Department of Planning, Lands and Heritage

GOVERNMENT OF WESTERN AUSTRALIA

Emu Point Precinct Structure Plan

Traffic Report

16-10-2025

Table of Contents

1. Purpose 3
   1.1 Report Purpose 3
   1.2 Project Objectives 3
2. Introduction 3
   2.1 Report Purpose 3
      2.1.1 Project Background 3
      2.1.2 Scope of Traffic Modelling 4
   2.2 Project Location and Modelling Area 4
      2.2.1 Study Area 4
      2.2.2 Land Use 5
      2.2.3 Existing Road Hierarchy 6
      2.1.1 Existing Traffic Conditions 9
      2.1.2 Crash Data 9
3. Base Model Development 12
   3.1 Modelling Platform 12
   3.1.1 Time Period 12
   3.2 Modelling Area, Data Collection and Modelling Parameters 12
   3.3 Base Model Calibration 14
4. Future Assessment 17
   4.1 Land use Changes 17
   4.2 Trip Generation 18
   4.3 Trip Distribution and Growth 19
   4.4 Network Changes 20
   4.5 Network Analysis 20
      4.5.1 Link Volume comparison 20
      4.5.2 Volume Capacity Ratio Plots 22
   4.6 SIDRA Analysis 24
      4.6.1 Golf Link Road / Emu Point Drive 25
      4.6.2 Lower King Road / Collingwood Road West and East 26
      4.6.3 Ulster Road/Lower King Road/ Boronia Avenue 30
      4.6.4 Lower King Road / New EW Link Connection 34

5. Summary 37
6. Appendices..... 38

List Of Tables

Table 1: Crash Data for the Study Area 10
Table 2: Heavy Vehicle Percentages in the Study Area 13
Table 3: Model Calibration Criteria..... 16
Table 4: Location and Future Land Use 17
Table 5: Emu Point Precinct – Trip Generation 18
Table 6: Peak Hour Direction Trips 18
Table 7: Background Growth..... 19
Table 8: Link Volumes AM Volumes..... 21
Table 9: Link Volumes PM Volumes..... 21
Table 10: Volume Capacity Ratio Plots..... 22
Table 11: Volume Capacity Ratio Plots..... 25
Table 11: Existing intersection analysis for Golf Link Road/Emu Point Drive/ Troode Street..... 26
Table 12: 2051 intersection analysis for Golf Link Road/Emu Point Drive/ Troode Street..... 26
Table 13: Existing intersection analysis for Lower King Road/Collingwood Road East 28
Table 14: 2051 intersection analysis for Lower King Road/Collingwood Road East 28
Table 15: Existing intersection analysis for Lower King Road/Collingwood Road West..... 29
Table 16: 2051 intersection analysis for Lower King Road/Collingwood Road West 29
Table 17: Existing intersection analysis for Ulster Road/ Lower King Road..... 30
Table 18: 2051 intersection analysis for Ulster Road/ Lower King Road..... 31
Table 19: 2051 intersection analysis for Ulster Road/ Lower King Road with roundabout..... 32
Table 20: Existing intersection analysis for Ulster Road/ Boronia Avenue 33
Table 21: 2051 intersection analysis for Ulster Road/ Boronia Avenue 33
Table 22: 2051 intersection analysis for Lower King Road and the new EW Link Connection 34
Table 23: 2051 intersection analysis for Lower King Road and the new EW Link Connection (With channelised left turn) 36

List of Figures

Figure 1: Emu Point Precinct Structure Plan - Study Area 5
Figure 2: Existing local planning scheme zoning 6
Figure 3: Emu Point Precinct – Road Classification 7
Figure 4: Emu Point Precinct – Posted Speed..... 8
Figure 5 : Crash History for the Study 10
Figure 6: Automatic Tube Count (ATC) Locations (Source: City of Albany)..... 13
Figure 7: Modelling Methodology 15
Figure *8: Existing AM Peak R Square* 16
Figure 9: Existing PM Peak R square 17
Figure 10: Network Changes..... 20
Figure 11: 2051 Volume Capacity Ratio Plots – 2051 AM Peak 23
Figure 12: 2051 Volume Capacity Ratio Plots – 2051 PM Peak 24

Figure 13: Existing layout of the Golf Link Road / Emu Point Drive 26
Figure 14: Existing layout of the Lower King Road and Collingwood Road West and East 27
Figure 15: existing layout of Lower King Road, Ulster Road, and Boronia Avenue 30
Figure 16: New Indicative layout of the Ulster Road and Lower King Road Intersection 32
Figure 17 : Indicative layout of Lower King Road and the new EW Link Connection 34
Figure 18: Final Indicative layout of the Ulster Road and Lower King Road Intersection 35

1. Purpose

1.1 Report purpose

This technical report documents the traffic modelling methodology, approach and assumptions for the Emu Point Precinct Structure Plan (EPPSP) traffic modelling.

The Department of Planning, Lands and Heritage (DPLH) has undertaken a traffic study of the Emu Point region to access the future road network scenarios in 2051 and identify the long term road infrastructure required to sustain potential growth and development.

1.2 Project objectives

The primary objective of this project is to develop a Macro Model using Aimsun Next (the latest version 24.0.1) to investigate several road network scenarios and assist DPLH in strategic planning and identifying long-term infrastructure needs. The model will assist in evaluating whether the road network has sufficient capacity and service level to accommodate future traffic within the area defined by the EPPSP.

An overview of the scope of work for this project is given below.

- Develop a model for the current and future EPPSP area.
- Forecast future traffic for the ultimate build-out.
- Undertake an operational capacity assessment of the existing road network and its ability to service future travel demand.
- Undertake intersection analysis at key location in the EPPSP network to understand future network capacity and operation.

2. Introduction

2.1 Report purpose

2.1.1 Project background

This project aligns with the strategic objectives outlined in the Albany Local Planning Strategy and the Great Southern Regional Planning and Infrastructure Framework. These frameworks provide guidance for sustainable development and integrated transport planning in Emu Point and broader Albany region.

The EPPSP has identified several urban expansions and investigation areas, particularly within the area under consideration.

To identify the opportunities and constraints of the current transport network in Emu Point and provide the evidence base for future infrastructure investment, DPLH has engaged the Road Planning Team (RPT) to undertake traffic modelling to support strategy development and assessment.

2.1.2 Scope of traffic modelling

DPLH is undertaking an internal traffic modelling study for Emu Point. The scope of work includes the following:

- A review of the Emu Point study area, including current and future development assumptions provided by the Planning team.
- Collection and analysis of existing traffic data, using Metro Count data for the Albany region.
- An Aimsun model has been developed to assess future network constraints and SIDRA for intersection analysis.
- Forecasting of future traffic conditions for the year 2051, incorporating anticipated land use changes and growth projections.
- Assessment of network performance under both existing and future year scenarios to identify potential capacity constraints and infrastructure needs.
- Preparation of modelling outputs and documentation, including assumptions, methodology, results, and recommendations to support strategic planning for the Emu Point PSP.

2.2 Project location and modelling area

2.2.1 Study area

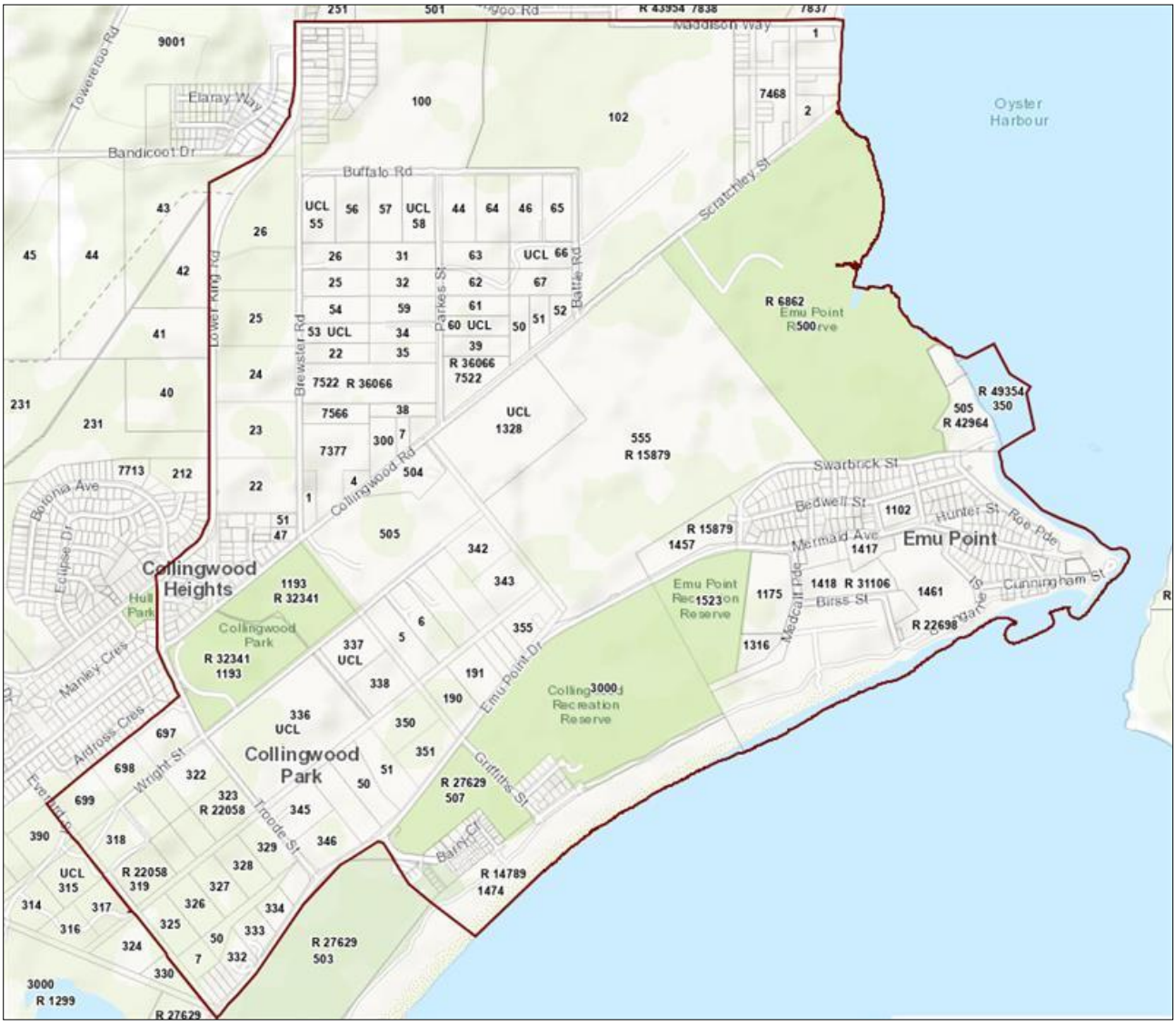
Emu Point is a coastal locality situated within the City of Albany, approximately five km northeast of the Albany city centre. The study area for this project has been defined by DPLH and encompasses key transport corridors and surrounding developments. The boundaries of the study area are as follows:

- Collingwood Road and Lower King Road to the west of the study area.
- Mercer Road to the north.
- Emu Point Drive to the south.

