | Northbound | not required |
| | | | | | | Southbound | upgrade |

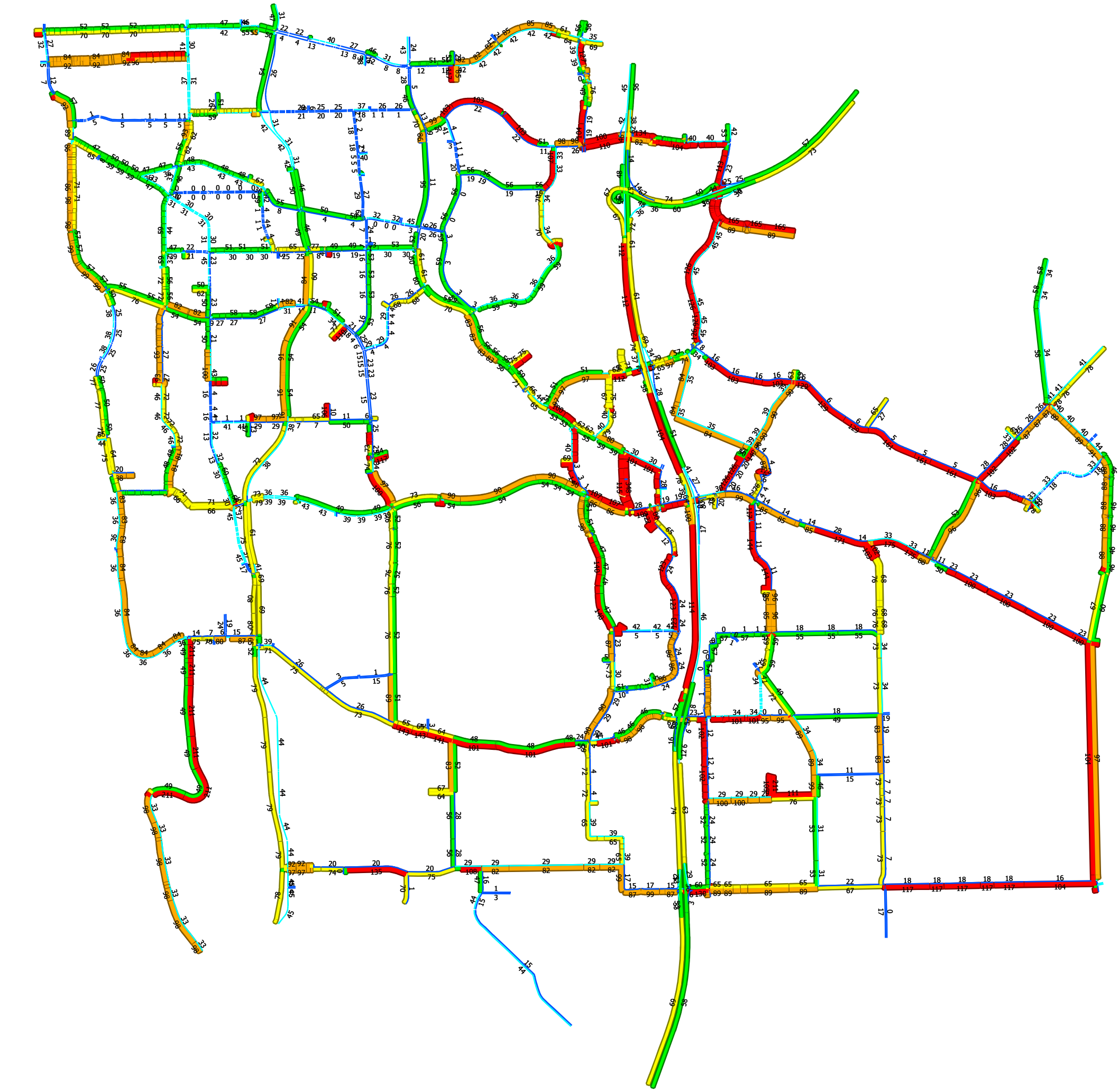



Figure 21 - Do Nothing - Volume Capacity Ratio – AM Peak, year 2021

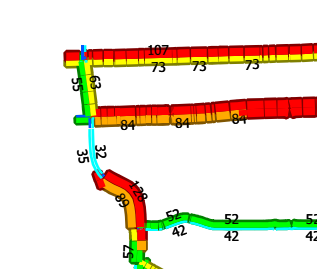



Figure 22 - Do Nothing - Volume Capacity Ratio – PM Peak, year 2021

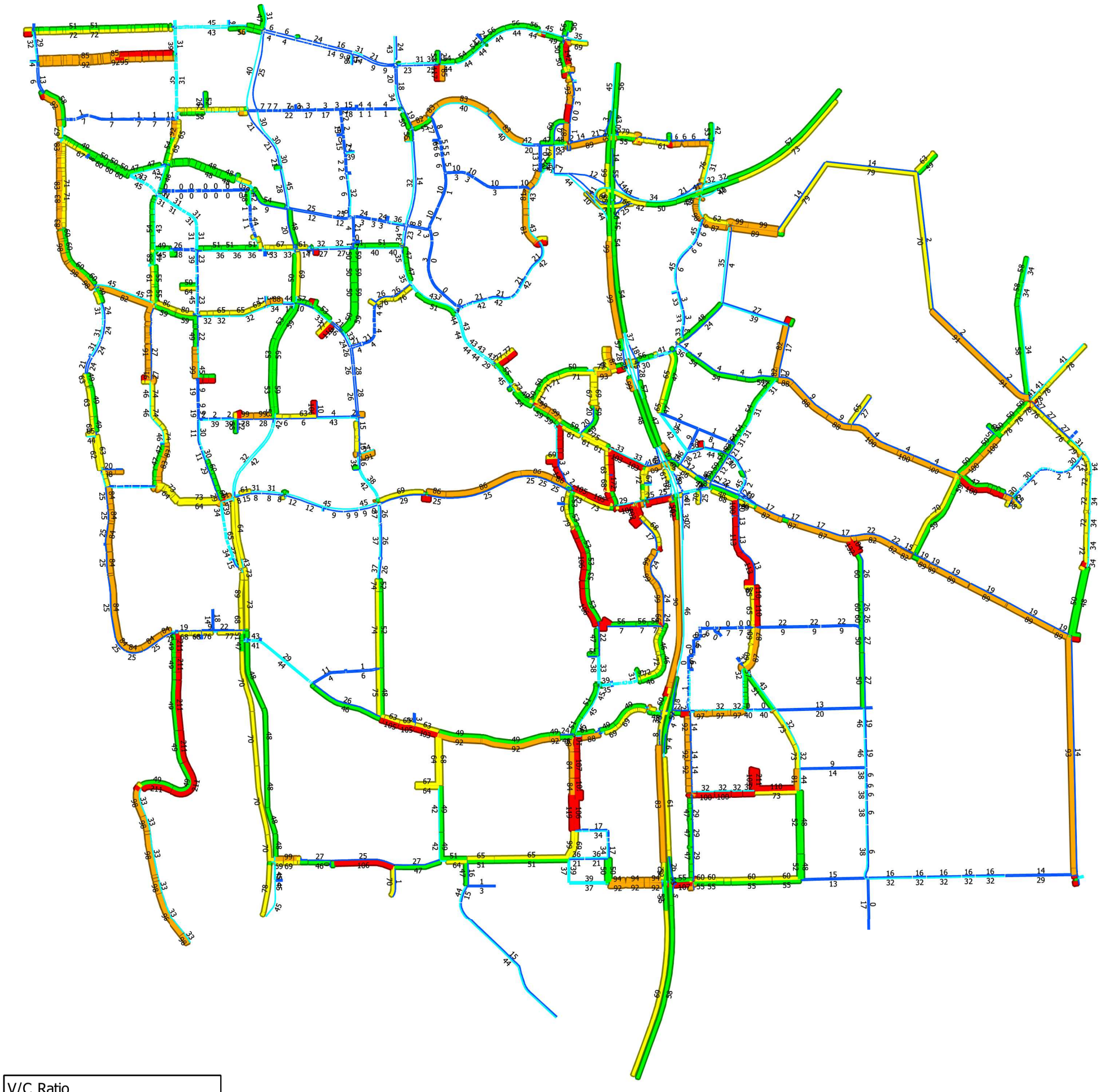



Figure 23 - Do Something - Volume Capacity Ratio – AM Peak, year 2021

Figure 24 - Do Something - Volume Capacity Ratio – PM Peak, year 2021

A comparison of 2016 results and 2021 results (assuming upgrades are in place as per the Road Improvements Plan), shows that some locations will experience capacity issues well into the future.

## 6.3 Road capacity results – year 2031

A 'do nothing' scenario for 2031 year has shown widespread growth with more links expected to operate within 95% to 100% of their capacity in the PM peak compared to the AM peak as shown in Table 19 and Figure 25.

No further upgrades have been assumed for Kwinana Freeway between 2021 and 2031 and consequently, it remains a congestion issue at several locations throughout City of Cockburn. Approaches to the freeway at Farrington Road, Roe Highway, and Beeliar Drive are also expected to operate close to capacity.

Table 19 - 2031 Do nothing roads with a volume capacity exceeding 100% in both peak periods.

| Reference Number | Road Type | Road Name |
|---|---|---|
| 1 | Primary Distributor | Kwinana Freeway |
| 2 | Primary Distributor | Cockburn Road |
| 3 | Primary Distributor | Rockingham Road |
| 4 | Primary Distributor | Armadale Road |
| 5 | Primary Distributor | Stock Road |
| 6 | Primary Distributor | Farrington Road |
| 7 | Regional Distributor | Jandakot Road |
| 8 | Regional Distributor | Rowley Road |
| 9 | Regional Distributor | Wattleup Road |
| 10 | Distributor A | Cockburn Road |
| 11 | Distributor A | Russell Road |
| 12 | Distributor A | Beeliar Drive |
| 13 | Distributor A | Hope Road |
| 14 | Distributor A | Karel Avenue |
| 15 | Distributor A | Spearwood Avenue |
| 16 | Distributor A | Berrigan Drive |
| 17 | Distributor B | Spearwood Avenue |
| 18 | Distributor B | Hamilton Road |
| 19 | Distributor B | Hammond Road |
| 20 | Distributor B | Midgegooroo Avenue |
| 21 | Local Distributor | Henderson Road |
| 22 | Local Distributor | Gibbs Road |
| 23 | Local Distributor | Lyon Road |
| 24 | Local Distributor | Liddelow Road |
| 25 | Local Distributor | Wentworth Parade |
| 26 | Local Distributor | Tapper Road |
| 27 | Local Distributor | Prinsep Road |

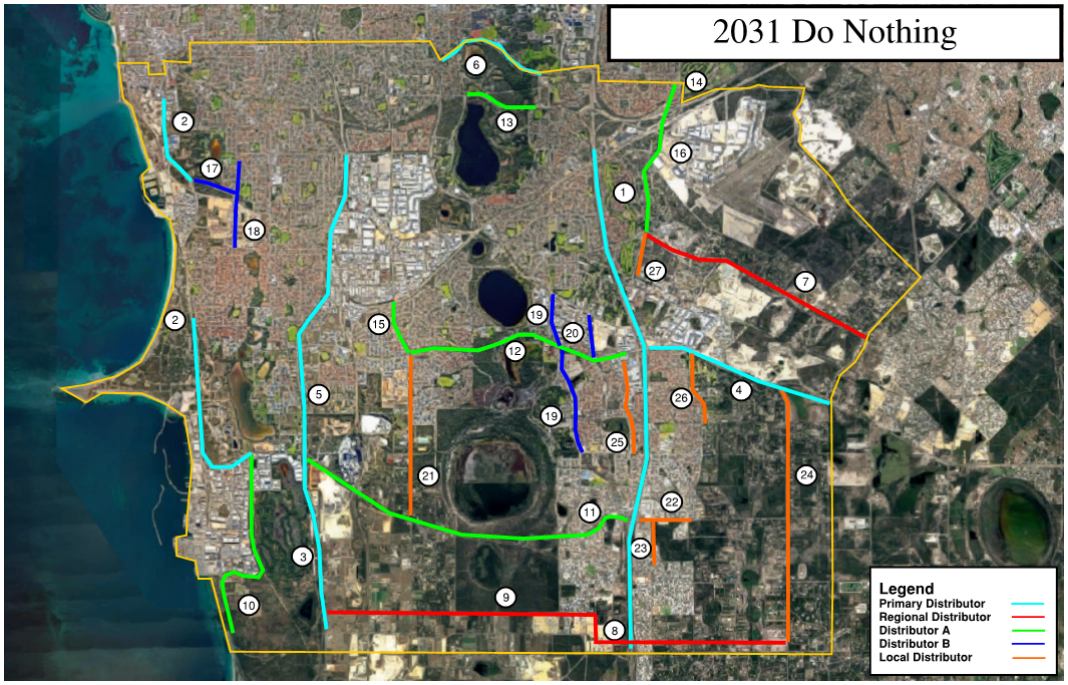



Figure 25 – Heat map of 2031 do nothing scenario of major roads with volume capacity ratios exceeding 100%

Modelling results with planned upgrades has indicated reduction in congestion in several locations. It can be seen in Table 20 and Figure 25 that the degree of congestion has reduced to smaller sections of each road identified in "do nothing" scenario as congestion issue. It was determined that all necessary upgrades listed in Table 21 are recommended to be implemented by 2031.

Table 20 - 2031 Do something major roads with volume capacity exceeding 100% in both peak periods.

| Reference Number | Road Type | Road Name |
|---|---|---|
| 1 | Primary Distributor | Kwinana Freeway |
| 2 | Primary Distributor | Cockburn Road |
| 3 | Primary Distributor | Rockingham Road |
| 4 | Primary Distributor | Armadale Road |
| 5 | Primary Distributor | Stock Road |
| 6 | Primary Distributor | Farrington Road |
| 7 | Regional Distributor | Jandakot Road |
| 8 | Regional Distributor | Rowley Road |
| 9 | Distributor A | Cockburn Road |
| 10 | Distributor A | Russell Road |
| 11 | Distributor A | Beeliar Drive |
| 12 | Distributor A | Hope Road |
| 13 | Distributor A | Karel Avenue |
| 14 | Distributor B | Spearwood Avenue |
| 15 | Distributor B | Hamilton Road |
| 16 | Distributor B | Hammond Road |
| 17 | Distributor B | Midgegooroo Avenue |
| 18 | Local Distributor | Henderson Road |

| | | |
|---|---|---|
| 19 | Local Distributor | Gibbs Road |
| 20 | Local Distributor | Lyon Road |
| 21 | Local Distributor | Liddelow Road |
| 22 | Local Distributor | Wentworth Parade |
| 23 | Local Distributor | Tapper Road |
| 24 | Local Distributor | Prinsep Road |

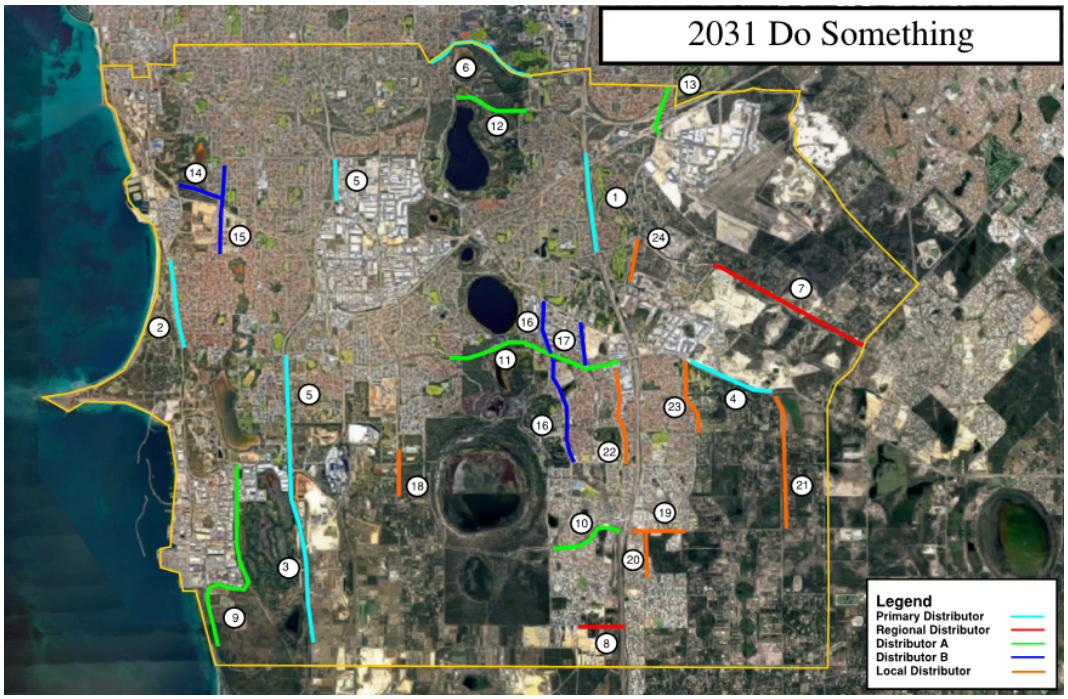



Figure 26 - Heat map of 2031 do something scenario of major roads with volume capacity ratios exceeding 100%

Other locations which were identified to have congestion issues in 2021, where no subsequent road network upgrades are planned, clearly continue to operate at close or over the capacity as shown in Figure 27 to Figure 30.

Table 21 - Implications of planned road network upgrades (Year 2031) in both peak periods.

| Implementation Plan | Planned Upgrade | | | | Sections | Direction | Planned Upgrades Based on Modelling Results by 2031 |
|---|---|---|---|---|---|---|---|
| | City of Cockburn | | Main Roads | | | | |
| **Road Network Upgrade** | **2021** | **2031** | **2021** | **2031** | | | |
| Rockingham Road – Phoenix Road to Spearwood Avenue reduction (1 lane each way) | ✓ | ✓ | ✓ | ✓ | Phoenix Road to Spearwood Ave | Northbound | not required |
| | | | | | | Southbound | upgrade |
| Spearwood Avenue - Barrington Street to Beeliar Drive (bridge / 2nd c/w) | ✓ | ✓ | | | Beeliar Drive to Mainsail Terrace | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Mainsail Terrace to Yangebup Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Yangebup Road to Barrington Street | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Spearwood Avenue – Beeliar Drive to Fancote Avenue (construct 2nd c/w) | ✓ | ✓ | | | Beeliar Drive to Fancote Avenue | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Henderson Road – Fancote Avenue to Russell Road (widen and upgrade 1 c/w) | | ✓ | | | Russell Road to Holmes Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Holmes Road to Fancote Avenue | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Beeliar Drive – Fawcett Road to Stock Road (reconstruction) | ✓ | ✓ | | | Fawcett Road to Rockingham Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| | | | | | Rockingham Road to Stock Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Midgegooroo Avenue – Beeliar Drive to North Lake Road (reduce to 2 lanes) | | ✓ | | | Beeliar Drive to Signal Terrace | Northbound | upgrade |
| | | | | | | Southbound | not required |
| | | | | | Signal Terrace to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | not required |
| Poletti Road – Beeliar Drive to North Lake Road (construct 2nd c/w & traffic signals) | ✓ | ✓ | | | Beeliar Drive to Cooper Road | Northbound | not required |
| | | | | | | Southbound | upgrade |
| | | | | | Cooper Road to Davison Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Davison Road to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Semple Court – North Lake Road to Jindabyne Heights (land / construct & re-align c/w) | | ✓ | | | North Lake Road to Muriel Court | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Muriel Court to Berrigan Drive | Northbound | upgrade |
| | | | | | | Southbound | not required |
| Hammond Road – Branch Circus to Bartram Road (construct 2nd c/w & upgrade verge) | ✓ | ✓ | | | Bartram Road to Branch Circus | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Hammond Road – Gaebler Road to Frankland Avenue (construct 1 c/w) | ✓ | ✓ | ✓ | ✓ | Frankland Avenue to Gaebler Road | Northbound | not required |
| | | | | | | Southbound | upgrade |
| Hammond Road – Frankland Avenue to Rowley Road (construct 1 c/w) | ✓ | ✓ | | | Rowley Road to Wattleup Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Wattelup Road to Frankland Avenue | Northbound | not required |
| | | | | | | Southbound | upgrade |
| Hammond Road – Beeliar Drive to North Lake Road (construct second c/w) | ✓ | ✓ | | ✓ | Beeliar Drive to Blackly Row | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Blackly Row to North Lake Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Jandakot Road – Berrigan Drive to Solomon Road (land & construct 2 c/w) | ✓ | ✓ | ✓ | ✓ | Solomon Road to Berrigan Drive | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Jandakot Road – Solomon Road to Fraser Road (construct 2nd c/w) | ✓ | ✓ | ✓ | ✓ | Fraser Road to Solomon Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Jandakot Road – Fraser Road to Warton Road (land & construct 2 c/w) | | ✓ | ✓ | ✓ | Warton Road to Fraser Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Russell Road - Hammond Road to Henderson Road (land & construct 2 c/w) | | ✓ | | | Henderson Road to Pearse Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| | | | | | Pearse Road to Hammond Road | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |

| Implementation Plan | Planned Upgrade | | | | Sections | Direction | Planned Upgrades Based on Modelling Results by 2031 |
|---|---|---|---|---|---|---|---|
| | City of Cockburn | | Main Roads | | | | |
| **Road Network Upgrade** | **2021** | **2031** | **2021** | **2031** | | | |
| Russell Road – Henderson Road to Rockingham Road (land & construct 2 c/w) | | ✓ | | | Rockingham Road to Holmes Road | Eastbound | not required |
| | | | | | | Westbound | upgrade |
| | | | | | Holmes Road to Henderson Road | Eastbound | not required |
| | | | | | | Westbound | upgrade |
| Rowley Road – Hammond Road to Kwinana Freeway (land & construct 1 c/w) | ✓ | ✓ | | ✓ | Hammond Road to Kwinana Freeway | Eastbound | upgrade |
| | | | | | | Westbound | upgrade |
| Karel Avenue – Berrigan Drive to Farrington Street (construct 2nd c/w) | | ✓ | ✓ | ✓ | Berrigan Drive to Roe Highway | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Roe Highway Bridge | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | | | | | Roe Highway to Farrington Street | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Cockburn Road - Rockingham Road South to Rockingham Road North | ✓ | ✓ | | | Rockingham Road South to Nautical Drive | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Nautical Drive to Russell Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Russell Road to Mayor Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Mayor Road to Spearwood Avenue | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Spearwood Avenue to Rockingham Road North | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| Stock Road - Rockingham Road to Garling Street | ✓ | ✓ | | | Rockingham Road to Beeliar Drive | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Beeliar Drive to Barrington Street | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Barrington Street to Spearwood Avenue | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Spearwood Avenue to Phoenix Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Phoenix Road to Forrest Road | Northbound | not required |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Forrest Road to Winterfold Road | Northbound | upgrade |
| | | | | | | Southbound | upgrade |
| | ✓ | ✓ | | | Winterfold Road to South Street | Northbound | not required |
| | | | | | | Southbound | upgrade |

