Veitch Lister Consulting Pty Ltd

Prepared for

Australian Government
Infrastructure Australia

Transport Planning for the Australian Infrastructure Audit

Transport Modelling Report for South East Queensland

March 2019

Transport Planning for the Australian Infrastructure Audit

FINAL

Transport Modelling Report for South East Queensland

Project No. 18-025

LIMITATION: This report is confidential and has been prepared on behalf of and for the exclusive use of VLC's Client, and is subject to and issued in connection with the provisions of the agreement between VLC and its Client.

The purpose of the work remains as per the current contractual arrangement with the Client and is not varied by any statement contained herein.

The quality of the information contained in this report is on a best efforts basis and subject to the constraints of scope, budgets and the time allowed by the Client.

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By issuing this report VLC is not recommending any course of action or investment undertaking.

Date	Revision	Prepared By	Checked By	Approved By	Description
15/10/2018	A	H Smithers	L Walker	D Veryard	Draft Report
16/11/2018	B	H Smithers / N Ng	L Walker	D Veryard	Draft Report
07/12/2018	C	L Walker	L Walker	D Veryard	Draft Report
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20/03/2019	E	N Ng	D Veryard	D Veryard	Final Report

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1. Introduction

1.1 Background

The first Infrastructure Audit, undertaken over 2014-15, for the first time provided evidence developed on a consistent basis to support the identification of current and emerging infrastructure problems. This helped IA to identify the most nationally significant problems that were not necessarily being identified or addressed by bottom-up state, territory and private sector proposals. Combining bottom-up submissions with top-down evidence developed through the Infrastructure Audit allows a more comprehensive and independent picture of national priorities.

Veitch Lister Consulting (VLC) supported the first Audit by modelling travel demands in six major mainland cities under base year (2011) and future year (2031) conditions using our multi-modal Zenith model. In the intervening four years, the landscape of Australian cities has changed considerably. New major transport projects have received significant political and financial commitment, while certain projects included in the original Audit have been cancelled or scaled down. Similarly, population growth has run ahead of projections in some urban areas but has slowed in other parts of the country.

It is important to note Infrastructure Australia does not view this modelling as a single version of the future. The modelling necessarily uses a set of assumptions about future projects, transport costs and technology. The chosen assumptions reflect a business as usual future, where there is minimal change to current conditions. However, in reality there is significant uncertainty about how these important inputs will change over time. The results in this modelling are therefore indicative and one of many potential futures.

1.2 Scope of this report

In response to these changed circumstances IA is updating their evidence base and VLC is assisting in this update by revising the travel modelling. Specific changes include:

- Updated future population and employment assumptions
- Revised transport system assumptions, including both networks and cost parameters
- Modelling with capacity-constrained public transport networks, and
- A wider range of transport-related indicators of success and challenges, including access to opportunities for employment, education, health and recreation, as well as the economic costs of crowding and road congestion.

This report summarises the results of this updated modelling for South East Queensland (SEQ). Specifically, it evaluates the performance of the transport network servicing Greater Brisbane, Gold Coast and Sunshine Coast in 2031 based on an evaluation framework that includes transport, economic, environmental and social indicators.

VLC is also assisting IA to test an alternative road-user charging regime. The results of this alternative policy scenario will be documented in a separate report.

***A note on tables and figures in this report**:*

All tables and figures which quote numbers have been rounded to reflect that these forecasts are subject to considerable uncertainty. Where a numerical or percentage change has been quoted, it has been calculated using the unrounded data.

2. South East Queensland in the future

Understanding how SEQ's transport network might perform in the future requires a detailed vision of what the region may look like at specific future planning horizons. The scale and distribution of population and job opportunities, upgrades to the transport network, as well as the cost of parking, public transport fares and fuel all require consideration in order to produce robust travel demand forecasts. This section of the report provides an overview of the assumptions underpinning the Zenith model of SEQ. More detailed assumptions can be found in the appendices.

2.1 People and jobs

The locations in which people live and work are key drivers of transport patterns. The cities of Brisbane, the Gold Coast and the Sunshine Coast form the region of SEQ, in 2016 SEQ had a total population of approximately 3.3 million people. Over 70 per cent of SEQ's population lived in the Brisbane Greater Capital City Statistical Area (GCCSA), with approximately 2.4 million residents. The Gold Coast and Sunshine Coast (considered in this study to be the Gold Coast and Sunshine Coast Level 4 Statistical Area (SA4s)) contained nearly 600,000 and 360,000 residents respectively.

Figure 2-1 describes Brisbane's 2016 population (along with the rest of SEQ) in more geographic detail using two metrics – total population by Level 3 Statistical Area (SA3) and gross population density by Zenith travel zone. Although Brisbane GCCSA extends from the Caboolture Hinterland in the north to Beaudesert in south, most of the city's population lived along either the north-south coastal axis or in the Brisbane River catchment towards Ipswich (Figure 2-1). The highest population densities were either in or close to the CBD, with lower densities in the outer suburbs and very low densities in the peri-urban peripheries.

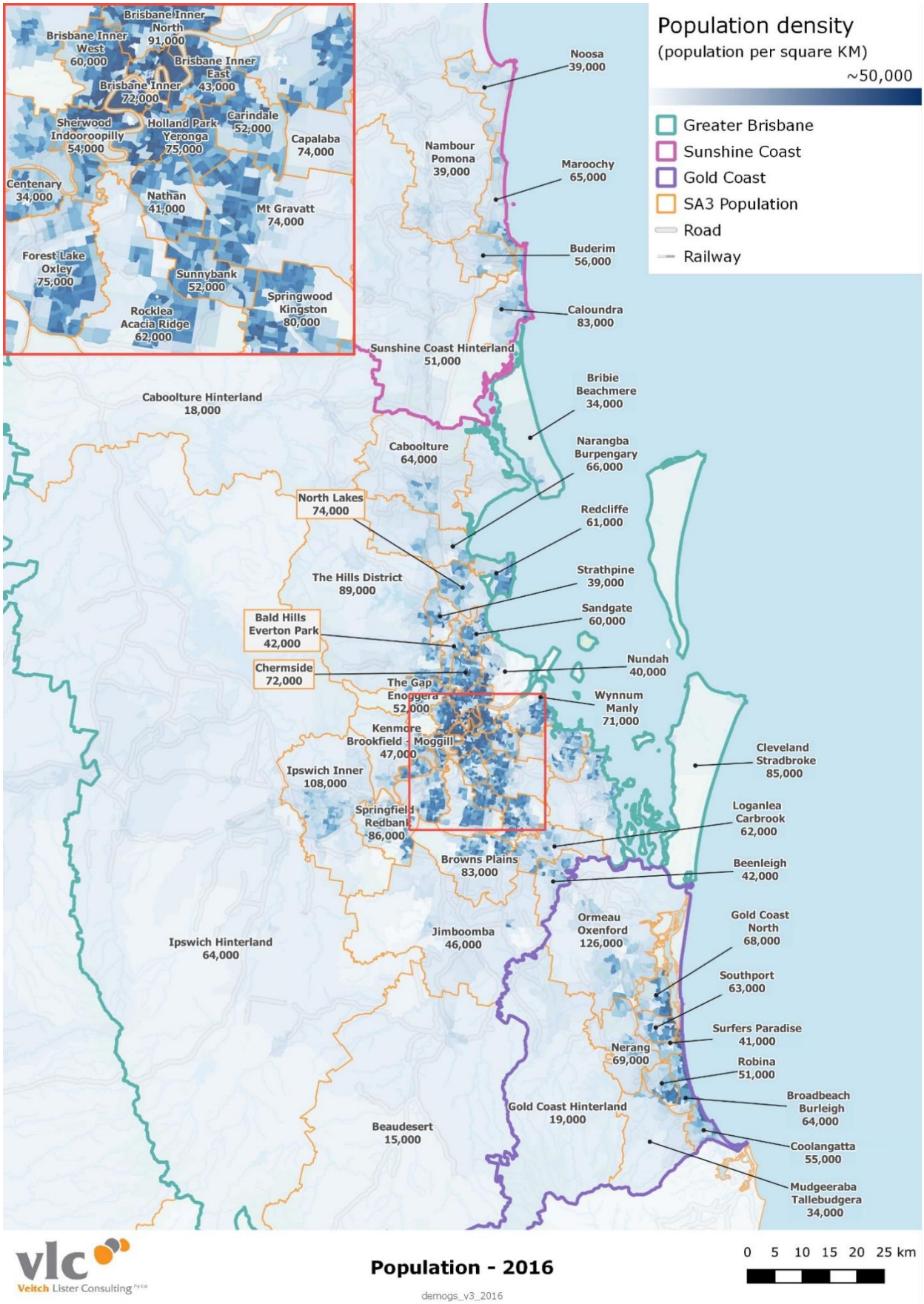
At a region level the number of people living in SEQ is forecast by the Queensland Government to increase by just over 1 million by 2031 (a 32% increase). A large proportion of SEQ's additional residents are expected to settle in outer suburbs or the hinterland surrounding the urban centres. This is likely to put pressure on transport infrastructure serving these areas.

The number of people living in the Brisbane GCCSA is forecast to grow by approximately 30 per cent to 2031, to just over 3 million people (Figure 2-2). Population is expected to grow fastest in the outer suburban and peri-urban areas with Jimboomba, Springfield-Redbank and Ipswich Inner all growing by at least 60,000 people (Figure 2-3). The number of residents in Brisbane Inner is also predicted to grow strongly, with an additional 46,000 residents. Growth in other areas, particularly inner areas is expected to be slower.

In 2016 most of the Gold Coast's population was clustered along the coast. By 2031 the Pacific Motorway corridor towards Brisbane is forecast to grow strongly with Ormeau-Oxenford adding an extra 89,000 residents. The population of Southport is also expected to increase by 2031 with approximately 26,000 extra residents. The Gold Coast's population is expected to grow by just over 200,000 people (37%).

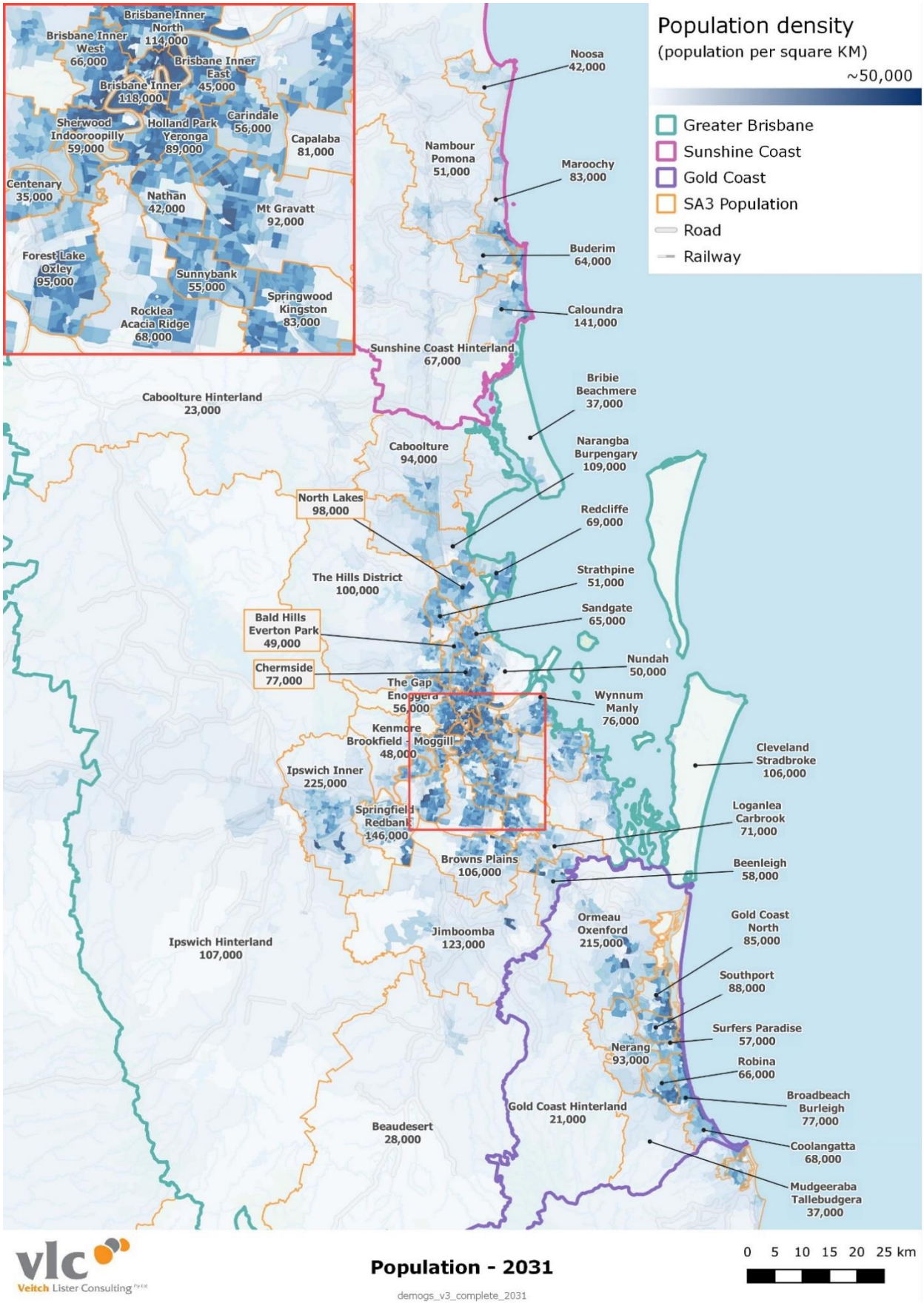
On the Sunshine Coast, Caloundra is expected to grow strongly, with a net increase in population of 57,000 people. As a whole the Sunshine Coast population is forecast to grow by approximately 120,000 people (33%)

Figure 2-1 – SEQ population density and SA3 totals in 2016



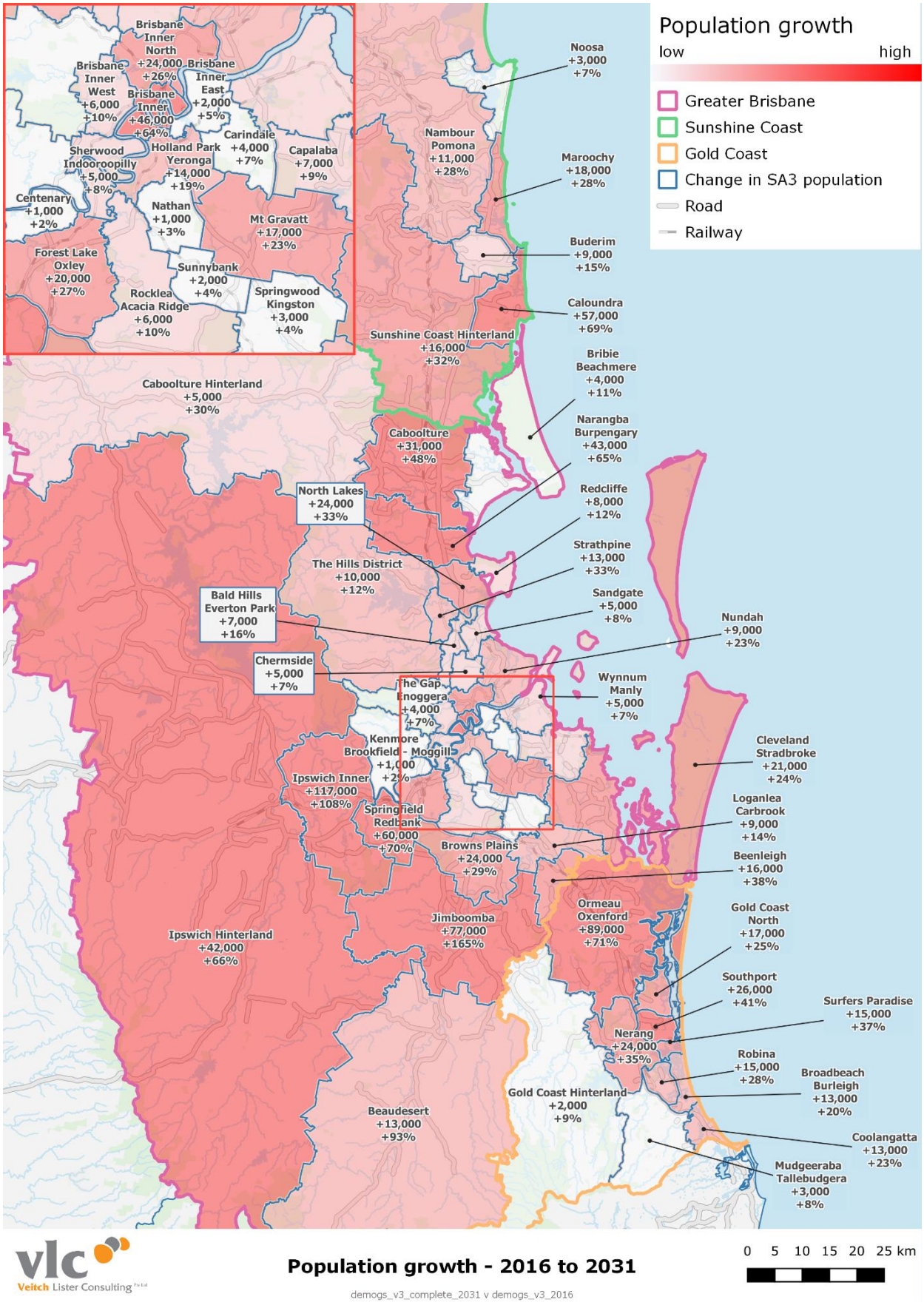
Source: ABS 2016 Census, disaggregated to Zenith travel zones

Figure 2-2 – SEQ population density and SA3 totals in 2031



Source: Queensland Government, disaggregated to Zenith travel zones

Figure 2-3 – SEQ population growth by SA3 2016 to 2031 forecast



Source: ABS and Queensland Government

In addition to where people live, the areas in which they work is a further determinant of travel choices. In 2016, there were around 1.6 million jobs in the SEQ region, most of these jobs (approximately 73%) were located in Greater Brisbane which contained approximately 1.18 million jobs. The Gold Coast and Sunshine Coast had fewer jobs, with approximately 280,000 and 150,000 jobs each. Though the ratio of jobs to population is broadly similar between the three sub-regions.

In 2016 most of Brisbane's employment was concentrated in inner areas. Brisbane Inner had the highest concentration of employment of any SA3 (approximately 226,000 jobs or just under 20% of the city's employment), while outer suburbs had fewer jobs (Figure 2-4) – yet with substantial populations. As a result, population in outer areas far outstrips the number of jobs available.

Almost 400,000 jobs are expected to be added to the Brisbane GCCSA by 2031 – a 33 per cent increase. Yet this future employment is likely to remain relatively concentrated (Figure 2-5). Strong employment growth is expected in Brisbane's CBD, with a net increase of approximately 85,000 jobs (Figure 2-6). In many outer areas employment is expected to grow quickly – high growth rates are forecast for Ipswich Inner and Jimboomba – though from a low base in 2016. Additionally, the increases in employment in most outer areas is outpaced by population growth, with more residents moving into these areas than jobs being created.

Employment on the Gold Coast was clustered along the Pacific Motorway corridor in 2016 (Figure 2-4). By 2031 this pattern is expected to be reinforced with particularly strong employment growth in Ormeau-Oxenford (expected to add an extra 39,000 jobs).

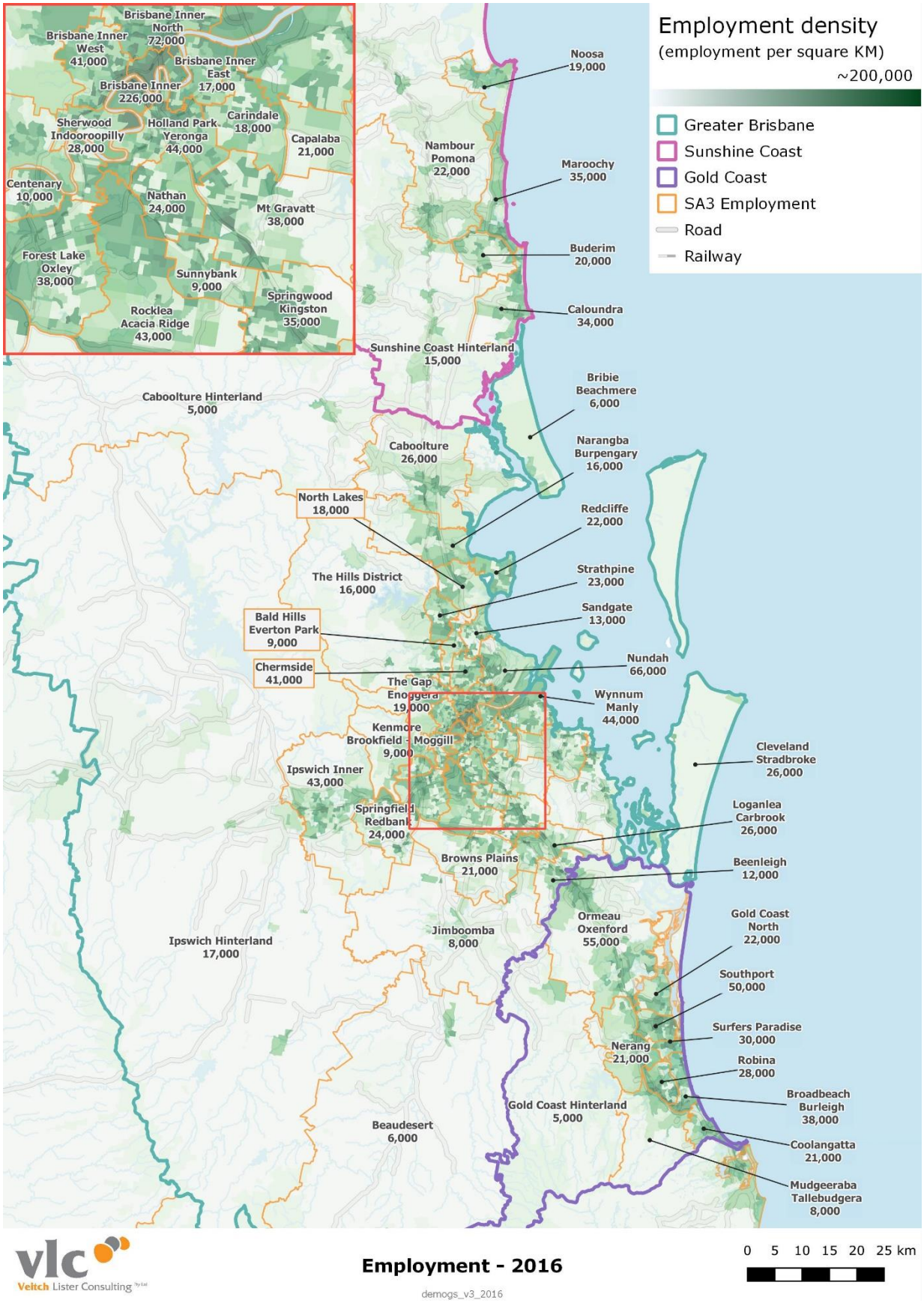
On the Sunshine Coast, employment in Caloundra is expected to grow by approximately 21,000 jobs.

Across the region, employment in SEQ is expected to grow by over half a million jobs by 2031 (a 34% increase). In 2016 the outer peri-urban and outer suburban areas had the largest disconnect between population and employment. By 2031 this disconnect is forecast to worsen, with population in these areas expected to grow faster than employment. This is likely to increase travel demand, an outcome that will place pressure on SEQ's transport infrastructure.

VLC modelling uses baseline projections from the Queensland Government Statisticians Office (Rebased 2015ed) that reflects current planning schemes as approved by local governments. These projections are consistent with our methodology of modelling a 'business as usual' future scenario. The Queensland Government has developed a separate set of demographic forecasts for their ShapingSEQ[1] plan, which provides a policy framework for managing the region's population growth. Shaping SEQ is therefore a policy aspiration of the Queensland Government, in contrast to the Queensland Government Statistician's Office baseline projection. The primary difference is that the ShapingSEQ plan anticipates increased levels of infill development, and also shows less growth along the Ipswich corridor and on the Gold Coast, thereby reducing pressure on transport links in these areas.

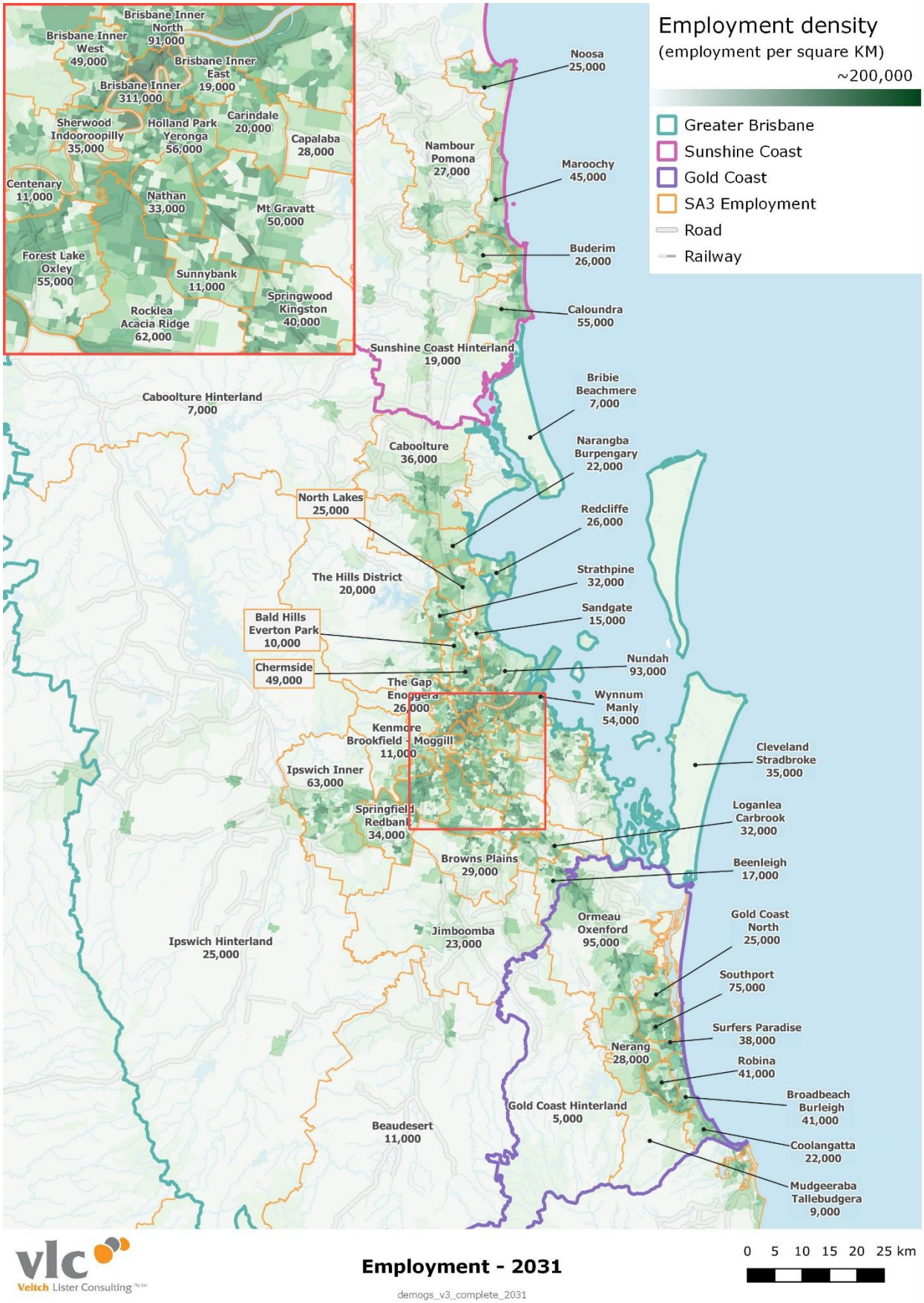
[1] Queensland Government, ShapingSEQ South East Queensland Regional Plan 2017 https://dsdmipprd.blob.core.windows.net/general/shapingseq.pdf

Figure 2-4 – SEQ employment density and SA3 totals in 2016



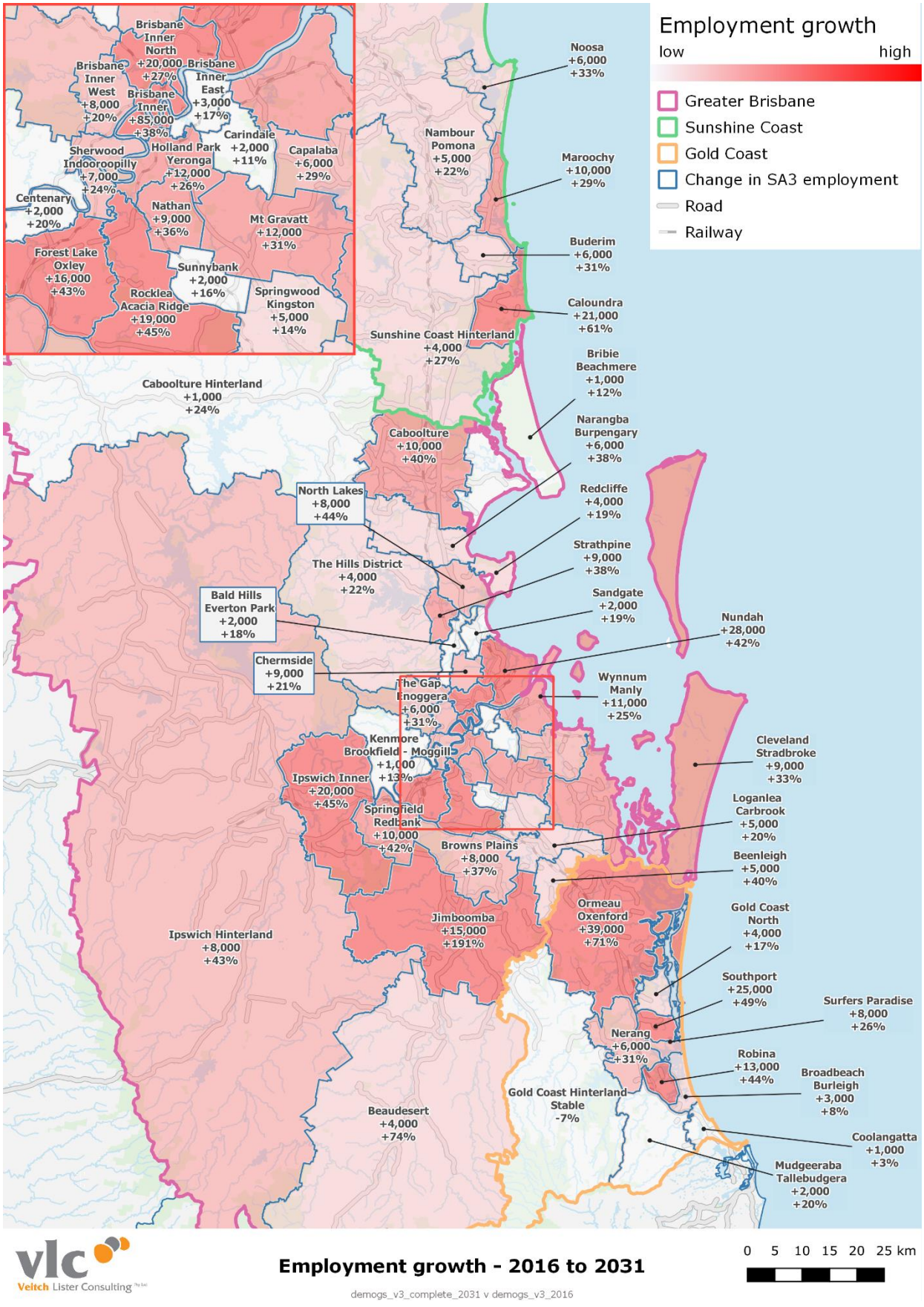
Source: ABS 2016 Census, disaggregated to Zenith travel zones

Figure 2-5 – SEQ employment density and SA3 totals in 2031 scenario



Source: Queensland Government, disaggregated to Zenith travel zones

Figure 2-6 – SEQ employment growth by SA3 2016 to 2031 forecast



Source: ABS and Queensland Government

2.2 Transport networks

The transport network assumed in transport modelling determines how (and how easily) people will get between their homes, jobs, schools, shops and other activity areas. The 2031 transport network for South East Queensland has been developed using a minimal-intervention approach. Included projects were (at the time of modelling in August 2018) either under construction, under procurement, or had a public commitment to fund construction from all relevant governments. It is important to note that some projects fall outside of government's budget forward estimates, so some modelled projects may not be fully funded. Finally, some bus routes have also been expanded to support the development of new suburbs. Some of the most significant projects are described in more detail below and can be referenced in Figure 2-7. A full list of network assumptions can be found in Appendix A.

*Access to Brisbane CBD will be increased through the **Cross River Rail** project. Tunnels under the Brisbane River add additional capacity to the inner-city rail network and provides new stations at Boggo Road, Woolloongabba, Albert Street and Roma Street. The project enables increases in service frequencies across the rail network, and service headways of 3-4 minutes will operate on the new infrastructure in the peak periods.*

***Brisbane Metro** will expand the capacity of existing busways to provide two high frequency bus rapid transit corridors bisecting Brisbane's CBD. Metro Line 1 will run from Eight Mile Plains to Roma Street, while Metro Line 2 will connect the University of Queensland in St Lucia to health and education precincts in the Herston.*

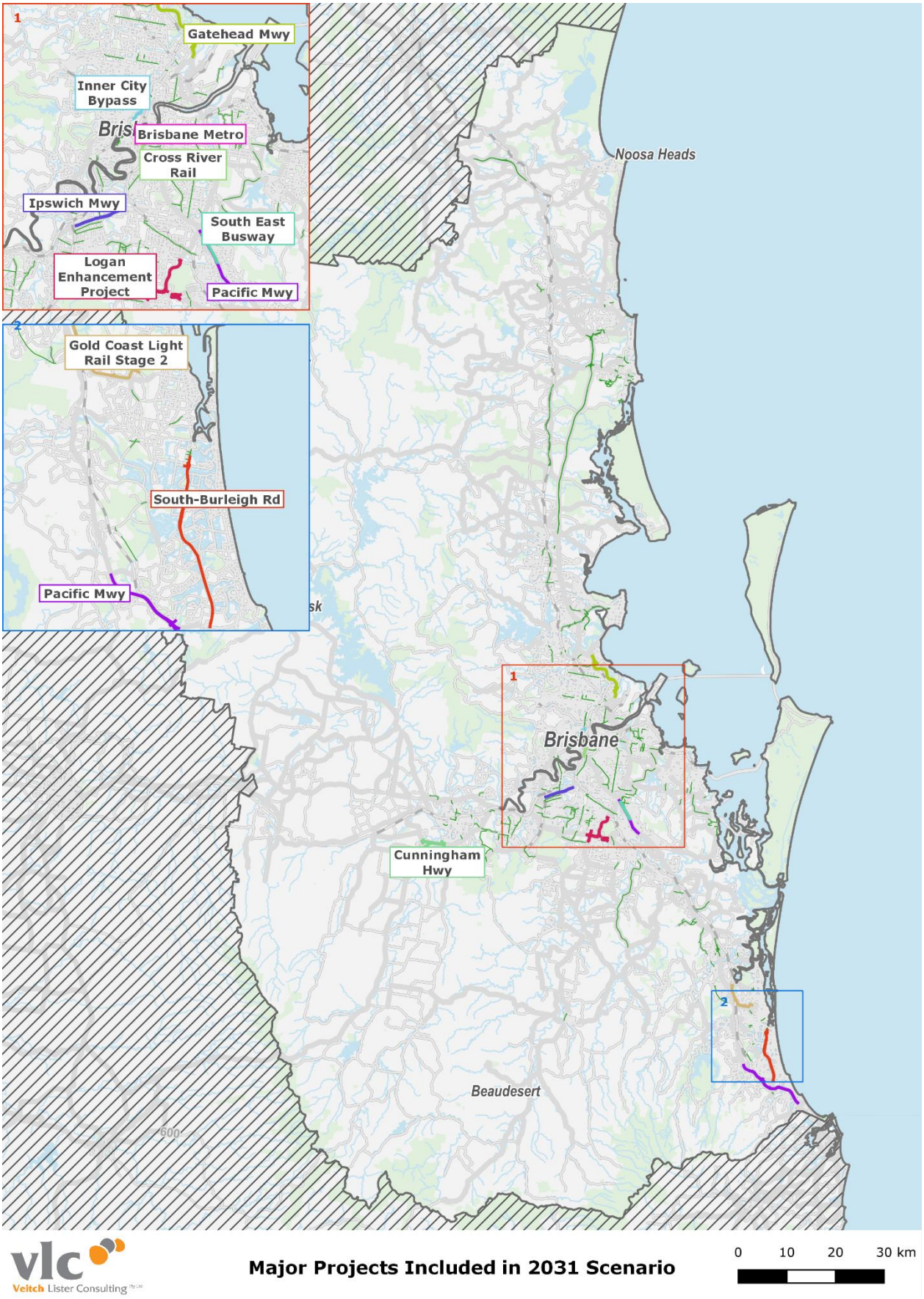
*On the Gold Coast, **Gold Coast Light Rail Stage 2** extends the light rail corridor north to connect with Helensvale Station on the Gold Coast heavy rail line.*

*The M1 motorway corridor will be improved with widening to the **Gateway Motorway** between Nudgee and Deagon. The **Pacific Motorway** will also be widened between Eight Mile Plains and Daisy Hill. This project will include the **Extension of the South East Busway** to Springwood.*

*Just to the north of Brisbane's CBD the **Inner City Bypass** was also recently widened. In Brisbane's southern suburbs the **Logan Enhancement Project** is intended to improve the connection between the Gateway and Logan Motorways. Widening on the Ipswich Motorway is also planned between Darra to Rocklea.*

*On the Gold Coast the **Pacific Motorway** will also be upgraded, while a major section of **Southport-Burleigh Road** corridor will also be widened.*

Figure 2-7 – Major projects included in 2031 forecast



By 2031 Brisbane's bus services will improve through increased service frequencies and the extension of routes into growth areas – around 30 per cent across the day (Table 2-1). This increase is consistent with population projections for the Brisbane GCCSA.

Rail in-service kilometres will increase substantially, almost tripling in the peak periods. This is a result of Cross River Rail. In addition to providing a new rail corridor, the project enables higher service frequencies across several existing rail corridors (Table 2-1).

Total public transport service kilometres grow by 39 per cent across the day, but by 42 per cent in the AM peak and PM peaks. This is greater than the 30 per cent increase in population forecast for the Brisbane GCCSA, indicating that investment in peak-period public transport services is keeping pace with growth.

Table 2-1 – Brisbane GCCSA weekday public transport service kilometres[2]

Metric	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	6,100	17,600	+11,500	+190%
	Inter-peak (9AM-4PM)	13,500	19,500	+6,000	+44%
	PM peak (4-6PM)	6,100	17,600	+11,500	+189%
	Off-peak (6PM-7AM)	16,400	25,400	+9,000	+55%
	Daily total	**42,100**	**80,000**	**+38,000**	**+90%**
Bus	AM peak (7-9AM)	41,400	50,000	+8,500	+21%
	Inter-peak (9AM-4PM)	93,900	119,000	+25,100	+27%
	PM peak (4-6PM)	40,000	47,900	+7,900	+20%
	Off-peak (6PM-7AM)	54,700	82,500	+27,800	+51%
	Daily total	**230,000**	**299,400**	**+69,300**	**+30%**
Total*	AM peak (7-9AM)	48,000	68,100	+20,100	+42%
	Inter-peak (9AM-4PM)	109,200	140,200	+31,100	+28%
	PM peak (4-6PM)	46,600	66,000	+19,400	+42%
	Off-peak (6PM-7AM)	72,200	109,000	+36,800	+51%
	Daily total	**276,000**	**383,300**	**+107,300**	**+39%**

* *Total PT metrics include data for ferry. However, analysis of ferry network performance is not provided in this report due to the small role it plays in the overall transport task*

Public transport service provision will increase considerably on the Gold Coast as a result of numerous investments affecting the region (Table 2-2). The significant increase in service frequencies enabled by Cross River Rail benefits the Gold Coast rail line to Varsity Lakes, with in-service kilometres on services to the Gold Coast increasing by a factor of five. The completion of the Gold Coast Light Rail extension also expands provision, while numerous bus routes have been added to growth area suburbs, resulting in higher bus service kilometres.

[2] Note that service kilometres include all public transport lines servicing the Brisbane GCCSA (and not exclusively kilometres operating within the Brisbane GCCSA).

Table 2-2 – Gold Coast weekday public transport service kilometres

Metric	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	1,300	7,800	+6,500	+518%
	Inter-peak (9AM-4PM)	3,000	7,600	+4,600	+155%
	PM peak (4-6PM)	1,500	7,800	+6,400	+437%
	Off-peak (6PM-7AM)	3,900	10,600	+6,800	+174%
	Daily total	**9,600**	**33,800**	**+24,300**	**+254%**
Bus	AM peak (7-9AM)	5,200	7,700	+2,400	+46%
	Inter-peak (9AM-4PM)	20,500	25,600	+5,100	+25%
	PM peak (4-6PM)	6,100	8,500	+2,500	+40%
	Off-peak (6PM-7AM)	9,000	17,300	+8,300	+92%
	Daily total	**40,800**	**59,100**	**+18,200**	**+45%**
Light Rail	AM peak (7-9AM)	400	600	+200	+59%
	Inter-peak (9AM-4PM)	1,400	2,200	+800	+61%
	PM peak (4-6PM)	400	600	+200	+61%
	Off-peak (6PM-7AM)	1,000	1,500	+600	+60%
	Daily total	**3,100**	**4,900**	**+1,900**	**+61%**
Total	AM peak (7-9AM)	6,900	16,100	+9,200	+133%
	Inter-peak (9AM-4PM)	24,800	35,300	+10,500	+42%
	PM peak (4-6PM)	7,900	17,000	+9,000	+114%
	Off-peak (6PM-7AM)	13,800	29,400	+15,600	+112%
	Daily total	**53,500**	**97,800**	**+44,300**	**+83%**

3. Travel demands

The population growth projected for SEQ is likely to increase the transport task by 2031. This part of the report includes the Zenith model's estimates and forecasts for travel in the 2016 base and the 2031 forecast. Individual metrics are reported on under the following themes:

- Growth in person travel,
- Growth in road network demand, and
- Growth in public transport demand.

3.1 Growth in person travel

Between 2016 and 2031 the total number of weekday trips in Brisbane GCCSA is expected to increase by 32 per cent (Table 3-1) – just above the rate of population growth (30%). On the Gold Coast and Sunshine Coast, trips are projected to grow in line with population; by around 37 per cent and 33 per cent respectively.

In Brisbane, car travel's share of trips is forecast to decline to 84 per cent of average weekday trips by 2031 (down from 86% in 2016) (Figure 3-1). Public transport increases its share of trips to approximately 8 per cent (from 6% in 2016), while active transport remains stable across both years at 8 per cent. On the Gold Coast public transport's share of trips is approximately 4 per cent while on the Sunshine Coast it is 2 per cent (Table 3-2 and Table 3-3). In all three cities public transport trips are expected to grow strongly, particularly on the Gold Coast (from a low base). This outcome is driven by major investments in public transport and increased traffic congestion.

Increased congestion and improvements to the public transport system are also likely to drive a slower rate of increase in car travel in Brisbane compared with other modes, with trip numbers expected to grow by approximately 30 per cent across the day.

People in Brisbane are forecast to take around 278,000 extra public transport trips by 2031 (Figure 3-2). In contrast public transport trips makes up a smaller portion of overall trip growth on the Gold Coast (Figure 3-3) and Sunshine Coast (Figure 3-4). Despite improvements in public transport in SEQ, particularly in Brisbane, it is expected that car travel will remain the most convenient mode for the majority of people.

Significant growth in trips is forecast within the Brisbane GCCSA, Gold Coast and Sunshine Coast regions, as well as in inter-regional travel, particularly between Gold Coast and Brisbane, as well as the Sunshine Coast and Brisbane (Table 3-4 and Table 3-5).

Table 3-1 – Brisbane GCCSA person trips by mode

Mode	Time period	2016	2031	Change	% change
Car	AM peak (7-9AM)	957,000	1,235,000	+278,000	+29%
	Inter-peak (9AM-4PM)	2,722,000	3,551,000	+829,000	+30%
	PM peak (4-6PM)	866,000	1,119,000	+253,000	+29%
	Off-peak (6PM-7AM)	1,230,000	1,615,000	+385,000	+31%
	Daily total	**5,775,000**	**7,520,000**	**+1,745,000**	**+30%**
Public transport	AM peak (7-9AM)	102,000	159,000	+57,000	+56%
	Inter-peak (9AM-4PM)	166,000	265,000	+98,000	+59%
	PM peak (4-6PM)	87,000	138,000	+51,000	+59%
	Off-peak (6PM-7AM)	80,000	126,000	+46,000	+57%
	Daily total	**434,000**	**687,000**	**+252,000**	**+58%**
Walk and cycle	AM peak (7-9AM)	83,000	113,000	+30,000	+36%
	Inter-peak (9AM-4PM)	275,000	385,000	+110,000	+40%
	PM peak (4-6PM)	73,000	99,000	+26,000	+35%
	Off-peak (6PM-7AM)	111,000	154,000	+43,000	+38%
	Daily total	**543,000**	**751,000**	**+208,000**	**+38%**
Total	AM peak (7-9AM)	1,142,000	1,507,000	+365,000	+32%
	Inter-peak (9AM-4PM)	3,163,000	4,200,000	+1,037,000	+33%
	PM peak (4-6PM)	1,026,000	1,356,000	+330,000	+32%
	Off-peak (6PM-7AM)	1,421,000	1,895,000	+474,000	+33%
	Daily total	**6,752,000**	**8,958,000**	**+2,205,000**	**+33%**

Table 3-2 – Gold Coast person trips by mode

Mode	Time period	2016	2031	Change	% change
Car	AM peak (7-9AM)	270,000	369,000	+99,000	+37%
	Inter-peak (9AM-4PM)	833,000	1,136,000	+303,000	+36%
	PM peak (4-6PM)	261,000	356,000	+94,000	+36%
	Off-peak (6PM-7AM)	377,000	516,000	+139,000	+37%
	Daily total	**1,740,000**	**2,376,000**	**+636,000**	**+37%**
Public transport	AM peak (7-9AM)	11,000	22,000	+10,000	+92%
	Inter-peak (9AM-4PM)	29,000	43,000	+15,000	+51%
	PM peak (4-6PM)	9,000	18,000	+9,000	+92%
	Off-peak (6PM-7AM)	9,000	15,000	+6,000	+60%
	Daily total	**58,000**	**97,000**	**+39,000**	**+67%**
Walk and cycle	AM peak (7-9AM)	27,000	35,000	+8,000	+31%
	Inter-peak (9AM-4PM)	93,000	122,000	+29,000	+31%
	PM peak (4-6PM)	28,000	36,000	+8,000	+28%
	Off-peak (6PM-7AM)	41,000	54,000	+13,000	+32%
	Daily total	**189,000**	**247,000**	**+58,000**	**+31%**
Total	AM peak (7-9AM)	308,000	426,000	+118,000	+38%
	Inter-peak (9AM-4PM)	954,000	1,301,000	+347,000	+36%
	PM peak (4-6PM)	298,000	409,000	+111,000	+37%
	Off-peak (6PM-7AM)	427,000	585,000	+158,000	+37%
	Daily total	**1,987,000**	**2,721,000**	**+734,000**	**+37%**

Table 3-3 – Sunshine Coast person trips by mode

Mode	Time period	2016	2031	Change	% change
Car	AM peak (7-9AM)	158,000	209,000	+51,000	+32%
	Inter-peak (9AM-4PM)	499,000	661,000	+162,000	+32%
	PM peak (4-6PM)	154,000	204,000	+50,000	+32%
	Off-peak (6PM-7AM)	223,000	298,000	+74,000	+33%
	Daily total	**1,035,000**	**1,372,000**	**+337,000**	**+33%**
Public transport	AM peak (7-9AM)	5,000	8,000	+3,000	+70%
	Inter-peak (9AM-4PM)	14,000	20,000	+7,000	+48%
	PM peak (4-6PM)	4,000	6,000	+2,000	+66%
	Off-peak (6PM-7AM)	3,000	5,000	+2,000	+56%
	Daily total	**25,000**	**39,000**	**+14,000**	**+56%**
Walk and cycle	AM peak (7-9AM)	13,000	18,000	+5,000	+40%
	Inter-peak (9AM-4PM)	47,000	66,000	+19,000	+39%
	PM peak (4-6PM)	14,000	20,000	+5,000	+37%
	Off-peak (6PM-7AM)	22,000	29,000	+7,000	+29%
	Daily total	**97,000**	**133,000**	**+36,000**	**+37%**
Total	AM peak (7-9AM)	176,000	236,000	+60,000	+34%
	Inter-peak (9AM-4PM)	560,000	747,000	+187,000	+33%
	PM peak (4-6PM)	172,000	229,000	+58,000	+33%
	Off-peak (6PM-7AM)	249,000	331,000	+82,000	+33%
	Daily total	**1,157,000**	**1,543,000**	**+386,000**	**+33%**

Figure 3-1 – Brisbane GCCSA, Gold Coast and Sunshine Coast mode share of daily trips - 2016 and 2031

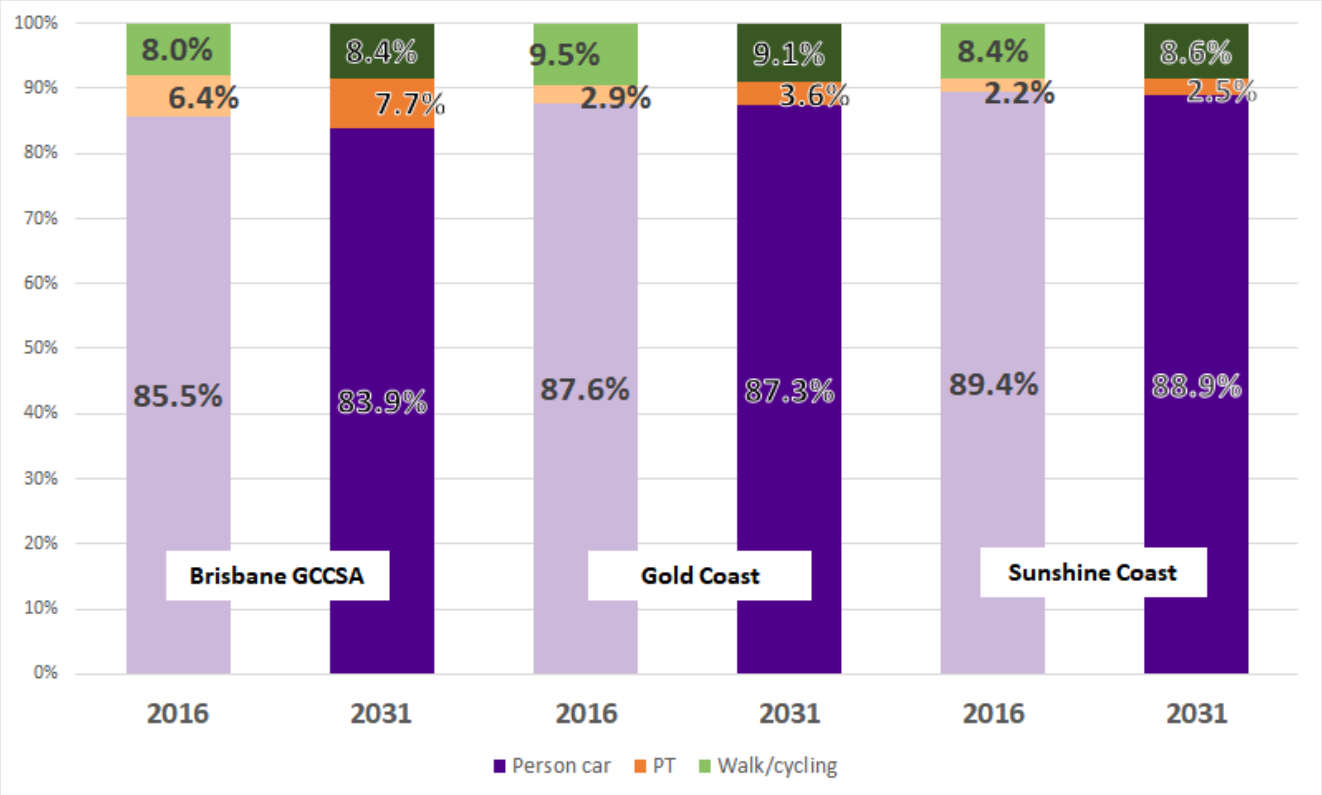


Figure 3-2 – Brisbane GCCSA growth in weekday person trips - 2016 to 2031

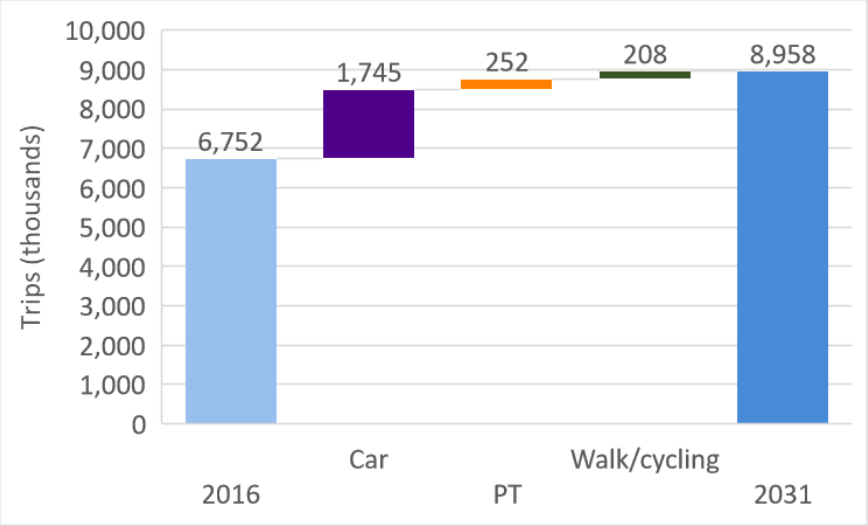


Figure 3-3 – Gold Coast growth in weekday person trips - 2016 to 2031

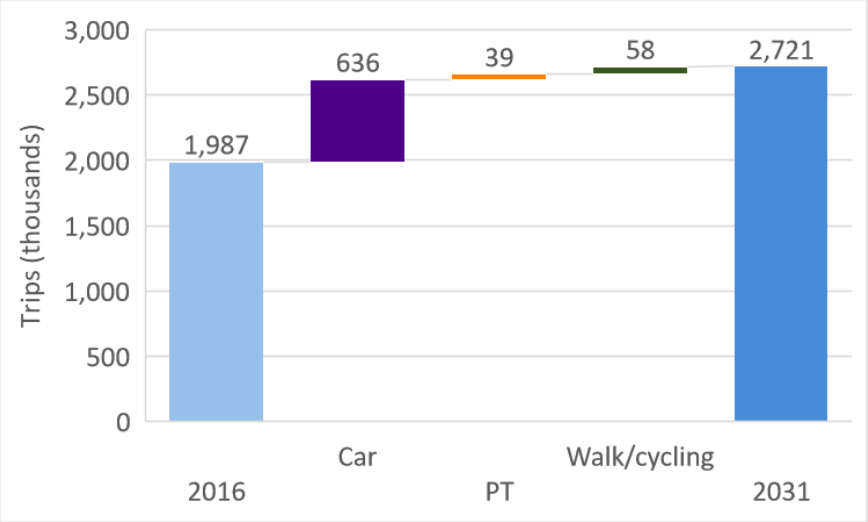


Figure 3-4 – Sunshine Coast growth in weekday person trips - 2016 to 2031

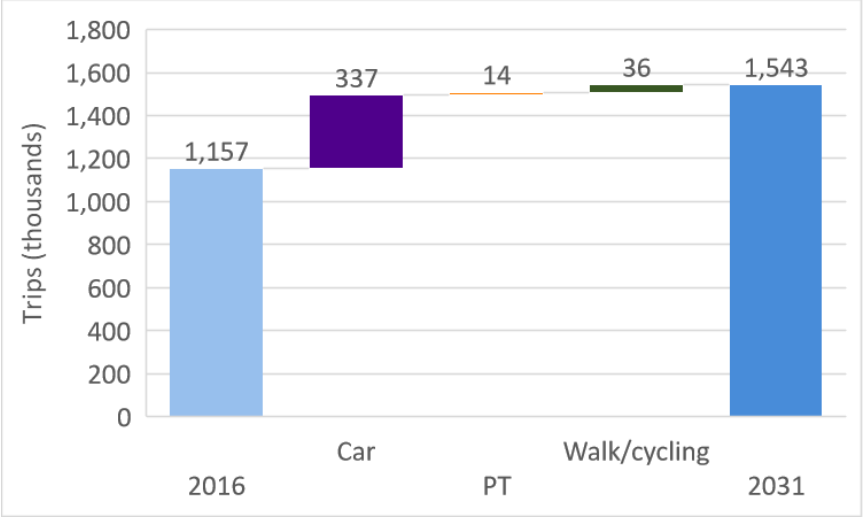


Table 3-4 Brisbane GCCSA, Gold Coast and Sunshine Coast inter-regional trips, 2016

	To:		
From:	**Brisbane GCCSA**	**Gold Coast**	**Sunshine Coast**
Brisbane GCCSA	6,414,000	112,000	34,000
Gold Coast	112,000	1,680,000	1,000
Sunshine Coast	34,000	1,000	1,071,000

Table 3-5 Brisbane GCCSA, Gold Coast and Sunshine Coast inter-regional trips, 2031

	To:		
From:	**Brisbane**	**Gold Coast**	**Sunshine Coast**
Brisbane GCCSA	8,464,000	166,000	48,000
Gold Coast	166,000	2,215,000	1,000
Sunshine Coast	48,000	1,000	1,424,000

3.2 Growth in vehicle travel

In Brisbane traffic on the road network is split between car (~95%) and commercial vehicles (~5%). Car trips grow more slowly to 2031 than commercial vehicle trips (30% and 35% respectively) as car users are able to switch to public transport in response to congestion (Table 3-6 and Table 3-7). See section Appendix D: for VLC's commercial vehicle definitions.