The Emu Point area includes a mix of established residential neighbourhoods, recreational areas, and areas identified for future development. The study area also has lodging facilities for short-time visitors and tourists. With anticipated growth and increased activity in the region, the study aims to assess the capacity and performance of the existing road network and forecast future traffic conditions. A base year model has been developed using AIMSUN, calibrated to reflect current traffic volumes, and will be used to evaluate future scenarios for the year 2051.

The following **Figure 1** shows the study area for this modelling project.

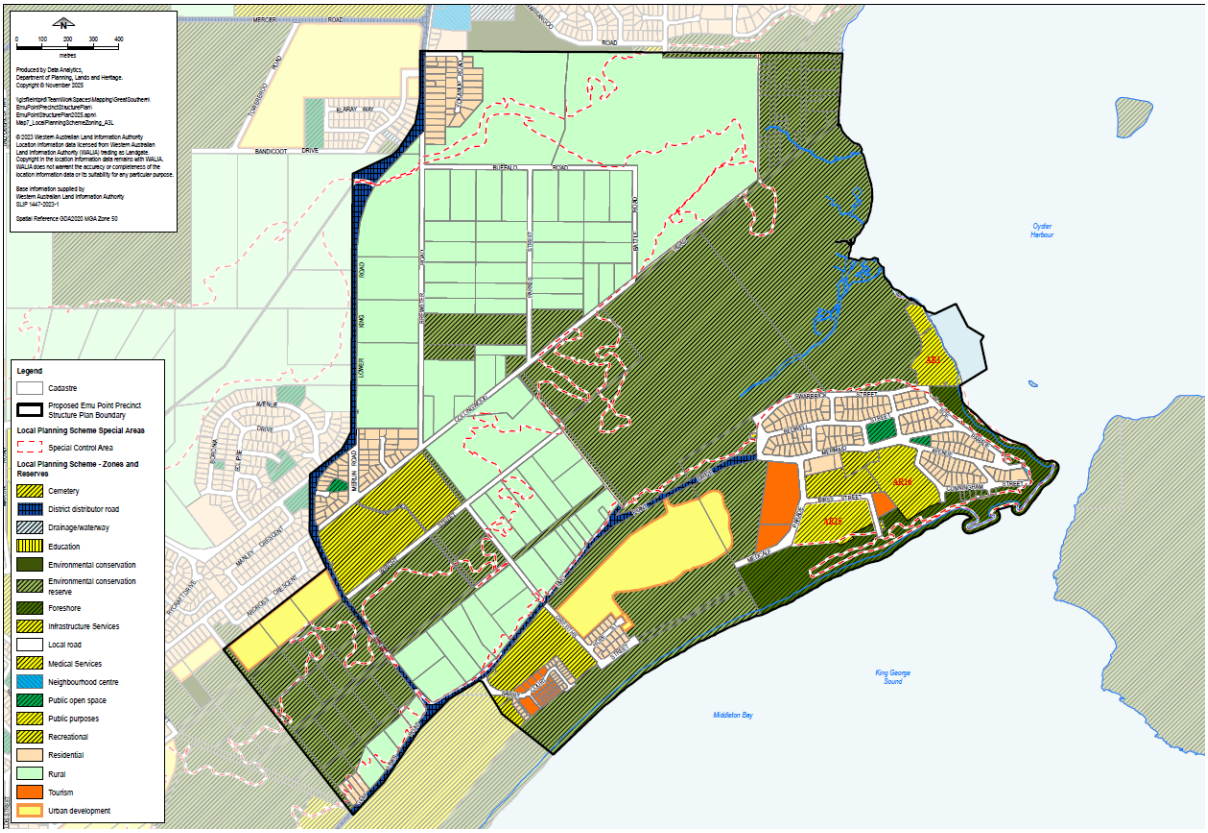
Figure 1: Emu Point Precinct Structure Plan - Study Area



2.2.2 Land use

Figure 2 below details the current land use zoning under City of Albany Local Planning Scheme No.2 within the study area, which includes a mix of land uses for residential, parks and recreations, public open spaces, and commercial/business purposes.

Figure 2: Local Planning Scheme Zoning



2.2.3 Existing road hierarchy

Road classifications and speed limits within the Emu Point Study Area:

- Emu Point Drive – Classified as a *Local Distributor* with a posted speed limit of 70 km/h.
- Lower King Road – A *Regional Distributor* with a speed limit of 80 km/h.
- Brewster Road – An *Access Road* with a speed limit of 50 km/h in built-up areas.
- Collingwood Road – An *Access Road*.
- Mercer Road – A *Regional Distributor* with a speed limit of 80 km/h.
- Ulster Road – A *District Distributor B* with a speed limit of 60 km/h.

Figure *3* below shows the road classification for Emu Point Precinct.

Figure 3: Emu Point Precinct – road classification

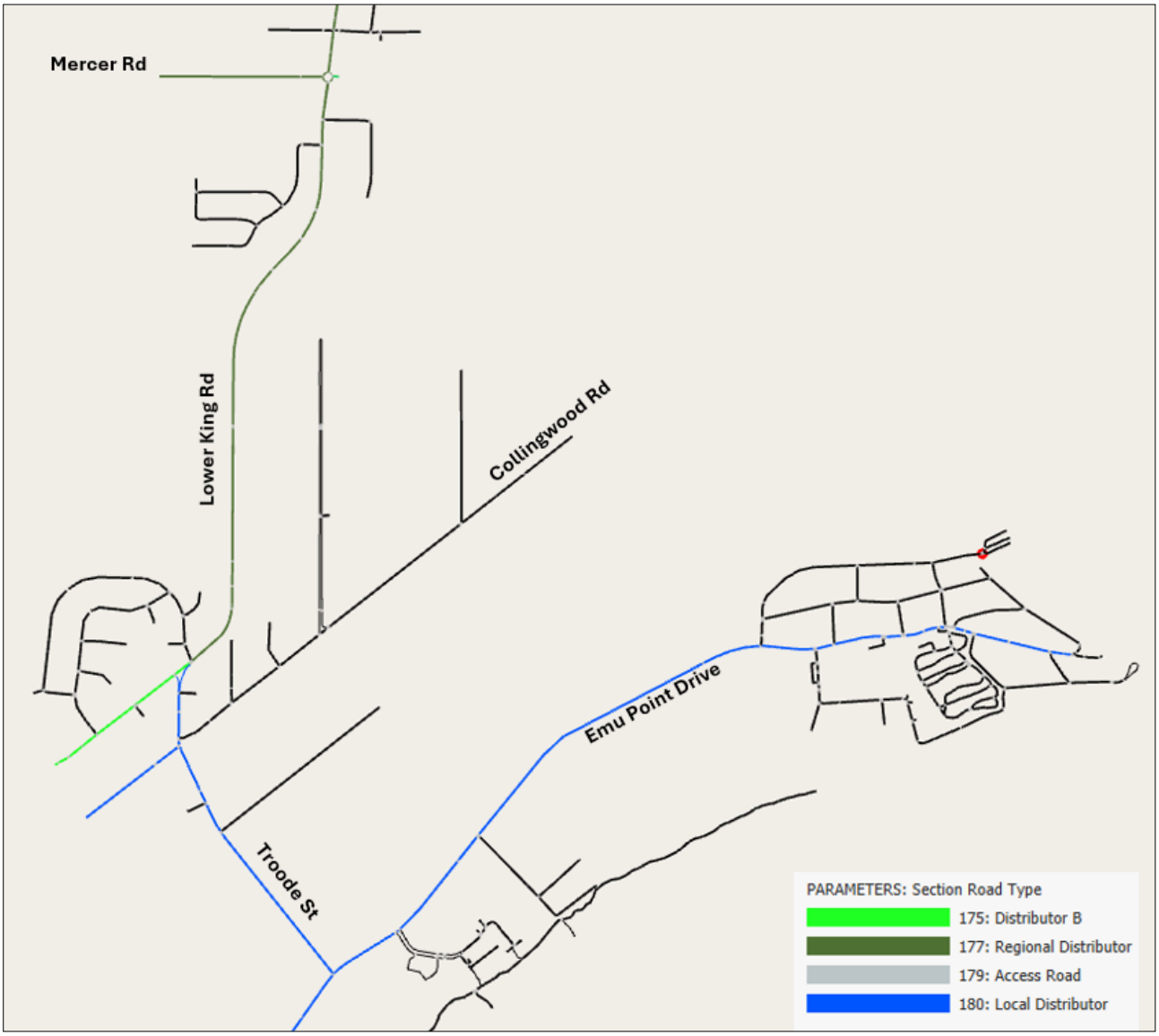


Figure *4* shows the post speed limit of Emu Point Precinct.

Figure 4: Emu Point Precinct – posted speed



2.1.1 Existing traffic conditions

Average Daily Traffic (ADT):

The highest ADT was recorded on Lower King Road (South of Bayonet Head) with 12,837 vehicles/day.

Roads with moderate ADT include:

1. Lower King Road (East of Boronia Ave): 7,977 vehicles/day
2. Mercer Road (West of Lower King): 5,818 vehicles/day
3. Ulster Road (West of Troode): 6,728 vehicles/day

Low-volume roads include Clark Street, Mermaid Avenue, and Roe Parade, with ADTs below 100 vehicles/day in some segments.

2.1.2 Crash data

Crash data has been extracted from the Main Roads crash data portal. There have been 55 crashes in total in the last five years including various major and minor accidents.

The following **Figure 5** demonstrates the crash history for the last five years in the study area.

Figure 5 : Crash history for the study



Table 1: Crash data for the study area

Road Name	Intersection Name	Location		SEVERITY		
		Midblock	Intersection	PDO Major	PDO Minor	Medical
Allwood Pde	-	2	0	1	1	0
Bayonet Head Road	Bayonet Head and Thistle St	2	1	2	0	0
Clive Street	-	1	0	0	1	0
Collingwood Road	Collingwood Road/Troode & Ardross Cr	2	2	1	2	1
Cunningham Street	-	1	0	0	0	1
Emu Point Drive	-	1	0	0	0	1
Griffith Street	-	1	0	1	0	0
Hewett Rise	-	1	0	1	0	0

Lower King Road	Lower King &Collingwood Road& Troode Street	-	2	1	0	1
	Lower King Road & Hopson Wy	-	2	2	0	0
	Lower King Road and Harbour Road	-	1	1	0	0
	Bayonet Head Road and Lower King Road	-	2	2	1	0
	-	1	0	0	1	0
Mermaid Avenue	-	3	0	0	1	2
Range Court Cres	Range Court Cr and Green Island Cr	0	1	0	0	1
Roe Pd	-	1	0	0	1	0
Ryecraft Dr	-	1	0	1	0	0
Ulster Road	Ulster Road and Hardie Road	-	2	1	0	1
	Ulster and Lower King Road	-	5	3	0	2
	-	1	-	0	0	1
Warlock Road	-	1	0	1	0	0

Table 1 summarises road accident occurrences across various streets, categorised by location type (midblock or intersection) and severity (property damage only major or minor, and medical). Ulster Road and Lower King Road shows five crashes included in the intersection assessment. However, the remaining road report includes very few incidents, suggesting that they are relatively safe.