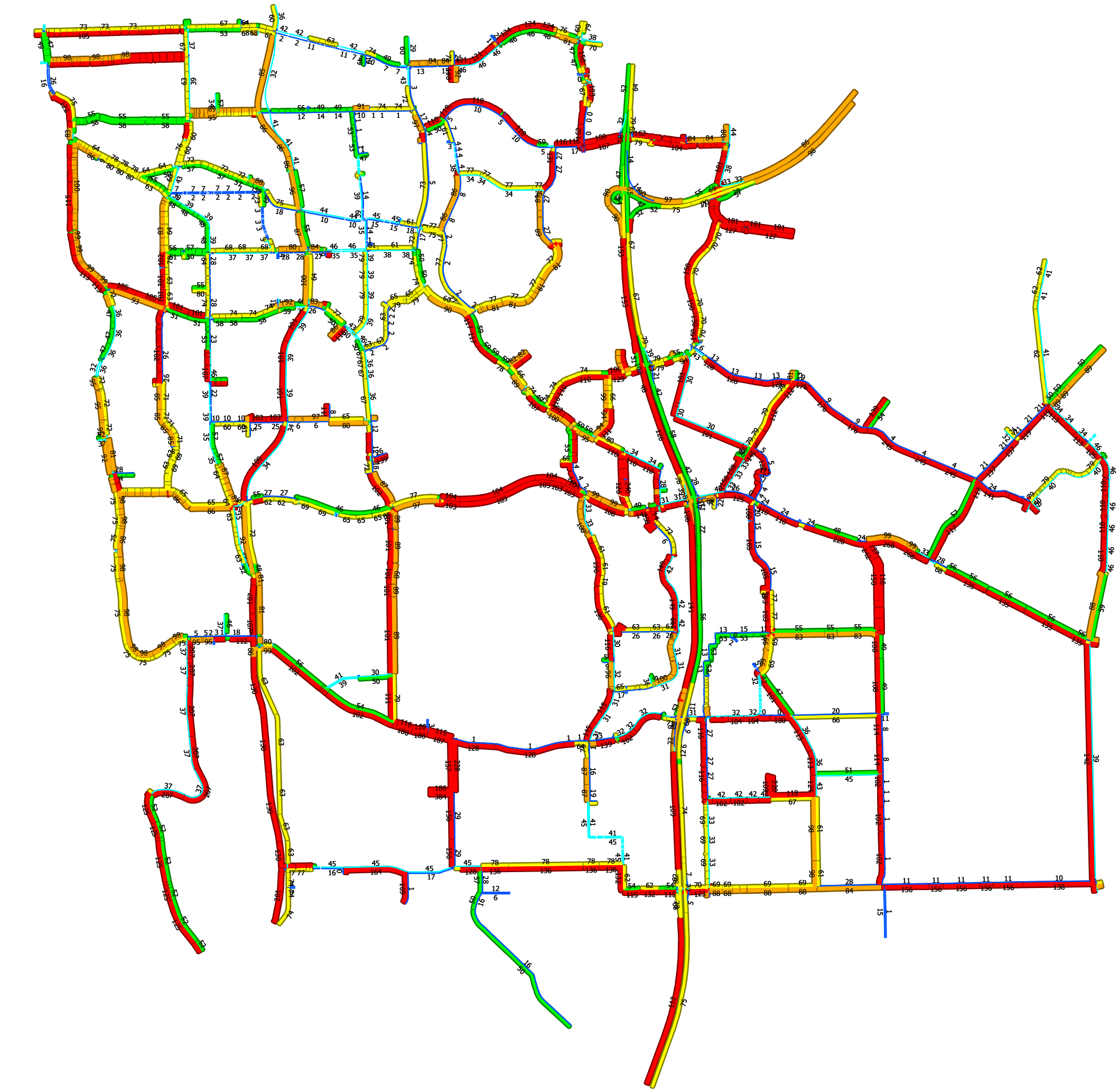



Figure 27 - Do Nothing - Volume Capacity Ratio – AM Peak, year 2031

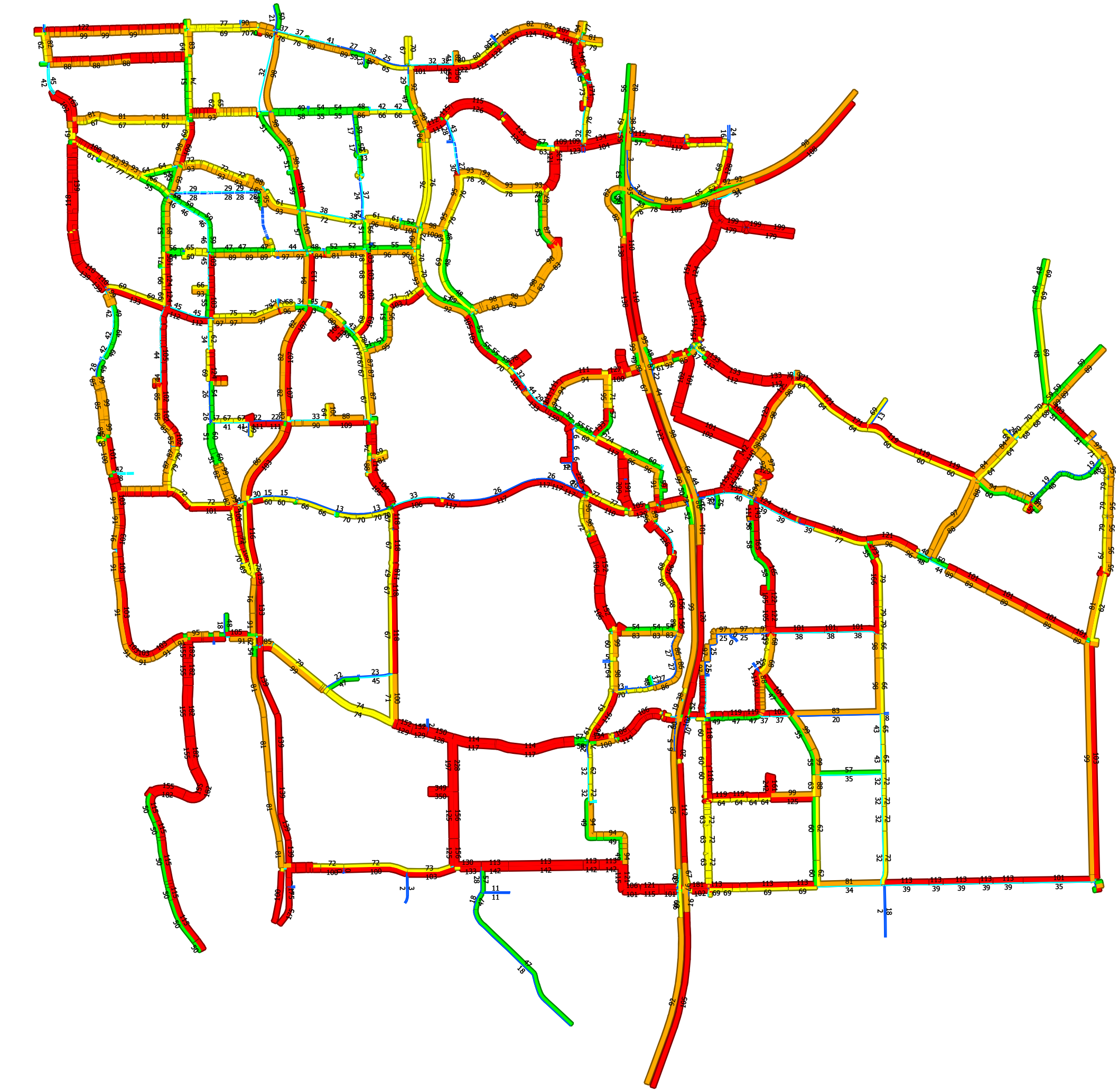



Figure 28 - Do Nothing - Volume Capacity Ratio – PM Peak, year 2031

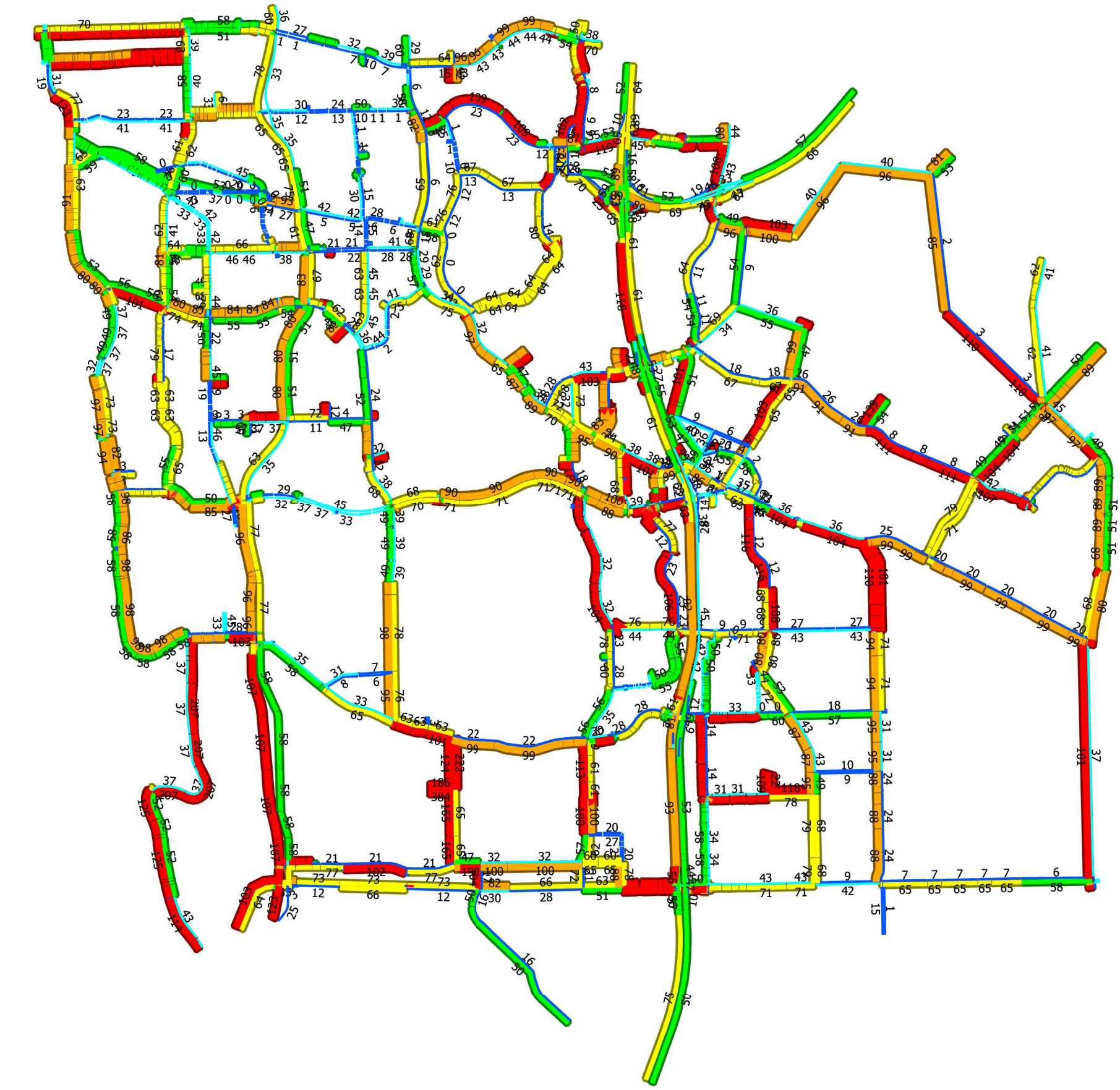



Figure 29 - Do Something - Volume Capacity Ratio – AM Peak, year 2031

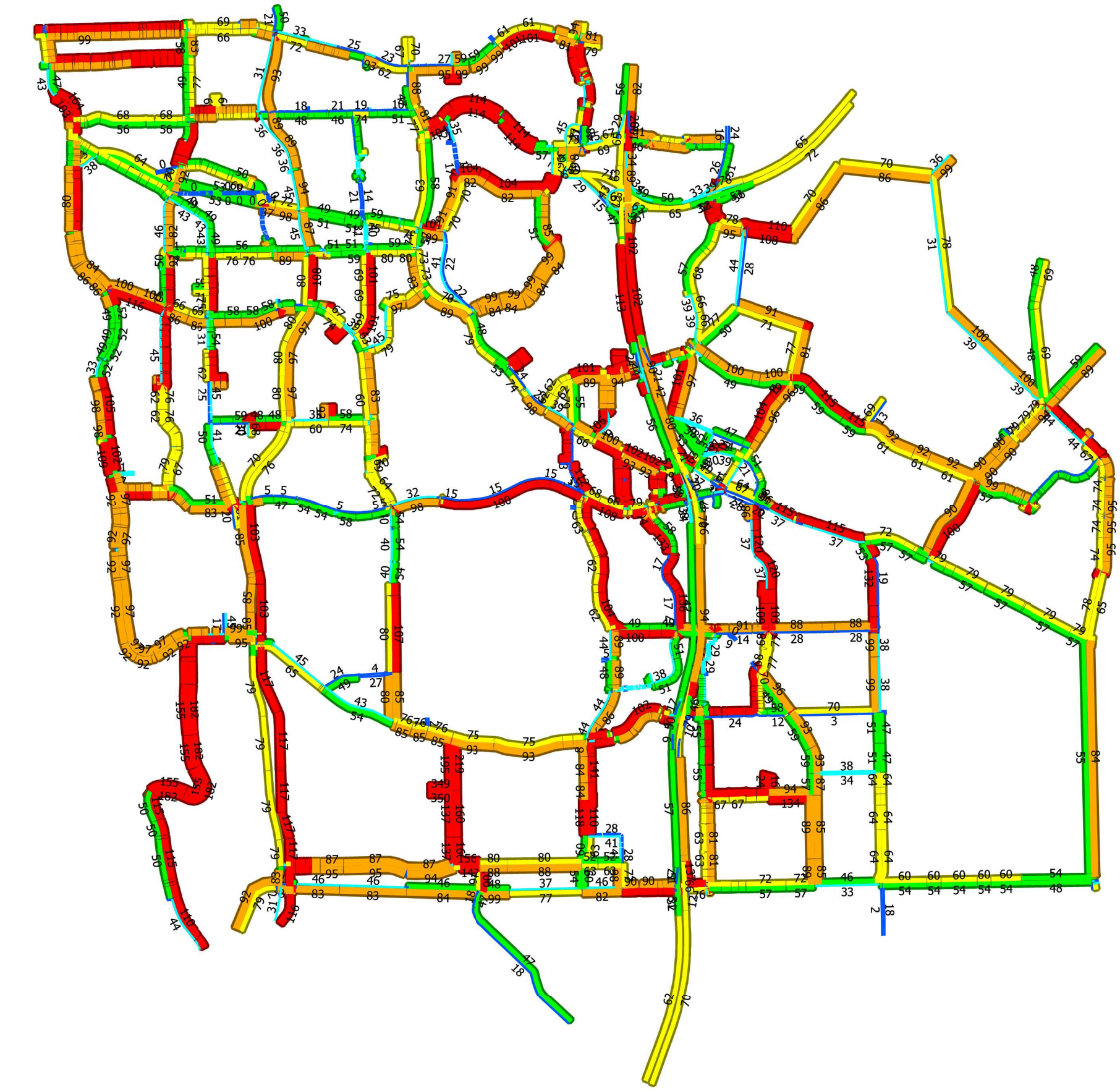



Figure 30 - Do Something - Volume Capacity Ratio – PM Peak, year 2031

## 6.4 Average daily traffic

Average daily traffic has been calculated using AM and PM volumes. The peak hour analysis has been more meaningful in order to assess the impacts of the proposed road improvements. However, average daily traffic has been calculated for all corridors where significant improvements are planned in order to see the daily magnitude of traffic as shown in Table 22. The average daily traffic results have been shown for all modelled years and following scenarios:

1. Do Nothing scenario – network without any road upgrades, and
2. Do Something scenarios – network with planned upgrades.

Table 22 shows general increase in average daily traffic on several sections were upgrades are planned. However, roads such as Polletti Road shows much higher traffic volumes in the future, which are due to future demographic growth within that area.

Table 22 – Average 5-day daily traffic comparison between various scenarios between year 2016 and 2031

| | Sections | Direction | AWDT | | | | |
|---|---|---|---|---|---|---|---|
| | | | Do Nothing Average | Do Nothing Average | Do Nothing Average | Do Something Average | Do Something Average |
| Road Network Upgrade | | | 2016 | 2021 | 2031 | 2021 | 2031 |
| Rockingham Road – Phoenix Road to Spearwood Avenue reduction (1 lane each way) | Phoenix Road to Spearwood Ave | Northbound | 10,300 | 11,900 | 16,900 | 10,700 | 9,400 |
| | | Southbound | 9,300 | 12,100 | 18,600 | 11,300 | 9,800 |
| Spearwood Avenue - Barrington Street to Beeliar Drive (bridge / 2nd c/w) | Beeliar Drive to Mainsail Terrace | Northbound | 9,400 | 10,800 | 10,900 | 11,200 | 14,500 |
| | | Southbound | 12,400 | 11,700 | 10,600 | 10,500 | 11,700 |
| | Mainsail Terrace to Yangebup Road | Northbound | 6,000 | 8,800 | 9,100 | 10,200 | 12,900 |
| | | Southbound | 8,400 | 8,200 | 7,300 | 8,300 | 8,700 |
| | Yangebup Road to Barrington Street | Northbound | 12,800 | 12,200 | 15,000 | 13,200 | 16,900 |
| | | Southbound | 14,000 | 9,100 | 7,200 | 9,600 | 10,400 |
| Spearwood Avenue – Beeliar Drive to Fancote Avenue (construct 2nd c/w) | Beeliar Drive to Fancote Avenue | Northbound | 2,400 | 6,300 | 8,700 | 6,300 | 8,300 |
| | | Southbound | 2,100 | 6,300 | 11,700 | 6,900 | 9,400 |
| Henderson Road – Fancote Avenue to Russell Road (widen and upgrade 1 c/w) | Russell Road to Holmes Road | Northbound | 2,700 | 7,200 | 8,500 | 6,500 | 8,100 |
| | | Southbound | 2,600 | 6,400 | 9,900 | 6,500 | 8,300 |
| | Holmes Road to Fancote Avenue | Northbound | 2,400 | 6,300 | 8,700 | 6,300 | 8,300 |
| | | Southbound | 2,100 | 6,300 | 11,700 | 6,900 | 9,400 |
| Beeliar Drive – Fawcett Road to Stock Road (reconstruction) | Fawcett Road to Rockingham Road | Eastbound | 4,100 | 6,400 | 10,200 | 6,600 | 5,800 |
| | | Westbound | 4,500 | 7,700 | 11,700 | 7,700 | 9,400 |
| | Rockingham Road to Stock Road | Eastbound | 6,200 | 6,200 | 7,200 | 6,300 | 7,600 |
| | | Westbound | 6,500 | 5,600 | 7,600 | 6,700 | 11,100 |
| North Lake Road – Kentucky Court to Kwinana Freeway (construct 2 c/ws) | Kentucky Court to Kwinana Freeway | Eastbound | Not in Model | Not in Model | Not in Model | 14,500 | 15,400 |
| | | Westbound | Not in Model | Not in Model | Not in Model | 20,700 | 22,700 |
| North Lake Road – Extend from Kwinana Freeway to Armadale Road (land, bridge, construct 2 c/ws, & traffic signals) | Kwinana Freeway to Armadale Road | Eastbound | Not in Model | Not in Model | Not in Model | 13,400 | 16,900 |
| | | Westbound | Not in Model | Not in Model | Not in Model | 12,200 | 14,700 |
| Verde Drive – Biscayne Way to Solomon Road (land & construct 1 c/w) | Biscayne Way to Solomon Road | Northbound | Not in Model | Not in Model | Not in Model | 8,300 | 11,900 |
| | | Southbound | Not in Model | Not in Model | Not in Model | 6,400 | 7,900 |
| Verve Drive – Solomon Road to North Lake Road (land & construct 1 c/w) | Solomon Road to North Lake Road | Northbound | Not in Model | Not in Model | Not in Model | 13,700 | 16,400 |
| | | Southbound | Not in Model | Not in Model | Not in Model | 7,900 | 11,200 |

| Road Network Upgrade | Sections | Direction | AWDT | | | | |
|---|---|---|---|---|---|---|---|
| | | | Do Nothing Average | Do Nothing Average | Do Nothing Average | Do Something Average | Do Something Average |
| | | | 2016 | 2021 | 2031 | 2021 | 2031 |
| Prinsep Road – Cutler Road to Verde Drive (construct 1 c/w) | Cutler Road to Verde Drive | Northbound | Not in Model | Not in Model | Not in Model | 6,100 | 6,700 |
| | | Southbound | Not in Model | Not in Model | Not in Model | 5,000 | 5,400 |
| Midgegooroo Avenue – Beeliar Drive to North Lake Road (reduce to 2 lanes) | Beeliar Drive to Signal Terrace | Northbound | 10,000 | 26,600 | 28,700 | 21,000 | 14,700 |
| | | Southbound | 8,000 | 14,900 | 15,100 | 16,800 | 11,700 |
| | Signal Terrace to North Lake Road | Northbound | 8,900 | 22,700 | 24,800 | 19,100 | 12,800 |
| | | Southbound | 7,600 | 13,100 | 13,000 | 17,000 | 12,100 |
| Poletti Road – Beeliar Drive to North Lake Road (construct 2nd c/w & traffic signals) | Beeliar Drive to Cooper Road | Northbound | 7,400 | 6,600 | 8,300 | 2,500 | 4,200 |
| | | Southbound | 3,500 | 25,200 | 17,000 | 23,700 | 14,300 |
| | Cooper Road to Davison Road | Northbound | 4,200 | 19,300 | 15,000 | 20,500 | 17,600 |
| | | Southbound | 2,800 | 41,200 | 29,300 | 41,300 | 30,900 |
| | Davison Road to North Lake Road | Northbound | 4,200 | 19,300 | 15,000 | 20,500 | 17,600 |
| | | Southbound | 2,800 | 41,200 | 29,300 | 41,700 | 31,300 |
| Semple Court – North Lake Road to Jindabyne Heights (land / construct & re-align c/w) | North Lake Road to Muriel Court | Northbound | 3,800 | 6,900 | 10,400 | 5,000 | 8,300 |
| | | Southbound | 3,600 | 6,600 | 8,300 | 5,200 | 5,600 |
| | Muriel Court to Berrigan Drive | Northbound | 4,800 | 5,200 | 8,400 | 4,800 | 8,000 |
| | | Southbound | 1,100 | 4,500 | 5,500 | 4,800 | 5,000 |
| Hammond Road – Branch Circus to Bartram Road (construct 2nd c/w & upgrade verge) | Bartram Road to Branch Circus | Northbound | 6,000 | 10,300 | 12,100 | 9,200 | 13,500 |
| | | Southbound | 4,800 | 6,500 | 9,000 | 7,300 | 11,100 |
| Hammond Road – Gaebler Road to Frankland Avenue (construct 1 c/w) | Frankland Avenue to Gaebler Road | Northbound | 1,500 | 4,700 | 3,000 | 11,000 | 9,000 |
| | | Southbound | 700 | 4,100 | 4,500 | 2,300 | 2,100 |
| Hammond Road – Frankland Avenue to Rowley Road (construct 1 c/w) | Rowley Road to Wattleup Road | Northbound | 2,700 | 8,200 | 9,600 | 5,300 | 8,700 |
| | | Southbound | 2,800 | 4,300 | 9,900 | 5,700 | 8,400 |
| | Wattelup Road to Frankland Avenue | Northbound | 1,500 | 4,700 | 3,000 | 3,800 | 2,900 |
| | | Southbound | 700 | 4,100 | 4,500 | 2,300 | 2,100 |
| Hammond Road – Beeliar Drive to North Lake Road (construct second c/w) | Beeliar Drive to Blackly Row | Northbound | 5,600 | 3,600 | 4,500 | 4,000 | 5,900 |
| | | Southbound | 6,300 | 4,900 | 5,300 | 6,000 | 9,400 |
| | Blackly Row to North Lake Road | Northbound | 7,200 | 9,800 | 12,000 | 12,900 | 19,300 |
| | | Southbound | 7,600 | 8,700 | 8,900 | 11,100 | 16,300 |
| Hammond Road – North Lake Road to Berrigan Drive (construct 1 c/w) | North Lake Road to Berrigan Drive | Northbound | Not in Model | Not in Model | Not in Model | Not in Model | 6,300 |
| | | Southbound | Not in Model | Not in Model | Not in Model | Not in Model | 7,500 |
| Pilatus Street – Berrigan Drive to airport boundary (construct 2nd c/w) | Berrigan Drive to Airport Boundary | Northbound | Not in Model | Not in Model | Not in Model | 13,700 | 17,700 |
| | | Southbound | Not in Model | Not in Model | Not in Model | 7,200 | 9,400 |
| Jandakot Road – Berrigan Drive to Solomon Road (land & construct 2 c/w) | Solomon Road to Berrigan Drive | Eastbound | 8,100 | 6,700 | 14,000 | 6,500 | 10,400 |
| | | Westbound | 9,300 | 11,400 | 14,800 | 9,500 | 11,800 |
| Jandakot Road – Solomon Road to Fraser Road (construct 2nd c/w) | Fraser Road to Solomon Road | Eastbound | 6,200 | 6,200 | 9,700 | 8,600 | 12,800 |
| | | Westbound | 6,800 | 9,100 | 12,100 | 12,400 | 15,000 |
| Jandakot Road – Fraser Road to Warton Road (land & construct 2 c/w) | Warton Road to Fraser Road | Eastbound | 6,500 | 5,300 | 6,300 | 6,700 | 8,000 |
| | | Westbound | 6,300 | 8,000 | 10,400 | 13,000 | 16,500 |
| Russell Road - Hammond Road to Henderson Road (land & construct 2 c/w) | Henderson Road to Pearse Road | Eastbound | 7,900 | 14,000 | 22,000 | 12,000 | 21,900 |
| | | Westbound | 9,200 | 20,400 | 26,400 | 17,600 | 32,800 |

| Road Network Upgrade | Sections | Direction | AWDT | | | | |
|---|---|---|---|---|---|---|---|
| | | | Do Nothing Average | Do Nothing Average | Do Nothing Average | Do Something Average | Do Something Average |
| | | | 2016 | 2021 | 2031 | 2021 | 2031 |
| | Pearse Road to Hammond Road | Eastbound | 6,500 | 10,900 | 8,300 | 9,500 | 12,000 |
| | | Westbound | 9,200 | 18,200 | 22,700 | 18,200 | 34,800 |
| Russell Road – Henderson Road to Rockingham Road (land & construct 2 c/w) | Rockingham Road to Holmes Road | Eastbound | 5,600 | 7,000 | 11,200 | 4,800 | 12,300 |
| | | Westbound | 6,000 | 10,900 | 17,700 | 8,100 | 23,500 |
| | Holmes Road to Henderson Road | Eastbound | 5,500 | 6,900 | 10,000 | 4,700 | 11,900 |
| | | Westbound | 5,900 | 10,200 | 14,900 | 7,900 | 20,900 |
| Rowley Road – Hammond Road to Kwinana Freeway (land & construct 1 c/w) | Hammond Road to Kwinana Freeway | Eastbound | 2,800 | 4,400 | 10,000 | 10,700 | 23,000 |
| | | Westbound | 3,200 | 9,700 | 11,400 | 11,300 | 28,000 |
| Rowley Road – Hammond Road to ~1.2km west of Hammond Road | Hammond Road to Rockingham Road | Eastbound | Not in Model | Not in Model | Not in Model | 4,900 | 14,600 |
| | | Westbound | Not in Model | Not in Model | Not in Model | 4,900 | 15,200 |
| Karel Avenue – Berrigan Drive to Farrington Street (construct 2nd c/w) | Berrigan Drive to Roe Highway | Northbound | 14,700 | 13,900 | 17,600 | 21,500 | 27,400 |
| | | Southbound | 6,400 | 19,100 | 20,700 | 14,100 | 17,800 |
| | Roe Highway Bridge | Northbound | 12,300 | 17,200 | 25,200 | 19,900 | 24,300 |
| | | Southbound | 7,100 | 18,300 | 21,000 | 12,100 | 14,100 |
| | Roe Highway to Farrington Street | Northbound | 9,900 | 10,800 | 16,100 | 12,100 | 15,100 |
| | | Southbound | 9,900 | 9,600 | 10,000 | 7,900 | 11,700 |
| Cockburn Road - Rockingham Road South to Rockingham Road North | Rockingham Road South to Nautical Drive | Northbound | 5,900 | 6,200 | 8,100 | 6,200 | 8,100 |
| | | Southbound | 7,400 | 6,900 | 8,500 | 6,800 | 8,300 |
| | Nautical Drive to Russell Road | Northbound | 4,700 | 9,500 | 14,200 | 9,600 | 9,200 |
| | | Southbound | 5,400 | 19,500 | 24,800 | 19,500 | 19,300 |
| | Russell Road to Mayor Road | Northbound | 6,000 | 7,800 | 12,900 | 7,400 | 10,600 |
| | | Southbound | 5,700 | 10,900 | 15,600 | 11,100 | 14,500 |
| | Mayor Road to Spearwood Avenue | Northbound | 8,500 | 10,700 | 12,800 | 9,000 | 13,800 |
| | | Southbound | 7,500 | 10,600 | 13,100 | 9,900 | 13,300 |
| | Spearwood Avenue to Rockingham Road North | Northbound | 9,700 | 12,500 | 16,500 | 11,600 | 24,000 |
| | | Southbound | 9,300 | 13,100 | 18,600 | 12,800 | 24,800 |
| Stock Road - Rockingham Road to Garling Street | Rockingham Road to Beeliar Drive | Northbound | 13,400 | 20,200 | 24,700 | 19,000 | 25,400 |
| | | Southbound | 13,800 | 23,400 | 32,900 | 23,000 | 27,100 |
| | Beeliar Drive to Barrington Street | Northbound | 14,000 | 22,700 | 23,300 | 13,500 | 19,000 |
| | | Southbound | 11,900 | 19,100 | 22,300 | 15,800 | 15,800 |
| | Barrington Street to Spearwood Avenue | Northbound | 16,900 | 24,400 | 23,000 | 17,900 | 22,700 |
| | | Southbound | 14,900 | 22,700 | 23,800 | 21,600 | 21,300 |
| | Spearwood Avenue to Phoenix Road | Northbound | 16,300 | 22,300 | 24,000 | 16,700 | 23,000 |
| | | Southbound | 14,800 | 26,500 | 29,900 | 24,500 | 25,700 |
| | Phoenix Road to Forrest Road | Northbound | 17,000 | 15,300 | 19,000 | 8,800 | 14,700 |
| | | Southbound | 14,900 | 21,600 | 25,200 | 18,300 | 19,300 |
| | Forrest Road to Winterfold Road | Northbound | 16,300 | 13,100 | 19,200 | 7,700 | 13,700 |
| | | Southbound | 13,200 | 18,900 | 23,600 | 14,400 | 17,300 |

| Road Network Upgrade | Sections | Direction | AWDT | | | | |
|---|---|---|---|---|---|---|---|
| | | | Do Nothing Average | Do Nothing Average | Do Nothing Average | Do Something Average | Do Something Average |
| | | | 2016 | 2021 | 2031 | 2021 | 2031 |
| | Winterfold Road to South Street | Northbound | 16,500 | 11,900 | 15,700 | 9,300 | 14,300 |
| | | Southbound | 14,300 | 17,100 | 19,700 | 13,800 | 17,300 |
| | South Street to Garling Street | Northbound | 9,800 | 9,000 | 10,700 | 8,900 | 10,500 |
| | | Southbound | 8,900 | 10,500 | 12,100 | 11,200 | 12,800 |

# 7 Implementation plan

The resulting implementation plan from the analysis combines the initial road network assumptions advice supplied by the City of Cockburn, outcomes of the modelling analysis and further work required to better understand the transport system. This chapter shows detailed analysis for each planned road improvement for all scenarios. The outcomes of the analysis have already been detailed in Section 6.2 and 6.3.

