Whanganui District Council

WHANGANUI DISTRICT STRATEGIC TRANSPORT MODEL

DUBLIN STREET BRIDGE REMOVAL SCENARIO MODELLING REPORT

2 FEBRUARY 2024

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Whanganui District Council

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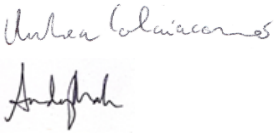
Prepared by:	Andrea Colaiacomo, Audrey Mak	February 2024	
Reviewed by:	Alex Gu	February 2024	
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1 INTRODUCTION

Whanganui District Council (WDC) is investigating the options regarding the retention, disposal, or replacement of the bridge at Dublin Street. The existing bridge at Dublin Street, which spans 300m and carries a significant Average Annual Daily Traffic (AADT) volume of around 20,000, presents a primary need for a replacement bridge business case. WDC has engaged WSP to develop and use the Whanganui District Strategic Transport Model (WDSTM) to investigate the impact of the removal of the Dublin Street Bridge on the current and future traffic demands and support the development of a business case that will consider the costs and benefits of alternative options.

This report outlines the development of the future year scenarios in WDSTM and the results from the model.

2 WHANGANUI DISTRICT STRATEGIC TRANSPORT MODEL

The WDSTM is a three-step model including trip generation, trip distribution and traffic assignment. It covers the entire residential area of Whanganui with a buffer of low-density areas (see Figure 2.1) and has four external zones representing State Highway 3, State Highway 4, the Great North Road, and Papaiti Road. Four time periods are modelled: AM peak (7 – 9 am), inter-peak (9 am – 3 pm), PM peak (3 – 6 pm), and off-peak (6 pm – 7 am). The base year model was calibrated and validated to represent conditions in 2023. For more details on the WDSTM, please refer to the Whanganui District Council Strategic Transport Model Development Methodology, Calibration and Validation Report (January 2024).

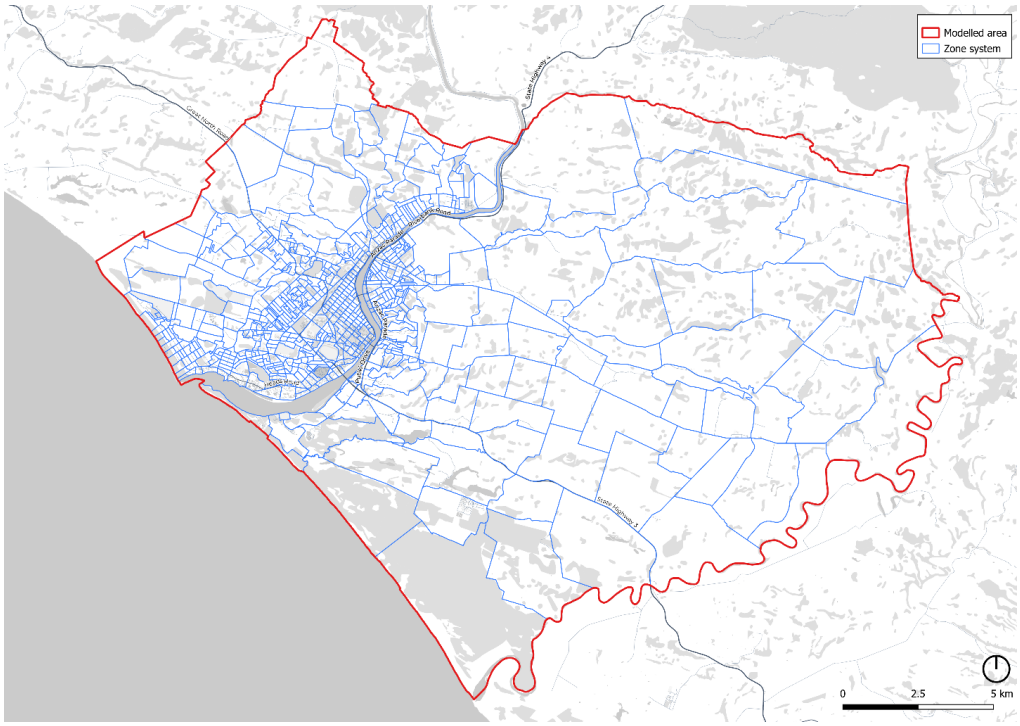

Figure 2.1 The zone system and modelled area

3 MODEL RUN LIST

Three years were modelled in the WDSTM: 2023, 2039 and 2054. The 2023 base year model was calibrated and validated to represent existing conditions, and 2039 and 2054 were selected as the horizon years. The scenarios modelled in each of the horizon years were with, and without the Dublin Street Bridge (see Table 3.1).

Table 3.1 Summary of modelled scenarios

SCENARIO	YEAR	DEMOGRAPHICS	NETWORK
Base year 2023	2023	2023 Base	2023 Base
Base 2039	2039	2039 Base	2023 Base
Without Dublin St Bridge 2039	2039	2039 Base	2023 without Dublin Street Bridge
Base 2054	2054	2054 Base	2023 Base
Without Dublin St Bridge 2054	2054	2054 Base	2023 without Dublin Street Bridge

4 FUTURE YEAR DEMOGRAPHICS

4.1 OVERVIEW

The 2039 Base and 2054 Base demographics were developed based on assumptions provided by WDC, including:

- Total projected population and employment in Whanganui for 2034 and 2054, with 2039 totals interpolated between 2034 and 2054 (see Table 4.1),
- The Springvale and North West population growth areas being completed by 2034, and
- Concentration of employment growth in areas of Castlecliff, Gonville, Whanganui East and Aramoho.
- Population and employment totals for all other modelled zones were factored by a global rate to match the projected totals.

Table 4.1 Summary of total population and employment by year

YEAR	POPULATION (%GROWTH FROM 2023)	EMPLOYMENT (%GROWTH FROM 2023)	SOURCE
2023	46,305	21,121	2018 NZ Census and business demographics statistics scaled using Environment Scan 2023, WDC
2034	52,981(14%)	24,382 (15%)	Environment Scan 2023, WDC
2039	54,740 (18%)	25,000 (18%)	Interpolated
2054	60,016 (30%)	26,855 (27%)	WDC projection

4.2 POPULATION

Two areas within Whanganui have been identified for higher population growth: the Springvale Urban and the North West Growth Areas (see Figure 4.1). The population growth in these areas were based on the number of new dwellings added and were sourced from the Development Contributions Policy published by WDC in 2021. It was assumed these new dwellings would be completed by 2034 and that the remaining population growth would be applied proportionately to the rest of the modelled area (see Table 4.2). Similarly, population growth from 2034 onwards is applied proportionately across the modelled area with no special treatment of the growth areas.

Total population by zone in 2023, 2039 and 2054 are shown in Figure 4.2, Figure 4.3 and Figure 4.4 respectively.

Table 4.2 Total population by area

AREA	2023	2034	2039	2054
Springvale Urban	465	2,151*	2,223	2,437
North West	1,189	1,688**	1,744	1,913
Rest of Model	44,651	49,142	50,773	55,666
All	46,305	52,981	54,740	60,016