3. Base model development

3.1 Modelling platform

The Emu Point study has been developed within Aimsun modelling platform version 24.0.1 and intersections were analysis using SIDRA 9.1.

This modelling exercise was conducted at a strategic level to support transport planning decisions across a relatively large study area. For better trip assignment, the Aimsun macro modeling was adopted instead of a conventional desktop model.

3.1.1 Time period

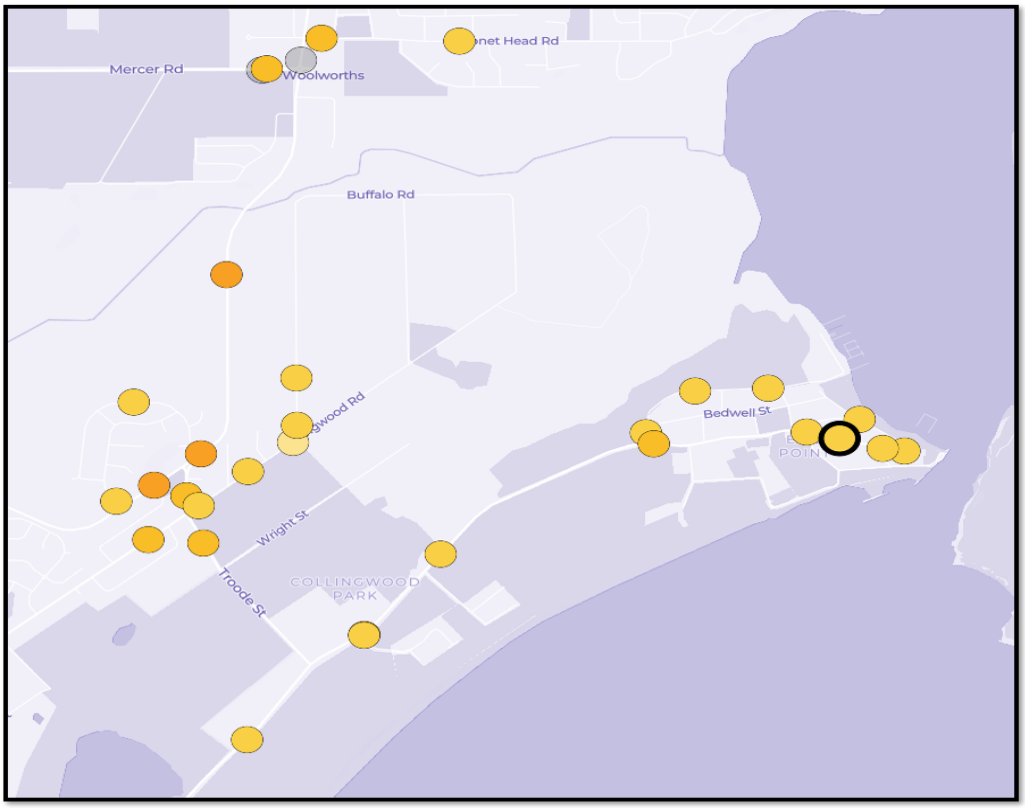
The model is developed for both weekday AM and PM peak hour periods. The ATC data indicates the AM peak hour – 8 – 9 am and PM peak hour – 3 – 4pm.

The data shows that the Emu Point weekend peak data is higher than the weekday peak, therefore if an assessment is conducted in the Emu Point area alone, weekend peak periods must be considered. However, during the weekend periods, the traffic on other key roads is much lower than on weekdays. For this reason, weekday peak period was considered suitable for this assessment.

3.2 Modelling area, data collection and modelling parameters

Figure 6 illustrates the defined modelling area for the Emu Point study. This area encompasses all relevant road sections and locations from which traffic and transport data were collected, and a total of 27 mid-block counts were collected across the Emu Point precinct.

Figure 6: Automatic Tube Count (ATC) Locations (Source: City of Albany)



Appendix A provides comprehensive datasets that show peak hour volumes, and heavy vehicle data. **Table 2** presents the percentage breakdown of heavy vehicles across the Emu Point Precinct network.

Table 2: Heavy vehicle percentages in the study area

#	Road	Section	HV%
1	Bayonet Head Road	west of Evans	7.2
2	Lower King Road	north of Bayonet	10.71
3	Lower King Road	south of Bayonet	8.48
4	Mercer Road	west of Lower King Rd	5.87
5	Lower King Road	East of Boronia Ave	8.84
6	Eclipse Dr	Between Ulster Rd and Sheoak Way	6.25
7	Lower King Road	north of Collingwood Rd	3.05
8	Ulster Rd	west of Troode (E of Manley Cr)	6.67
9	Collingwood Rd	West of Troode	12.47
10	Collingwood Rd	East of Troode	2.99
11	Brewster Road	north of Collingwood Rd	3.67
12	Troode Street	south of Collingwood	8.56
13	Mermaid Ave	east of Hunter St	2.19
14	Emu Point Dr	east of Griffiths St	9.95
15	Golf Links Rd	West of Troode St. Close to Lake Seppings	14.51

A conservative growth rate was adopted during the data collection process to account for future traffic projections in the absence of complete data. It is noted that four Metrocount data were collected prior to 2016, therefore a two per cent annual growth rate was applied, which is slightly higher than the observed historical growth rate of the Albany region of approximately **1.5 per cent**. This approach ensures that the model remains robust and accommodates potential increases in traffic volumes, particularly in areas where recent or reliable data was unavailable.

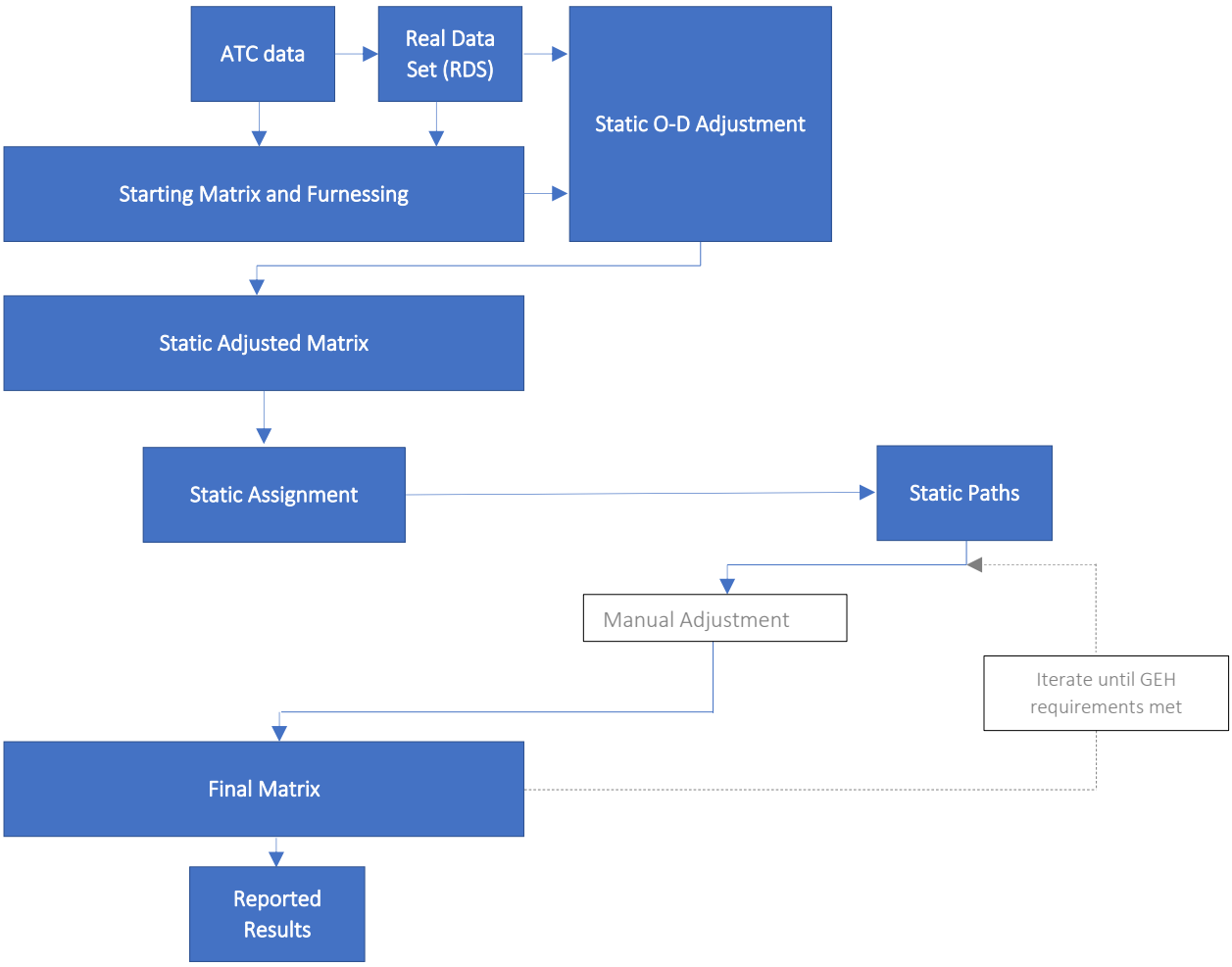
3.3 Base model calibration

The calibration of the Emu Point traffic model follows Main Roads Western Australia (MRWA) Category 2 (Urban Area) standards, as outlined in Tables 5–7 of the *Operational Modelling Guidelines Version No. 2.0 Issue Date January 2021*.

The methodology to develop the base year's traffic demand is as follows:

1. Develop a prior traffic demand matrix based on origin / destination data surveyed on December 2019. The prior matrix was verified against classified intersection count data.
2. A real data set (RDS) was developed by porting the tube counts into Aimsun.
3. Use the Aimsun Static OD Adjustment tool to refine the matrix using the imported RDS and produce the first iteration of route choice estimation.
4. Run the Aimsun Static Assignment and manual adjustment of the Aimsun matrices to further refine volumes in accordance with RDS.

Figure 7: Modelling methodology



The calibration criteria are essential for validating the accuracy and reliability of the traffic model. Metrics such as GEH statistics (a measure of goodness-of-fit between observed and modelled traffic volumes) ensure that the model closely replicates real-world conditions. The thresholds for individual link volumes across both the total network and core areas confirm that the model performs well at different spatial scales. Additionally, XY scatter plot criteria—including the coefficient of determination (R^2) and slope—verify the strength and proportionality of the relationship between observed and simulated flows. Adhering to these standards ensures compliance with MRWA guidelines and supports robust decision-making for future traffic planning.