# Table 23 - Road network action plan as a result of modelling

| Implementation Plan | Planned Upgrade | | | | Sections | | Planned Upgrades Based on Modelling Results | | Do Nothing AM | | Do Nothing PM | | Do Nothing AM | | Do Nothing PM | | Do Nothing AM | | Do Nothing PM | | Do Something AM | | Do Something PM | | Do Something AM | | Do Something PM | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | City of Cockburn | | Main Roads | | | | by 2021 | by 2031 | 2016 | | 2016 | | 2021 | | 2021 | | 2031 | | 2031 | | 2021 | | 2021 | | 2031 | | 2031 | |
| Road Network Upgrade | 2021 | 2031 | 2021 | 2031 | | Direction | | | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR | Volume | VCR [%] | Volume | VCR |
| Rockingham Road – Phoenix Road to Spearwood Avenue reduction (1 lane each way) | ✓ | ✓ | ✓ | ✓ | Phoenix Road to Spearwood Ave | Northbound | x | x | 1,701 | 47 | 1,268 | 35 | 1,796 | 50 | 1,700 | 47 | 2,659 | 74 | 1,980 | 55 | 1,611 | 45 | 1,555 | 43 | 1,421 | 79 | 1,351 | 75 |
| | | | | | | Southbound | x | upgrade | 800 | 22 | 1,642 | 46 | 818 | 23 | 2,524 | 70 | 1,000 | 28 | 3,690 | 103 | 843 | 23 | 2,261 | 63 | 798 | 44 | 1,827 | 102 |
| Spearwood Avenue - Barrington Street to Beeliar Drive (bridge / 2nd c/w) | ✓ | ✓ | | | Beeliar Drive to Mainsail Terrace | Northbound | upgrade | upgrade | 1,680 | 105 | 1,180 | 74 | 1,606 | 100 | 1,684 | 105 | 1,633 | 102 | 1,682 | 105 | 1,351 | 42 | 2,227 | 70 | 2,182 | 68 | 2,291 | 72 |
| | | | | | | Southbound | upgrade | upgrade | 992 | 62 | 1,880 | 117 | 1,554 | 97 | 1,363 | 85 | 1,393 | 87 | 1,662 | 104 | 1,219 | 38 | 1,682 | 53 | 1,215 | 38 | 2,051 | 64 |
| | | | | | Mainsail Terrace to Yangebup Road | Northbound | upgrade | upgrade | 385 | 24 | 1,359 | 85 | 1,183 | 74 | 1,408 | 88 | 1,157 | 72 | 1,413 | 88 | 1,246 | 39 | 2,006 | 63 | 1,963 | 61 | 1,994 | 62 |
| | | | | | | Southbound | upgrade | upgrade | 1,201 | 75 | 553 | 35 | 542 | 34 | 1,498 | 94 | 290 | 18 | 1,832 | 114 | 524 | 16 | 1,872 | 58 | 369 | 12 | 2,193 | 69 |
| | | | | | Yangebup Road to Barrington Street | Northbound | upgrade | upgrade | 2,295 | 143 | 1,305 | 82 | 1,760 | 110 | 1,752 | 110 | 2,557 | 160 | 1,785 | 112 | 2,013 | 63 | 2,058 | 64 | 2,955 | 92 | 2,089 | 65 |
| | | | | | | Southbound | upgrade | upgrade | 1,115 | 62 | 2,226 | 124 | 450 | 25 | 1,881 | 105 | 208 | 12 | 2,301 | 128 | 494 | 15 | 2,296 | 72 | 327 | 10 | 2,755 | 86 |
| Spearwood Avenue – Beeliar Drive to Fancote Avenue (construct 2nd c/w) | ✓ | ✓ | | | Beeliar Drive to Fancote Avenue | Northbound | x | upgrade | 574 | 41 | 203 | 15 | 1,064 | 76 | 740 | 53 | 1,410 | 101 | 934 | 67 | 1,042 | 37 | 874 | 31 | 1,379 | 49 | 1,118 | 40 |
| | | | | | | Southbound | upgrade | upgrade | 81 | 6 | 432 | 31 | 722 | 52 | 1,190 | 85 | 1,249 | 89 | 1,654 | 118 | 727 | 26 | 1,188 | 42 | 1,098 | 39 | 1,500 | 54 |
| Henderson Road – Fancote Avenue to Russell Road (widen and upgrade 1 c/w) | | ✓ | | | Russell Road to Holmes Road | Northbound | upgrade | upgrade | 763 | 54 | 204 | 15 | 1,243 | 89 | 817 | 58 | 1,549 | 111 | 992 | 71 | 1,050 | 75 | 916 | 65 | 1,326 | 95 | 1,121 | 80 |
| | | | | | | Southbound | x | upgrade | 88 | 6 | 632 | 45 | 716 | 51 | 1,183 | 85 | 1,111 | 79 | 1,398 | 100 | 669 | 48 | 1,153 | 82 | 1,061 | 76 | 1,187 | 85 |
| | | | | | Holmes Road to Fancote Avenue | Northbound | x | upgrade | 574 | 41 | 203 | 15 | 1,064 | 76 | 740 | 53 | 1,410 | 101 | 934 | 67 | 1,042 | 74 | 874 | 62 | 1,379 | 98 | 1,118 | 80 |
| | | | | | | Southbound | upgrade | upgrade | 81 | 6 | 432 | 31 | 722 | 52 | 1,190 | 85 | 1,249 | 89 | 1,654 | 118 | 727 | 52 | 1,188 | 85 | 1,098 | 78 | 1,500 | 107 |
| Beeliar Drive – Fawcett Road to Stock Road (reconstruction) | ✓ | ✓ | | | Fawcett Road to Rockingham Road | Eastbound | x | x | 474 | 30 | 593 | 37 | 1,130 | 71 | 763 | 48 | 1,043 | 65 | 1,153 | 72 | 1,166 | 73 | 668 | 42 | 801 | 50 | 815 | 51 |
| | | | | | | Westbound | x | upgrade | 611 | 38 | 657 | 41 | 1,055 | 66 | 1,205 | 75 | 1,376 | 86 | 1,617 | 101 | 1,023 | 64 | 1,193 | 75 | 1,360 | 85 | 1,330 | 83 |
| | | | | | Rockingham Road to Stock Road | Eastbound | x | x | 778 | 49 | 894 | 56 | 1,200 | 75 | 640 | 40 | 1,051 | 66 | 707 | 44 | 1,301 | 81 | 437 | 27 | 1,599 | 100 | 506 | 32 |
| | | | | | | Westbound | x | upgrade | 863 | 54 | 804 | 50 | 428 | 27 | 1,263 | 79 | 464 | 29 | 1,504 | 94 | 687 | 43 | 1,281 | 80 | 1,280 | 80 | 1,956 | 122 |
| North Lake Road – Kentucky Court to Kwinana Freeway (construct 2 c/ws) | | ✓ | ✓ | ✓ | Kentucky Court to Kwinana Freeway | Eastbound | x | x | | | | | | | | | | | | | 577 | 16 | 4,151 | 115 | 1,002 | 28 | 3,760 | 104 |
| | | | | | | Westbound | x | x | | | | | | | | | | | | | 3,211 | 89 | 2,626 | 73 | 3,579 | 99 | 2,838 | 79 |
| North Lake Road – Extend from Kwinana Freeway to Armadale Road (land, bridge, construct 2 c/ws, & traffic signals) | | ✓ | ✓ | ✓ | Kwinana Freeway to Armadale Road | Eastbound | x | x | | | | | | | | | | | | | 584 | 16 | 3,762 | 104 | 1,192 | 33 | 3,962 | 110 |
| | | | | | | Westbound | x | x | | | | | | | | | | | | | 1,885 | 52 | 1,543 | 43 | 2,192 | 61 | 1,923 | 53 |
| Verde Drive – Biscayne Way to Solomon Road (land & construct 1 c/w) | ✓ | ✓ | ✓ | ✓ | Biscayne Way to Solomon Road | Northbound | x | x | | | | | | | | | | | | | 1,445 | 40 | 539 | 15 | 2,089 | 58 | 747 | 21 |
| | | | | | | Southbound | x | x | | | | | | | | | | | | | 48 | 1 | 1,492 | 41 | 78 | 2 | 1,846 | 51 |
| Verve Drive – Solomon Road to North Lake Road (land & construct 1 c/w) | ✓ | ✓ | ✓ | ✓ | Solomon Road to North Lake Road | Northbound | x | x | | | | | | | | | | | | | 1,651 | 46 | 2,093 | 58 | 2,137 | 59 | 2,266 | 63 |
| | | | | | | Southbound | x | x | | | | | | | | | | | | | 991 | 28 | 1,175 | 33 | 1,287 | 36 | 1,752 | 49 |
| Prinsep Road – Cutler Road to Verde Drive (construct 1 c/w) | ✓ | ✓ | | | Cutler Road to Verde Drive | Northbound | x | x | | | | | | | | | | | | | 761 | 42 | 900 | 50 | 850 | 47 | 954 | 53 |
| | | | | | | Southbound | x | x | | | | | | | | | | | | | 625 | 35 | 734 | 41 | 595 | 33 | 859 | 48 |
| Midgegooroo Avenue – Beeliar Drive to North Lake Road (reduce to 2 lanes) | | ✓ | | | Beeliar Drive to Signal Terrace | Northbound | upgrade | upgrade | 1,543 | 43 | 1,559 | 43 | 3,922 | 109 | 4,242 | 118 | 4,588 | 127 | 4,406 | 122 | 2,628 | 73 | 3,798 | 106 | 1,847 | 103 | 2,636 | 146 |
| | | | | | | Southbound | x | x | 859 | 24 | 1,158 | 32 | 1,407 | 39 | 2,391 | 66 | 1,562 | 43 | 1,893 | 53 | 2,723 | 76 | 1,006 | 28 | 1,804 | 100 | 912 | 51 |
| | | | | | Signal Terrace to North Lake Road | Northbound | upgrade | upgrade | 1,458 | 40 | 1,322 | 37 | 3,780 | 105 | 3,094 | 86 | 4,359 | 121 | 3,264 | 91 | 2,579 | 72 | 3,284 | 91 | 1,792 | 100 | 2,152 | 120 |
| | | | | | | Southbound | x | x | 719 | 20 | 1,388 | 39 | 1,006 | 28 | 2,469 | 69 | 1,014 | 28 | 2,124 | 59 | 2,416 | 67 | 1,718 | 48 | 1,430 | 79 | 1,801 | 100 |
| Poletti Road – Beeliar Drive to North Lake Road (construct 2nd c/w & traffic signals) | ✓ | ✓ | | | Beeliar Drive to Cooper Road | Northbound | x | x | 1,417 | 51 | 672 | 24 | 2 | 0 | 451 | 16 | 112 | 4 | 1,058 | 38 | 10 | 0 | 617 | 22 | 169 | 6 | 981 | 35 |
| | | | | | | Southbound | upgrade | upgrade | 255 | 18 | 594 | 42 | 1,708 | 122 | 5,515 | 394 | 878 | 63 | 4,043 | 289 | 1,534 | 55 | 5,369 | 192 | 818 | 29 | 3,508 | 125 |
| | | | | | Cooper Road to Davison Road | Northbound | upgrade | upgrade | 808 | 58 | 655 | 47 | 1,605 | 115 | 4,043 | 289 | 1,767 | 126 | 2,927 | 209 | 1,907 | 68 | 4,189 | 150 | 1,918 | 69 | 3,466 | 124 |
| | | | | | | Southbound | upgrade | upgrade | 248 | 18 | 350 | 25 | 4,866 | 348 | 3,590 | 256 | 3,366 | 240 | 2,681 | 191 | 4,829 | 170 | 3,751 | 134 | 3,535 | 126 | 2,999 | 107 |
| | | | | | Davison Road to North Lake Road | Northbound | upgrade | upgrade | 808 | 58 | 655 | 47 | 1,605 | 115 | 4,043 | 289 | 1,767 | 126 | 2,927 | 209 | 1,907 | 68 | 4,189 | 150 | 1,918 | 69 | 3,466 | 124 |
| | | | | | | Southbound | upgrade | upgrade | 348 | 25 | 350 | 25 | 4,935 | 353 | 3,590 | 256 | 3,440 | 246 | 2,681 | 191 | 4,898 | 175 | 3,751 | 134 | 3,609 | 129 | 2,999 | 107 |
| Semple Court – North Lake Road to Jindabyne Heights (land / construct & re-align c/w) | | ✓ | | | North Lake Road to Muriel Court | Northbound | upgrade | upgrade | 808 | 58 | 557 | 40 | 560 | 40 | 1,595 | 114 | 1,319 | 94 | 1,857 | 133 | 276 | 20 | 1,329 | 95 | 1,165 | 83 | 1,487 | 106 |
| | | | | | | Southbound | x | upgrade | 470 | 34 | 836 | 60 | 1,108 | 79 | 799 | 57 | 1,551 | 111 | 801 | 57 | 824 | 59 | 776 | 55 | 1,150 | 82 | 540 | 39 |
| | | | | | Muriel Court to Berrigan Drive | Northbound | x | upgrade | 417 | 30 | 734 | 52 | 944 | 67 | 837 | 60 | 1,384 | 99 | 1,334 | 95 | 941 | 67 | 592 | 42 | 1,168 | 83 | 1,383 | 99 |
| | | | | | | Southbound | x | x | 109 | 8 | 258 | 18 | 1,044 | 75 | 498 | 36 | 927 | 66 | 995 | 71 | 968 | 69 | 492 | 35 | 376 | 27 | 1,244 | 89 |
| Hammond Road – Branch Circus to Bartram Road (construct 2nd c/w & upgrade verge) | ✓ | ✓ | | | Bartram Road to Branch Circus | Northbound | upgrade | upgrade | 1,597 | 100 | 721 | 45 | 2,246 | 140 | 1,374 | 86 | 3,130 | 196 | 1,696 | 106 | 1,692 | 106 | 1,596 | 100 | 3,323 | 104 | 1,985 | 62 |
| | | | | | | Southbound | upgrade | upgrade | 413 | 26 | 1,369 | 86 | 756 | 47 | 1,856 | 116 | 983 | 61 | 2,438 | 152 | 855 | 53 | 1,665 | 104 | 1,018 | 32 | 3,320 | 208 |
| Hammond Road – Gaebler Road to Frankland Avenue (construct 1 c/w) | ✓ | ✓ | ✓ | ✓ | Frankland Avenue to Gaebler Road | Northbound | x | x | 52 | 4 | 350 | 29 | 781 | 65 | 853 | 71 | 542 | 45 | 585 | 49 | 1,660 | 110 | 2,053 | 147 | 1,404 | 100 | 1,649 | 118 |
| | | | | | | Southbound | x | upgrade | 81 | 7 | 84 | 7 | 465 | 39 | 710 | 59 | 490 | 41 | 1,122 | 94 | 241 | 17 | 630 | 45 | 286 | 20 | 397 | 28 |
| Hammond Road – Frankland Avenue to Rowley Road (construct 1 c/w) | ✓ | ✓ | | | Rowley Road to Wattleup Road | Northbound | upgrade | upgrade | 714 | 51 | 472 | 34 | 1,385 | 99 | 1,491 | 106 | 1,846 | 132 | 1,616 | 115 | 801 | 50 | 998 | 62 | 1,403 | 88 | 1,575 | 98 |
| | | | | | | Southbound | upgrade | upgrade | 292 | 21 | 703 | 50 | 234 | 17 | 1,375 | 98 | 868 | 62 | 1,698 | 121 | 803 | 50 | 950 | 59 | 1,243 | 78 | 1,225 | 77 |
| | | | | | Wattelup Road to Frankland Avenue | Northbound | x | x | 52 | 4 | 350 | 29 | 781 | 65 | 853 | 71 | 542 | 45 | 585 | 49 | 479 | 34 | 737 | 53 | 372 | 27 | 574 | 41 |
| | | | | | | Southbound | x | upgrade | 81 | 7 | 84 | 7 | 465 | 39 | 710 | 59 | 490 | 41 | 1,122 | 94 | 241 | 17 | 630 | 45 | 286 | 20 | 397 | 28 |
| Hammond Road – Beeliar Drive to North Lake Road (construct second c/w) | ✓ | ✓ | | ✓ | Beeliar Drive to Blackly Row | Northbound | upgrade | upgrade | 1,590 | 99 | 601 | 38 | 2,295 | 143 | 74 | 5 | 2,688 | 168 | 100 | 6 | 2,255 | 141 | 42 | 3 | 3,242 | 101 | 103 | 7 |
| | | | | | | Southbound | upgrade | upgrade | 1,139 | 71 | 1,399 | 87 | 48 | 3 | 3,205 | 200 | 68 | 4 | 3,650 | 228 | 51 | 3 | 3,161 | 198 | 569 | 18 | 3,589 | 112 |
| | | | | | Blackly Row to North Lake Road | Northbound | upgrade | upgrade | 324 | 20 | 1,591 | 99 | 645 | 40 | 2,903 | 181 | 876 | 55 | 3,424 | 214 | 647 | 40 | 2,958 | 185 | 1,678 | 52 | 4,121 | 129 |
| | | | | | | Southbound | upgrade | upgrade | 1,526 | 95 | 514 | 32 | 2,111 | 132 | 211 | 13 | 2,274 | 142 | 92 | 6 | 2,156 | 135 | 253 | 16 | 3,024 | 95 | 725 | 23 |
| Hammond Road – North Lake Road to Berrigan Drive (construct 1 c/w) | | ✓ | | | North Lake Road to Berrigan Drive | Northbound | x | x | | | | | | | | | | | | | | | | | 582 | 32 | 1,425 | 79 |
| | | | | | | Southbound | x | x | | | | | | | | | | | | | | | | | 1,307 | 73 | 993 | 55 |
| Pilatus Street – Berrigan Drive to airport boundary (construct 2nd c/w) | | ✓ | ✓ | ✓ | Berrigan Drive to Airport Boundary | Northbound | x | x | | | | | | | | | | | | | 1,726 | 48 | 2,247 | 62 | 2,480 | 69 | 2,767 | 77 |
| | | | | | | Southbound | x | x | | | | | | | | | | | | | 847 | 24 | 1,463 | 41 | 1,209 | 34 | 1,806 | 50 |
| Jandakot Road – Berrigan Drive to Solomon Road (land & construct 2 c/w) | ✓ | ✓ | ✓ | ✓ | Solomon Road to Berrigan Drive | Eastbound | upgrade | upgrade | 652 | 41 | 1,683 | 105 | 251 | 16 | 1,723 | 108 | 204 | 13 | 2,123 | 133 | 137 | 4 | 2,582 | 81 | 582 | 18 | 3,185 | 100 |
| | | | | | | Westbound | upgrade | upgrade | 1,615 | 101 | 1,122 | 70 | 1,643 | 103 | 1,603 | 100 | 2,047 | 128 | 1,790 | 112 | 1,733 | 54 | 1,261 | 39 | 2,131 | 67 | 1,559 | 49 |
| Jandakot Road – Solomon Road to Fraser Road (construct 2nd c/w) | ✓ | ✓ | ✓ | ✓ | Fraser Road to Solomon Road | Eastbound | upgrade | upgrade | 472 | 30 | 1,639 | 102 | 102 | 6 | 2,188 | 137 | 151 | 9 | 2,737 | 171 | 287 | 9 | 3,154 | 99 | 818 | 26 | 3,681 | 115 |
| | | | | | | Westbound | upgrade | upgrade | 1,499 | 94 | 693 | 43 | 2,066 | 129 | 775 | 48 | 2,823 | 176 | 1,016 | 64 | 2,823 | 88 | 1,422 | 44 | 2,927 | 91 | 1,903 | 59 |
| Jandakot Road – Fraser Road to Warton Road (land & construct 2 c/w) | | ✓ | ✓ | ✓ | Warton Road to Fraser Road | Eastbound | upgrade | upgrade | 415 | 26 | 1,480 | 92 | 76 | 5 | 1,732 | 108 | 68 | 4 | 1,906 | 119 | 124 | 4 | 2,691 | 84 | 258 | 8 | 2,958 | 92 |
| | | | | | | Westbound | upgrade | upgrade | 1,672 | 104 | 688 | 43 | 2,571 | 161 | 755 | 47 | 3,927 | 245 | 962 | 60 | 3,190 | 100 | 1,395 | 44 | 3,554 | 111 | 1,957 | 61 |
| Russell Road - Hammond Road to Henderson Road (land & construct 2 c/w) | | ✓ | | | Henderson Road to Pearse Road | Eastbound | upgrade | upgrade | 491 | 27 | 1,706 | 95 | 1,176 | 65 | 1,952 | 108 | 2,088 | 116 | 2,727 | 152 | 1,141 | 63 | 1,764 | 98 | 2,266 | 63 | 2,752 | 76 |
| | | | | | | Westbound | upgrade | upgrade | 1,772 | 98 | 740 | 41 | 2,566 | 143 | 1,797 | 100 | 3,382 | 188 | 2,329 | 129 | 1,884 | 105 | 1,675 | 93 | 3,672 | 102 | 3,078 | 85 |
| | | | | | Pearse Road to Hammond Road | Eastbound | x | upgrade | 600 | 33 | 1,279 | 71 | 871 | 48 | 1,454 | 81 | 19 | 1 | 2,048 | 114 | 873 | 49 | 1,459 | 81 | 784 | 22 | 2,686 | 75 |
| | | | | | | Westbound | upgrade | upgrade | 1,414 | 79 | 842 | 47 | 1,812 | 101 | 1,746 | 97 | 2,299 | 128 | 2,097 | 117 | 1,661 | 92 | 1,806 | 100 | 3,569 | 99 | 3,354 | 93 |
| Russell Road – Henderson Road to Rockingham Road (land & construct 2 c/w) | | ✓ | | | Rockingham Road to Holmes Road | Eastbound | x | x | 416 | 23 | 1,108 | 62 | 466 | 26 | 744 | 41 | 1,007 | 56 | 1,420 | 79 | 526 | 29 | 543 | 30 | 1,256 | 35 | 1,609 | 45 |
| | | | | | | Westbound | x | upgrade | 1,071 | 60 | 544 | 30 | 1,356 | 75 | 1,055 | 59 | 1,844 | 102 | 1,780 | 99 | 797 | 44 | 784 | 44 | 2,085 | 58 | 2,355 | 65 |
| | | | | | Holmes Road to Henderson Road | Eastbound | x | x | 402 | 22 | 1,074 | 60 | 460 | 26 | 769 | 43 | 977 | 54 | 1,330 | 74 | 472 | 26 | 612 | 34 | 1,205 | 33 | 1,565 | 43 |
| | | | | | | Westbound | x | upgrade | 1,010 | 56 | 537 | 30 | 1,323 | 73 | 980 | 54 | 1,833 | 102 | 1,338 | 74 | 834 | 46 | 759 | 42 | 2,346 | 65 | 1,957 | 54 |
| Rowley Road – Hammond Road to Kwinana Freeway (land & construct 1 c/w) | ✓ | ✓ | | ✓ | Hammond Road to Kwinana Freeway | Eastbound | upgrade | upgrade | 292 | 21 | 703 | 50 | 234 | 17 | 1,375 | 98 | 868 | 62 | 1,698 | 121 | 1,510 | 94 | 1,670 | 104 | 3,510 | 110 | 2,872 | 90 |
| | | | | | | Westbound | upgrade | upgrade | 714 | 51 | 472 | 34 | 1,385 | 99 | 1,491 | 106 | 1,846 | 132 | 1,616 | 115 | 1,467 | 92 | 1,759 | 110 | 3,225 | 101 | 4,541 | 142 |
| Rowley Road – Hammond Road to ~1.2km west of Hammond Road | ✓ | ✓ | | ✓ | Hammond Road to Rockingham Road | Eastbound | x | x | | | | | | | | | | | | | 707 | 39 | 721 | 40 | 2,277 | 63 | 1,649 | 46 |
| | | | | | | Westbound | x | x | | | | | | | | | | | | | 666 | 37 | 762 | 42 | 995 | 28 | 2,774 | 77 |
| Karel Avenue – Berrigan Drive to Farrington Street (construct 2nd c/w) | | ✓ | ✓ | ✓ | Berrigan Drive to Roe Highway | Northbound | upgrade | upgrade | 1,942 | 108 | 1,928 | 107 | 2,046 | 114 | 2,974 | 165 | 2,806 | 156 | 3,515 | 195 | 3,515 | 98 | 3,654 | 102 | 4,828 | 134 | 4,270 | 119 |
| | | | | | | Southbound | upgrade | upgrade | 1,555 | 86 | 672 | 37 | 3,006 | 167 | 2,829 | 157 | 3,084 | 171 | 3,672 | 204 | 1,305 | 36 | 2,970 | 83 | 1,419 | 39 | 4,092 | 114 |
| | | | | | Roe Highway Bridge | Northbound | upgrade | upgrade | 2,159 | 120 | 2,150 | 119 | 2,599 | 144 | 2,774 | 154 | 4,262 | 237 | 3,260 | 181 | 3,583 | 100 | 3,019 | 84 | 4,706 | 131 | 3,306 | 92 |
| | | | | | | Southbound | upgrade | upgrade | 1,031 | 57 | 698 | 39 | 2,423 | 135 | 2,385 | 132 | 2,618 | 145 | 3,199 | 178 | 1,497 | 42 | 2,034 | 57 | 1,786 | 50 | 2,303 | 64 |
| | | | | | Roe Highway to Farrington Street | Northbound | upgrade | upgrade | 1,406 | 78 | 1,703 | 95 | 2,038 | 113 | 1,309 | 73 | 3,254 | 181 | 1,216 | 68 | 2,747 | 76 | 1,179 | 33 | 3,877 | 108 | 951 | 26 |
| | | | | | | Southbound | upgrade | upgrade | 1,113 | 62 | 1,541 | 86 | 419 | 23 | 1,779 | 99 | 679 | 38 | 2,311 | 128 | 1,117 | 31 | 1,135 | 32 | 1,548 | 43 | 1,831 | 51 |
| Cockburn Road - Rockingham Road South to Rockingham Road North | ✓ | ✓ | | | Rockingham Road South to Nauticle Drive | Northbound | upgrade | upgrade | 1,498 | 94 | 543 | 34 | 1,570 | 98 | 580 | 36 | 1,993 | 125 | 805 | 50 | 1,570 | 98 | 580 | 36 | 1,993 | 125 | 805 | 50 |
| | | | | | | Southbound | upgrade | upgrade | 569 | 36 | 1,814 | 113 | 531 | 33 | 1,645 | 103 | 837 | 52 | 1,840 | 115 | 531 | 33 | 1,645 | 103 | 837 | 52 | 1,840 | 115 |
| | ✓ | ✓ | | | Nauticle Drive to Russell Road | Northbound | upgrade | upgrade | 786 | 49 | 816 | 51 | 780 | 49 | 2,426 | 152 | 595 | 37 | 2,484 | 155 | 780 | 49 | 2,426 | 152 | 595 | 37 | 2,484 | 155 |
| | | | | | | Southbound | upgrade | upgrade | 823 | 51 | 811 | 51 | 3,370 | 211 | 2,914 | 182 | 3,309 | 207 | 2,916 | 182 | 3,370 | 211 | 2,914 | 182 | 3,309 | 207 | 2,916 | 182 |
| | ✓ | ✓ | | | Russell Road to Mayor Road | Northbound | x | upgrade | 992 | 41 | 1,130 | 47 | 876 | 36 | 1,958 | 82 | 1,810 | 75 | 2,194 | 91 | 604 | 25 | 1,873 | 78 | 1,388 | 58 | 2,202 | 92 |
| | | | | | | Southbound | x | upgrade | 1,127 | 47 | 843 | 35 | 2,006 | 84 | 1,608 | 67 | 2,358 | 98 | 2,483 | 103 | 2,016 | 84 | 1,567 | 65 | 2,361 | 98 | 2,318 | 97 |
| | ✓ | ✓ | | | Mayor Road to Spearwood Avenue | Northbound | x | upgrade | 1,580 | 66 | 1,249 | 52 | 1,848 | 77 | 1,786 | 74 | 2,268 | 95 | 2,039 | 85 | 1,504 | 63 | 1,565 | 65 | 2,335 | 97 | 2,362 | 98 |
| | | | | | | Southbound | upgrade | upgrade | 899 | 37 | 1,474 | 61 | 1,202 | 50 | 2,182 | 91 | 1,727 | 72 | 2,371 | 99 | 1,166 | 49 | 2,005 | 84 | 1,762 | 73 | 2,516 | 105 |
| | ✓ | ✓ | | | Spearwood Avenue to Rockingham Road North | Northbound | upgrade | upgrade | 1,884 | 78 | 1,422 | 59 | 2,052 | 86 | 2,092 | 87 | 2,768 | 115 | 2,832 | 118 | 1,987 | 83 | 1,967 | 82 | 4,351 | 91 | 3,845 | 80 |
| | | | | | | Southbound | upgrade | upgrade | 891 | 37 | 2,025 | 84 | 1,699 | 71 | 2,433 | 101 | 2,389 | 100 | 3,347 | 139 | 1,713 | 71 | 2,404 | 100 | 3,032 | 63 | 4,945 | 103 |
| Stock Road - Rockingham Road to Garling Street | ✓ | ✓ | | | Rockingham Road to Beeliar Drive | Northbound | x | upgrade | 2,794 | 58 | 2,035 | 42 | 3,623 | 75 | 3,290 | 69 | 4,408 | 92 | 3,438 | 72 | 3,132 | 65 | 3,273 | 68 | 4,593 | 96 | 4,082 | 85 |
| | | | | | | Southbound | upgrade | upgrade | 1,879 | 39 | 2,705 | 56 | 2,926 | 61 | 4,176 | 87 | 3,440 | 72 | 5,591 | 116 | 3,094 | 64 | 4,267 | 89 | 3,691 | 77 | 4,947 | 103 |
| | ✓ | ✓ | | | Beeliar Drive to Barrington Street | Northbound | x | upgrade | 2,868 | 60 | 1,838 | 38 | 3,435 | 72 | 4,027 | 84 | 4,807 | 100 | 4,135 | 86 | 1,560 | 33 | 2,772 | 58 | 3,039 | 63 | 3,341 | 70 |
| | | | | | | Southbound | x | upgrade | 1,345 | 28 | 2,728 | 57 | 1,825 | 38 | 3,803 | 79 | 1,613 | 34 | 4,925 | 103 | 2,008 | 42 | 3,114 | 65 | 1,678 | 35 | 3,654 | 76 |
| | ✓ | ✓ | | | Barrington Street to Spearwood Avenue | Northbound | upgrade | upgrade | 3,596 | 75 | 2,379 | 50 | 4,353 | 91 | 4,175 | 87 | 4,872 | 102 | 3,933 | 82 | 2,558 | 53 | 3,351 | 70 | 3,846 | 80 | 3,837 | 80 |
| | | | | | | Southbound | upgrade | upgrade | 1,822 | 38 | 3,200 | 67 | 2,602 | 54 | 4,696 | 98 | 1,869 | 39 | 5,158 | 107 | 2,811 | 59 | 4,157 | 87 | 2,432 | 51 | 4,678 | 97 |
| | ✓ | ✓ | | | Spearwood Avenue to Phoenix Road | Northbound | x | upgrade | 3,082 | 64 | 2,336 | 49 | 4,051 | 84 | 3,885 | 81 | 4,787 | 100 | 4,025 | 84 | 2,420 | 50 | 3,102 | 65 | 3,981 | 83 | 3,838 | 80 |
| | | | | | | Southbound | upgrade | upgrade | 1,672 | 35 | 2,972 | 62 | 2,881 | 60 | 4,728 | 99 | 3,089 | 64 | 5,437 | 113 | 3,304 | 69 | 4,536 | 95 | 3,207 | 67 | 5,194 | 108 |
| | ✓ | ✓ | | | Phoenix Road to Forrest Road | Northbound | x | upgrade | 3,327 | 69 | 2,563 | 53 | 2,350 | 49 | 2,616 | 54 | 4,166 | 87 | 2,746 | 57 | 981 | 20 | 1,842 | 38 | 2,924 | 61 | 2,178 | 45 |
| | | | | | | Southbound | x | upgrade | 1,731 | 36 | 2,995 | 62 | 2,213 | 46 | 3,979 | 83 | 2,631 | 55 | 4,794 | 100 | 2,319 | 48 | 3,649 | 76 | 2,238 | 47 | 4,178 | 87 |
| | ✓ | ✓ | | | Forrest Road to Winterfold Road | Northbound | x | upgrade | 3,086 | 64 | 2,365 | 49 | 2,016 | 42 | 2,190 | 46 | 4,151 | 86 | 2,439 | 51 | 985 | 21 | 1,509 | 31 | 3,138 | 65 | 1,749 | 36 |
| | | | | | | Southbound | x | upgrade | 1,290 | 27 | 2,976 | 62 | 1,495 | 31 | 3,742 | 78 | 1,946 | 41 | 4,689 | 98 | 1,418 | 30 | 3,538 | 74 | 1,685 | 35 | 4,289 | 89 |
| | ✓ | ✓ | | | Winterfold Road to South Street | Northbound | x | upgrade | 3,410 | 71 | 2,248 | 47 | 2,606 | 54 | 1,584 | 33 | 4,103 | 85 | 1,534 | 32 | 1,941 | 40 | 1,306 | 27 | 3,766 | 78 | 1,475 | 31 |
| | | | | | | Southbound | x | upgrade | 1,630 | 34 | 2,855 | 59 | 1,239 | 26 | 3,851 | 80 | 1,555 | 32 | 4,694 | 98 | 1,180 | 25 | 3,664 | 76 | 1,573 | 33 | 4,460 | 93 |
| | ✓ | ✓ | | | South Street to Garling Street | Northbound | x | x | 2,720 | 57 | 909 | 19 | 2,275 | 47 | 963 | 20 | 2,893 | 60 | 1,015 | 21 | 2,275 | 47 | 963 | 20 | 2,893 | 60 | 1,015 | 21 |
| | | | | | | Southbound | x | x | 1,225 | 26 | 1,810 | 38 | 1,508 | 31 | 2,070 | 43 | 1,719 | 36 | 2,393 | 50 | 1,508 | 31 | 2,070 | 43 | 1,719 | 36 | 2,393 | 50 |
| | | | | | Number of locations with VCR>85% | | | | 13 | | 14 | | 30 | | 46 | | 49 | | 61 | | 17 | | 29 | | 31 | | 47 | |
| | | | | | | | | | 92 | | 92 | | 92 | | 92 | | 92 | | 92 | | 106 | | 106 | | 108 | | 108 | |

# 8 Additional modelling results

City of Cockburn has requested additional option testing to determine optimal Major Roadworks Plan. Initially, it was determined that two options need to be tested as part of first round of modelling, which are as follows:

1. Cockburn Road widening
2. Stock Road widening

Cockburn Road and Stock Road widening has been tested in order to investigate what potential impacts it may have on the City of Cockburn network. However, those two roads are under Main Road jurisdiction and therefore, this analysis has been done for information only. The results of the additional analysis have been explained in Appendix B.