Table 3-6 – Brisbane GCCSA weekday car traffic statistics

Mode	Time period	2016	2031	Change	% change
Trips	AM peak (7-9AM)	678,000	877,000	+198,000	+29%
	Inter-peak (9AM-4PM)	1,981,000	2,591,000	+610,000	+31%
	PM peak (4-6PM)	666,000	860,000	+194,000	+29%
	Off-peak (6PM-7AM)	932,000	1,226,000	+294,000	+32%
	Daily total	**4,258,000**	**5,554,000**	**+1,296,000**	**+30%**
Kilometres	AM peak (7-9AM)	9,521,000	12,968,000	+3,447,000	+36%
	Inter-peak (9AM-4PM)	26,398,000	36,424,000	+10,026,000	+38%
	PM peak (4-6PM)	9,678,000	13,160,000	+3,482,000	+36%
	Off-peak (6PM-7AM)	14,129,000	19,769,000	+5,639,000	+40%
	Daily total	**59,726,000**	**82,321,000**	**+22,595,000**	**+38%**
Hours	AM peak (7-9AM)	228,000	422,000	+194,000	+85%
	Inter-peak (9AM-4PM)	475,000	736,000	+262,000	+55%
	PM peak (4-6PM)	215,000	381,000	+167,000	+78%
	Off-peak (6PM-7AM)	225,000	319,000	+93,000	+41%
	Daily total	**1,142,000**	**1,858,000**	**+716,000**	**+63%**
Average assigned speed (kph)	AM peak (7-9AM)	42	31	-11	-27%
	Inter-peak (9AM-4PM)	56	49	-6	-11%
	PM peak (4-6PM)	45	35	-11	-23%
	Off-peak (6PM-7AM)	63	62	-1	-1%
	Daily total	**52**	**44**	**-8**	**-15%**

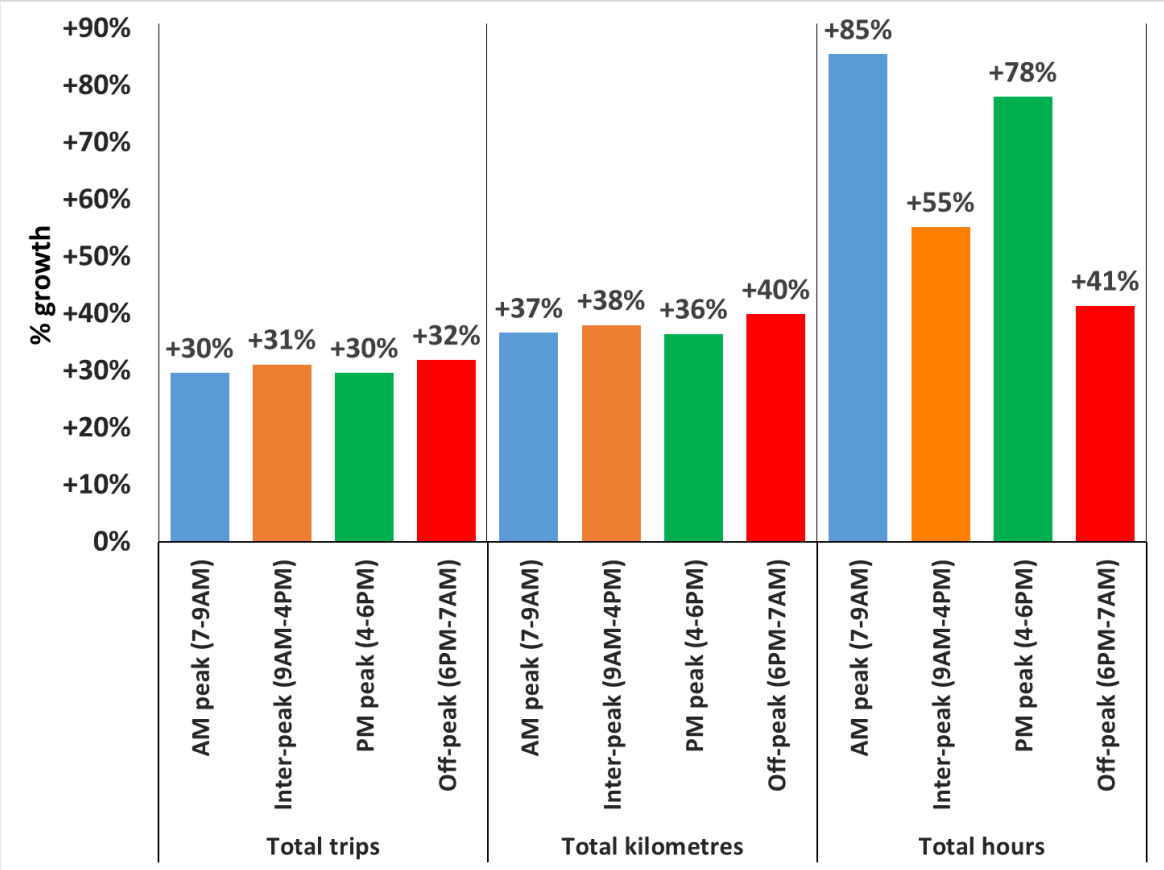
Table 3-7 – Brisbane GCCSA weekday commercial vehicle traffic statistics

Metric	Time period	2016	2031	Change	% change
Trips	AM peak (7-9AM)	43,000	57,000	+15,000	+34%
	Inter-peak (9AM-4PM)	136,000	183,000	+47,000	+35%
	PM peak (4-6PM)	48,000	66,000	+17,000	+36%
	Off-peak (6PM-7AM)	63,000	86,000	+22,000	+36%
	Daily total	**290,000**	**392,000**	**+102,000**	**+35%**
Kilometres	AM peak (7-9AM)	640,000	908,000	+268,000	+42%
	Inter-peak (9AM-4PM)	2,079,000	2,860,000	+781,000	+38%
	PM peak (4-6PM)	731,000	1,036,000	+305,000	+42%
	Off-peak (6PM-7AM)	1,151,000	1,597,000	+446,000	+39%
	Daily total	**4,601,000**	**6,401,000**	**+1,800,000**	**+39%**
Hours	AM peak (7-9AM)	14,000	25,000	+12,000	+86%
	Inter-peak (9AM-4PM)	35,000	54,000	+19,000	+56%
	PM peak (4-6PM)	15,000	27,000	+12,000	+81%
	Off-peak (6PM-7AM)	17,000	24,000	+7,000	+41%
	Daily total	**80,000**	**130,000**	**+50,000**	**+62%**

In Brisbane total vehicle kilometres are forecast to grow slightly above trips (Figure 3-5). This indicates a slight increase in trip lengths – a result of the population growth in outer areas and employment concentration in the central area.

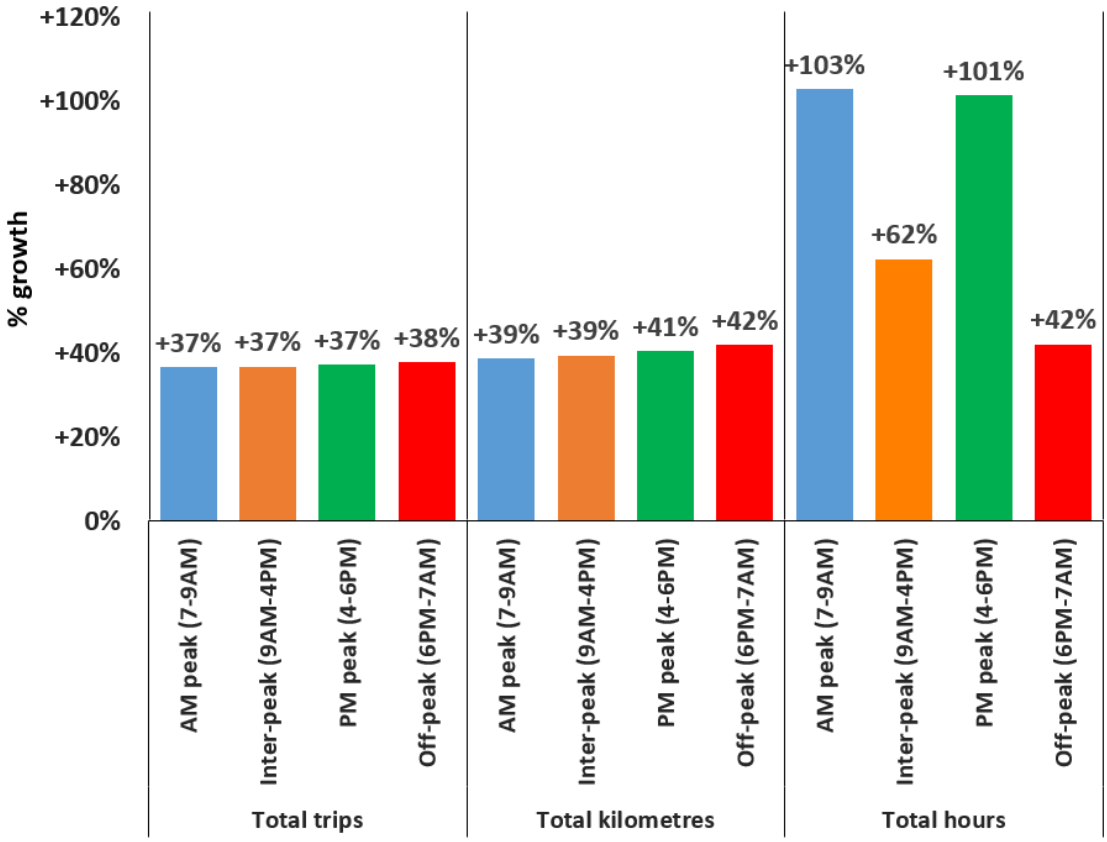
Substantial increases in vehicle hours are forecast in the AM and PM periods (85% and 78% respectively). This is a result of the underlying dynamics of traffic flow (when additional traffic is added to an already congested road, the resultant delay is disproportionately higher than in less congested conditions). In contrast, vehicle hours are forecast to grow more slowly in the inter-peak (55%) when congestion is more limited and off-peak (41%) when the road network is relatively uncongested.

Figure 3-5 – Brisbane GCCSA weekday total vehicle metrics - growth between 2016 and 2031



On the Gold Coast both car trips and car kilometres grow in line with population – indicating relatively stable trip lengths between 2016 and 2031 (Figure 3-6). On the Gold Coast congestion is expected to increase substantially, with Figure 3-6 indicating a doubling of trip times in 2031.

Figure 3-6 – Gold Coast weekday total vehicle metrics - growth between 2016 and 2031



3.3 Growth in public transport ridership

By 2031 the demand placed on SEQ's public transport network is expected to increase. This is reflected in the key public transport metrics, with public transport boardings, in-vehicle passenger kilometres and in-vehicle passenger hours predicted to grow substantially.

The increased popularity of public transport is primarily driven by infrastructure improvements, most notably Brisbane Metro and Cross River Rail. The road network congestion identified above also encourages a shift towards public transport, particularly in Brisbane. Table 3-8 illustrates considerable growth in:

- Boardings
- in-vehicle passenger kilometres
- in-vehicle passenger hours.

In-vehicle passenger kilometres *(or passenger kilometres) are a measure of movement of passengers for a particular mode or the public transport network as a whole. In-vehicle passenger kilometres are calculated through the network wide summation of the distances travelled by users onboard vehicles. This excludes the distance travelled (by car, walk or bike) accessing the service.*

In-vehicle passenger hours *(or passenger hours) are an analogous metric which is calculated through the network wide summation of the time spent by users onboard vehicles.*

A ***boarding*** *counts a person entering any public transport vehicle, irrespective of whether this is the first vehicle they have boarded for their trip, or whether they have transferred from another vehicle. One trip may include multiple boardings.*

Table 3-8 – Brisbane GCCSA weekday public transport metrics

Metric	Time period	2016	2031	Change	% change
Boardings	AM peak (7-9AM)	135,000	232,000	+97,000	+72%
	Inter-peak (9AM-4PM)	237,000	382,000	+145,000	+61%
	PM peak (4-6PM)	117,000	200,000	+83,000	+71%
	Off-peak (6PM-7AM)	99,000	159,000	+60,000	+60%
	Daily total	**588,000**	**972,000**	**+384,000**	**+65%**
In-vehicle passenger kilometres	AM peak (7-9AM)	1,973,000	3,968,000	+1,994,000	+101%
	Inter-peak (9AM-4PM)	3,399,000	6,341,000	+2,942,000	+87%
	PM peak (4-6PM)	1,590,000	3,305,000	+1,715,000	+108%
	Off-peak (6PM-7AM)	1,186,000	2,281,000	+1,095,000	+92%
	Daily total	**8,148,000**	**15,894,000**	**+7,746,000**	**+95%**
In-vehicle passenger hours	AM peak (7-9AM)	52,000	100,000	+48,000	+93%
	Inter-peak (9AM-4PM)	81,000	142,000	+61,000	+75%
	PM peak (4-6PM)	42,000	80,000	+39,000	+92%
	Off-peak (6PM-7AM)	30,000	52,000	+23,000	+77%
	Daily total	**204,000**	**374,000**	**+170,000**	**+83%**

Rail boardings are forecast to almost double across the day (Table 3-9). The strongest growth is in the peak periods where rail boardings are forecast to double (primarily driven by more services, see section 2.2). In the other periods boardings are still forecast to grow substantially. Boardings on buses are forecast to grow more moderately (by 49% across the day).

Table 3-9 – Brisbane GCCSA weekday public transport boardings

Metric	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	54,000	111,000	+57,000	+105%
	Inter-peak (9AM-4PM)	86,000	155,000	+69,000	+80%
	PM peak (4-6PM)	47,000	96,000	+48,000	+102%
	Off-peak (6PM-7AM)	43,000	79,000	+36,000	+84%
	Daily total	**231,000**	**441,000**	**+210,000**	**+91%**
Bus	AM peak (7-9AM)	78,000	118,000	+39,000	+50%
	Inter-peak (9AM-4PM)	145,000	218,000	+73,000	+50%
	PM peak (4-6PM)	66,000	99,000	+33,000	+51%
	Off-peak (6PM-7AM)	54,000	77,000	+23,000	+43%
	Daily total	**343,000**	**512,000**	**+169,000**	**+49%**

The distance travelled by passengers on the Brisbane rail network increases substantially between 2016 and 2031 (132% in the AM peak and 142% in the PM peak), a reflection of population growth in outer areas and travel from the Gold and Sunshine Coasts, which all contribute to increasing average rail trip lengths (Table 3-10).

The increase in bus passenger kilometres is more modest (51% across the day), indicating that bus trip lengths are not forecast to grow, and will remain shorter than rail trips.

Table 3-10 – Brisbane GCCSA weekday in-vehicle passenger kilometres

Mode	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	1,235,000	2,867,000	+1,633,000	+132%
	Inter-peak (9AM-4PM)	2,154,000	4,402,000	+2,248,000	+104%
	PM peak (4-6PM)	1,001,000	2,422,000	+1,421,000	+142%
	Off-peak (6PM-7AM)	712,000	1,604,000	+892,000	+125%
	Daily total	**5,102,000**	**11,295,000**	**+6,194,000**	**+121%**
Bus	AM peak (7-9AM)	729,000	1,087,000	+358,000	+49%
	Inter-peak (9AM-4PM)	1,221,000	1,902,000	+681,000	+56%
	PM peak (4-6PM)	576,000	863,000	+287,000	+50%
	Off-peak (6PM-7AM)	465,000	664,000	+199,000	+43%
	Daily total	**2,990,000**	**4,515,000**	**+1,525,000**	**+51%**

Average weekday rail passenger hours are forecast to double in Brisbane (again driven by the longer trips, Table 3-11). In contrast, bus passenger hours grow more slowly.

Table 3-11 – Brisbane GCCSA weekday in-vehicle passenger hours

Mode	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	27,000	56,000	+29,000	+108%
	Inter-peak (9AM-4PM)	45,000	84,000	+39,000	+87%
	PM peak (4-6PM)	22,000	48,000	+26,000	+115%
	Off-peak (6PM-7AM)	17,000	34,000	+17,000	+102%
	Daily total	**111,000**	**223,000**	**+111,000**	**+100%**
Bus	AM peak (7-9AM)	24,000	43,000	+19,000	+76%
	Inter-peak (9AM-4PM)	35,000	56,000	+21,000	+61%
	PM peak (4-6PM)	19,000	31,000	+13,000	+68%
	Off-peak (6PM-7AM)	12,000	18,000	+5,000	+43%
	Daily total	**90,000**	**148,000**	**+58,000**	**+64%**

On the Gold Coast, public transport usage is forecast to grow very substantially (Table 3-12). The extra services to Brisbane provided by Cross River Rail enables boardings, in-vehicle passenger kilometres and in-vehicle passenger kilometres hours to increase very strongly (Table 3-12, Table 3-13, Table 3-14 and Table 3-15). In a similar way the extension of the Gold Coast light rail is also expected to drive growth in the key light rail metrics. The increase in bus usage is expected to be more modest, reflecting the incremental improvements assumed for the bus network.

Table 3-12 – Gold Coast weekday public transport metrics

Metric	Time period	2016	2031	Change	% change
Boardings	AM peak (7-9AM)	19,000	52,000	+33,000	+173%
	Inter-peak (9AM-4PM)	47,000	92,000	+45,000	+95%
	PM peak (4-6PM)	16,000	43,000	+26,000	+161%
	Off-peak (6PM-7AM)	15,000	32,000	+17,000	+112%
	Daily total	**97,000**	**218,000**	**+121,000**	**+124%**
In-vehicle passenger kilometres	AM peak (7-9AM)	387,000	1,665,000	+1,278,000	+331%
	Inter-peak (9AM-4PM)	857,000	3,028,000	+2,171,000	+253%
	PM peak (4-6PM)	312,000	1,429,000	+1,117,000	+358%
	Off-peak (6PM-7AM)	235,000	851,000	+615,000	+262%
	Daily total	**1,791,000**	**6,972,000**	**+5,181,000**	**+289%**
In-vehicle passenger hours	AM peak (7-9AM)	7,000	28,000	+21,000	+294%
	Inter-peak (9AM-4PM)	16,000	51,000	+35,000	+217%
	PM peak (4-6PM)	6,000	24,000	+18,000	+311%
	Off-peak (6PM-7AM)	5,000	15,000	+10,000	+217%
	Daily total	**34,000**	**118,000**	**+84,000**	**+249%**

Table 3-13 – Gold Coast weekday public transport boardings

Mode	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	7,000	32,000	+25,000	+356%
	Inter-peak (9AM-4PM)	15,000	49,000	+34,000	+221%
	PM peak (4-6PM)	7,000	27,000	+21,000	+317%
	Off-peak (6PM-7AM)	6,000	18,000	+12,000	+200%
	Daily total	**35,000**	**126,000**	**+92,000**	**+262%**
Bus	AM peak (7-9AM)	8,000	13,000	+4,000	+55%
	Inter-peak (9AM-4PM)	21,000	25,000	+4,000	+21%
	PM peak (4-6PM)	6,000	9,000	+3,000	+44%
	Off-peak (6PM-7AM)	4,000	6,000	+2,000	+40%
	Daily total	**39,000**	**52,000**	**+13,000**	**+34%**
Light rail	AM peak (7-9AM)	3,800	7,000	+3,200	+83%
	Inter-peak (9AM-4PM)	11,100	17,900	+6,800	+61%
	PM peak (4-6PM)	3,900	7,100	+3,200	+81%
	Off-peak (6PM-7AM)	4,700	7,600	+2,900	+62%
	Daily total	**23,600**	**39,600**	**+16,100**	**+68%**

Table 3-14 – Gold Coast weekday in-vehicle passenger kilometres

Mode	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	313,000	1,528,000	+1,215,000	+388%
	Inter-peak (9AM-4PM)	661,000	2,742,000	+2,081,000	+315%
	PM peak (4-6PM)	252,000	1,320,000	+1,068,000	+423%
	Off-peak (6PM-7AM)	188,000	765,000	+577,000	+307%
	Daily total	**1,414,000**	**6,356,000**	**+4,941,000**	**+349%**
Bus	AM peak (7-9AM)	60,000	92,000	+32,000	+53%
	Inter-peak (9AM-4PM)	161,000	186,000	+25,000	+15%
	PM peak (4-6PM)	47,000	66,000	+19,000	+40%
	Off-peak (6PM-7AM)	32,000	45,000	+13,000	+41%
	Daily total	**301,000**	**389,000**	**+89,000**	**+29%**
Light rail	AM peak (7-9AM)	13,300	44,100	+30,800	+231%
	Inter-peak (9AM-4PM)	35,100	100,300	+65,100	+185%
	PM peak (4-6PM)	12,500	42,000	+29,500	+237%
	Off-peak (6PM-7AM)	15,300	40,500	+25,300	+165%
	Daily total	**76,200**	**226,900**	**+150,700**	**+198%**

Table 3-15 – Gold Coast weekday in-vehicle passenger hours

Mode	Time period	2016	2031	Change	% change
Rail	AM peak (7-9AM)	5,000	23,000	+19,000	+394%
	Inter-peak (9AM-4PM)	10,000	42,000	+32,000	+319%
	PM peak (4-6PM)	4,000	20,000	+16,000	+422%
	Off-peak (6PM-7AM)	3,000	12,000	+9,000	+292%
	Daily total	**22,000**	**97,000**	**+76,000**	**+350%**
Bus	AM peak (7-9AM)	2,000	3,000	+1,000	+84%
	Inter-peak (9AM-4PM)	4,000	5,000	+1,000	+23%
	PM peak (4-6PM)	1,000	2,000	+1,000	+64%
	Off-peak (6PM-7AM)	1,000	1,000	0,000	+39%
	Daily total	**8,000**	**12,000**	**+4,000**	**+44%**
Light rail	AM peak (7-9AM)	600	1,600	+1,000	+152%
	Inter-peak (9AM-4PM)	1,700	3,800	+2,100	+122%
	PM peak (4-6PM)	600	1,600	+1,000	+164%
	Off-peak (6PM-7AM)	700	1,600	+900	+115%
	Daily total	**3,700**	**8,600**	**+4900**	**+133%**

Further public transport metric detail for all SEQ regions is provided in Appendix F.

4. Road network performance

The previous section demonstrated that travel demand across SEQ is expected to increase significantly by 2031. This section analyses the likely impacts of increased demand on the performance of the road network using the following metrics:

- *Volume capacity (V/C) ratio*. The V/C ratio for a section of road is a useful metric to gauge its level of congestion during a period of the day. As the demand placed on the link approaches capacity, the travel speed deteriorates, causing congestion. In strategic modelling it is possible for the V/C ratio to exceed 1.0. When this occurs, travel speed on this link deteriorates further.
- *Average speed*. Average speed reflects the amount of delay on the road network as a whole, it is the total distance travelled on a network divided by the time taken to do so. Average speed can be calculated either for an entire day or for a particular time period.

By 2031, traffic is forecast to grow substantially on Greater Brisbane's road network. Figure 4-1 illustrates this growth on an average weekday. Traffic volumes on the Pacific Motorway south of Eight Mile Plains are expected to grow particularly strongly, by 25 per cent in each direction (carrying up to an additional 29,000 vehicles per direction). This is largely driven by the substantial population growth both in Brisbane's southern suburbs but also from the Gold Coast. Strong traffic growth is also expected on Logan Motorway, with population growth in Ipswich playing a substantial role in the additional 12,000 vehicles in both directions each day. Access to the central areas from Ipswich is a major contributor to traffic increases on the Ipswich and Centenary Highways (growing by 35% and 15% respectively). A similar outcome expected on Mt Lindesay Highway with traffic growing by 40 per cent. This is a result of population growth in the peri-urban areas to the far south, such as Jimboomba.

Brisbane's north-south development pattern makes the Gateway Motorway a key corridor. At the Brisbane River crossing, traffic volumes are forecast to increase by approximately 24,000 vehicles in each direction. Demand for travel to the northern suburbs and Sunshine Coast is also expected to increase significantly, with at least 21,000 additional vehicles forecast to travel in each direction on the Bruce Highway.

On the Gold Coast traffic volumes increase substantially across the network. The largest increase is expected on the Pacific Motorway with Figure 4-2 illustrating that over 31,000 additional vehicles are projected in each direction by 2031 (a 30% increase). This outcome highlights the importance of the Pacific Motorway in connecting the Gold Coast to Brisbane.

Figure 4-1 – Brisbane GCCSA weekday traffic volume growth - 2016 to 2031

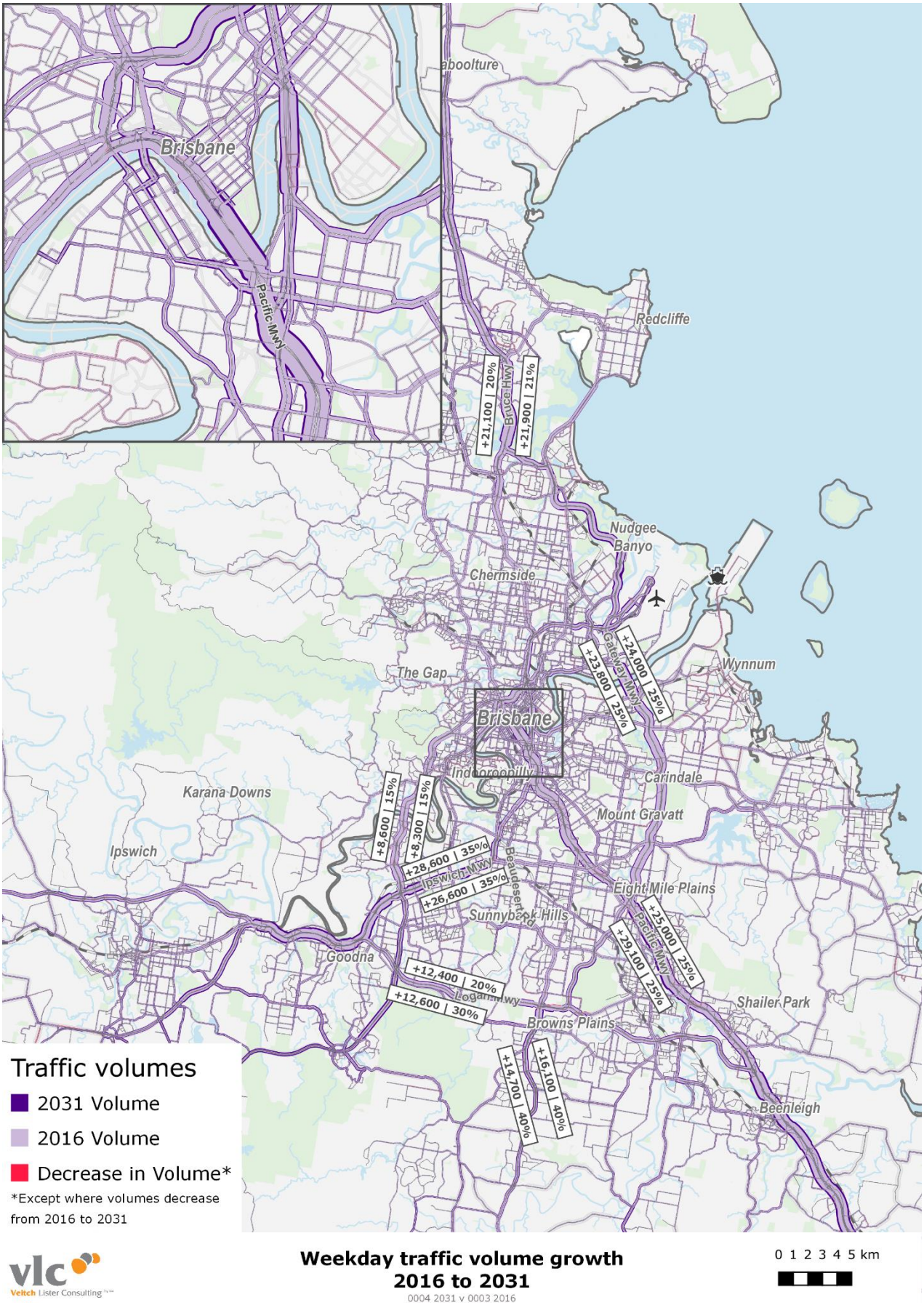
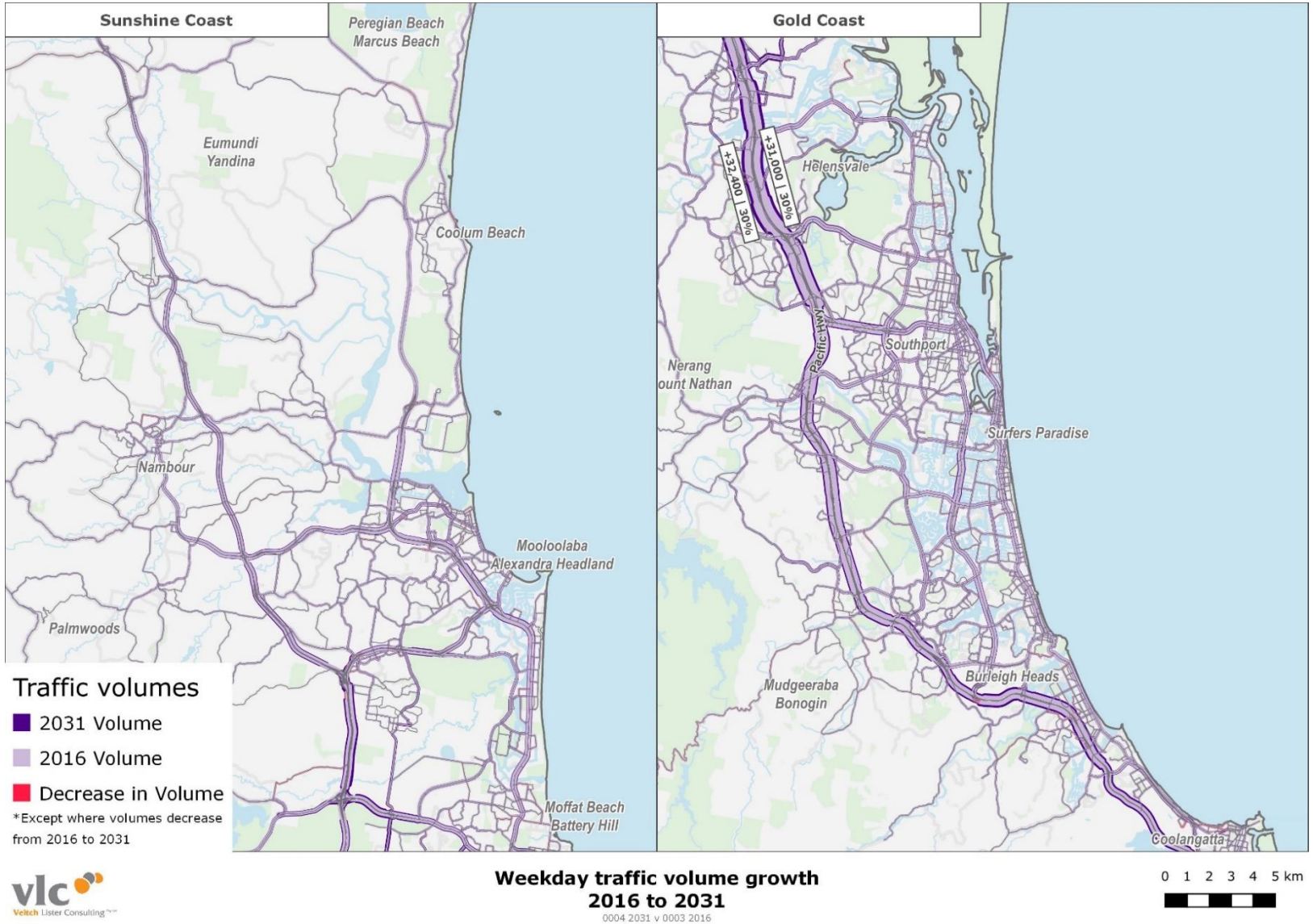


Figure 4-2 – Gold Coast and Sunshine Coast weekday traffic volume growth - 2016 to 2031



The following images illustrate the levels of congestion observed in Greater Brisbane in both 2016 and 2031 (Figure 4-4 to Figure 4-7). The V/C ratios are shown as the worst hour in the 2-hour peak. This peak one hour is assumed to be 56 per cent of the AM peak, and 52 per cent in the PM peak, an assumption developed based on observed travel data from various Australian cities. The colour of the bandwidth indicates the level of congestion, and the width is proportional to the volume of traffic using this link. (Minor roads have been excluded for clarity, as these links generally carry low volumes of traffic and are relatively uncongested).

Figure 4-3 shows how congestion in the model impacts travel speeds on the network. For arterials, increasing V/C ratios result in a gradual decline in travel speeds to about 0.6 (where speeds reduce to 85% of free flow), with a steeper decline between ratios of 0.6 and 1.0 (50% of free flow). Travel speeds on motorways are less affected by congestion up to a V/C ratio of 0.6 but experience a much steeper reduction in travel speeds thereafter. Managed motorways can accommodate far more vehicles relative to capacity before travel speeds are materially impacted (though there are no managed motorways in the 2031 forecast for SEQ).

Figure 4-3 – Speed flow to volume / capacity ratio relationship

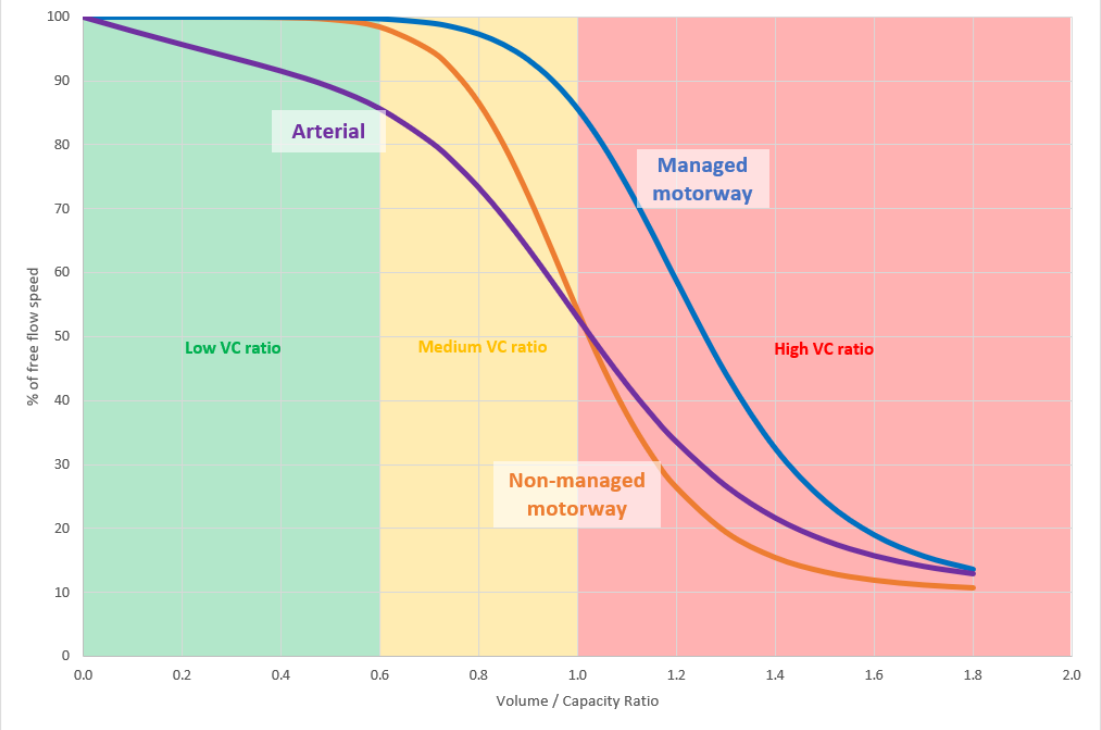


Figure 4-4 and Figure 4-5 suggest that several major roads and freeways across Brisbane are already under pressure during the peak periods in 2016. Travel in the peak direction is the most constrained (i.e. southbound for roads north of the Brisbane River and northbound for roads south of the Brisbane River). However some routes experience high levels of congestion in both directions of travel (Centenary Highway and the Pacific Motorway). The demand for travel between Brisbane's northern suburbs and the major activity centres in the south drives congestion on the Bruce Highway, Sandridge Road and Gateway Motorway.

The most significant corridors servicing east-west movements are the Ipswich Motorway (with high levels of congestion) and the Logan Motorway (with moderate congestion). Congestion on these corridors is a result of the demand for travel from the western parts of the city (Ipswich, Springfield and Redbank) to the activity centres located further east.

Figure 4-4 – Brisbane GCCSA weekday traffic volume / road capacity - 2016 1-hour AM peak

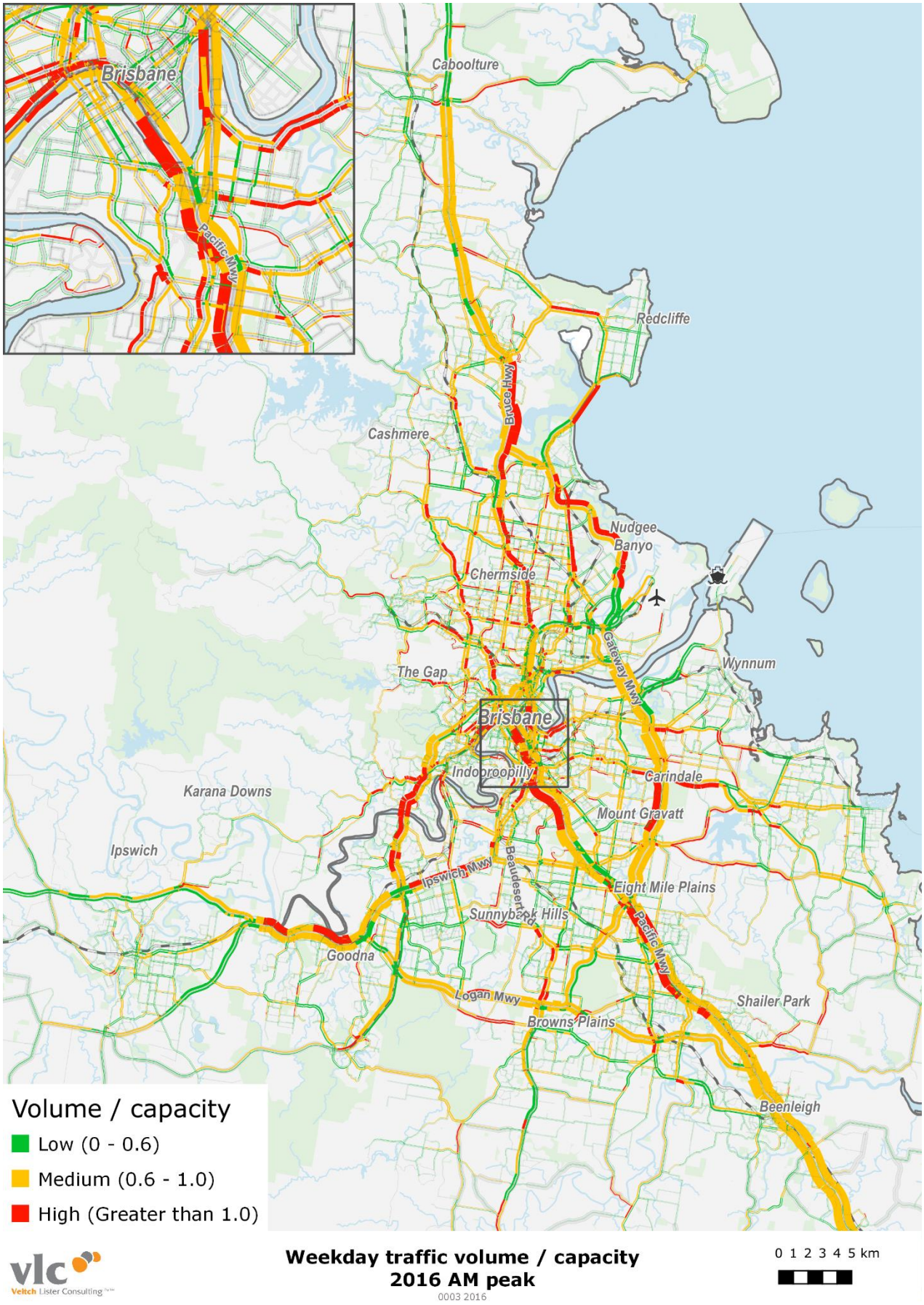
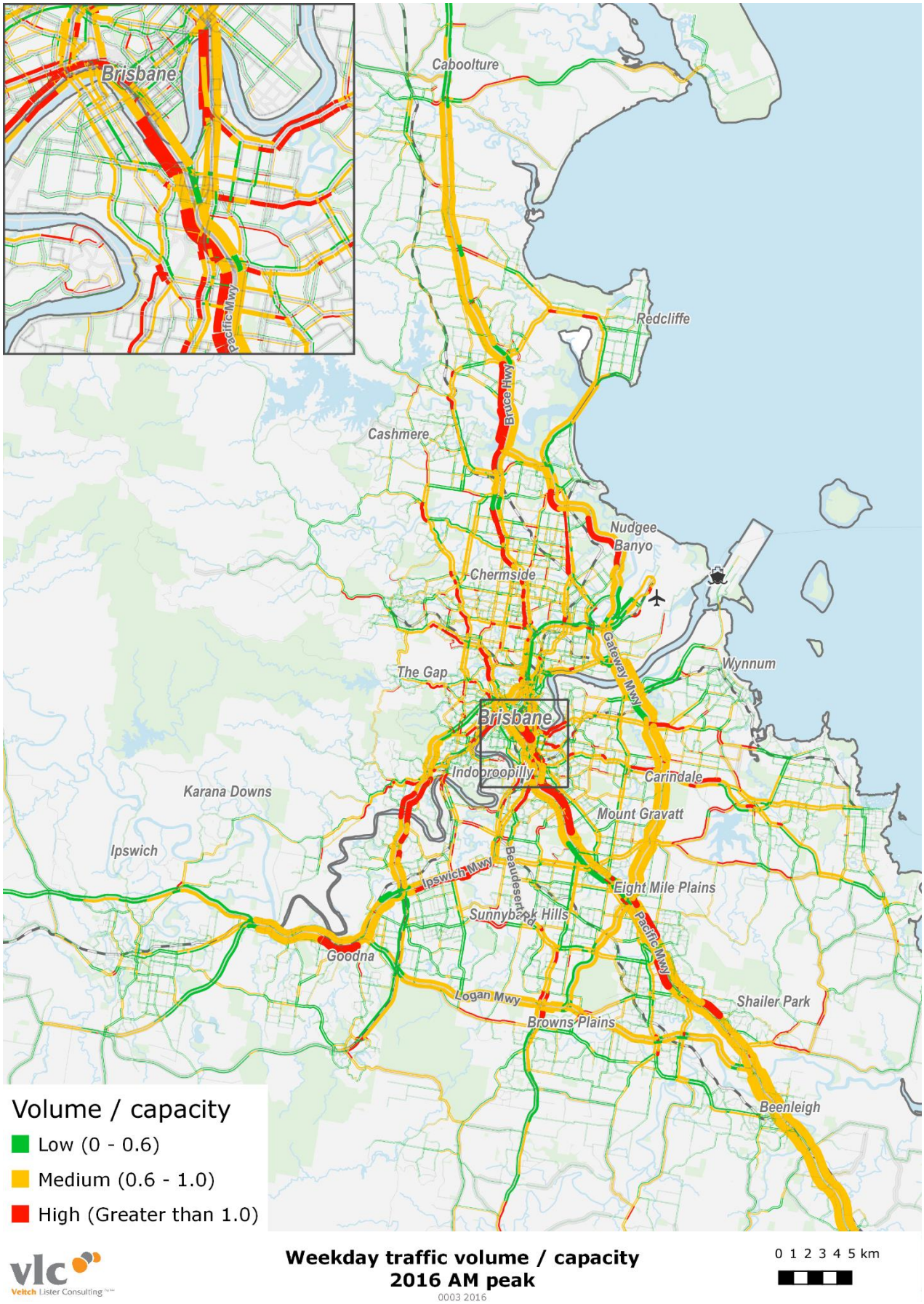


Figure 4-5 – Brisbane GCCSA weekday traffic volume / road capacity - 2016 1-hour PM peak



By 2031, the patterns of congestion identified above are predicted to become more pronounced. Congestion on the motorways and highways is forecast to worsen and in turn contributes to increased congestion on parallel arterials (Figure 4-6 and Figure 4-7).

Longer sections of high and moderate congestion are forecast to affect the major northern corridors (Bruce Highway and Gateway Motorway). These roads provide access to central Brisbane from the northern suburbs and the Sunshine Coast, with the strong population growth driving this congestion.

The 2031 forecast indicates that a greater proportion of the Pacific Motorway will operate in highly congested conditions in the peak periods. Congestion is expected to extend into Brisbane's outer southern suburbs, a result of the high population growth along this corridor and a larger number of trips from the Gold Coast.

The increased demand for travel is forecast to increase the pressure on Brisbane's River crossings, with congestion on these crossings worsening and spreading between 2016 and 2031. Longer sections of the main east-west corridors are also forecast to become highly congested in 2031, most notably the Ipswich and the Logan Motorways.

By 2031, long sections of the Mt Lindsey Highway are expected to carry traffic volumes above the highway's capacity. This is the result the very strong population growth in areas such as Jimboomba (section 2.1), the demand created by this growth is predicted to exceed the capacity of this corridor.

The level of travel demand forecast in Brisbane in 2031 is also likely to cause congestion in the counter-peak direction on road corridors. This outcome is expected on the Ipswich Motorway, the Logan Motorway and the Pacific Motorway.