The model calibration exercise involved comparisons between modelled and observed traffic count data. The GEH statistic was used during the calibration of the models to compare the difference between observed flow and assigned flow on each turn movement.

The GEH statistics are calculated using the following equation:

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

Where:

Vo = observed flow in vehicles per hour

Vm = is the modelled flow in vehicles per hour

Comparisons between the modelled and observed flow are made using the GEH statistic since its nonlinear scalable metric able to cope with a wide range of traffic flows. For example, the difference of 100 vehicles per hour is significant in the flow of 200 vehicles per hour but it is insignificant in the flow of thousands of vehicles per hour.

The criteria applied are summarized below:

Table 3: Model Calibration Criteria

Criteria	Desirable	AM Peak	PM Peak	Calibration
GEH <5	80%	94%	94%	✓
GEH < 10	90%	100%	100%	✓
R-Square	0.95	0.97	0.96	✓

Figure 8 presents the scatter plot illustrating the R^2 (Coefficient of Determination) for the existing AM Peak period, which measures the correlation between observed and modelled traffic volumes. The accompanying table provides a detailed comparison of assigned versus observed values, supporting the validation of the model's accuracy during the AM peak period.

Figure *8: Existing AM Peak R Square*

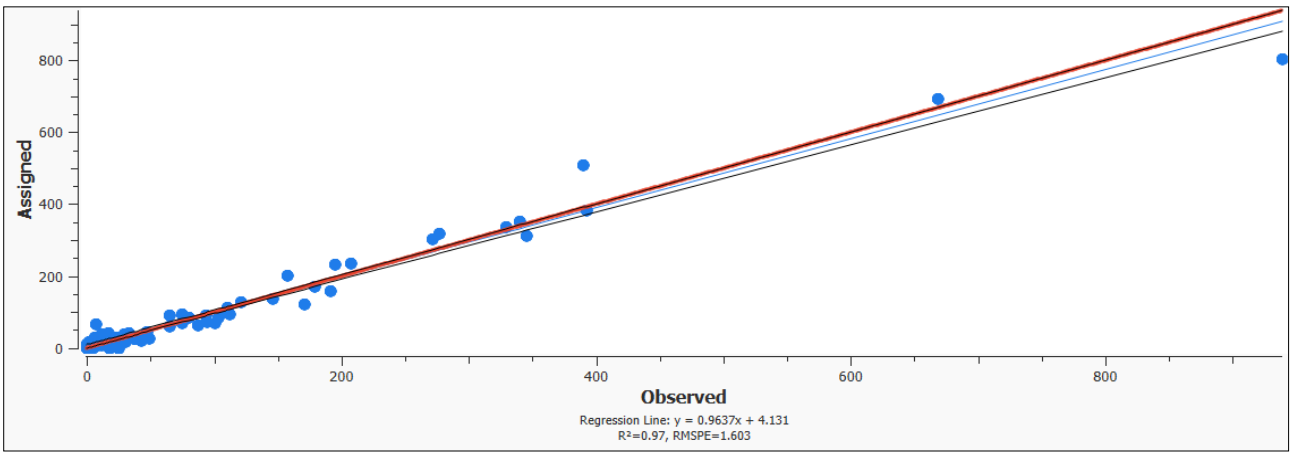
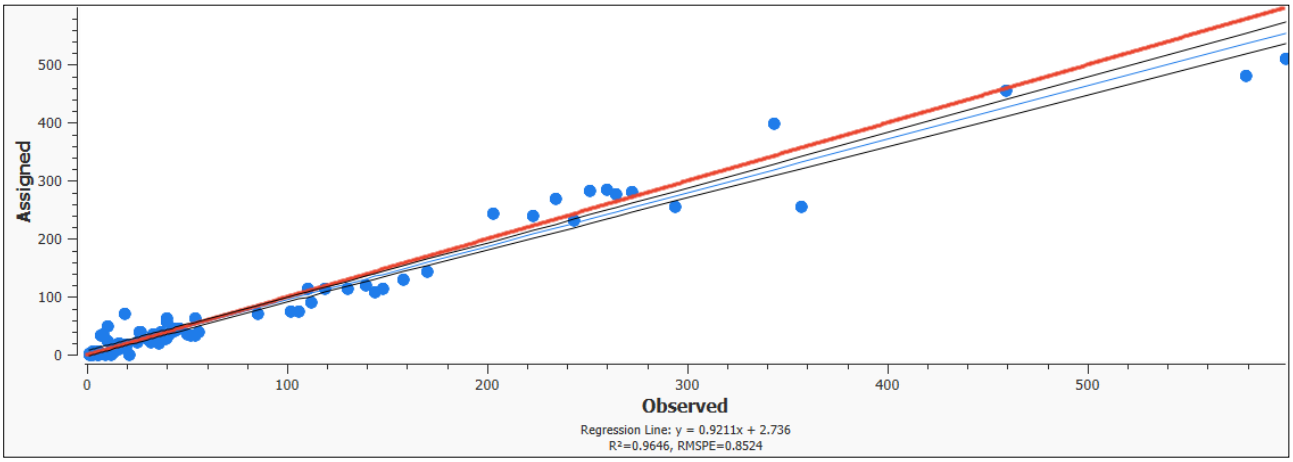


Figure 9 presents the scatter plot illustrating the R^2 (Coefficient of Determination) for the existing PM Peak period, which measures the correlation between observed and modelled traffic volumes.

Figure 9: Existing PM Peak R square



The base model calibration has been carried out in accordance with the Main Roads Western Australia (MRWA) Operational Modelling Guidelines, ensuring compliance with established standards for accuracy and reliability in traffic modelling. This assessment represents a high-level analysis, intended to replace the conventional desktop modeling approach. It provides a broader perspective on traffic conditions and future scenarios while maintaining compliance with relevant modelling standards.

4. Future assessment

4.1 Land use changes

Table 4 below summarises Emu Point Precinct future land use changes and density potential.

Table 4: Location and future land use

Cell	Location	Future land use changes	Yield
1	Lot 22 and 23 Lower King Rd	Urban Development - residential	4ha @ R20 (450 av) = 90 lots Infill of 54 lots = 30 lots
2	Lots 24 to 26 Lower King Rd	Church lot - in consultation expressed interest in partial residential infill	7ha @ R15 = 100 lots
4	East of Brewster Rd	Potential change in zoning - no intensification	1 dwelling per lot
5	Harbour Road Residential area	Potential infill	R20 (av 450m2) = 20 lots

6	Wright Street	Potential residential infill	1/3rd area (2ha) at R20 @450m2 average = 50 lots or 1/2 area = 90 lots
8	Emu Point Residential Precinct	Potential infill R20 (av 450m2) – 158 existing lots	240 lots
9	Caravan Parks	Note – additional tourist accommodation could be explored by lease holders e.g. potential reorganization/consolidation of existing development footprint to increase capacity	Some leases but generally no residential dwelling changes.

4.2 Trip generation

Table 5 outlines trip generation for the Emu Point Precinct, which has been calculated in accordance with Table 1 of the *Western Australian Planning Commission (WAPC) Guidelines for Trip Generation*. These guidelines provide standard trip rates for various land uses, ensuring consistency and reliability in estimating traffic demand for the proposed development. **Table 6** summarises peak hour direction trips within the Emu Point Precinct.

Table 5: Emu Point Precinct – trip generation

Cell	Location	Yield	Peak hour trip rates	Peak hour (veh/hr)
1	Lot 22 and 23 Lower King Rd	120 lots	0.8 trips per Dwelling for both AM and PM Peak	96
2	Lots 24 to 26 Lower King Rd	100 lots		80
4	East of Brewster Rd	-		
5	Harbour Road Residential area	20 lots		16
6	Wright Street	140 lots		112
8	Emu Point Residential Precinct	240 lots		192
9	Caravan Parks	-		-

Table 6: Peak hour direction trips

Cell	Location	Peak hour (veh/hr)	AM IN (25%	AM Out (75%)	PM IN (63%)	PM Out (37%)
1	Lot 22 and 23 Lower King Rd	96	24	72	60	36
2	Lots 24 to 26 Lower King Rd	80	20	60	50	30
4	East of Brewster Rd	-	-	-	-	-
5	Harbour Road Residential area	16	4	12	10	6

6	Wright Street	112	28	84	71	41
8	Emu Point Residential Precinct	192	48	144	121	71
9	Caravan Parks	-	-	-	-	-

4.3 Trip distribution and growth

Population growth has been derived from **Australian Bureau of Statistics (ABS) data**, and accounts for the **background traffic growth**, incorporating projected increases in travel demand to maintain consistency with future planning scenarios.

Trip generation and growth have been addressed using two key components:

1. **External-to-external trips**

These represent trips that pass through the study area without originating or terminating within it. Growth for these trips has been based on ABS data, applying an annual growth rate of 1.2 per cent per annum. to reflect regional traffic trends and ensure consistency with observed long-term patterns. **Table 7** shows background growth of the Emu Point Precinct.

Table 7: Background growth

Statistics	Census data for Albany Local			Growth rate per annum	2051 Growth
	2011	2016	2021	2016 to 2021 (5 years)	
Population	33,650	36,583	38,763	1.2%	31%
Dwellings	15,626	16,847	17,961	1.3%	34%

2. **Internal-to-external trips**

These are trips that originate within the study area and travel to destinations outside it. The distribution for these trips has been derived from the **existing calibrated Origin-Destination (OD) matrices**, which accurately represent current travel behavior. This approach ensures that internal trip patterns remain realistic while accommodating projected growth.