* Additional 675 dwellings, Development Contributions Policy 2021

** Additional 208 dwellings, Development Contributions Policy 2021

Figure 4.1 Population growth areas

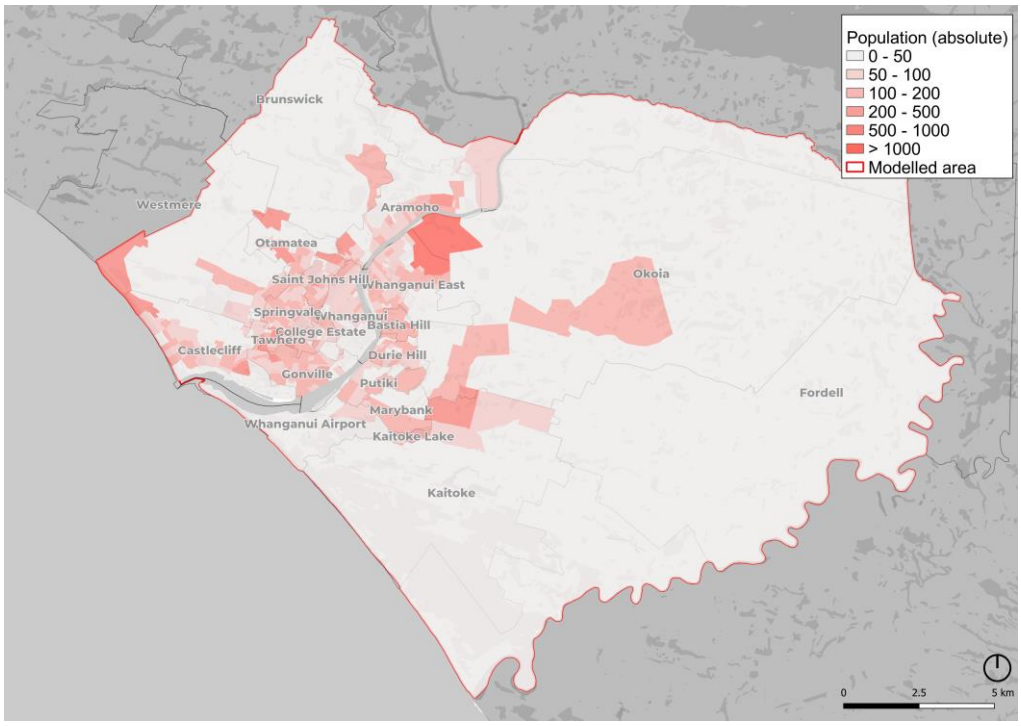

Figure 4.2 2023 population

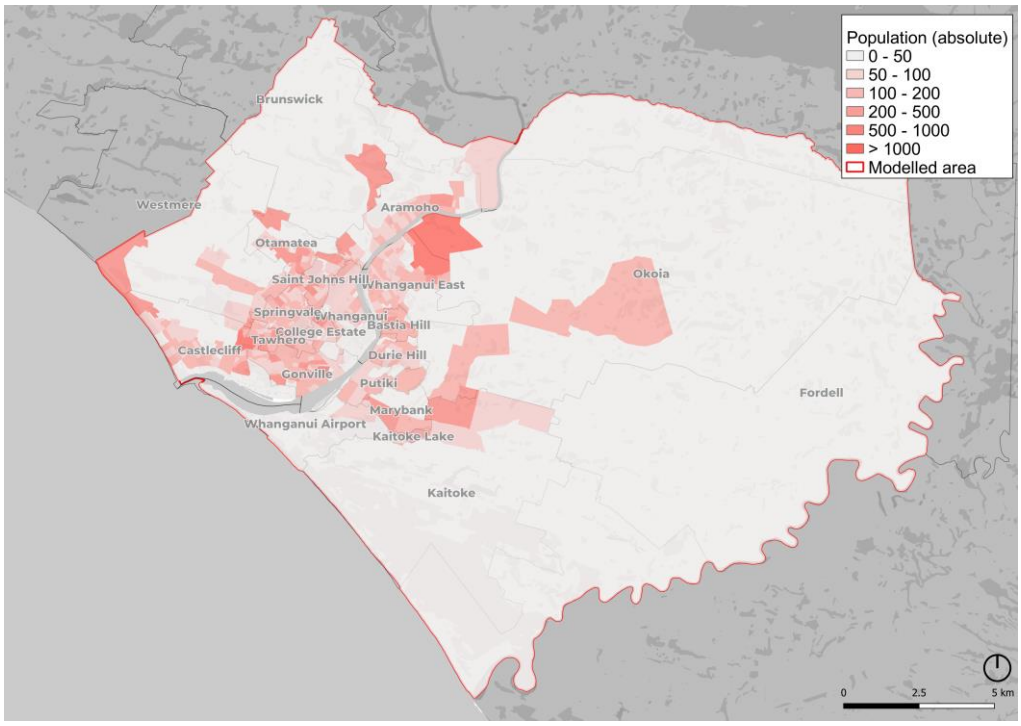

Figure 4.3 2039 population

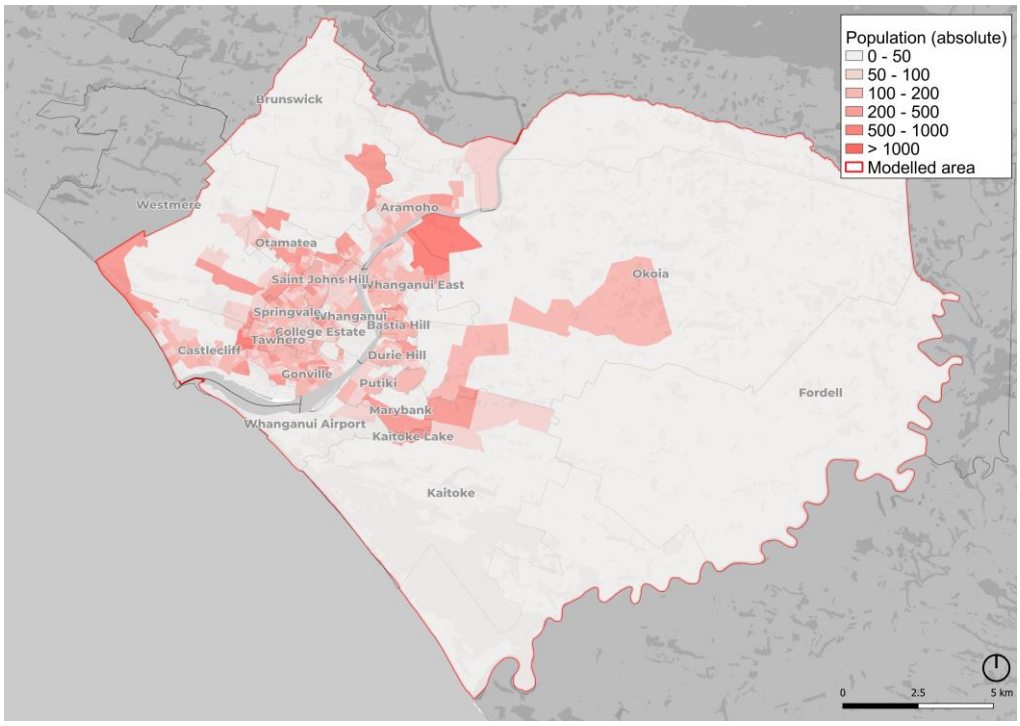

Figure 4.4 2054 population

4.3 EMPLOYMENT

Five areas within Whanganui were identified for higher employment growth (see Figure 4.5). WDC specified 90% of the employment growth would be directed to these areas, with the remaining 10% applied proportionately to the rest of the model (see Table 4.3).

Total employment by zone in 2023, 2039 and 2054 are shown in Figure 4.6, Figure 4.7 and Figure 4.8 respectively).

Table 4.3 Total employment by area

AREA	SHARE OF GROWTH (AFTER 2023)	2023	2034	2039	2054
Castlecliff South	30%	3,176	4,154	4,340	4,896
Gonville	25%	3,228	4,043	4,198	4,662
Castlecliff West	30%	58	1,036	1,222	1,778
Aramoho	2.5%	351	432	448	494
Whanganui East	2.5%	54	136	151	198
Rest of Model	10%	14,254	14,581	14,641	14,827
All	100%	21,121	24,382	25,000	26,855