Figure 4-6 – Brisbane GCCSA weekday traffic volume / road capacity - 2031 1-hour AM peak

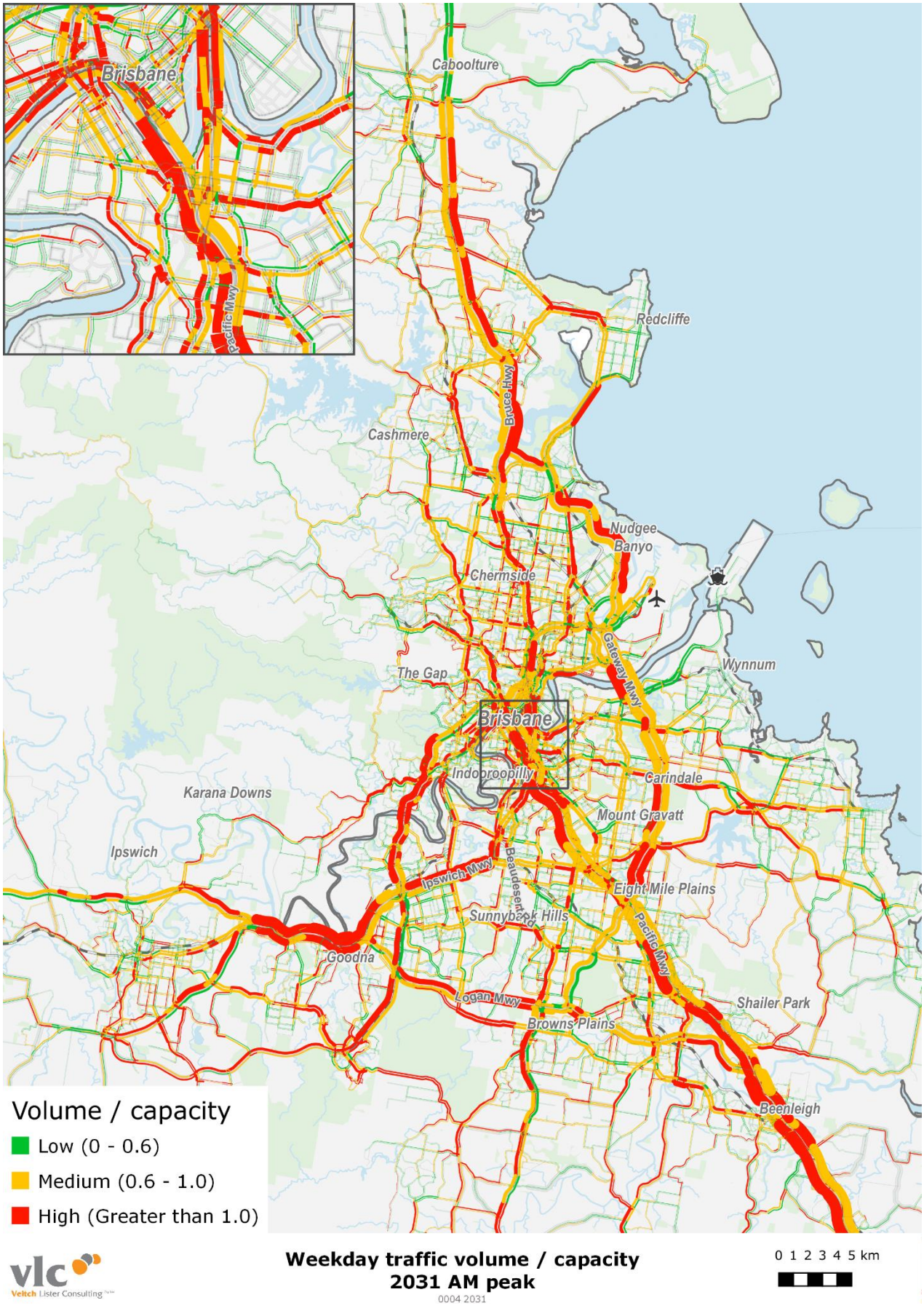
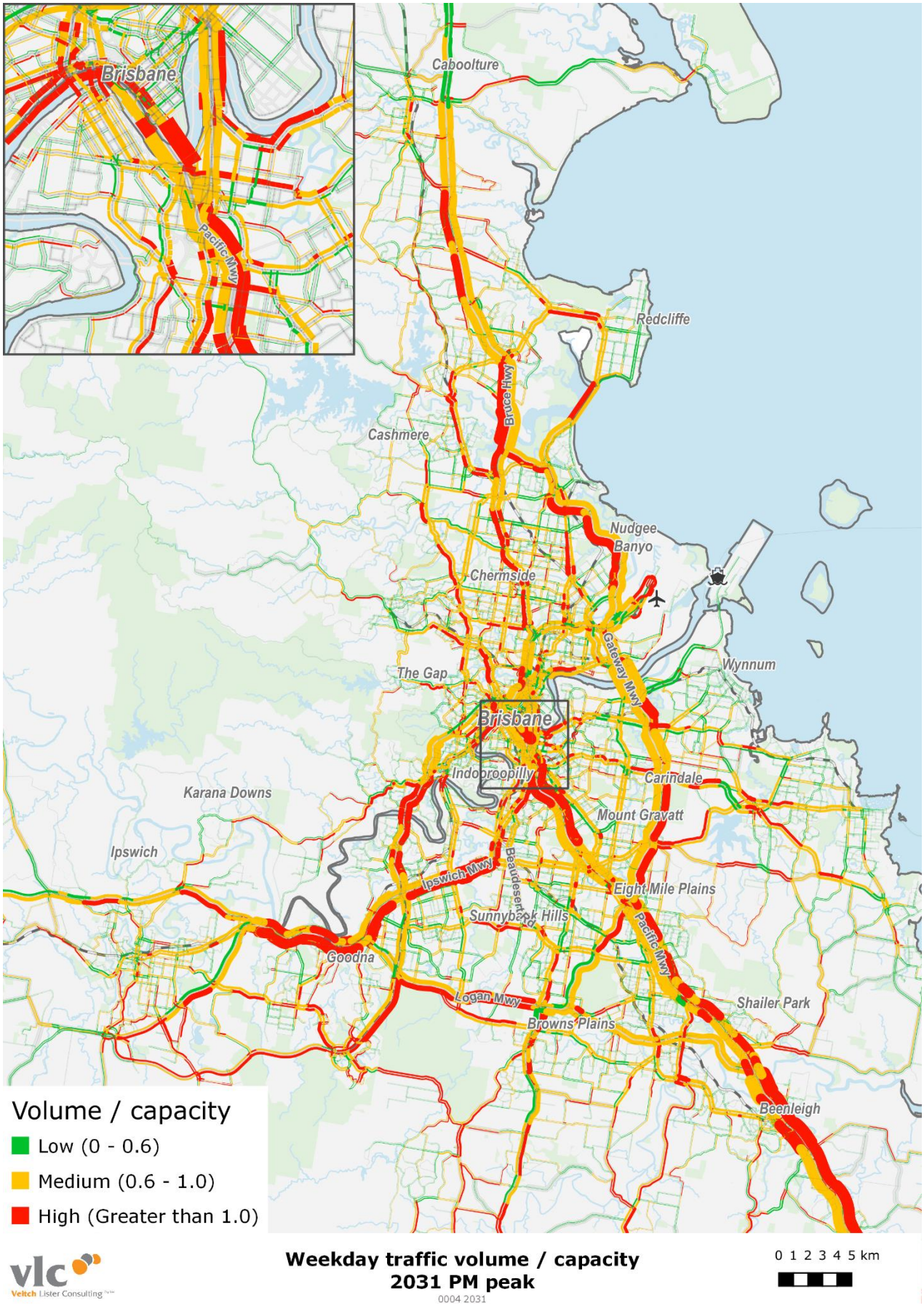
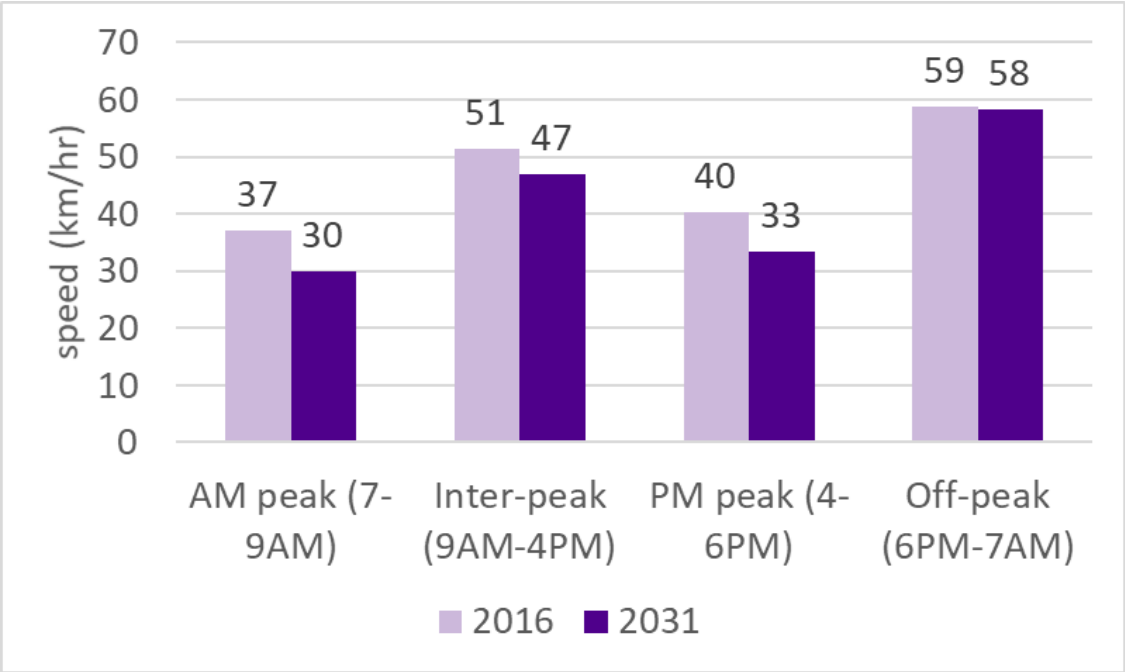


Figure 4-7 – Brisbane GCCSA weekday traffic volume / road capacity - 2031 1-hour PM peak



Average vehicle speeds on the road network are expected to decline by approximately seven kilometres per hour in the AM and PM peak periods. In the inter-peak, average speed is forecast to decline by approximately 4 kilometres per hour. This reflects the worsening congestion occurring on the network. Off-peak speeds are predicted to decline very slightly, reflecting the average travel speed on a relatively uncongested network.

Figure 4-8 – Brisbane GCCSA total average assigned speed



Congestion causes substantial delay hours for vehicles on SEQ's road networks (Table 4-1). Delays are most intense in the peak periods with moderate delay in the inter-peak and a small amount of delay in the off-peak. By 2031 daily traffic delay is forecast to more than double in Brisbane GCCSA and on the Sunshine Coast, on the Gold Coast it increases even more.

Table 4-1 – Road network total delay hours

	Time period	2016	2031	Change	% change
Brisbane GCCSA	AM peak (7-9AM)	80,000	226,000	+145,000	+181%
	Inter-peak (9AM-4PM)	69,000	183,000	+115,000	+167%
	PM peak (4-6PM)	66,000	183,000	+117,000	+177%
	Off-peak (6PM-7AM)	11,000	24,000	+13,000	+112%
	Daily total	**227,000**	**617,000**	**+390,000**	**+172%**
Gold Coast	AM peak (7-9AM)	10,000	43,000	+33,000	+317%
	Inter-peak (9AM-4PM)	11,000	42,000	+31,000	+278%
	PM peak (4-6PM)	9,000	41,000	+32,000	+333%
	Off-peak (6PM-7AM)	2,000	4,000	+2,000	+123%
	Daily total	**33,000**	**130,000**	**+97,000**	**+298%**
Sunshine Coast	AM peak (7-9AM)	4000	12000	+8,000	+187%
	Inter-peak (9AM-4PM)	7,000	17,000	+11,000	+158%
	PM peak (4-6PM)	4,000	11,000	+7,000	+166%
	Off-peak (6PM-7AM)	1,000	2,000	+1,000	+83%
	Daily total	**17,000**	**43,000**	**+27,000**	**+161%**

5. Public transport system performance

This section analyses the impact of passenger demand on SEQ's public transport network.

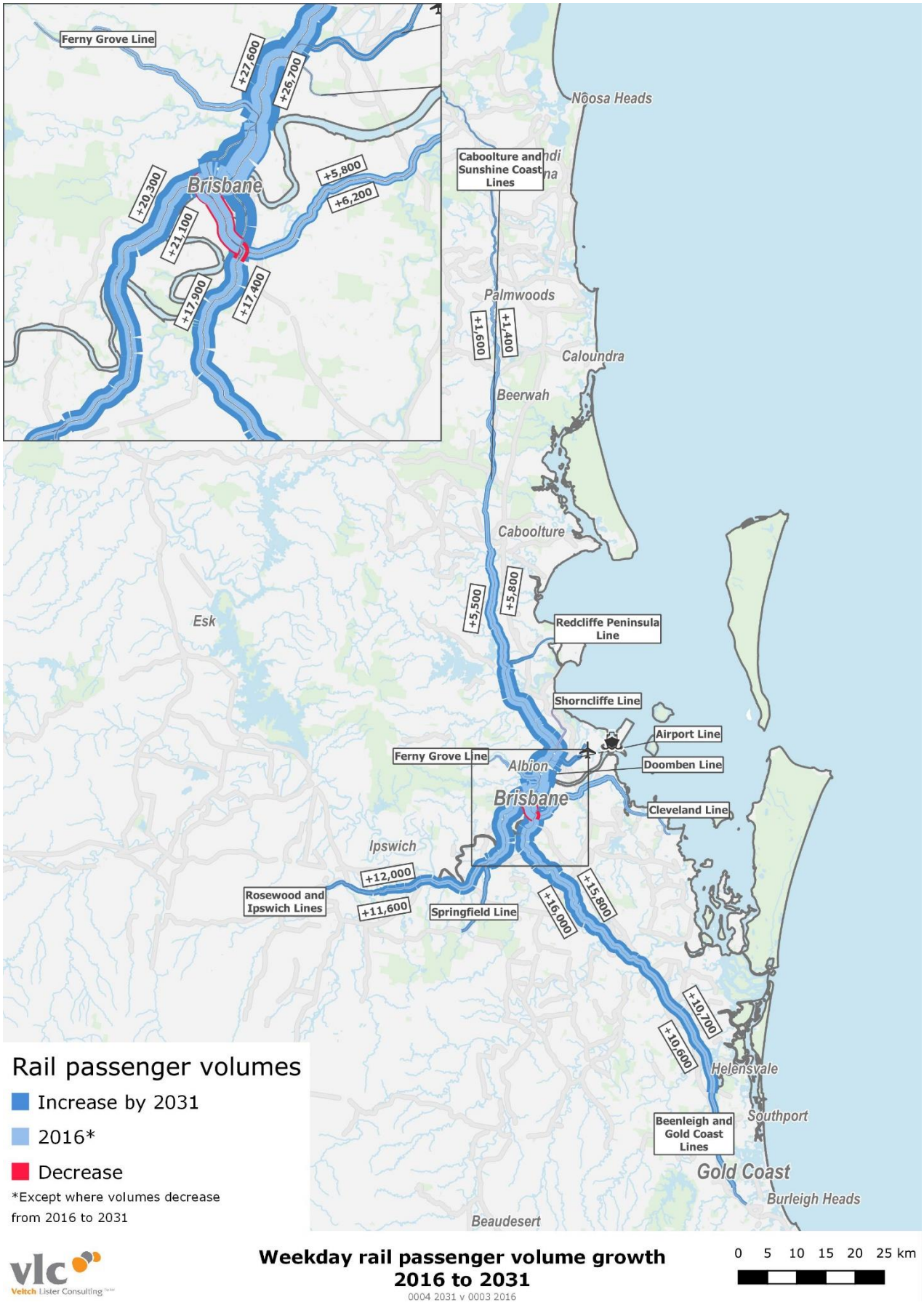
SEQ's public transport facilitates significant inter-city travel as well as intra-city travel. Public transport travel between regions is largely facilitated by heavy rail while buses and light rail cater to each city's internal travel demand. In Brisbane the bus network complements the rail network by serving a radial line haul function, with most routes providing access to the CBD. Feeder bus services are largely contained to Brisbane's growth areas as well as to the Gold Coast and Sunshine Coast region. Feeder buses carry the most patronage in these areas. The Gold Coast also has a light rail corridor.

Public transport usage in SEQ is expected to increase significantly to 2031, with the patronage on rail forecast to increase by more than buses (section 3.3). The rail system connects Brisbane's outer suburbs to the central city, and plays an importing role in facilitating travel from the Sunshine Coast and Gold Coast. The Cross River Rail project greatly increases the capacity of SEQ's rail system and accounts for much of the uplift in patronage (the small and localised decrease in passenger volumes on the southwestern approach to the CBD in Figure 5-1 is a result of train services being redirected to the new infrastructure).

On the Rosewood and Ipswich lines, average weekday patronage is forecast to increase by around 12,000 passengers in each direction. This increase is driven by the high levels of population growth expected in Ipswich. A similar outcome is expected in Caboolture where population growth is predicted to result in nearly 6,000 additional passengers in each direction. Strong patronage growth is expected along the Caboolture and Sunshine Coast Lines south of Caboolture through to Albion Station (trains passing through Albion are expected to carry approximately 27,000 passengers in each direction by 2031).

An uplift in demand is also expected from the south with the rail corridor at Logan forecast to carry almost 16,000 additional passengers in each direction by 2031. Many of these passengers will travel from the Gold Coast: more than 10,000 extra passengers are forecast to travel north from Helensville each weekday. The increase in passengers originating from the Sunshine Coast is more modest with less than 2,000 extra passengers forecast to travel south through Palmwoods.

Figure 5-1 – Brisbane GCCSA weekday rail passenger volume growth - 2016 to 2031



Brisbane's bus network includes high capacity corridors (the South Eastern and Northern Busways), feeder services to rail stations and local services (Figure 5-2). The strongest patronage growth is expected on the South Eastern Busway. The Brisbane Metro project will implement a substantial shift in the operating model of Brisbane's bus network. The existing system is largely a direct service model, where commuters can board a bus route in their suburb and travel on a 'single seat' journey to the city. The new operating model involves greater use of feeder routes that will intersect with a high capacity corridor, requiring passengers to change onto high frequency services.

The Brisbane Metro is forecast to carry approximately 17,000 additional passengers in each direction through South Bank on an average weekday in 2031 (Figure 5-2). The South Eastern Busway along the Pacific Motorway (the future Brisbane Metro line 1) is expected to see the largest uplift among Brisbane's bus corridors. Considerable patronage growth is also forecast on the Northern Busway, with nearly 4,000 additional daily passengers travelling in each direction. Lower levels of patronage growth are expected on the bus corridors to the eastern and western suburbs (the red bandwidths in Figure 5-2 are a result of a slight re-routing of buses in 2031).

***A note on Brisbane Metro**:*

Brisbane Metro will improve existing infrastructure, offering a 'metro'-style service intended to make it easier for passengers to interchange. While interchange is a component of the public transport journey that is typically unappealing, it is not clear how the project might change passenger 'perceptions' of the need to transfer between services.

In this analysis a conservative approach has been adopted and assumes that Brisbane Metro will be perceived similarly to the high-frequency Brisbane BUZ services.

On the Gold Coast the light rail patronage grows strongly carrying approximately extra 3,000 passengers in each direction through Southport. The extension to Helensvale railway station (Gold Coast Light Rail Stage 2) accounts for much of the uplift in ridership (Figure 5-3). For Gold Coast residents this project will streamline the connection to the heavy rail system, resulting in decreased use of the parallel bus routes.

The rest of this chapter focuses on crowding on the public transport network. This has been measured by using a V/C ratio, where the number of passengers on each service on a line is divided by the crush capacity of the rail rolling stock allocated to that service during the worst hour in the peak period. The worst hour in the 2-hour peak is assumed to be 55 per cent of travel demand in that period, an assumption developed based on observed travel data from various Australian cities.

In the morning, services become busier as they approach the Brisbane CBD, however there is minimal crowding (Figure 5-4). Figure 5-5 shows the reverse as commuters return home, however crowding is still not widespread.

By 2031, the implementation of Cross River Rail results in a significant expansion of Brisbane's rail network, with the number of services in the AM peak assumed to quadruple on some parts of the network. This increase in capacity means that, despite a significant uplift in patronage, passengers are not forecast to experience significant crowding in 2031 (Figure 5-6 and Figure 5-7).

Limitations of crowding measures:

While the model provides a sophisticated representation of the impacts of passenger crowding on the public transport network, there are two primary limitations to the crowding metric used in this report:

Firstly, the model represents 'timetabled' public transport operating conditions. When severe crowding occurs, it is often a result of service delays, cancellations or incidents. This is not captured in the modelling.

Secondly, the V/C ratios represent a weighted average of all services on each corridor. This means that the measure does not reflect the complexity of the crowding on each individual service. For example, there may be uneven demand across services on the same line (i.e. more passengers on an express service compared with an all-stopper), or within a single service (i.e. one carriage is at capacity while another is much less crowded).

Figure 5-2 – Brisbane GCCSA weekday bus passenger volume growth - 2016 to 2031

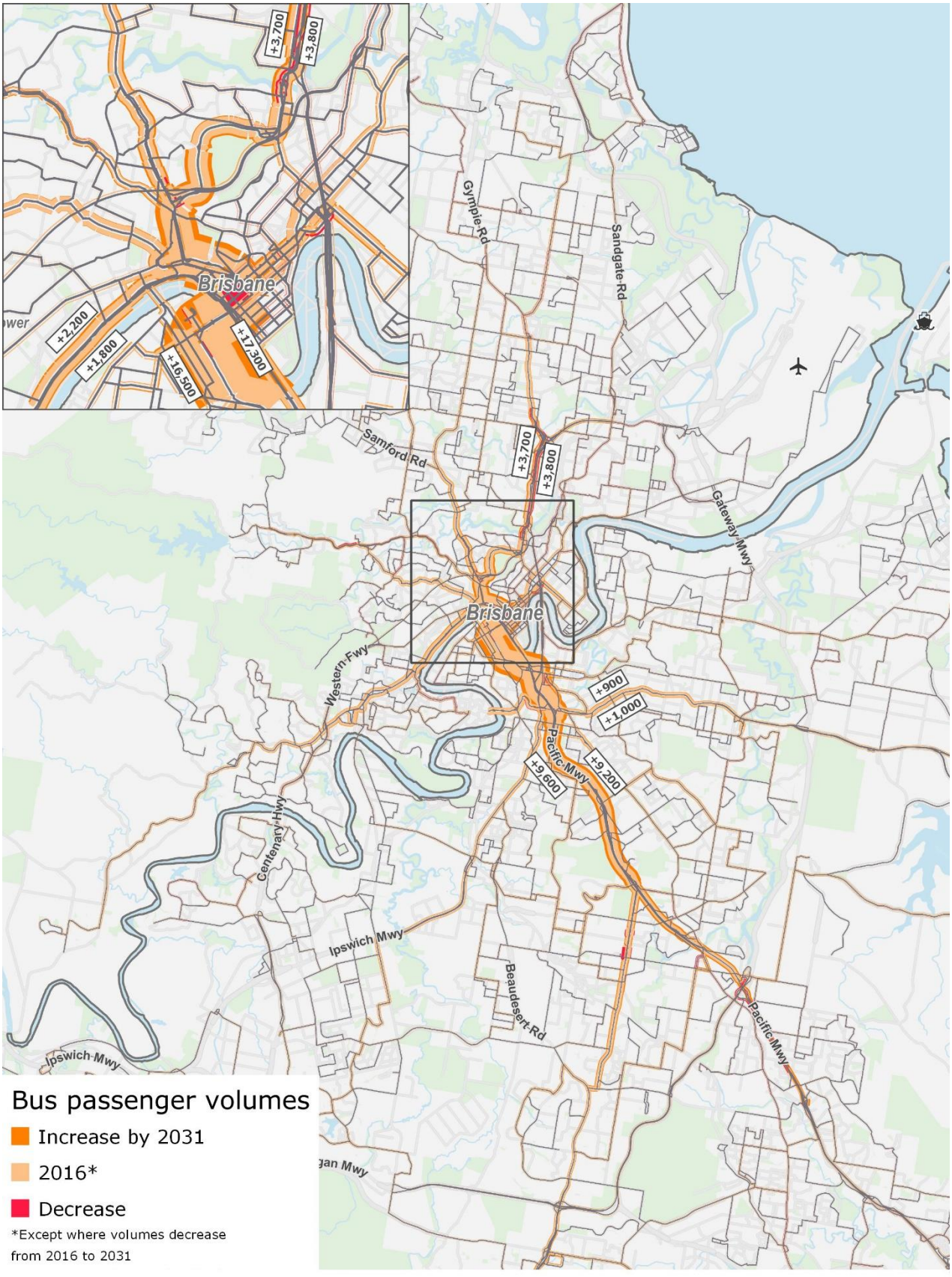


Figure 5-3 – Brisbane GCCSA weekday bus and light rail passenger volume growth - 2016 to 2031

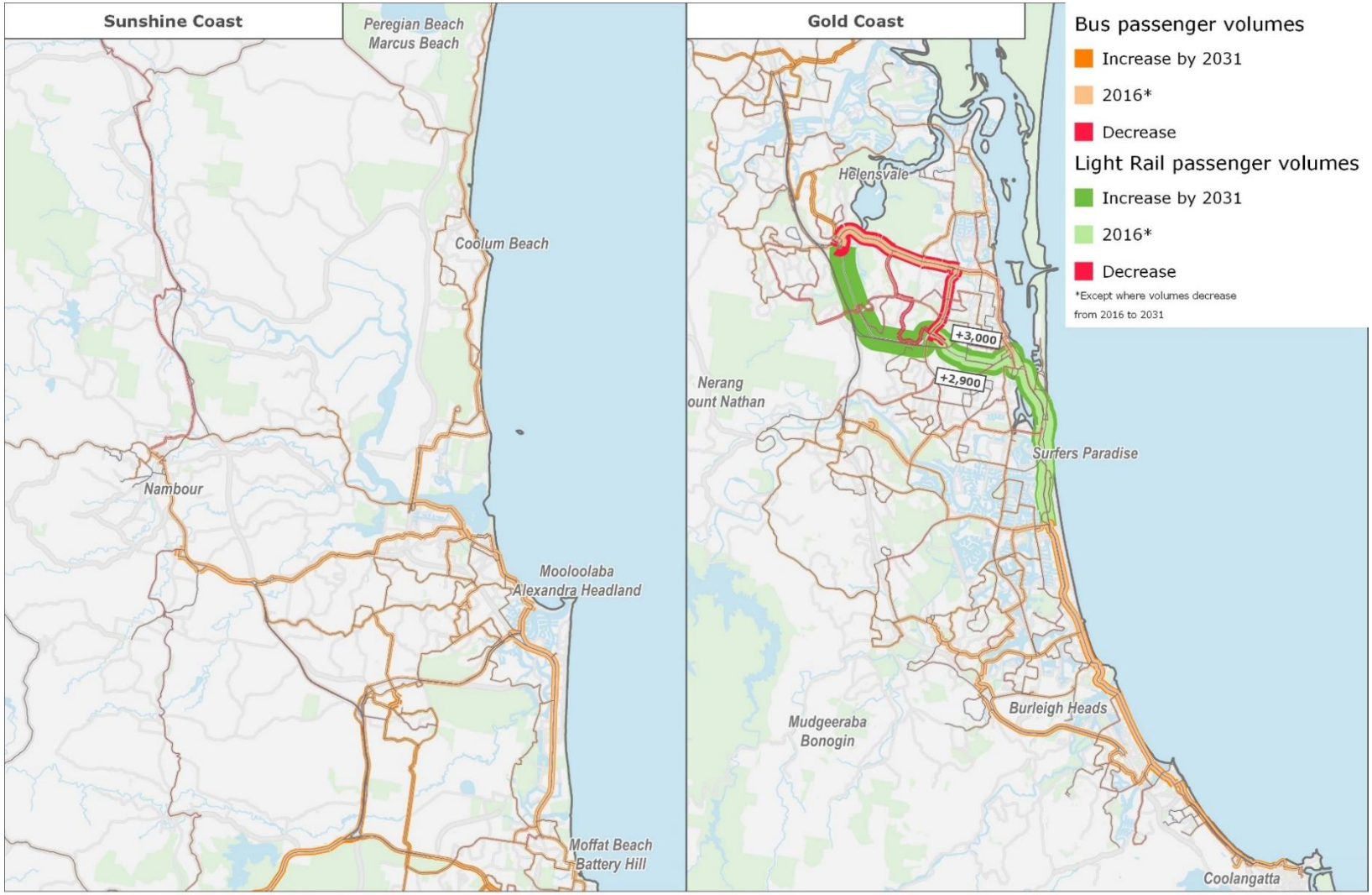


Figure 5-4 – Brisbane GCCSA weekday rail passenger volume / crush capacity - 2016 AM 1-hour peak

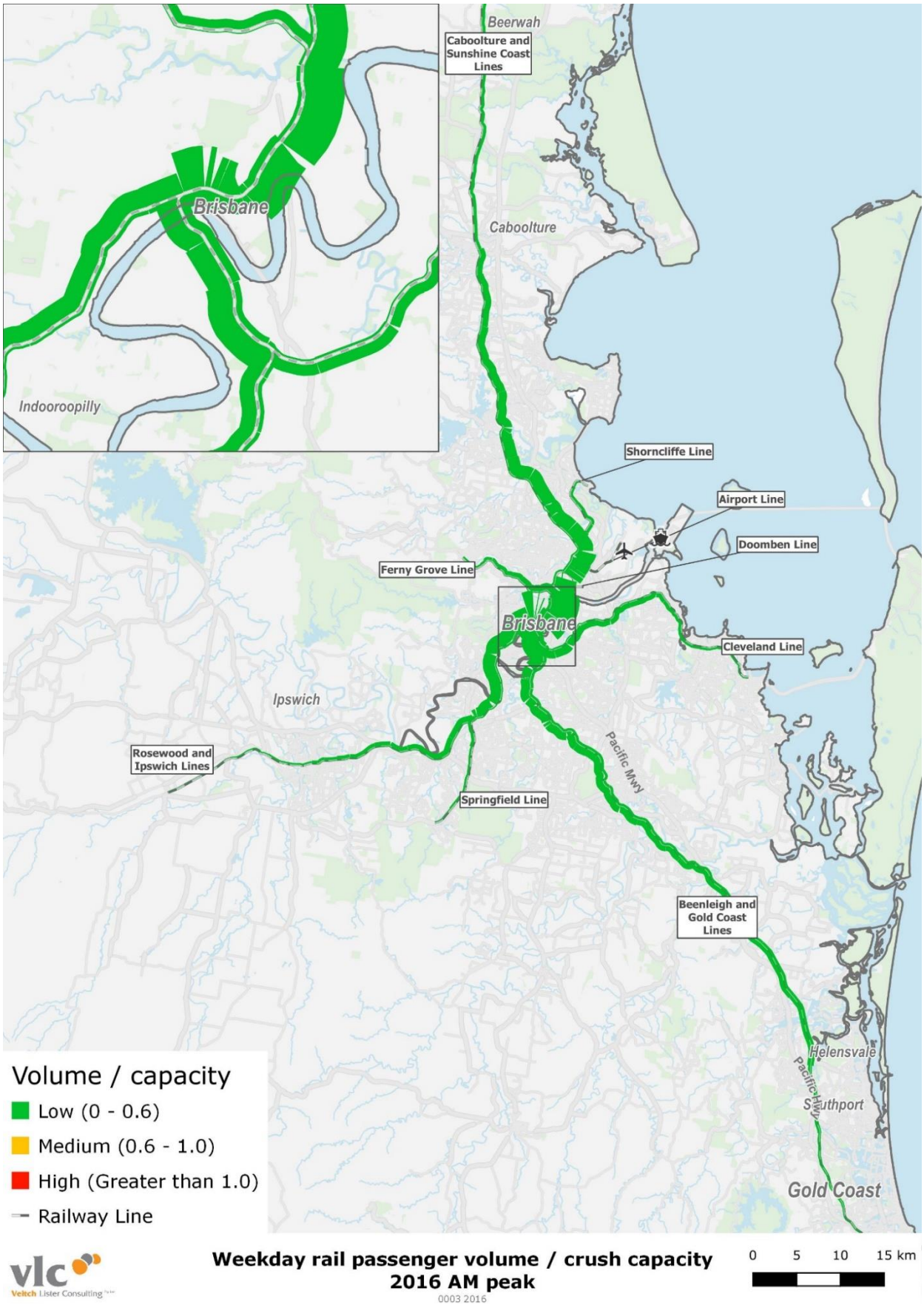


Figure 5-5 – Brisbane GCCSA weekday rail passenger volume / crush capacity - 2016 PM 1-hour peak

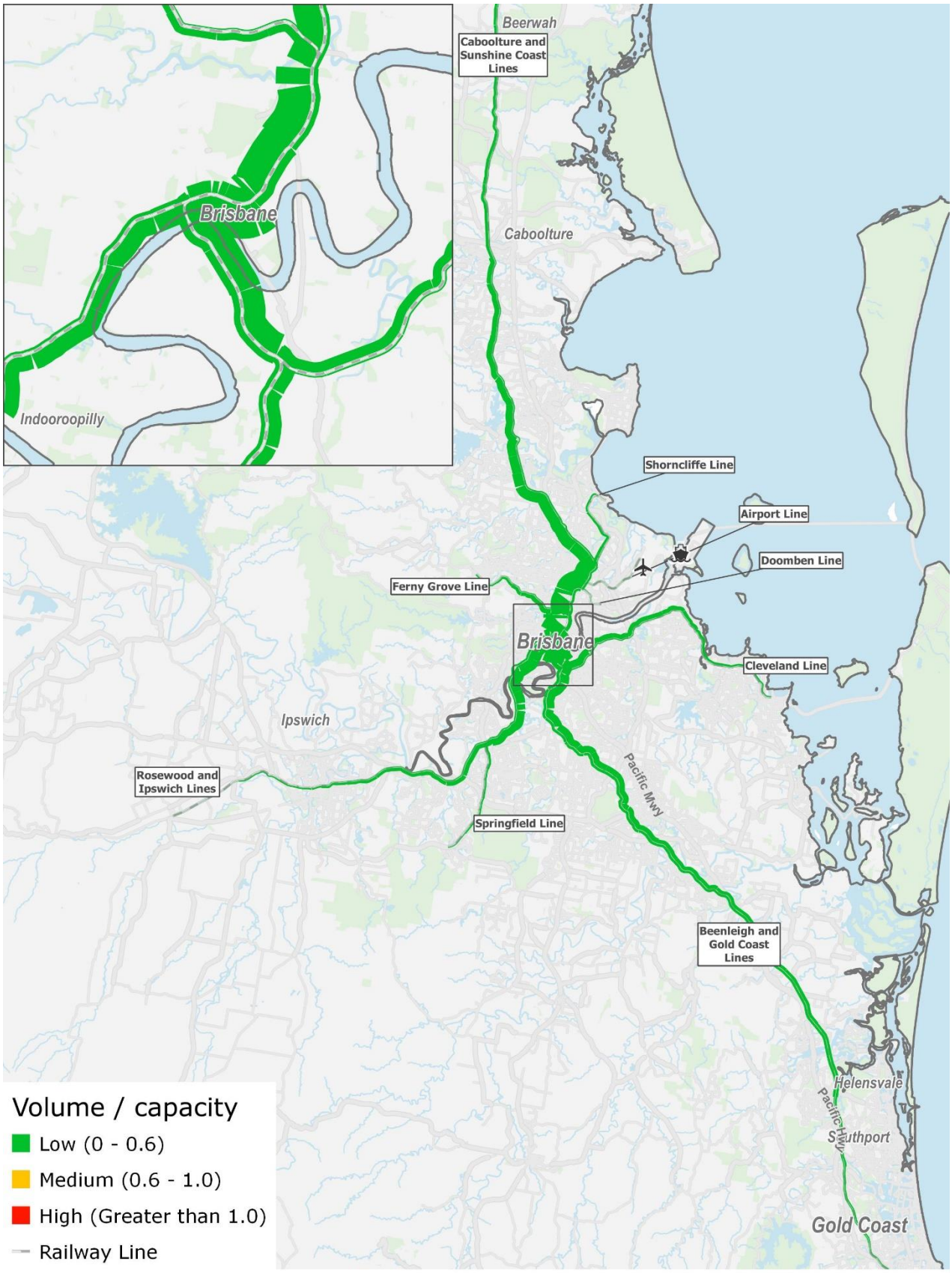


Figure 5-6 – Brisbane GCCSA weekday rail passenger volume / crush capacity - 2031 AM 1-hour peak

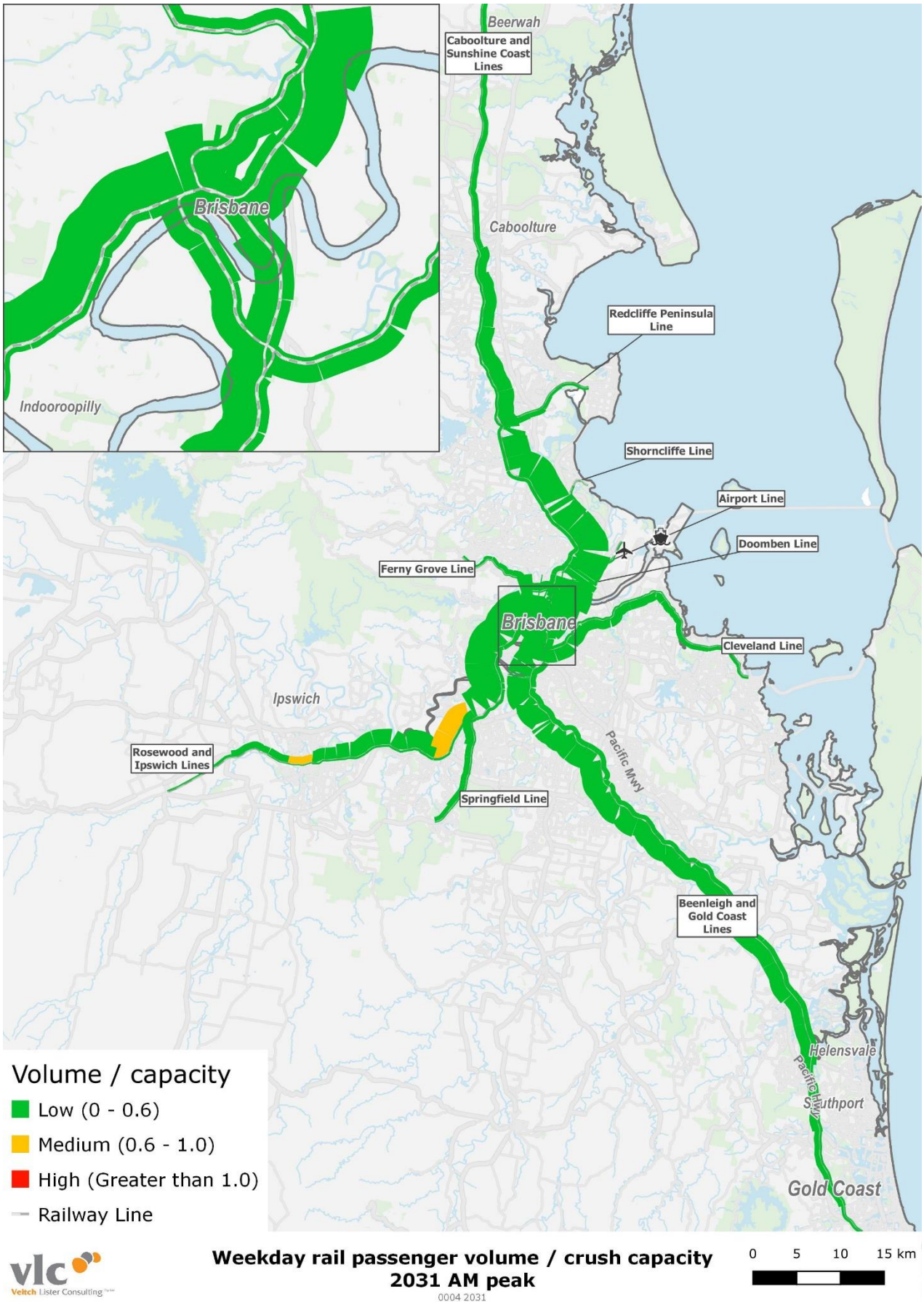
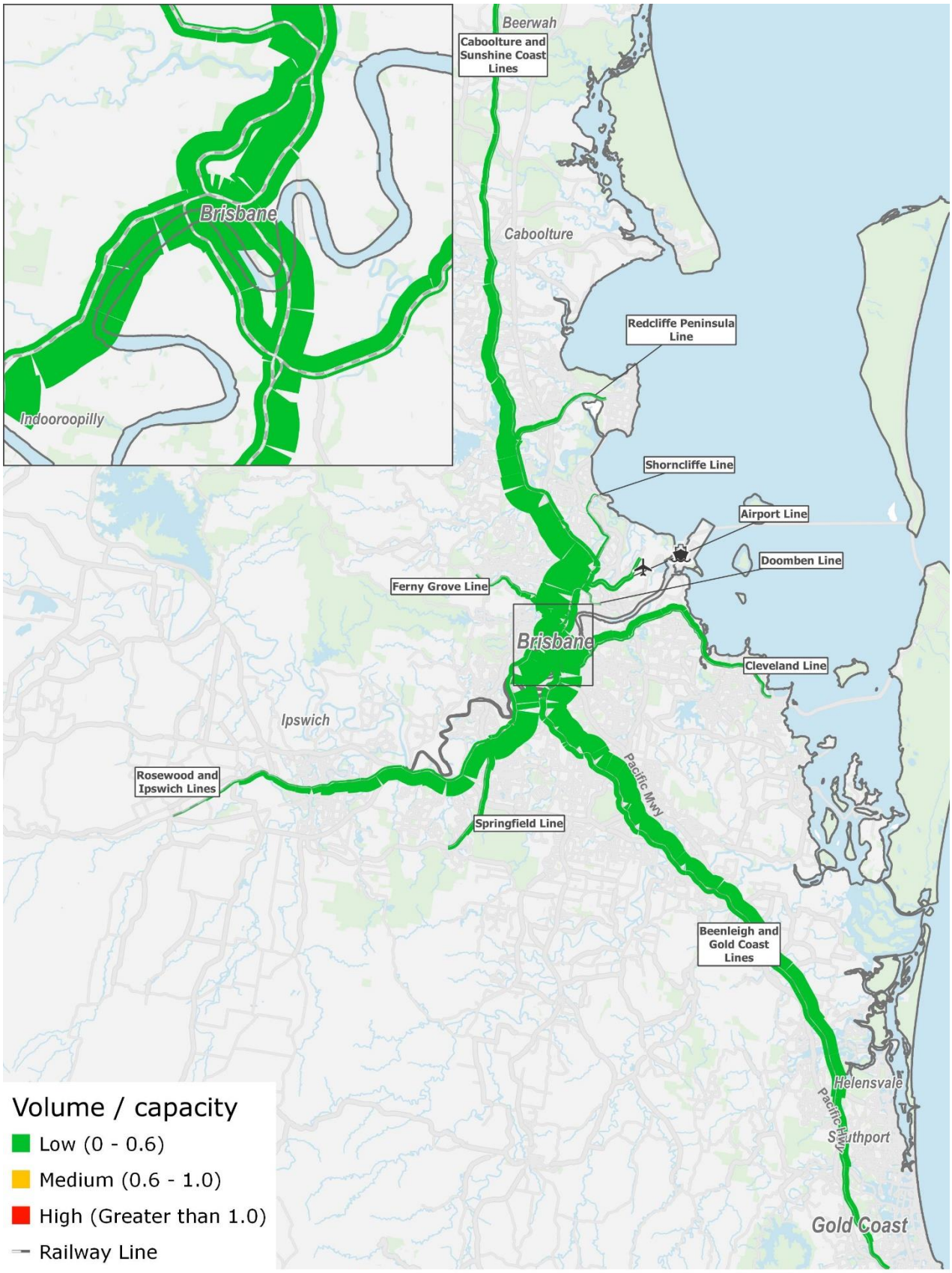


Figure 5-7 – Brisbane GCCSA weekday rail passenger volume / crush capacity - 2031 PM 1-hour peak



In this section the volume capacity analysis is undertaken for light rail and bus networks. Levels of crowding on the bus network are also examined through the use of V/C ratios, though in this case the ratio compares the number of passengers on a service to the crush capacity of the bus.

In 2016, moderate levels of crowding were apparent on Brisbane's major bus corridors during the peak periods (Figure 5-9 and Figure 5-10). Crowding is likely to be worst on the bus routes which serve the areas outside rail catchments. By 2031, increases in patronage are expected to place additional demands on Brisbane's bus network. As a result, many key corridors are expected to be crowded (Figure 5-11 and Figure 5-12).

In the morning bus routes are expected to become more crowded further from the city, while in the evening the reverse is predicted. As a result, bus passengers are less likely to be able to sit and more likely to have to stand for longer periods. As was seen in 2016, higher levels of crowding are forecast on the bus routes serving areas outside the rail catchments.

Nevertheless, the high frequency corridors (the South Eastern and Northern Busways) are only expected to be significantly crowded immediately outside the CBD, suggesting the average passenger will not spend long periods standing[3].

Outside of dedicated bus corridors, buses can be affected by traffic congestion in the AM and PM peak periods. Overall, Brisbane's average bus speeds are expected to decline between 2016 and 2031 by approximately 3 kilometres per hour during these periods (Figure 5-8). There is a very small increase in inter-peak bus delay to 2031 and negligible delay in the off-peak. The relatively minor impact of congestion at a network level demonstrates the benefit of bus separation from general traffic on key corridors such as the South East and Northern Busways.

[3] The high levels of crowding outbound on the South Eastern Busway (Figure 5-11) are a function of the conservative approach taken to modelling Brisbane Metro. We have simply scaled up 2016 frequencies to model Brisbane Metro in 2031. But existing highly peak-direction-heavy service provision on the South Eastern Busway are likely to be supported by additional counter-peak services, the counter-peak capacity used in the 2031 forecast is likely to overstate crowding. Additionally, a network-wide set of seated capacities for buses has been assumed. In reality, it is likely that Brisbane Metro vehicles will have higher capacities than the existing stock. This will have also increased the estimated V/C ratio in this corridor.

Figure 5-8 – Brisbane GCCSA average bus speeds

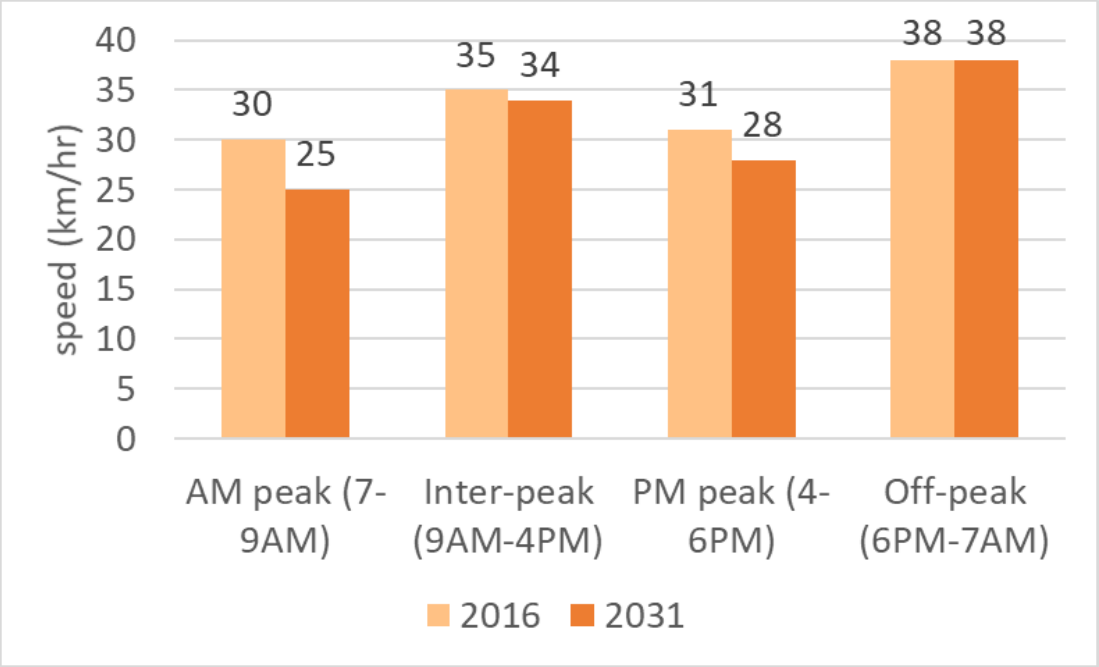


Figure 5-9 – Brisbane GCCSA weekday bus passenger volume / crush capacity - 2016 AM 1-hour peak

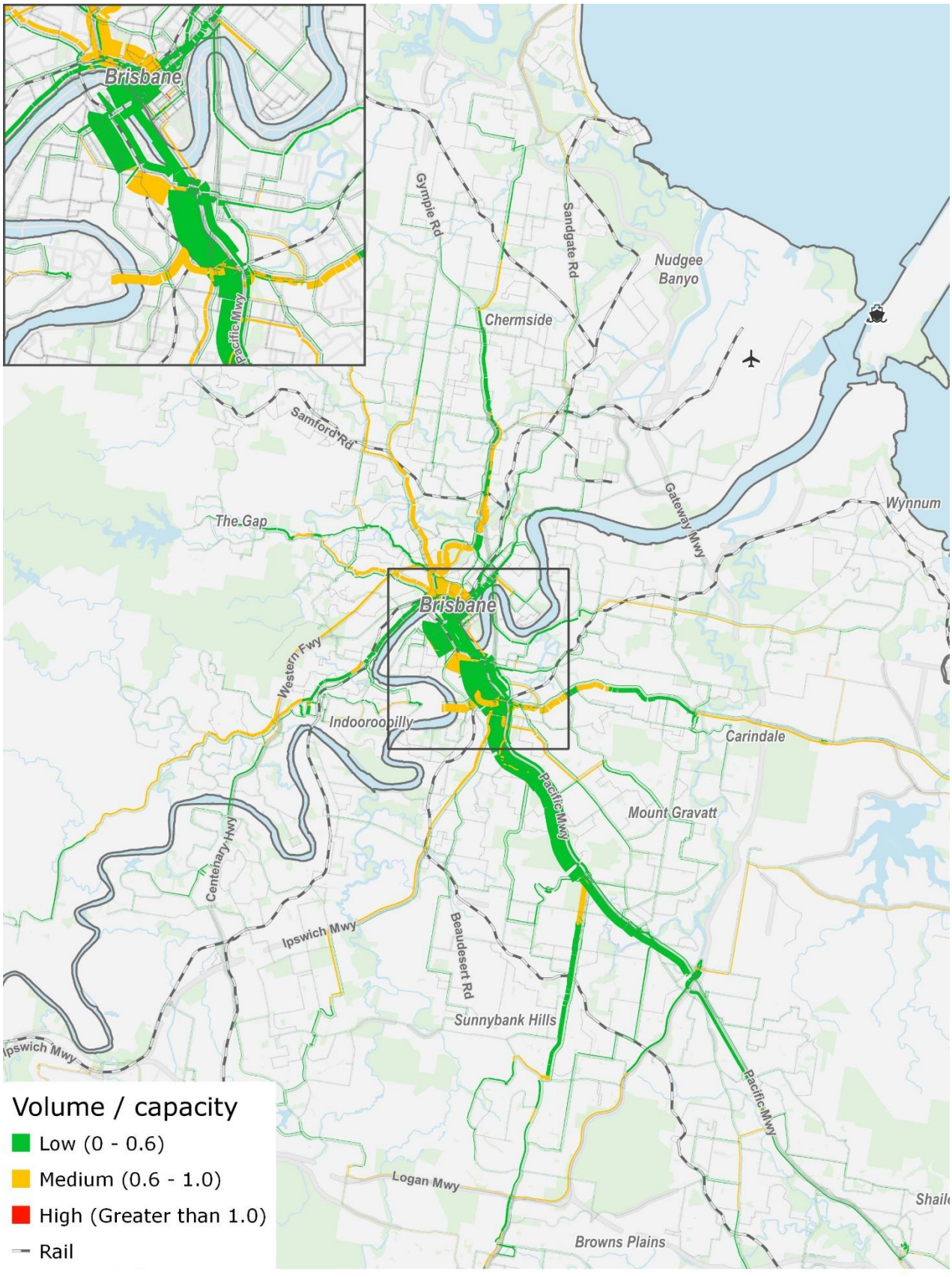


Figure 5-10 – Brisbane GCCSA weekday bus passenger volume / crush capacity - 2016 PM 1-hour peak

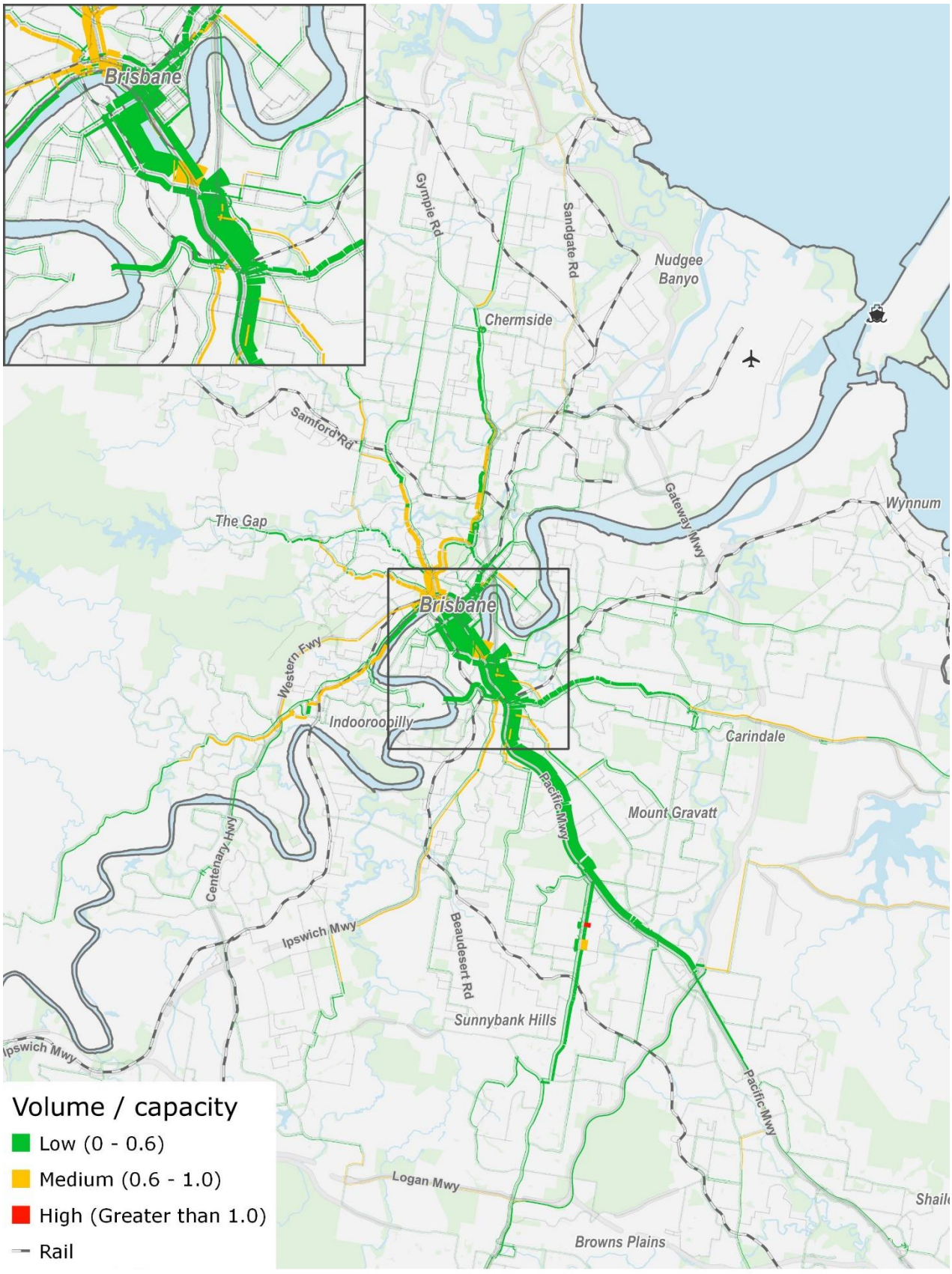


Figure 5-11 – Brisbane GCCSA weekday bus passenger volume / crush capacity - 2031 AM 1-hour peak

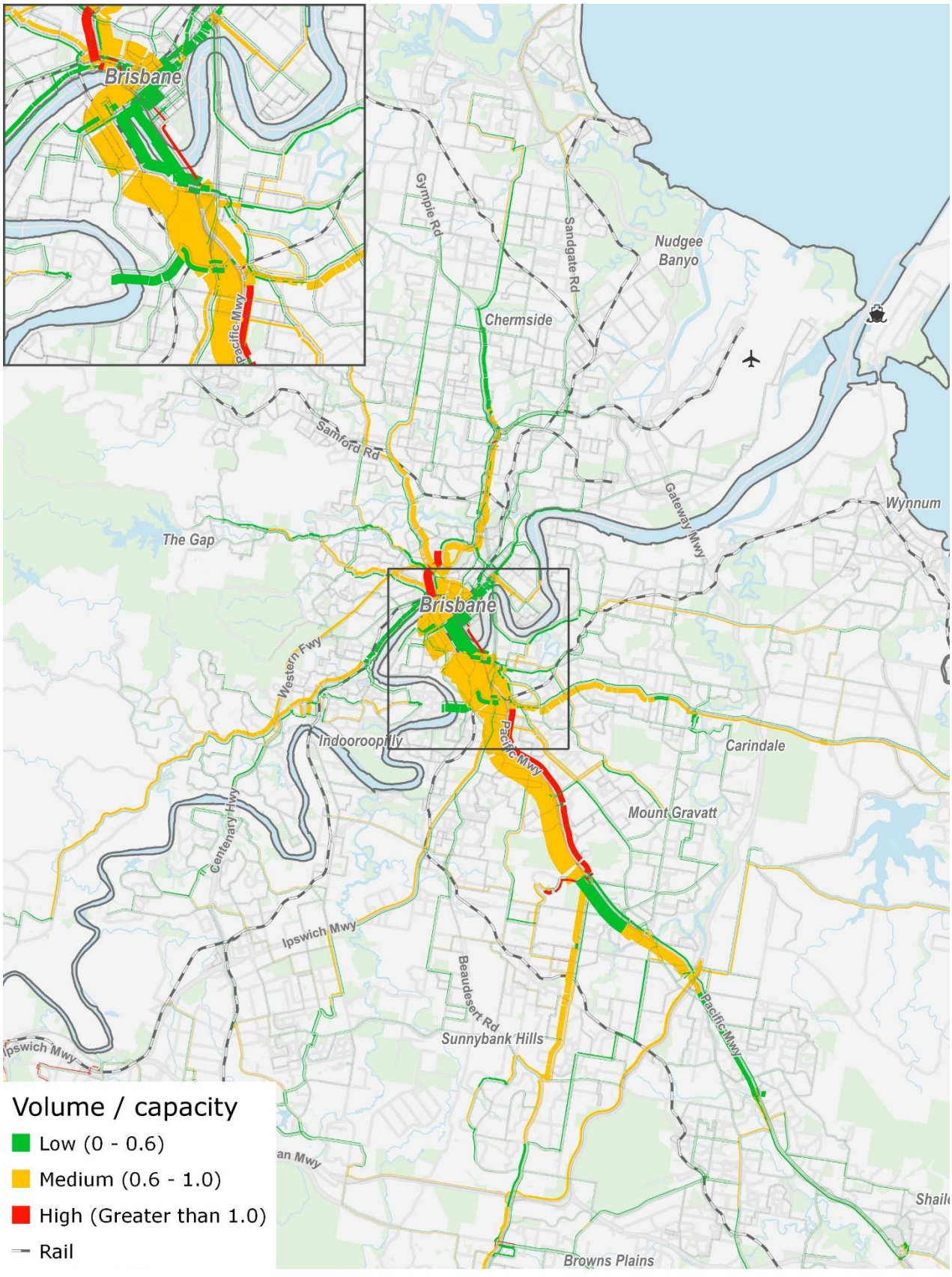
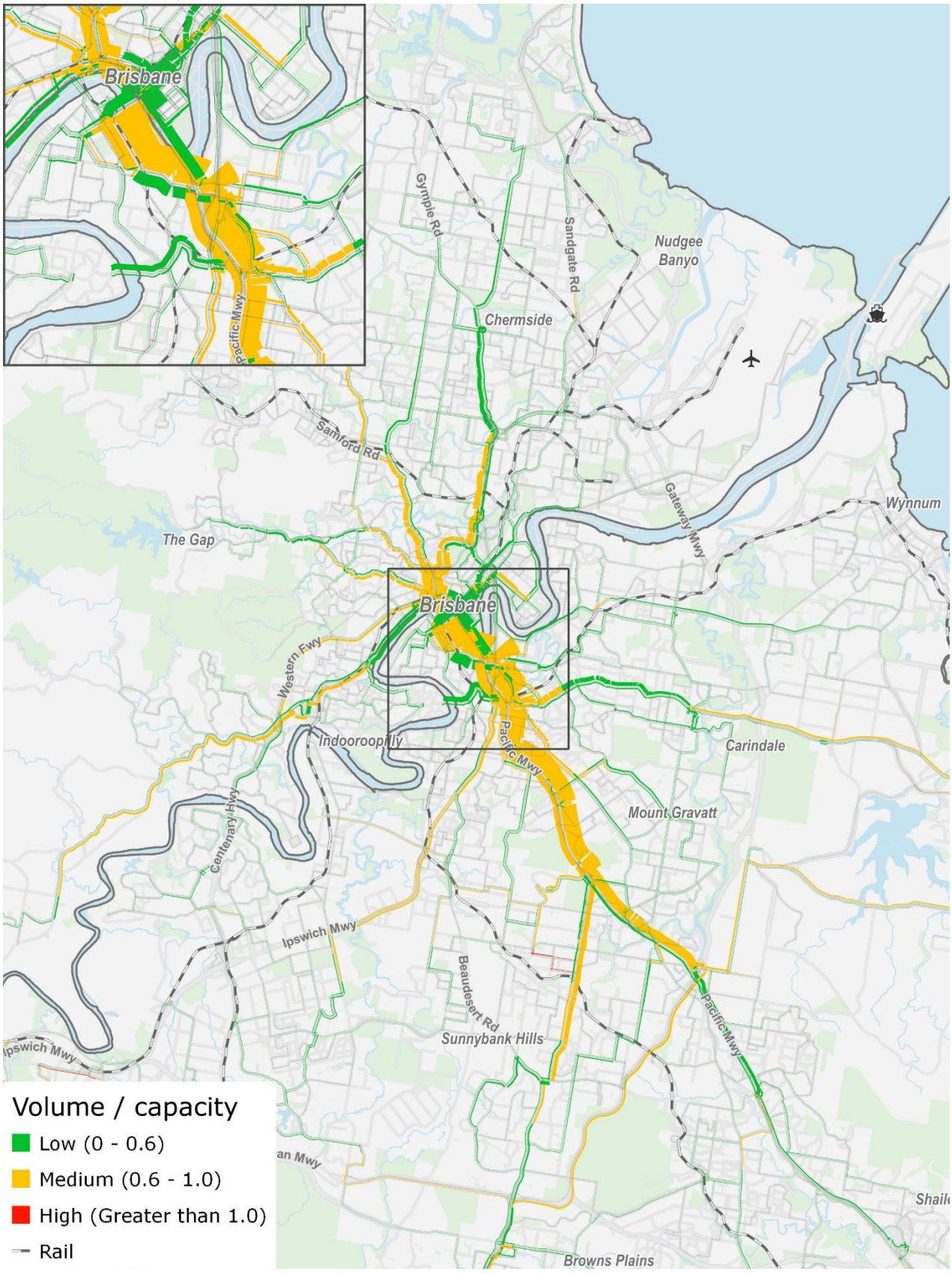


Figure 5-12 – Brisbane GCCSA weekday bus passenger volume / crush capacity - 2031 PM 1-hour peak



In general, there were low levels of crowding on the bus routes serving the Sunshine and Gold Coast in 2016 (Figure 5-13 and Figure 5-14). The exceptions to this are routes connecting to the rail system on the Gold Coast, and some lower volume bus routes on the Sunshine Coast.