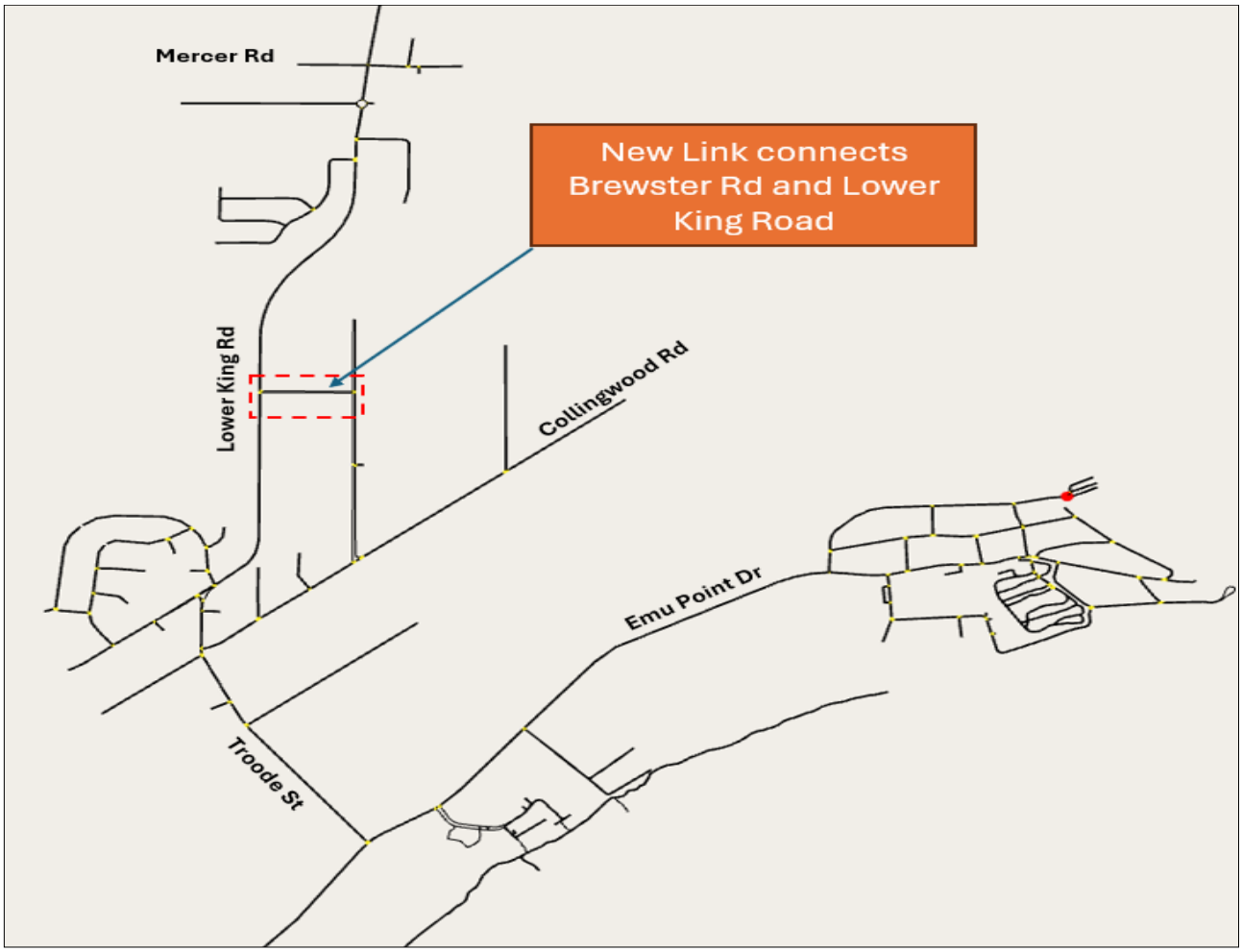
By combining ABS-based growth rates for external movements with calibrated OD matrices for internal trips, the model maintains a balance between observed conditions and future projections.

In the absence of origin-destination survey data, we have adopted the calibrated matrices. The EPPSP area has mostly residential and recreational land uses with very low internal to internal traffic movement, therefore, in the absence of OD survey data, we have adopted the internal-to-internal traffic movement directly from the furnessed calibrated Aimsun OD matrices.

4.4 Network changes

Figure 10 below shows a new link connection between Brewster Road and Lower King Road proposed in future. No other major road network changes have been proposed within EPPSP area.

Figure 10: Network changes



4.5 Network analysis

Link volume comparison

Table 8 and **Table 9** show the key road peak volume compared with 2051 volumes. It is noted all key roads are within capacity. The new connection between Brewster Road and Lower King Road will divert some traffic away from Ulster Road/Collingwood Road intersection. In the absence of a new connection, the existing Collingwood Road East will exceed-capacity.

Table 8: Link volumes AM volumes

#	Road	Section Location	Existing AM Peak		2051 AM Peak	
1	Lower King Road	South of Mercer	353 (NB)	805 (SB)	541 (NB)	939 (SB)
2	Mercer Road	East of Lower King Rd	264 (EB)	353 (WB)	341 (EB)	521 (WB)
	Lower King Road	South of Ulster Rd	290 (NB)	427 (SB)	504 (NB)	287 (SB)
3	Collingwood Road (West)	West of Lower King Rd	131 (EB)	214 (WB)	169 (EB)	327 (WB)
4	Collingwood Road East	East of Lower King Rd	127 (EB)	86 (WB)	75 (EB)	330 (WB)
5	Ulster Road	East of Lower King Rd	174 (EB)	507 (WB)	215 (EB)	679 (WB)
6	Emu Point Drive	East of Troode St	121 (EB)	115 (WB)	171 (EB)	265 (WB)
7	Golf Link Road	West of Troode St	108 (EB)	115 (WB)	140 (EB)	184 (WB)

Table 9: Link Volumes PM Volumes

#	Road	Section Location	Existing PM Peak		2051 PM Peak	
1	Lower King Road	South of Mercer	535 (NB)	466 (SB)	698 (NB)	639 (SB)
2	Mercer Road	East of Lower King Rd	288 (EB)	314 (WB)	420 (EB)	423 (WB)
3	Lower King Road	South of Ulster Rd	346 (NB)	304 (SB)	396 (NB)	436 (SB)
4	Collingwood Road (West)	West of Lower King Rd	156 (EB)	144 (WB)	222 (EB)	194 (WB)
5	Collingwood Road East	East of Lower King Rd	70 (EB)	83 (WB)	148 (EB)	107 (WB)
6	Ulster Road	East of Lower King Rd	315 (EB)	306 (WB)	447 (EB)	387 (WB)
7	Emu Point Drive	East of Troode St	128 (EB)	124 (WB)	252 (EB)	207 (WB)

8	Golf Link Road	West of Troode St	125 (EB)	104 (WB)	190 (EB)	141 (WB)

Volume capacity ratio plots

The volume to capacity (V/C) ratio is used to understand road capacities and conditions as well as measuring the quality of travel. The V/C ratio is described in terms of the ratio of demand or arrival flow to capacity, where a V/C ratio larger than one (1) represents over capacity or over saturation. The proposed road capacity outlines in **Table 10** below and sourced from *Austroads Guide to Traffic Management Part 3: Transport Study and Analysis Methods (2020) Table 6.1 – Typical mid-block capacity with interrupted flow per lane*.

Table 10: Volume capacity ratio plots

Modelling Road	Peak hour (veh/hr)	AM IN (25%)	AM Out (75%)
Divided Arterials	Primary Distributor	Primary Distributor	1,000
	District Distributor (A)	Integrator A	
Undivided Arterials	Regional Distributor	Integrator B	900
	Local Distributor (B)		
Residential	Local Distributor	Neighbourhood Connector	900
	Access Road	Access Street	900

Source: *Austroads' Guide to Traffic Management Part 3: Transport Study and Analysis Methods (2020) Table 6.1 – Typical mid-block capacities with interrupted flow per lane.*

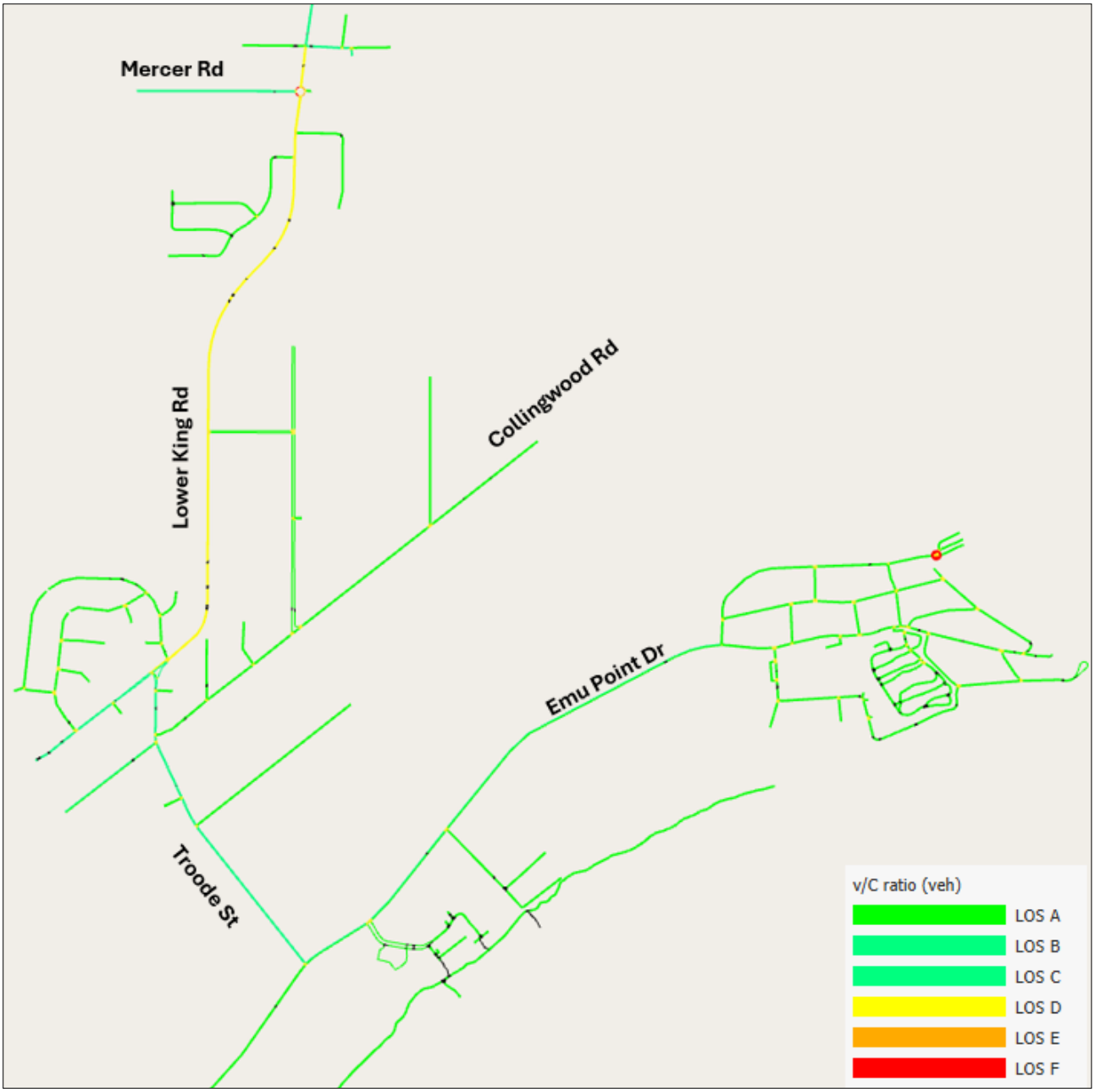
Figure 11 and Figure 12 show the 2051 volume to capacity ratio for both AM and PM peak periods. It shows that the Lower King Road section between Bayonet Head to the proposed E-W new connection exceeds the road capacity. The Emu Point area and other key roads operate at LOS C or better.