Results of the first round of modelling was presented to Councillors at briefing meeting in August 2018.

As the result of the presentation, Councillors requested additional option testing which are as follows:

1. Network with/without Roe 9 link and Hammond Road extension
2. Network with/without Rockingham Road duplication
3. Network with/without Farrington Road duplication
4. Network with/without Roe 9 only
5. Network with/without Russell Road duplication
6. Network with Armadale Road widening by 2020
7. Bartram Road link analysis

The outcomes of this analysis have been explained and shown in Appendix C. A further briefing of those results was presented to Councillors in October 2018.

# 9 Conclusion

The 2018 City of Cockburn District Traffic Study has undertaken a comprehensive review of the traffic demand, current and forecast, in the City of Cockburn local government area. As part of the study the following key outcomes have been achieved:

- Development of AM and PM peak traffic models in Aimsun software for the City of Cockburn Local Government Area consistent with Main Roads ROM24 daily output for external movements. This will provide a valuable tool for future transport and land use planning in the City of Cockburn.
- Demographic data review undertaken to refine AM and PM peak models to provide more accurate forecasting for the local area.
- Validation of link-based traffic volumes to very good levels for peak periods within the City of Cockburn area. This offers the ability for modelling accurate traffic forecasts.
- Forecasts for 2021 (do nothing and City of Cockburn aligned upgrades) and 2031 (City of Cockburn aligned upgrades) forecast years.

The analysis has shown significant increases in traffic demand and travel times without any road network upgrades. Even with the proposed upgrades there are sections which are forecast to operate over the available road network capacity as identified in Section 6. However, despite the increase in demand there will insufficient capacity in upgrading the road network to fully solve congestion due to already constrained network.

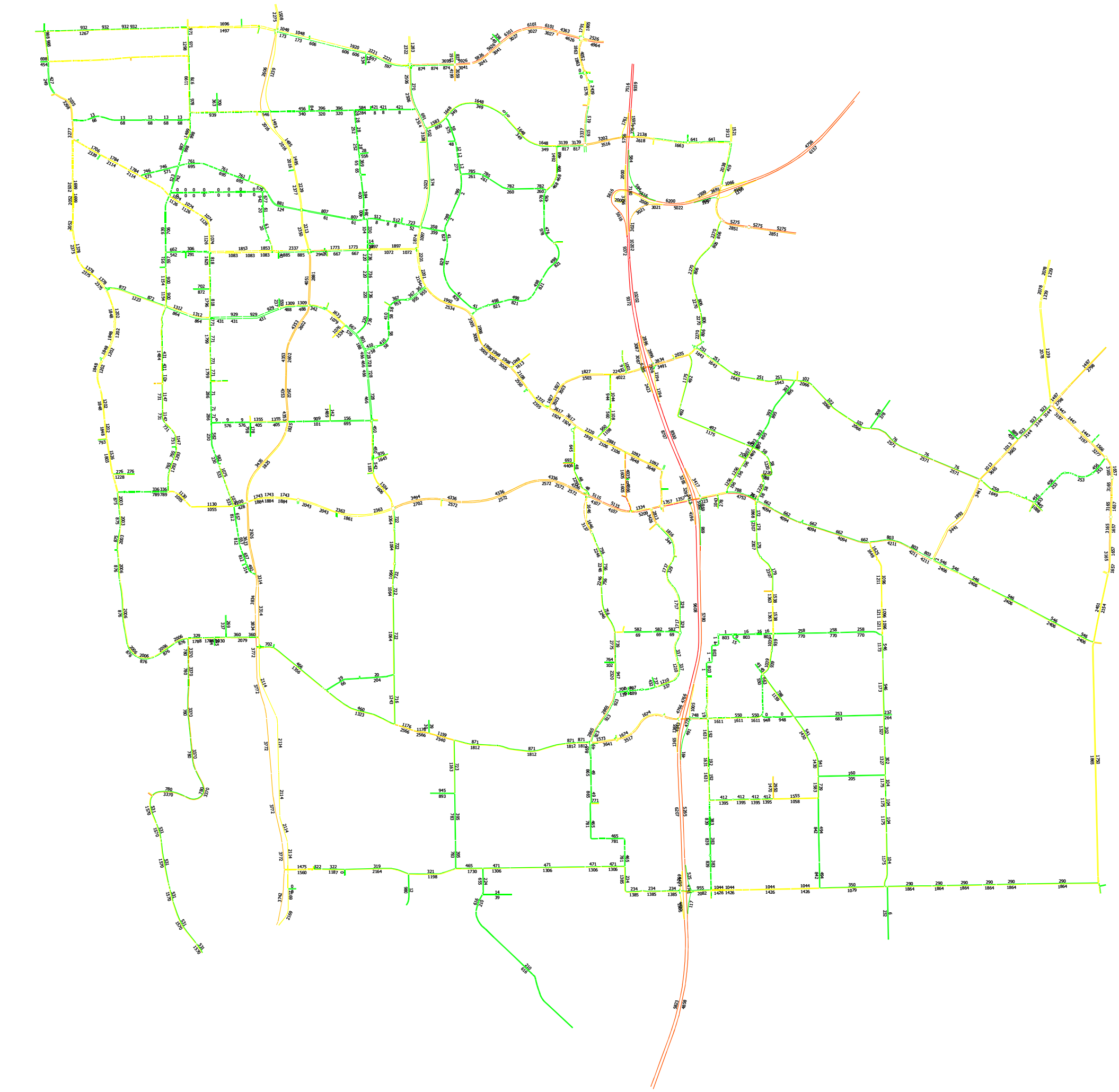
This indicates that additional road network demand management measures will be required beyond road network upgrades similar to what has been identified in the previous Integrated Transport Strategy for the city. These could include but not be limited to the following:

- Public transport improvements to rail and bus routes and infrastructure
- Further encouraging pedestrian and cycle transport modes
- Examining the impact of peak spreading on road infrastructure requirements
- Examining the timing and sequencing of development
- Increasing implementation of Intelligent Transport Systems