On the Gold Coast the bus routes connecting Helensvale Station to Southport were crowded in 2016. This outcome is driven by the demand for travel between the rail link to Brisbane and light rail which provides access to the key activity centres on the Gold Coast.

In 2031, the extension of the light rail to Helensvale Railway Station is forecast to relieve bus crowding by attracting significant light rail patronage. Nevertheless, crowding is forecast on the routes connecting the rail network to Burleigh Heads and Coolangatta (Figure 5-15).

Figure 5-13 – Gold Coast and Sunshine Coast weekday bus and light rail passenger volume / crush capacity - 2016 AM peak

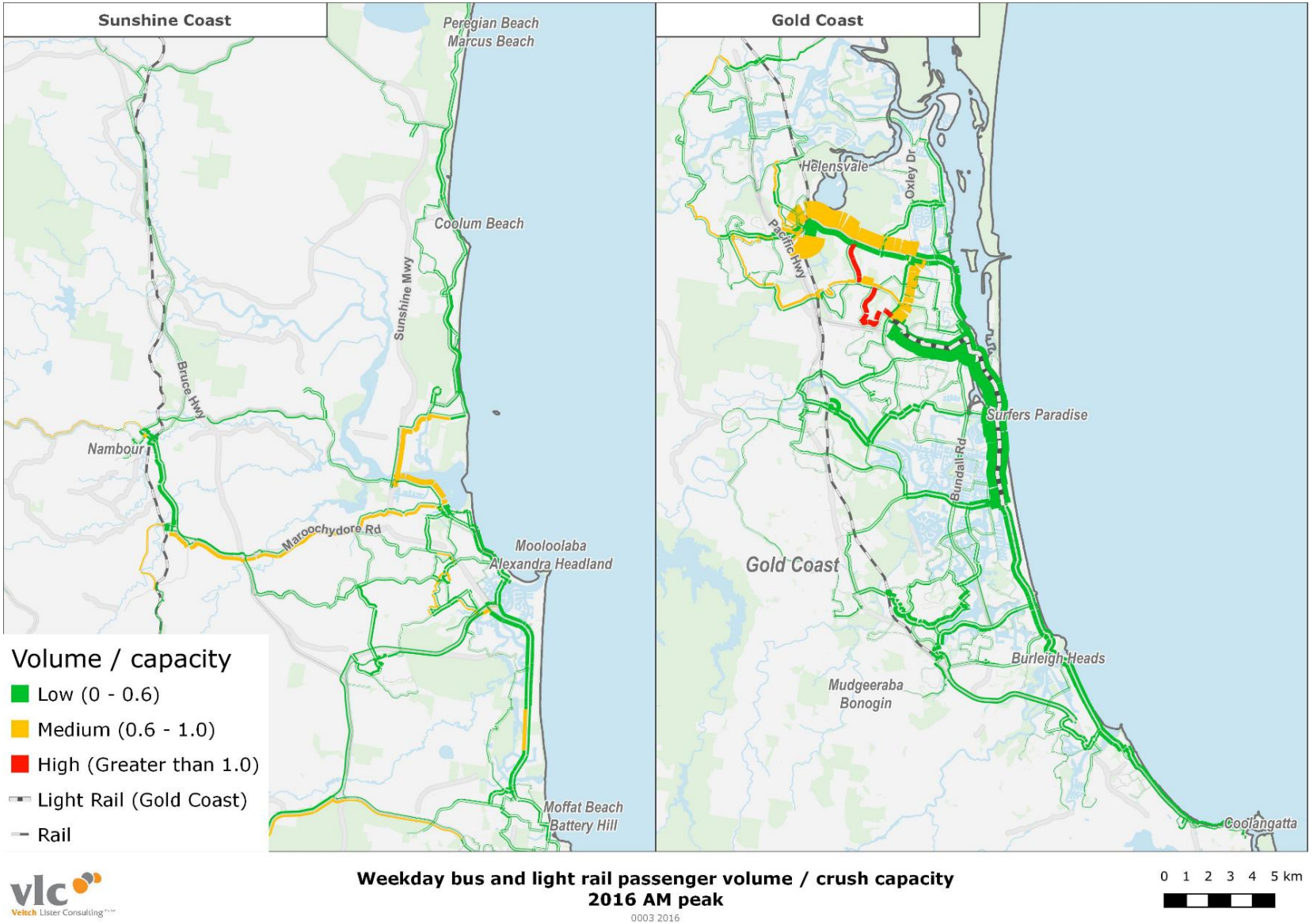


Figure 5-14 – Gold Coast and Sunshine Coast weekday bus and light rail passenger volume / crush capacity - 2016 PM peak

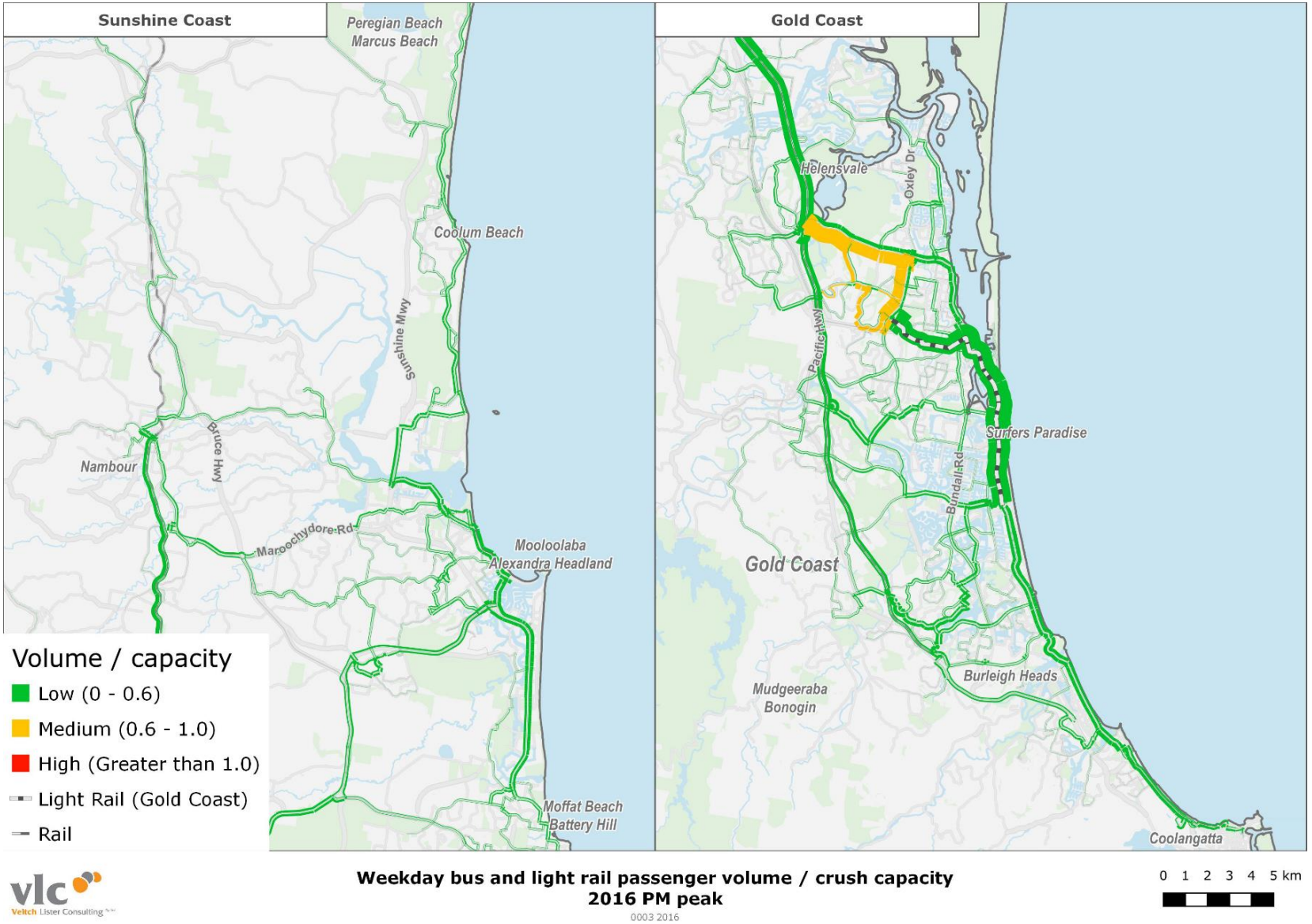


Figure 5-15 – Gold Coast and Sunshine Coast weekday bus and light rail passenger volume / crush capacity - 2031 AM peak

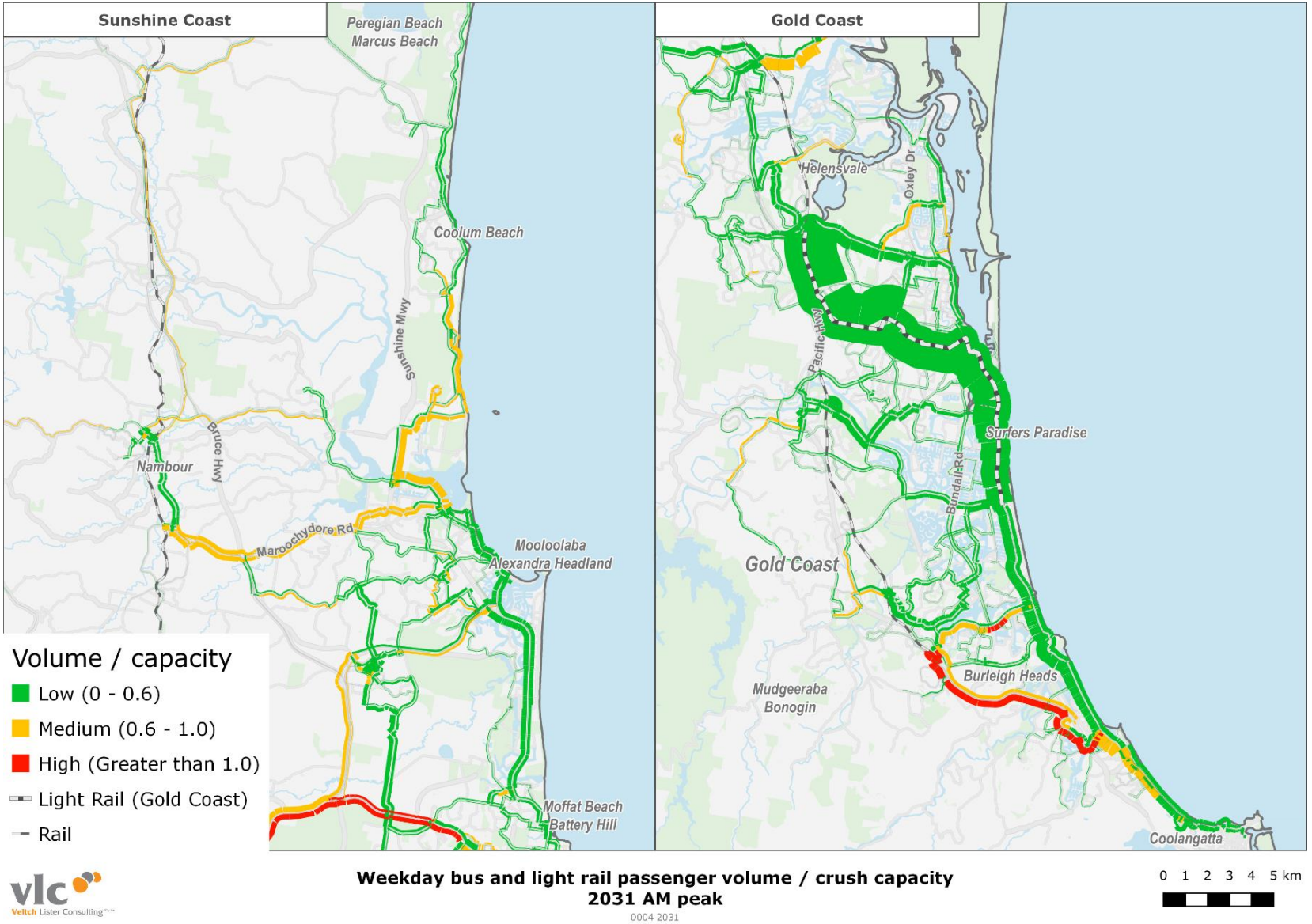
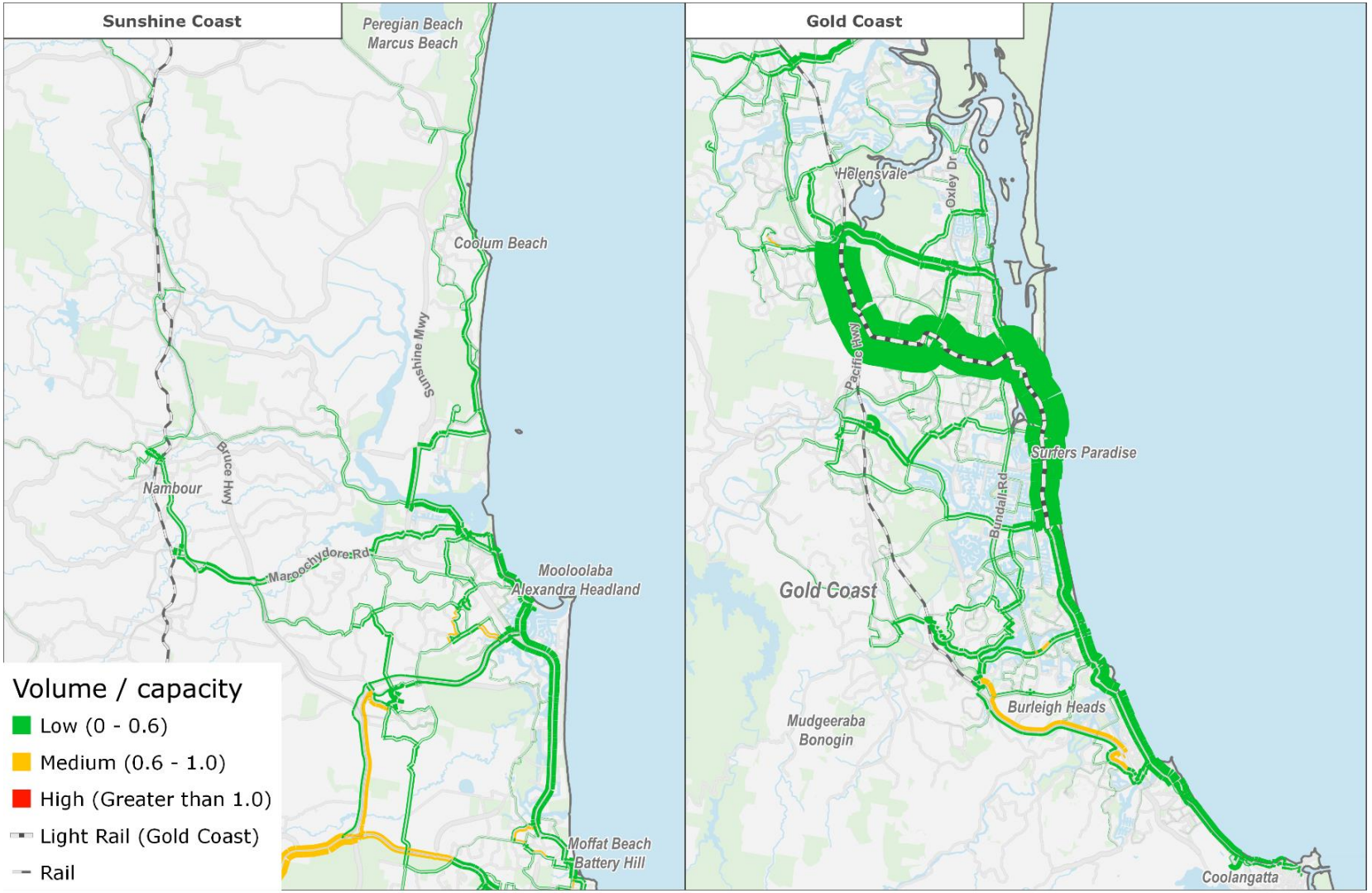


Figure 5-16 – Gold Coast and Sunshine Coast weekday bus and light rail passenger volume / crush capacity - 2031 PM peak



6. Accessibility and social inclusion

The ability to participate in society is greatly affected by access to services and opportunities. Hospitals, schools, child care services and green space are all vital types of social infrastructure that can enhance the wellbeing of individuals and the community generally. Conversely, poor transport connections and lack of access to these kinds of services can lead to social isolation and exclusion.

This section of the report examines the extent to which areas across Greater Sydney have adequate access to key services and opportunities both now and in the future. Services have been considered at two levels of geography – local and regional (Table 6-1). Shorter travel times would be expected for services in the former group, while longer travel times are more acceptable for regional social infrastructure.

Two factors affect a person's accessibility to services. The first is the travel times across the transport network. For example, increased congestion on the road network causes longer travel times, resulting in lower accessibility. New road connections, on the other hand, may reduce travel times, resulting in higher accessibility. Accessibility is measured by both car and public transport travel times.

The second factor is the spatial distribution of services. The addition of more jobs, a new hospital, or a new park would result in an improvement to accessibility for adjacent areas, even without apparent changes to travel times. The locations of child care services, hospitals, schools and green space are assumed to remain static between 2016 and 2031. In reality this is unlikely to be the case, and new services will almost certainly be developed over the coming years. While to some extent this is a limitation of these measures, it also provides an opportunity to highlight where new social infrastructure development should be focused if it is not already in planning.

Limitations of strategic accessibility modelling:

All travel times represent journeys between travel zones – one zone is at the home end of the trip and the other at the destination. Demand produced from each travel zone is fed onto the transport network from a single point (the 'centroid') via a notional link known as a 'centroid connector'. The precision of modelled travel times is therefore highly dependent on the granularity of travel zones at either end of the journey. Geographically larger travel zones (generally at the fringes of the urban area) have a greater imprecision associated with the location of the centroid versus the actual locations of households. Larger zones also have longer centroid connectors, so the travel time on these connectors to reach the realistic transport network becomes a proportionally longer component of the overall trip. The model is not able to estimate travel times for trips made by public transport entirely within a travel zone – 'intrazonal trips'. Travel times for these trips are therefore based on walk times. Finally, the model does not consider all factors that can affect end-to-end car travel time, such as locating a car park.

To aid interpretation, two adjustments are made to the maps of PT accessibility: large and low population density zones are not mapped, and remaining zones containing the relevant social infrastructure are capped at 30 minute access time.

Table 6-1 – Social infrastructure services

Service	Accessibility metric	Rationale	Spatial data source
		Local	
Child care services	Average travel time to the nearest five child care centres	The availability of child care services is an important driver for participation in social activities for parents and children alike. Having a choice of more than one service increases the likelihood that parents and children will find a centre to meet their specific needs, for example in terms of opening hours or style of care.	Approved education and care services in 2018 from the Australian Children's Education & Care Quality Authority.
Public schools (primary/ secondary)	Travel time to the nearest school	School is generally the most significant social activity for school age children and teenagers. This metric has been limited to public schools to cover all residents.	Schools in 2016 from the Australian Curriculum, Assessment and Reporting Authority
Green space	% of the residential population in an SA3 within a 10-minute walk of green space	Green space is a vital component of liveable cities and provides an opportunity for recreation and socialising for residents.	Parkland classified meshblocks in the 2016 Census. This includes nature reserves, conserved/protected areas, and public open space. It may also include sporting facilities not open to the public. Minor alterations have been made based on satellite data.
		Regional	
Jobs	Number of jobs that can be reached within 30 minutes by car and public transport	Access to jobs is a critical indicator of social inclusion. The more employment opportunities within a reasonable travel time from a person's home, the higher the likelihood of that person finding a job that appropriately matches their skills and experience.	2016 and 2031 employment data from Zenith, which is adapted from the 2016 ABS Census and 2031 Queensland Government projections
Hospitals (public/ emergency)	Travel time to the nearest public/emergency hospital	Limited access to healthcare can negatively impact health outcomes and overall quality of life. This metric has been limited to public hospitals and/or hospitals with an emergency department to ensure that the service is usable by all residents.	Hospitals in 2018 from the MyHospital database (Australian Institute of Health and Welfare)

6.1 Accessibility in 2016 and 2031

Local infrastructure should be accessible within short travel times. Ideally, residents should also have options to choose motorised or active modes of transport for these journeys.

The average resident of Brisbane with access to a car is within five minutes of a public primary school or child care centre in 2016 (Table 6-2). A slightly longer travel time of 6.6 minutes is needed to reach the nearest secondary school. By 2031, forecasts indicate this will increase to 6.6 minutes for child care centres, 5.6 minutes from primary schools and 9.2 minutes for secondary schools. The average Gold Coast resident with a car has similar access to local infrastructure as a resident of Brisbane, while Sunshine Coast residents generally have to travel slightly longer. This is a result of the more dispersed development in the Sunshine Coast region.

Those dependent on public transport are likely to be required to travel for much longer – between 30 and 45 minutes – to reach child care centres and schools in Brisbane GCCSA in 2016, slightly worsening in 2031. For the Gold Coast and Sunshine Coast, travel times are longer than those in Brisbane, however, these areas are forecast to experience a material improvement in accessibility between 2016 and 2031 across all three metrics. Rail lines servicing these areas gain considerably higher rail service frequencies enabled by the Cross River Rail project, suggesting that this project will provide regional benefits beyond inner Brisbane. The completion of the Gold Coast Light Rail extension also provides additional accessibility in the Gold Coast.

Table 6-2 – SEQ population-weighted weekday average travel times to child care and public schools - AM peak (7-9AM)

Service	Car (mins)		PT (mins)	
	2016	*2031*	*2016*	*2031*
Brisbane GCCSA				
Child care services	4.8	6.6	30.6	32.2
Public primary school	4.1	5.6	26.5	28.5
Public secondary school	6.6	9.2	41.8	43.3
Gold Coast				
Child care services	4.4	4.9	31.4	29.5
Public primary school	4.4	4.9	31.5	29.8
Public secondary school	6.1	6.9	43.4	40.5
Sunshine Coast				
Child care services	6.2	7.7	46.2	43.3
Public primary school	5.4	7.3	38.7	37.9
Public secondary school	8.5	10.4	57.4	52.9

Lower accessibility to education infrastructure by public transport is a function of the numerous regional areas that form part of the modelled region (Figure 6-1 through Figure 6-6). Even Brisbane GCCSA encompasses areas that are relatively sparsely-populated. This is illustrated in Table 6-3, which disaggregates population-weighted average travel times into SA3s for Brisbane. More remote parts of the city (particularly Caboolture Hinterland and Ipswich Hinterland) effectively cannot reach services by public transport, with average travel times of over 2 hours. Other SA3s, more reflective of typical 'urban' Brisbane, show much lower average travel times – within 25 minutes for childcare services and public primary schools, and slightly more for secondary school students. Poor public transport accessibility in SEQ is not unique in an Australian context – its largely radial public transport

network is much more effective at transporting large numbers of people into city centres than it is at catering for localised travel.

The lower measured car accessibility in most areas in 2031 is simply due to gradually increasing congestion. Areas with high forecast population growth, such as Ipswich and Jimboomba, show the largest decreases in car accessibility. In these cases the deterioration is more likely to be a function of significant population growth and limited supply of both transport and social infrastructure in greenfield areas. The modelling limitations described earlier (large travel zones and an absence of projected childcare centres) also lengthen modelled journey times. Despite these limitations, the analysis highlights the importance of ensuring that social and transport infrastructure is carefully planned for greenfield development.

The equivalent values for the Gold Coast show considerable improvement in accessibility by public transport experienced in Ormeau-Oxenford and Gold Coast Hinterland resulting from the Gold Coast Light Rail extension to connect with heavy rail.

Table 6-3 – SEQ population-weighted weekday average travel times to child care and public schools by SA3 - AM peak (7-9AM)*

SA3	Child care (nearest five, mins)						Nearest public primary school (mins)						Nearest public secondary school (mins)					
	Car			PT			Car			PT			Car			PT		
	2016	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*
Bald Hills - Everton Park	4.7	4.8	*+0.2*	25.4	25.7	*+0.3*	4.8	4.9	*+0.2*	26.6	27.4	*+0.9*	6.4	6.8	*+0.4*	33.2	32.2	*-1.1*
Beaudesert	13.0	14.8	*+1.8*	149.8	122.4	*-27.4*	9.4	9.6	*+0.3*	91.1	79.0	*-12.1*	14.0	15.9	*+1.9*	158.5	131.3	*-27.2*
Beenleigh	3.8	6.1	*+2.3*	24.9	28.6	*+3.8*	3.4	5.8	*+2.4*	22.7	27.3	*+4.6*	4.9	6.1	*+1.2*	31.9	33.0	*+1.1*
Bribie - Beachmere	9.3	9.5	*+0.3*	68.1	65.9	*-2.2*	7.9	7.9	*+0.1*	53.1	52.0	*-1.1*	10.5	11.4	*+1.0*	67.3	65.9	*-1.3*
Brisbane Inner	2.5	2.8	*+0.3*	12.8	12.7	*-0.1*	2.7	3.0	*+0.3*	16.3	15.4	*-0.9*	5.7	6.2	*+0.5*	24.5	24.0	*-0.5*
Brisbane Inner - East	3.1	3.2	*+0.1*	17.4	17.4	*+0.1*	2.5	2.5	*+0.1*	13.8	13.9	*+0.1*	4.8	5.0	*+0.2*	26.9	26.7	*-0.2*
Brisbane Inner - North	2.7	2.8	*+0.2*	15.1	14.9	*-0.2*	2.6	2.8	*+0.2*	14.9	15.0	*+0.1*	5.1	5.7	*+0.6*	26.7	28.1	*+1.4*
Brisbane Inner - West	2.9	3.1	*+0.2*	15.7	15.6	*-0.1*	2.5	2.6	*+0.1*	14.4	14.3	*-0.1*	6.0	6.3	*+0.3*	28.9	27.4	*-1.5*
Browns Plains	4.2	5.6	*+1.4*	29.6	29.5	*-0.1*	4.1	5.1	*+1.0*	28.8	28.5	*-0.3*	6.1	7.9	*+1.9*	42.2	40.2	*-1.9*
Caboolture	5.8	8.5	*+2.6*	40.9	42.7	*+1.8*	5.7	8.8	*+3.1*	40.9	42.7	*+1.8*	7.2	10.8	*+3.6*	53.0	54.9	*+1.9*
Caboolture Hinterland	21.4	23.0	*+1.6*	152.7	159.4	*+6.7*	9.7	10.4	*+0.7*	75.7	77.0	*+1.3*	14.6	17.2	*+2.6*	129.3	136.3	*+7.0*
Capalaba	3.5	3.6	*+0.1*	23.6	23.3	*-0.3*	3.3	3.4	*+0.1*	22.8	22.8	*-0.0*	5.0	5.1	*+0.1*	35.5	35.0	*-0.5*
Carindale	3.2	3.3	*+0.1*	17.8	17.7	*-0.2*	3.3	3.5	*+0.1*	18.7	18.8	*+0.1*	5.5	6.0	*+0.5*	28.5	28.8	*+0.3*
Centenary	3.8	4.0	*+0.2*	21.3	21.4	*+0.0*	3.4	3.5	*+0.1*	20.8	20.9	*+0.1*	5.4	5.7	*+0.3*	37.7	37.2	*-0.5*
Chermside	3.0	3.1	*+0.1*	17.0	16.7	*-0.4*	2.8	2.9	*+0.1*	16.1	16.2	*+0.1*	3.9	4.1	*+0.2*	23.7	23.8	*+0.0*
Cleveland - Stradbroke	10.0	10.1	*+0.1*	39.2	38.5	*-0.7*	4.8	4.9	*+0.0*	35.2	34.8	*-0.4*	13.5	14.4	*+0.9*	56.6	56.4	*-0.2*
Forest Lake - Oxley	3.5	3.9	*+0.5*	20.9	21.0	*+0.1*	3.4	4.0	*+0.6*	20.6	21.8	*+1.3*	4.7	5.6	*+0.9*	28.2	29.8	*+1.5*
Hills District	6.4	6.8	*+0.4*	48.0	48.1	*+0.2*	5.9	6.3	*+0.4*	40.8	41.2	*+0.5*	9.9	10.8	*+0.9*	74.2	74.1	*-0.0*
Holland Park - Yeronga	2.8	3.1	*+0.3*	16.0	15.8	*-0.2*	2.7	2.9	*+0.2*	14.8	14.6	*-0.2*	3.7	4.4	*+0.7*	20.2	20.0	*-0.2*
Ipswich Hinterland	17.5	18.5	*+1.0*	143.5	121.9	*-21.6*	12.2	12.2	*-0.0*	88.8	78.0	*-10.7*	17.6	17.9	*+0.3*	150.1	127.6	*-22.5*
Ipswich Inner	4.7	14.1	*+9.4*	31.1	41.8	*+10.7*	3.9	9.3	*+5.4*	26.5	35.3	*+8.9*	7.9	21.0	*+13.1*	50.5	65.2	*+14.8*
Jimboomba	9.4	14.5	*+5.2*	73.5	46.8	*-26.7*	8.3	15.5	*+7.3*	64.3	48.3	*-16.0*	15.1	23.2	*+8.1*	120.3	61.4	*-58.9*
Kenmore - Brookfield - Moggill	6.0	6.7	*+0.7*	33.8	34.4	*+0.6*	4.9	5.1	*+0.1*	27.2	27.3	*+0.1*	10.9	15.4	*+4.5*	45.2	49.3	*+4.1*
Loganlea - Carbrook	3.9	4.7	*+0.8*	23.8	24.8	*+1.0*	4.2	5.1	*+0.9*	27.2	27.4	*+0.2*	6.4	8.2	*+1.8*	39.0	38.1	*-0.8*
Mt Gravatt	3.6	3.9	*+0.3*	21.0	21.6	*+0.6*	3.4	3.8	*+0.4*	20.2	20.4	*+0.2*	4.3	4.7	*+0.4*	24.6	24.7	*+0.2*
Narangba - Burpengary	5.0	7.4	*+2.4*	33.9	37.4	*+3.5*	4.3	6.7	*+2.4*	29.2	34.8	*+5.6*	5.9	8.6	*+2.7*	40.4	46.2	*+5.8*
Nathan	2.8	3.0	*+0.2*	16.9	16.9	*+0.0*	2.6	2.8	*+0.2*	15.5	15.5	*+0.0*	5.4	6.1	*+0.7*	30.9	30.5	*-0.3*
North Lakes	5.0	6.7	*+1.7*	26.3	27.1	*+0.9*	3.9	4.5	*+0.6*	21.4	22.2	*+0.8*	6.2	8.1	*+1.9*	32.9	33.9	*+1.0*
Nundah	3.5	4.1	*+0.6*	19.7	19.7	*+0.0*	2.9	3.6	*+0.7*	17.4	17.9	*+0.5*	4.9	6.0	*+1.1*	28.0	30.4	*+2.5*
Redcliffe	3.2	3.5	*+0.2*	20.8	20.5	*-0.3*	3.3	3.5	*+0.2*	21.4	20.9	*-0.4*	4.5	4.9	*+0.4*	28.1	28.2	*+0.0*
Rocklea - Acacia Ridge	4.1	4.6	*+0.4*	21.0	21.8	*+0.9*	4.1	4.7	*+0.6*	21.7	22.2	*+0.5*	5.7	6.5	*+0.8*	31.9	32.9	*+1.0*
Sandgate	3.3	3.4	*+0.1*	19.8	20.1	*+0.4*	2.8	2.9	*+0.1*	16.5	16.8	*+0.3*	5.3	5.5	*+0.2*	33.9	33.8	*-0.1*

SA3	Child care (nearest five, mins)						Nearest public primary school (mins)						Nearest public secondary school (mins)					
	Car			PT			Car			PT			Car			PT		
	2016	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*	*2016*	*2031*	*Diff*
Sherwood - Indooroopilly	2.7	2.8	*+0.1*	15.2	14.8	*-0.4*	3.3	3.5	*+0.1*	19.3	19.2	*-0.1*	3.9	3.9	*+0.0*	22.5	22.0	*-0.6*
Springfield - Redbank	3.6	6.4	*+2.9*	22.2	24.1	*+1.9*	3.9	8.4	*+4.5*	24.0	29.8	*+5.8*	5.7	8.3	*+2.6*	35.0	35.7	*+0.7*
Springwood - Kingston	2.8	3.0	*+0.1*	18.2	17.9	*-0.3*	2.9	3.0	*+0.1*	17.9	17.7	*-0.2*	4.2	4.2	*+0.1*	27.5	27.0	*-0.5*
Strathpine	4.0	4.6	*+0.6*	24.7	23.4	*-1.3*	3.2	3.7	*+0.4*	19.7	18.6	*-1.1*	5.2	6.7	*+1.5*	31.7	31.4	*-0.3*
Sunnybank	3.2	3.4	*+0.1*	18.9	19.2	*+0.2*	3.3	3.4	*+0.1*	18.1	18.3	*+0.2*	4.5	4.8	*+0.2*	24.3	24.3	*-0.0*
The Gap - Enoggera	4.2	4.4	*+0.1*	22.8	22.2	*-0.6*	3.4	3.5	*+0.1*	19.4	19.2	*-0.2*	3.9	4.0	*+0.1*	24.1	22.9	*-1.2*
Wynnum - Manly	3.2	3.2	*-0.0*	21.4	20.8	*-0.6*	3.0	2.9	*-0.0*	19.5	19.4	*-0.1*	5.2	5.1	*-0.1*	33.8	32.9	*-0.9*
Brisbane GCCSA	**4.8**	**6.6**	***+1.8***	**30.6**	**32.2**	***+1.6***	**4.1**	**5.6**	***+1.5***	**26.5**	**28.5**	***+2.0***	**6.6**	**9.2**	***+2.6***	**41.8**	**43.3**	***+1.6***
Broadbeach - Burleigh	3.4	3.6	*+0.2*	22.0	22.1	*+0.1*	3.1	3.1	*+0.0*	21.7	21.1	*-0.6*	4.3	4.7	*+0.4*	27.4	27.4	*+0.0*
Coolangatta	3.7	4.0	*+0.3*	23.8	23.5	*-0.3*	3.1	3.1	*+0.0*	23.5	22.6	*-0.8*	4.3	4.5	*+0.2*	31.4	30.5	*-0.9*
Gold Coast - North	3.4	3.7	*+0.3*	23.3	23.3	*-0.0*	3.1	3.4	*+0.3*	22.3	22.1	*-0.2*	6.1	6.5	*+0.4*	36.8	35.8	*-1.0*
Gold Coast Hinterland	17.1	17.8	*+0.7*	148.2	133.3	*-15.0*	10.9	11.2	*+0.3*	85.7	73.2	*-12.5*	17.1	18.9	*+1.8*	150.9	139.0	*-11.9*
Mudgeeraba - Tallebudgera	5.3	5.6	*+0.3*	41.9	41.9	*-0.0*	6.4	6.8	*+0.4*	46.7	46.6	*-0.0*	8.3	8.7	*+0.4*	67.6	67.0	*-0.6*
Nerang	4.1	5.2	*+1.1*	29.4	30.9	*+1.5*	4.6	5.8	*+1.2*	31.7	34.0	*+2.4*	5.4	7.1	*+1.8*	39.0	40.0	*+1.0*
Ormeau - Oxenford	5.0	5.9	*+0.9*	35.2	31.6	*-3.6*	5.5	6.2	*+0.6*	39.9	34.1	*-5.8*	7.3	8.8	*+1.5*	54.4	46.2	*-8.2*
Robina	3.5	3.6	*+0.1*	25.1	24.3	*-0.8*	3.7	3.8	*+0.1*	28.7	28.5	*-0.2*	4.6	4.6	*+0.0*	32.1	30.8	*-1.3*
Southport	3.1	3.1	*+0.0*	21.2	19.6	*-1.6*	3.5	3.6	*+0.2*	23.9	22.4	*-1.5*	4.2	4.2	*+0.0*	28.7	26.6	*-2.1*
Surfers Paradise	3.9	5.1	*+1.2*	21.6	21.6	*+0.0*	4.5	5.5	*+1.1*	24.1	24.0	*-0.0*	6.1	7.5	*+1.4*	35.1	35.5	*+0.3*
Gold Coast	**4.4**	**4.9**	***+0.5***	**31.4**	**29.5**	***-1.8***	**4.4**	**4.9**	***+0.5***	**31.5**	**29.8**	***-1.7***	**6.1**	**6.9**	***+0.9***	**43.4**	**40.5**	***-2.9***
Buderim	4.7	5.5	*+0.8*	29.5	28.4	*-1.1*	5.2	5.8	*+0.6*	29.0	26.9	*-2.1*	7.0	8.2	*+1.2*	37.2	35.7	*-1.5*
Caloundra	4.7	8.8	*+4.1*	29.8	32.2	*+2.5*	5.1	10.2	*+5.0*	32.9	35.1	*+2.2*	6.6	11.8	*+5.2*	41.0	41.2	*+0.1*
Maroochy	4.2	4.4	*+0.1*	28.3	27.6	*-0.7*	3.9	4.1	*+0.2*	29.0	28.7	*-0.3*	6.4	6.8	*+0.4*	40.2	39.6	*-0.6*
Nambour - Pomona	7.4	7.2	*-0.2*	66.2	60.3	*-5.9*	6.2	5.9	*-0.3*	54.0	50.0	*-4.0*	8.8	8.6	*-0.2*	79.1	70.4	*-8.7*
Noosa	5.6	5.7	*+0.0*	33.8	33.3	*-0.5*	4.9	4.9	*+0.0*	32.2	31.8	*-0.4*	8.1	8.2	*+0.0*	44.8	44.0	*-0.8*
Sunshine Coast Hinterland	12.1	13.6	*+1.5*	98.9	87.0	*-11.9*	7.5	9.9	*+2.4*	57.5	55.3	*-2.2*	16.0	17.7	*+1.7*	111.3	95.9	*-15.4*
Sunshine Coast	**6.2**	**7.7**	***+1.5***	**46.2**	**43.3**	***-2.9***	**5.4**	**7.3**	**+1.9**	**38.7**	**37.9**	***-0.9***	**8.5**	**10.4**	**+1.9**	**57.4**	**52.9**	***-4.5***

*The travel times reflect all modelled zones and so does not reflect adjustments made in Figures 6-2, 6-4 and 6-6 (see 'Limitations of strategic accessibility modelling' box above).

Figure 6-1 – SEQ average time to nearest five child care centres by Car - 2031 AM peak (7-9AM)

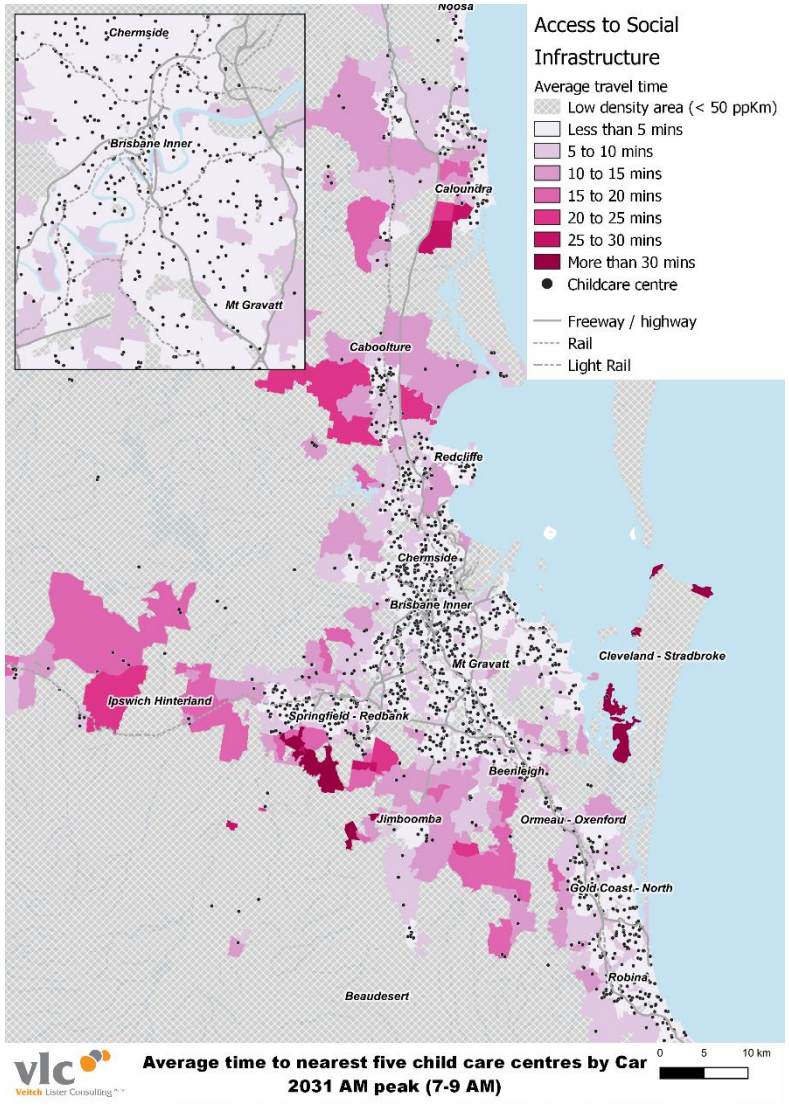


Figure 6-2 – SEQ average time to nearest five child care centres by PT - 2031 AM peak (7-9AM)

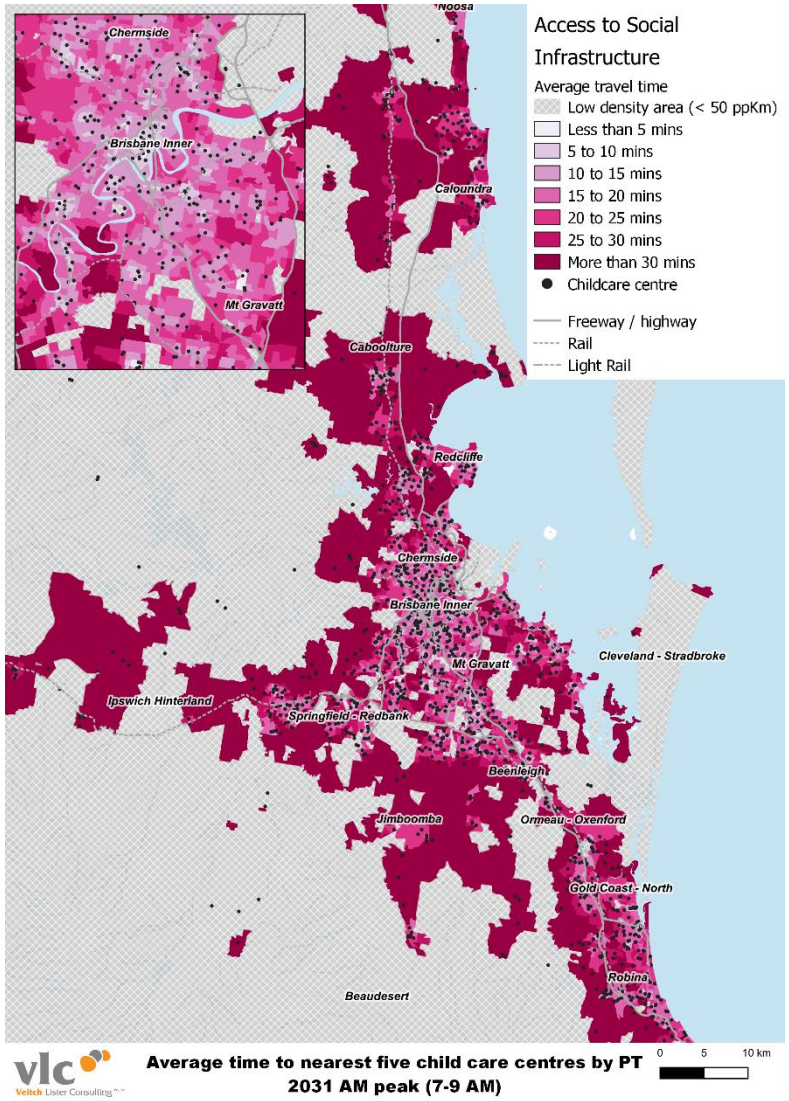


Figure 6-3 – SEQ average time to nearest public primary school by Car - 2031 AM peak (7-9AM)

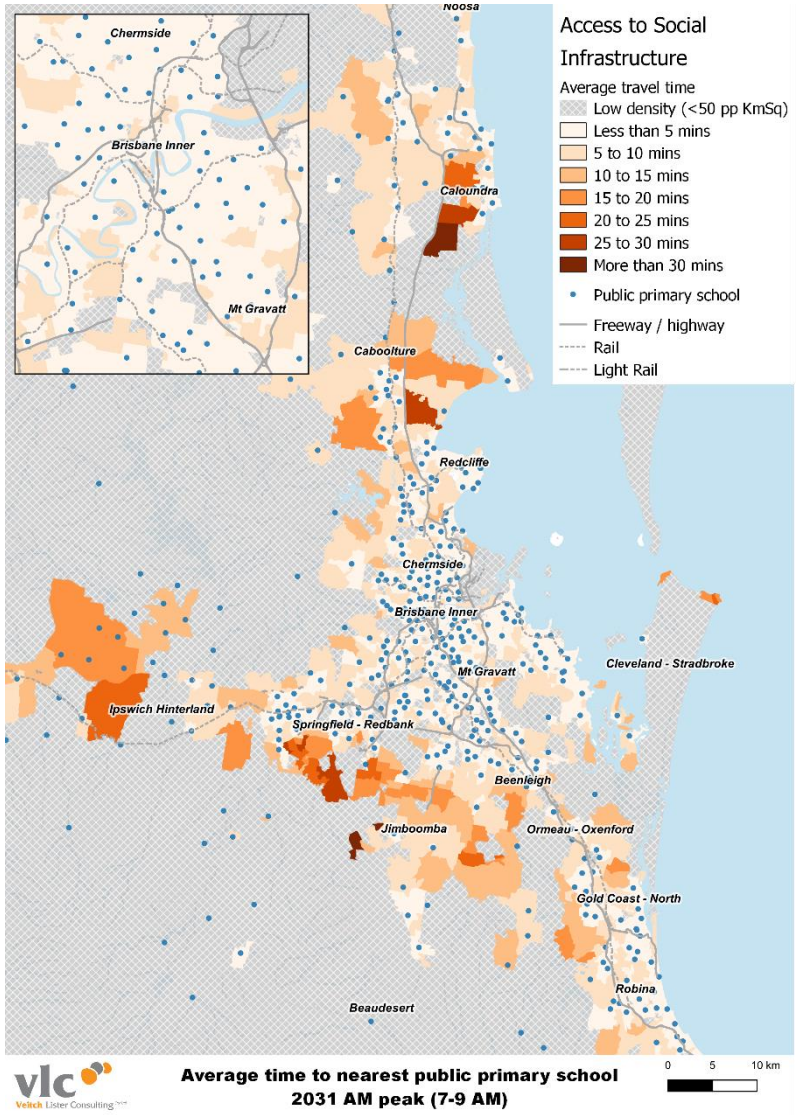


Figure 6-4 – SEQ average time to nearest public primary school by PT - 2031 AM peak (7-9AM)