It is important to note that the V/C plots as based on both light and heavy vehicles. Through the conversion of heavy vehicles equivalent to passenger car units the v/c ratio will further deteriorate.

Figure 11: 2051 Volume capacity ratio plots – 2051 AM Peak



Figure 12: 2051 Volume capacity ratio plots – 2051 PM Peak



4.6 SIDRA analysis

SIDRA analysis was undertaken using SIDRA version 9.1. SIDRA is an intersection modelling tool commonly used to access intersection performance. The SIDRA outputs are presented in the form of Degree of Saturation (DOS), Level of Service (LoS), Average Delay and 95th percentile Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of arrival traffic flow to the capacity of the approach during the same period. The DOS ranges from close to zero for varied flow up to one for saturated flow or capacity.
- Level of Service (LoS) is the qualitative measure describing operational conditions with a traffic street and the perception by motorists and/or passengers. In general, LoS ranges from LoS A to LoS F with LoS A representing the best operating condition (i.e. free flow) and LoS F represents the worst.

The Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different Level of Service can generally be described as shown in table 11.

Table 11: Level of Service

Level of Service	Description	Unsignalised Intersection
A	Free-flow Operations	≤10 sec
B	Reasonable free-flow operations	10-15 sec
C	At or near free-flow operations	15-25 sec
D	Decreasing free-flow levels	25-35 sec
E	Operations at capacity	35-50 sec
F	A breakdown in vehicular flow (worst condition)	≥50 sec

The SIDRA intersection model was coded with references to the current *Main Roads Operational Modelling Guidelines*. **Appendix B** provides comprehensive SIDRA analysis output.

The key intersections identified in the EPPSP are listed below:

1. Golf Link Road / Emu Point Drive
2. Lower King Road / Collingwood Road West and East
3. Ulster Road / Lower King Road / Boronia Avenue
4. Lower King Road / New EW Link Connection.

4.6.1 Golf Link Road / Emu Point Drive

Figure 13 below shows the existing layout of Golf Link Road / Emu Point Drive.

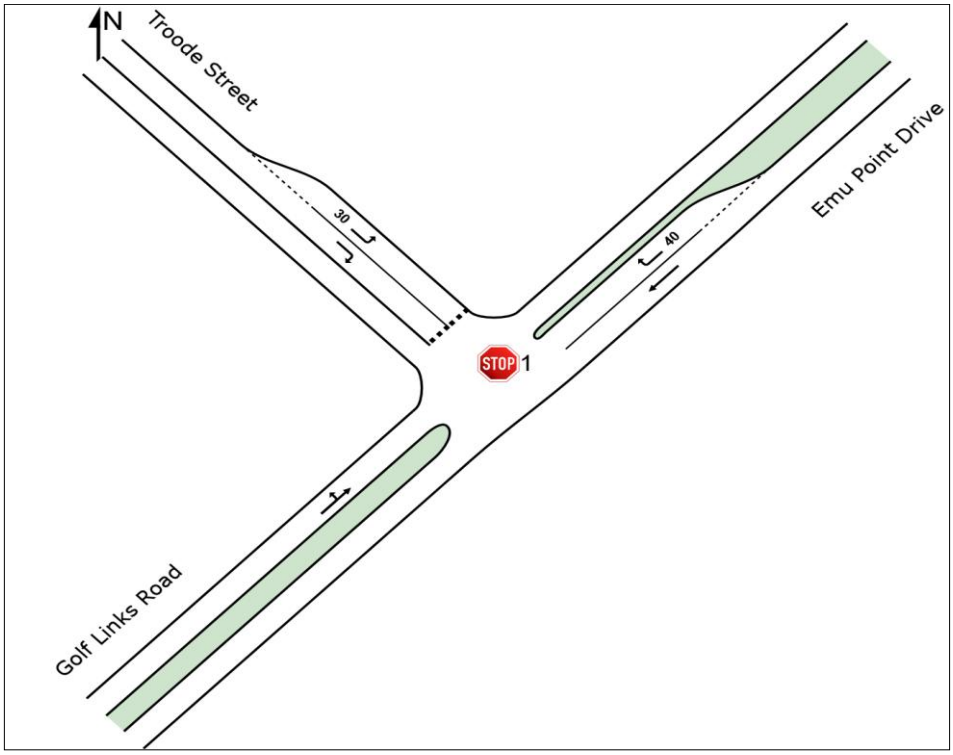


Figure 13: Existing layout of the Golf Link Road / Emu Point Drive

Table 11 summarizes the intersection performance of Golf Link Road / Emu Point Drive / Troode Street.

Table 12: Existing intersection analysis for Golf Link Road/Emu Point Drive/ Troode Street

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Golf Link Rd/Emu Point Dr/Troode Str	E	0.07	6.9	A	0.03	6.9	A
	N	0.12	7.1	A	0.10	6.9	A
	W	0.01	6.5	A	0.08	6.7	A

Table 13: 2051 intersection analysis for Golf Link Road/Emu Point Drive/ Troode Street

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Golf Link Rd/Emu Point Dr/Troode Str	E	0.16	7.0	A	0.13	7.1	A
	N	0.23	9.0	A	0.17	8.7	A
	W	0.83	6.8	A	0.12	6.6	A

Table 11 and 12 show the traffic performance for the Golf link road/Emu Point Drive and Troode street intersection during AM and PM peak periods for existing and future scenario, broken down by approach (south, east, north). Key metrics include:

- **DOS (Degree of Saturation)**: Indicates how much of the intersection capacity is being used. All values are well below 1.0, meaning the intersection operates efficiently.
- **Avg. Delay (seconds)**: Average delay per vehicle. Delays are very low, ranging from 3.5 to 10 seconds.
- **LOS (Level of Service)**: Rated A for all approaches and both peak periods, which represents excellent operating conditions with minimal delay.

4.6.2 Lower King Road / Collingwood Road West and East

Figure 14 below shows the existing layout of Lower King Road and Collingwood Road west and east. A network has been developed for these two intersections to get a holistic view of the effect of traffic on this area.

Figure 14: Existing layout of the Lower King Road and Collingwood Road West and East

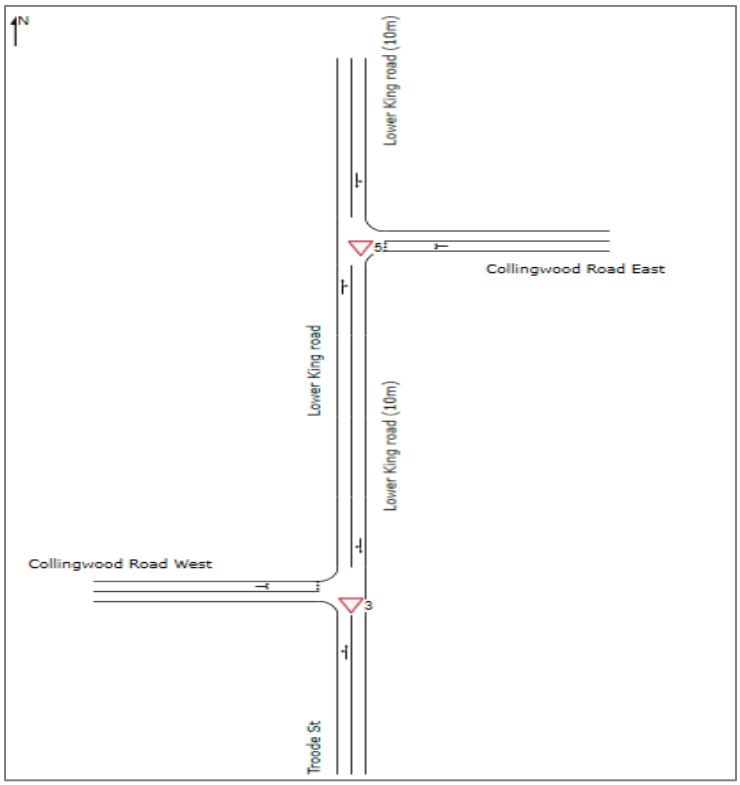


Table 14: Existing intersection analysis for Lower King Road/Collingwood Road East

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Collingwood Rd East	S	0.174	4.3	A	0.19	3.5	A
	E	0.148	10	A	0.122	9	A
	N	0.253	5.7	A	0.178	5.6	A

Table 13 above the traffic performance for the Lower King Road/Collingwood Road East intersection during AM and PM peak periods, broken down by approach (south, east, north). Key metrics include:

- **DOS (Degree of Saturation):** Indicates how much of the intersection capacity is being used. All values are well below 1.0, meaning the intersection operates efficiently.
- **Avg. Delay (seconds):** Average delay per vehicle. Delays are very low, ranging from 3.5 to 10 seconds.
- **LOS (Level of Service):** Rated A for all approaches and both peak periods, which represents excellent operating conditions with minimal delay.

The intersection performs very well during both AM and PM peaks, with low saturation, minimal delays, and the highest LOS rating.

Table 15: 2051 intersection analysis for Lower King Road/Collingwood Road East

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Collingwood Rd East	S	0.287	3.5	A	0.323	4.6	A
	E	0.566	15.9	C	0.174	13.3	B
	N	0.246	5.7	A	0.272	5.7	A

Table 14 presents intersection performance for the Lower King Road/Collingwood Road East intersection during AM and PM peak periods in 2051, by approach (south, east, north). Key indicators include:

- **DOS (Degree of Saturation):** Indicates how much of the intersection capacity is being used. All values are well below 1.0, meaning the intersection operates efficiently.
- **Avg. Delay (seconds):** Average delay per vehicle. Delays are in average range from 3.5 seconds to 15.9 seconds, which means that intersection performs well.
- **LOS (Level of Service):** Rated A for all approaches and both peak periods except east approach, which represents good operating conditions with minor delay.

In summary, the intersection generally performs well, however, the east approach shows moderate delays and reduced LOS compared to other directions. The intersection spacing between both intersections is, however, around 10m, which is contrary to Liveable

Neighbourhoods guidelines (Table 5- Junction Spacing), that require a Neighbourhood Connector Road should reflect a spacing of at least 40m (centerline to centerline) to avoid overlapping right turns. It is recommended to realign these intersections to create a four-leg intersection to improve safety.

Table 16: Existing intersection analysis for Lower King Road/Collingwood Road West

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Collingwood Rd West	S	0.097	5.8	A	0.107	5.7	A
	E	0.239	2.8	A	0.187	2.9	A
	N	0.108	9.5	A	0.126	7.9	A

Table 15 above shows the existing performance for the Lower King Road/Collingwood Road West intersection during AM and PM peak periods, broken down by approach (south, north, west). Key metrics include:

- **DOS (Degree of Saturation)**: Indicates how much of the intersection capacity is used. All values are very low (0.097–0.239 AM, 0.107–0.187 PM), meaning the intersection operates well below capacity.
- **Avg. Delay (seconds)**: Average delay per vehicle is minimal, ranging from 2.8 to 9.5 seconds for AM peak periods and 2.9 to 7.9 seconds for PM peak periods.
- **LOS (Level of Service)**: All approaches achieve LOS A, which represents excellent operating conditions.