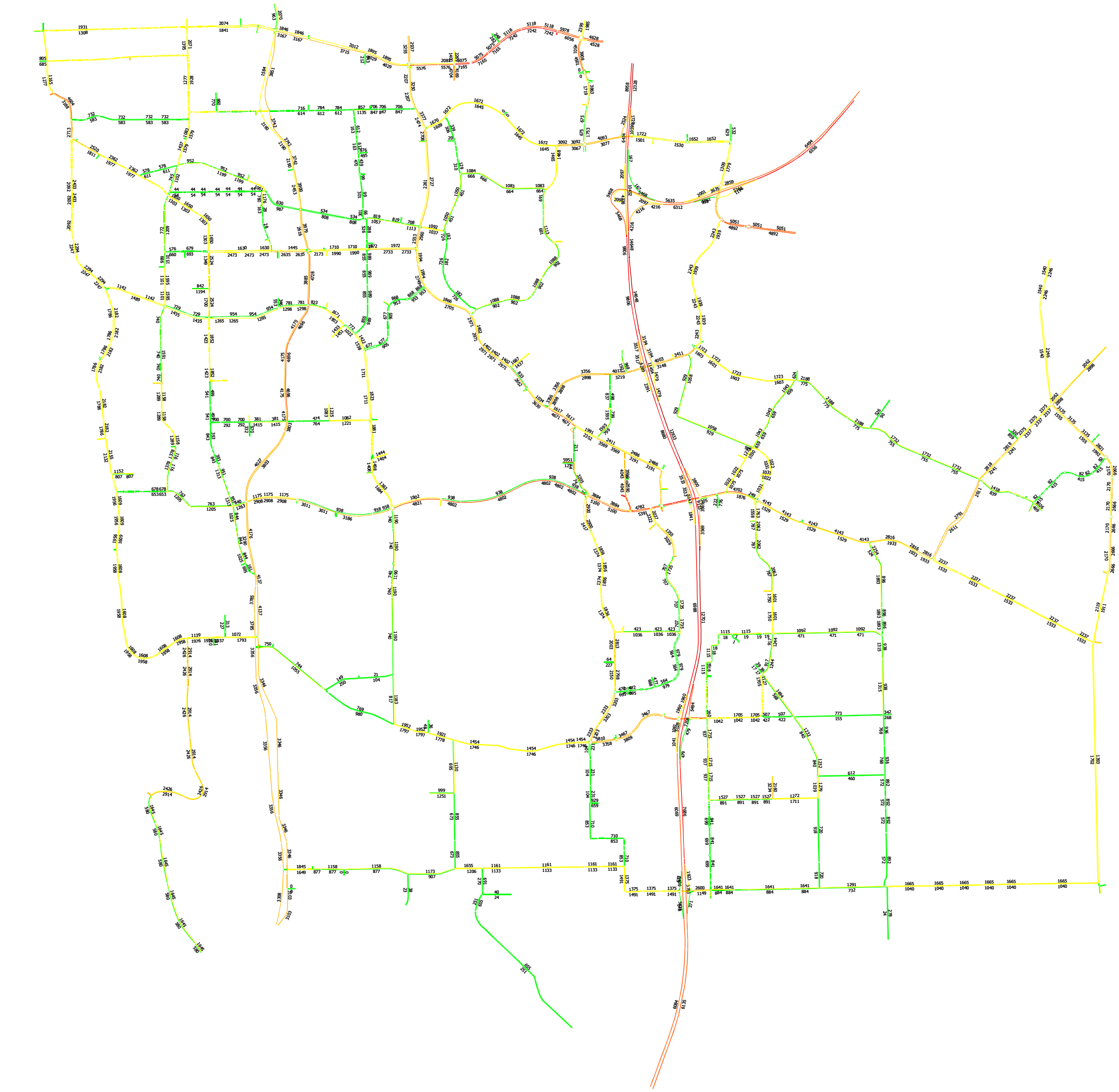
# Appendix A

Assigned volumes

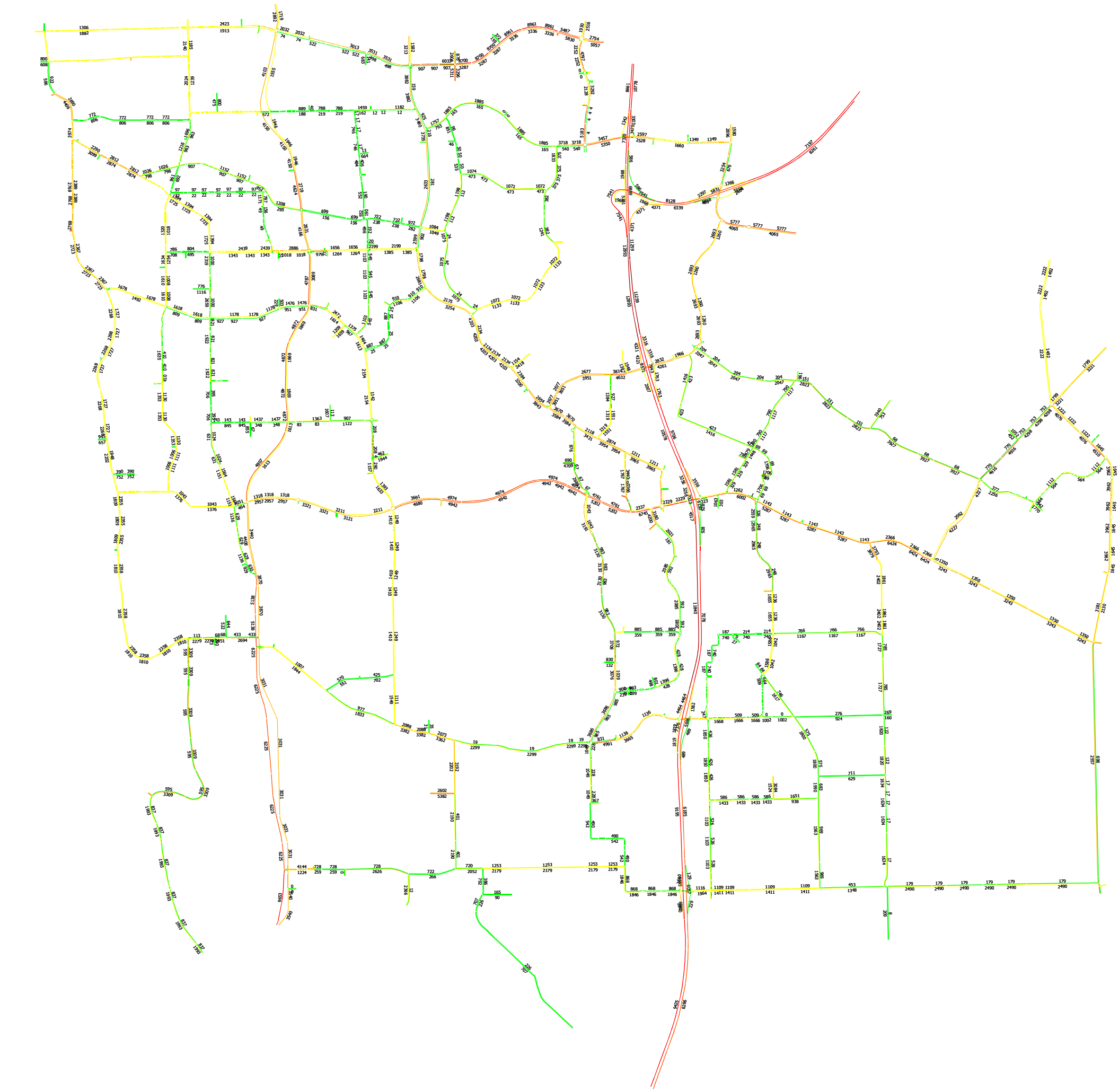
# A1 2021 Do Nothing - AM Peak



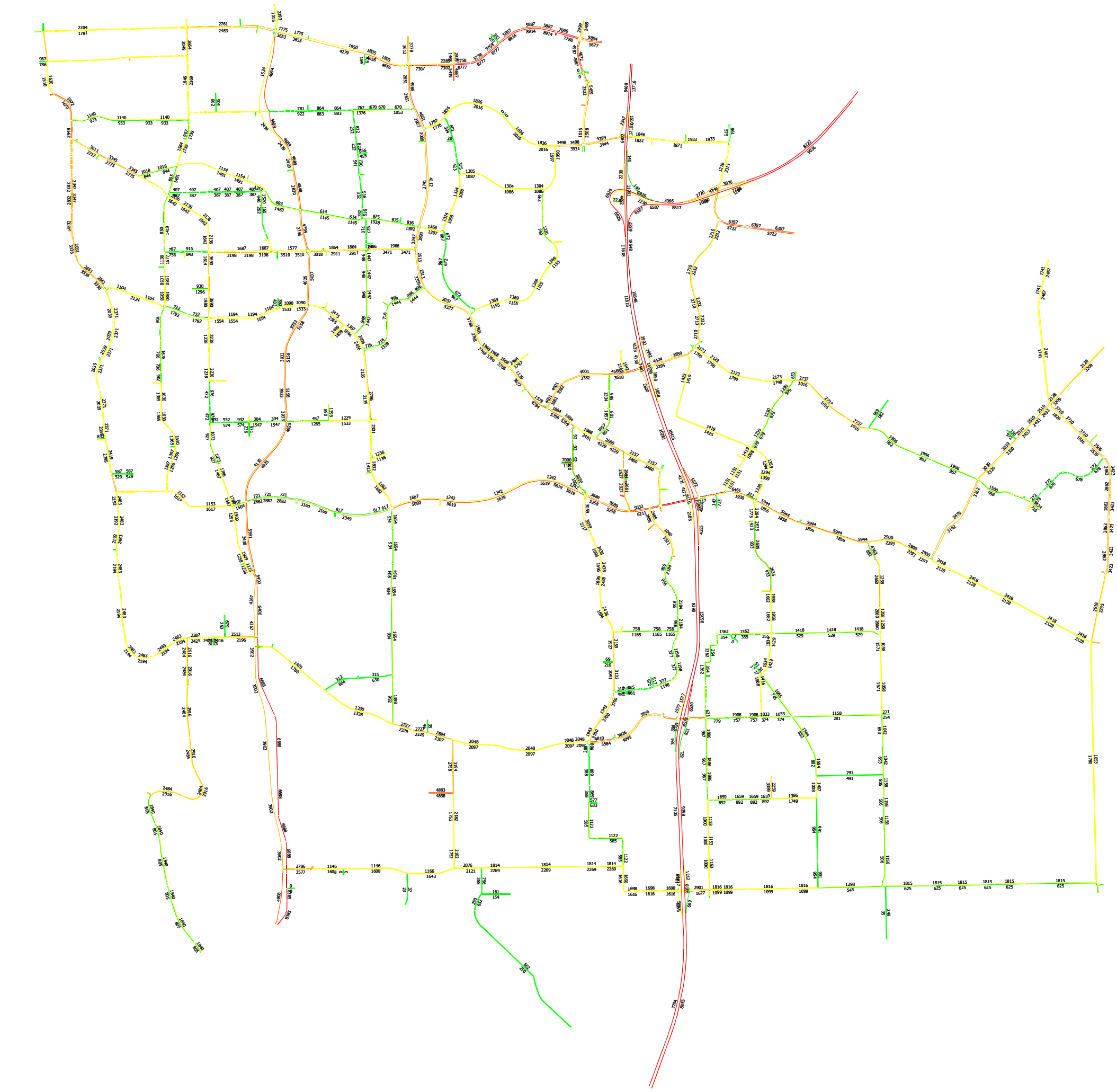
# A2 2021 Do Nothing - PM Peak



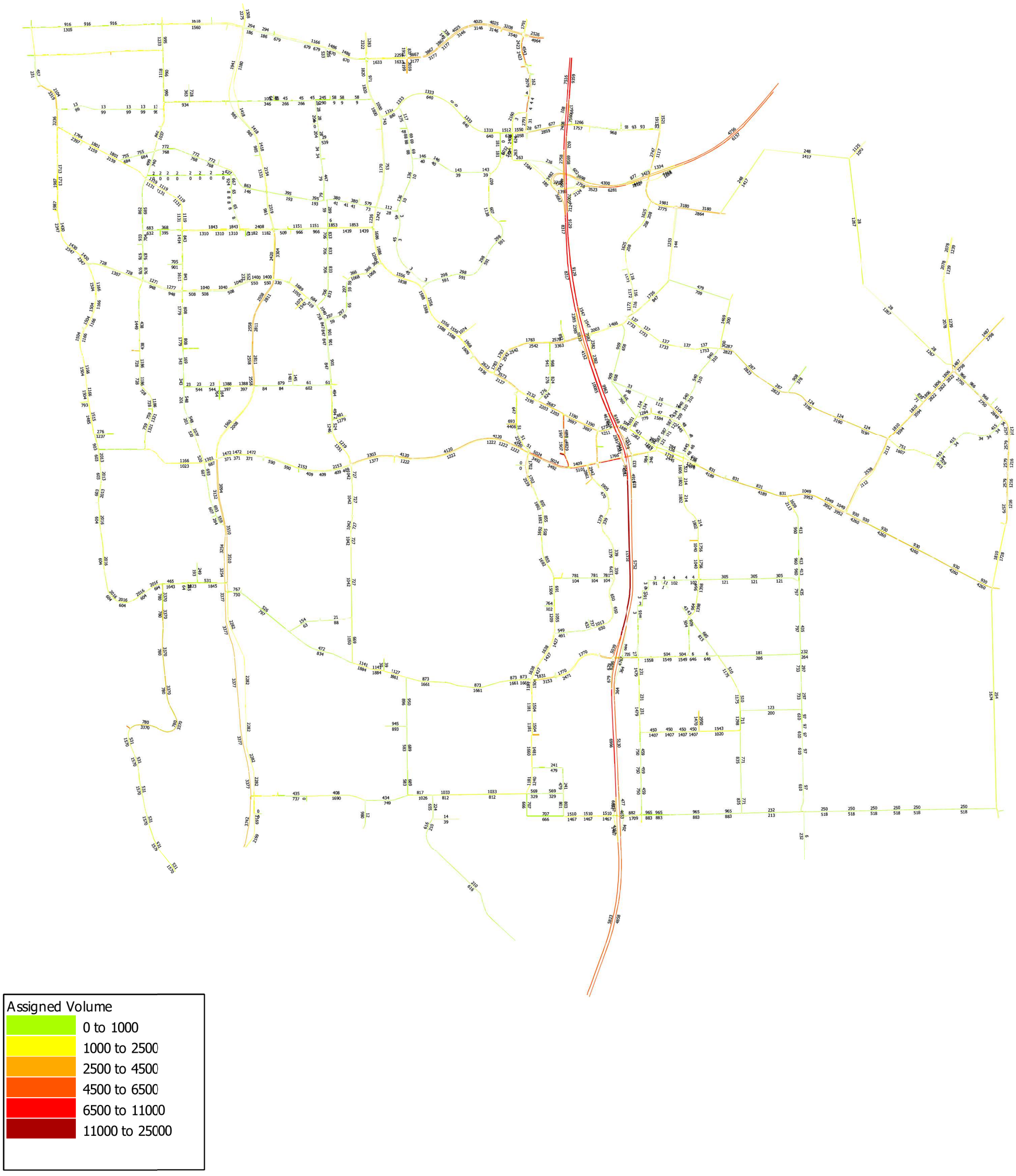
# A3 2031 Do Nothing - AM Peak



# A4 2031 Do Nothing - PM Peak

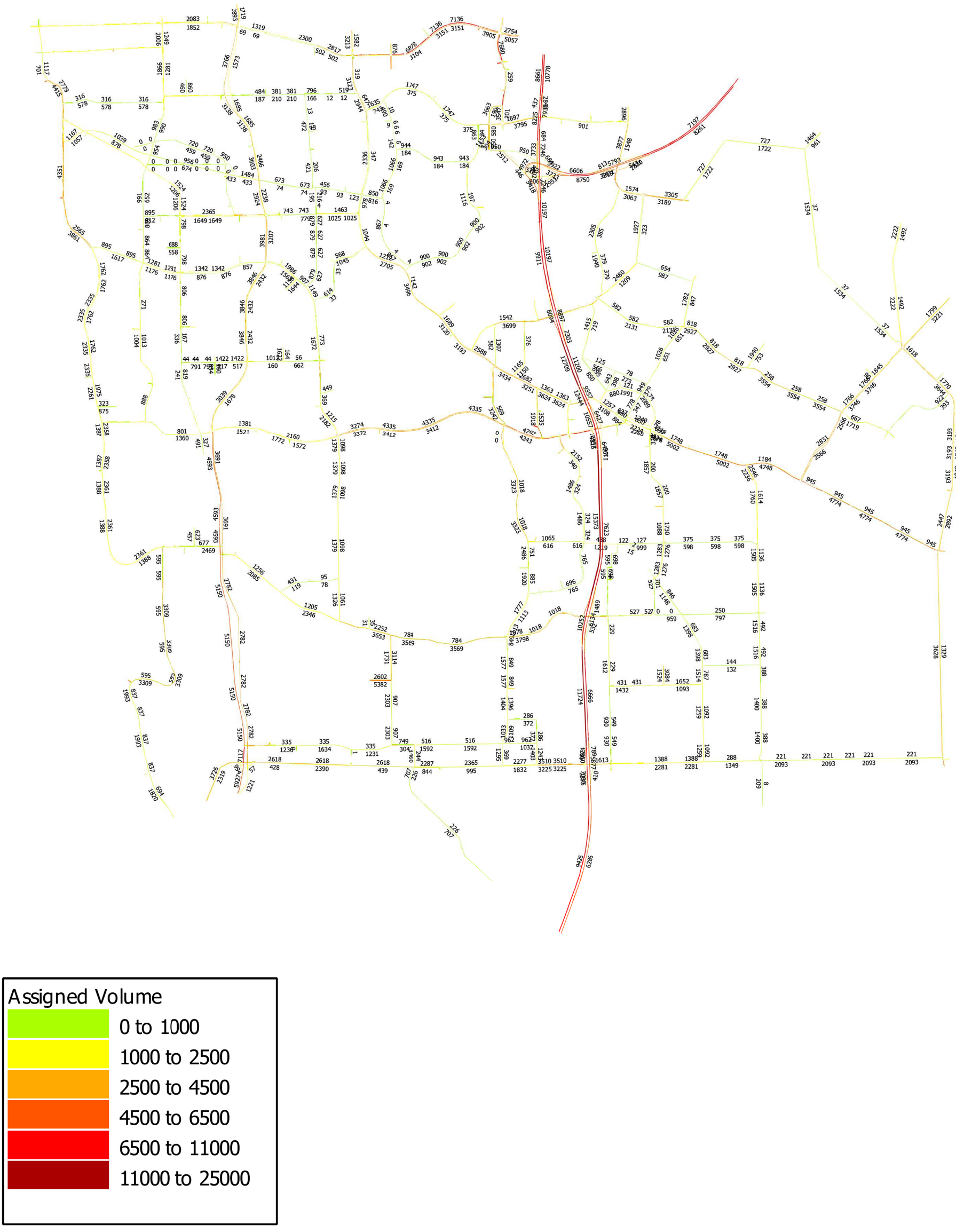


# A5 2021 Do Something - AM Peak

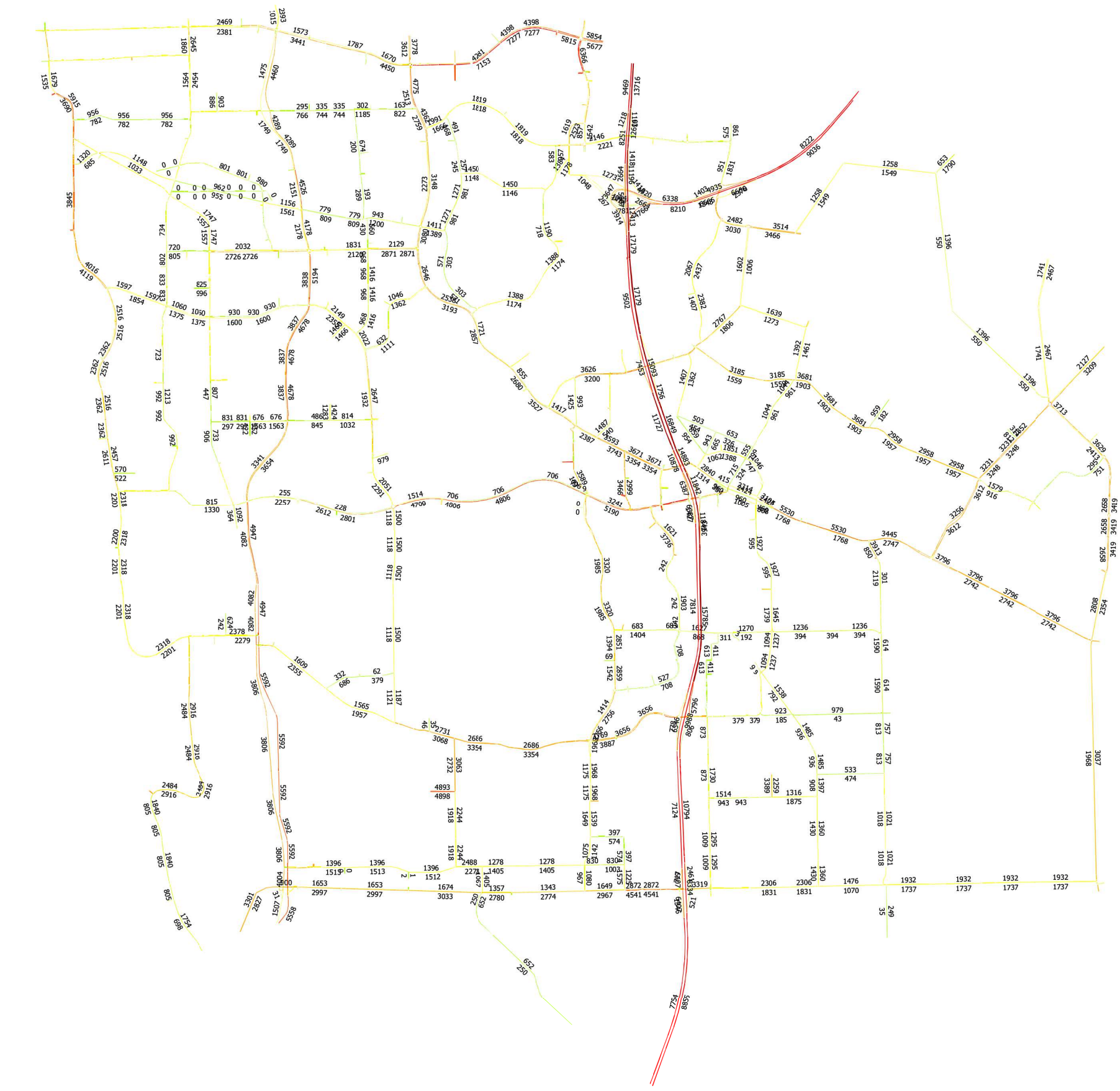


# A6 2021 Do Something - PM Peak

# A7 2031 Do Something - AM Peak



# A8 2031 Do Something - PM Peak

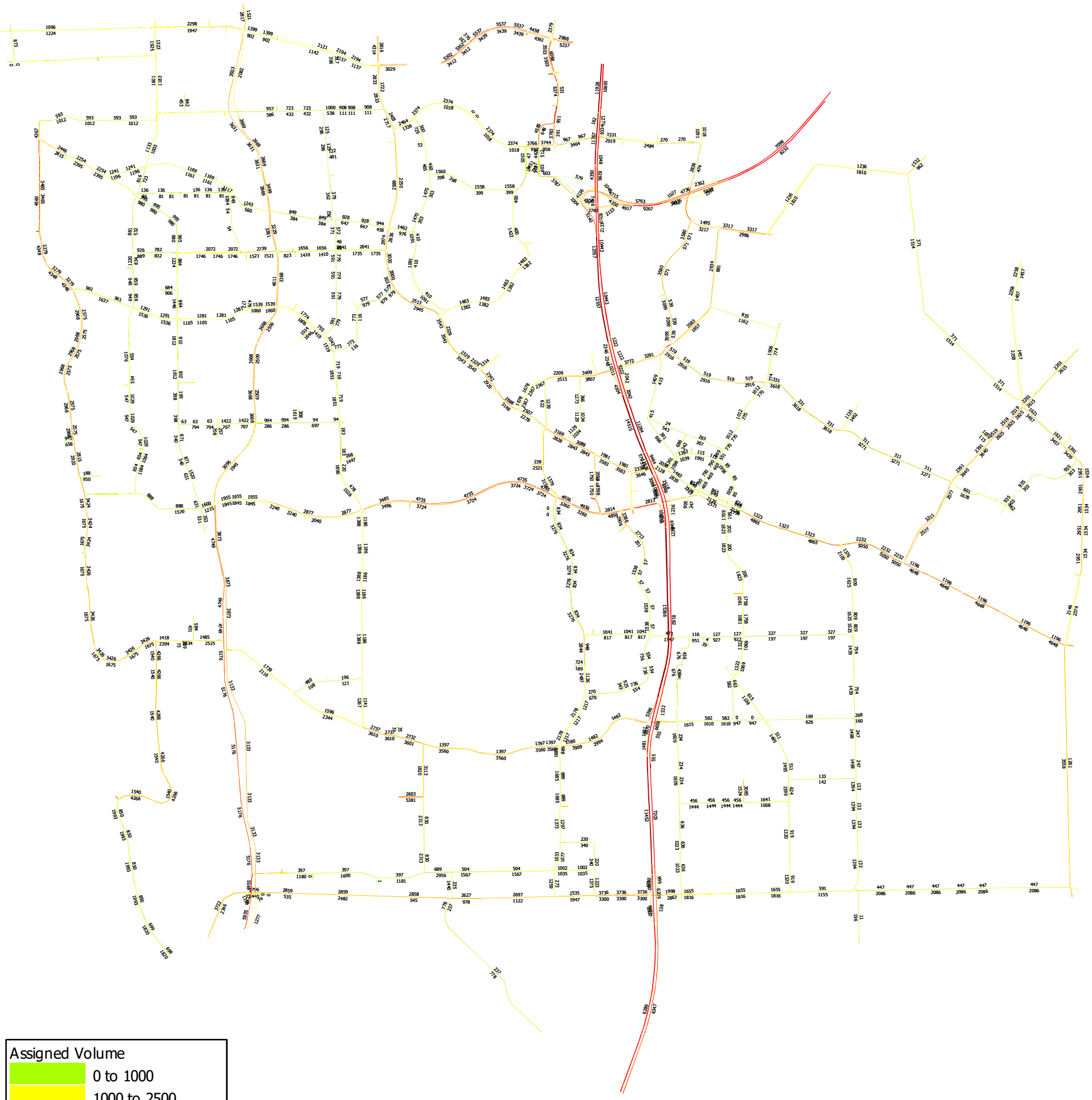


# Appendix B

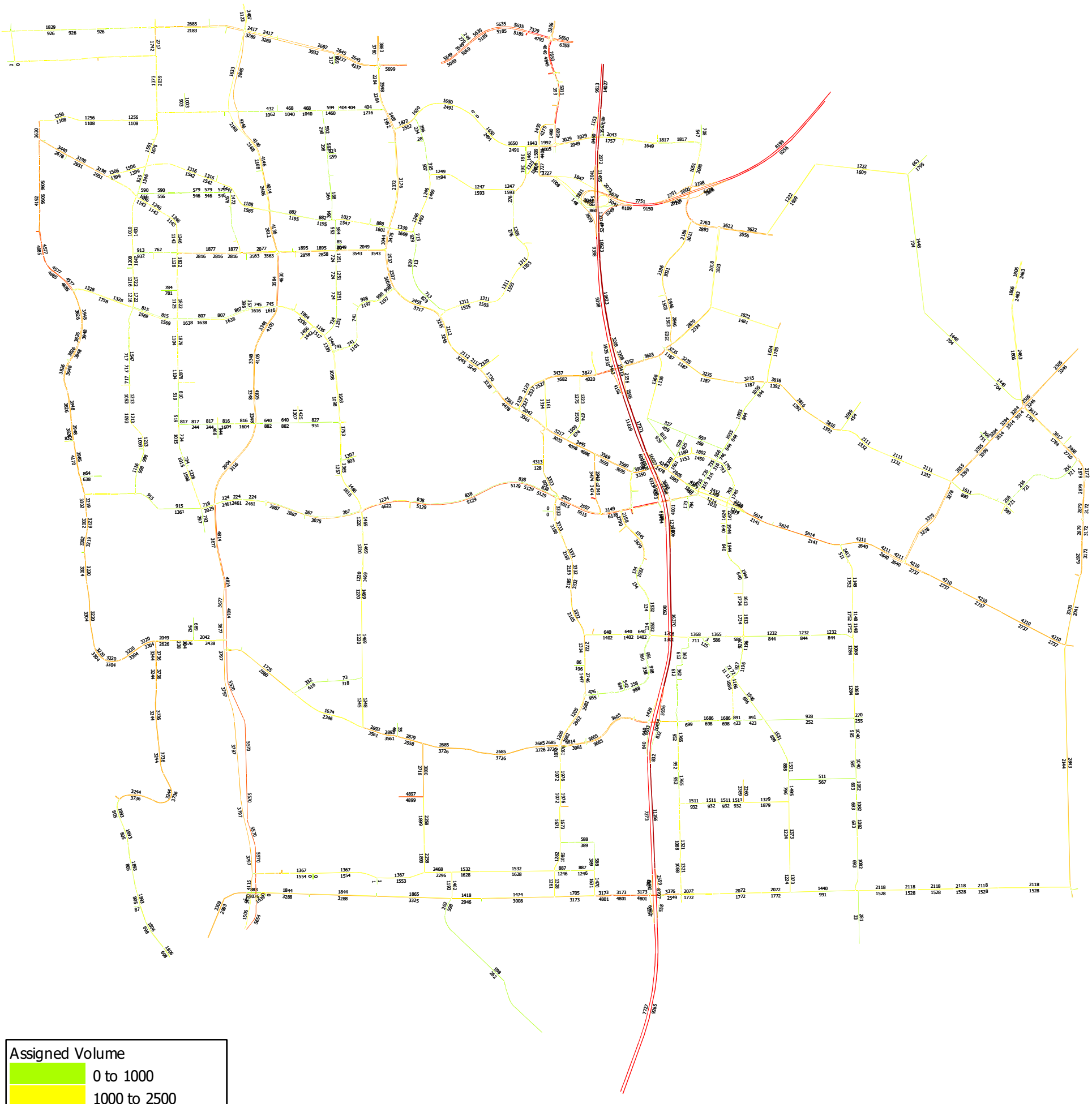
## Stock Road and Cockburn Road Widening Scenarios

Two additional scenarios have been tested in order to investigate implication of Stock Road and Cockburn Road widening. Below are figures showing assigned volume and volume capacity ratio figures indicating isolated impact of those widening on the road network. As mentioned in section 8 this analysis has been produced for information only as both these roads are responsibility of the Main Roads WA.

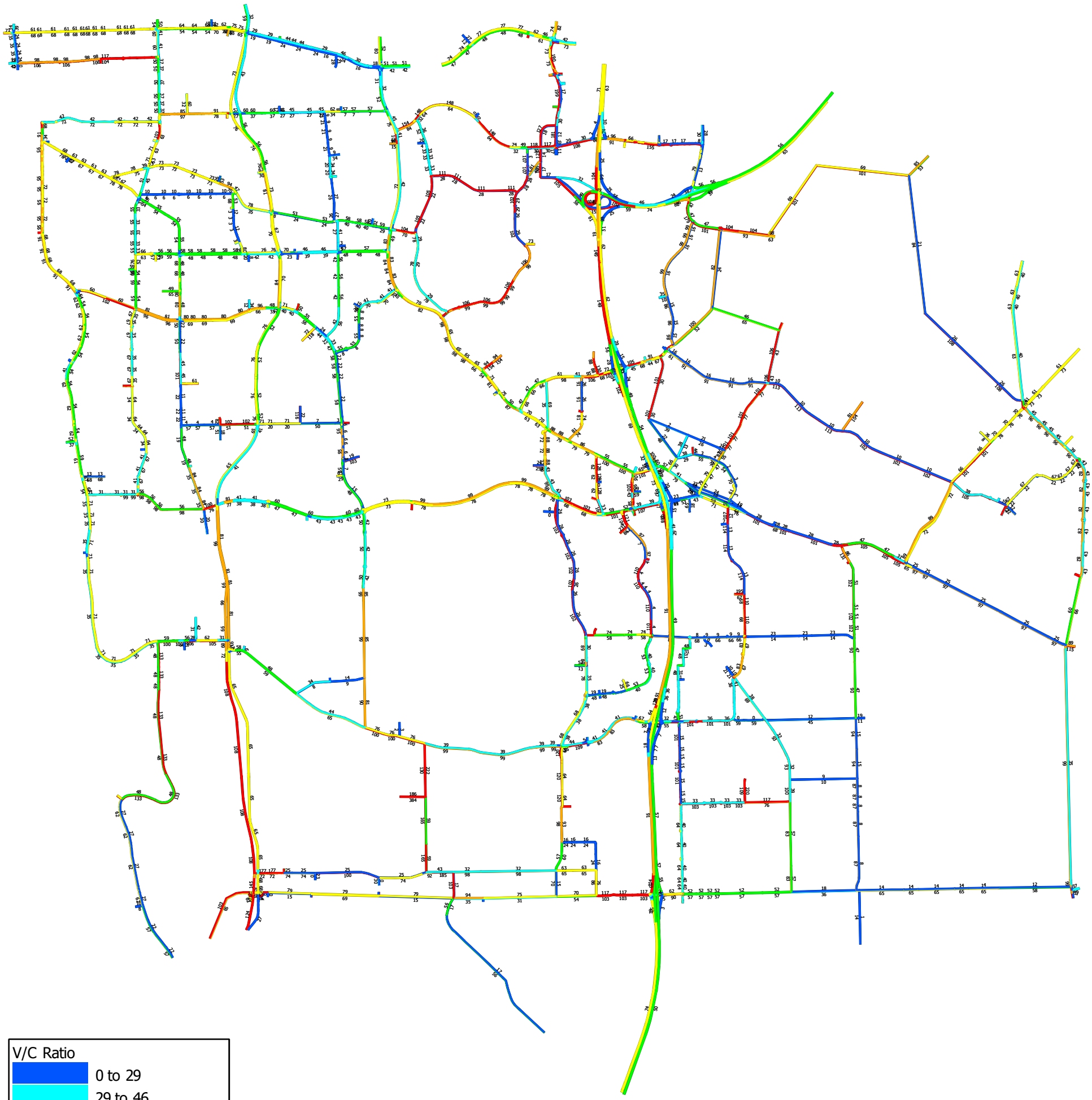
# B1 2031 Do Something - Cockburn Road Widening - Assigned Volume - AM Peak



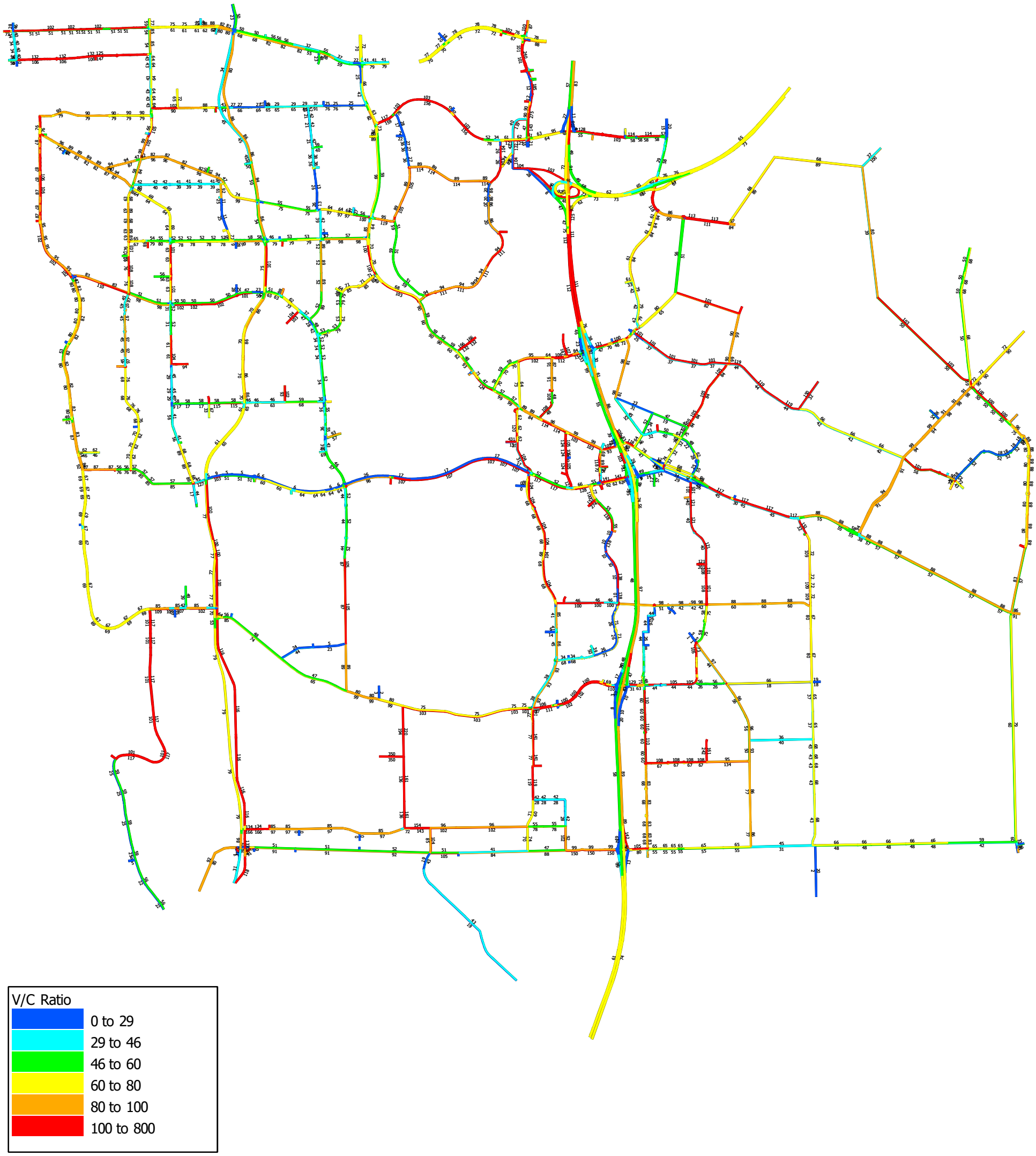
# B2 2031 Do Something - Cockburn Road Widening - Assigned Volume - PM Peak



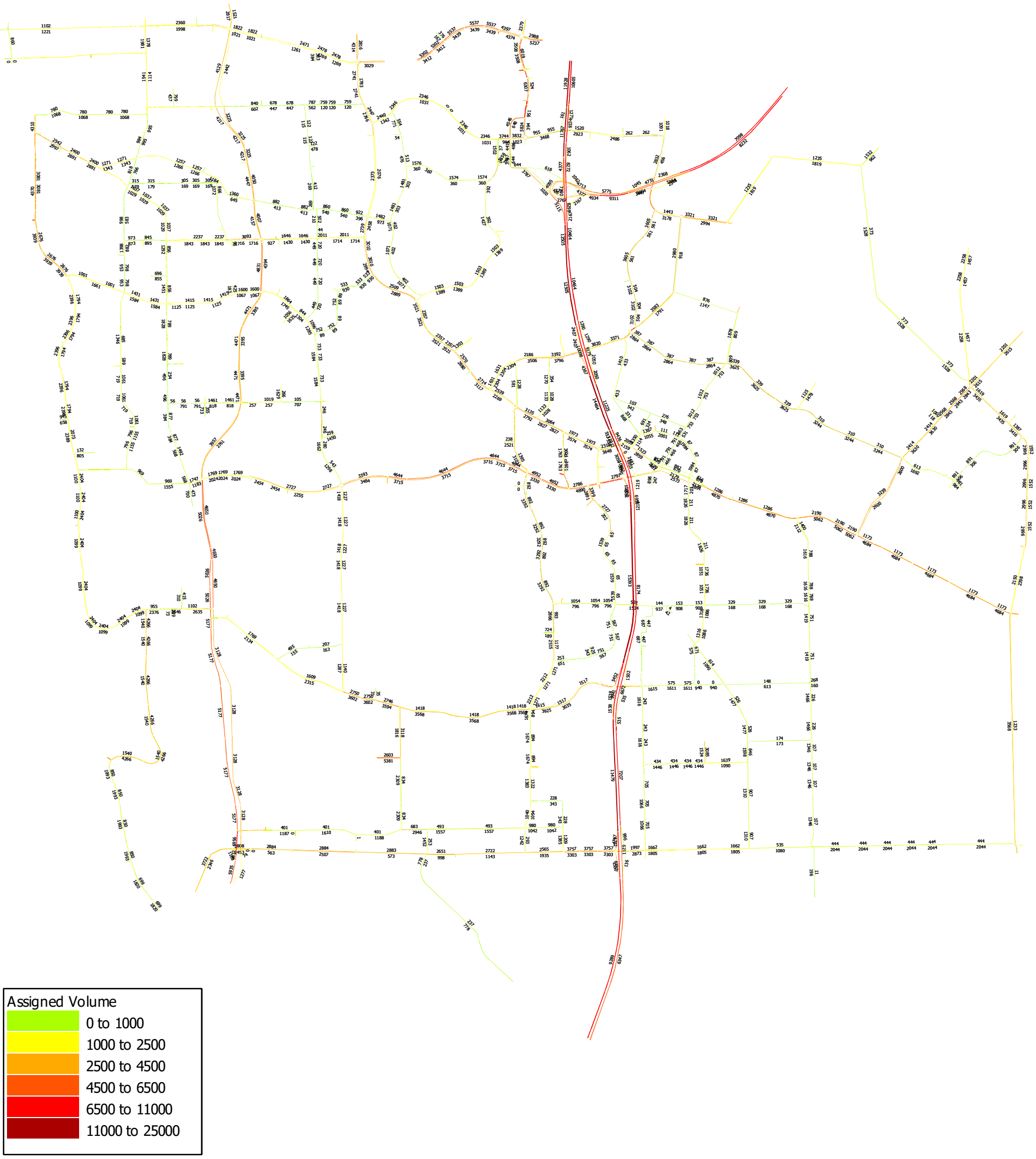
# B3 2031 Do Something - Cockburn Road Widening - Volume Capacity - AM Peak



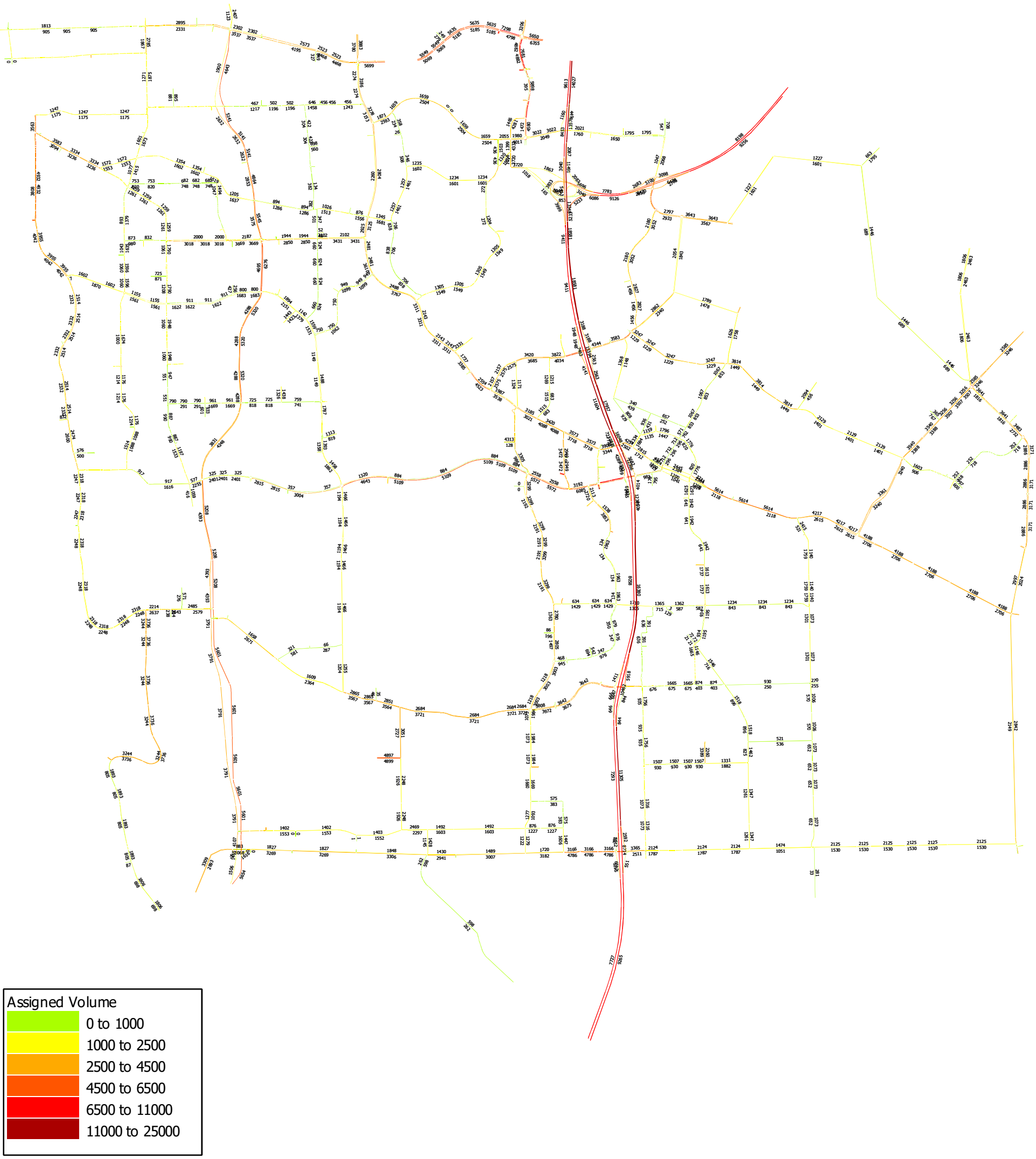
# B4 2031 Do Something - Cockburn Road Widening - Volume Capacity - PM Peak



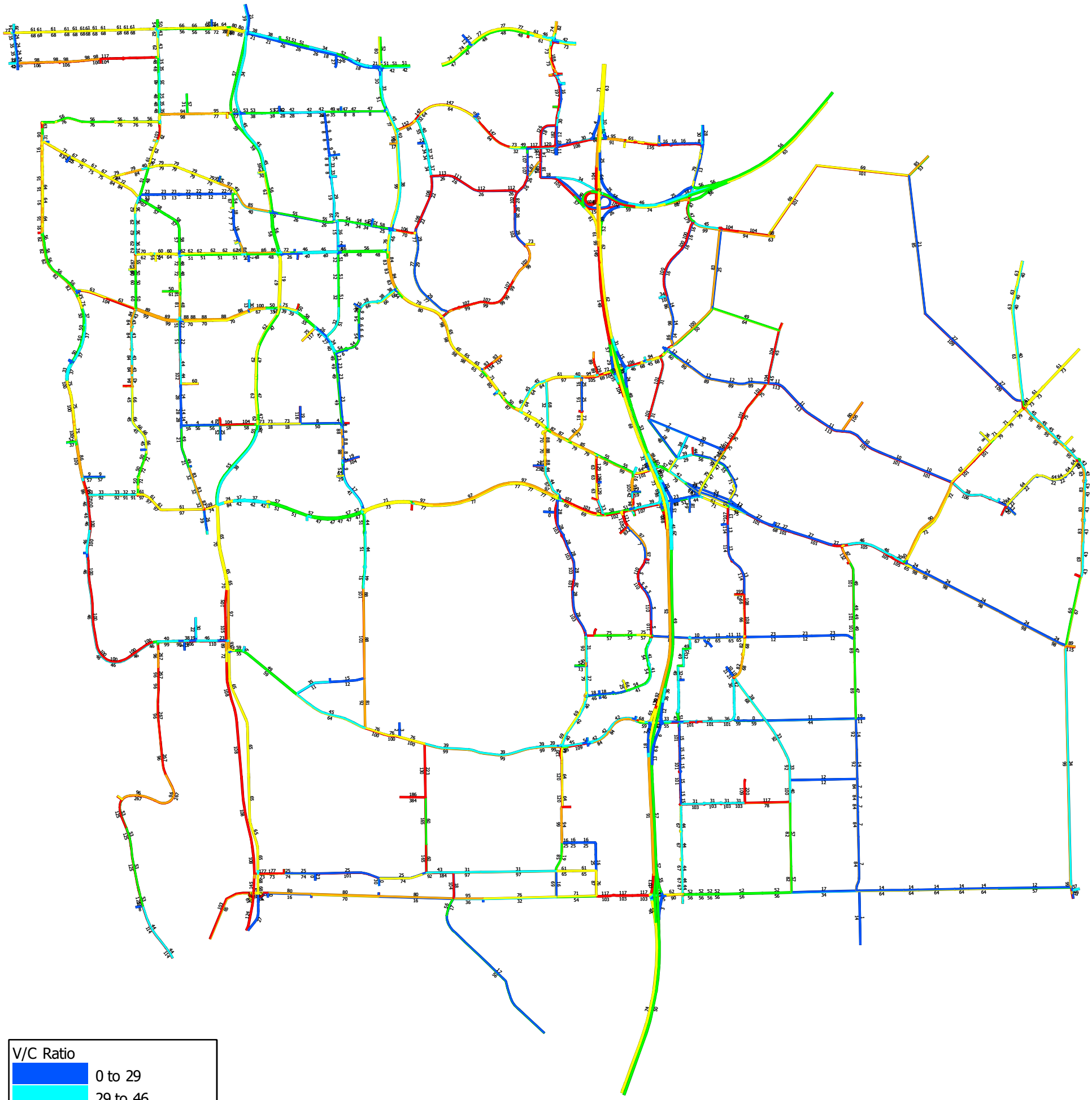
# B5 2031 Do Something - Stock Road Widening - Assigned Volume - AM Peak



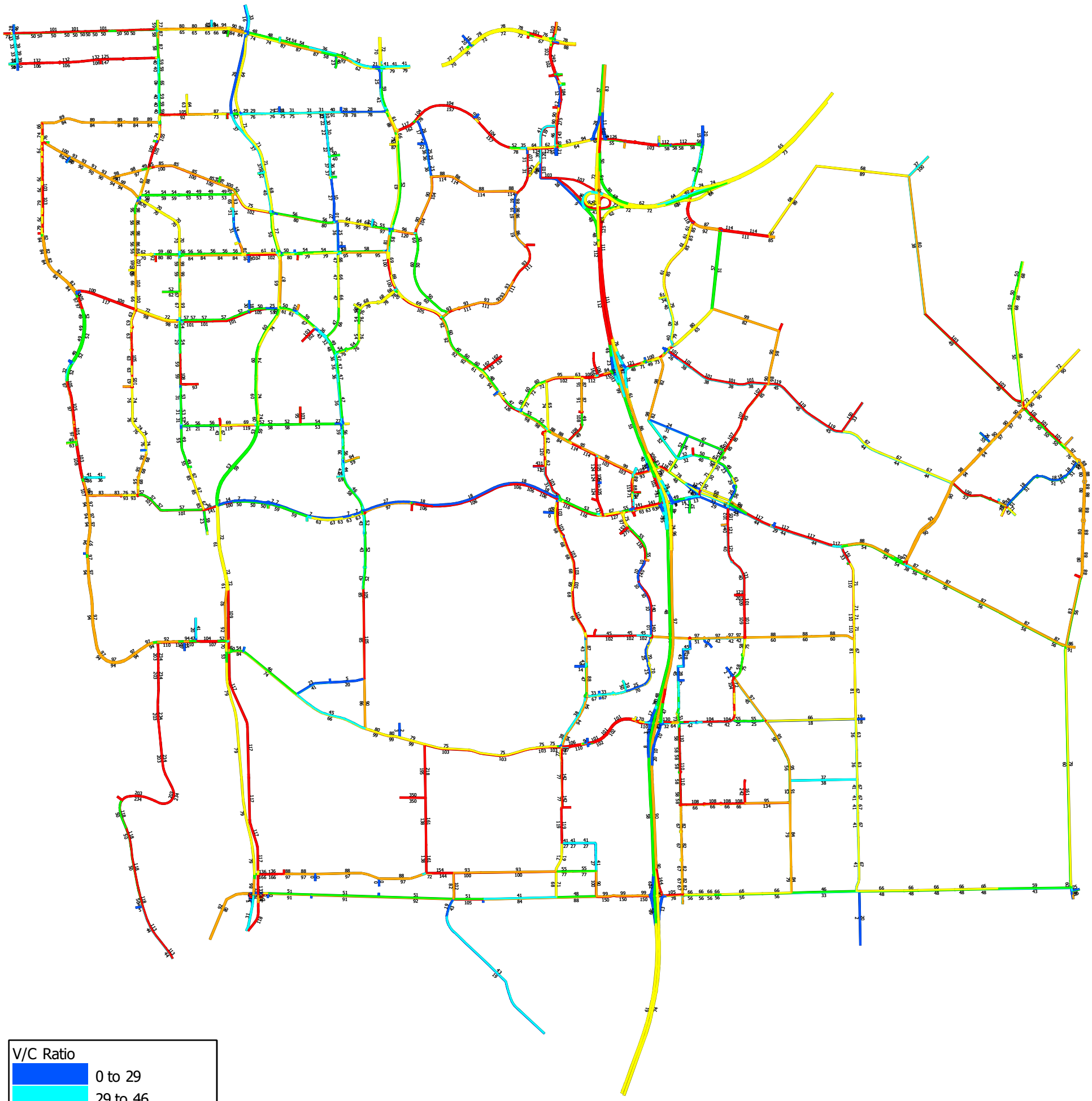
# B6 2031 Do Something - Stock Road Widening - Assigned Volume - PM Peak