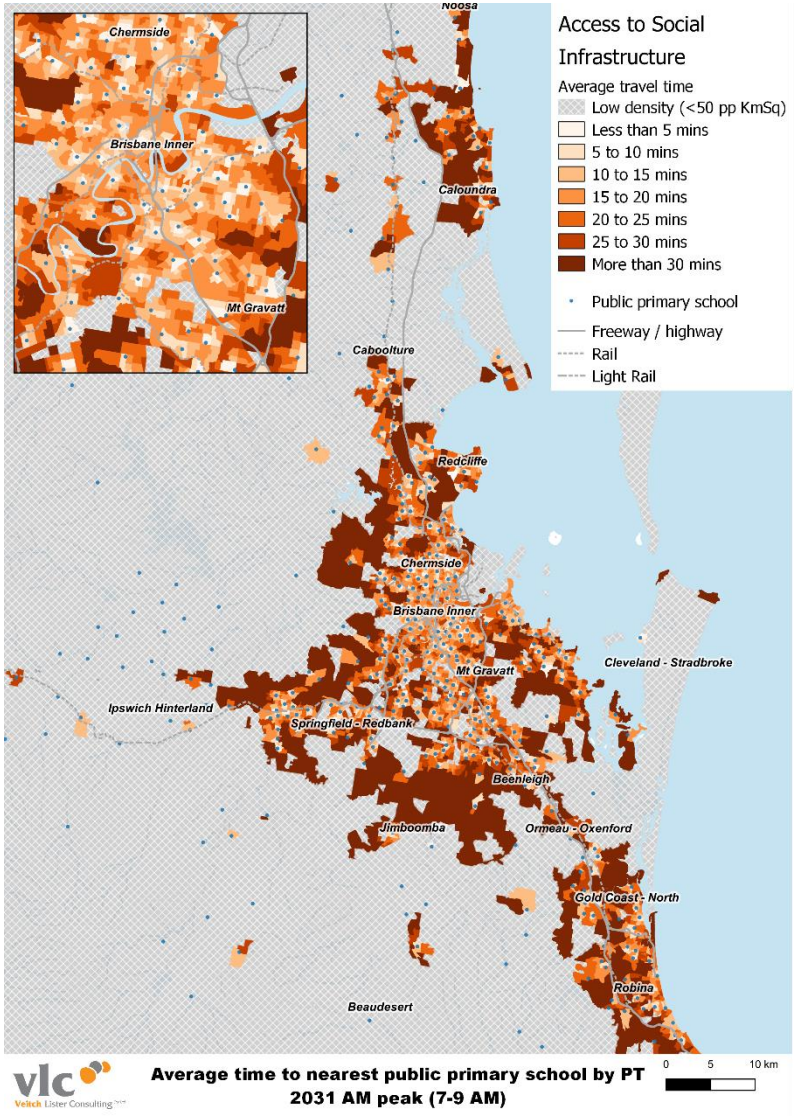


Figure 6-5 – SEQ average time to nearest public secondary school by Car - 2031 AM peak (7-9AM)

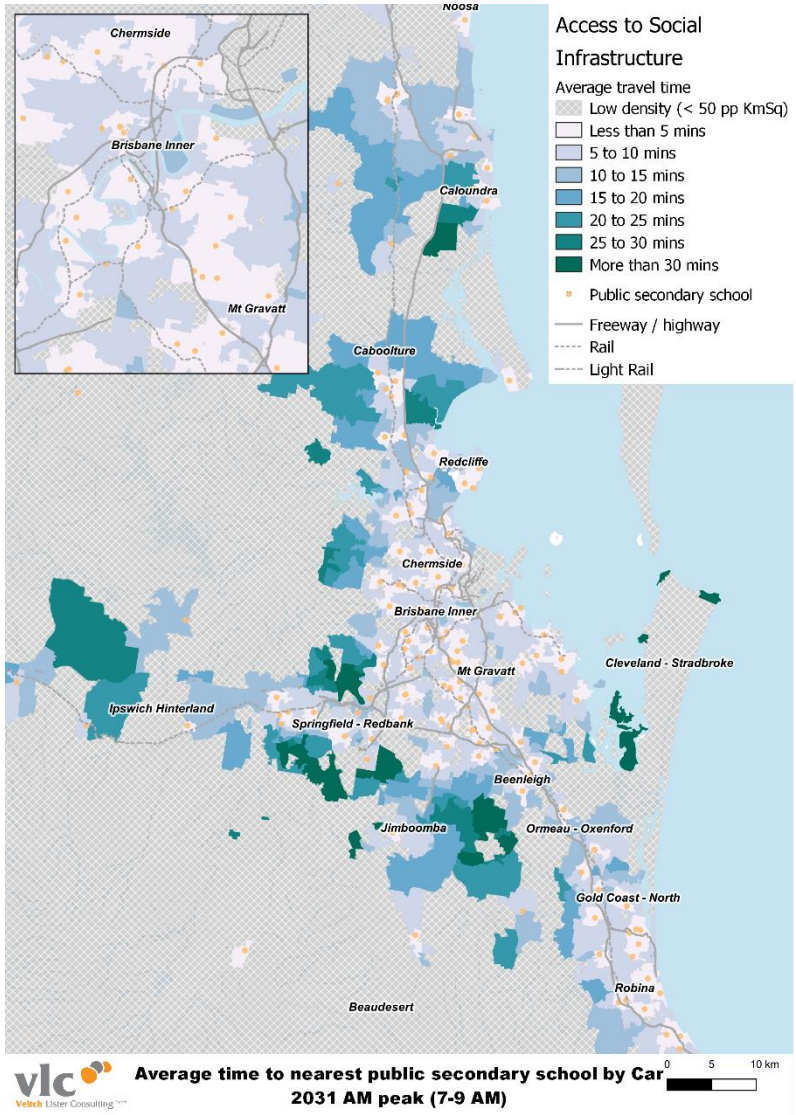
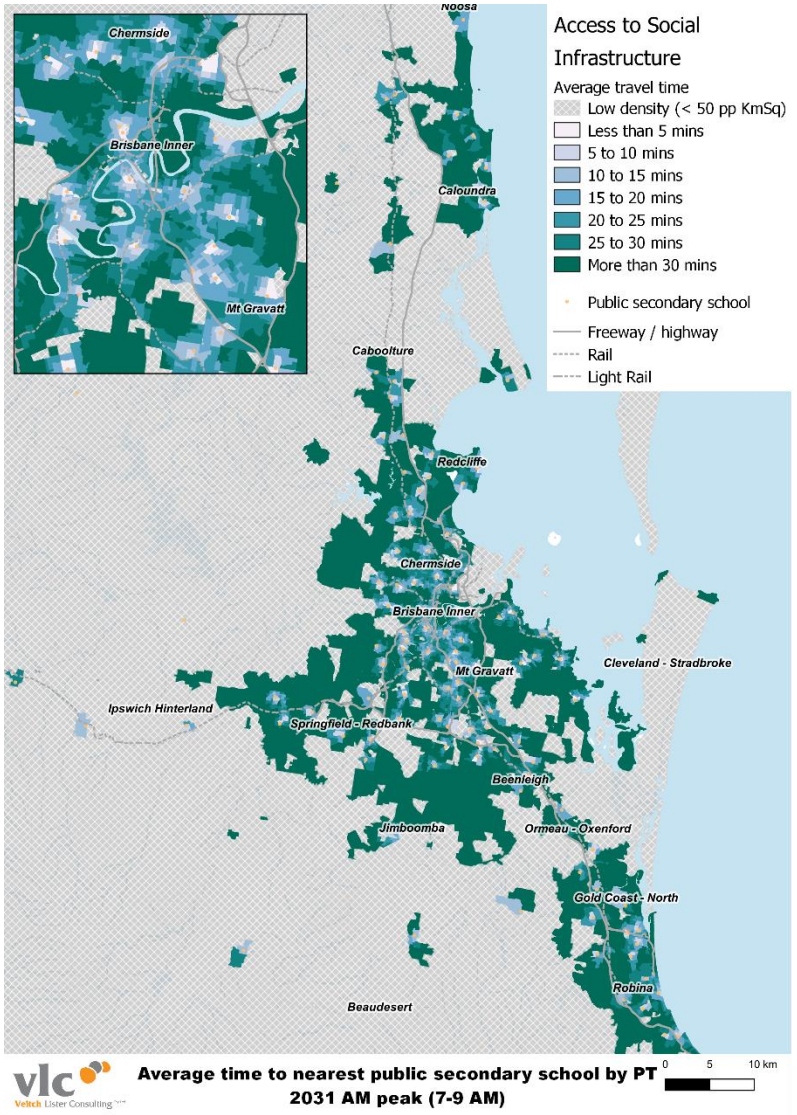


Figure 6-6 – SEQ average time to nearest public secondary school by PT - 2031 AM peak (7-9AM)



Residents of Greater Brisbane largely have good access to green space. In 2016, 84 per cent of the population is assessed as being able to reach green space within 10 minutes, decreasing slightly to 82 per cent in 2031. This measure excludes population in large travel zones (mostly on the urban fringe or rural areas). Applying a similar filter at an SA3 level constrains the analysis largely to established areas – many of which are assessed as having good walking access to green space of some kind (Figure 6-7). Strathpine and Sandgate in the north, as well as much of the Gold Coast (Figure 6-8) show particularly good accessibility, while Brown Plains, Forest Lake – Oxley and Mt Gravatt have below average access to green space.[4]

Limitations to measuring green space access:

Green areas defined in Figure 6-7 and Figure 6-8 overleaf are used to estimate the green space accessibility metric. This interpretation of green space is quite broad, and does not account for the quality or quantity of the area. All residents in a travel zone are measured as having the same access to green space in one of two ways. The first is if the travel zone itself includes green space, it is assumed that walking time for everyone is 10 minutes or less. The second is if the walking time to nearby travel zones with green space is 10 minutes or less.

Both of these cases for estimation of metrics have issues on the urban fringe where travel zones are large. To overcome these issues, large and low-population-density travel zones have been excluded from the SA3 metrics mapped in Figure 6-7 and Figure 6-8. Similarly, SA3s with more than 80 per cent of its population in large travel zones are not mapped.

[4] While not mapped, the Sunshine Coast is assessed to have relatively poor accessibility to green space. Although there is ample green space in these SA3s, they are not typically in walking distance of established and projected population centres. Growth areas such as Ormeau – Oxenford and Jimboomba are also assessed to have low levels of green spac accessibility. This is likely due to a combination of the spatial distribution of projected population growth in these areas and a lack of resolution in modelling of the future land uses on the urban fringe (travel zones, pedestrian and local road infrastructure, as well as future parklands themselves). Plans for these areas are at an early stage which limits the level of detail that can be input to the model and, in turn, the realism of accessibility outcomes for such a localised metric.

Figure 6-7 – Brisbane GCCSA percentage of population within a 10-minute walk of green space in 2031

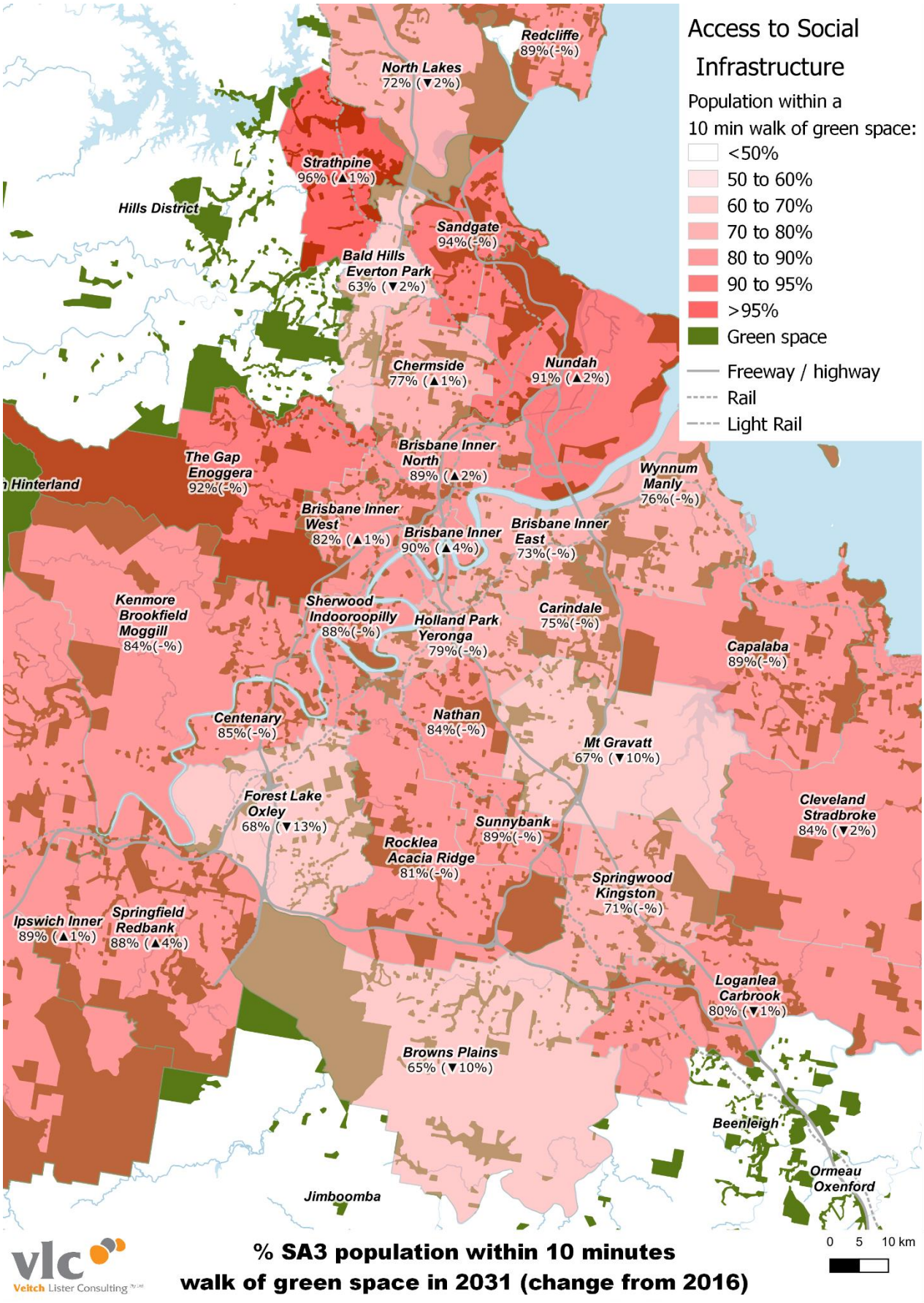


Figure 6-8 – Gold Coast percentage of population within a 10-minute walk of green space in 2031

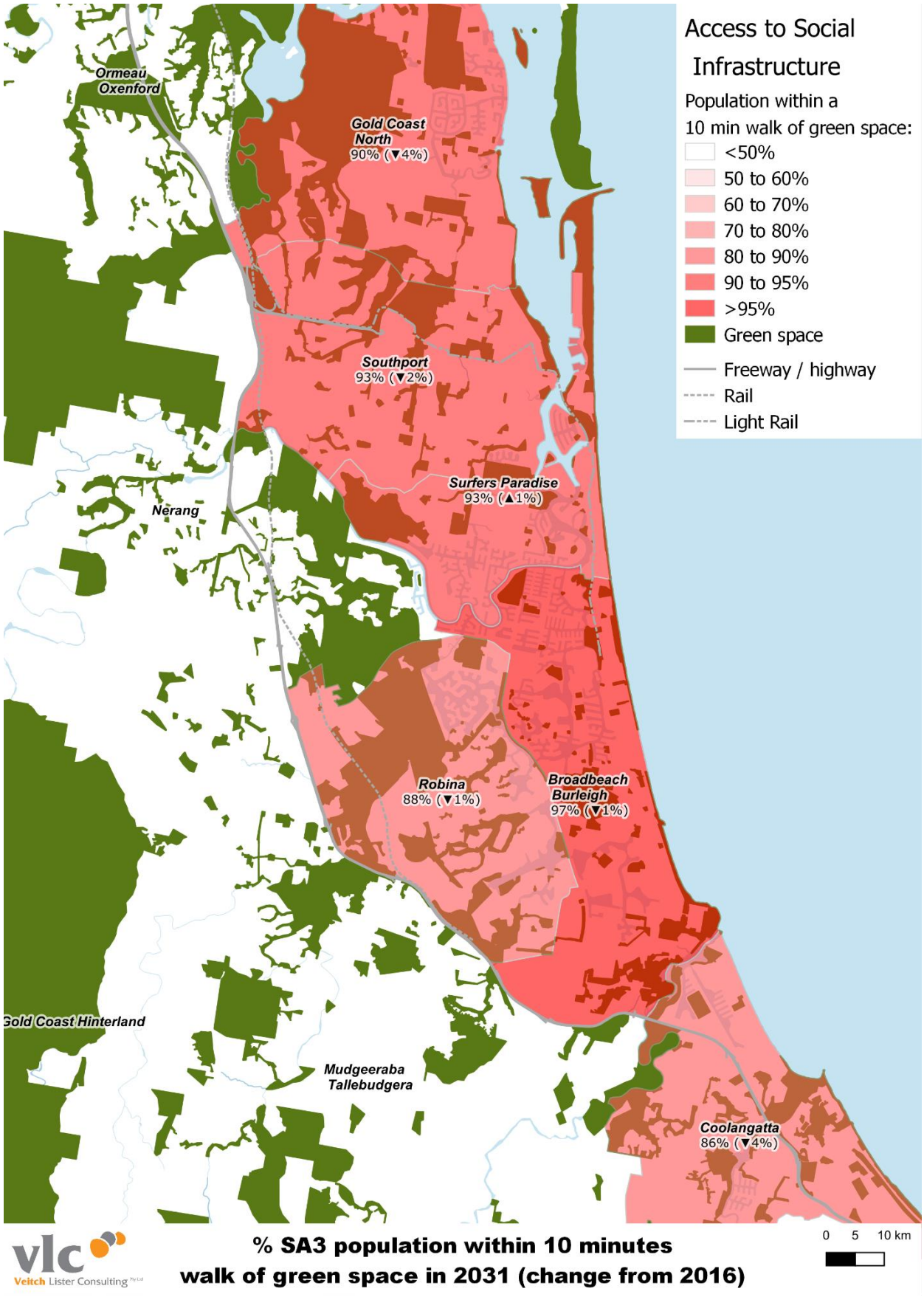


Figure 6-9 and Figure 6-10 show the proportion of SEQ's jobs that can be reached by car within a 30-minute travel time in 2016 and 2031 respectively, while Figure 6-11 and Figure 6-12 show the same for travel by public transport. Brisbane has the dominant job market in the region. As a result, residents of Brisbane can reach a much larger proportion of total jobs than residents of Gold or Sunshine Coast. Ease of access to Brisbane's urban core is the main determinant of employment accessibility, and areas near infrastructure that provide a direct connection to the CBD have the highest level of access by both car and public transport.

Travelling to work by car offers SEQ residents access to a much higher proportion of the region's jobs than public transport (in both 2016 and the 2031 forecast). This is a result of the higher level of flexibility that car travel affords. However, while AM peak car accessibility deteriorates between 2016 and 2031 due to increasing road network congestion, accessibility by public transport remains largely unchanged. Areas with decreasing public transport access are generally those serviced by buses not operating in priority lanes that are affected by congestion. Cross River Rail enables considerably higher frequencies along most rail lines, providing higher levels of accessibility to residents serviced by these corridors.

While Gold Coast and Sunshine Coast residents can reach a much smaller proportion of regional jobs than those in Brisbane, when a level of self-containment is assumed, and accessibility is constrained to the percentage of jobs available within each individual region, the picture changes somewhat (Figure 6-13 through Figure 6-16). Gold Coast and Sunshine Coast residents travelling by car can to access a much higher percentage of jobs in their own region within a 30-minute travel window than can residents of Greater Brisbane in both 2016 and 2031. Accessibility will diminish slightly from congestion between 2016 and 2031, however this is more pronounced in the busier urban areas (Brisbane and Gold Coast) than on the Sunshine Coast.

Residents of all three regions have more limited accessibility if they travel to work by public transport. However, projects including the Gold Coast Light Rail extension and Cross River rail improve accessibility for the areas directly serviced by those corridors.

Figure 6-9 – SEQ access to jobs by Car - 2016 AM Peak (7-9AM)

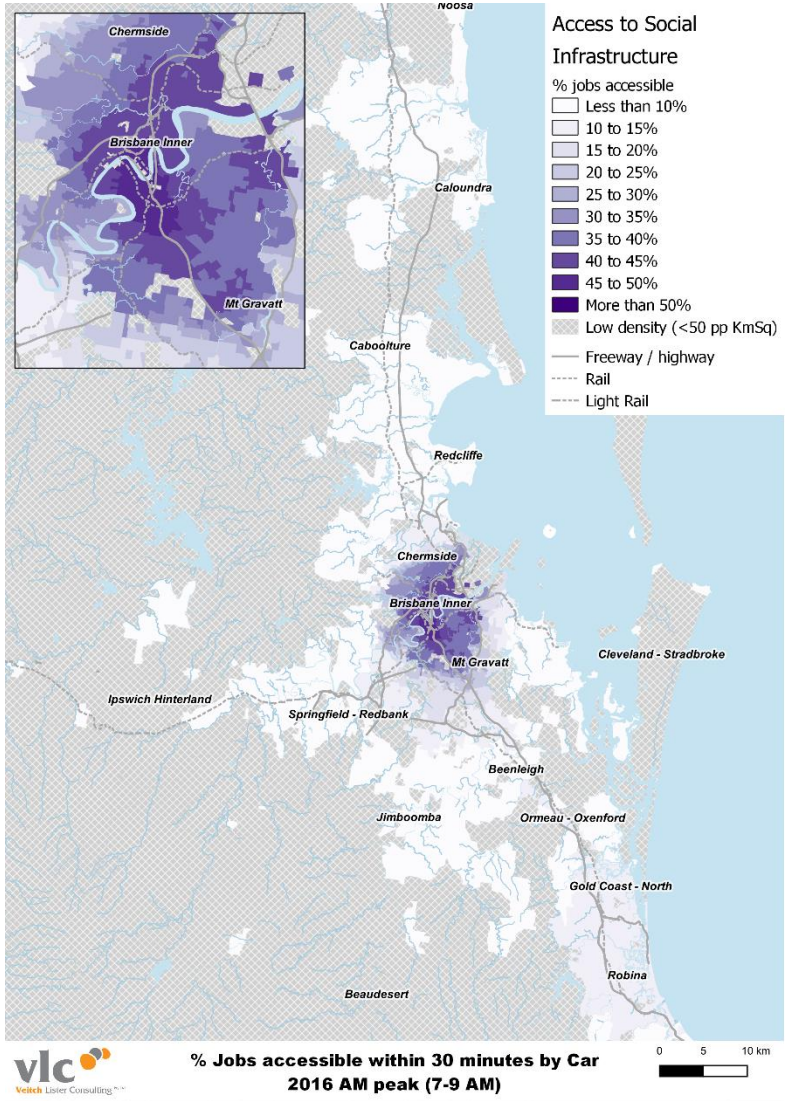


Figure 6-10 – SEQ access to jobs by Car - 2031 AM Peak (7-9AM)

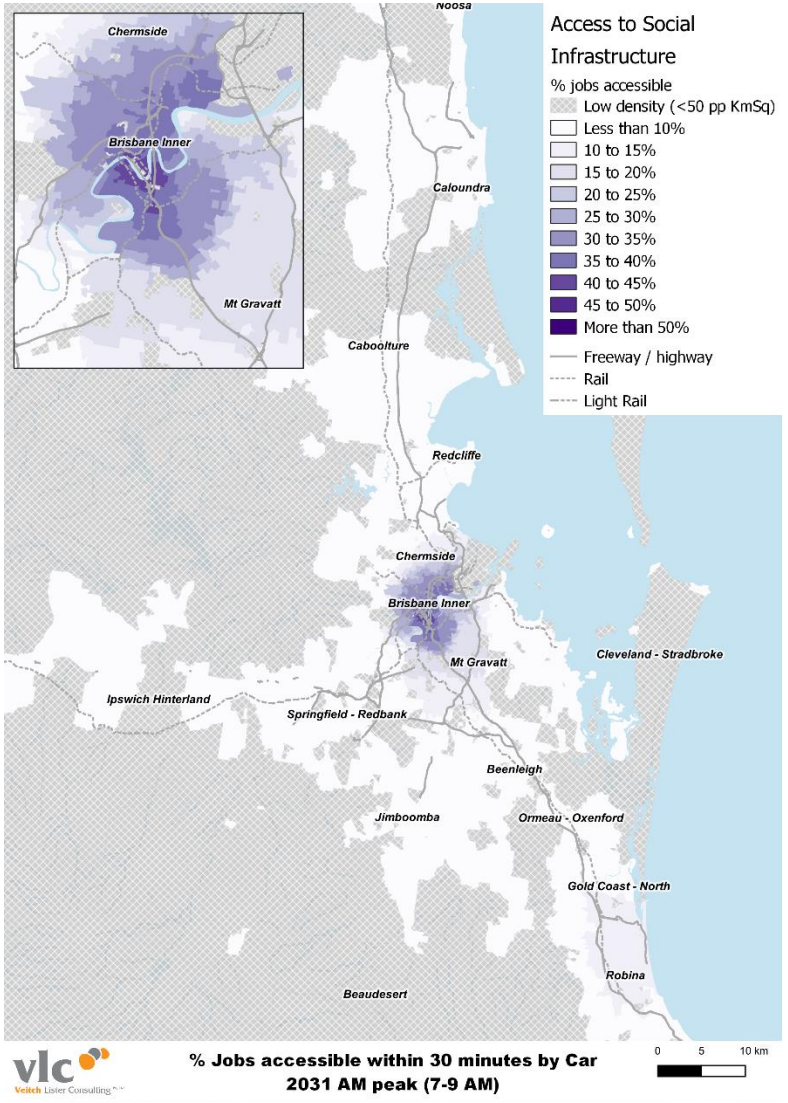


Figure 6-11 – SEQ access to jobs by PT - 2016 AM Peak (7-9AM)

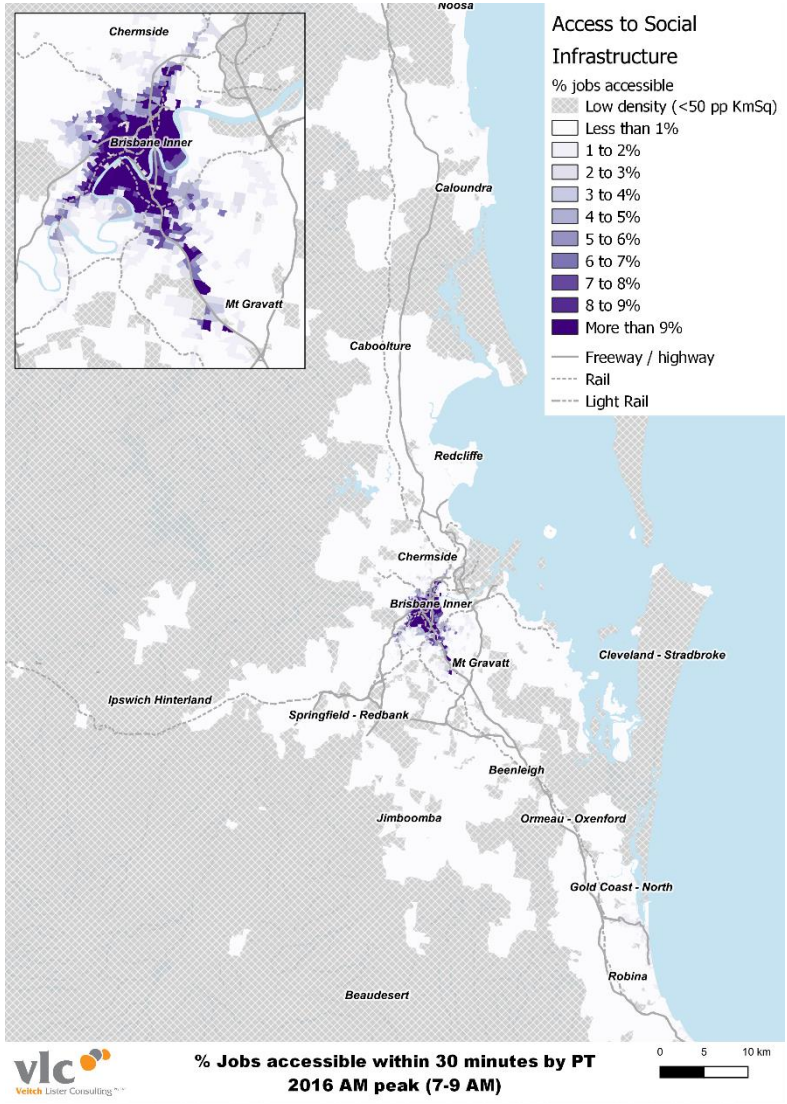


Figure 6-12 – SEQ access to jobs by PT - 2031 AM Peak (7-9AM)

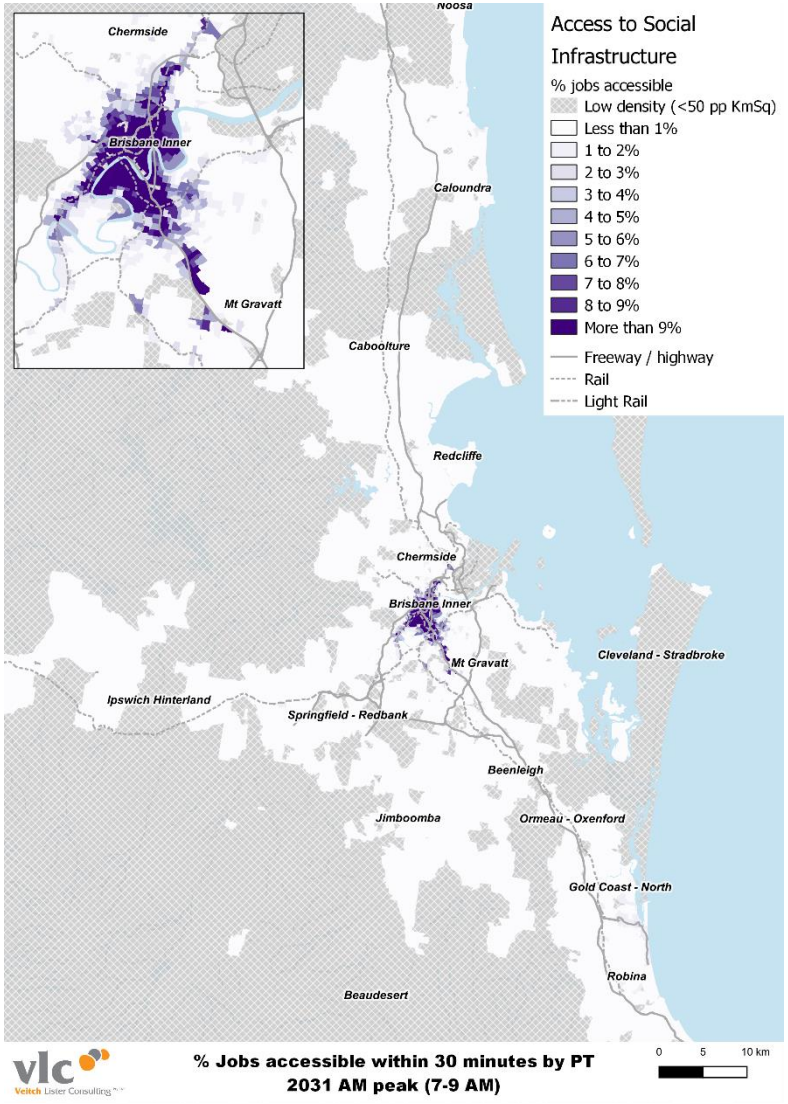


Figure 6-13 – SEQ access to jobs by Car contained by region - 2016 AM Peak (7-9AM)

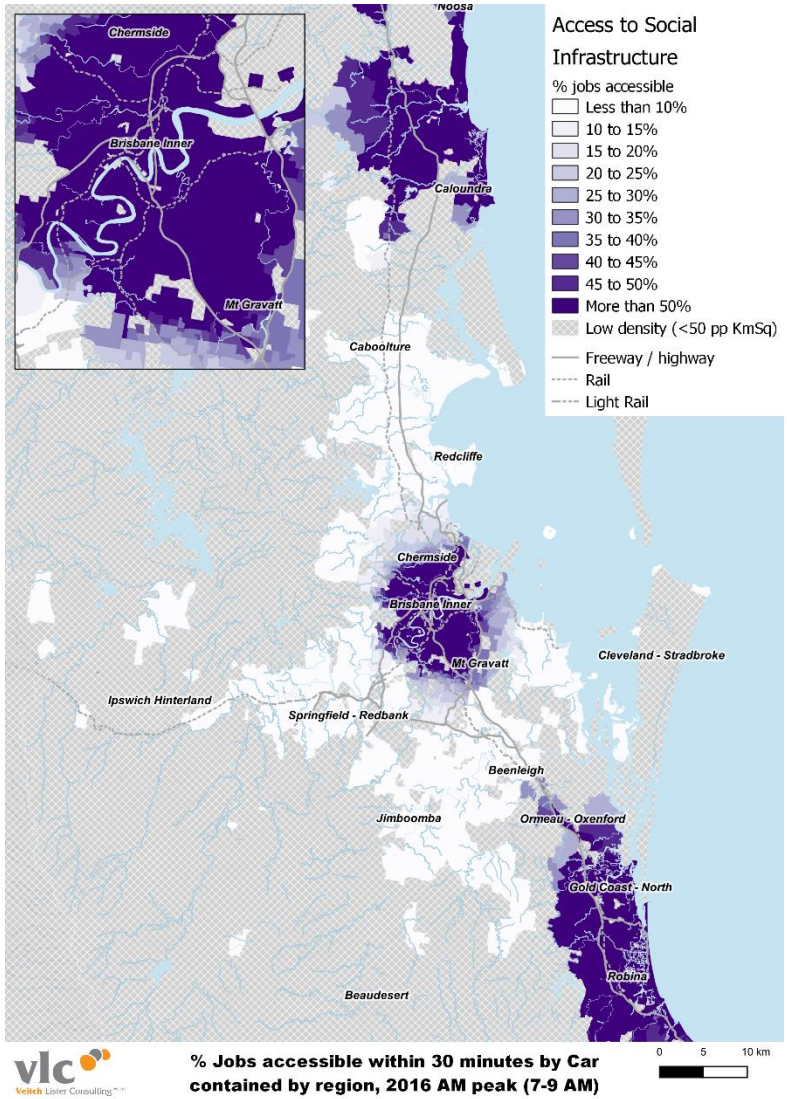


Figure 6-14 – SEQ access to jobs by Car contained by region - 2031 AM Peak (7-9AM)

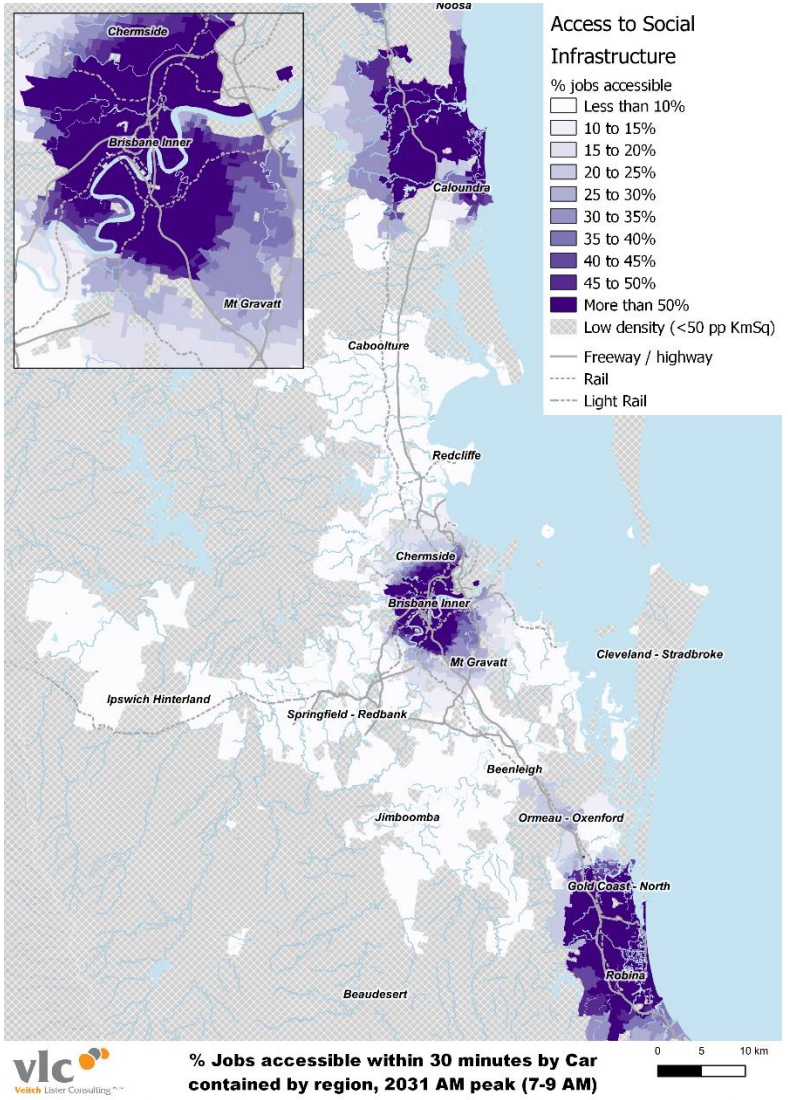


Figure 6-15 – SEQ access to jobs by PT contained by region - 2016 AM Peak (7-9AM)

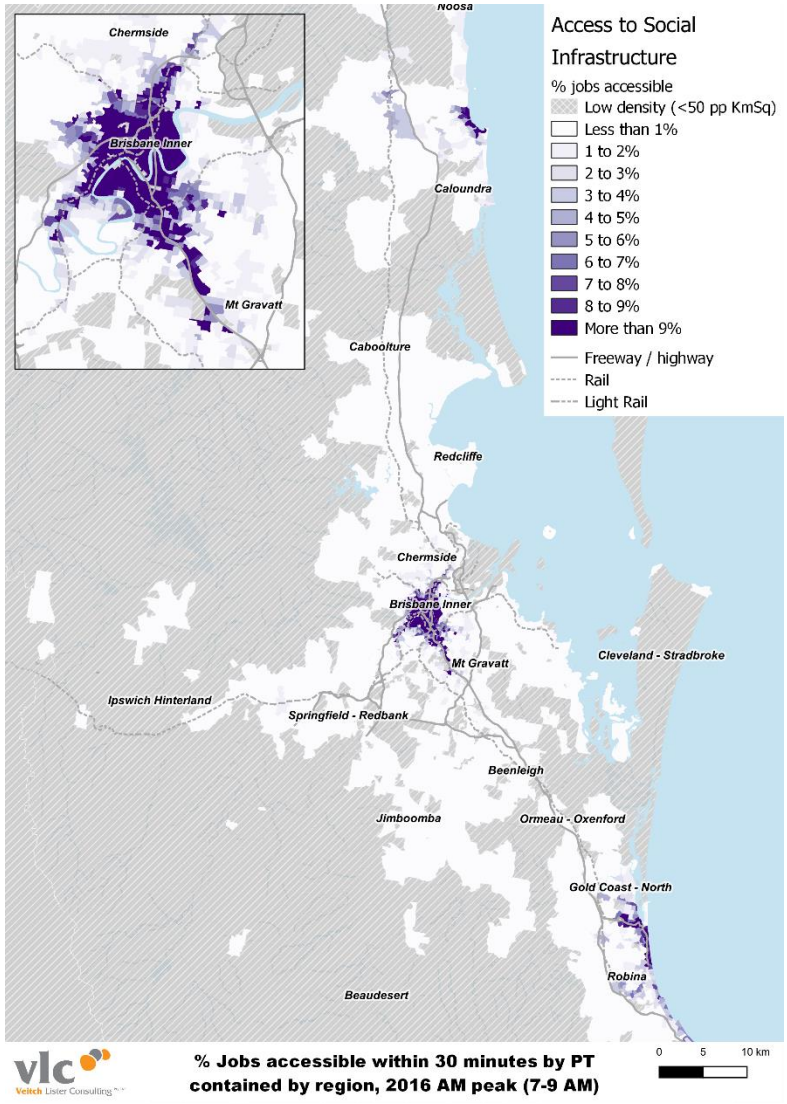
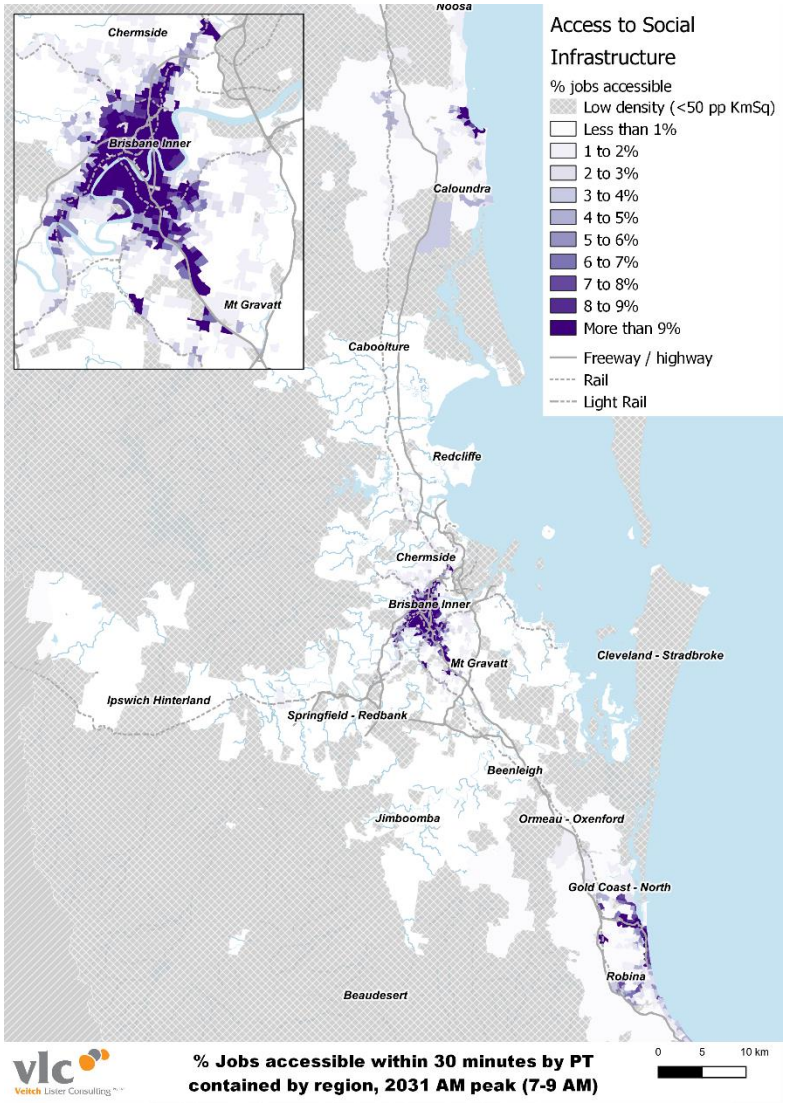


Figure 6-16 – SEQ access to jobs by PT contained by region - 2031 AM Peak (7-9AM)



Access to critical healthcare is measured by the travel time to the nearest public hospital/hospital with an emergency department by car and public transport (Figure 6-17 and Figure 6-18). AM peak travel times to access hospitals are much better by car than by public transport.

Only the areas in station precincts or directly around public hospitals are forecast to be able to access a hospital within 30 minutes by public transport (Table 6-4). In the rest of the city, those who don't have access to a car can expect to travel for over an hour. Average public transport travel times for residents on the Gold Coast and Sunshine Coast are expected to improve considerably (by 8 and 10 minutes respectively). As the location of hospitals remains static between 2016 and 2031, the improvements in the two regional cities are purely a result of investments in the public transport network.

Table 6-4 – SEQ population-weighted weekday average travel time* to the nearest public/emergency hospital - AM peak (7-9AM)

SA3	Car			PT		
	2016	2031	*Change*	2016	2031	Change
Greater Brisbane	16.3	22.0	*+5.8*	62.9	63.5	*+0.6*
Gold Coast	13.4	18.4	*+5.0*	71.3	63.2	*-8.1*
Sunshine Coast	17.4	19.6	*+2.2*	90.5	80.2	*-10.3*

*The travel times reflect all modelled zones and so does not reflect adjustments made in Figure 6-18 (see 'Limitations of strategic accessibility modelling' box above).

Figure 6-17 – SEQ average time to nearest public/emergency hospital by Car - 2031 AM peak (7-9AM)

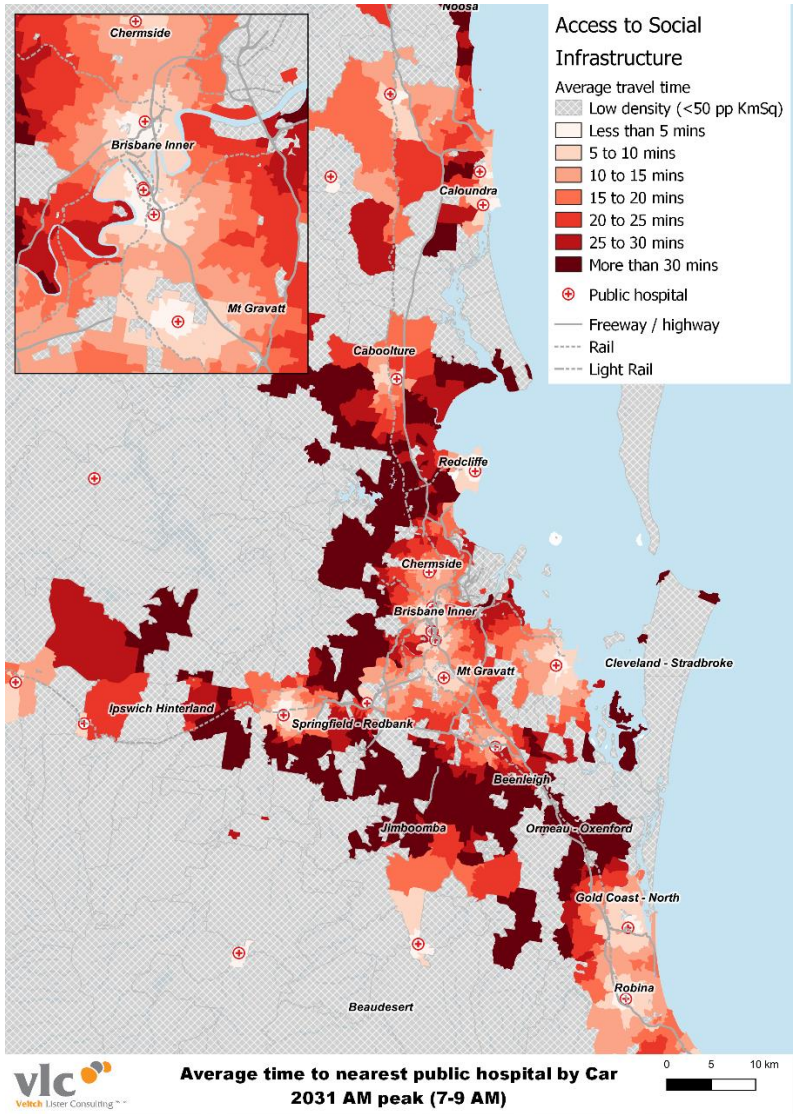
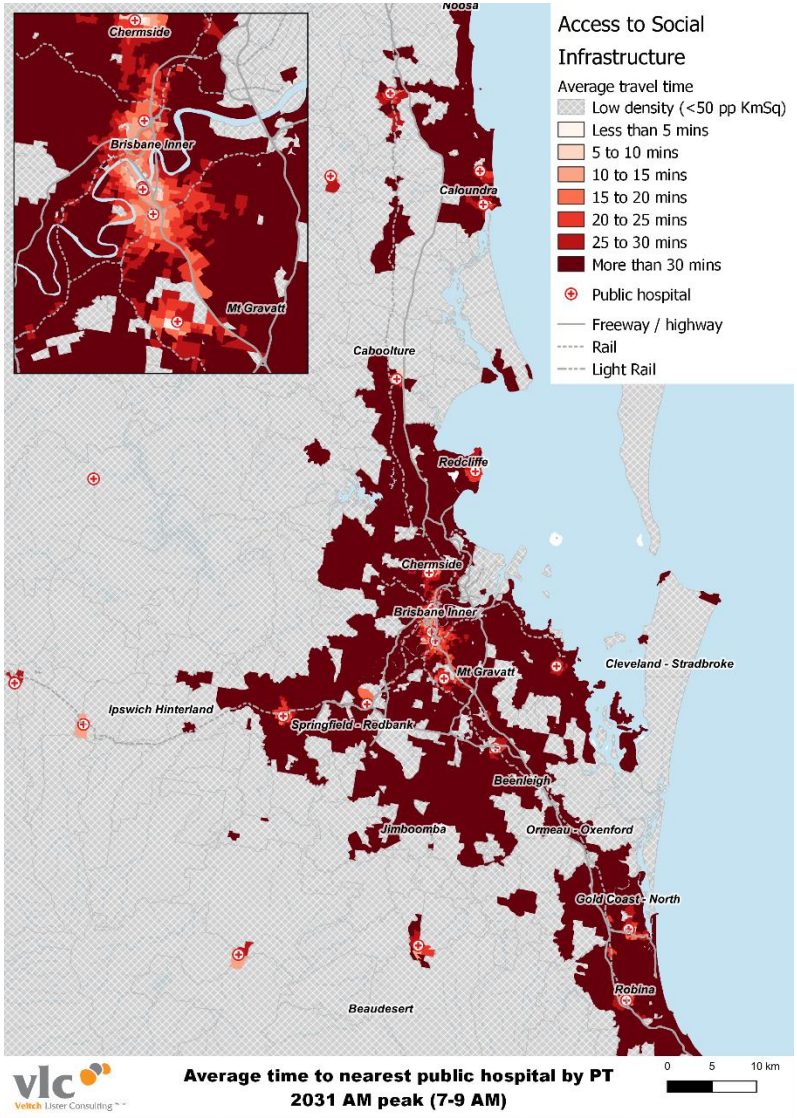


Figure 6-18 – SEQ average time to nearest public/emergency hospital by PT - 2031 AM peak (7-9AM)



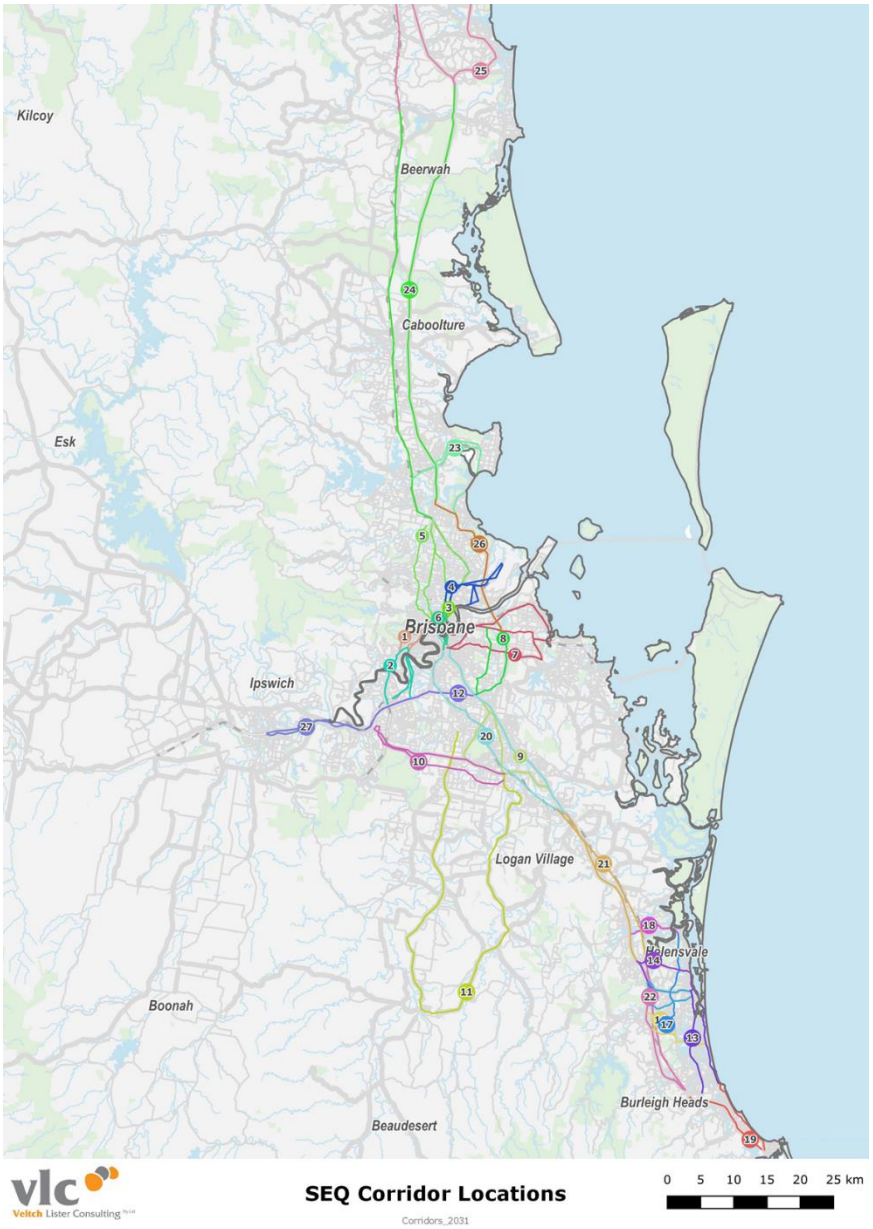
7. Assessment

This section draws together the analysis of the preceding chapters and assesses transport network performance along two dimensions: corridors and regions. It also discusses some of the economic impacts of the deteriorating network performance.