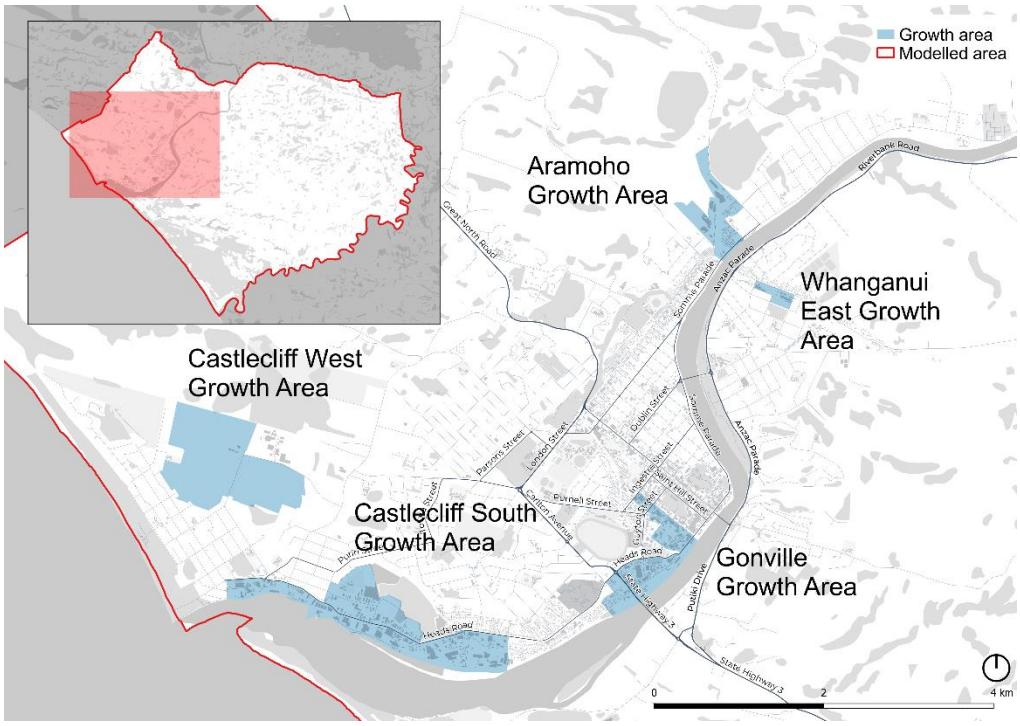

Figure 4.5 Employment growth areas

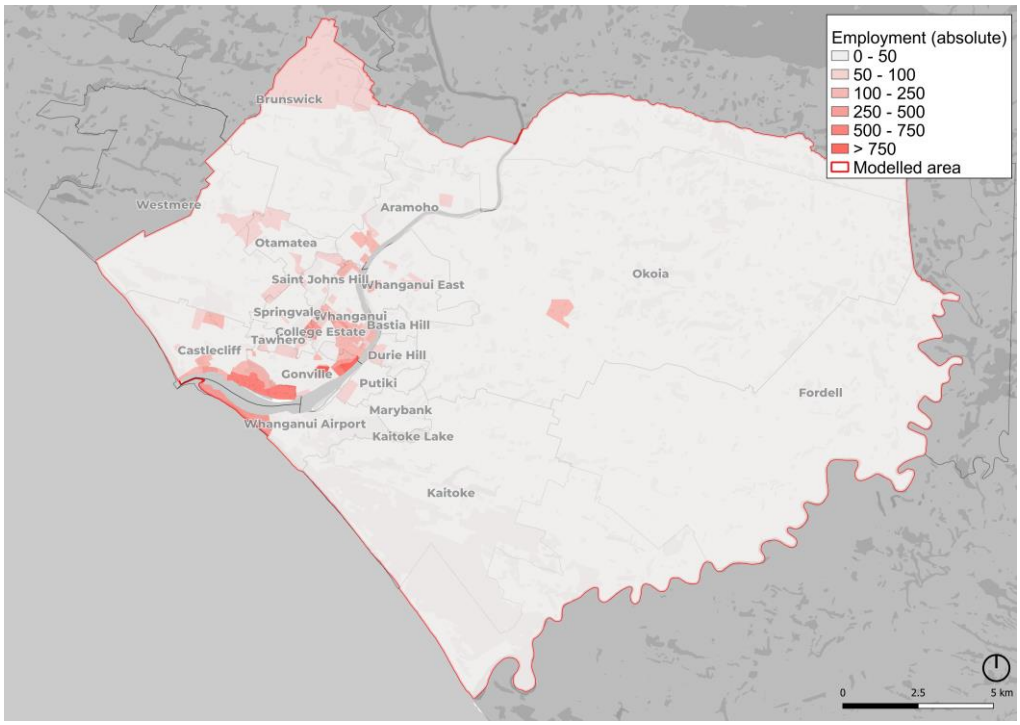

Figure 4.6 2023 employment

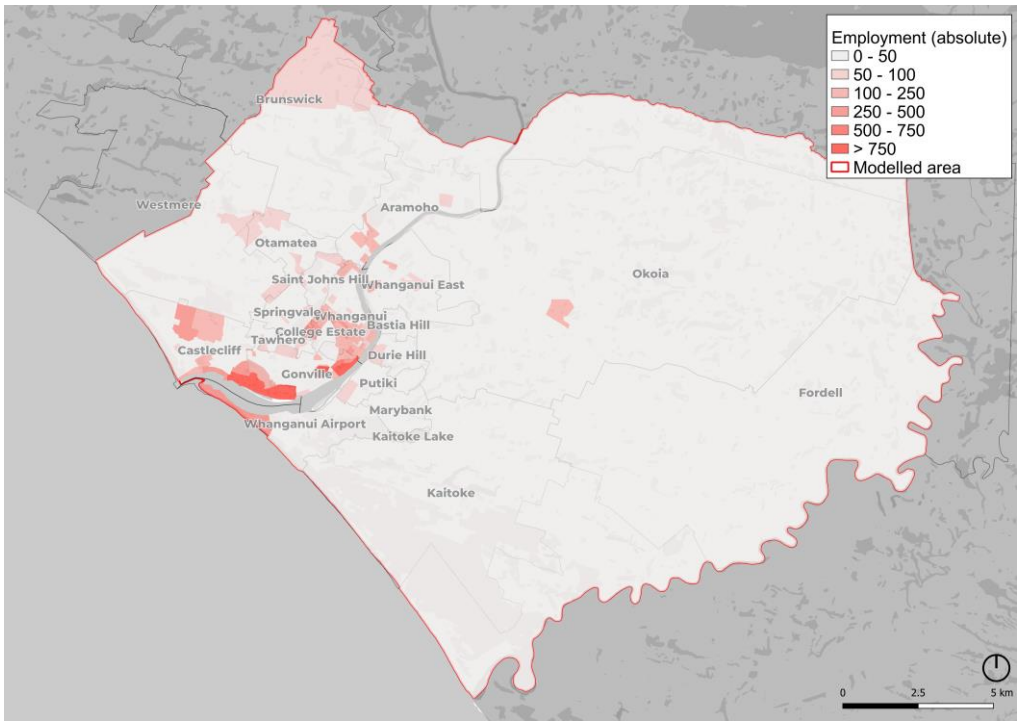

Figure 4.7 2039 employment

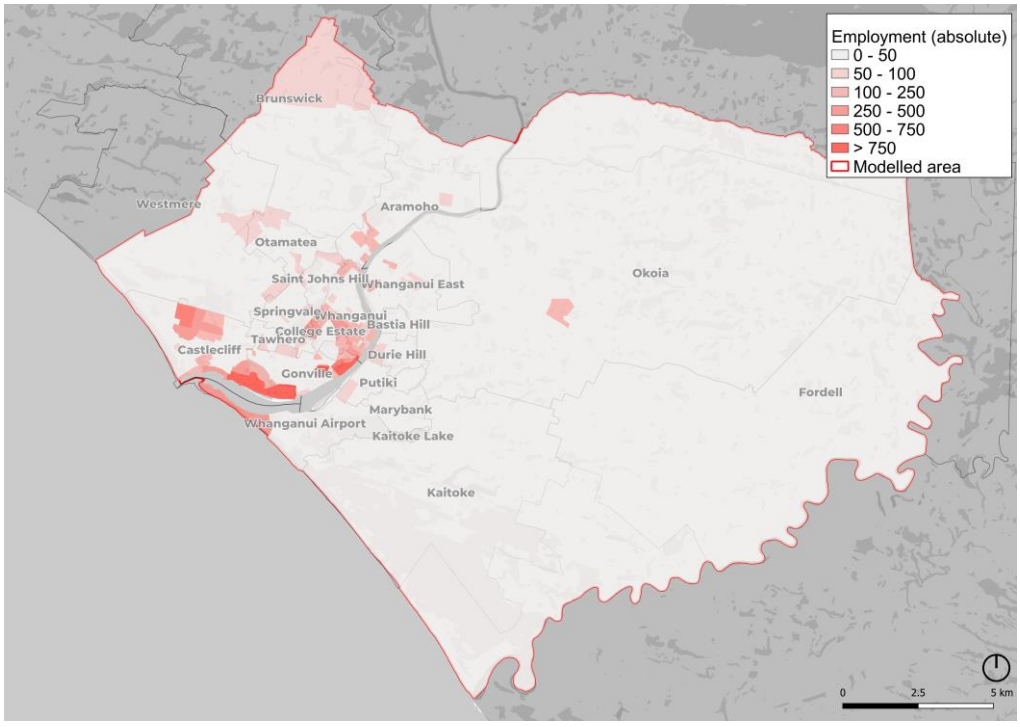

Figure 4.8 2054 employment

5 FUTURE YEAR NETWORKS

The road network for 2039 and 2054 Base were the same as the Base Year 2023 network as no changes are currently anticipated. The “Without Dublin Street Bridge” network was developed by removing the Dublin Street Bridge link (see Figure 5.1) from the Base Year 2023 network.

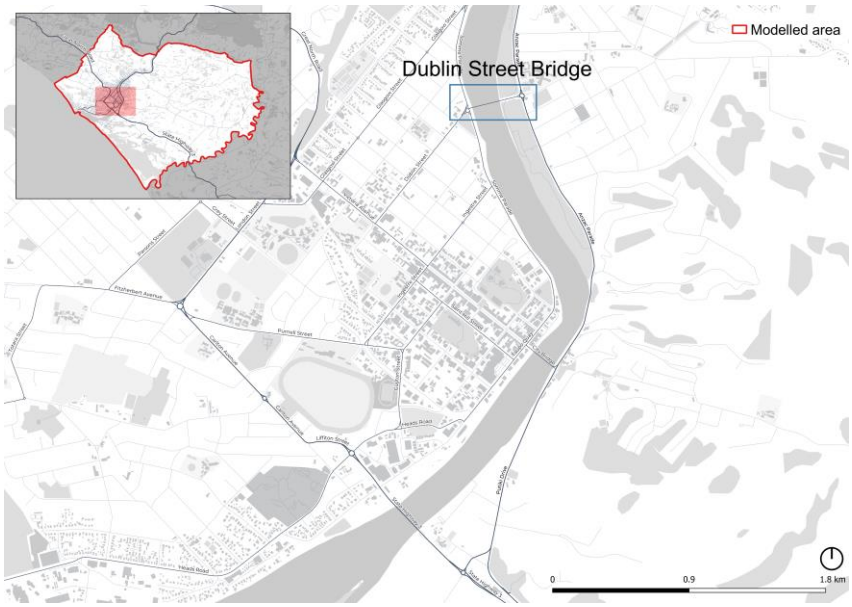

Figure 5.1 Dublin Street Bridge

6 MODEL RESULTS

6.1 OVERVIEW

The 2023 network is generally uncongested except for river crossings and key arterials enabling travel into the CBD. Vehicular kilometres travelled (VKT) is predicted to increase in line with population and employment growth, with vehicular hours travelled (VHT) increasing slightly above population and employment growth, indicating an increasingly congested network (see Table 6.1 and Table 6.2).