# B7 2031 Do Something - Stock Road Widening - Volume Capacity - AM Peak



# B8 2031 Do Something - Stock Road Widening - Volume Capacity - PM Peak



# Appendix C

Additional Scenarios

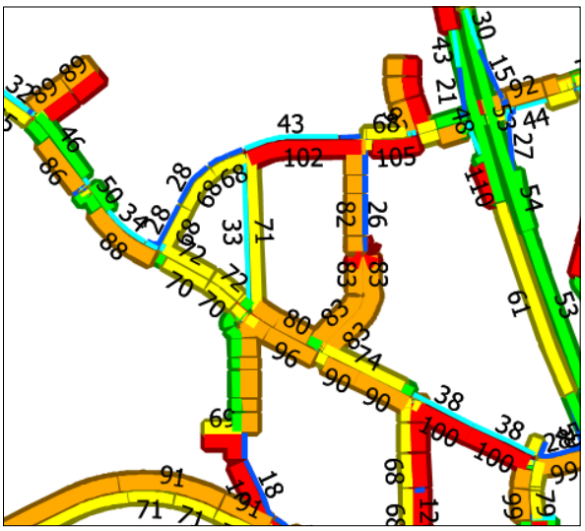
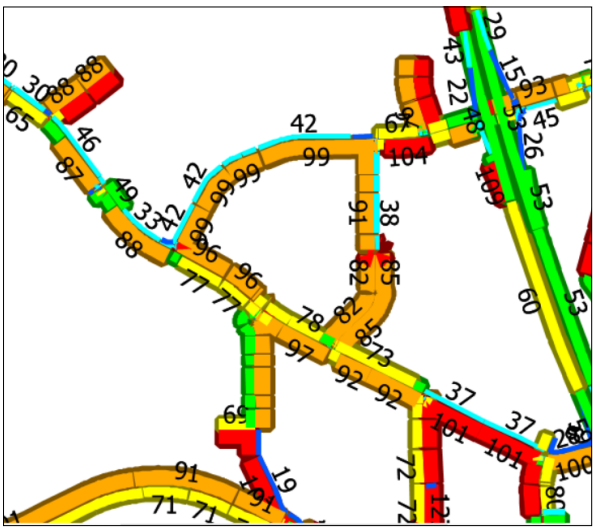
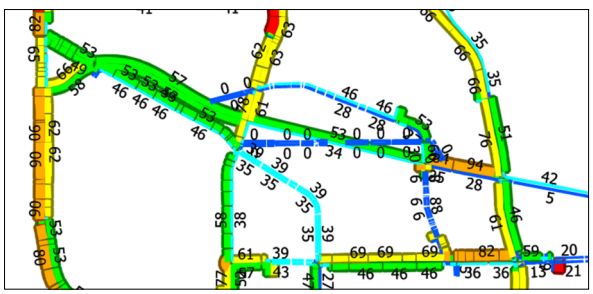
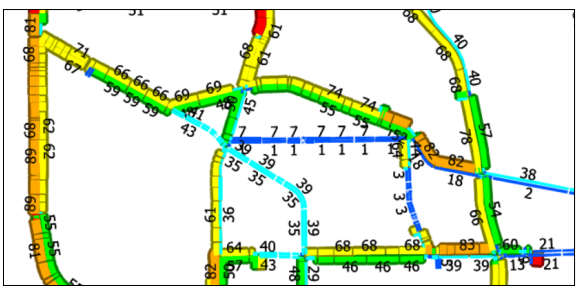
# C1 Scenario 1 (year 2031) – network without items 36, 53 and 54

Modelling results of Scenario 1 with Hammond Road extension (between North Lake Road and Berrigan Drive) and Roe 9 link indicated several findings:

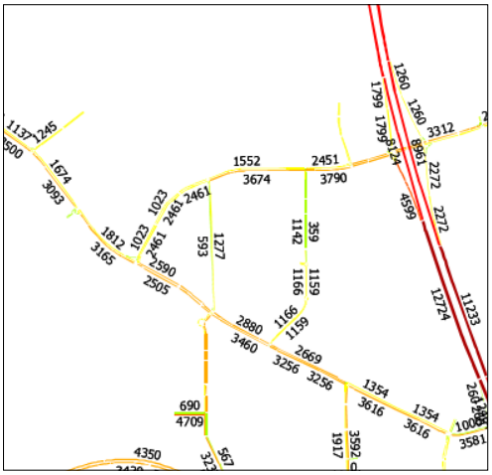
1. Hammond Road extension shows it contributes to higher congestion at surrounding intersections and therefore degrades the overall performance of the network in the area
2. Hammond Road extension relieve some congestion around small sections of Berrigan Drive and North Lake Road
3. Roe 9 link reliefs some sections of Forrest Road from congestion
4. Roe 9 link increases congestion around Cockburn Road

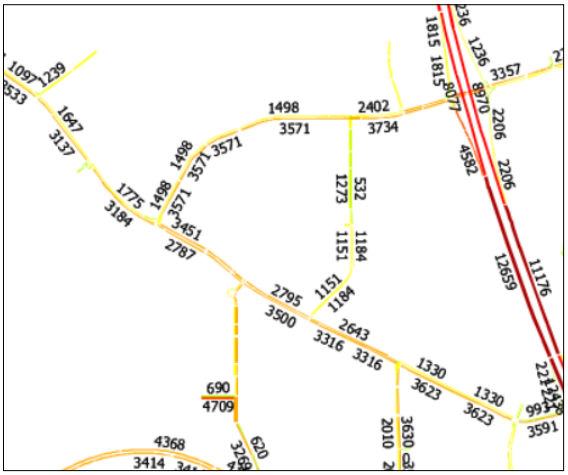
Modelling results of Scenario 1 without Hammond Road extension and Roe 9 link shows:

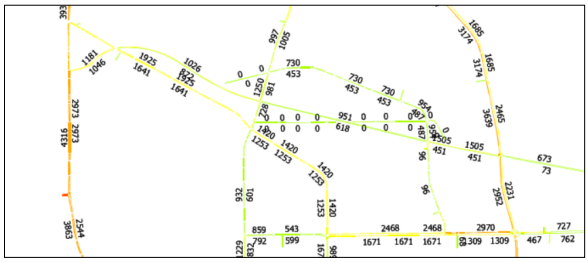
1. Network without Hammond Road extension still performs within acceptable limits
2. Without Roe 9 link network still operates at acceptable levels with many links still within capacity

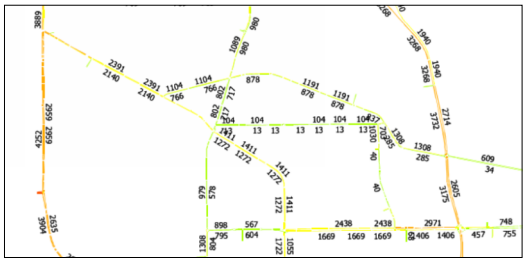
| **With Hammond Road extension and Roe 9 link** | **Without Hammond Road extension and Roe 9 link** |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |
|  |  |

2031 AM Assigned Volume

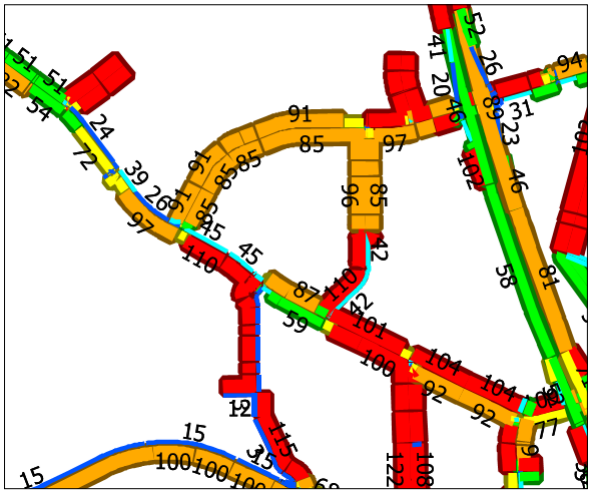


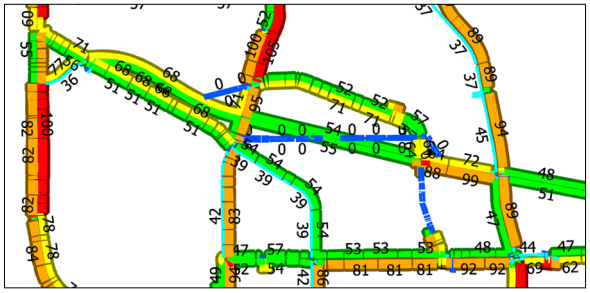


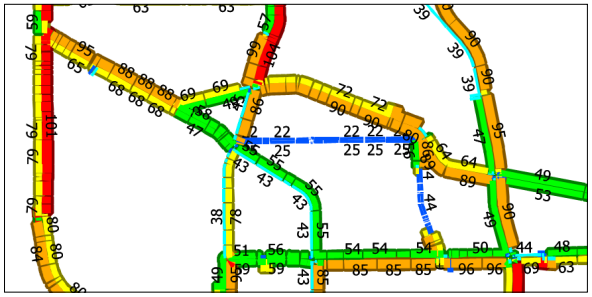




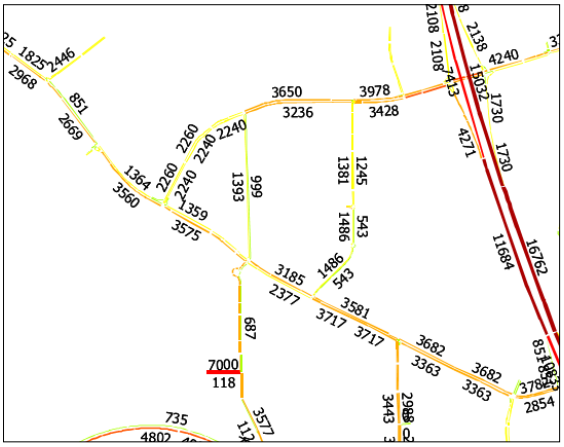
2031 PM Volume Capacity

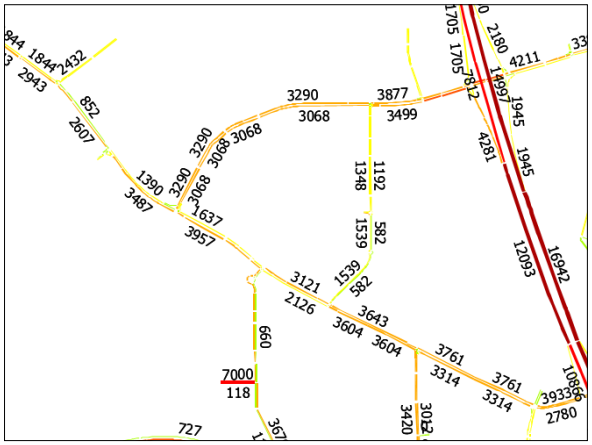


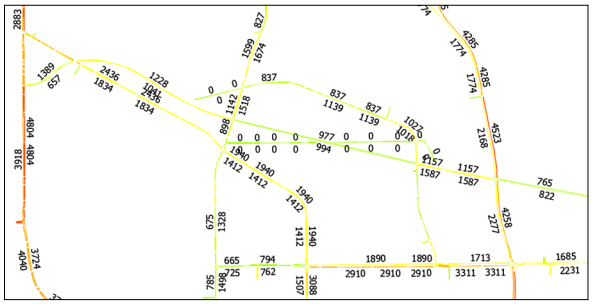


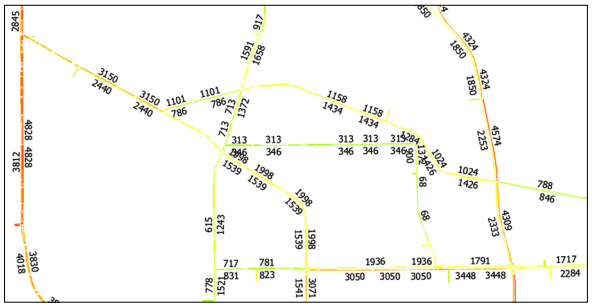


# 2031 PM Assigned Volume



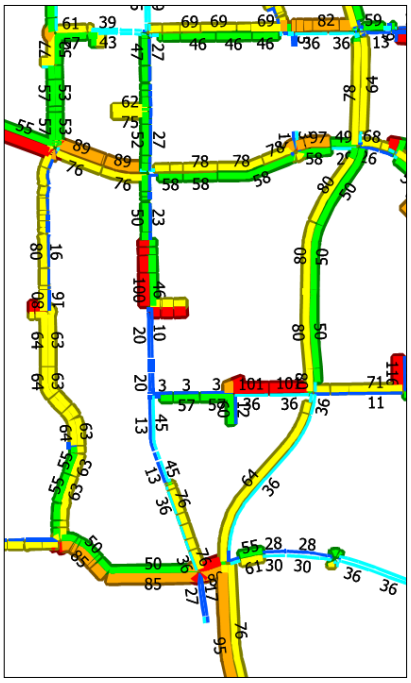
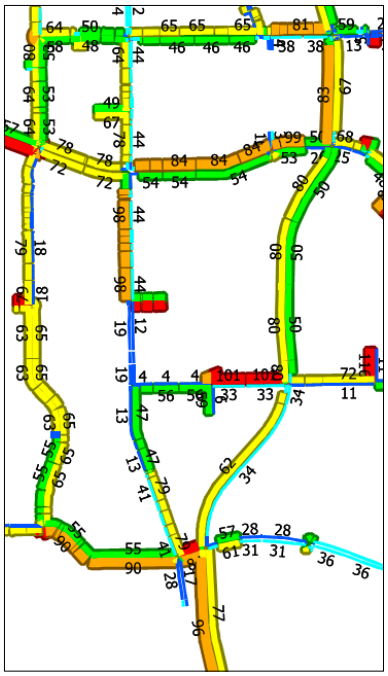
# C2 Scenario 2 (year 2031) – network with Rockingham Road narrowed to 2 lanes

Modelling results of Scenario 2 with Rockingham Road as is with 4 lanes indicated several findings:

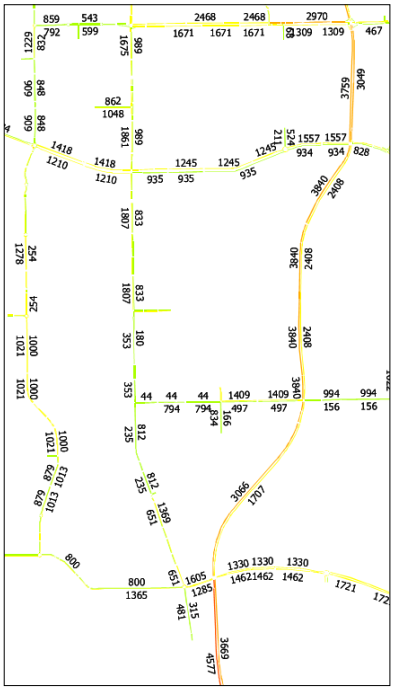
1. Rockingham Road with 4 lanes increases congestion around intersection between Spearwood Avenue and Rockingham Road,
2. Small sections of Stock Road between Spearwood Avenue and Phoenix Road reduces in congestion.
3. Small section of Spearwood Avenue performs marginally better

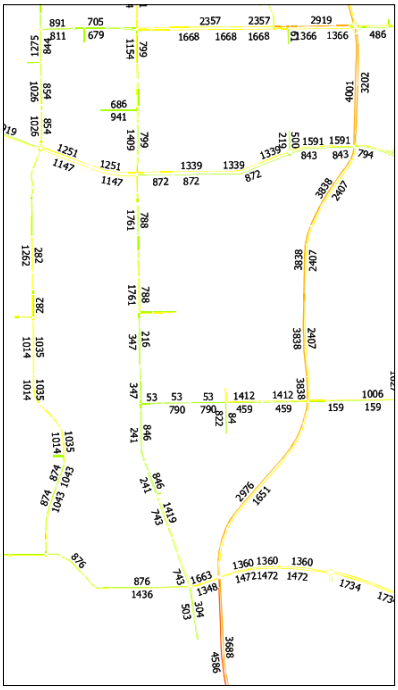
Modelling results of Scenario 2 with Rockingham Road narrowing to 2 lanes shows:

1. Spearwood Avenue still operates within capacity
2. Small section of Rockingham Road shows higher congestion
3. There is minor increase in congestion in surrounding network but generally volume capacity ration between scenarios very similar
4. Network still performs within road capacity

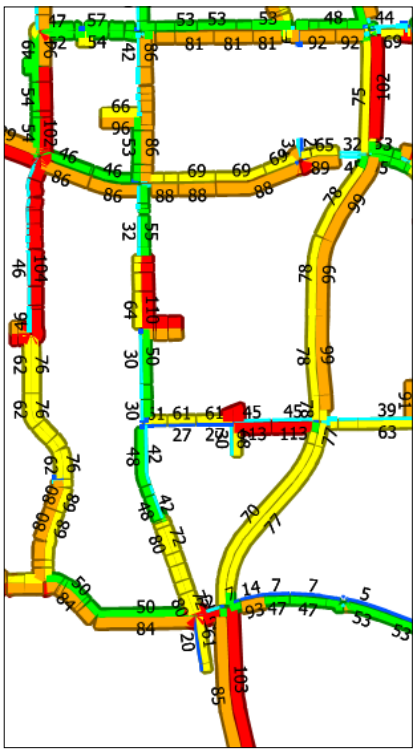
| **With Rockingham Road with 4 lanes** | **With Rockingham Road Narrowing to 2 lanes** |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |

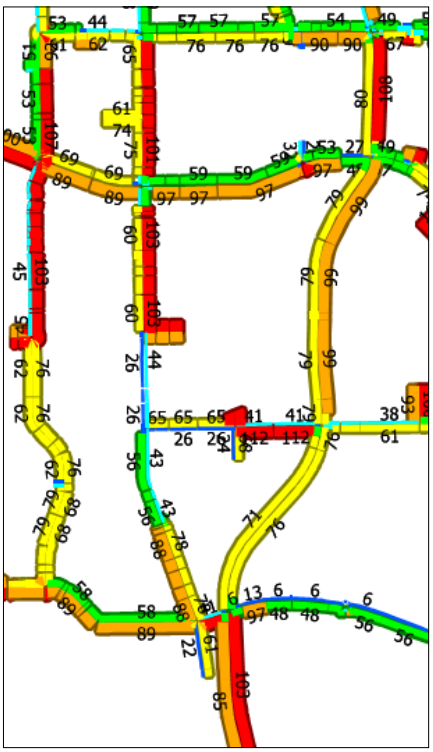
2031 AM Assigned Volume



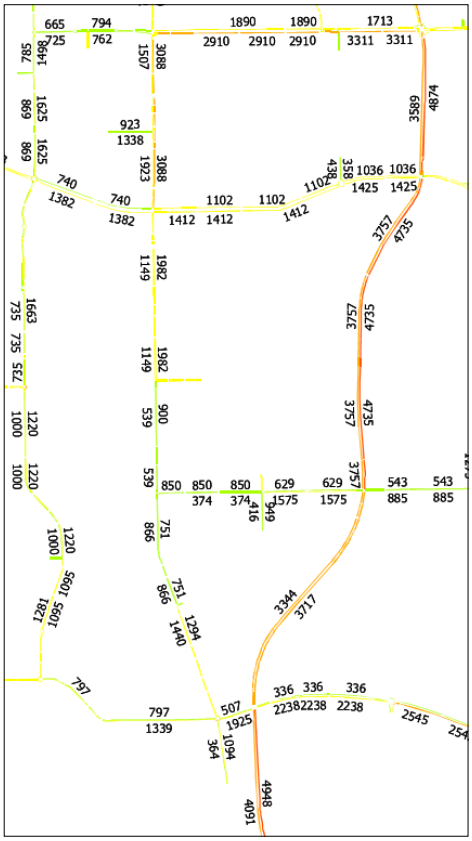


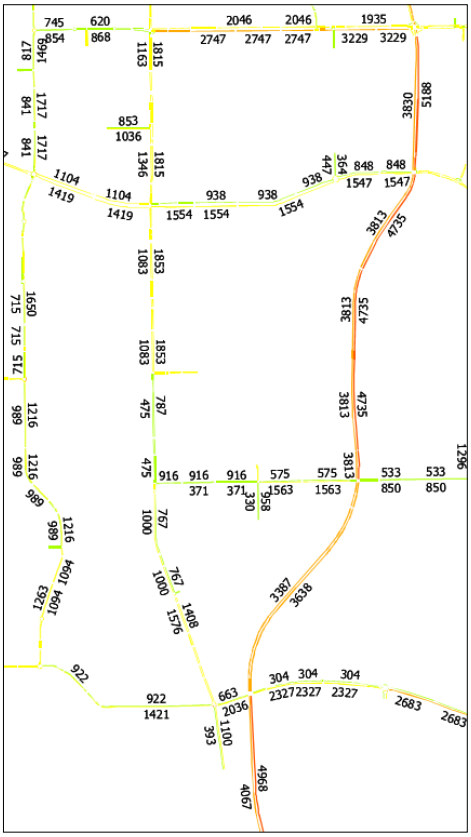
2031 PM Volume Capacity





2031 PM Assigned Volume





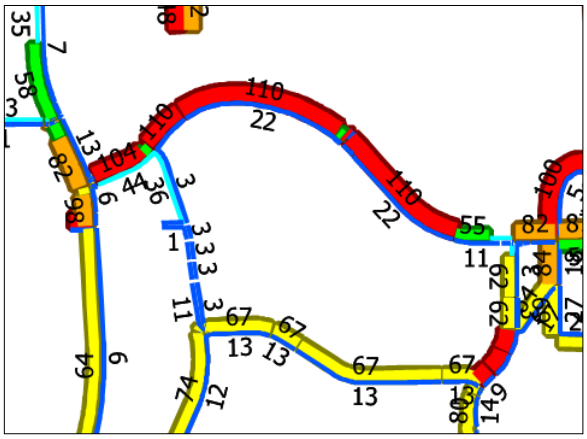
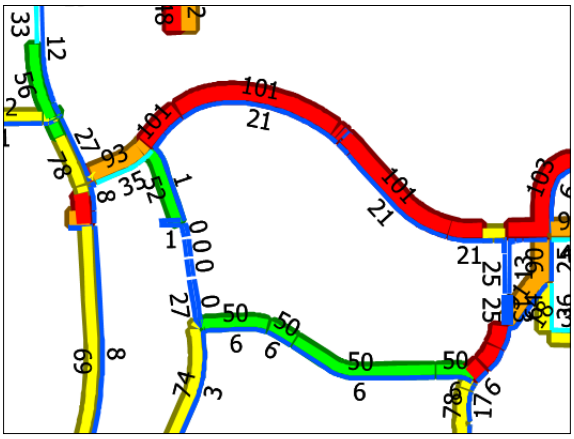
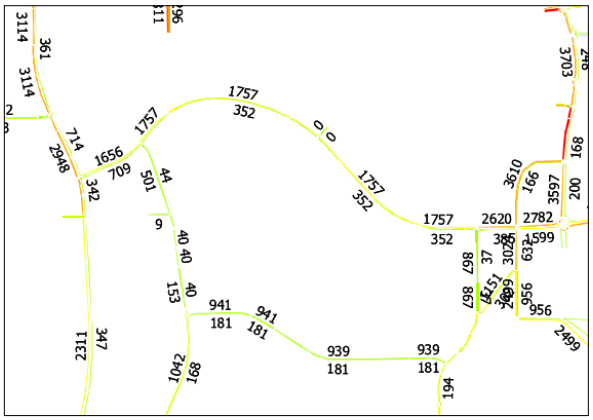
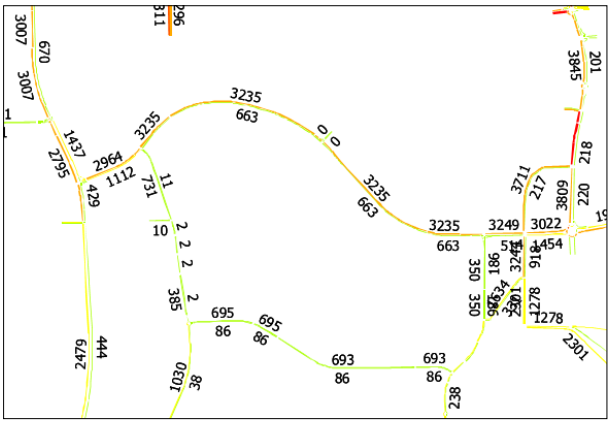
# C3 Scenario 3 (year 2031) – network with Farrington Road duplication

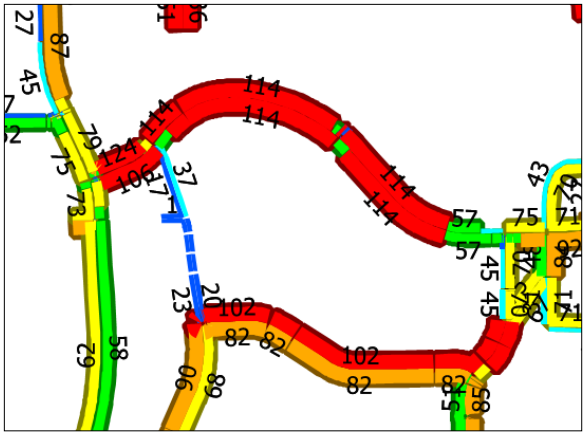
Modelling results of Scenario 3 With Farrington Road Duplication indicated several findings:

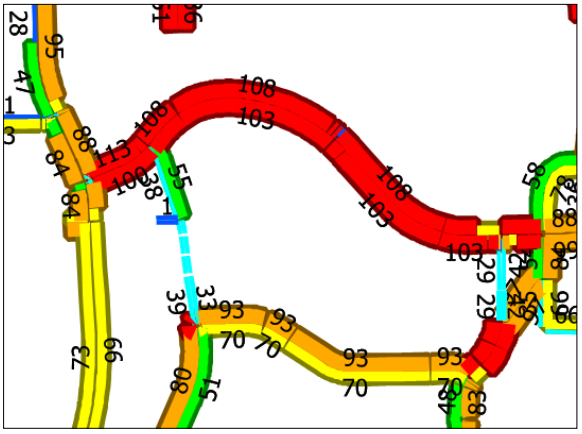
1. Farrington Road performance is still over capacity after duplication
2. Duplication attracts almost double volume to Farrington Road
3. North Lake Road and Farrington intersection, south arm is over capacity after duplication
4. Small reduction in congestion on Hope Road

Modelling results of Scenario 3 Without Farrington Road Duplication shows:

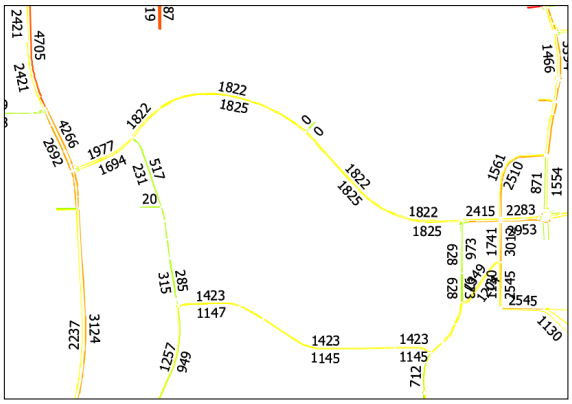
1. Farrington Road over capacity without duplication
2. Overall performance between two scenarios is very similar because Farrington road is already congested and with increase of capacity Farrington Road attracts significantly more traffic which causes it to reach capacity again. Therefore, there is minimal benefit in duplication.