7.1 Corridor deficiencies

Demand on the key transport corridors is expected to increase to 2031. As a result, the performance of these corridors is likely to decline substantially, causing significant delays for motorists and, to some extent, users of buses. Increasing demand can also increase crowding on public transport services if service frequencies do not keep pace. In this section we measure network performance for road, rail and bus corridors in 2016 and 2031 using 27 key multi-modal corridors that were identified with Infrastructure Australia. The focus is on Brisbane corridors (Figure 7-1) is this is where the most significant delays emerge. A full list of SEQ corridors is in Appendix Table C-1.

Figure 7-1 – Brisbane transport corridors



Performance on each road corridor is analysed in terms of delay hours (an aggregate measure) and percentage of journey time accounted for by congestion (a measure of individual road user experience). In both 2016 and 2031 the modelling indicates significant delays on the key motorways during peak times (Table 7-1 to Table 7-6). The most significant contributors to aggregate delay in SEQ are the major north-south corridors running from the Sunshine Coast in the north to the Gold Coast in the south:

- Bruce Highway
- Gateway Motorway
- Pacific Motorway.

This outcome reflects the strong demand for movements both within and between the cities on SEQ's coastal axis.

The other deficient corridors identified in this analysis are within the Greater Brisbane area. The strong population growth expected in Ipswich means that by 2031 delay hours are forecast to more than triple on the Ipswich Motorway. A similar outcome is expected on the Mt Lindsey Highway Corridor where strong population growth drives substantial delay hours on this corridor in the 2031 forecast. The Centenary Highway is also expected to become a major source of delay. This corridor is one of the city's few river crossings and provides an alternative to the similarly congested Ipswich Motorway.

Table 7-1 – Brisbane GCCSA 2016 ten most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Pacific Mwy (City - Beenleigh)	20	NB	4,800
2	Gateway Mwy (Wynumm - M3)	26	SB	2,400
3	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	NB	2,100
4	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	2,000
5	Old Cleveland Rd (Thornside - The Gabba)	7	WB	1,700
6	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	EB	1,700
7	Kelvin Grove (ICB - M1)	5	SB	1,500
8	Wynnum Rd (Thornside - The Gabba)	7	WB	1,400
9	Wandell St - Bridgeman Rd (ICB - M1)	5	SB	1,200
10	Pacific Mwy (City - Beenleigh)	20	SB	1,200
	PM peak (4-6PM)			
1	Pacific Mwy (City - Beenleigh)	20	SB	3,700
2	Gateway Mwy (Wynumm - M3)	26	NB	2,100
3	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	SB	1,800
4	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	1,700
5	Pacific Mwy (Loganholme - Mt Gravatt)	9	SB	1,600
6	Pacific Mwy (City - Beenleigh)	20	NB	1,500
7	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	WB	1,300
8	Old Cleveland Rd (Thornside - The Gabba)	7	EB	1,200
9	Wynnum Rd (Thornside - The Gabba)	7	EB	1,200
10	Kelvin Grove (ICB - M1)	5	NB	1,200

Table 7-2 – Brisbane GCCSA 2031 top ten most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Pacific Mwy (City - Beenleigh)	20	NB	11,700
2	Pacific Mwy (Beenleigh - Helensvale)	21	NB	9,300
3	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	6,700
4	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	EB	5,700
5	Ipswich Mwy - Brisbane Rd (Ipswich - Goodna)	27	EB	5,600
6	Mt Lindesay Hwy (Beaudesert - North Logan)	11	NB	5,200
7	Pacific Mwy (Loganholme - Mt Gravatt)	9	NB	4,900
8	Gateway Mwy (Wynumm - M3)	26	SB	4,200
9	Pacific Mwy (Beenleigh - Helensvale)	21	SB	4,100
10	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	NB	3,400
	PM peak (4-6PM)			
1	Pacific Mwy (Beenleigh - Helensvale)	21	SB	9,500
2	Pacific Mwy (City - Beenleigh)	20	SB	9,400
3	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	5,500
4	Ipswich Mwy - Brisbane Rd (Ipswich - Goodna)	27	WB	5,500
5	Mt Lindesay Hwy (Beaudesert - North Logan)	11	SB	3,900
6	Pacific Mwy (Beenleigh - Helensvale)	21	NB	3,800
7	Gateway Mwy (Wynumm - M3)	26	NB	3,800
8	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	WB	3,700
9	Pacific Mwy (Loganholme - Mt Gravatt)	9	SB	3,500
10	Pacific Mwy (City - Beenleigh)	20	NB	3,500

Table 7-3 – Sunshine Coast 2016 top five most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	2,000
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	400
3	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	400
4	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	200
5	David Low Way (Sippy Downs - Noosaville)	25	SB	100
	PM peak (4-6PM)			
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	1,700
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	400
3	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	300
4	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	300
5	David Low Way (Sippy Downs - Noosaville)	25	NB	100

Table 7-4 – Sunshine Coast 2031 top five most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	6,700
2	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	1,400
3	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	700
4	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	600
5	David Low Way (Sippy Downs - Noosaville)	25	SB	300
	PM peak (4-6PM)			
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	5,500
2	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	1,600
3	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	700
4	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	500
5	David Low Way (Sippy Downs - Noosaville)	25	NB	300

Table 7-5 – Gold Coast 2016 top five most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Pacific Mwy (Beenleigh - Helensvale)	21	SB	1,000
2	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	1,000
3	Pacific Mwy (Beenleigh - Helensvale)	21	NB	900
4	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	SB	700
5	Smith Street Mtw (Southport - Helensvale)	14	SB	400
	PM peak (4-6PM)			
1	Pacific Mwy (Helensvale - Varsity Lakes)	22	NB	800
2	Pacific Mwy (Beenleigh - Helensvale)	21	NB	800
3	Pacific Mwy (Beenleigh - Helensvale)	21	SB	700
4	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	NB	700
5	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	400

Table 7-6 – Gold Coast 2031 top five most delayed road corridors

	Corridor name	Number	Direction	Delay Hours
	AM peak (7-9AM)			
1	Pacific Mwy (Beenleigh - Helensvale)	21	NB	9,300
2	Pacific Mwy (Beenleigh - Helensvale)	21	SB	4,100
3	Pacific Mwy (Helensvale - Varsity Lakes)	22	NB	2,000
4	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	1,800
5	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	NB	1,200
	PM peak (4-6PM)			
1	Pacific Mwy (Beenleigh - Helensvale)	21	SB	9,500
2	Pacific Mwy (Beenleigh - Helensvale)	21	NB	3,800
3	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	2,300
4	Pacific Mwy (Helensvale - Varsity Lakes)	22	NB	1,500
5	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	SB	1,200

Table 7-7 to Table 7-12 consider traffic delays using a user-focused approach for 2016 and 2031 respectively. Many of the worst-performing corridors at an aggregate level also appear in the user-focused list, however the order of priority changes. The Centenary Highway from Ipswich has the worst delays for users across both years and in peak periods. By 2031 over 74 per cent of travel time is a result of traffic delays, up from 66 per cent in 2016. In the AM peak, this represents an increase from 18 minutes to 26 minutes delay per vehicle.

While in 2016 the Centenary Highway was the only corridor where over 60 per cent of travel time was a result of congestion, by 2031 this is the case for nearly all the worst-performing corridors. Of note is the shift in geography of the worst user delays. In 2016, corridors providing access from Brisbane's inner east, such as Wynnum Road and Old Cleveland Road, were among the city's worst. By 2031, these rankings are replaced by roads and motorways linking to growth areas in the south west of Greater Brisbane, including Coronation Drive, the Ipswich Motorway and the Centenary Highway.

Table 7-7 – Brisbane GCCSA 2016 top ten most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	NB	10	68%	18	26
2	Wynnum Rd (Thornside - The Gabba)	7	WB	17	59%	25	42
3	Pacific Mwy (Loganholme - Mt Gravatt)	9	NB	17	58%	14	24
4	Oxley Rd (Ipswich Mwy - Indooroopilly)	2	NB	8	57%	13	23
5	Kelvin Grove (ICB - M1)	5	SB	14	57%	22	38
6	Old Cleveland Rd (Thornside - The Gabba)	7	WB	21	56%	25	45
7	Pacific Mwy (City - Beenleigh)	20	NB	35	55%	27	49
8	Gateway Mwy (Wynumm - M3)	26	SB	26	55%	20	36
9	Coronation Dve (Moggill Rd - ICB)	1	NB	5	52%	7	13
10	Wandell St - Bridgeman Rd (ICB - M1)	5	SB	16	50%	20	39
	PM peak (4-6PM)						
1	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	SB	9	66%	14	21
2	Wynnum Rd (Thornside - The Gabba)	7	EB	17	54%	20	37
3	Oxley Rd (Ipswich Mwy - Indooroopilly)	2	SB	8	52%	10	20
4	Kelvin Grove (ICB - M1)	5	NB	14	50%	17	34
5	Gateway Mwy (Wynumm - M3)	26	NB	26	50%	16	33
6	Pacific Mwy (Loganholme - Mt Gravatt)	9	SB	16	48%	9	18
7	Old Cleveland Rd (Thornside - The Gabba)	7	EB	21	48%	18	38
8	Pacific Mwy (City - Beenleigh)	20	SB	34	48%	20	41
9	Coronation Dve (Moggill Rd - ICB)	1	SB	5	47%	6	12
10	Milton Rd (Moggil Rd - ICB)	1	SB	7	46%	5	12

Table 7-8 – Brisbane GCCSA 2031 top ten most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	NB	10	76%	26	34
2	Pacific Mwy (Beenleigh - Helensvale)	21	NB	26	73%	37	51
3	Pacific Mwy (City - Beenleigh)	20	NB	35	71%	53	75
4	Pacific Mwy (Loganholme - Mt Gravatt)	9	NB	17	70%	23	33
5	Mt Lindesay Hwy (Beaudesert - North Logan)	11	NB	47	68%	73	106
6	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	EB	19	68%	34	50
7	IIpswich Mwy - Brisbane Rd (Ipswich - Goodna)	27	EB	15	68%	28	41
8	Lutwiche Rd - Gympye Rd (ICB - M1)	5	SB	13	65%	25	39
9	Coronation Dve (Moggill Rd - ICB)	1	NB	5	65%	12	19
10	Oxley Rd (Ipswich Mwy - Indooroopilly)	2	NB	8	65%	18	28
	PM peak (4-6PM)						
1	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	SB	9	74%	20	28
2	Pacific Mwy (Beenleigh - Helensvale)	21	SB	27	71%	36	51
3	IIpswich Mwy - Brisbane Rd (Ipswich - Goodna)	27	WB	15	69%	27	39
4	Pacific Mwy (City - Beenleigh)	20	SB	34	66%	42	63
5	Pacific Mwy (Loganholme - Mt Gravatt)	9	SB	16	63%	16	26
6	Mt Lindesay Hwy (Beaudesert - North Logan)	11	SB	47	63%	56	90
7	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	WB	18	61%	23	38
8	Coronation Dve (Moggill Rd - ICB)	1	SB	5	60%	10	16
9	Lutwiche Rd - Gympye Rd (ICB - M1)	5	NB	13	60%	20	34
10	Oxley Rd (Ipswich Mwy - Indooroopilly)	2	SB	8	59%	14	23

Table 7-9 – Sunshine Coast 2016 top five most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	47	29%	13	44
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	47	27%	12	43
3	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	66	23%	11	49
4	David Low Way (Sippy Downs - Noosaville)	25	SB	28	22%	7	30
5	David Low Way (Sippy Downs - Noosaville)	25	NB	29	17%	5	29
	PM peak (4-6PM)						
1	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	47	28%	12	43
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	47	25%	10	42
3	David Low Way (Sippy Downs - Noosaville)	25	NB	29	21%	6	30
4	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	66	20%	10	48
5	David Low Way (Sippy Downs - Noosaville)	25	SB	28	19%	5	29

Table 7-10 – Sunshine Coast 2031 top five most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	66	47%	34	72
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	47	36%	18	49
3	David Low Way (Sippy Downs - Noosaville)	25	SB	28	34%	12	36
4	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	47	33%	15	46
5	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	65	20%	9	47
	PM peak (4-6PM)						
1	Bruce Hwy (Mango Hills - Sippy Downs)	24	NB	65	42%	27	65
2	Sunshine Mwy (Sippy Downs - Noosaville)	25	NB	47	35%	17	48
3	David Low Way (Sippy Downs - Noosaville)	25	NB	29	32%	11	35
4	Sunshine Mwy (Sippy Downs - Noosaville)	25	SB	47	30%	14	45
5	Bruce Hwy (Mango Hills - Sippy Downs)	24	SB	66	21%	10	49

Table 7-11 – Gold Coast 2016 top five most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	SB	15	42%	7	15
2	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	21	34%	7	19
3	Broadwater Av (Paradise Point - Pacific Mwy)	18	NB	8	28%	3	11
4	Pacific Mwy (Beenleigh - Helensvale)	21	SB	27	27%	5	20
5	Gold Coast Hwy (Southport - Burleigh Heads)	13	SB	15	26%	6	22
	PM peak (4-6PM)						
1	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	NB	15	41%	6	15
2	Pacific Mwy (Helensvale - Varsity Lakes)	22	NB	22	32%	6	19
3	Gold Coast Hwy (Southport - Burleigh Heads)	13	NB	15	27%	6	22
4	Broadwater Av (Paradise Point - Pacific Mwy)	18	NB	8	26%	3	10
5	Broadwater Av (Paradise Point - Pacific Mwy)	18	SB	8	25%	3	10

Table 7-12 – Gold Coast 2031 top five most delayed road corridors (ranked by user delay)

	Corridor name	Number	Direction	Corridor length (km)	% of journey time accounted for by congestion	Delay per vehicle (mins)	Congested travel time for corridor (mins)
	AM peak (7-9AM)						
1	Pacific Mwy (Beenleigh - Helensvale)	21	NB	26	73%	37	51
2	Broadwater Av (Paradise Point - Pacific Mwy)	18	NB	8	60%	12	19
3	Pacific Mwy (Beenleigh - Helensvale)	21	SB	27	56%	18	33
4	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	NB	15	49%	9	18
5	Broadwater Av (Paradise Point - Pacific Mwy)	18	SB	8	47%	7	14
	PM peak (4-6PM)						
1	Pacific Mwy (Beenleigh - Helensvale)	21	SB	27	71%	36	51
2	Broadwater Av (Paradise Point - Pacific Mwy)	18	SB	8	58%	11	18
3	Pacific Mwy (Beenleigh - Helensvale)	21	NB	26	53%	16	30
4	Pacific Mwy (Helensvale - Varsity Lakes)	22	SB	21	49%	12	25
5	Pacific Mwy (Burleigh Heads - Terranora Ck)	19	SB	15	48%	8	17

By 2031, the level of demand placed on SEQ's public transport system is expected to increase. In this study, high levels of crowding are taken as an indicator of poor network performance. (In reality, other adverse network performance outcomes not modelled by VLC are likely to result from high loadings of services, such as increased dwell times at stations, reduced reliability and passengers being unable to board their preferred service.)

Despite these additional demands, limited crowding is expected on SEQ's rail network. This is a result of the considerable uplift in service provision that results from the completion of Cross River Rail. With service frequencies quadrupling on some rail lines, there is ample passenger capacity to cater for forecast rail patronage.

Although the level of demand placed on Brisbane's bus network is expected to increase to 2031, the levels of crowding are expected remain relatively stable. In the AM peak (for both 2016 and 2031) the modelling indicates that the most crowded sections of the bus network are those just before bus routes join the major busways (i.e. South Eastern and Northern Busways). Examples of this include Kelvin Grove Road and Ipswich Road (Table 7-13 and Table 7-14). This outcome is driven by the lower capacity of these corridors compared to the major busways they feed. In both 2016 and 2031 the modelling indicates passenger volumes on these corridors only slightly above seated capacity. This outcome is likely to be driven by the key public transport projects (Brisbane Metro and Cross River Rail), which provide additional capacity to the public transport network.

Table 7-13 – Brisbane GCCSA crowding on 2016 public transport corridors

Corridor	Direction	Indicative volume / seated capacity	Indicative volume / crush capacity
AM peak (7-9AM)			
Latrobe Terrace/Given Terrace/Caxton Street just north of CBD	SB	1.3	0.9
Kelvin Grove Road just north of CBD	SB	1	0.7
Ipswich Road south of Pacific Motorway	NB	1.1	0.8
PM peak (4-6PM)			
Latrobe Terrace/Given Terrace/Caxton Street just north of CBD	NB	1.1	0.8
Kelvin Grove Road just north of CBD	NB	1.1	0.8
Ipswich Road south of Pacific Motorway	SB	1.1	0.8

Table 7-14 – Brisbane GCCSA crowding on 2031 public transport corridors

Corridor	Direction	Indicative volume / seated capacity	Indicative volume / crush capacity
AM peak (7-9AM)			
Latrobe Terrace/Given Terrace/Caxton Street just north of CBD	SB	1.1	0.8
Kelvin Grove Road just north of CBD	SB	1.1	0.8
Ipswich Road south of Pacific Motorway	NB	1.1	0.8
Mains Road south of Pacific Motorway	NB	1.1	0.7
PM peak (4-6PM)			
Latrobe Terrace/Given Terrace/Caxton Street just north of CBD	NB	0.9	0.6
Kelvin Grove Road just north of CBD	NB	1.2	0.8
Ipswich Road south of Pacific Motorway	SB	1.2	0.8
Mains Road south of Pacific Motorway	SB	1.1	0.8

7.2 Regional deficiencies

Residents of SEQ with access to a car can generally reach local social services, including childcare centres, primary and secondary schools, within a ten-minute drive in the morning peak in 2016. Despite growing road congestion, this is also generally the case in 2031. For more remote parts of the Brisbane GCCSA, specifically Caboolture and Ipswich Hinterlands, travel times are considerably above the city-wide average. However this is a much more expected outcome for these areas and residents would be aware of the longer distances required to reach every day destinations by moving to these locations. Accessibility for residents dependent on public transport is much more varied, with only those residents within direct access of a heavy rail, light rail or bus priority corridor experiencing average travel times below 30 minutes.

Growing congestion in high-growth population centres, such as Ipswich, is expected to reduce social accessibility into the future. The most congested road corridors service this area, and average travel times to local infrastructure are forecast more than double between 2016 and 2031 as a result. Ipswich is also one of the few SA3s in Greater Brisbane that experiences a material increase in average travel times to social infrastructure by public transport into the future. Modelled growth in congestion around this SA3 may partly reflect limitations in the knowledge of the future networks (section 2). However, the modelling highlights what could happen if public transport services, local road networks and social infrastructure investment does not keep pace with projected increases in population.

7.3 Economic impacts

Congestion, traffic delays and poor travel time reliability result in widespread negative impacts on the community and economy. Delays (particularly where they are unexpected) can result in missed appointments, wasted time and frustration for users of the transport system.

VLC has estimated the dollar value of the cost of congestion in SEQ in 2016 and 2031 based on the way people are prepared to trade off money for reductions in the time spent travelling (see Appendix Appendix D.4 for a detailed calculation methodology). The cost of congestion is estimated to nearly treble between 2016 and 2031, from $8.6 million to $24.4 million (Figure 7-2). This is consistent with the growing population and deteriorating network performance described in the preceding chapters.

Each modelled time-period contributes to the total daily congestion cost. The costs accrued in the AM peak, inter-peak and PM peak are comparable. In 2016, values range from $2.4 million (PM peak) to $2.9 million (AM peak), while in 2031 they range from $7.0 million (PM peak) to $8.6 million (PM peak). As the inter-peak spans seven hours while each peak accounts for just two hours, the hourly cost incurred in the peaks is considerably higher (Figure 7-4). The PM peak has a slightly lower hourly cost of congestion than the AM peak in both years. This is a function of the lower hours of delay on key corridors described earlier in this chapter, as well as the concentration of 'higher value' trips (i.e. business travel and freight trips) in the AM peak compared with the PM peak.

Figure 7-2 – SEQ average weekday cost of congestion

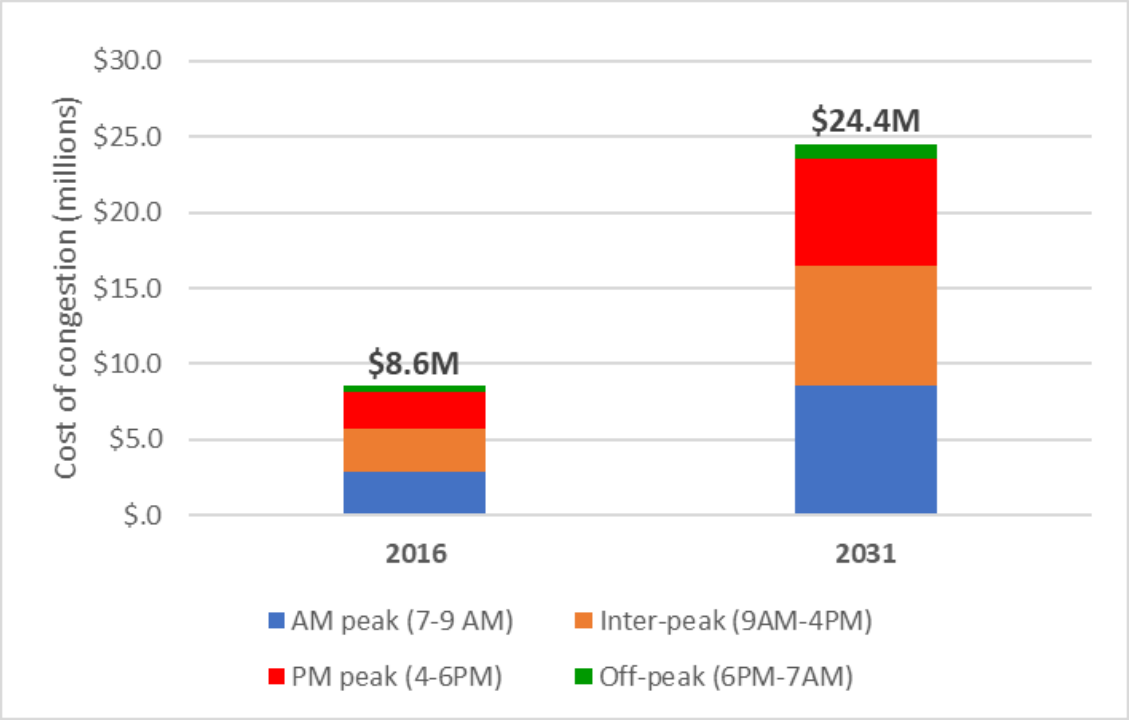


Figure 7-3 shows the contribution of each region in SEQ to the overall daily congestion cost. While the majority of costs are accrued in Brisbane in both 2016 and 2031, the impact of growing pressures on the Gold Coast's road network is clear. The area's contribution to total congestion costs increases from 11.7 per cent in 2016 to 16.3 per cent in 2031, with the value quadrupling from $1.0 million to $4.0 million. Brisbane and Sunshine Coast congestion costs grow at a slightly slower rate.

The total cost of congestion by time period and region is provided in Table 7-15, while the estimated annual cost of congestion for each region is shown in Table 7-16

Figure 7-3 – SEQ average weekday cost of congestion by region

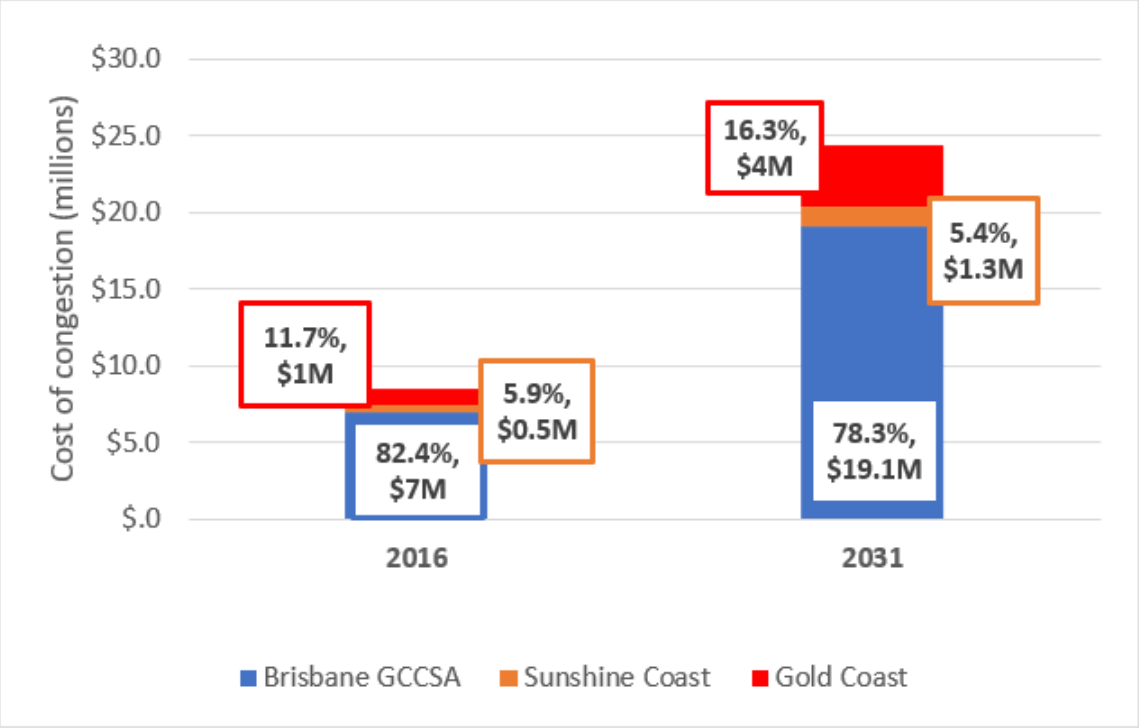


Figure 7-4 – SEQ average weekday hourly cost of congestion by time-period

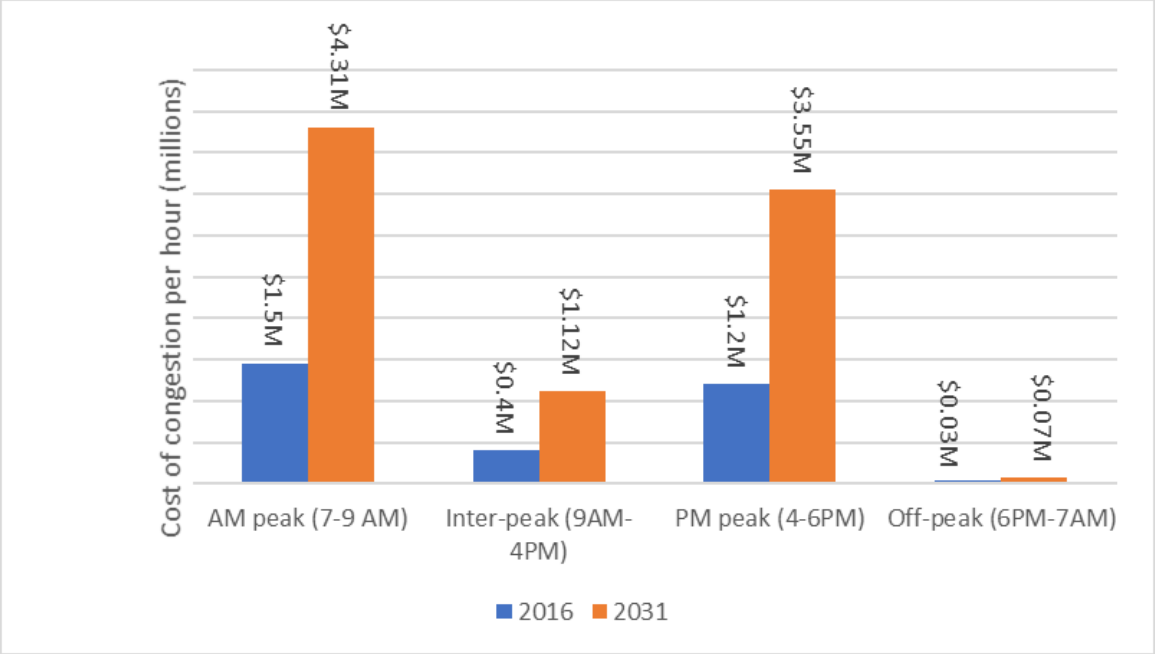


Table 7-15 – Brisbane GCCSA, Gold Coast and Sunshine Coast average weekday cost of congestion by time period

	Time period	2016	2031
Brisbane GCCSA	AM peak (7-9AM)	$2,457,000	$6,902,000
	Inter-peak (9AM-4PM)	$2,218,000	$5,915,000
	PM peak (4-6PM)	$1,987,000	$5,521,000
	Off-peak (6PM-7AM)	$347,000	$729,000
	Daily total	$7,009,000	$19,067,000
Gold Coast	AM peak (7-9AM)	$314,000	$1,324,000
	Inter-peak (9AM-4PM)	$347,000	$1,309,000
	PM peak (4-6PM)	$280,000	$1,223,000
	Off-peak (6PM-7AM)	$52,000	$117,000
	Daily total	$993,000	$3,973,000
Sunshine Coast	AM peak (7-9AM)	$128,000	$369,000
	Inter-peak (9AM-4PM)	$210,000	$545,000
	PM peak (4-6PM)	$126,000	$336,000
	Off-peak (6PM-7AM)	$40,000	$73,000
	Daily total	$504,000	$1,323,000

Table 7-16 – SEQ estimated annual cost of congestion by region

Region	2016 (millions)	2031 (millions)
Brisbane GCCSA	$1,717	$4,672
Gold Coast	$243	$973
Sunshine Coast	$123	$324
Total region	$2,084	$5,969

An economic cost can also be estimated for the crowding experienced by passengers on the public transport network reflecting the dislike people have when they have to stand on a train or bus, and particularly where vehicles are very full (again, see Appendix D.4 for a detailed calculation methodology). Crowding costs are small compared to the road congestion costs and are contained to the peak periods (Table 7-17). When travelling outside of the AM and PM peaks, passengers are generally able to travel in a seat.

During the peak periods, crowding costs increase for rail and bus users between 2016 and 2031 (note that light rail crowding costs are extremely small and for this reason have been excluded from analysis). Bus users incur the highest costs in both years and increase dramatically to 2031, particularly in the AM peak. Buses are SEQ's dominant mode of public transport and are also the main service option in growth areas. However, service kilometres will increase by just 20 per cent to 2031. As buses can accommodate far fewer standing passengers before reaching crush capacity than rail modes, costs increase more rapidly with smaller incremental growth in demand.

Rail crowding costs are comparatively smaller, and patronage growth is largely offset by strong investment in capacity with in-service kilometres nearly double between 2016 and 2031. The majority of costs are accrued by seated passengers on rail services that are just becoming crowded. Annually, the estimated cost of crowding across SEQ is $14 million in 2016, growing to $90 million in 2031.

Table 7-17 – SEQ average weekday cost of public transport crowding

Mode	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Rail	AM peak (7-9AM)	$8,300	$24,200	$15,900	192%
	PM peak (4-6PM)	$3,300	$9,400	$6,100	185%
Bus	AM peak (7-9AM)	$22,600	$208,800	$186,200	824%
	PM peak (4-6PM)	$9,100	$61,100	$52,000	571%
Gold Coast					
Rail	AM peak (7-9AM)	$200	$400	$200	100%
	PM peak (4-6PM)	0	0	0	-
Bus	AM peak (7-9AM)	$1,400	$4,100	$2,700	193%
	PM peak (4-6PM)	$800	$200	-$600	-75%
Sunshine Coast					
Rail	AM peak (7-9AM)	$1,400	$900	-$500	-36%
	PM peak (4-6PM)	$0	$600	$600	-
Bus	AM peak (7-9AM)	$400	$4,600	$4,200	1050%
	PM peak (4-6PM)	0	$300	$300	-
Total Region					
Rail	AM peak (7-9AM)	$9,900	$25,500	$15,600	158%
	PM peak (4-6PM)	$3,300	$10,000	$6,700	203%
Bus	AM peak (7-9AM)	$24,400	$217,500	$193,100	791%
	PM peak (4-6PM)	$9,900	$61,600	$51,700	522%

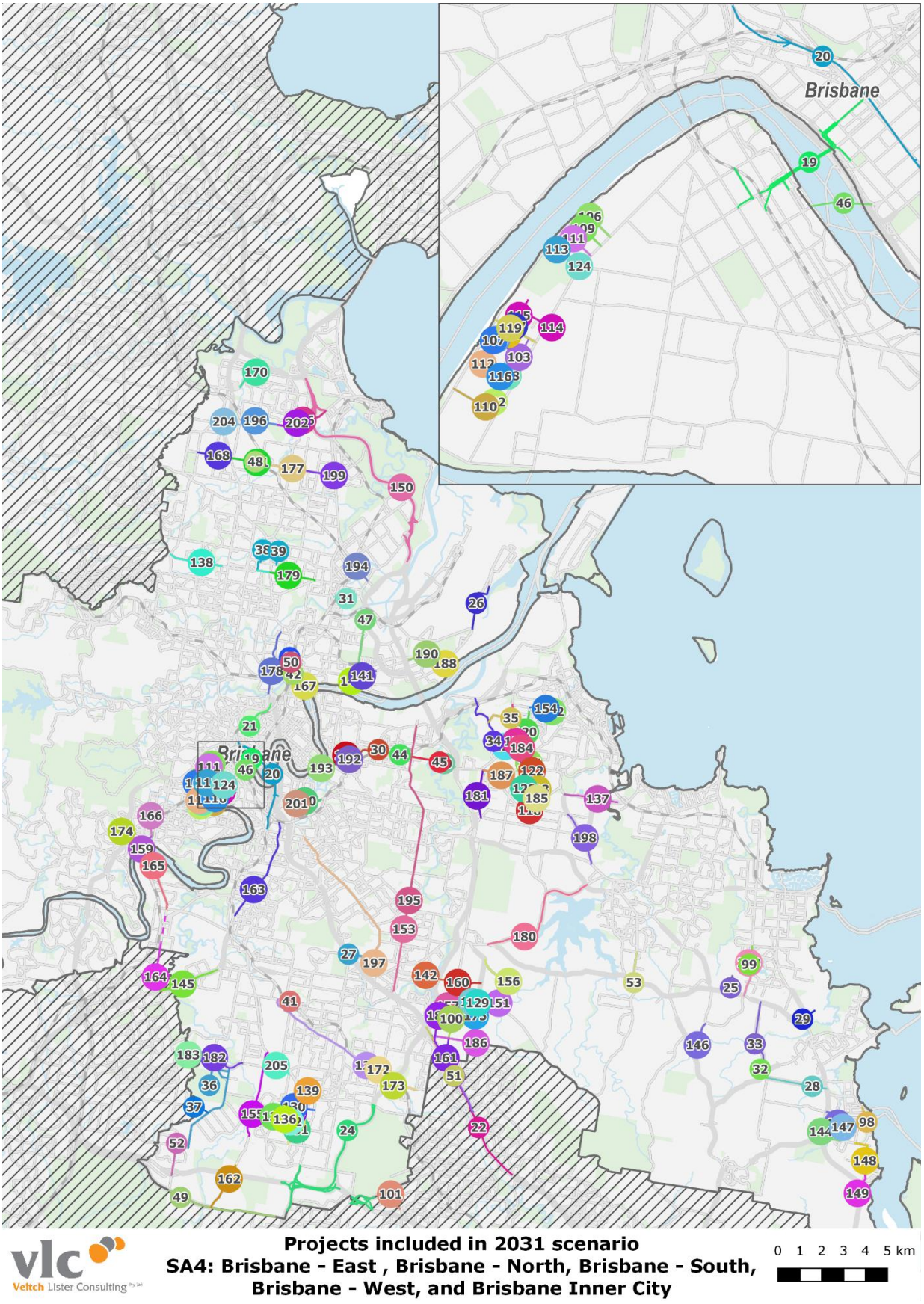
Crowding costs are based on the average crowding of services in each two-hour peak period (similar to chapter 5). As such, the cost of crowding would underestimate costs where there is high variability in crowding levels across services within this peak period.

Appendix A: Projects included in modelling

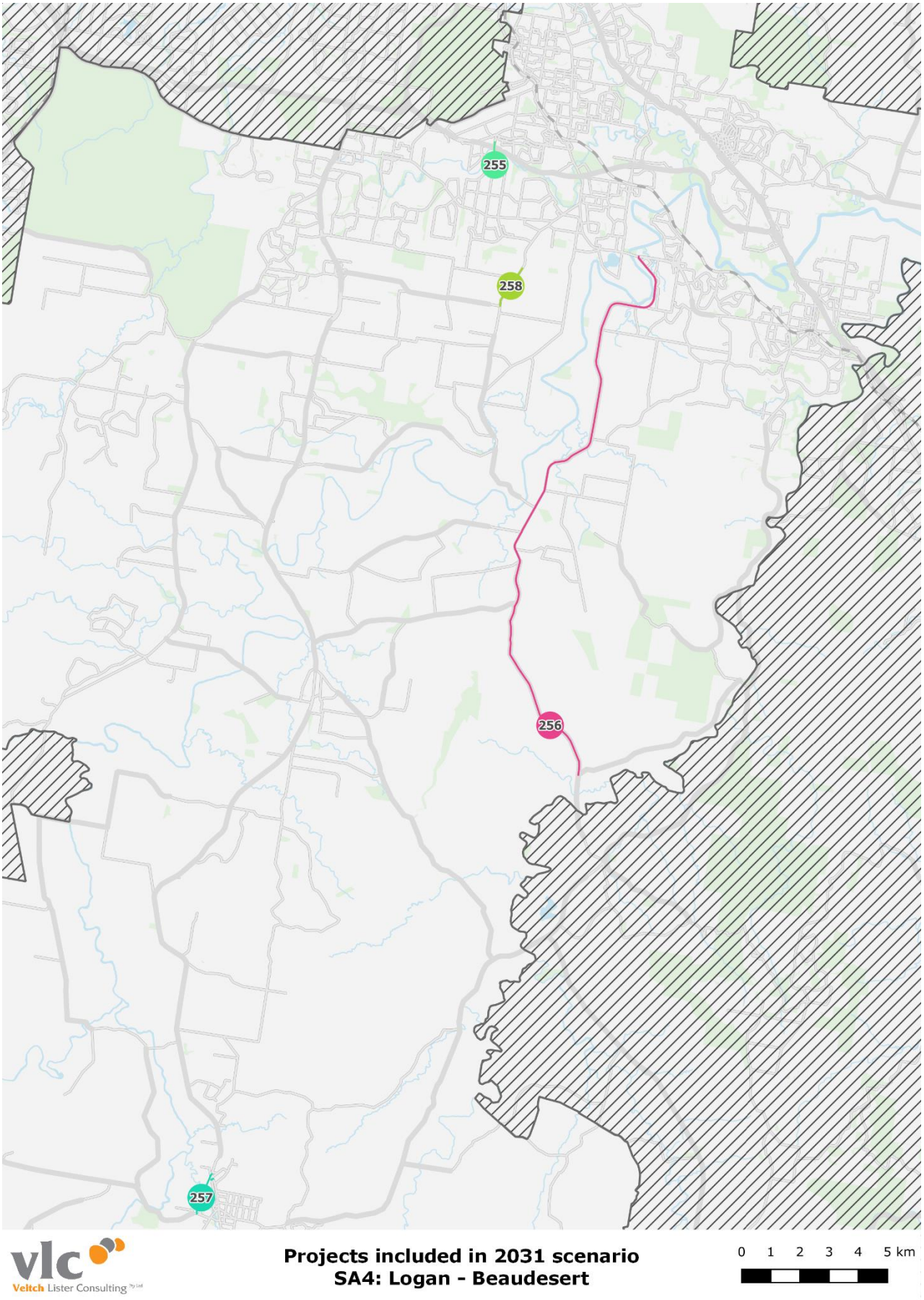
This section details the projects included in the modelling. A map for each SA4 has been included (Appendix Figure A-1 gives an overview of the relevant SA4s). The numbers referenced in maps are linked to project names in Appendix Table A-1.

Appendix Figure A-1 – SEQ SA4 overview

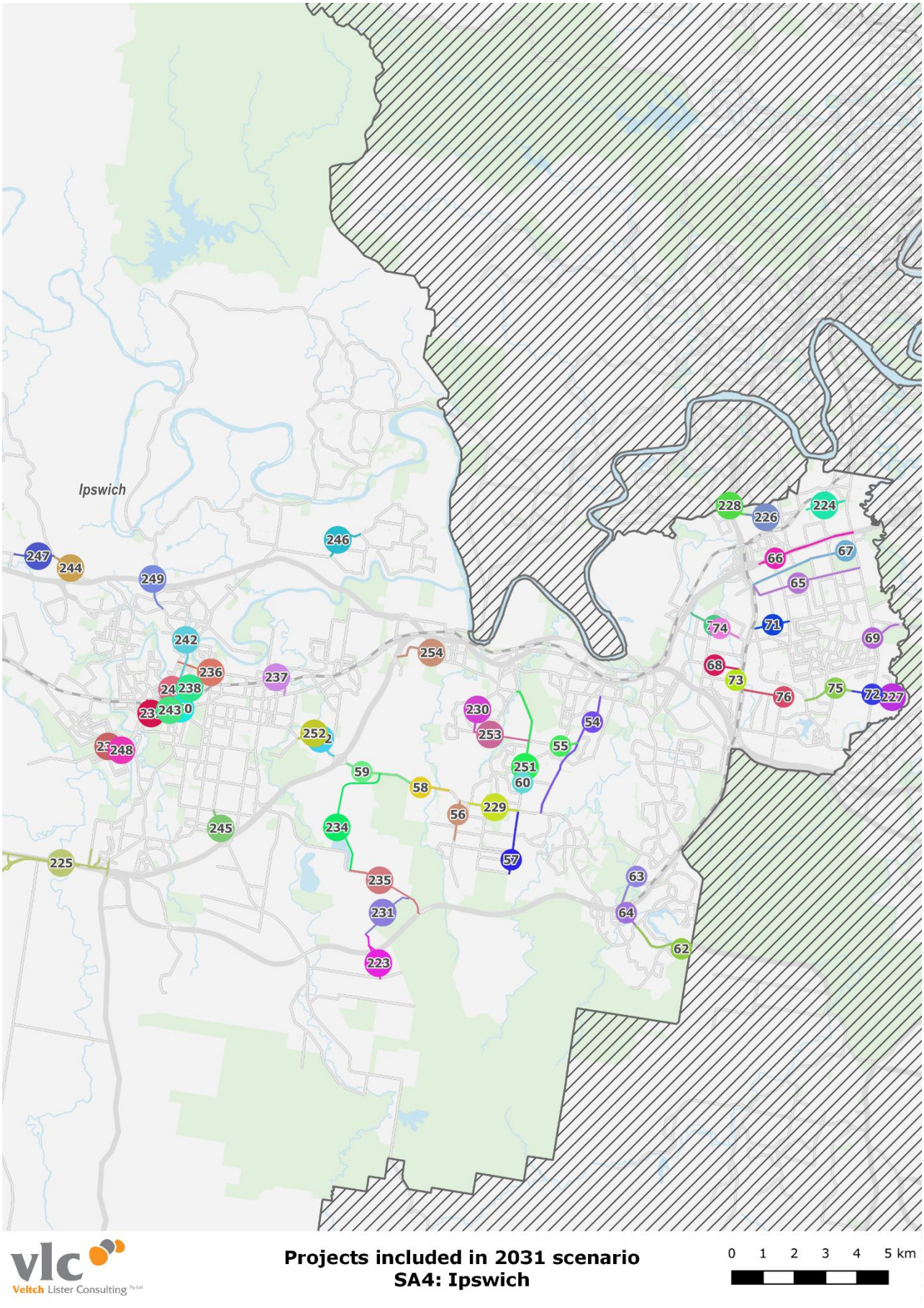
Appendix Figure A-2 – Projects included in the 2031 scenario SA4: Brisbane



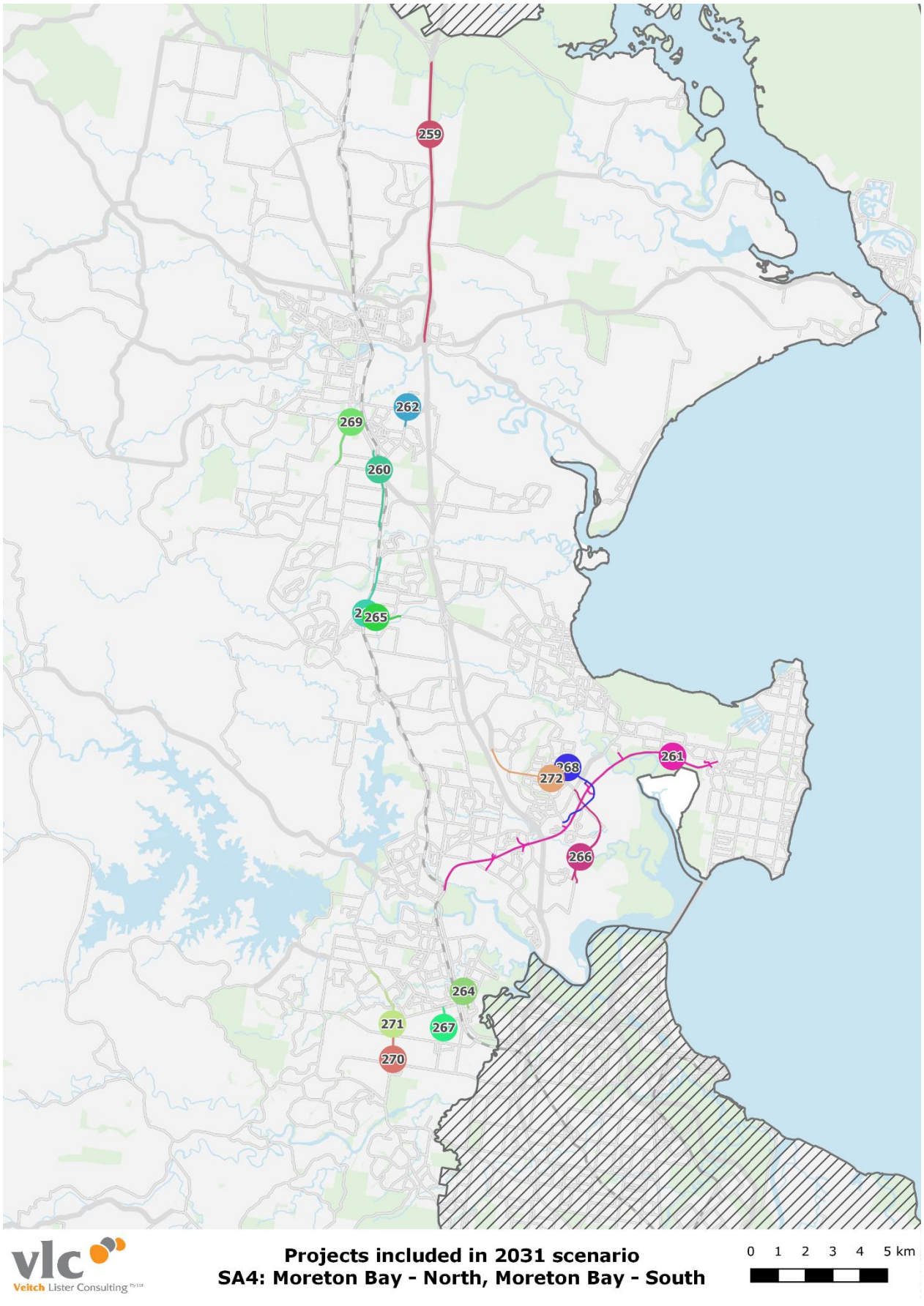
Appendix Figure A-3 – Projects included in the 2031 scenario SA4: Logan - Beaudesert



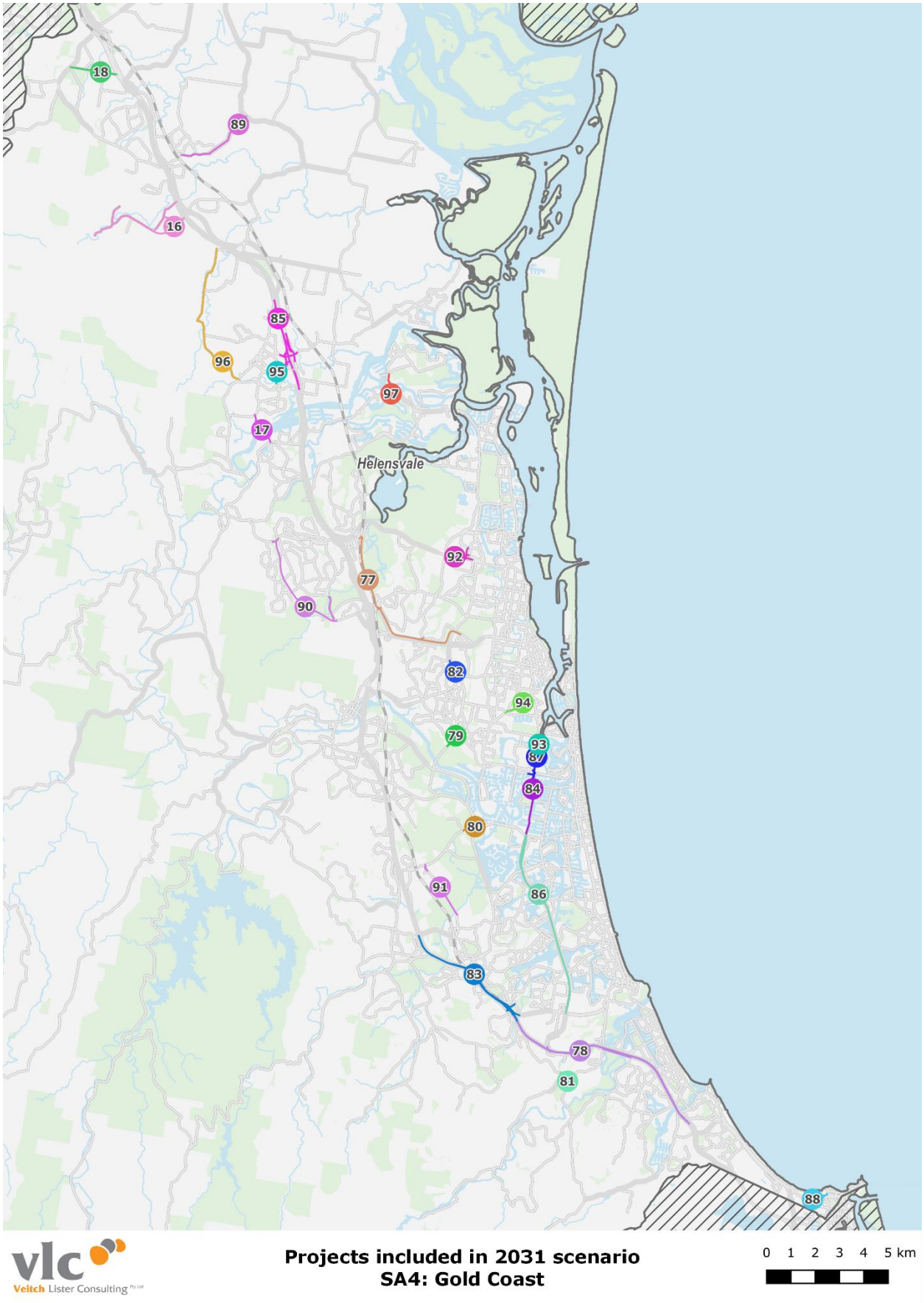
Appendix Figure A-4 – Projects included in the 2031 scenario SA4: Ipswich



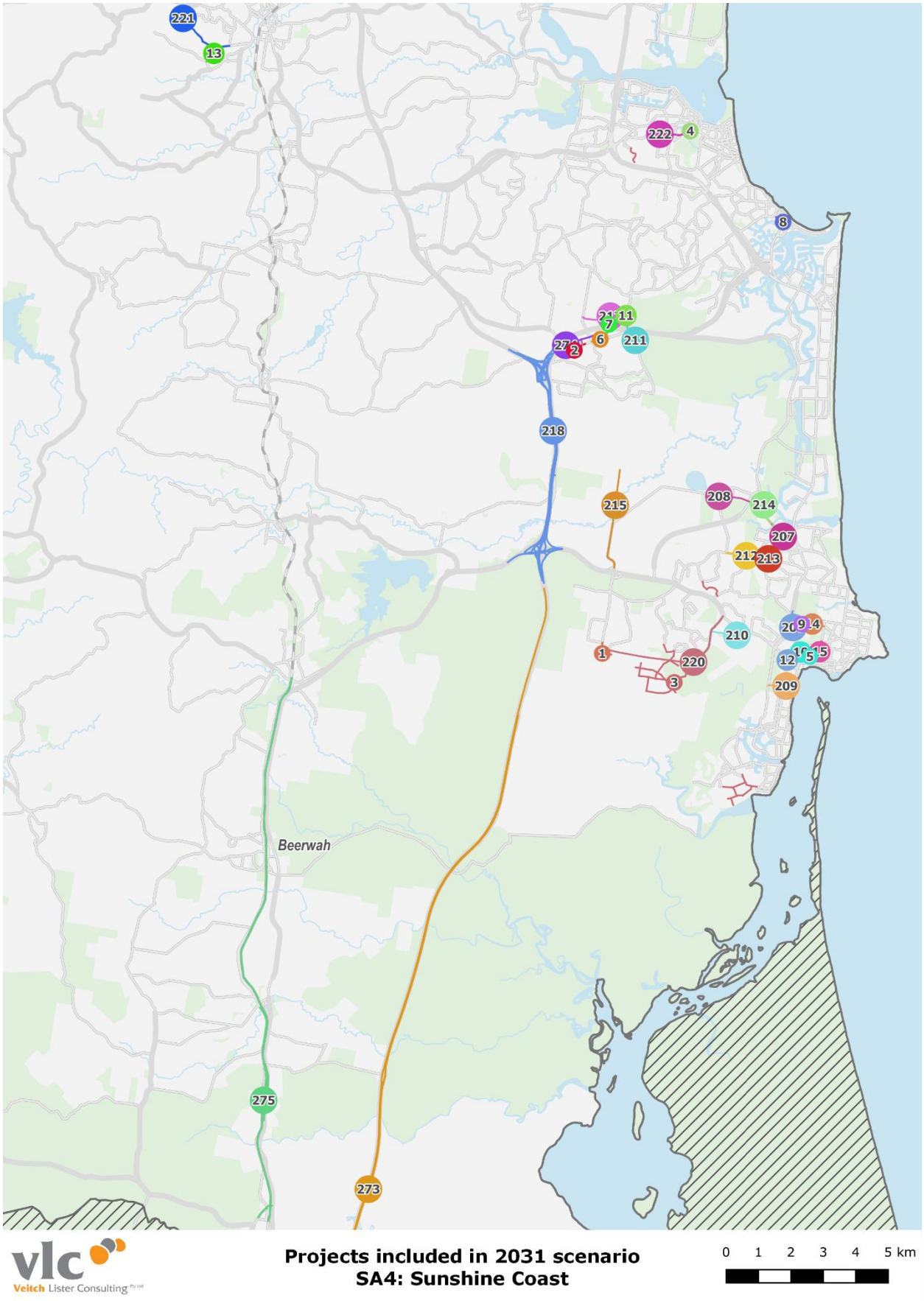
Appendix Figure A-5 – Projects included in the 2031 scenario SA4: Moreton Bay – North and Moreton Bay – South



Appendix Figure A-6 – Projects included in the 2031 scenario SA4: Gold Coast



Appendix Figure A-7 – Projects included in the 2031 scenario SA4: Sunshine Coast



Appendix Table A-1 – Projects included in modelling

Project no.	Name
1	Resource Road extension - Between Resource Road and Caloundra South. New route.
2	Sippy Downs Drive - Between University Way and Siena College, Sippy Downs 4 lanes.
3	Sunshine Coast local roads built by 2018.
4	Plaza Parade Stage 2B - Between Maud Canal and Mungar St. Upgrade to 4 lanes.
5	Oval Ave and Gosling St - Between Gosling St and Second Ave. Upgrade to 4 lanes.
6	Sippy Downs Drive - Between Stringybark road and Power Road, Sippy Downs. Upgrade to 4 lanes.
7	Power Road - Between Sippy Downs Drive and Goshawk Boulevard. New 2 lane route.
8	Brisbane-Walan-Stage 3 - Between Brunett St and Venning St (includes Naroo Ct to Muraban St and Muraban St to Brisbane Rd). Upgrade to 4 lanes.
9	Queens St Stage 3 - Between Nicklin Way (off ramp) and Bower St. Upgrade to 4 lanes.
10	Oval Ave and Gosling St - Between Second Ave and West Tce. Upgrade to 4 lanes.
11	Power Road - Between Goshwk Boulevard and Dixon Road. Upgrade to 4 lanes.
12	West Tce - Between Bowman Rd and Oval Ave. Upgrade to 4 lanes.
13	Burnside Blvd Stage 2 - Between Burnside Rd and Windsor Rd. New route. 2 lanes.
14	Queens St Stage 2 - Between Bower St and Ulm St. Upgrade to 4 lanes.
15	Ulm Street Stage 1 - Between Queen St and Bowman Rd. New route. 2 lanes.
16	Upper Ormeau Rd - Between Mirrambeena Dr interchange and Cliff Barrons Rd. 2 lanes.
17	Ghostgum Grove - Between Tamborine-Oxenford Rd and Brygon Creek Dr. 2 lanes.
18	Darlington Dr - Between Stanmore Rd and Elderslie Dr. 4 lanes.
19	Brisbane Metro. Expected new route in 2023.
20	Cross River Rail - Between Dutton Park rail station and Roma St rail station. Expected new route in 2023.
21	Inner City Bypass (ICB) Widening - Between Legacy Way and Bowen Bridge Rd. Upgrade to 8 lanes.
22	Pacific Motorway - Eight Mile Plains to Daisy Hill - Between Eight Mile Plains busway station and Daisy Hill. Upgrade.
23	South East Busway - School Rd to Springwood - Between School Rd and Springwood busway station. New route. 2 lanes.
24	Logan Enhancement Project - Between Mt Lindesay Hwy and Compton Rd, Wembley Rd. Upgrade to 6 lanes.
25	Kinross Road - Between Boundary Rd and 3rd new roundabout. Upgrade to 2 lanes.
26	Main Myrtletown Road, Bancroft Road - Between Eagle Farm Road and Brownlee Street. Upgrade to 2 lanes.
27	Klumpp Road - Between Pacific Motorway and Logan Road. Upgrade to 4 lanes.
28	Double Jump Road - Between Cleveland-Redland Bay Road and Heinemann Road. Upgrade to 2 lanes.
29	Beveridge Rd - Between Redland Bay Rd and Rachow St. Upgrade to 2 lanes.
30	Wynnum Road - Between Thynne Road and Cleveland Line Rail Track Underpass. Upgrade to 4 lanes.
31	Buckland Road Railway Overpass. Upgrade to 2 lanes.
32	Double Jump Rd - Between Heinemann Rd and Kingfisher Rd. 2 lanes.
33	Kingfisher Road, Springacre Road - Between Bunker Road and Boundary Road. Upgrade to 2 lanes.
34	Hemmant and Tingalpa Road, Fleming Road - Between Lytton Road and Wynnum Road.
35	Youngs Road - Between Kianawah Road and Hemmant and Tingalpa Road.