The removal of Dublin Street Bridge leads to traffic rerouting to the City Bridge to its south, with subsequent easing of congestion on Dublin Street and increasing congestion on Victoria Avenue, Saint Hill Street and Anzac Parade. In 2039, the City Bridge is at capacity in the Base scenario and becomes overcapacity with the Dublin Street Bridge removed, while it is already overcapacity in 2054 Base scenario and becomes further strained with the Dublin Street Bridge removed.

Table 6.1 Summary statistics for Base Case scenarios

	BASE YEAR 2023	BASE 2039	% DIFFERENCE (VS. 2023)	BASE 2054	% DIFFERENCE (VS. 2023)
Vehicle Kilometres Travelled					
AM	110,632	132,054	19%	145,343	31%
IP	323,745	382,546	18%	416,485	29%
PM	201,630	240,831	19%	264,586	31%
OP	134,835	161,523	20%	177,509	32%
Daily	**770,842**	**916,954**	**19%**	**1,003,922**	**30%**
Vehicle Hours Travelled					
AM	2,337	2,954	26%	3,384	45%
IP	6,797	8,258	21%	9,194	35%
PM	4,509	5,796	29%	6,743	50%
OP	2,669	3,227	21%	3,562	33%
Daily	**16,311**	**20,235**	**24%**	**22,882**	**40%**
Average Speed (km/h)					
AM	47.34	44.71	-6%	42.95	-9%
IP	47.63	46.32	-3%	45.30	-5%

PM	44.72	41.55	-7%	39.24	-12%
OP	50.52	50.06	-1%	49.83	-1%
Daily	**47.26**	**45.32**	**-4%**	**43.87**	**-7%**

Table 6.2 Summary statistics for horizon year scenarios

	BASE 2039	WITHOUT DUBLIN BRIDGE 2039	% DIFFERENCE	BASE 2054	WITHOUT DUBLIN BRIDGE 2054	% DIFFERENCE
Vehicle Kilometres Travelled						
AM	32,054	135,663	3%	145,343	148,551	2%
IP	82,546	393,534	3%	416,485	426,743	2%
PM	40,831	248,061	3%	264,586	271,045	2%
OP	161,523	165,418	2%	177,509	181,276	2%
Daily	**916,954**	**942,677**	**3%**	**1,003,922**	**1,027,615**	**2%**
Vehicle Hours Travelled						
AM	2,954	3,610	22%	3,384	4,156	23%
IP	8,258	9,901	20%	9,194	11,272	23%
PM	5,796	7,484	29%	6,743	8,636	28%
OP	3,227	3,330	3%	3,562	3,664	3%
Daily	**20,235**	**24,324**	**20%**	**22,882**	**27,729**	**21%**
Average Speed (km/h)						
AM	44.71	37.58	-16%	42.95	35.74	-17%
IP	46.32	39.75	-14%	45.30	37.86	-16%
PM	41.55	33.15	-20%	39.24	31.38	-20%
OP	50.06	49.68	-1%	49.83	49.48	-1%
Daily	**45.32**	**38.75**	**-14%**	**43.87**	**37.06**	**-16%**

6.2 BASE CASE SCENARIOS

The network is generally uncongested in 2023 Base, with the notable exception of the river crossings (Dublin Street Bridge, City Bridge, and State Highway 3 Bridge) and arterials leading into the Central Business District (Great North Road, State Highway 3, Anzac Parade, Fitzherbert Avenue, Puriri Street) (see volume over capacity (VC) plots for 2023 AM and PM in Figure 6.6 and Figure 6.9 respectively). Roads are more congested in the PM peak than the AM peak due to people returning home from work, school and shopping trips.

This pattern holds with the network becoming increasingly congested in 2039 Base (see VC plots for AM in Figure 6.7, PM in Figure 6.10) and 2054 Base (see VC plots for AM in Figure 6.8; PM in Figure 6.11) due to population growth. In comparing VC ratios between 2039 and 2023 Base scenarios, the road network surrounding the residential growth areas become noticeably more congested. Increased traffic volumes and congestion surrounding the employment growth areas can also be observed across 2039 Base (Figure 6.4) and 2054 Base (Figure 6.5).