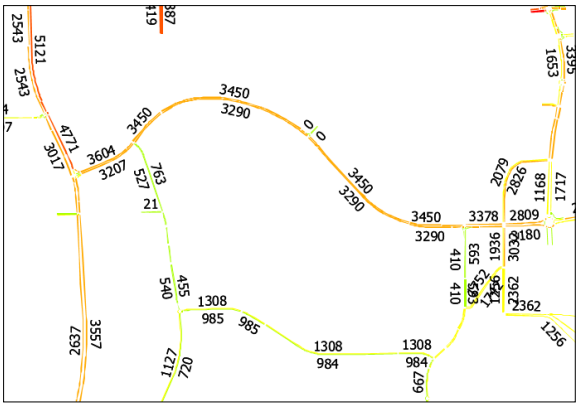
| **Without Farrington Road Duplication** | **With Farrington Road Duplication** |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |
| 2031 AM Assigned Volume | |
|  |  |
| 2031 PM Volume Capacity | |





2031 PM Assigned Volume





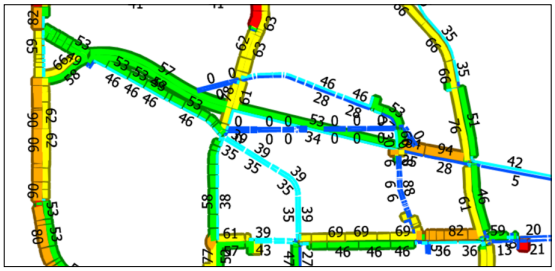
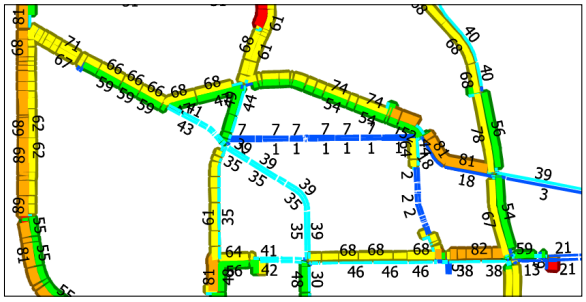
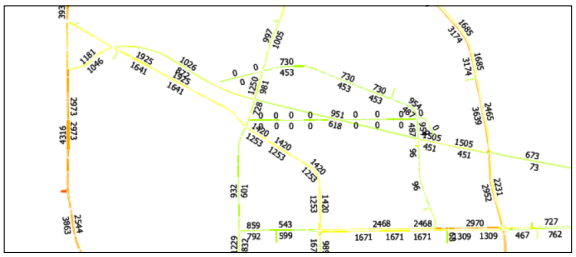
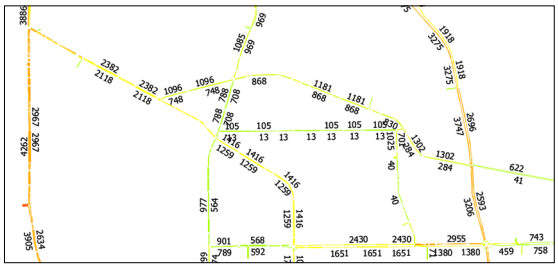
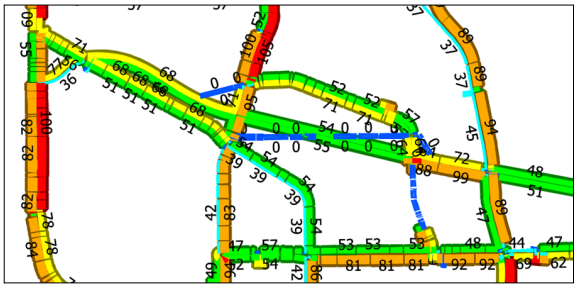
# C4 Scenario 4 (year 2031) – network without Roe 9 link

Modelling results of Scenario 4 indicated several findings:

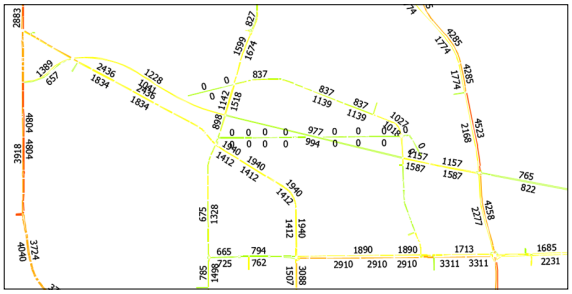
1. Roe 9 link relieves some sections of Forrest Road from congestion
2. Roe 9 link increases congestion around Cockburn Road

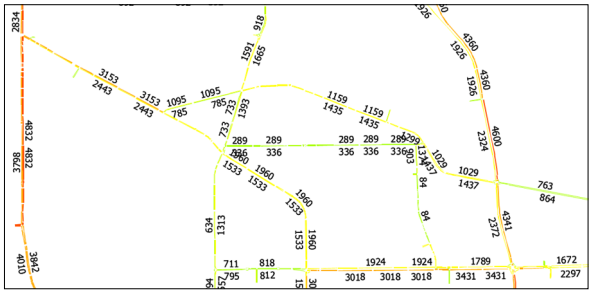
Modelling results of Scenario 4 Without Roe 9 only shows:

1. Without Roe 9 link network still operates at acceptable levels with many links still within capacity

| With Roe 9 only | Without Roe 9 only |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |
| 2031 AM Assigned Volume | |
|  |  |
| 2031 PM Volume Capacity | |
|  | |

# 2031 PM Assigned Volume





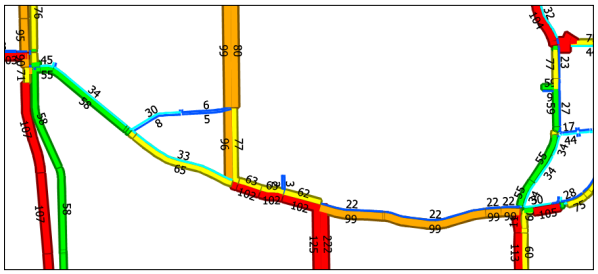
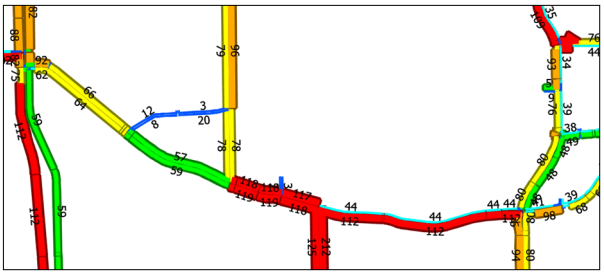
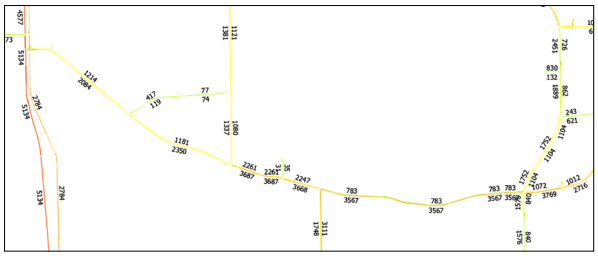
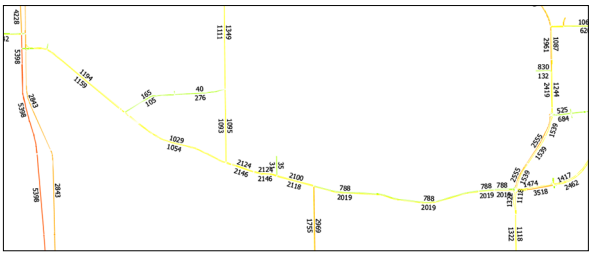
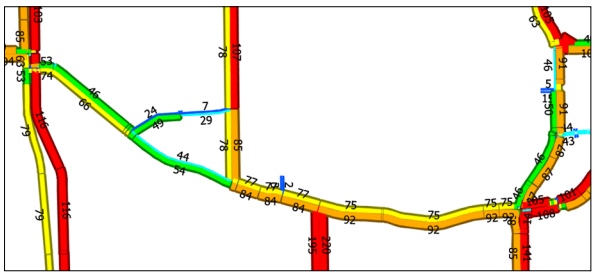
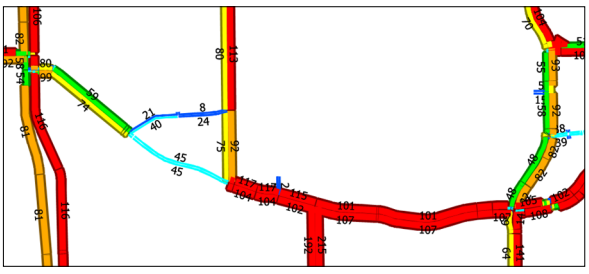
# C5 Scenario 5 (year 2031) – network with Russell Road duplication

Modelling results of Scenario 5 With Rowley Road duplication & with Russell Road duplication indicated several findings:

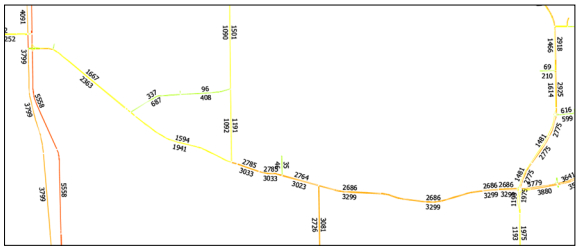
1. Major decrease in congestion on Russell Road between Henderson Road and Rockingham Road
2. Major decrease in congestion on Russell Road between Frankland Avenue and Kwinana Freeway
3. Some additional congestion on south arm of Frankland Road

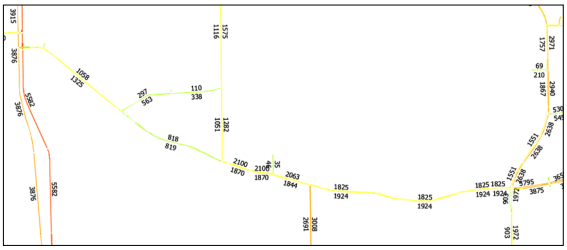
Modelling results of Scenario with Rowley Road duplication & Without Russell Road duplication shows:

1. Significant increase in congestion between Kwinana Freeway and Henderson Road
2. Frankland Road south arm is already over capacity

| **With Rowley Road duplication & with Russell Road duplication** | **With Rowley Road duplication & without Russell Road duplication** |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |
| 2031 AM Assigned Volume | |
|  |  |
| 2031 PM Volume Capacity | |
|  |  |
| | |

# 2031 PM Assigned Volume





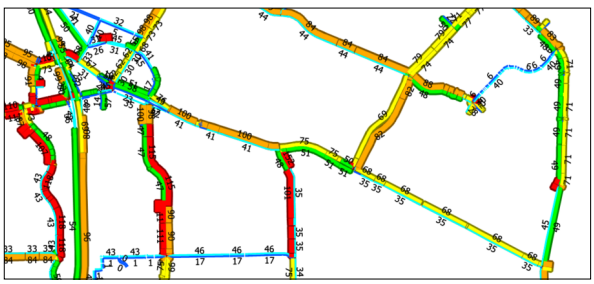
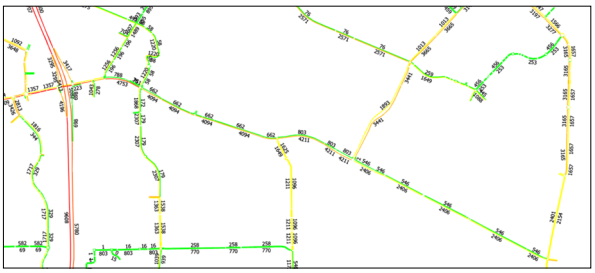
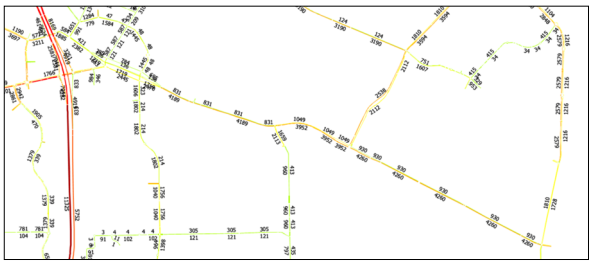
# C6 Scenario 6 (year 2021) – network with Armadale Road duplication

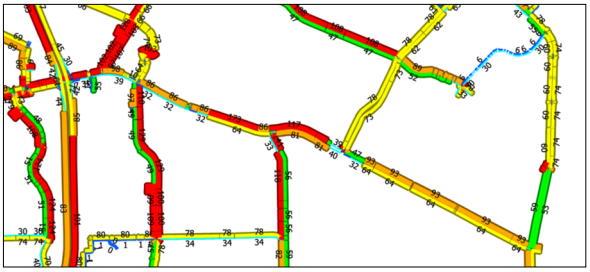
Modelling results of Scenario 6 with Armadale Road duplication of the entire length by 2021 indicated several findings:

1. Major decrease in congestion on Armadale Road
2. Some increase in congestion on Liddelow Road
3. Tapper Rodd northbound movement shows reduction in congestion
4. Tapper Road southbound remains congested
5. Significant reduction in congestion around Armadale Road and Kwinana Freeway interchange
6. Reduction in traffic volume on Bartram Road

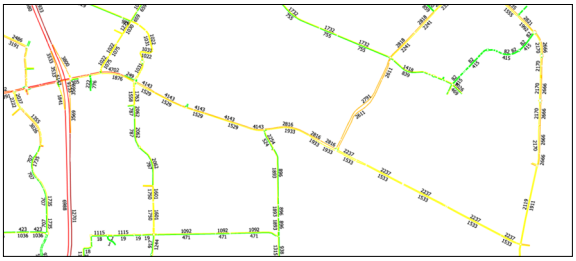
Modelling results of Scenario 6 without Armadale Road duplication by 2021 shows:

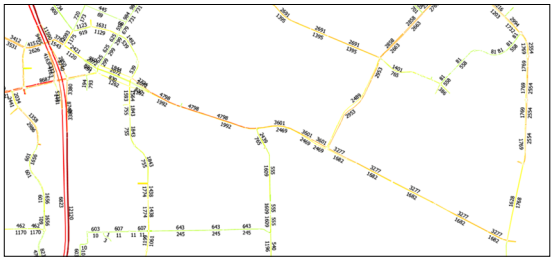
1. Significant congestion on the whole stretch of Armadale Road
2. Tapper Road over capacity
3. Liddelow Road over capacity
4. Significant congestion around Armadale Road and Kwinana Freeway interchange

| **Without Armadale Road duplication** | **With Armadale Road duplication** |
|---|---|
| 2021 AM Volume Capacity | |
| |  |
| 2021 AM Assigned Volume | |
|  |  |
| 2021 PM Volume Capacity | |



2021 PM Assigned Volume





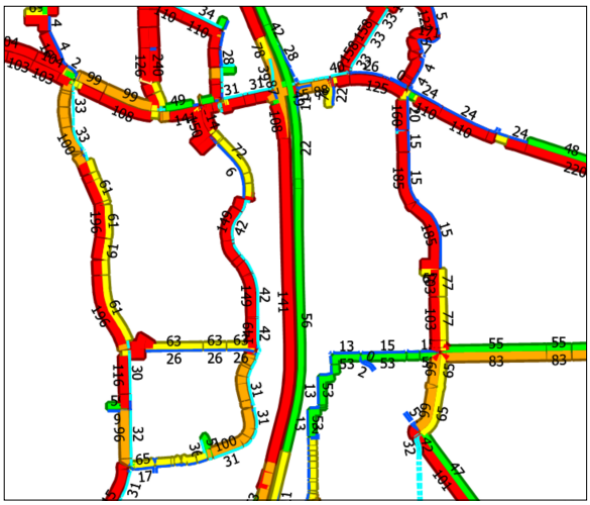
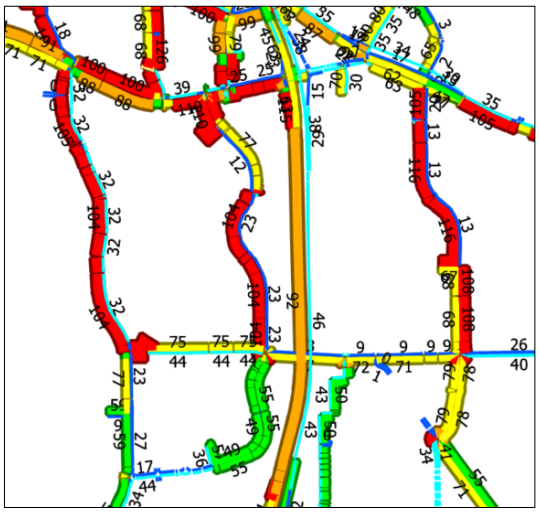
# C7 Scenario 7 (year 2031) – network with Bartram Road Bridge crossing of the freeway

Modelling results of Scenario 7 with Bartram Road bridge crossing indicated several findings:

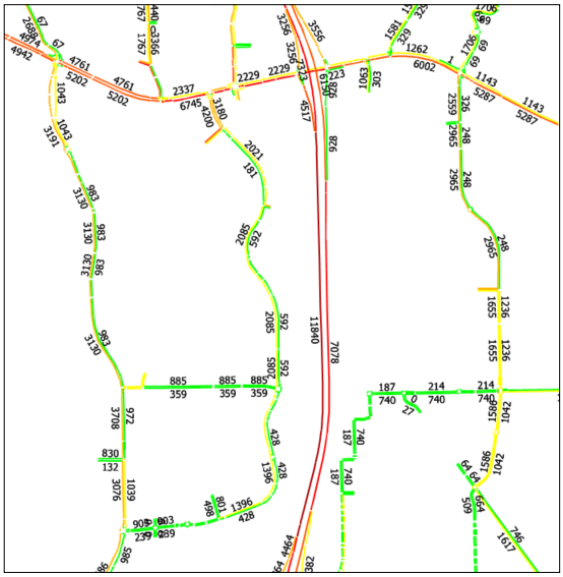
1. Major improvement on section of the Wentworth Parade between Bartram Road and Hammond Road
2. Reduction in congestion on Hammond Road
3. Reduction in congestion Tapper Road by around 10% but still just over capacity
4. Reduction in congestion on Wentworth Parade between Bartram Road and Beeliar Drive by around 40% but still just over capacity
5. Reduction in congestion on Hammond Road by around 90% but still just over capacity
6. Significant reduction in congestion on Kwinana Freeway

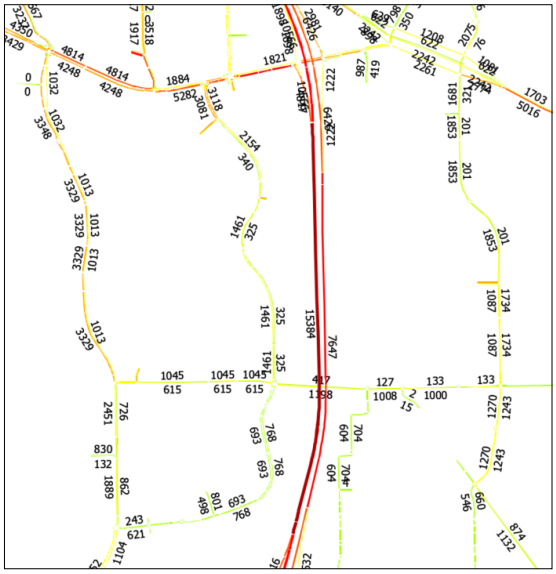
Modelling results of Scenario 7 without Bartram Road bridge crossing shows:

1. High congestion around whole Wentworth Parade, Hammond Road, Beeliar Drive, Tapper Road and Kwinana Freeway

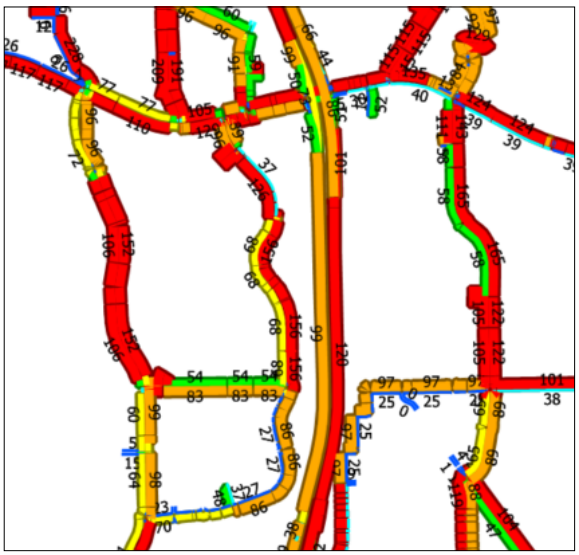
| **Without Bartram Road Bridge crossing** | **With Bartram Road Bridge crossing** |
|---|---|
| 2031 AM Volume Capacity | |
|  |  |

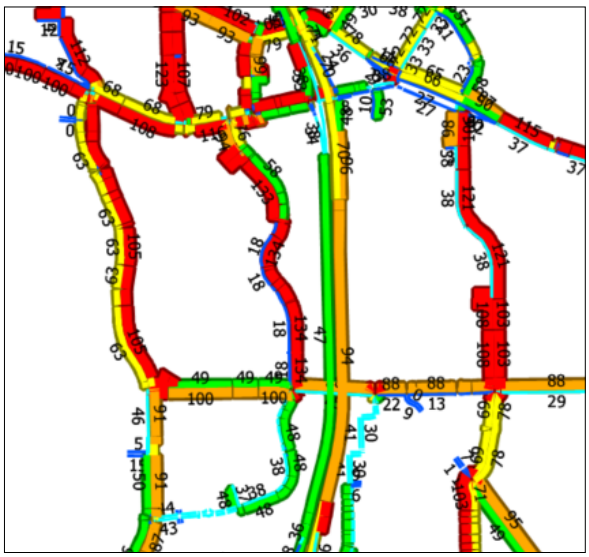
2031 AM Assigned Volume



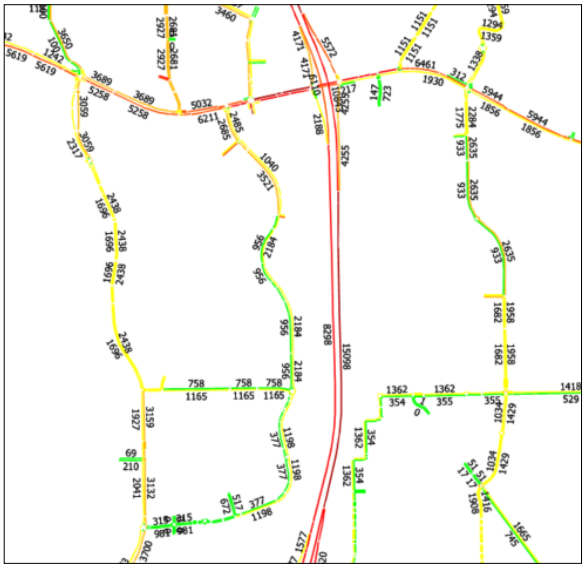


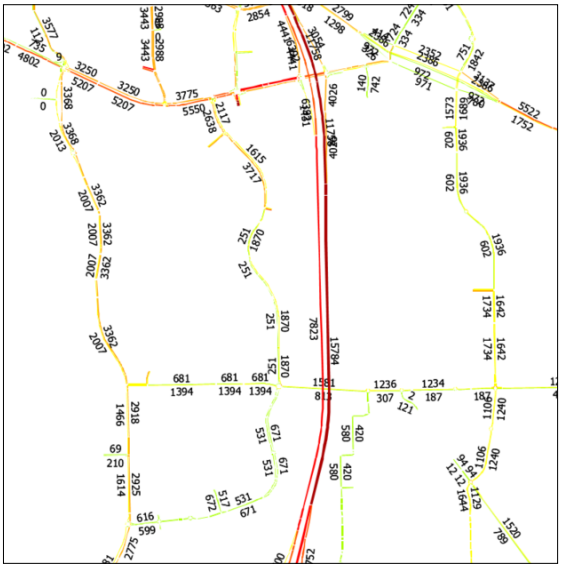
2031 PM Volume Capacity





2031 PM Assigned Volume





# Appendix D

Demographic data

| Zone | Population | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | | | | 2031 | | | | |
| | Main Roads | CoC Adjusted to Main Roads Zones | Main Roads Growth Rate 2016-2021 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback | Main Roads Growth Rate 2016-2031 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback |
| **666** | 2,922 | 2,207 | 0.98 | 2,877 | 2,160 | 2,173 | 2,160 | 0.88 | 2,570 | 2,212 | 1,941 | 2,212 |
| **667** | 909 | 909 | 0.55 | 499 | 499 | 499 | 499 | 0.55 | 500 | 500 | 500 | 500 |
| **690** | 1,745 | 1,745 | 1.04 | 1,812 | 1,812 | 1,812 | 1,812 | 0.90 | 1,563 | 1,563 | 1,563 | 1,563 |
| **727** | 3,413 | 3,413 | 1.10 | 3,756 | 3,756 | 3,756 | 3,756 | 1.23 | 4,191 | 4,191 | 4,191 | 4,191 |
| **728** | 2,132 | 2,132 | 1.01 | 2,158 | 2,158 | 2,158 | 2,158 | 1.05 | 2,236 | 2,236 | 2,236 | 2,236 |
| **729** | 3,180 | 3,180 | 1.08 | 3,448 | 3,448 | 3,448 | 3,448 | 1.26 | 4,017 | 4,017 | 4,017 | 4,017 |
| **733** | 629 | 584 | 8.26 | 5,198 | 4,338 | 4,828 | 2,503 | 15.90 | 10,000 | 9,036 | 9,288 | 7,499 |
| **734** | 1,569 | 1,457 | 1.28 | 2,016 | 1,682 | 1,872 | 2,048 | 1.59 | 2,496 | 2,255 | 2,318 | 2,644 |
| **735** | 3,246 | 3,496 | 1.08 | 3,515 | 3,948 | 3,785 | 3,948 | 1.29 | 4,180 | 4,751 | 4,501 | 4,751 |
| **736** | 2,450 | 2,638 | 1.09 | 2,678 | 3,008 | 2,884 | 3,008 | 1.28 | 3,124 | 3,551 | 3,364 | 3,551 |
| **737** | 1,640 | 1,757 | 1.05 | 1,730 | 1,932 | 1,854 | 1,932 | 1.40 | 2,298 | 2,550 | 2,462 | 2,550 |
| **738** | 3,073 | 3,309 | 1.04 | 3,204 | 3,598 | 3,450 | 3,598 | 1.25 | 3,834 | 4,358 | 4,129 | 4,358 |
| **739** | 1,444 | 1,516 | 1.01 | 1,458 | 1,591 | 1,530 | 1,591 | 1.07 | 1,549 | 1,551 | 1,626 | 1,551 |
| **740** | 1,903 | 1,997 | 1.05 | 1,998 | 2,181 | 2,097 | 2,181 | 1.43 | 2,727 | 2,731 | 2,862 | 2,731 |
| **741** | 3,174 | 2,948 | 1.20 | 3,812 | 3,181 | 3,541 | 4,089 | 1.31 | 4,160 | 3,759 | 3,864 | 4,482 |
| **742** | 6,395 | 6,712 | 1.11 | 7,067 | 7,713 | 7,417 | 7,713 | 1.23 | 7,876 | 7,886 | 8,266 | 7,886 |
| **743** | 2,446 | 2,272 | 1.06 | 2,598 | 2,168 | 2,413 | 2,730 | 1.16 | 2,847 | 2,573 | 2,644 | 2,997 |
| **744** | 3,101 | 3,182 | 1.04 | 3,238 | 3,590 | 3,322 | 3,590 | 1.06 | 3,274 | 3,418 | 3,359 | 3,418 |
| **745** | 7 | 7 | 1.00 | 7 | 6 | 7 | 6 | 1.00 | 7 | 6 | 7 | 6 |
| **746** | 1,230 | 1,262 | 1.24 | 1,529 | 1,695 | 1,569 | 1,695 | 1.89 | 2,319 | 2,421 | 2,379 | 2,421 |
| **747** | 1 | 1 | 1.00 | 1 | 1 | 1 | 1 | 1.00 | 1 | 1 | 1 | 1 |
| **748** | 10 | 8 | 1.00 | 10 | 9 | 8 | 9 | 1.50 | 15 | 19 | 11 | 19 |
| **749** | 199 | 152 | 1.02 | 203 | 178 | 155 | 178 | 0.82 | 163 | 210 | 124 | 210 |
| **750** | 426 | 325 | 0.90 | 384 | 338 | 293 | 2,395 | 1.16 | 496 | 639 | 378 | 4,812 |
| **751** | 53 | 54 | 0.94 | 50 | 55 | 51 | 55 | 0.96 | 51 | 53 | 52 | 53 |
| **752** | - | - | | - | - | - | - | | - | - | - | - |
| **753** | 72 | 74 | 0.99 | 71 | 79 | 73 | 79 | 0.97 | 70 | 73 | 72 | 73 |
| **754** | 4,728 | 5,336 | 0.98 | 4,655 | 5,357 | 5,253 | 5,357 | 0.94 | 4,466 | 5,306 | 5,040 | 5,306 |
| **755** | 1,848 | 2,086 | 1.17 | 2,165 | 2,492 | 2,443 | 2,492 | 1.23 | 2,270 | 2,697 | 2,562 | 2,697 |
| **756** | 1,802 | 1,978 | 1.05 | 1,887 | 2,509 | 2,071 | 2,509 | 1.02 | 1,834 | 2,846 | 2,013 | 2,846 |
| **757** | 4,483 | 4,921 | 1.01 | 4,548 | 6,047 | 4,993 | 6,047 | 0.95 | 4,250 | 6,596 | 4,665 | 6,596 |
| **758** | 866 | 951 | 0.99 | 859 | 1,142 | 943 | 1,142 | 0.97 | 841 | 1,305 | 923 | 1,305 |
| **759** | - | - | | - | - | - | - | | - | - | - | - |
| **760** | - | - | | - | - | - | - | | - | - | - | - |
| **761** | - | - | | - | - | - | - | | - | - | - | - |
| **762** | 1,065 | 1,003 | 1.09 | 1,161 | 1,131 | 1,094 | 1,131 | 1.07 | 1,143 | 1,243 | 1,077 | 1,243 |