The intersection operates at LOS B or better in both AM and PM peak periods.

Table 17: 2051 intersection analysis for Lower King Road/Collingwood Road West

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Collingwood Rd West	S	0.226	5.7	A	0.19	5.7	A
	E	0.397	4.8	A	0.323	3.9	A
	N	0.190	14.8	B	0.249	13.1	B

Table 16 above shows the 2051 intersection analysis for Lower King Road/Collingwood Road West during AM and PM peak periods, broken down by approach (south, north, west). Key metrics include:

- **DOS (Degree of Saturation)**: All values remain below 0.8, indicating the intersection operates within capacity.
- **Avg. Delay (seconds)**: South and north approaches have low delays (3.9–5.7 sec), while the west approach experiences significantly higher delays (14.8 sec AM, 13.1 sec PM).
- **LOS (Level of Service)**: All the approach operates at LoS B or better.

The intersection generally performs well in 2051.

4.6.3 Ulster Road/Lower King Road/ Boronia Avenue

The **Figure 15** shows the existing layout of Lower King Road, Ulster Road, and Boronia Avenue. A network has been developed for these intersections to get a holistic view regarding the effect of traffic on this area.

Figure 15: existing layout of Lower King Road, Ulster Road, and Boronia Avenue

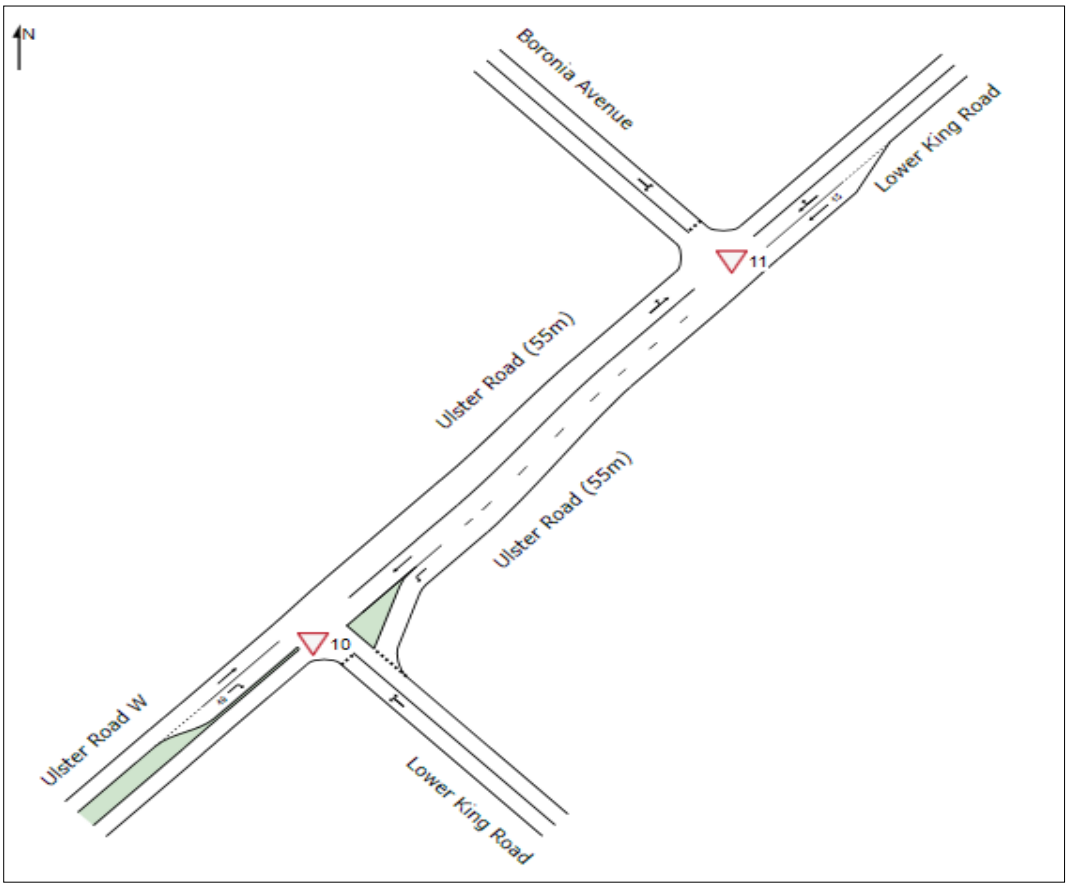


Table 18: Existing intersection analysis for Ulster Road/ Lower King Road

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Ulster Road	SE	0.828	33.8	D	0.749	23	C
	NE	0.262	4.5	A	0.163	4.6	A
	SW	0.066	8	A	0.069	6.8	A

Table 17 shows the existing intersection analysis for Ulster Road/Lower King Road during AM and PM peak periods, broken down by approach (SE, NE, SW). Key metrics include:

- **DOS (Degree of Saturation)**: The Lower King Road approach operates close to capacity and has the DOS 0.828 for AM peak periods and 0.749 for PM peak periods.
- **Avg. Delay (seconds)**: Lower King Road approach experiences significant delays (33.8 sec AM, 23 sec PM) due to the heavy movement on Ulster Road, the Lower King Road right turning movement is provided with minimal gaps.
- **LOS (Level of Service)**: The Lower King Road approach operates at an acceptable level.

The intersection generally performs well for the NE and SW approaches, but the SE approach shows high congestion and delays, suggesting a need for improvement in the near future.
The following recommendations can be considered to improve the condition of the intersection:

1. Consider introducing a roundabout treatment. This will help manage conflicting movements and reduce delays for the SE approach.
2. Add a dedicated left-turn or right-turn lane for the SE approach to separate turning traffic from through movements, reducing queue lengths and delays.

Table 19: 2051 intersection analysis for Ulster Road/ Lower King Road

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Ulster Road	SE	1.22	232.5	F	0.749	23	C
	NE	0.257	4.6	A	0.163	4.6	A
	SW	0.089	8.2	A	0.13	6.8	A

Table 18 presents projected traffic performance for the Ulster Road/Lower King Road intersection for 2051 during AM and PM peak periods, broken down by approach (SE, NE, SW). Key metrics include:

- **DOS (Degree of Saturation)**: Indicates how much of the intersection capacity is used. The SE approach in AM peak is DOS = 1.22, meaning it is overcapacity, while the PM peak is 0.749 (still high).
- **Avg. Delay (seconds)**: The SE approach experiences extreme delays in the AM peak (232.5 sec).
- **LOS (Level of Service)**: SE approach drops to LOS F in the AM peak (failing) and LOS C at the PM peak (moderate congestion). NE and SW maintain LOS A, indicating excellent conditions.

By 2051, the SE approach becomes a major bottleneck during AM peak, operating far beyond capacity with severe delays and failing LOS. PM peak also shows moderate congestion for SE.

Mitigation measure:

Figure 16 below shows the new indicative layout of the Ulster Road and Lower King Road Intersection.

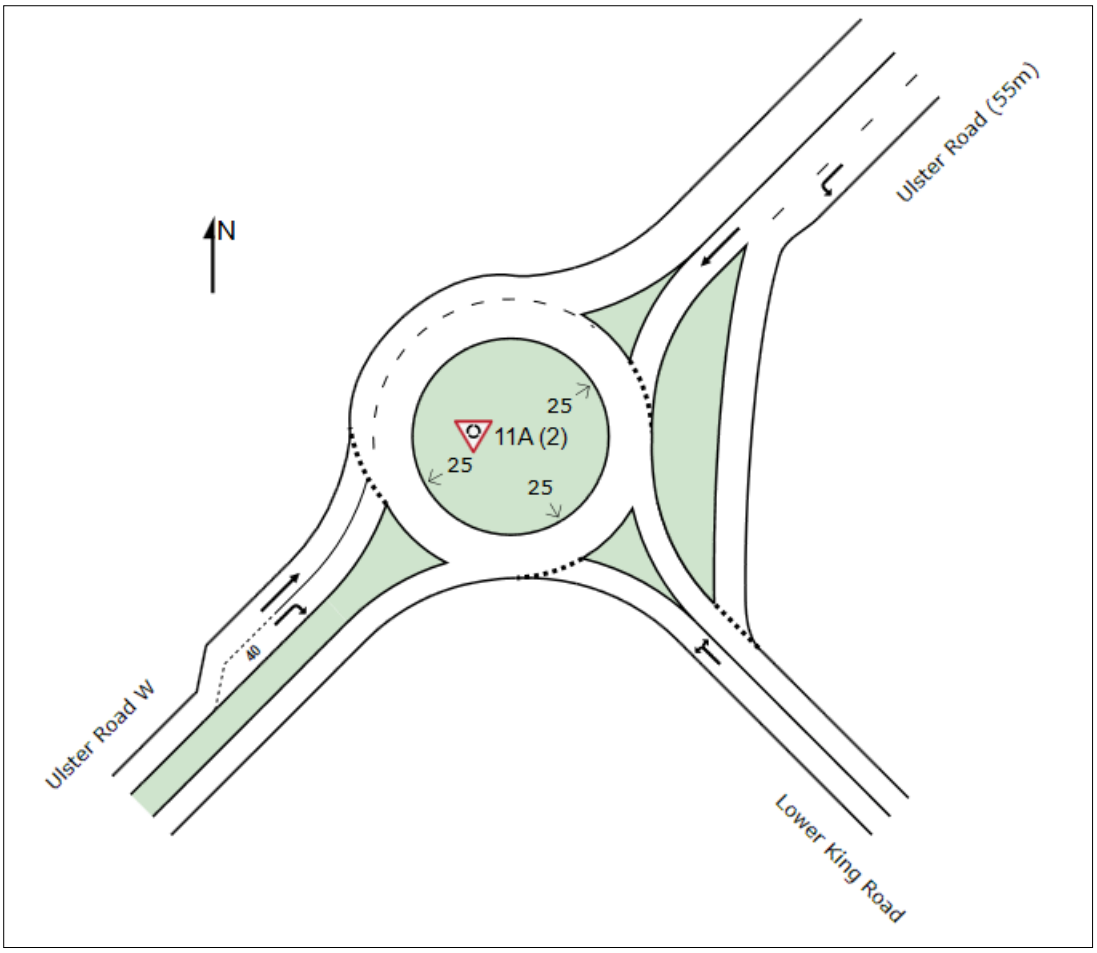


Figure 16: New indicative layout of the Ulster Road and Lower King Road Intersection

Table 19 summarises results obtained from introducing a roundabout at Ulster Road and the Lower King Road, which improves the LOS significantly from F to B.