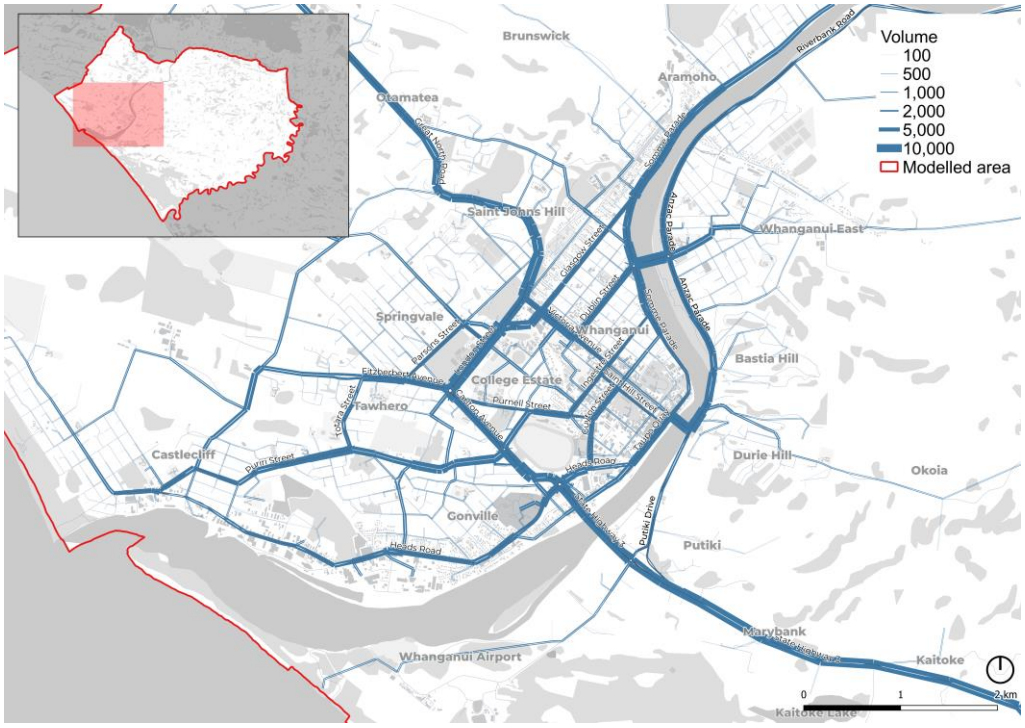

Figure 6.1 Daily volumes in 2023 Base

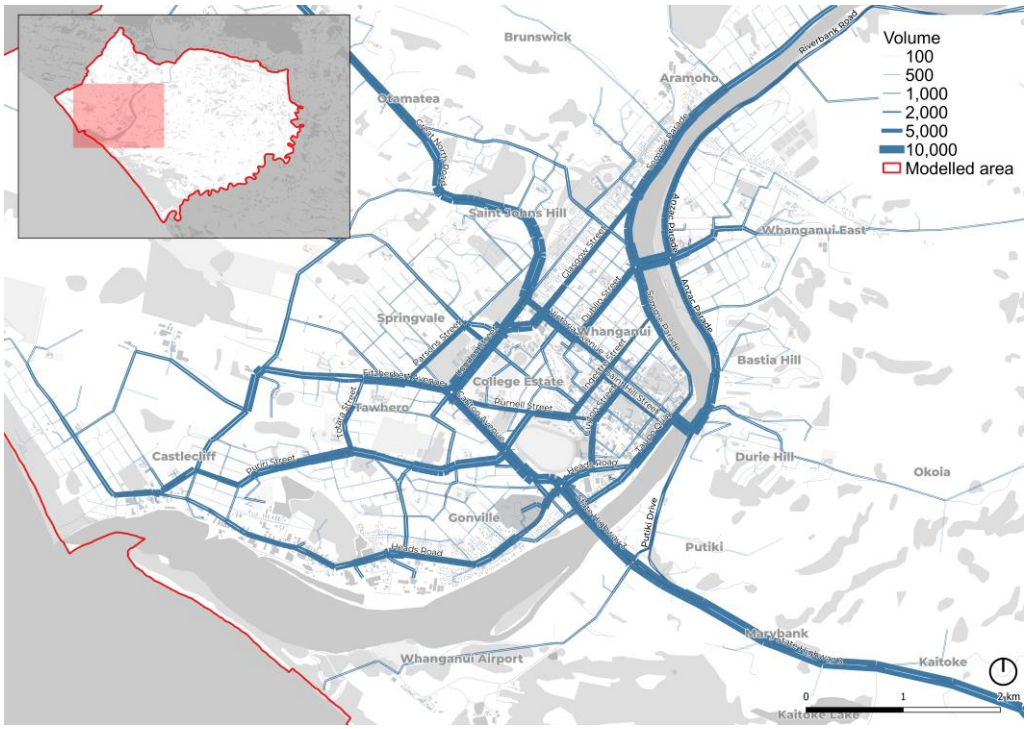

Figure 6.2 Daily volumes in 2039 Base

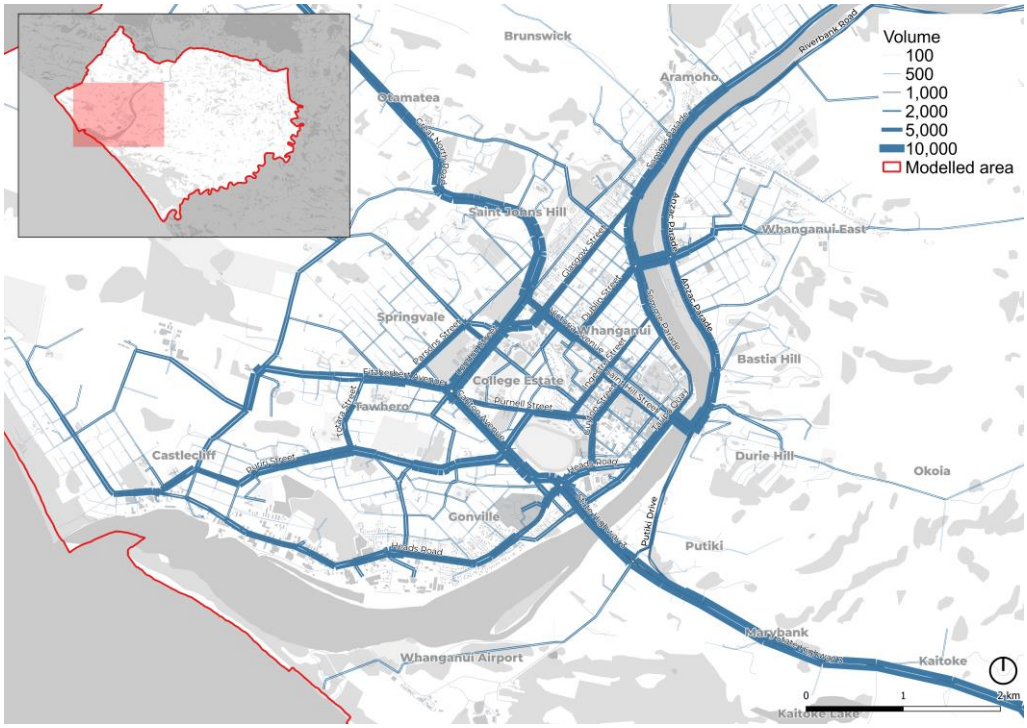

Figure 6.3 Daily volumes in 2054 Base

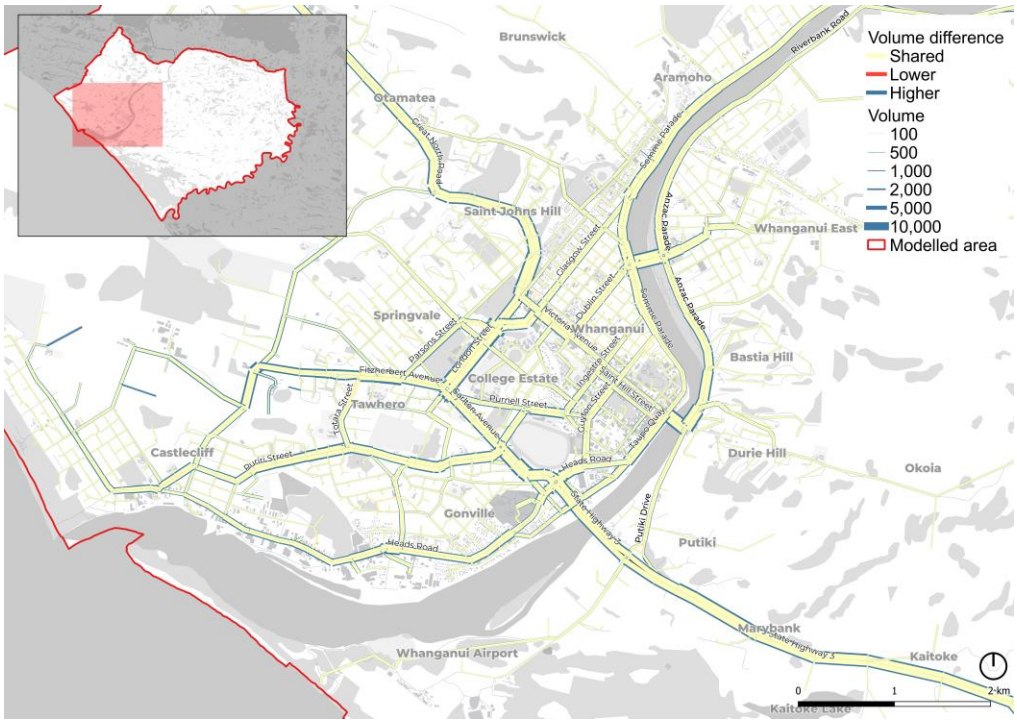

Figure 6.4 Daily volume differences, 2039 Base – 2023 Base

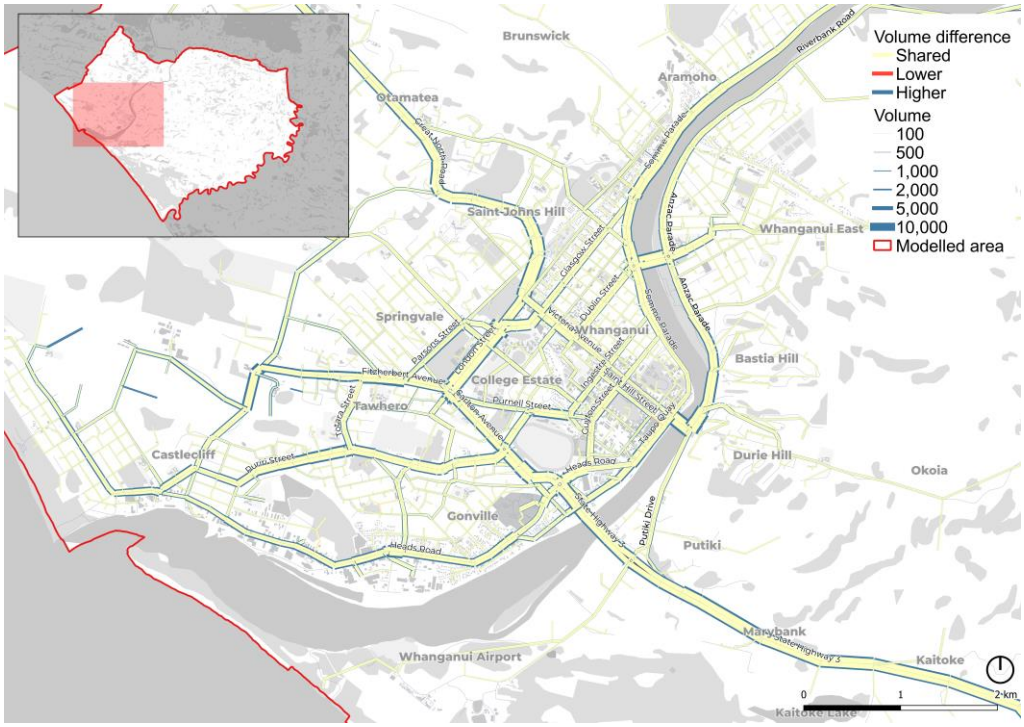

Figure 6.5 Daily volume differences, 2054 Base – 2023 Base

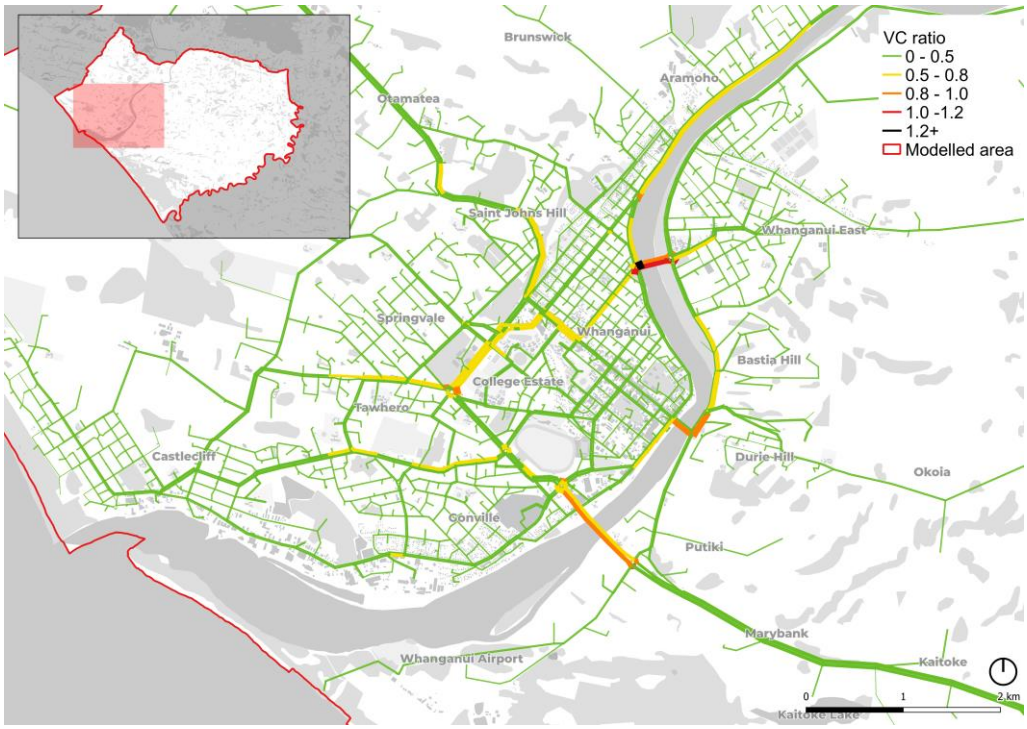

Figure 6.6 VC ratios in the AM peak, 2023 Base

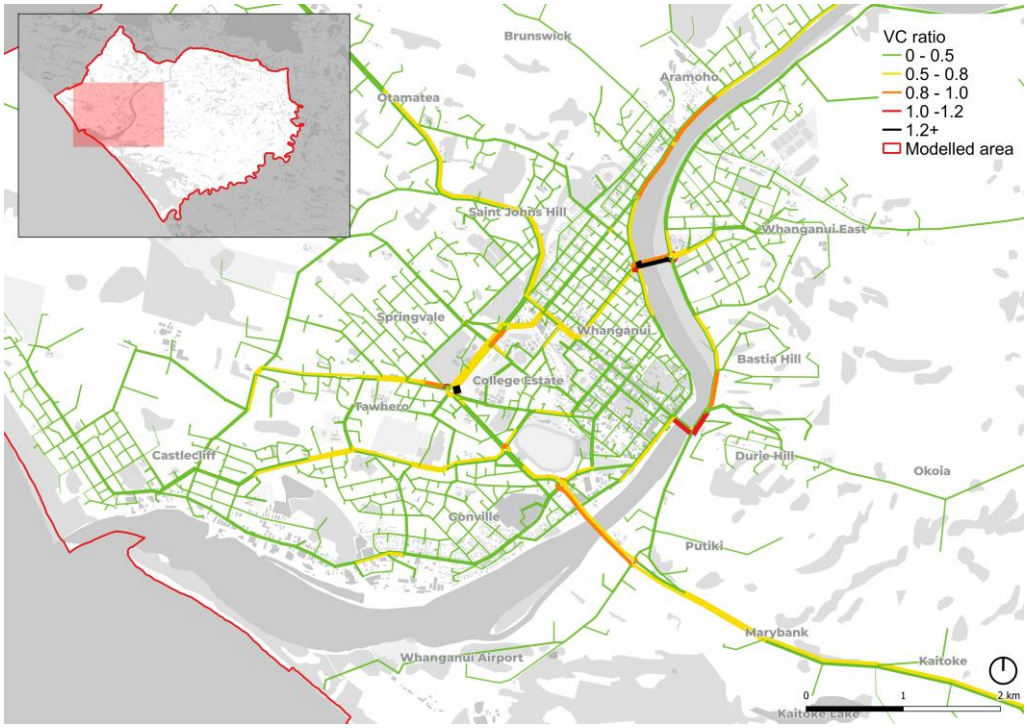

Figure 6.7 VC ratios in the AM peak, 2039 Base

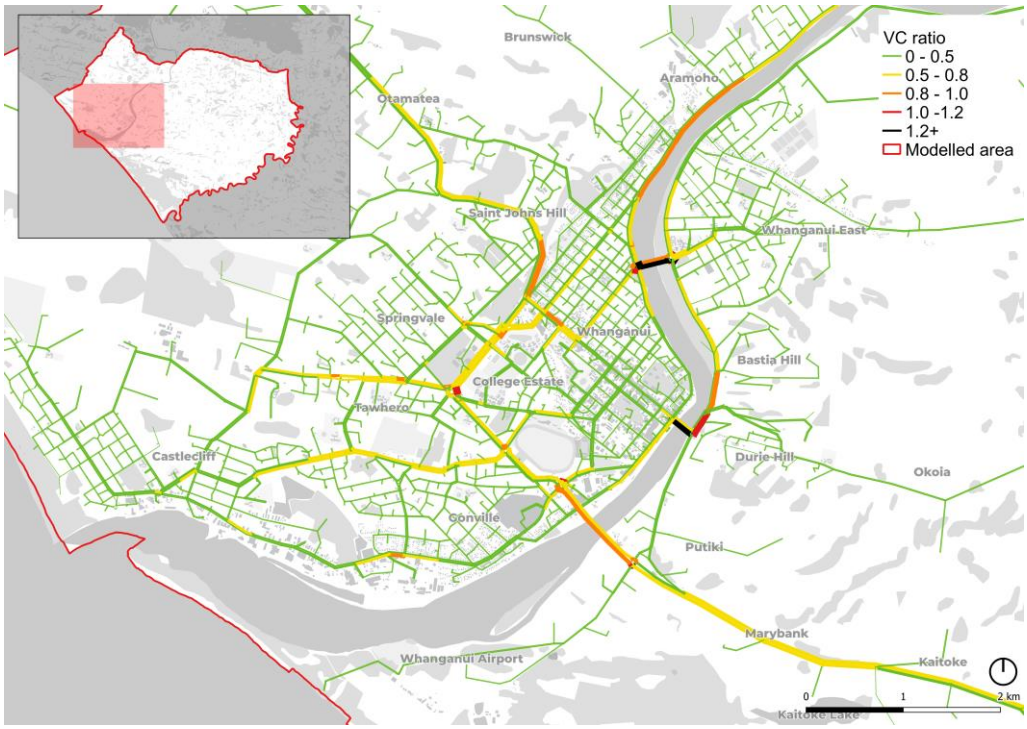