| Zone | Population | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | | | | 2031 | | | | |
| | Main Roads | CoC Adjusted to Main Roads Zones | Main Roads Growth Rate 2016-2021 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback | Main Roads Growth Rate 2016-2031 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback |
| **763** | - | - | | - | - | - | - | | - | - | - | - |
| **764** | 2,626 | 2,731 | 1.05 | 2,749 | 3,203 | 2,859 | 3,203 | 1.15 | 3,018 | 3,476 | 3,139 | 3,476 |
| **765** | 879 | 690 | 1.01 | 891 | 709 | 700 | 709 | 1.02 | 896 | 906 | 704 | 906 |
| **766** | 2,632 | 2,737 | 1.03 | 2,705 | 3,152 | 2,813 | 3,152 | 1.12 | 2,950 | 3,398 | 3,068 | 3,398 |
| **767** | 1,273 | 1,098 | 1.00 | 1,277 | 1,148 | 1,101 | 1,148 | 0.96 | 1,218 | 1,272 | 1,050 | 1,272 |
| **768** | 959 | 827 | 1.02 | 978 | 879 | 843 | 879 | 0.96 | 918 | 959 | 792 | 959 |
| **769** | - | - | | - | - | - | - | | - | - | - | - |
| **770** | 834 | 655 | 0.95 | 792 | 630 | 622 | 630 | 0.87 | 728 | 737 | 572 | 737 |
| **771** | 4,090 | 3,527 | 0.99 | 4,047 | 3,638 | 3,490 | 3,638 | 1.00 | 4,093 | 4,276 | 3,530 | 4,276 |
| **772** | 4,756 | 4,913 | 1.00 | 4,747 | 5,070 | 4,904 | 5,070 | 0.96 | 4,578 | 8,071 | 4,729 | 8,071 |
| **773** | 2,174 | 2,246 | 1.16 | 2,529 | 2,701 | 2,612 | 2,701 | 1.29 | 2,812 | 4,957 | 2,904 | 4,957 |
| **774** | 263 | 272 | 3.42 | 901 | 963 | 931 | 963 | 2.45 | 644 | 1,135 | 665 | 1,135 |
| **775** | 2,779 | 9,403 | 0.97 | 2,693 | 9,680 | 9,114 | 9,680 | 0.86 | 2,384 | 9,282 | 8,068 | 9,282 |
| **776** | 5,384 | 10,548 | 1.00 | 5,394 | 12,151 | 10,569 | 12,151 | 1.04 | 5,592 | 15,173 | 10,957 | 15,173 |
| **777** | 6,613 | 5,038 | 1.27 | 8,407 | 7,391 | 6,405 | 5,334 | 1.22 | 8,052 | 10,372 | 6,135 | 6,200 |
| **778** | 5,489 | 6,548 | 1.20 | 6,568 | 11,304 | 7,835 | 8,035 | 1.22 | 6,687 | 14,321 | 7,977 | 8,127 |
| **779** | 2,864 | 1,708 | 0.30 | 848 | 730 | 506 | 730 | 0.10 | 296 | 317 | 177 | 317 |
| **780** | 35 | 38 | 1.49 | 52 | 58 | 57 | 58 | 3.06 | 107 | 134 | 118 | 134 |
| **781** | 2,310 | 2,540 | 0.99 | 2,296 | 2,540 | 2,524 | 2,540 | 0.94 | 2,169 | 2,720 | 2,385 | 2,720 |
| **782** | 570 | 664 | 0.88 | 503 | 773 | 586 | 4,041 | 0.89 | 509 | 954 | 593 | 7,148 |
| **891** | 3,103 | 4,181 | 0.53 | 1,651 | 3,361 | 2,225 | 3,361 | 0.66 | 2,060 | 1,984 | 2,776 | 1,984 |
| **892** | 3,647 | 4,914 | 1.26 | 4,596 | 9,356 | 6,193 | 9,356 | 2.02 | 7,360 | 7,087 | 9,917 | 7,087 |
| **893** | 313 | 422 | 5.02 | 1,571 | 3,198 | 2,117 | 3,198 | 9.92 | 3,105 | 2,990 | 4,184 | 2,990 |
| **939** | 60 | 60 | 1.58 | 95 | 95 | 95 | 95 | 2.12 | 127 | 127 | 127 | 127 |
| **940** | 84 | 84 | 0.95 | 80 | 80 | 80 | 80 | 0.99 | 83 | 83 | 83 | 83 |
| **941** | 1 | 1 | 38.00 | 38 | 38 | 38 | 38 | 5.00 | 5 | 5 | 5 | 5 |
| **Total ROM Area** | **115,899** | **129,456** | | **127,000** | **156,649** | **141,010** | **156,649** | | **141,759** | **181,292** | **157,089** | **181,292** |
| **Cockburn only area** | **97,312** | **108,415** | | **107,296** | **128,848** | **118,590** | **128,848** | | **116,512** | **156,510** | **127,490** | **156,510** |
| **City of Cockburn forecast** | 108,770 | 108,770 | | 129,308 | 129,308 | 129,308 | 129,308 | | 157,018 | 157,018 | 157,018 | 157,018 |
| Difference | (11,458) | (355) | | (22,012) | (460) | (10,718) | (460) | | (40,506) | (508) | (29,528) | (508) |
| External Zones Total | 18,587 | 21,041 | | 19,704 | 27,801 | 22,420 | 27,801 | | 25,247 | 24,782 | 29,599 | 24,782 |

| Zone | Dwellings | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | | | | 2031 | | | | |
| | Main Roads | CoC Adjusted to Main Roads Zones | Main Roads Growth Rate 2016-2021 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback | Main Roads Growth Rate 2016-2031 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback |
| **666** | 947 | 749 | 1.01 | 952 | 754 | 753 | 754 | 1.02 | 970 | 770 | 767 | 770 |
| **667** | 287 | 287 | 0.94 | 270 | 270 | 270 | 270 | 1.34 | 385 | 385 | 385 | 385 |
| **690** | 710 | 710 | 1.02 | 721 | 721 | 721 | 721 | 1.02 | 726 | 726 | 726 | 726 |
| **727** | 1,525 | 1,525 | 1.11 | 1,688 | 1,688 | 1,688 | 1,688 | 1.24 | 1,895 | 1,895 | 1,895 | 1,895 |
| **728** | 781 | 781 | 1.02 | 795 | 795 | 795 | 795 | 1.07 | 837 | 837 | 837 | 837 |
| **729** | 1,485 | 1,485 | 1.10 | 1,639 | 1,639 | 1,639 | 1,639 | 1.31 | 1,947 | 1,947 | 1,947 | 1,947 |
| **733** | 255 | 269 | 9.84 | 2,510 | 2,717 | 2,650 | 1,250 | 19.02 | 4,849 | 4,121 | 5,119 | 3,751 |
| **734** | 447 | 472 | 1.42 | 636 | 688 | 671 | 1,000 | 1.86 | 831 | 706 | 877 | 815 |
| **735** | 1,543 | 1,669 | 1.07 | 1,653 | 1,848 | 1,788 | 1,848 | 1.24 | 1,917 | 2,208 | 2,074 | 2,208 |
| **736** | 1,145 | 1,239 | 1.09 | 1,244 | 1,391 | 1,346 | 1,391 | 1.25 | 1,426 | 1,643 | 1,542 | 1,643 |
| **737** | 774 | 838 | 1.05 | 816 | 911 | 884 | 911 | 1.31 | 1,013 | 1,141 | 1,097 | 1,141 |
| **738** | 1,416 | 1,532 | 1.04 | 1,474 | 1,648 | 1,594 | 1,648 | 1.20 | 1,695 | 1,953 | 1,833 | 1,953 |
| **739** | 644 | 701 | 1.01 | 648 | 721 | 706 | 721 | 1.09 | 701 | 719 | 764 | 719 |
| **740** | 898 | 978 | 1.04 | 931 | 1,036 | 1,014 | 1,036 | 1.27 | 1,137 | 1,166 | 1,238 | 1,166 |
| **741** | 1,292 | 1,364 | 1.22 | 1,580 | 1,710 | 1,668 | 2,370 | 1.40 | 1,804 | 1,533 | 1,904 | 1,726 |
| **742** | 2,553 | 2,781 | 1.12 | 2,861 | 3,183 | 3,116 | 3,183 | 1.29 | 3,296 | 3,380 | 3,590 | 3,380 |
| **743** | 934 | 986 | 1.12 | 1,043 | 1,129 | 1,101 | 1,624 | 1.31 | 1,225 | 1,041 | 1,293 | 1,111 |
| **744** | 1,148 | 1,161 | 1.09 | 1,249 | 1,333 | 1,263 | 1,333 | 1.22 | 1,403 | 1,364 | 1,419 | 1,364 |
| **745** | 4 | 4 | 1.00 | 4 | 4 | 4 | 4 | 1.00 | 4 | 3 | 4 | 3 |
| **746** | 527 | 533 | 1.26 | 665 | 710 | 673 | 710 | 1.79 | 944 | 918 | 955 | 918 |
| **747** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **748** | 7 | 5 | 1.00 | 7 | 6 | 5 | 6 | 0.86 | 6 | 7 | 5 | 7 |
| **749** | 141 | 107 | 0.99 | 140 | 112 | 106 | 112 | 0.96 | 136 | 150 | 103 | 150 |
| **750** | 166 | 126 | 1.00 | 166 | 133 | 126 | 749 | 1.14 | 189 | 208 | 143 | 1,321 |
| **751** | 21 | 21 | 1.00 | 21 | 22 | 21 | 22 | 1.00 | 21 | 20 | 21 | 20 |
| **752** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **753** | 30 | 30 | 1.00 | 30 | 32 | 30 | 32 | 1.00 | 30 | 29 | 30 | 29 |
| **754** | 1,827 | 2,010 | 1.00 | 1,831 | 1,979 | 2,015 | 1,979 | 1.01 | 1,840 | 1,992 | 2,025 | 1,992 |
| **755** | 748 | 823 | 1.22 | 910 | 983 | 1,001 | 983 | 1.30 | 975 | 1,056 | 1,073 | 1,056 |
| **756** | 624 | 685 | 1.11 | 692 | 838 | 759 | 838 | 1.18 | 739 | 936 | 811 | 936 |
| **757** | 1,652 | 1,813 | 1.07 | 1,762 | 2,135 | 1,934 | 2,135 | 1.10 | 1,820 | 2,306 | 1,997 | 2,306 |
| **758** | 350 | 384 | 1.07 | 373 | 452 | 409 | 452 | 1.10 | 386 | 489 | 424 | 489 |
| **759** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **760** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **761** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |

| Zone | Dwellings | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | | | | 2031 | | | | |
| | Main Roads | CoC Adjusted to Main Roads Zones | Main Roads Growth Rate 2016-2021 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback | Main Roads Growth Rate 2016-2031 | Main Roads | CoC Data Split into Main Roads Zones | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | CoC Further Refined from Feedback |
| **762** | 429 | 413 | 1.15 | 494 | 472 | 475 | 472 | 1.20 | 514 | 524 | 494 | 524 |
| **763** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **764** | 1,296 | 1,382 | 1.03 | 1,339 | 1,569 | 1,428 | 1,569 | 1.09 | 1,414 | 1,630 | 1,508 | 1,630 |
| **765** | 334 | 272 | 1.03 | 344 | 283 | 281 | 283 | 1.13 | 378 | 359 | 308 | 359 |
| **766** | 1,161 | 1,238 | 1.03 | 1,194 | 1,399 | 1,273 | 1,399 | 1.13 | 1,314 | 1,514 | 1,401 | 1,514 |
| **767** | 470 | 424 | 1.04 | 491 | 443 | 443 | 443 | 1.07 | 503 | 500 | 454 | 500 |
| **768** | 328 | 296 | 1.09 | 356 | 321 | 321 | 321 | 1.15 | 376 | 374 | 339 | 374 |
| **769** | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - | - |
| **770** | 263 | 215 | 1.06 | 279 | 229 | 228 | 229 | 1.10 | 288 | 273 | 235 | 273 |
| **771** | 1,647 | 1,486 | 1.01 | 1,662 | 1,498 | 1,500 | 1,498 | 1.03 | 1,703 | 1,692 | 1,537 | 1,692 |
| **772** | 1,827 | 2,129 | 1.01 | 1,841 | 2,120 | 2,145 | 2,120 | 1.03 | 1,880 | 3,390 | 2,191 | 3,390 |
| **773** | 819 | 954 | 1.27 | 1,040 | 1,198 | 1,212 | 1,198 | 1.41 | 1,157 | 2,086 | 1,348 | 2,086 |
| **774** | 123 | 144 | 3.36 | 414 | 476 | 482 | 476 | 2.85 | 352 | 634 | 410 | 634 |
| **775** | 950 | 3,140 | 1.02 | 970 | 3,293 | 3,203 | 3,293 | 1.05 | 995 | 3,308 | 3,286 | 3,308 |
| **776** | 2,002 | 3,920 | 1.05 | 2,111 | 4,464 | 4,134 | 4,464 | 1.16 | 2,319 | 5,444 | 4,541 | 5,444 |
| **777** | 2,339 | 1,776 | 1.34 | 3,140 | 2,513 | 2,384 | 1,897 | 1.38 | 3,227 | 3,554 | 2,450 | 2,442 |
| **778** | 2,188 | 2,283 | 1.21 | 2,650 | 3,934 | 2,765 | 2,606 | 1.31 | 2,873 | 5,175 | 2,997 | 2,747 |
| **779** | 1,120 | 584 | 0.26 | 289 | 215 | 151 | 215 | 0.10 | 108 | 97 | 56 | 97 |
| **780** | 12 | 13 | 1.58 | 19 | 20 | 21 | 20 | 3.42 | 41 | 45 | 45 | 45 |
| **781** | 822 | 895 | 1.05 | 860 | 897 | 937 | 897 | 1.10 | 906 | 987 | 987 | 987 |
| **782** | 143 | 151 | 1.37 | 196 | 265 | 207 | 1,593 | 1.39 | 198 | 314 | 209 | 2,743 |
| **891** | 1,227 | 1,416 | 0.52 | 632 | 1,090 | 729 | 1,090 | 0.62 | 756 | 1,100 | 872 | 1,100 |
| **892** | 1,459 | 1,684 | 1.18 | 1,724 | 2,972 | 1,989 | 2,972 | 1.85 | 2,700 | 3,929 | 3,116 | 3,929 |
| **893** | 120 | 138 | 4.81 | 577 | 995 | 666 | 995 | 9.49 | 1,139 | 1,658 | 1,314 | 1,658 |
| **939** | 22 | 22 | 1.64 | 36 | 36 | 36 | 36 | 2.41 | 53 | 53 | 53 | 53 |
| **940** | 34 | 34 | 1.03 | 35 | 35 | 35 | 35 | 1.03 | 35 | 35 | 35 | 35 |
| **941** | 2 | 2 | 2.00 | 4 | 4 | 4 | 4 | 2.00 | 4 | 4 | 4 | 4 |
| **Total ROM Area** | **46,018** | **51,080** | | **52,007** | **62,327** | **57,801** | **62,327** | | **60,378** | **74,330** | **67,090** | **74,330** |
| **Cockburn only area** | **38,366** | **42,996** | | **43,886** | **52,082** | **49,228** | **52,082** | | **49,901** | **61,761** | **55,906** | **61,761** |
| **City of Cockburn forecast** | 43,333 | 43,333 | | 50,949 | 50,949 | 50,950 | 50,951 | | 62,098 | 62,098 | 62,099 | 62,100 |
| **Difference** | (4,967) | (337) | | (7,063) | 1,133 | (1,722) | 1,131 | | (12,197) | (337) | (6,193) | (339) |
| **External Zones Total** | 7,652 | 8,084 | | 8,121 | 10,245 | 8,573 | 10,245 | | 10,477 | 12,569 | 11,184 | 12,569 |

| Zone | Employment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016 | | Growth 2016-2021 | 2021 | | Growth 2016-2031 | 2031 | |
| | Main Roads | Adjusted | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors |
| **666** | 180 | 1,165 | 1.03 | 186 | 1,204 | 0.77 | 138 | 893 |
| **667** | 2,703 | 2,703 | 4.03 | 10,904 | 10,904 | 7.12 | 19,257 | 19,257 |
| **690** | 124 | 124 | 1.00 | 124 | 124 | 1.10 | 136 | 136 |
| **727** | 362 | 362 | 1.05 | 379 | 379 | 1.16 | 421 | 421 |
| **728** | 224 | 224 | 1.08 | 242 | 242 | 1.25 | 279 | 279 |
| **729** | 1,327 | 1,327 | 1.07 | 1,423 | 1,423 | 1.22 | 1,617 | 1,617 |
| **733** | 364 | 516 | 4.51 | 1,642 | 2,328 | 7.67 | 2,791 | 3,958 |
| **734** | 274 | 261 | 1.95 | 533 | 509 | 1.64 | 448 | 428 |
| **735** | 600 | 677 | 1.06 | 633 | 714 | 1.18 | 705 | 795 |
| **736** | 180 | 203 | 1.11 | 200 | 226 | 1.26 | 227 | 256 |
| **737** | 211 | 358 | 1.01 | 213 | 362 | 1.15 | 242 | 411 |
| **738** | 236 | 548 | 1.04 | 246 | 571 | 1.14 | 269 | 625 |
| **739** | 31 | 24 | 1.10 | 34 | 26 | 1.23 | 38 | 29 |
| **740** | 1,916 | 1,457 | 1.05 | 2,017 | 1,534 | 1.18 | 2,255 | 1,715 |
| **741** | 392 | 322 | 0.90 | 353 | 290 | 0.93 | 366 | 301 |
| **742** | 1,245 | 789 | 1.01 | 1,252 | 794 | 1.08 | 1,341 | 850 |
| **743** | 118 | 107 | 1.02 | 120 | 108 | 1.19 | 140 | 126 |
| **744** | 196 | 177 | 1.07 | 209 | 189 | 1.20 | 235 | 212 |
| **745** | 358 | - | 0.91 | 324 | - | 0.92 | 328 | - |
| **746** | 368 | 332 | 1.07 | 393 | 355 | 1.42 | 521 | 470 |
| **747** | 198 | 272 | 1.08 | 214 | 294 | 1.22 | 242 | 333 |
| **748** | 3,953 | 5,439 | 1.03 | 4,054 | 5,578 | 1.09 | 4,315 | 5,937 |
| **749** | 276 | 243 | 5.41 | 1,494 | 1,318 | 16.09 | 4,440 | 3,916 |
| **750** | 133 | 117 | 6.18 | 822 | 725 | 48.29 | 6,423 | 5,665 |
| **751** | 13 | 11 | 23.38 | 304 | 268 | 41.40 | 538 | 475 |
| **752** | 245 | 216 | 2.19 | 536 | 473 | 3.57 | 874 | 771 |
| **753** | 15 | 22 | 1.00 | 15 | 22 | 1.07 | 16 | 24 |
| **754** | 290 | 376 | 1.05 | 305 | 396 | 1.17 | 339 | 440 |
| **755** | 111 | 144 | 1.05 | 116 | 151 | 1.15 | 128 | 166 |
| **756** | 99 | 171 | 1.12 | 111 | 192 | 1.10 | 109 | 189 |
| **757** | 427 | 739 | 1.08 | 462 | 800 | 1.21 | 515 | 891 |
| **758** | 113 | 196 | 1.04 | 118 | 204 | 1.10 | 124 | 215 |
| **759** | 9 | 12 | 0.78 | 7 | 9 | 0.78 | 7 | 9 |
| **760** | 772 | 1,126 | 1.28 | 989 | 1,443 | 1.44 | 1,111 | 1,621 |
| **761** | 2,442 | 3,563 | 1.03 | 2,521 | 3,678 | 1.14 | 2,794 | 4,077 |

| Zone | Employment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016 | | Growth 2016-2021 | 2021 | | Growth 2016-2031 | 2031 | |
| | Main Roads | Adjusted | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with CoC data and factored up with Main Roads growth factors |
| **762** | 2,731 | 3,151 | 1.04 | 2,838 | 3,274 | 1.12 | 3,063 | 3,534 |
| **763** | 1,777 | 1,527 | 1.04 | 1,841 | 1,582 | 1.12 | 1,999 | 1,718 |
| **764** | 235 | 269 | 1.04 | 244 | 280 | 1.16 | 272 | 312 |
| **765** | 27 | 31 | 1.19 | 32 | 37 | 1.26 | 34 | 39 |
| **766** | 96 | 110 | 1.09 | 105 | 120 | 1.43 | 137 | 157 |
| **767** | 151 | 173 | 1.26 | 191 | 219 | 1.25 | 189 | 217 |
| **768** | 36 | 41 | 1.64 | 59 | 68 | 1.47 | 53 | 61 |
| **769** | 11 | 5 | 0.73 | 8 | 4 | 0.55 | 6 | 3 |
| **770** | 151 | 117 | 0.99 | 150 | 116 | 1.06 | 160 | 124 |
| **771** | 470 | 328 | 1.04 | 488 | 341 | 1.19 | 561 | 392 |
| **772** | 847 | 1,224 | 1.05 | 888 | 1,283 | 1.18 | 999 | 1,444 |
| **773** | 68 | 98 | 3.73 | 253 | 366 | 8.23 | 559 | 807 |
| **774** | 300 | 3,305 | 3.94 | 1,181 | 13,008 | 2.79 | 836 | 9,205 |
| **775** | - | - | 1.00 | - | - | 1.00 | - | - |
| **776** | 366 | 1,583 | 1.04 | 379 | 1,642 | 0.95 | 349 | 1,509 |
| **777** | 383 | 1,527 | 1.84 | 704 | 2,806 | 0.98 | 376 | 1,499 |
| **778** | 297 | 514 | 1.02 | 304 | 526 | 1.03 | 307 | 532 |
| **779** | 224 | 194 | 0.93 | 208 | 180 | 1.39 | 311 | 269 |
| **780** | 1,349 | 2,604 | 1.21 | 1,635 | 3,156 | 1.33 | 1,788 | 3,451 |
| **781** | 742 | 875 | 1.02 | 758 | 894 | 1.16 | 858 | 1,012 |
| **782** | 1,605 | 5,112 | 1.06 | 1,705 | 5,431 | 1.08 | 1,741 | 5,544 |
| **891** | 160 | 160 | 0.73 | 117 | 117 | 1.10 | 176 | 176 |
| **892** | 181 | 181 | 1.47 | 266 | 266 | 1.97 | 357 | 357 |
| **893** | 1 | 1 | 3.00 | 3 | 3 | 5.00 | 5 | 5 |
| **939** | 2 | 2 | 1.00 | 2 | 2 | 84.00 | 168 | 168 |
| **940** | - | - | 1.00 | 838 | - | 1.00 | 1,634 | - |
| **941** | 2 | 2 | 564.00 | 1,128 | 1,128 | 1,363.05 | 2,726 | 2,726 |
| **Total ROM Area** | **32,716** | **47,460** | | **49,821** | **74,681** | | **73,392** | **92,766** |
| **Cockburn only area** | **27,630** | **42,374** | | **34,395** | **60,093** | | **46,616** | **67,624** |
| **City of Cockburn forecast** | 54,575 | 54,575 | | 54,577 | 54,578 | | 54,580 | 54,581 |
| **Difference** | (26,945) | (12,201) | | (20,182) | 5,515 | | (7,964) | 13,043 |
| **External Zones Total** | 5,086 | 5,086 | | 15,426 | 14,588 | | 26,776 | 25,142 |

| Zone | Education | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016 | | Growth 2016-2021 | 2021 | | Growth 2016-2031 | 2031 | |
| | Main Roads | Adjusted | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with Department of Education data and factored up with Main Roads growth factors | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with Department of Education data and factored up with Main Roads growth factors |
| **666** | - | - | 1.00 | - | - | 1.00 | - | - |
| **667** | 1,311 | 1,311 | 1.01 | 1,318 | 1,318 | 1.01 | 1,326 | 1,326 |
| **690** | 613 | 613 | 1.04 | 635 | 635 | 1.09 | 671 | 671 |
| **727** | 583 | 583 | 1.03 | 602 | 602 | 1.06 | 620 | 620 |
| **728** | 1,193 | 1,193 | 1.01 | 1,205 | 1,205 | 1.02 | 1,222 | 1,222 |
| **729** | 1,601 | 1,601 | 1.02 | 1,639 | 1,639 | 1.05 | 1,681 | 1,681 |
| **733** | - | - | 1.00 | 250 | - | 1.00 | 500 | - |
| **734** | - | - | 1.00 | - | - | 1.00 | - | - |
| **735** | 1,173 | 1,173 | 1.00 | 1,175 | 1,175 | 1.01 | 1,179 | 1,179 |
| **736** | 18 | 18 | 1.00 | 18 | 18 | 1.00 | 18 | 18 |
| **737** | 41 | 41 | 1.00 | 41 | 41 | 0.85 | 35 | 35 |
| **738** | 450 | 450 | 1.00 | 451 | 451 | 0.98 | 443 | 443 |
| **739** | - | - | 1.00 | - | - | 1.00 | - | - |
| **740** | 366 | 366 | 1.00 | 367 | 367 | 1.00 | 366 | 366 |
| **741** | - | - | 1.00 | - | - | 1.00 | - | - |
| **742** | 746 | 746 | 1.00 | 747 | 747 | 0.97 | 723 | 723 |
| **743** | 439 | 439 | 1.06 | 466 | 466 | 1.09 | 479 | 479 |
| **744** | 843 | 843 | 1.01 | 848 | 848 | 1.00 | 842 | 842 |
| **745** | - | - | 1.00 | - | - | 1.00 | - | - |
| **746** | 524 | 524 | 1.05 | 551 | 551 | 1.13 | 591 | 591 |
| **747** | - | - | 1.00 | - | - | 1.00 | - | - |
| **748** | - | - | 1.00 | - | - | 1.00 | - | - |
| **749** | 138 | 138 | 0.98 | 135 | 135 | 0.98 | 135 | 135 |
| **750** | - | - | 1.00 | - | - | 1.00 | - | - |
| **751** | - | - | 1.00 | - | - | 1.00 | - | - |
| **752** | - | - | 1.00 | - | - | 1.00 | - | - |
| **753** | - | - | 1.00 | - | - | 1.00 | - | - |
| **754** | 1,358 | 1,358 | 1.01 | 1,371 | 1,371 | 1.01 | 1,374 | 1,374 |
| **755** | - | - | 1.00 | - | - | 1.00 | - | - |
| **756** | - | 461 | 1.00 | - | 461 | 1.00 | - | 461 |
| **757** | 714 | 714 | 1.12 | 799 | 799 | 1.18 | 846 | 846 |
| **758** | 546 | 546 | 1.00 | 547 | 547 | 0.99 | 540 | 540 |
| **759** | - | - | 1.00 | - | - | 1.00 | - | - |
| **760** | - | - | 1.00 | - | - | 1.00 | - | - |
| **761** | - | - | 1.00 | - | - | 1.00 | - | - |

| Zone | Education | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2016 | | Growth 2016-2021 | 2021 | | Growth 2016-2031 | 2031 | |
| | Main Roads | Adjusted | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with Department of Education data and factored up with Main Roads growth factors | Main Roads | Main Roads | Forecast based on the Adjusted 2016 Base with Department of Education data and factored up with Main Roads growth factors |
| **762** | 165 | 165 | 1.00 | 165 | 165 | 0.92 | 151 | 151 |
| **763** | - | - | 1.00 | - | - | 1.00 | - | - |
| **764** | 286 | 286 | 1.00 | 287 | 287 | 1.00 | 286 | 286 |
| **765** | - | - | 1.00 | - | - | 1.00 | - | - |
| **766** | 74 | - | 1.00 | 74 | - | 0.93 | 69 | - |
| **767** | - | - | 1.00 | - | - | 1.00 | - | - |
| **768** | - | - | 1.00 | - | - | 1.00 | - | - |
| **769** | - | - | 1.00 | - | - | 1.00 | - | - |
| **770** | - | - | 1.00 | - | - | 1.00 | - | - |
| **771** | 918 | 918 | 1.00 | 920 | 920 | 0.99 | 913 | 913 |
| **772** | 1,208 | 1,208 | 1.00 | 1,210 | 1,210 | 0.99 | 1,199 | 1,199 |
| **773** | - | - | 1.00 | - | - | 1.00 | - | - |
| **774** | - | - | 1.00 | - | - | 1.00 | - | - |
| **775** | 445 | 445 | 1.07 | 478 | 478 | 1.11 | 493 | 493 |
| **776** | 760 | 760 | 1.08 | 822 | 822 | 1.09 | 825 | 825 |
| **777** | - | 629 | 1.00 | - | 629 | 1.00 | - | 629 |
| **778** | - | 1,083 | 1.00 | - | 1,083 | 1.00 | - | 1,083 |
| **779** | 769 | - | 0.96 | 741 | - | 0.98 | 751 | - |
| **780** | - | - | 1.00 | - | - | 1.00 | - | - |
| **781** | - | - | 1.00 | - | - | 1.00 | - | - |
| **782** | - | - | 1.00 | - | - | 1.00 | - | - |
| **891** | 126 | - | 1.45 | 183 | - | 1.98 | 250 | - |
| **892** | 88 | 927 | 2.56 | 225 | 2,370 | 5.11 | 450 | 4,740 |
| **893** | - | - | 1.00 | 100 | - | 1.00 | 200 | - |
| **939** | - | - | 1.00 | - | - | 1.00 | - | - |
| **940** | - | - | 1.00 | - | - | 1.00 | - | - |
| **941** | - | - | 1.00 | - | - | 1.00 | - | - |
| **Total ROM Area** | **17,496** | **19,539** | | **18,370** | **21,340** | | **19,178** | **23,871** |
| **Cockburn only area** | **11,981** | **13,311** | | **12,463** | **13,571** | | **12,758** | **13,611** |
| **City of Cockburn forecast** | 54,582 | 54,583 | | 54,585 | 54,586 | | 54,588 | 54,589 |
| **Difference** | (42,601) | (41,272) | | (42,122) | (41,015) | | (41,830) | (40,978) |
| **External Zones Total** | 5,515 | 6,228 | | 5,907 | 7,769 | | 6,420 | 10,260 |

| Zone Area | Population | | | | | | Dwellings | | | | | | Employment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2016 | | 2021 | | 2031 | | 2016 | | 2021 | | 2031 | | 2016 | | 2021 | | 2031 | |
| | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted | Main Roads | CoC Adjusted |
| **Total ROM Area** | 115,899 | 129,456 | 127,000 | 156,649 | 141,759 | 181,292 | 46,018 | 51,080 | 52,007 | 62,327 | 60,378 | 74,330 | 32,716 | 47,460 | 49,821 | 74,681 | 73,392 | 92,766 |
| **Cockburn only area** | 97,312 | 108,415 | 107,296 | 128,848 | 116,512 | 156,510 | 38,366 | 42,996 | 43,886 | 52,082 | 49,901 | 61,761 | 27,630 | 42,374 | 34,395 | 60,093 | 46,616 | 67,624 |
| City of Cockburn forecast | 108,770 | 108,770 | 129,308 | 129,308 | 157,018 | 157,018 | 43,333 | 43,333 | 50,949 | 50,949 | 62,098 | 62,098 | 54,575 | 54,575 | 54,577 | 54,578 | 54,580 | 54,581 |
| Difference | -11,458 | -355 | -22,012 | -460 | -40,506 | -508 | -4,967 | -337 | -7,063 | 1,133 | -12,197 | -337 | -26,945 | -12,201 | -20,182 | 5,515 | -7,964 | 13,043 |
| External Zones Total | 18,587 | 21,041 | 19,704 | 27,801 | 25,247 | 24,782 | 7,652 | 8,084 | 8,121 | 10,245 | 10,477 | 12,569 | 5,086 | 5,086 | 15,426 | 14,588 | 26,776 | 25,142 |