Project no.	Name
36	Gooderham Road, Ritchie Road, Sherbrook Road, Camden Road, Burman Road - Between Learoyd Road and Wadeville Street. Upgrade to 2 lanes.
37	New Road - Between Brookside Street Extension and Ritchie Road. New route. 4 lanes.
38	Farnell Street / Rainey Street / Sammells Drive - Between Rainey Street and Rode Road. Upgrade to 2 lanes.
39	Kingsmill Street - Between Hamilton Road and Kuran Street. Upgrade to 2 lanes.
40	Wynnum Road - Between Bulimba Creek and Gateway Motorway. Upgrade to 6 lanes.
41	Boundary Road Open Level Crossing - Between Rosedale Street and Babbidge Street. Upgrade to 4 lanes.
42	Abbotsford Road - Between Bimbil Street and Crosby Road/Sandgate Road/Frodsham Street. Upgrade to 4 lanes.
43	Sandgate Road - Between Albion Overpass and Abbotsford Road/Frodshame Street/Crosby Road. Upgrade to 2 lanes.
44	Wynnum Road - Between Rail Underpass and Creek Road. Upgrade to 6 lanes.
45	Wynnum Road - Between Creek Road and Bulimba Creek. Upgrade to 6 lanes.
46	Neville Bonner Bridge - Between South Bank and Queen's Wharf. New route.
47	Nudgee Road - Between Kingsford Smith Drive and East-West Arterial Road. Upgrade to 4 lanes.
48	Beams Road Open Level Crossing - Between Balcara Avenue and Carselgrove Avenue. Upgrade to 4 lanes.
49	Johnson Road - Between Stapylton Rd and Southlink St. 4 lanes.
50	Sandgate Road - Between Lot 1 RP131196 and Abbotsford Road. Upgrade to 4 lanes.
51	Pacific Motorway M1 Southbound Stage 1 Upgrades - Between Gateway Motorway and Springwood Road.
52	Stapylton Rd stage 1 - Between Wadeville St and Logan Mwy. 4 lanes.
53	Ney Road - Between Boundary Rd and Degen Rd. 4 lanes.
54	Jones Road - Between Augusta Parkway and Alice Street. Upgrade to 2 lanes.
55	Brennan Street - Between Redbank Plains Road and Jones Road. Upgrade to 2 lanes.
56	School Road - Between Redbank Plains Road and Redbank Plains Distributor. Upgrade to 4 lanes.
57	Keidges Road - Between Redbank Plains Road and Redbank Plains Distributor. Upgrade to 2 lanes.
58	Red Bank Plains Road - Between Collingwood Drive and Greenwood Village Road. Upgrade to 4 lanes.
59	Red Bank Plains Road - Between Greenwood Village Road and Cunningham Highway. Upgrade to 4 lanes.
60	Redbank Plains Rd - Between Kruger Pde and Jones Rd. Upgrade to 4 lanes.
61	Springfield-Greenbank Arterial - Between Springfield Town Centre D and Sinnathamby Bvd. Upgrade to 6 lanes.
62	Springfield-Greenbank Arterial - Between Sinnathamby Bvd and ICC Boundary. Upgrade to 4 lanes.
63	Springfield-Greenbank Arterial - Between Springfield Parkway and Springfield Town Centre D. Upgrade to 4 lanes.
64	Springfield-Greenbank Arterial - Between Springfield Town Centre D and Sinnathamby Bvd. Upgrade to 4 lanes.
65	Freeman Rd, Kelliher Rd - Between Boundary Rd and Blunder Rd. Upgrade to 4 lanes.
66	Ipswich Mwy Rocklea to Darra part B - Between Blunder Rd and Centenary Mwy. Upgrade to 6 lanes.
67	Boundary Rd - Between Kelliher Rd and Blunder Rd. Upgrade to 4 lanes.
68	Tile St - Between Boundary Rd and Clendon St. Upgrade to 4 lanes.
69	Inala Ave, King Ave, Learoyd Rd Stage 2 - Between Blunder Rd and King Ave. Upgrade to 4 lanes.
70	Progress Rd stage 5 - Between Ipswich Mwy and Boundary Rd. Upgrade to 6 lanes.

Project no.	Name
71	Pine Rd - Between Garden Rd and Archerfield Rd. Upgrade to 4 lanes.
72	Crossacres St - Between Blunder Rd and Rockfield Rd. Upgrade to 4 lanes.
73	Clendon St - Between Tile St and Considine St. Upgrade to 4 lanes.
74	Progress Rd Stage 4 - Between Boundary Rd and Clendon St. Upgrade to 4 lanes.
75	Crossacres St - Between Joseph Banks Ave and Rockfield Rd. Upgrade to 2 lanes.
76	Waterford Rd - Between Considine St and Woogaroo St. Upgrade to 2 lanes.
77	Gold Coast Light Rail stage 2 - Between Helensvale Station and Gold Coast University station.
78	Pacific Motorway - Varsity Lakes to Tugun - Between Varsity Lakes and Tugun.
79	Ashmore Avenue and Ross Street Intersection - Between Ross Street and Ross Street. Upgrade to 4 lanes.
80	Gooding Drive - Between Palm Meadows Drive and Nerang-Broadbeach Rd.
81	Old Coach Rd upgrade - Between Oyster Creek Dr and Tallebudgera Creek Rd. Upgrade to 2 lanes.
82	Labrador-Carrara Road (Olsen Avenue) - Between Crestwood Dr and Southport-Nerang Rd. Upgrade to 6 lanes.
83	Pacific Mwy - Between Mudgeeraba and Varsity Lakes. Upgrade to 6 lanes.
84	Southport-Burleigh Rd - Between Fremar St and Rudd St. Upgrade 6 lanes.
85	Coomera Interchange (Exit 54) Upgrade.
86	Southport-Burleigh Rd - Between Nerang-Broadbeach Rd and Reedy Creek Rd. 4 lanes.
87	Southport-Burleigh Rd - Between Vespa Crescent and Monaco Street. Upgrade to 6 lanes.
88	Coolangatta railway cutting connection - Between Miles St and Musgrave St. 2 lanes.
89	Eggersdorf Rd - Between Jacobs Ridge Rd and Norwell Rd.
90	Gaven Arterial - Between Binstead Way and Smith St. 2 lanes.
91	Ghilgai Rd extension - Between end of Ghilgai Rd and Laver Dr. 2 lanes.
92	Gateway Dr - Between end of Gateway Dr and Telford Pl. 2 lanes.
93	Bundall Rd service roads - Between Crombie Ave and Asmore Rd. 2 lanes.
94	Benowa Rd - Between Cotlew St and Drury Ave. 4 lanes.
95	Dine Ct bridge connection - Between end of Dine Ct and Andalusian Dr. 2 lanes.
96	Baileys Mountain Rd, Ruffles Rd, Hotham Creek Cr - Between Old Coach Rd and Rifle Range Rd. 2 lanes.
97	Santa Barbara Rd - Between Hope Island Rd and Caseys Rd. 4 lanes.
98	Hamilton St, Pitt St, Weinam St - Between Meissner St and Peel St. Upgrade to 4 lanes.
99	Wellington St - Between South St and Panorama Dr. Upgrade to 4 lanes.
100	Gardner Rd extension - Between Miles Platting Rd and Priestdale Rd. New route. 2 lanes.
101	Third Ave extension - Between Gilmore Rd and Wembley Rd. New route. 4 lanes.
102	Tondara Ln extension 2 - Between Rogers St and Ferry Rd. New route. 2 lanes.
103	Tondara Ln extension 1 - Between Victoria St and Kurilpa St. New route. 2 lanes.
104	Filmer St extension - Between end of Filmer St and Victoria St. New route. 2 lanes.
105	Duncan St extension 1 - Between Victoria St and north end of Duncan St. New route. 2 lanes.
106	Donkin St - Between Montague Rd and Buchanan St. Upgrade to 2 lanes.
107	Kurilpa St - Between Montague Rd and Riverside Dr. Upgrade to 2 lanes.

Project no.	Name
108	Tondara Ln - Between Montague Rd and Riverside Dr. Upgrade to 2 lanes.
109	Anthony St - Between Montague Rd and Buchanan St. Upgrade to 2 lanes.
110	Ferry Rd - Between Montague Rd and Riverside Dr. Upgrade to 2 lanes.
111	Musgrave St - Between Kurilpa St and Buchanan St. Upgrade to 2 lanes.
112	Duncan St. Upgrade to 2 lanes.
113	Buchanan St - Between Jane St and Donkin St. Upgrade to 2 lanes.
114	Beesley St - Between Montague Rd and Riverside Dr. Upgrade to 2 lanes.
115	Pidgeon Close - Between Beesley St and end of Pidgeon Close. Upgrade to 2 lanes.
116	Rogers St - Between Montague Rd and Riverside Dr. New route. 2 lanes.
117	Filmer St - Between Beesley St and Filmer St. Upgrade to 2 lanes.
118	Dianthus St - Between Basella St and New Cleveland Rd. Upgrade to 2 lanes.
119	Victoria St - Between Montague Rd and Duncan St (extension 1). Upgrade to 2 lanes.
120	School Rd - Between New Lindum Rd and Ropley Rd. Upgrade to 2 lanes.
121	Kianawah Rd - Between Wynnum Rd and Millenium Pl. New route. 2 lanes.
122	Arenga St - Between Basella St and Manly Rd. Upgrade to 2 lanes.
123	Basella St - Between Caladium St and Dianthus St. Upgrade to 2 lanes.
124	Jane St - Between Montague Rd and Riverside Dr. Upgrade to 2 lanes.
125	Kianawah Rd - Between Wondall Rd and Wynnum Rd. New route. 2 lanes.
126	Beenleigh Rd - Between Boundary Rd and Warrigal Rd. Upgrade to 6 lanes.
127	Bognor St - Between Wynnum Rd and Wondall Rd. Upgrade to 2 lanes.
128	Caladium St - Between New Cleveland Rd and Basella St. Upgrade to 2 lanes.
129	Ford Rd extension - Between Gardner Rd and Rochedale Rd. New route. 2 lanes.
130	Benhiam St - Between Riverina St and Beaudesert Rd. New route. 4 lanes.
131	Formby St - Between Algester Rd and Benhiam St. Upgrade to 2 lanes.
132	Benhiam St - Between Ormskirk St and Hamish St. Upgrade to 4 lanes.
133	Benhiam St - Between Nottingham Rd and Formby St. Upgrade to 4 lanes.
134	Benhiam St - Between Formby St and Ormskirk St. Upgrade to 4 lanes.
135	Ormskirk St - Between Algester Rd and Benhiam St. Upgrade to 4 lanes.
136	Ormskirk St - Between Hamish St and Benhiam St. New route. 2 lanes.
137	Rickertt Rd - Between Green Camp Rd and Thorneside Rd. Upgrade to 4 lanes.
138	Rode Rd - Between Beckett Rd and Gympie Rd. Upgrade to 4 lanes.
139	Benhiam St - Between Benhiam St (near Riverina St) and Highlands Dr. New route. 2 lanes.
140	Kingsford Smith Drive - Between Riverview Tce and Seymour Rd. Upgrade to 6 lanes.
141	Kingsford Smith Drive - Between Seymour Rd and Theodore Rd. Upgrade to 6 lanes.
142	Prebble St - Between Gardner Rd and Gateway Mwy. Upgrade to 2 lanes.
143	Gordon Rd, Government Rd, Giles Rd - Between Cleveland-Redland Bay Rd and Moores Rd. Upgrade to 4 lanes.
144	School of Arts Rd - Between German Church Rd and Queen St. Upgrade to 4 lanes.

Project no.	Name
145	Ipswich Mwy Rocklea to Darra part A - Between Blunder Rd and Granard Rd. Upgrade to 6 lanes.
146	Woodlands Dr - Between Mount Cotton Rd and Taylor Rd. Upgrade to 4 lanes.
147	German Church Rd - Between School of Arts Rd and Gordon Rd. Upgrade to 4 lanes.
148	School of Arts Rd, Collins St - Between Queen St and Sapium Rd. Upgrade to 4 lanes.
149	Serpentine Creek Rd - Between Cleveland-Redland Bay Rd and Sapium Rd. Upgrade to 4 lanes.
150	Gateway Mwy - Between Nudgee Rd and Deagon Deviation. Upgrade to 6 lanes.
151	Grieve Rd. Upgrade to 4 lanes.
152	Pandorea St - Between Manettia St and Wynnum Rd. Upgrade to 2 lanes.
153	Newnham Rd - Between Creek Rd and Logan Rd. Upgrade to 4 lanes.
154	Pandorea St - Between School Rd and Manettia St. Upgrade to 2 lanes.
155	Paradise Rd - Between south of Beaudesert Rd and near Kulcha St. Upgrade to
156	Grieve Rd. Upgrade to 4 lanes.
157	Ford Rd extension - Between Miles Platting Rd and School Rd extension. New route. 2 lanes.
158	Ford Rd extension - Between Rochedale Rd and Grieve Rd.
159	Coonan St - Between Westminster St and Radnor St. Upgrade to 4 lanes.
160	Prebble St extension - Between Gardner Rd and Rochedale Rd. New route. 2 lanes.
161	Gardner Rd extension - Between Priestdale Rd and School Rd. New route.
162	Paradise Rd - Between Johnson Rd and Radius Dr.
163	Ipswich Rd - Between O'Keefe St and Keats St. Upgrade to 6 lanes.
164	Oxley Rd - Between Wharf St and Sherwood Rd. Upgrade to 4 lanes.
165	Oxley Rd - Between Sherwood Rd and Ipswich Mwy. Upgrade to 4 lanes.
166	Coonan St - Between Moggill Rd and Westminster St. Upgrade to 4 lanes.
167	Kingsford Smith Dr stage 3 - Between Riverview Tce and Breakfast Creek Rd. Upgrade to 6 lanes.
168	Beams Rd Stage 4 - Between Bridgeman Rd and Gympie Rd. Upgrade to 4 lanes.
169	Stanley St - Cavendish Rd stage 4 - Between Stanley St and Old Cleveland Rd. Upgrade to 6 lanes.
170	Hoyland St - Between Gympie Arterial Rd and Norris Rd. Upgrade to 4 lanes.
171	Beams Rd Stage 1 - Between Gympie Rd and Balcara Ave. Upgrade to 4 lanes.
172	Beenleigh Rd - Between Warrigal Rd and Saint Andrews Dr, Stiller Dr. Upgrade to 4 lanes.
173	Beenleigh Rd - Between Saint Andrews Dr and Besline St. Upgrade to 4 lanes.
174	Finney Rd - Between Moggill Rd and Woodville St. Upgrade to 2 lanes.
175	School Rd extension - Between Miles Platting Rd and Rochedale Rd. Upgrade to 2 lanes.
176	Depot Rd - Between Quinlan St and Braun St. Upgrade to 4 lanes.
177	Beams Rd stage 2 - Between Carselgrove Ave and Handford Rd. Upgrade to 4 lanes.
178	Lutwyche Rd - Between Enoggera Creek and Gympie Rd. Upgrade to 6 lanes.
179	Rode Rd - Between Gympie Rd and Bilsen Rd. Upgrade to 4 lanes.
180	Mount Gravatt Capalaba Rd - Between Moreton Bay Rd and Mount Cotton Rd. Upgrade to 4 lanes.
181	Belmont Rd - Between Manly Rd and Meadowlands Rd. Upgrade to 4 lanes.

Project no.	Name
182	Inala Ave, King Ave, Learoyd Rd Stage 4 - Between Sherbrooke Rd and Watson Rd. Upgrade to 4 lanes.
183	Inala Ave, King Ave, Learoyd Rd Stage 3 - Between Inala Ave and Sherbrooke Rd. Upgrade to 4 lanes.
184	Kianawah Rd - Between Crawford Rd and Wynnum Rd. New route. 2 lanes.
185	Tilley Rd extension - Between New Cleveland Rd and Manly Rd. New route. 2 lanes.
186	Priestdale Rd - Between School Rd and Rochedale Rd. Upgrade to 4 lanes.
187	Wynnum Rd, Manly Rd interim upgrade - Between Wynnum Rd and New Cleveland Rd. Upgrade to 6 lanes.
188	Kingsford Smith Dr - Between Sugarmill Rd and Eagle Farm Rd. Upgrade to 6 lanes.
189	School Rd - Between Miles Platting Rd and Underwood Rd. Upgrade to 4 lanes.
190	Kingsford Smith Dr - Between French St and Sugarmill Rd. Upgrade to 6 lanes.
191	Shafston Avenue - Lytton Road - Wynnum Road Stage 3 - Balmoral Street - Between Hawthorn Rd and Riding Rd. Upgrade to 6 lanes.
192	Shafston Avenue - Lytton Road - Wynnum Road Stage 2 - Balmoral Street - Between Overend St and Riding Rd. Upgrade to 6 lanes.
193	Shafston Avenue - Lytton Road - Wynnum Road Stage 4 - Between Overend St and Laidlaw Pde. Upgrade to 6 lanes.
194	Toombul Rd - Between Nudgee Rd and Melton Rd. Upgrade to 6 lanes.
195	Creek Rd - Between Lytton Rd and Cavendish Rd. Upgrade to 6 lanes.
196	Telegraph Rd - Between Norris Rd and Mustang St. Upgrade to 4 lanes.
197	Logan Rd - Between Cornwall St and Kessels Rd. Upgrade to 6 lanes.
198	New Cleveland Rd - Between Green Camp Rd and Old Cleveland Rd. Upgrade to 4 lanes.
199	Beams Rd - Between Handford Rd and Sandgate Rd. Upgrade to 4 lanes.
200	Stanley St - Cavendish Rd stage 3 - Between Caswell St and Cavendish Rd. Upgrade to 6 lanes.
201	Stanley St - Cavendish Rd stage 2 - Between Wellington Rd and Caswell St. Upgrade to 6 lanes.
202	Telegraph Rd - Between Quinlan St and Mustang St. Upgrade to 4 lanes.
203	Panorama Dr - Between Boundary Rd and Wellington St. Upgrade to 4 lanes.
204	Linkfield Rd - Between Gympie Arterial Rd and Lacey Rd. Upgrade to 4 lanes.
205	New road - Between Learoyd Rd and Delathin Rd. New route. 2 lanes.
206	Nicklin Way. New route. 1 lane.
207	Creekside Blvd - Stage 4. Upgrade to 4 lanes.
208	MMTC service road - Between Meridan Way and Creekside Interchange. New route. 2 lanes.
209	Burke St - Between Blaxland and Pelican Water Blvd. New route. 2 lanes.
210	Bunnings Link - Between Caloundra Rd and Bellvista BVD. Upgrade to 2 lanes.
211	Claymore Rd - Between University Way and Dixon Rd. Upgrade to 4 lanes.
212	Parkland Blvd - Stage1 - Between Mridan Way and Sunset Dr. Upgrade to 4 lanes.
213	Parkland Blvd - Stage2 - Between Saffron Dr and Sunset Dr. Upgrade to 4 lanes.
214	Creekside Blvd - Stage 3 - Between Sycamore St and Currimundi Creek. Upgrade to 4 lanes.
215	Palmview Southern Link - Between Caloundra and Palmview southern boundary. Upgrade to 2 lanes.
216	Creekside Blvd - Stage 2 - Between Erang St and Currimundi Creek. Upgrade to 4 lanes.
217	Goshawk Drive - Between Stringybark Rd and Power Rd. New route. 2 lanes.

Project no.	Name
218	Bruce Hwy upgrades Caloundra Rd to Sunshine Mwy - Between Caloundra Rd and Sunshine Mwy.
219	Bruce Hwy upgrades Cooroy to Curra section A - Between Cooroy southern interchange and Sankeys Rd.
220	Bellvista Bvd - Between Caloundra Rd and East West road (Caloundra South). 4 lanes.
221	Windsor Rd Stage 1 - Between Perwillowen Rd and Mapleton Rd. 2 lanes.
222	Plaza Pde Stage 1 and 2A - Between Maroochy Bvd and Maud Canal Mungar St. Upgrade to 4 lanes.
223	Road 14 (Ripley) - Between Point (L) and point (O). New route.
224	Englefield Road - Between Appoline Street and Oxley Station Road. Upgrade to 2 lanes.
225	Cunningham Highway - Yamanto interchange to Ebenezer Creek - Between Yamanto and Ebenezer. New route.
226	Westcombe Street - Between Sumners Road and Ashridge Road. Upgrade to 2 lanes.
227	Brookside Street - Between Blunder Road and End of Street. Upgrade to 4 lanes.
228	Sumners Road - Between Monier Road and Westcombe Street. Upgrade to 2 lanes.
229	Red Bank Plains Road - Between Jones Road and School Road. 4 lanes.
230	Collingwood Drive - Between Goss Drive and Eagle Street. 4 lanes.
231	Swanbank Enterprise Park Est-Wst Rd - Between SEP Nth-Sth Rd and SEP Business Park Access Rd. New route. 2 lanes.
232	Mary Street - Between William Street and Cunningham Highway. 4 lanes.
233	Old Toowoomba Road - Between Ernest Street and Toongarra Road. 4 lanes.
234	Swanbank Enterprise Park North-South Rd - Between Redbank Plains Rd and Swanbank Rd. New route. 2 lanes.
235	Swanbank Enterprise Park North-South Rd - Between Centenary Hwy and Swanbank Rd. New route. 2 lanes.
236	Lawrence Street - Norman Street - Between Downs Street and Jacaranda Street. New route. 4 lanes.
237	Hamilton Street Extension - Between Dudleigh Street and Brisbane Road. New route. 4 lanes.
238	Olga Street - Between East Street and Bremer Street. Upgrade to 4 lanes.
239	Burnett Street - Between Darling Street East and Brisbane Street. Upgrade to 4 lanes.
240	Marsden Parade - Gordon Street - Between Bremer Street and Roderick Street. Upgrade to 4 lanes.
241	Bremer Street - Between Marsden Parade and Olga Street. Upgrade to 4 lanes.
242	Pine Street - Between Delacaey Street and The Terrace. Upgrade to 4 lanes.
243	Roderick Street - Between Gordon Street and Burnett Street. Upgrade to 4 lanes.
244	Pine Mountain Road - Between Warrego Highway and Baileys Road. Upgrade to 2 lanes.
245	Ripley Road - Between Edwards Street and Cunningham Highway. Upgrade to 4 lanes.
246	Junction Road - Between Albatross Avenue and Arthur Summervilles Road. Upgrade to 4 lanes.
247	Bailey Road Extension - Between Glenross Drive and Pine Mountain Road. New route. 2 lanes.
248	Toongarra Road - Between Old Toowoomba Road and Samford Street. Upgrade to 4 lanes.
249	Waterworks Road - Between Holdsworth Road and Pine Mountain Road. Upgrade to 4 lanes.
250	Marsden Parade Realignment - Between Rail Line and Brisbane Street. Upgrade to 2 lanes.
251	Kruger Parade - Between Redbank Plains Road and Namatjira Drive. Upgrade to 4 lanes.
252	Mary Street - Between Thomas Street and William Street. Upgrade to 4 lanes.
253	Eagle Street - Between Collingwood Drive and Kruger Parade. New route. 2 lanes.

Project no.	Name
254	Pottery Road / Jacob Street / Old Ipswic - Between Aberdare Street and Child Street. Upgrade to 2 lanes.
255	Third Ave - Between Curtisii Crt and Fourth Ave.
256	Waterford - Tamborine Road - Between 0km and 22km. Upgrade to 2 or 4 lanes.
257	Beaudesert Town Centre Bypass (Stage 1) - Between Mount Lindesay Hwy and Beaudesert-Boonah Rd. New route. 2 lanes.
258	Chambers Flat Rd - Between Entrance St and Park Ridge Rd. Upgrade to 4 lanes.
259	Bruce Hwy upgrades Pine River to Caloundra 1 - Between Caboolture and Steve Irwin Way.
260	Lindsay Road - Between Morayfield Rd and O'Brien Rd. Upgrade to 2 lanes.
261	Redcliffe Railway Line (Moreton Bay Rail Link) - Between Petrie railway station and Kippa-Ring railway station. New route.
262	Graham Rd - Between Lomandra Drive and Buchanan Rd. Upgrade to 4 lanes.
263	Burpengary Rd & Station Rd - Between O'Brien Rd and Rosehill Dr. Upgrade to 2 lanes.
264	Eastern Collector Road - Between Flynn Ln and Learmonth St. Upgrade to 2 lanes.
265	Burpengary Rd / New Settlement Rd - Between Intersection and Rail bridge. Upgrade to 2 lanes.
266	North-South Urban Arterial - Between Brays Rd and Anzac Ave. 2 lanes.
267	Leitchs Road - Between Kremzow Rd and Stanley St. Upgrade to 2 lanes.
268	Capestone Boulevard - Between Anzac Avenue and Kinsellas Road. New route.
269	Oakey Flat Rd - Between Walkers Rd and Clark Rd. Upgrade to 4 lanes.
270	Old North Rd - Between South Pine Rd and Stanley St. Upgrade to 4 lanes.
271	Old North Rd - Between Stanley St and Samsonvale Rd. Upgrade to 4 lanes.
272	Diamond Jubilee Way - Between Bounty Bvd and Discovery Dr. New route. 4 lanes.
273	Bruce Hwy upgrades Pine River to Caloundra 2 - Between Steve Irwin Way and Caloundra Rd Interchange.
274	Sippy Downs Town Centre new link - Between University Way and Sippy Downs Dr. New route. 2 lanes.
275	Beerburrum to Nambour Rail Upgrade Project - Between Beerburrum and Nambour.

Appendix B: Public Transport Network Assumptions

This section provides a high level overview of the public transport networks used in the modelling.

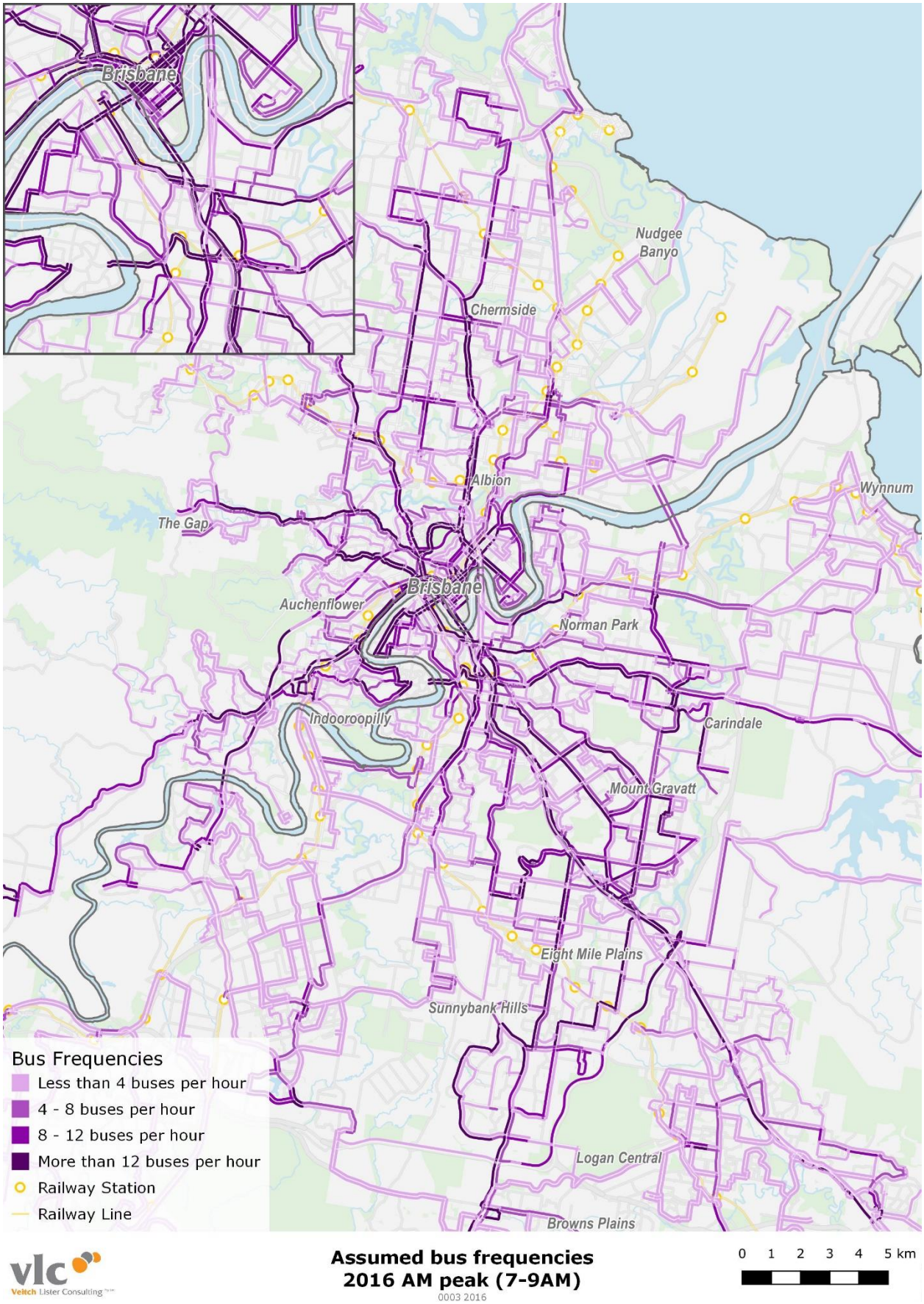
Appendix Figure B-1 through to Appendix Figure B-7 illustrate the frequencies assumed on SEQ's bus network.

Appendix Figure B-9 through to Appendix Figure B-12 illustrate the frequencies assumed on SEQ's rail network.

Appendix Figure B-13 through to Appendix Figure B-16 illustrate the frequencies assumed on the Gold Coast's light rail service.

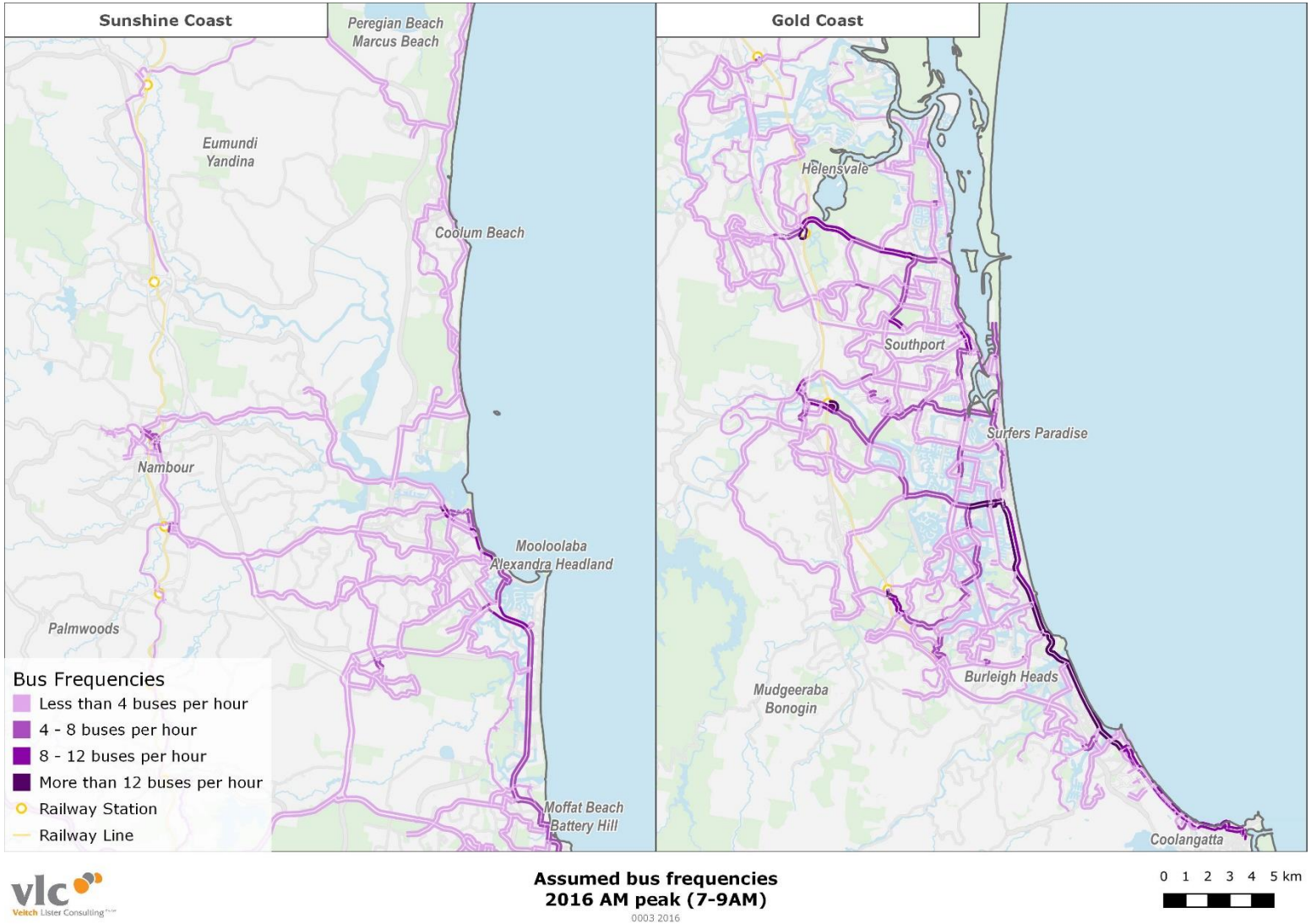
The 2016 routes and frequencies used in modelling were obtained from Translink. Details of how the 2031 network were developed can be found in Model Assumptions.

Appendix Figure B-1 – Brisbane GCCSA assumed bus frequencies - 2016 AM peak (7-9AM)



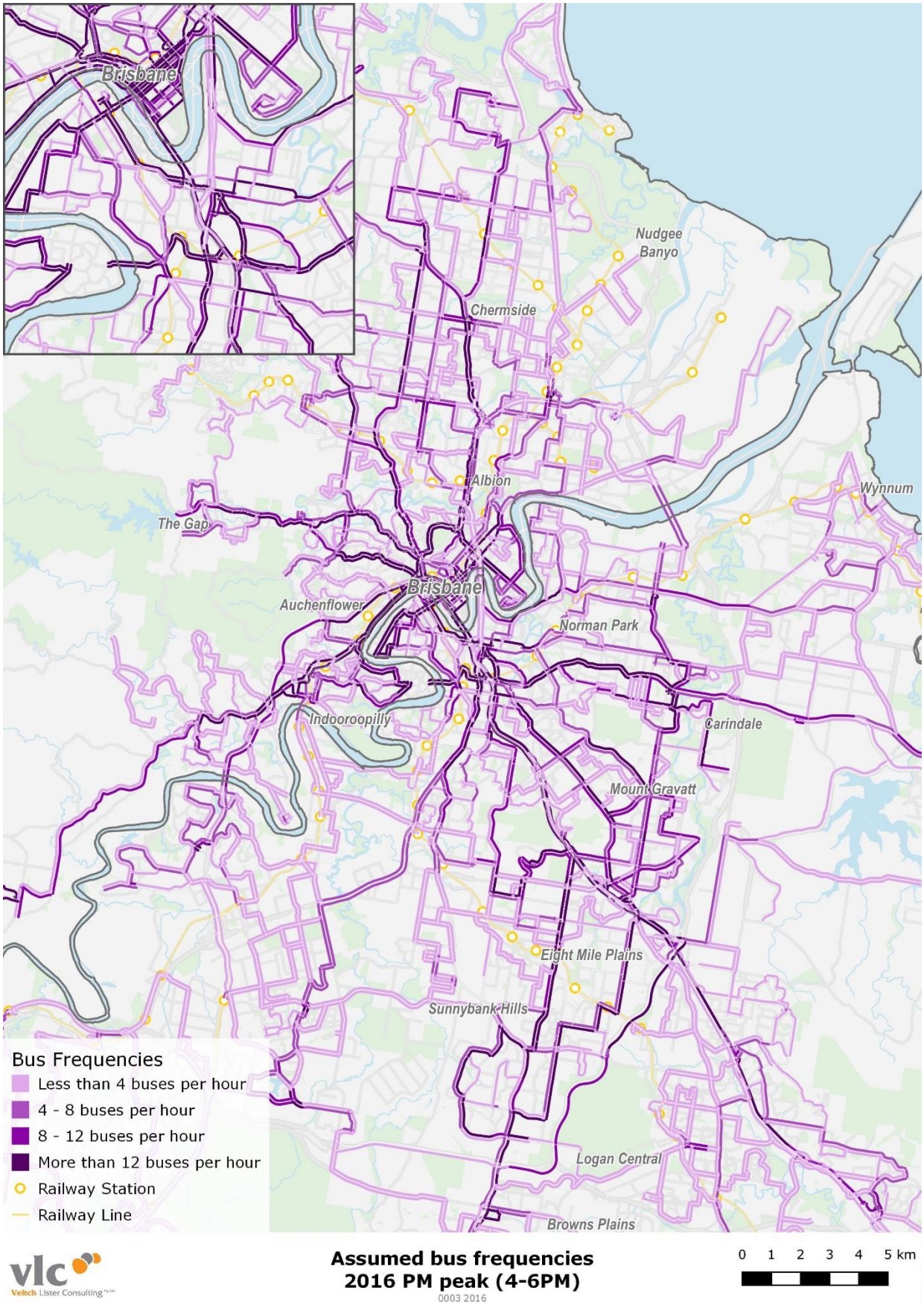
Source: Translink

Appendix Figure B-2 – Sunshine Coast and Gold Coast assumed bus frequencies - 2016 AM peak (7-9AM)



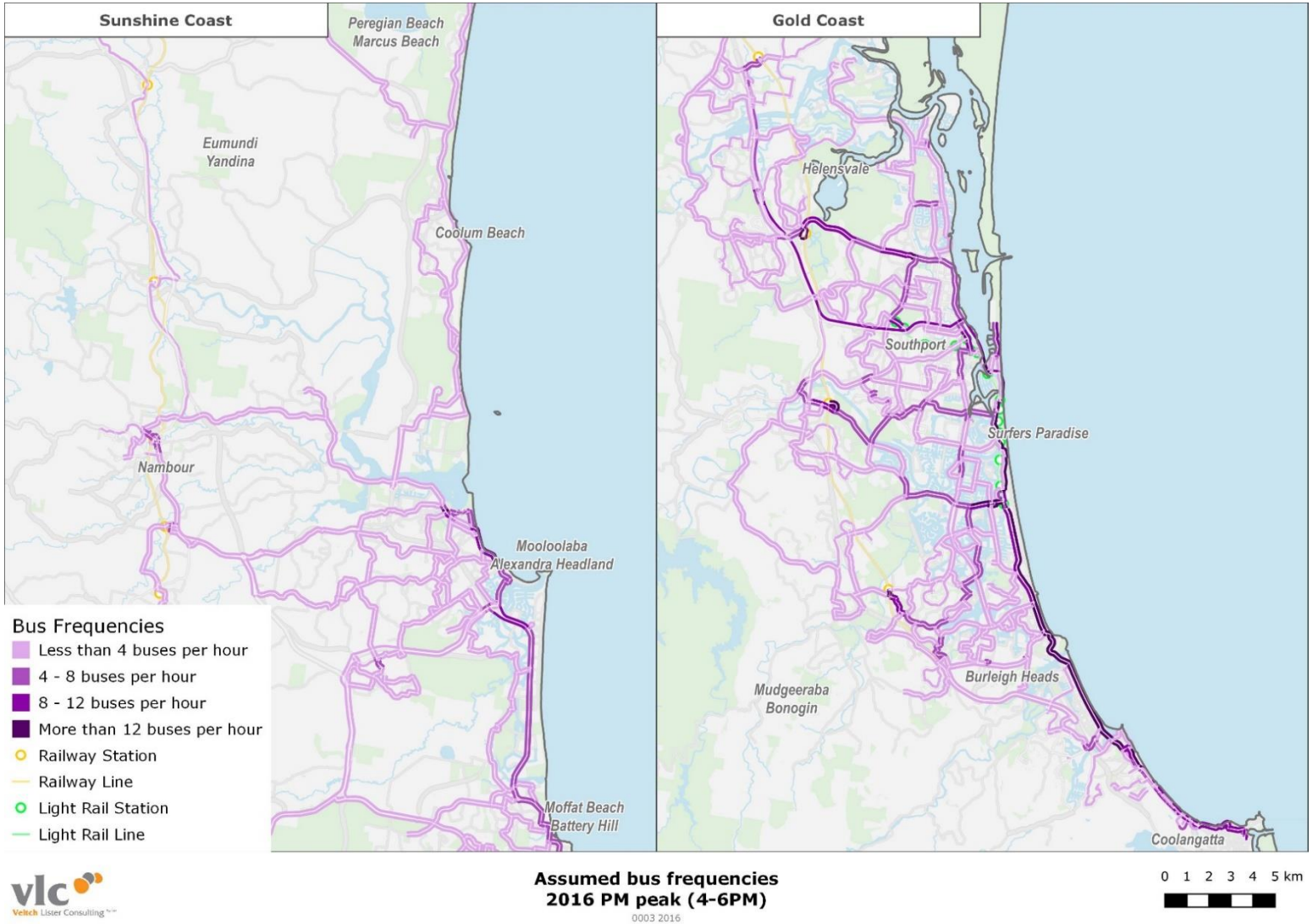
Source: Translink

Appendix Figure B-3 – Brisbane GCCSA assumed bus frequencies - 2016 PM peak (4-6PM)



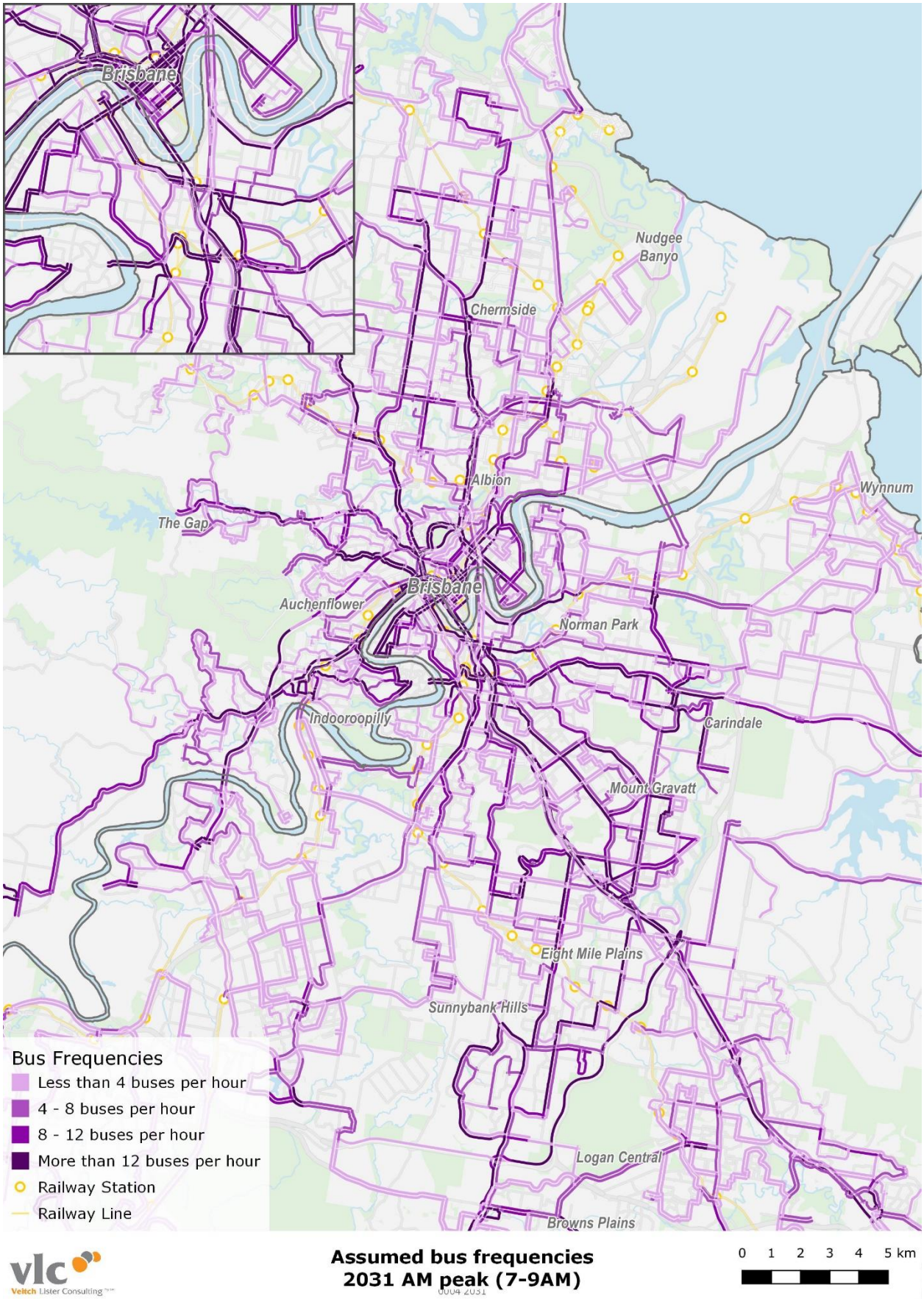
Source: Translink

Appendix Figure B-4 – Sunshine Coast and Gold Coast assumed bus frequencies - 2016 PM peak (4-6PM)