Figure 6.8 VC ratios in the AM peak, 2054 Base

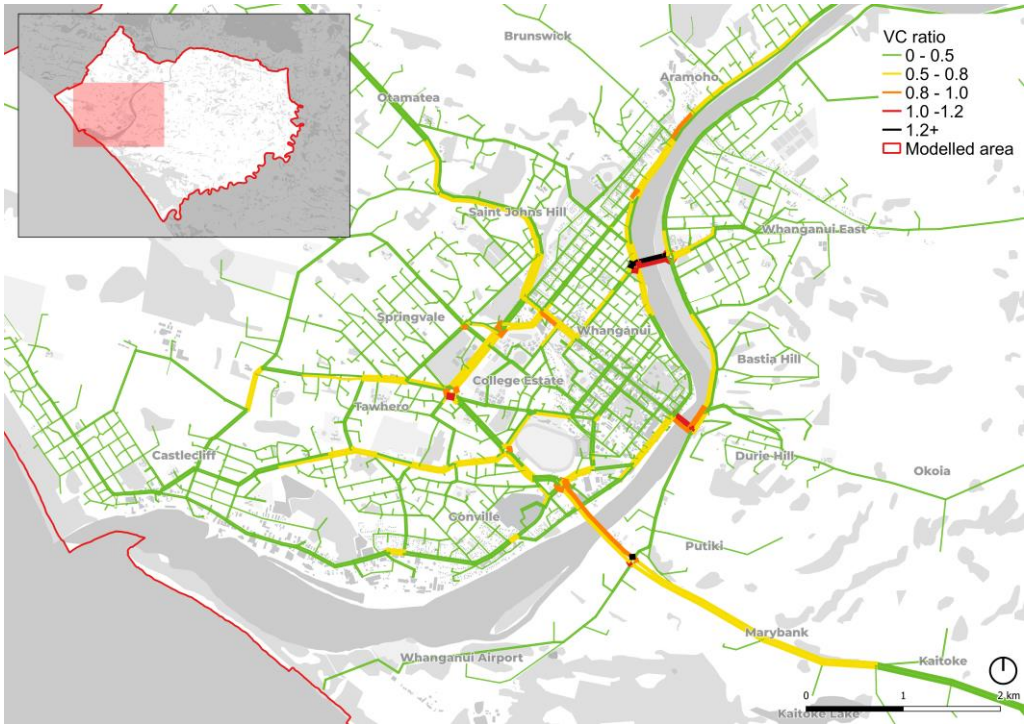

Figure 6.9 VC ratios in the PM peak, 2023 Base

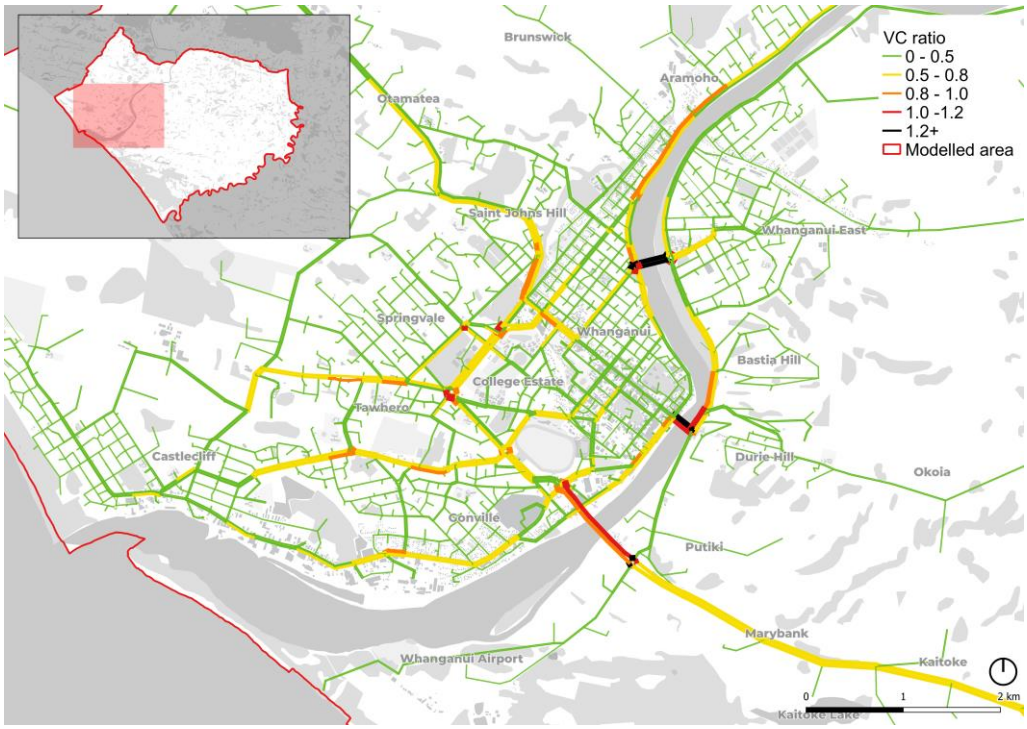

Figure 6.10 VC ratios in the PM peak, 2039 Base

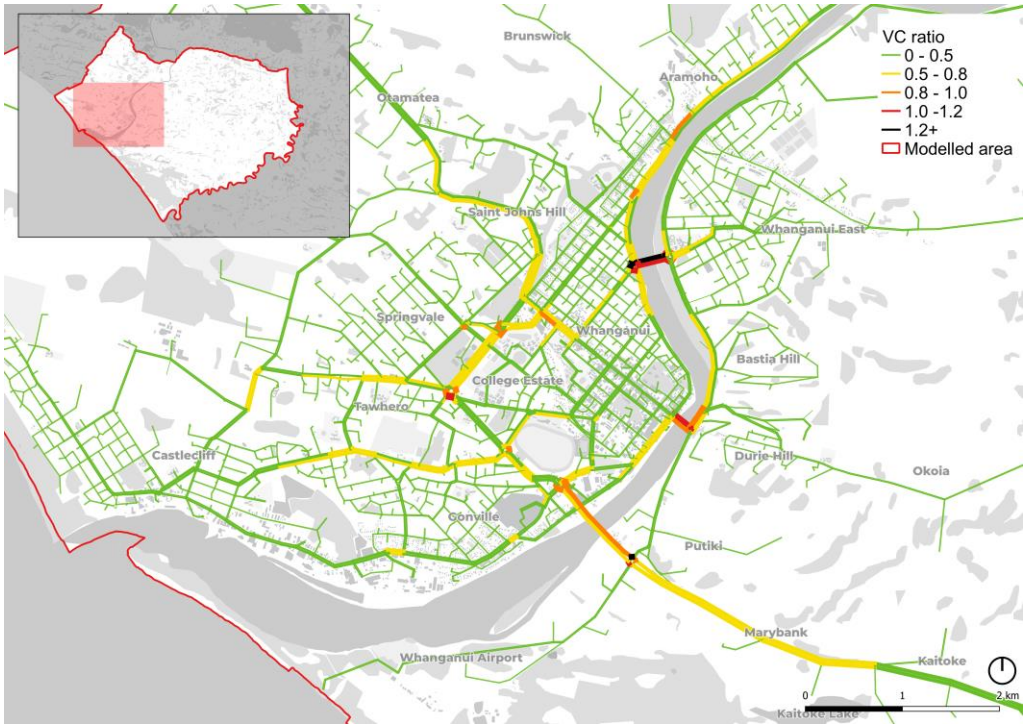

Figure 6.11 VC ratios in the PM peak, 2054 Base

6.3 REMOVAL OF DUBLIN STREET BRIDGE

The removal of Dublin Street Bridge reroutes the traffic mainly to the nearby City Bridge and to the State Highway 3 Bridge to a lesser extent (see volume difference plots Figure 6.12 and Figure 6.13 for 2039 and 2054 respectively). Roads feeding into these river crossings are also affected, with traffic diverted away from Dublin