Table 20: 2051 intersection analysis for Ulster Road/ Lower King Road with roundabout

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Rd/Ulster Road	SE	0.669	18.5	B	0.406	11.6	B
	NE	0.340	4.6	A	0.209	3.5	A
	SW	0.089	8.2	A	0.224	11.3	B

The analysis shows an improved Level of Service (LOS) along with reduced delays. It is important, however, to note that the new EW Link (connecting Brewster Road and Lower King Road) that is proposed is critical to the performance of this intersection as it has a significant impact on the volumes. The absence of EW Link will attract more traffic to the Ulster Road/Lower King Road intersection. Without the EW link, a new assessment is required.

Table 21: Existing intersection analysis for Ulster Road/ Boronia Avenue

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Ulster Road/ Boronia Avenue	NE	0.228	5.8	A	0.134	10	A
	NW	0.039	21	C	0.049	17.9	C
	SW	0.181	4.1	A	0.277	4.1	A

Table 20 shows current traffic performance at the Ulster Road/Boronia Avenue intersection during AM and PM peak periods, broken down by approach (NE, NW, SW). Key metrics include:

- **DOS (Degree of Saturation)**: All approaches operate well below capacity (values range from 0.039 to 0.277), indicating that the intersection is not overloaded.
- **Avg. Delay (seconds)**: NE and SW approaches reflect low delays (4.1–10 sec), while NW experiences higher delays (21 sec AM, 17.9 sec PM).
- **LOS (Level of Service)**: NE and SW maintain LOS A (excellent) at both peaks. NW drops to LOS C in both AM and PM peaks, reflecting moderate congestion.

The intersection generally performs well, but the NW approach shows noticeable delays and reduced LOS compared to other directions, but it is satisfactory as per the guidelines.

Table 22: 2051 intersection analysis for Ulster Road/ Boronia Avenue

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Ulster Road/ Boronia Avenue	NE	0.19	5.9	A	0.154	6.9	A
	NW	0.029	18	C	0.051	20.9	C
	SW	0.198	4.1	A	0.293	4.1	A

Table 21 presents projected traffic performance for the Ulster Road/Boronia Avenue intersection in 2051 during AM and PM peak periods, broken down by approach (NE, NW, SW). Key metrics include:

- **DOS (Degree of Saturation)**: All approaches remain well below capacity (0.029–0.293),
- **Avg. Delay (seconds)**: NE and SW approaches have very low delays (4.1–6.9 sec), maintaining efficient flow. The NW approach experiences slight delays (18 sec AM, 20.9 sec PM), which is consistent with its lower priority movements.
- **LOS (Level of Service)**: NE and SW maintain LOS A at both peaks, showing excellent performance. NW remains at LOS C in both AM and PM peaks, indicating moderate congestion.

By 2051, the intersection continues to operate efficiently overall.

The crash data suggests that Ulster Road has recorded more crashes compared to similar roads and intersections within the EPPSP area. The proposed EW Link connection and roundabout will improve the safety of this intersection.

4.6.4 Lower King Road / New EW Link Connection

The **Figure 17** shows the proposed layout of Lower King Road and the new EW Link connection.

Figure 17 : Indicative layout of Lower King Road and the new EW Link Connection

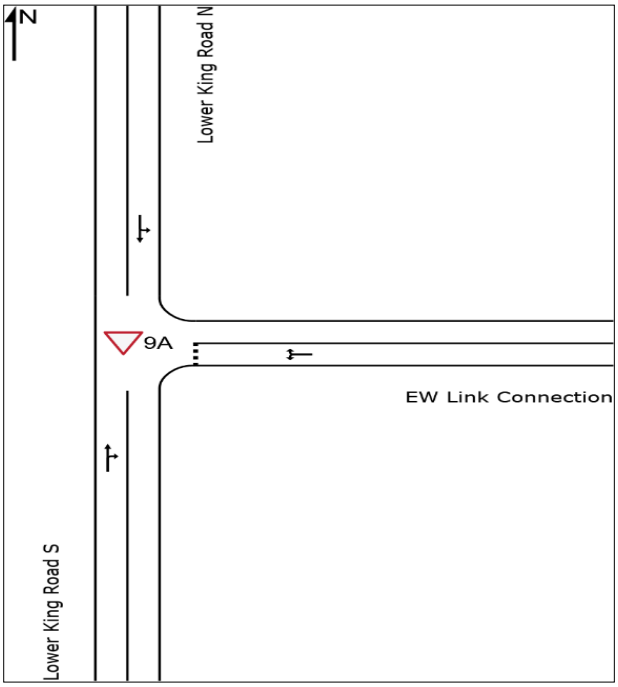


Table 23: 2051 intersection analysis for Lower King Road and the new EW Link connection

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Road/ New EW Link Connection	S	0.252	14	B	0.32	9.3	A
	E	0.605	32.5	D	0.525	24.3	C
	N	0.521	5.8	A	0.352	5.7	A

Table 22 shows projected traffic performance for the intersection during **AM and PM peak periods**, broken down by approach (south, east, north). Key metrics include:

- **DOS (Degree of Saturation)**: All approaches remain below 1.0, meaning the intersection operates within capacity. The eastern approach has the highest DOS (0.605 AM, 0.525 PM), indicating heavier demand compared with other directions.
- **Avg. Delay (seconds)**: eastern approach experiences moderate delays (32.5 sec AM, 24.3 sec PM). The southern approach has moderate delay in AM (14 sec) but improves in

PM (9.3 sec). The northern approach maintains very low delays (around 5.8 sec AM, 5.7 sec PM).

- **LOS (Level of Service)**: The eastern approach drops to **LOS D in the AM peak** and **LOS C in the PM peak**, showing some congestion. South approach is **LOS B in AM** and improves to **A in PM**. The northern approach remains **LOS A** at both peaks, indicating excellent performance.

By 2051, the intersection generally operates at LOS D or better.

As this is a new intersection that has not been constructed, intersection warrants were reviewed as per Main Roads WA Supplement to Austroads Guide to Traffic Management. The following arrangements are recommended;

1. Right Turn Assessment: A simple right turn treatment has been recommended as per the Main Roads WA Supplement to Austroads Guide to Traffic Management.

2. Left Turn Assessment: A channelised offset left lane has been recommended as per the Main Roads WA Supplement to Austroads Guide to Traffic Management.

Figure 18 below shows the proposed layout according to the Austroads guidelines, the length of the deceleration lane (left lane) should be 100 metres long for safety. The intersection has been analysed again with the assessment results, and the following results have been obtained.

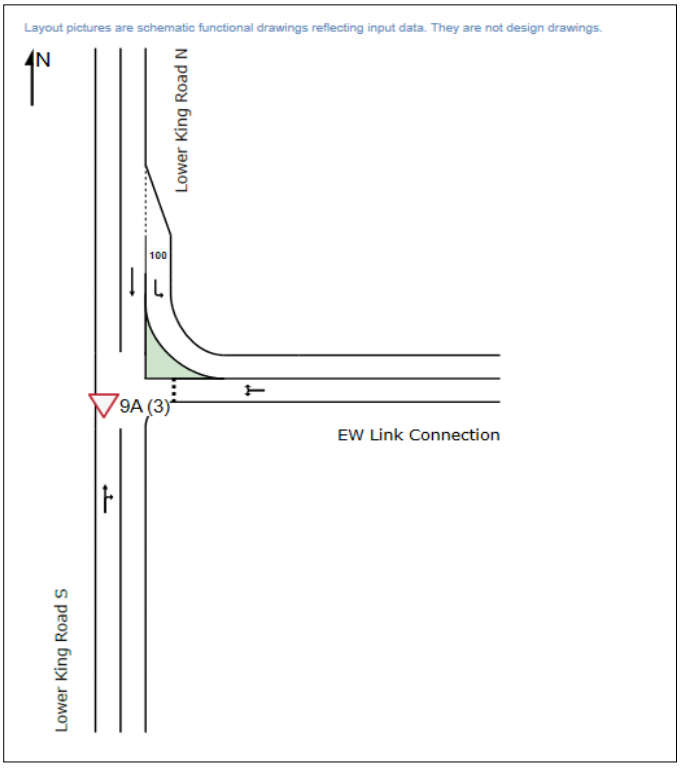


Figure 18: Final Indicative layout of the Ulster Road and Lower King Road Intersection

SIDRA analysis summarised in **Table 23** shows the following results after introducing channelised left lane. The degree of saturation has improved and delays have been reduced. It is

important to note that this new link is significantly impacting traffic downstream. In the absence of this link the intersections south will experience worse conditions in terms of degree of saturation, average delays and level of service.

Table 24: 2051 intersection analysis for Lower King Road and the new EW link connection (With channelised left turn)

Intersection	Approach	AM Peak			PM Peak		
		DOS	Avg. Delay	LOS	DOS	Avg. Delay	LOS
Lower King Road/ New EW Link Connection	S	0.247	9.3	A	0.319	7.9	A
	E	0.490	25.2	D	0.486	22.4	C
	N	0.358	5.7	A	0.294	5.7	A

5. Summary

The Emu Point Precinct Traffic Study provides a robust and data-driven foundation for strategic transport planning in the Albany region. Through detailed modelling using Aimsun and SIDRA platforms, the study evaluates both current and projected traffic conditions up to the year 2051. Key findings include:

Base model development:

Aimsun model was developed, and the model was calibrated in accordance with Main Roads WA Operational Modelling Guidelines.

Current conditions:

- The existing road network generally operates within the capacity across the network, with all the intersections achieving an acceptable level of service.
- Some areas, such as the Ulster Road/Lower King Road intersection, show signs of congestion during peak periods.

Future projections:

- Land use changes and population growth were incorporated to forecast traffic demand for 2051. A conservative 2% annual growth rate was adopted for regional growth.
- Future land use trips were calculated using WAPC guidelines.
- A new east-west link between Brewster and lower King Road is proposed. This is critical to alleviate pressure on Lower King Road and other key intersection along Lower King Road.
- The volume to capacity ratios plots indicates that without the new east-west link, Lower King Road will exceed road capacity by 2051.
- In the absence of an east-west link, the Ulster Road/Lower King Road and Lower King Road/Collingwood Road intersections are expected to experience longer delays and may fail.

Intersection analysis:

Ulster Road/Lower King Road: the existing layout operates at LOS F for the projected 2051 AM peak. As part of mitigation measures, a roundabout layout was assessed. The results show the new intersection operates at LOS B. Ulster Road recorded the highest number of crashes in the Emu Point PSP area; the roundabout will improve the safety and operation of the intersection.

Lower King Road/New EW Link: MRWA turn warrant assessment was conducted to identify the intersection turn treatment. A channelised left turn lane was adopted, and the intersection operates at an acceptable level of service.

Collingwood Road East and West: The existing layout will operate at an acceptable level in future. However, it is recommended to merge into a 4-leg intersection due to safety and spacing issues.

All the other intersections operate at LOS C or better.