Street and onto Victoria Avenue, Saint Hill Street and Anzac Parade. This pattern is observed across both the horizon years. The additional traffic rerouted onto the City Bridge and State Highway 3 Bridge push these river crossings which are nearing or at capacity in the 2039 scenario (see Figure 6.14 and Figure 6.16 for AM and PM VC plots) well over capacity by 2054 (see Figure 6.15 and Figure 6.17 for AM and PM VC plots).

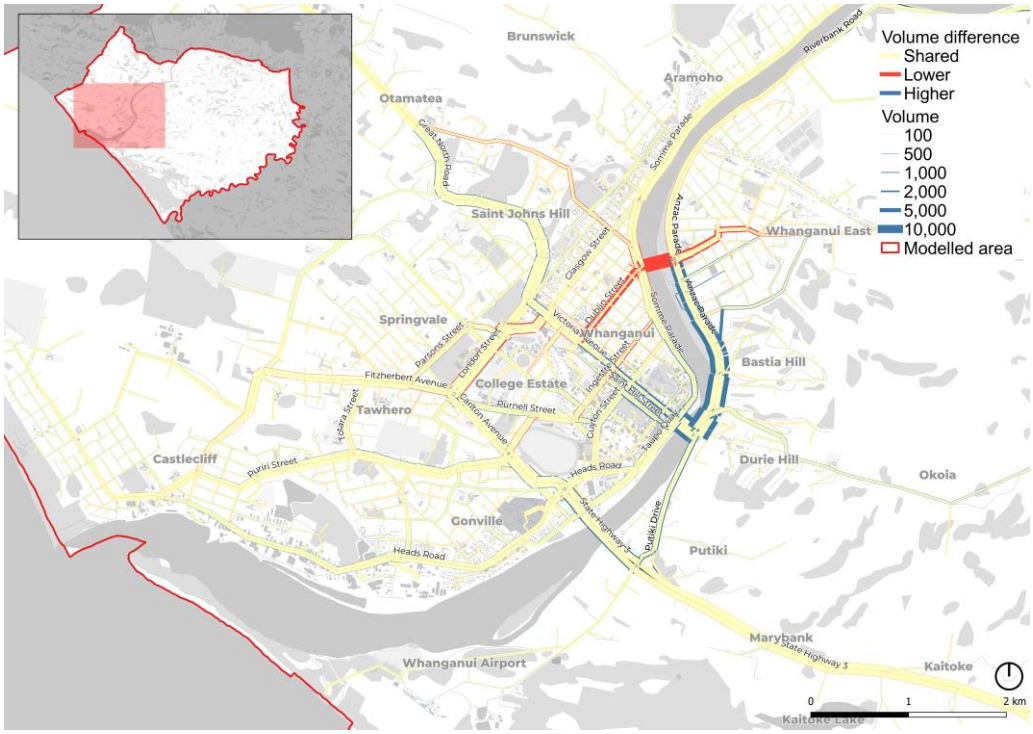

Figure 6.12 Daily volume differences, 2039 Without Dublin Street Bridge – 2039 Base

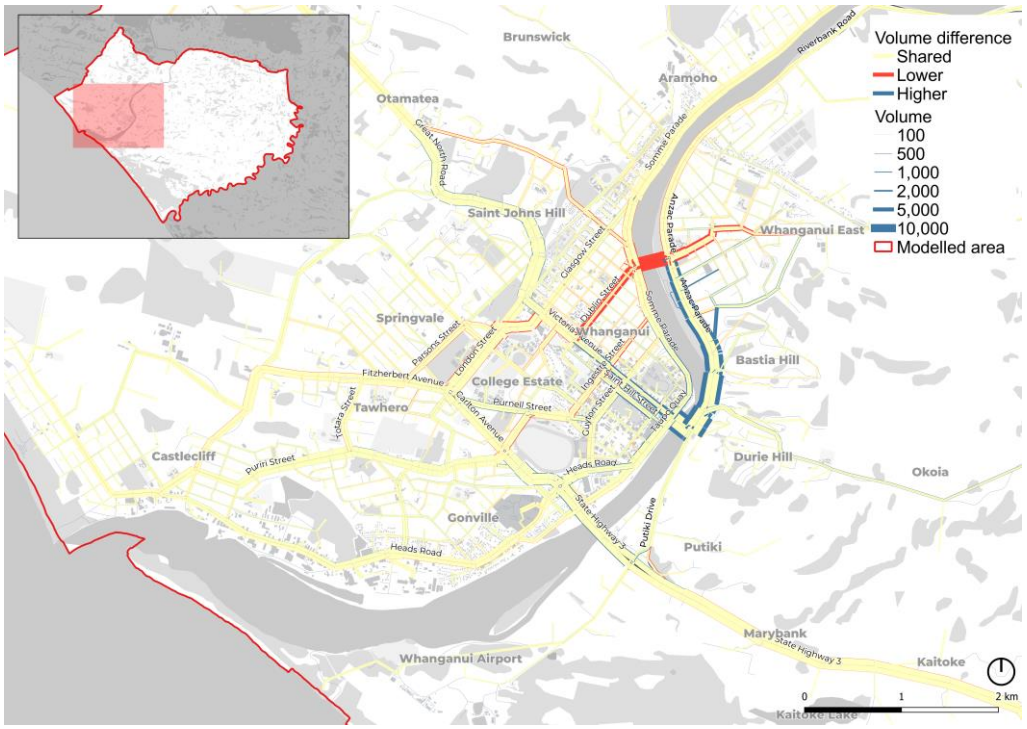

Figure 6.13 Daily volume differences, 2054 Without Dublin Street Bridge – 2054 Base

Figure 6.14 VC ratios in the AM peak, 2039 Without Dublin Street Bridge

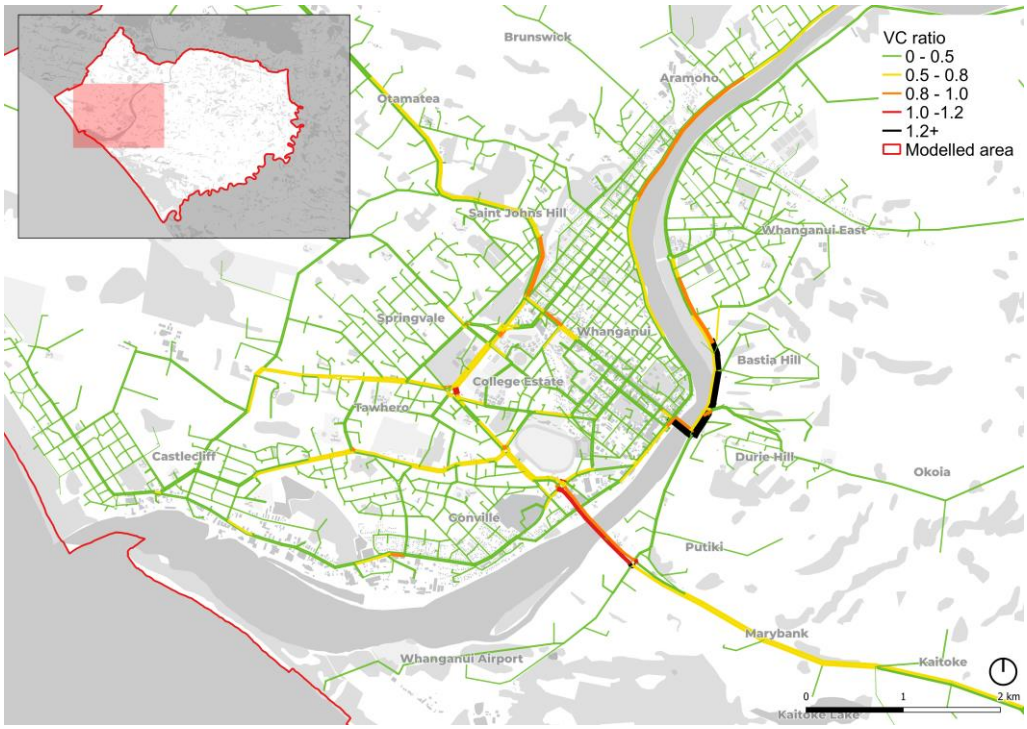

Figure 6.15 VC ratios in the AM peak, 2054 Without Dublin Street Bridge

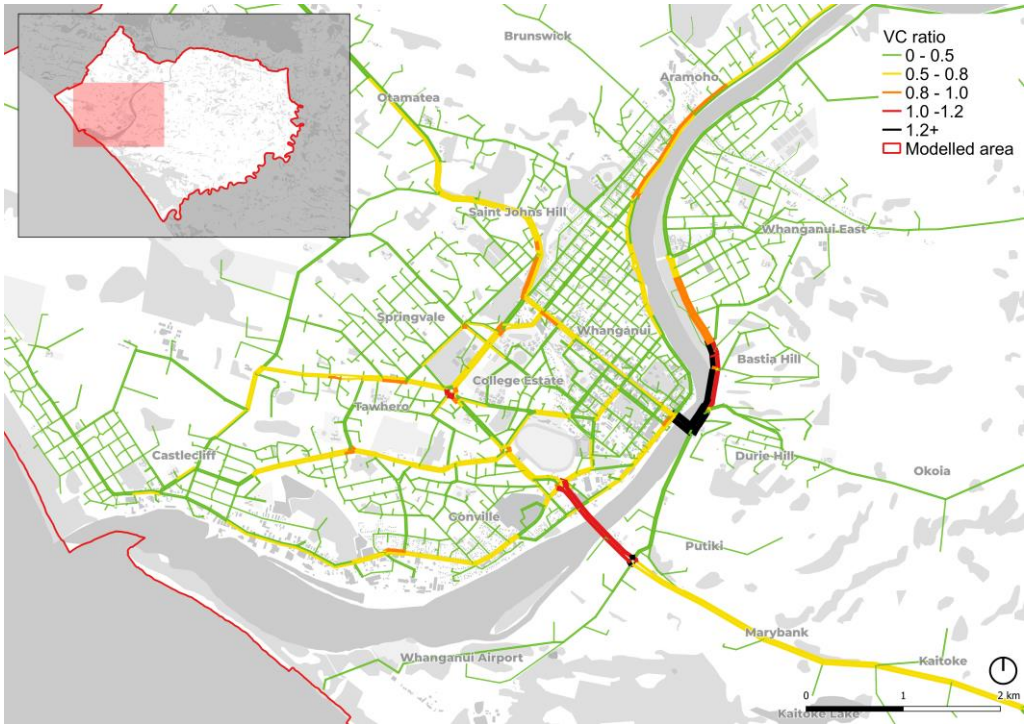

Figure 6.16 VC ratios in the PM peak, 2039 Without Dublin Street Bridge

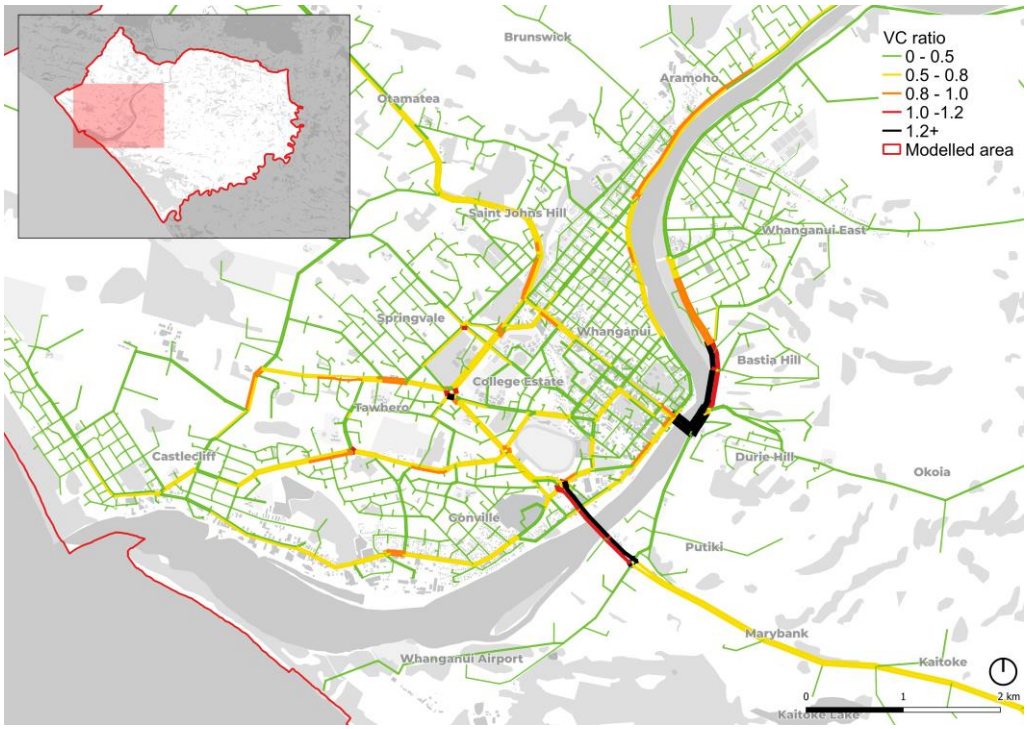

Figure 6.17 VC ratios in the PM peak, 2054 Without Dublin Street Bridge

7 CONCLUSIONS

The WDSTM has been used to forecast traffic conditions in the horizon years 2039 and 2054 with and without the Dublin Street Bridge. In the Base scenarios with the Dublin Street Bridge (i.e. the current condition), VKT is expected to grow in line with population while VHT grows slightly above population growth. The Dublin Street Bridge, City Bridge and State Highway Bridge will all be over capacity by 2054.

With the removal of Dublin Street Bridge, most of the traffic is diverted to Victoria Avenue and City Bridge with some traffic diverting to State Highway Bridge, adding further pressure on these bridges. This rerouting also leads to a further increase in VKT and VHT accompanied by a reduction in average speed across the network.

8 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Whanganui District Council ('Client') in accordance with the CCCS contract with the Client dated 15 June 2023 ('Agreement').

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