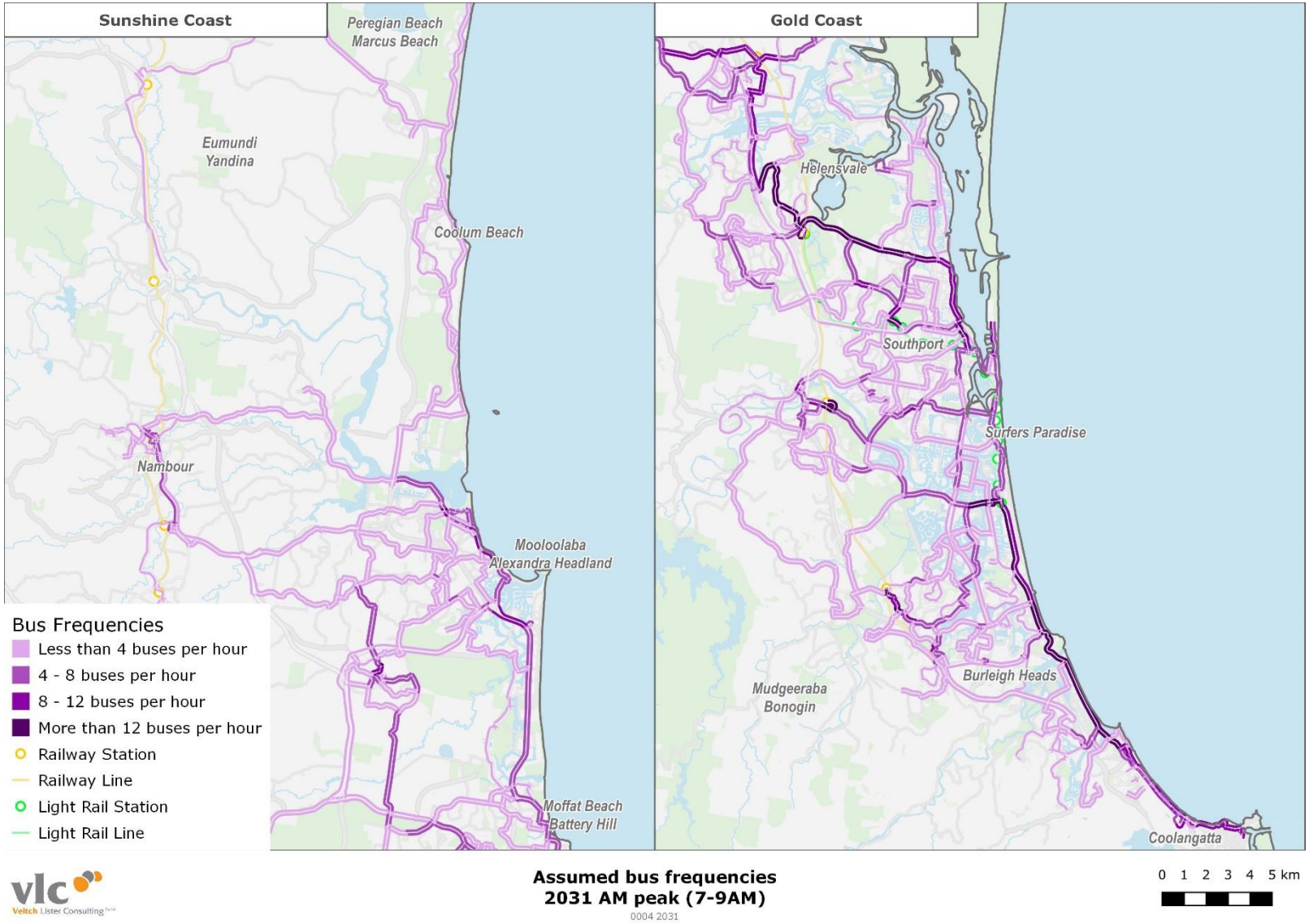


Source: Translink

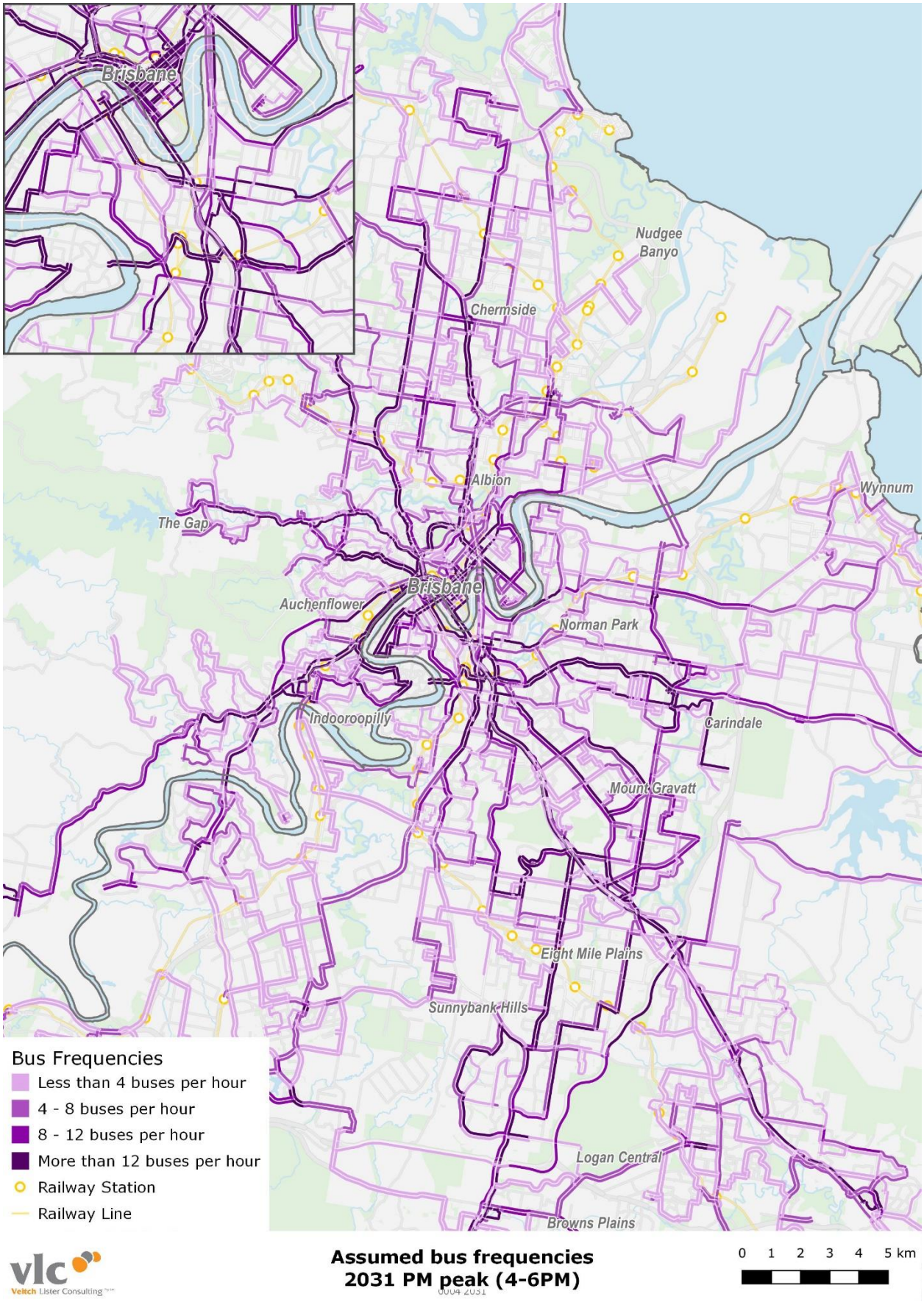
Appendix Figure B-5 – Brisbane GCCSA, assumed bus frequencies - 2031 AM peak (7-9AM)



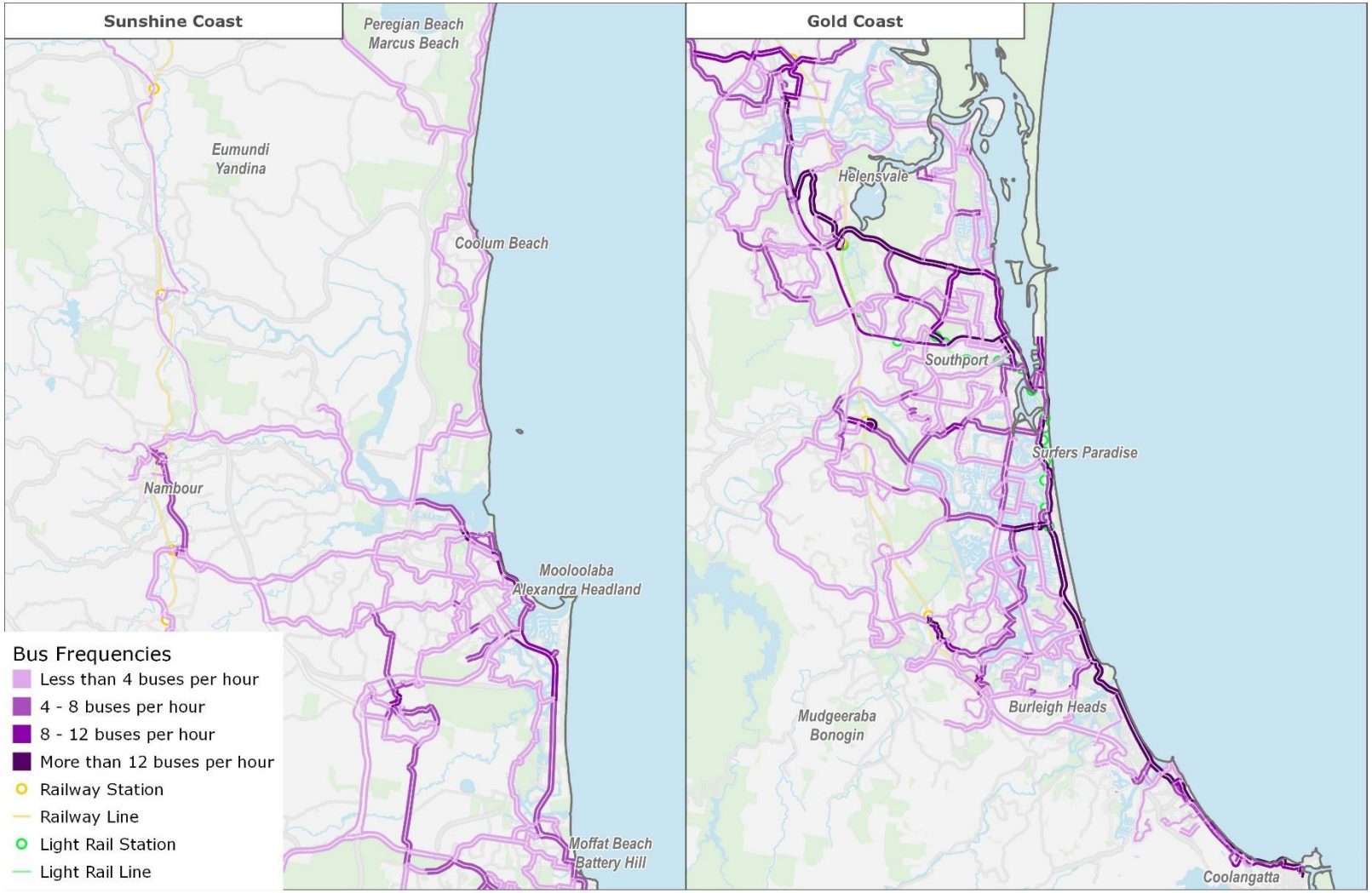
Appendix Figure B-6 – Sunshine Coast and Gold Coast, assumed bus frequencies - 2031 AM peak (7-9AM)



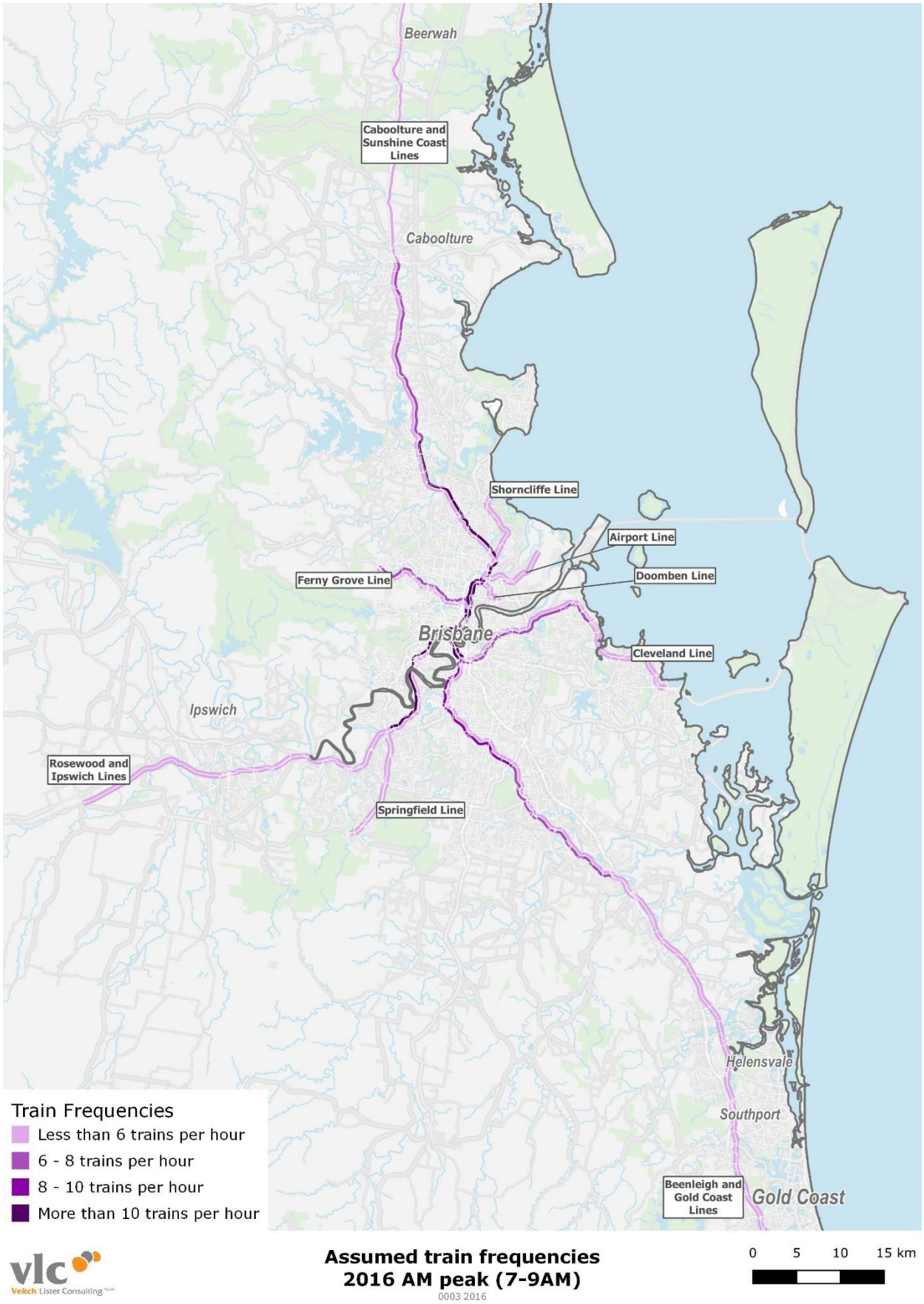
Appendix Figure B-7 – Brisbane GCCSA, assumed bus frequencies - 2031 PM peak (4-6PM)



Appendix Figure B-8 – Sunshine Coast and Gold Coast, assumed bus frequencies - 2031 PM peak (4-6PM)

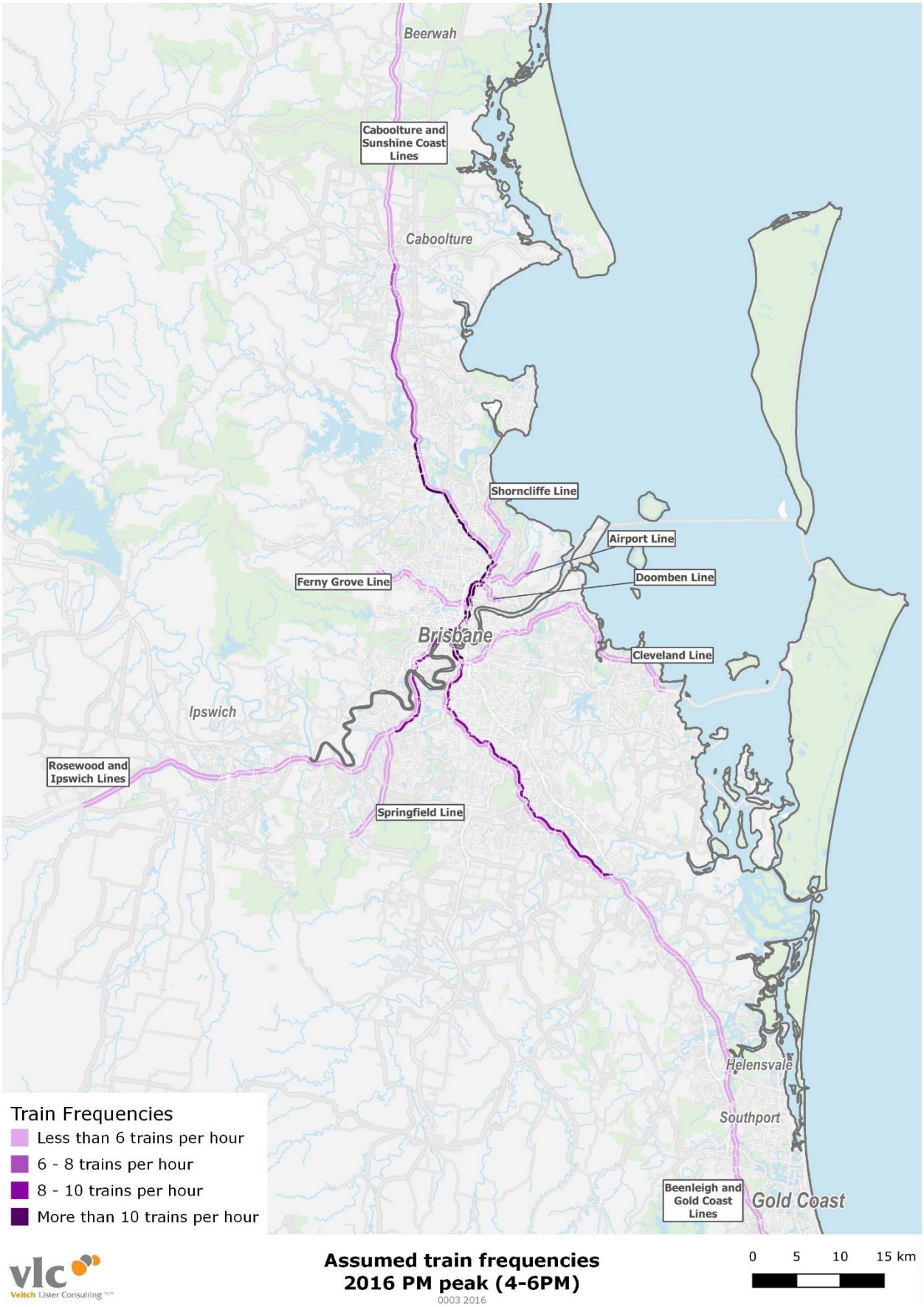


Appendix Figure B-9 – SEQ assumed train frequencies - 2016 AM peak (7-9AM)



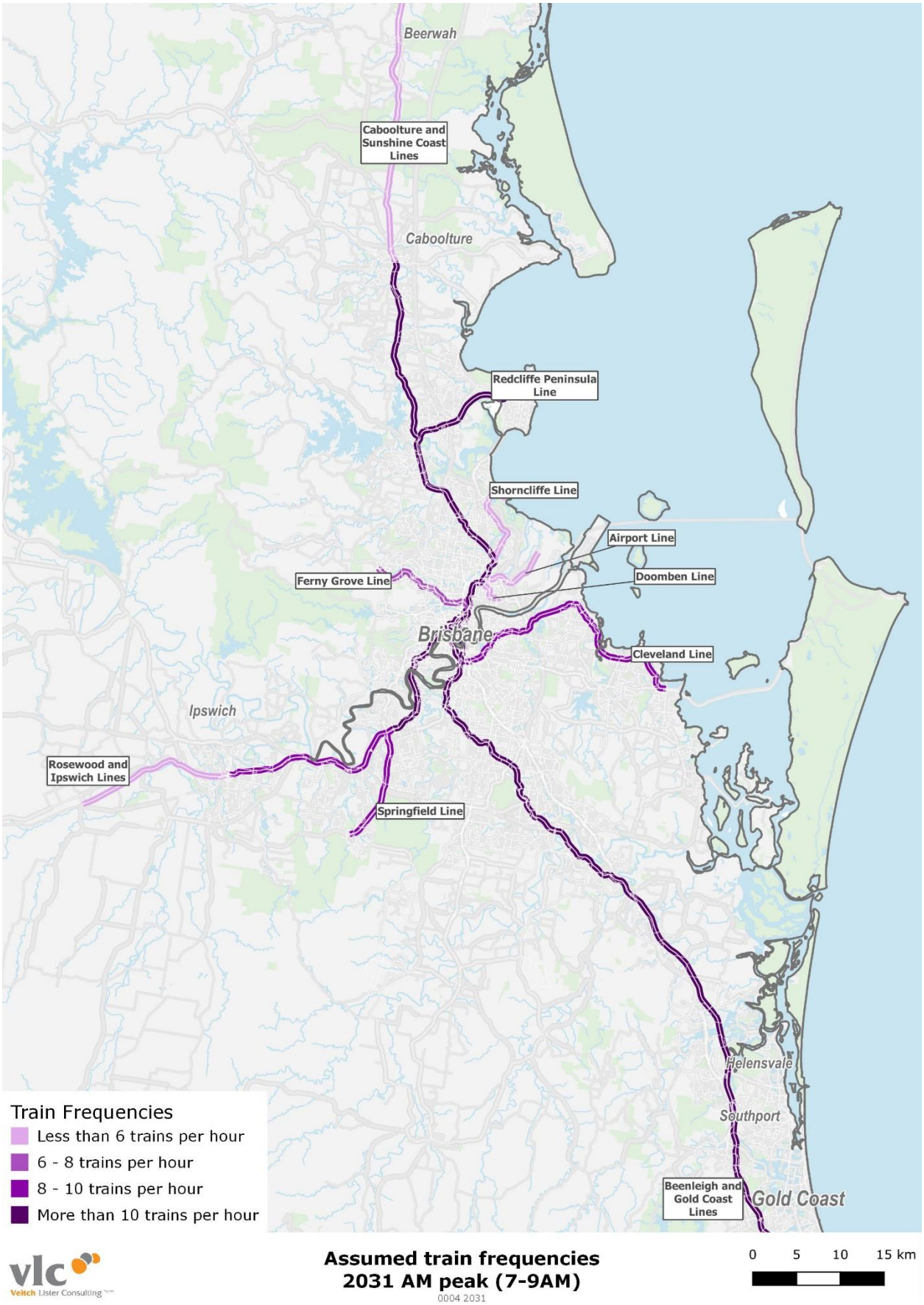
Source: Translink

Appendix Figure B-10 – SEQ assumed train frequencies - 2016 PM peak (4-6PM)

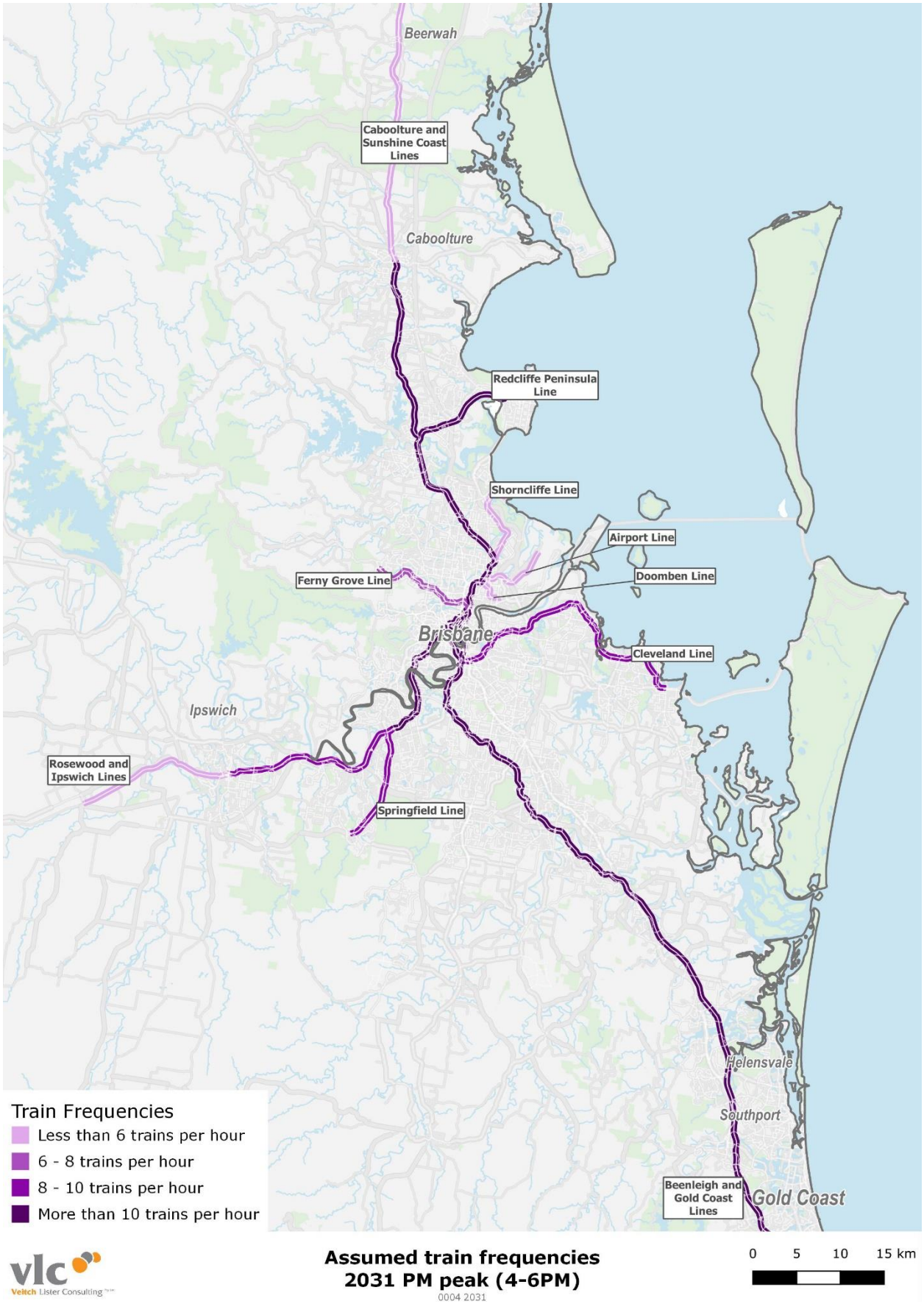


Source: Translink

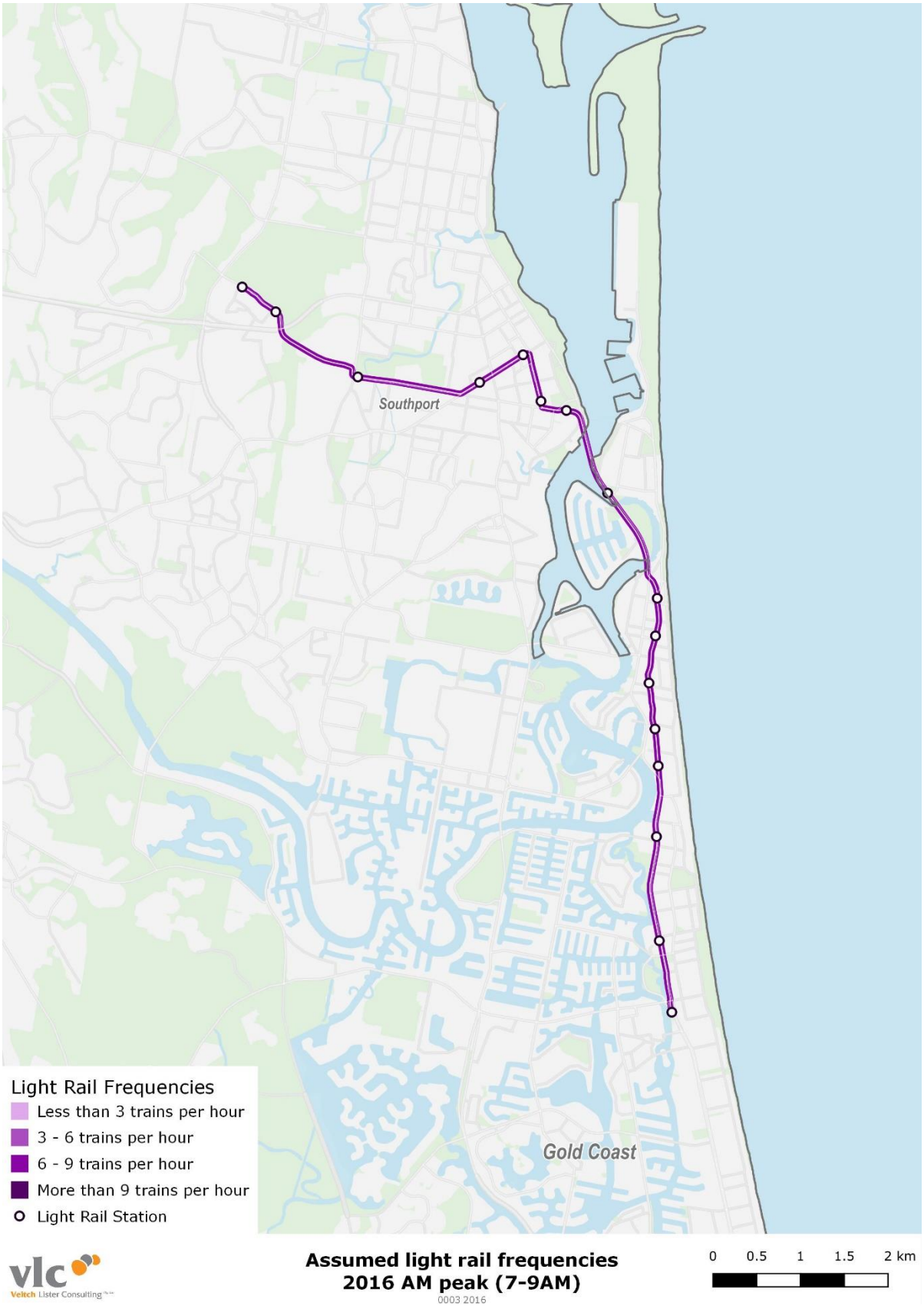
Appendix Figure B-11 – SEQ assumed train frequencies - 2031 AM peak (7-9AM)



Appendix Figure B-12 – SEQ assumed train frequencies - 2031 PM peak (4-6PM)

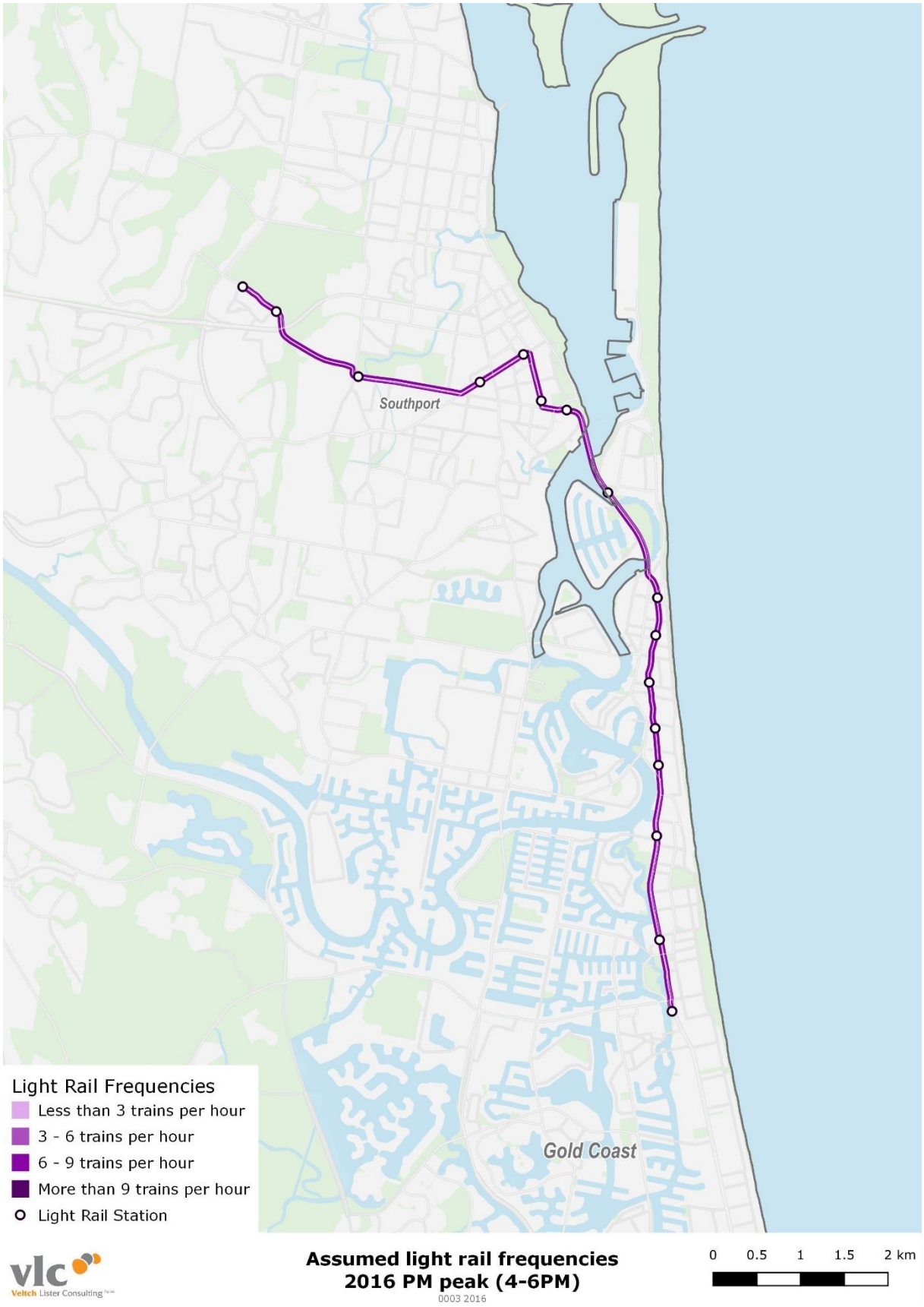


Appendix Figure B-13 – Gold Coast assumed light rail frequencies - 2016 AM peak (7-9AM)



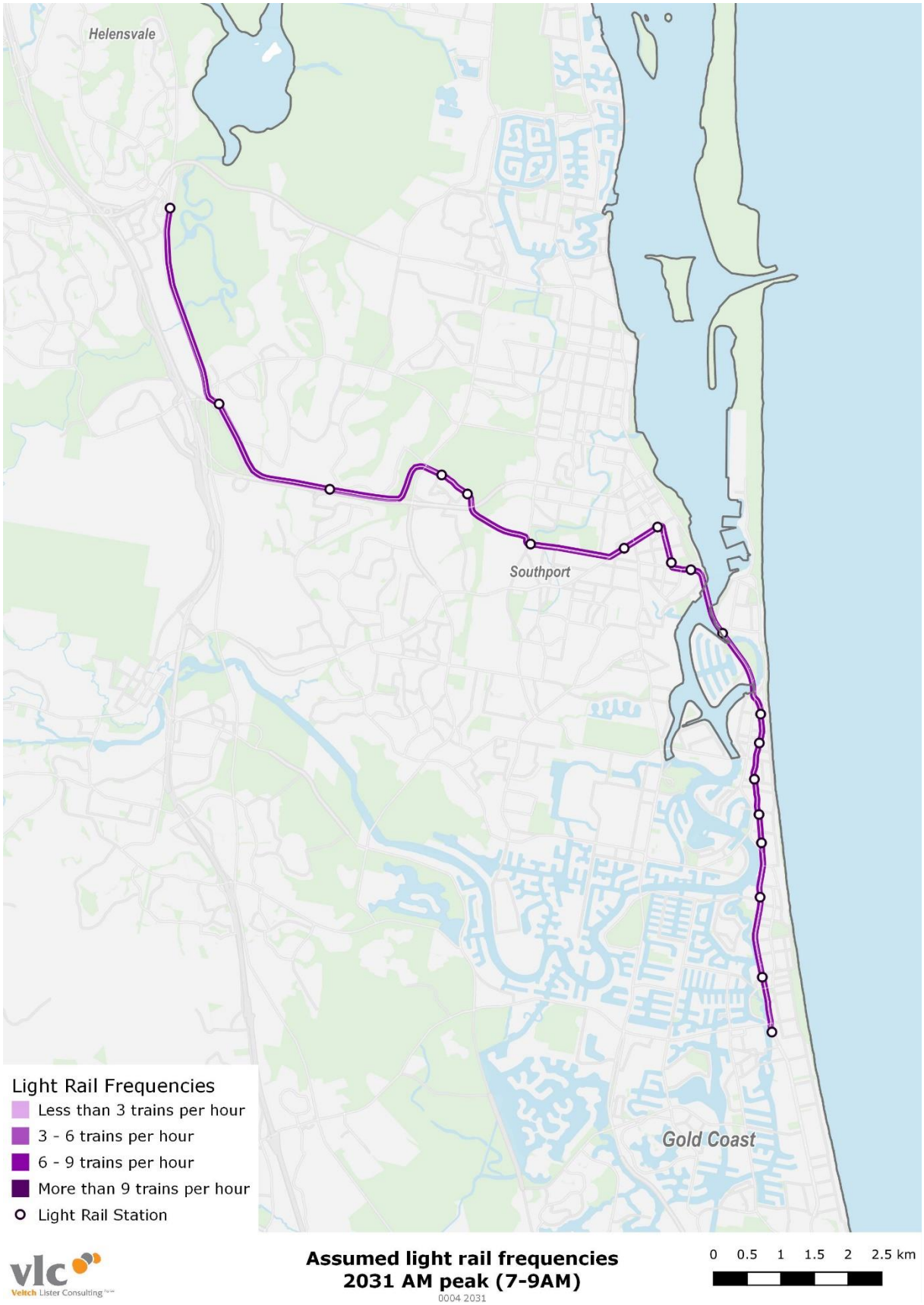
Source: Translink

Appendix Figure B-14 – Gold Coast assumed light rail frequencies - 2016 PM peak (4-6PM)

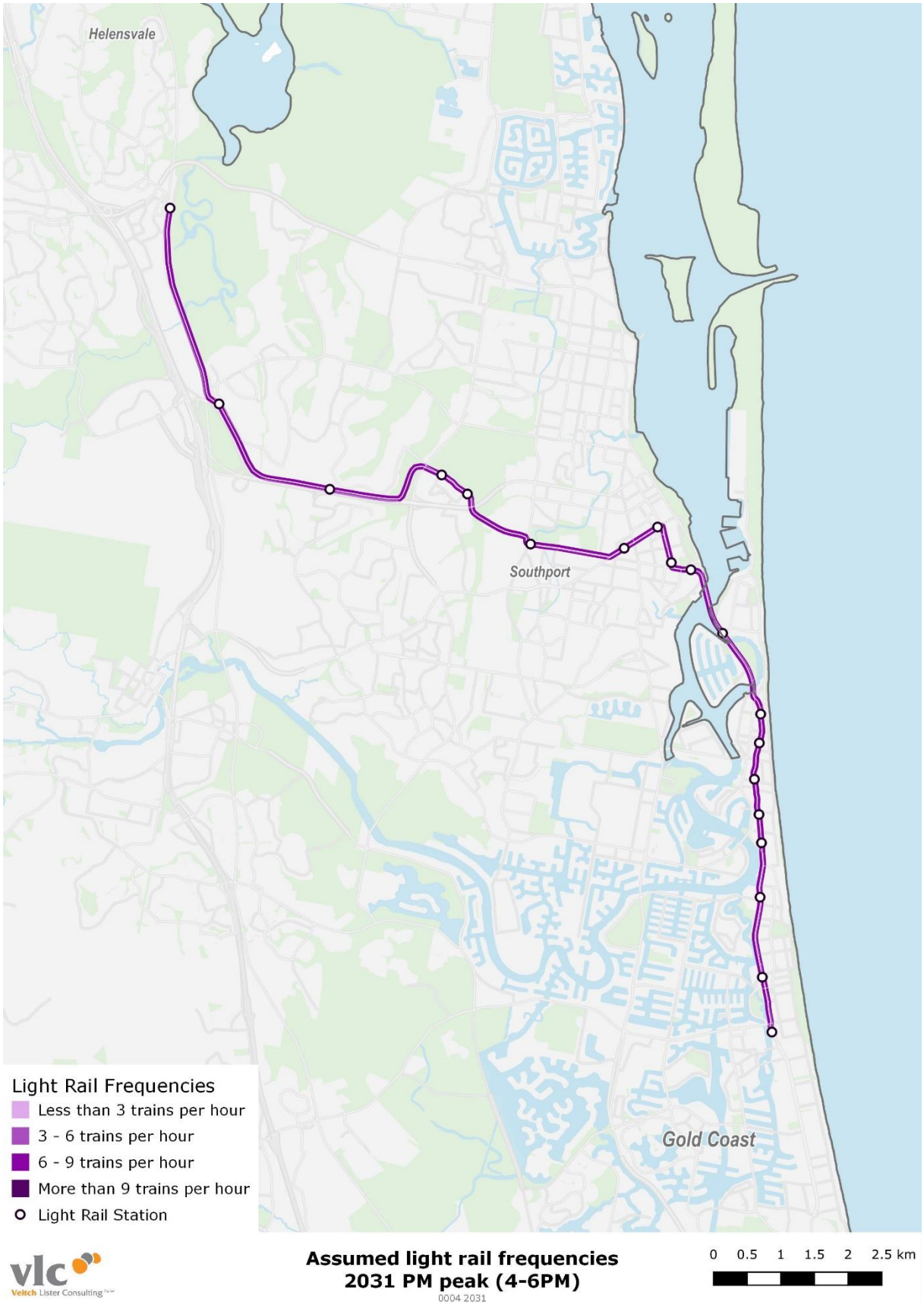


Source: Translink

Appendix Figure B-15 – Gold Coast assumed light rail frequencies - 2031 AM peak (7-9AM)



Appendix Figure B-16 – Gold Coast assumed light rail frequencies - 2031 PM peak (4-6PM)



Appendix C: SEQ Road Corridors

Appendix Table C-1 – SEQ road corridors

Corridor	Route Name
1	Milton Rd (Moggil Rd - ICB)
	Coronation Dve (Moggill Rd - ICB)
	Legacy Way (Moggill Rd - ICB)
2	Centenary Hwy (Ipswich Mwy - Indooroopilly)
	Oxley Rd (Ipswich Mwy - Indooroopilly)
3	ICB (M3 - Kingsford Smith Dve)
	Turbot St (M3 - Kingsford Smith Dve)
4	AirportLink (ICB - Domestic Airport)
	Nudgee Rd (ICB - Domestic Airport)
	Southern Cross Way (ICB - Domestic Airport)
5	Airport Link (ICB - Stafford)
	Lutwiche Rd - Gympye Rd (ICB - M1)
	Kelvin Grove (ICB - M1)
	Wandell St - Bridgeman Rd (ICB - M1)
6	Clem7 (M3 - Windsor)
	Story Bridge (M3 - Windsor)
	ICB (M3 - Windsor)
7	Old Cleveland Rd (Thornside - The Gabba)
	Wynnum Rd (Thornside - The Gabba)
8	Gateway Mwyl (Mt Gravatt - Wynnum Rd)
	Creek Rd (Mt Gravatt - Wynnum Rd)
9	Pacific Mwy (Loganholme - Mt Gravatt)
	Logan Mwy - Gateway Mwy (Loganholme - Mt Gravatt)
	Logan Mwy - Kingston Rd (Loganholme - Mt Gravatt)
10	Logan Mwy (Loganlea - Goodna)
	Johnson Rd (Loganlea - Goodna)
11	Mt Lindesay Hwy (Beaudesert - North Logan)
	WTR (Beaudesert - North Logan)
12	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)
13	Gold Coast Hwy (Southport - Burleigh Heads)
	Bermuda St (Southport - Burleigh Heads)
14	Smith Street Mtw (Southport - Helensvale)
	Gold Coast Hwy (Southport - Helensvale)
15	NBR (Southport - Nerang)

Corridor	Route Name
16	NBR (Broadbeach - Nerang)
	Nielsen Rd (Broadbeach - Nerang)
17	Olsen Av - Ross St (Paradise Point - Carrara)
18	Broadwater Av (Paradise Point - Pacific Mwy)
19	Gold Coast Hwy (Burleigh Heads - Terranora Ck)
	Pacific Mwy (Burleigh Heads - Terranora Ck)
20	Pacific Mwy (City - Beenleigh)
21	Pacific Mwy (Beenleigh - Helensvale)
22	Pacific Mwy (Helensvale - Varsity Lakes)
23	Deagon Deviation (Deagon - Kappa Ring)
	Bruce Hwy (Deagon - Kappa Ring)
24	Bruce Hwy (Mango Hills - Sippy Downs)
25	Bruce Hwy (Sippy Downs - Noosaville)
	David Low Way (Sippy Downs - Noosaville)
	Sunshine Mwy (Sippy Downs - Noosaville)
26	Gateway Mwy (Wynumm - M3)
27	Ipswich Mwy - Brisbane Rd (Ipswich - Goodna)

Appendix D: Model Assumptions

D.1 Purpose

This appendix sets out the overarching assumptions and methodology applied in our modelling. It also documents some of the city specific assumptions such as parking charges and public transport fares.

D.2 Modelling methodology

This section briefly describes the Zenith Travel Models developed by VLC and used to undertake all modelling for the Audit.

D.2.1 Development of the Zenith Travel Models

The Zenith models have been established through applying behavioural relationships calibrated from household travel surveys and validating these against traffic counts and public transport passenger surveys. These relationships have been updated on several occasions over the past 18 years. Zenith models operate using OmniTRANS, offering a versatile and interactive platform for multimodal transport planning. The platform also adds value in the presentation and discussion of patronage forecasts.

The models simulate all travel undertaken by households and firms, and visitors to the region during an average weekday in each forecast year. Given a scenario of land use and demographic change, the models reflect the level of participation in a range of activities across the region and the frequency of travel to them, as well as the choice of destination, mode and route.

The models are unique in their ability to reflect access to public transport, which is a key influence on accessibility in Australian cities, and in reflecting the travel choices made by their residents and visitors.

Many of the parameters of the multimodal model have their genesis in the calibration of the Zenith model of Melbourne in 1995, which made extensive use of the Victorian Activity and Travel Survey (VATS) database. When household travel surveys later became available in other regions, this provided the opportunity to revalidate the regional models against local data and to recalibrate selected sub-models and market segments where appropriate to better reflect behaviour specific to each region.

VLC is continually undertaking research and development to ensure the Zenith models remain at the forefront of transport planning practice and incorporates evolving state-of-the-art techniques when it is appropriate to do so. All of the data sets underpinning the models are reviewed frequently and maintained to be consistent with the latest information available.

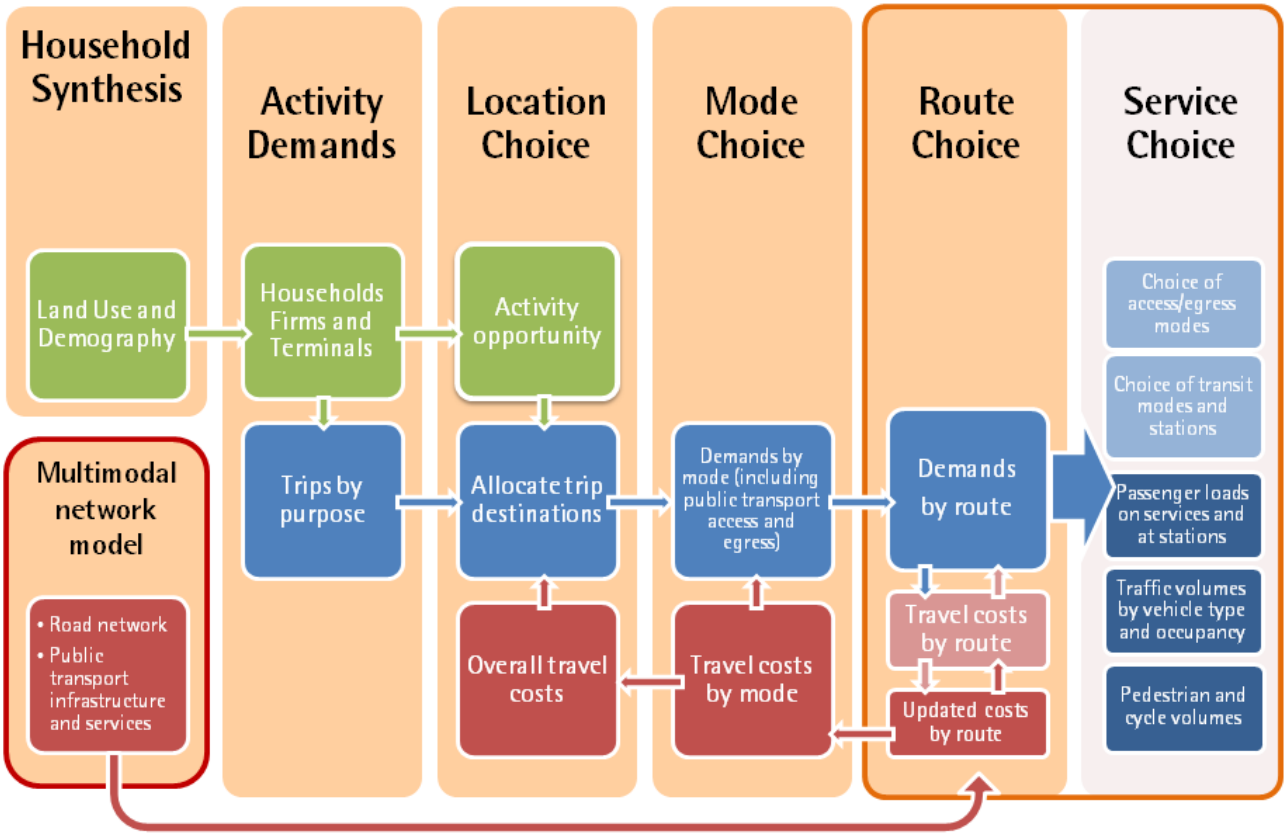
D.2.2 Model Architecture

The prime objective of Zenith is to provide a planning tool to support the evolving policy issues of relevance to planners and government. This is accomplished through replicating the demand for travel by residents and visitors in the modelled region, which is derived from the demand for participation in activities. Travel choices may differ depending on the activity for which the travel is undertaken. The nature of the activity may influence the frequency, timing and duration of participation, the location, as well as the mode of travel and in some cases, the route chosen.

The Zenith travel demand model simulates the travel behaviour of households, firms and visitors within the modelled region associated with their participation in the range of activities described above. The model makes use of information that is available to describe the potential demands for these activities in each location, such as statistics on employment in various industries, enrolments at educational facilities, and demographic variables such as population and households.

The key stages of the Zenith model process are illustrated in Appendix Figure D-1.

Appendix Figure D-1 – Key Stages of the Zenith Models



Each region is divided into several thousand travel zones, providing a high degree of resolution for forecasting movements between suburbs and across the city. A large range of demographic, socioeconomic and land use variables are used to identify the types of households and range of activities in each zone.

The model forecasts the number of trips made for work, education, shopping, personal business, recreation, social and "other" journey purposes (why travel?). It simulates the decisions made by households regarding the time period (when?), destination (where?) and mode of travel (how?) for each trip, with models developed from surveys of travel behaviour undertaken in each region.

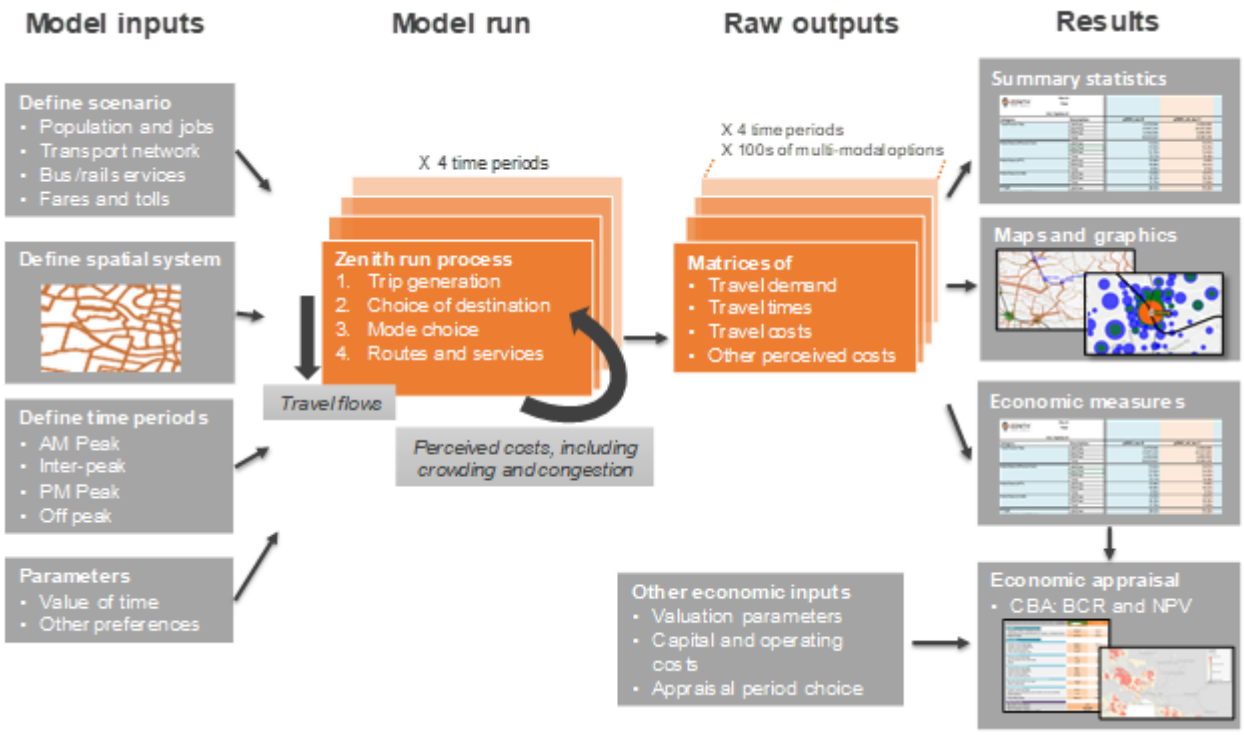
Having determined the destination and mode of travel, the model then reflects the choice of route for trips by private or commercial vehicle, public transport and active travel modes such as cycling and walking.

The more fine-grained the travel zone system, the more accurate travel forecasts have the potential to be. This is particularly the case on parts of the road network with lower traffic volumes, and on public transport services, as smaller zones capture vehicle movements on lower-order roads used to reach major arterials, and more closely reflect walking distances to the public transport stops.

D.2.3 Model process

The practicalities of establishing and running a given forecast year scenario are described in Appendix Figure D-2. For a given set of infrastructure and services assumptions, inputs are devised and entered into the Zenith user interface, the model is run, raw outputs are produced, and finally a range of detailed results are prepared.

Appendix Figure D-2 – Scenario testing with the Zenith model



Model inputs

- Define scenario – the distribution of population and employment in the forecast year, the nature of the transport network (including any upgrades assumed) as well as all of the service attributes (such as tolls, fares and service frequencies) must each be set.
- Define spatial system – the zone system determines how wide the model's coverage will be (generally the greater metropolitan area), how disaggregated the representation of the area will be in the model (number of zones), and which areas have more or less detailed representation (e.g. disaggregated zones in the corridor under consideration). In general, major capital cities are modelled In Zenith with between around 2000 and 4500 zones. More zones gives greater detail (for example for people choosing whether or not to walk to train stations), but requires longer model running times.
- Define time periods – some models only consider a single period of a weekday. Zenith applies a four-period breakdown of the weekday, with the actual hours distinguishing the AM and PM peaks potentially varying depending on local travel conditions.

- Input parameters – a range of behavioural parameters define the trade-offs people in the model are assumed to make, for example the trade-off between travel time and out-of-pocket spending is represented by the value of time. These parameters are estimated to best reflect existing travel behaviour.

Model run

The process of the Zenith model's operation is described in some detail in the remainder of this document. From the perspective of running a single model scenario, the most important feature is the iterative nature of the estimation of travel costs and travel demand. The model attempts to find an 'equilibrium' set of costs and demands for a wide range of travel modes, routes and services. Through making increasingly small adjustments to variables it converges towards the most consistent set of costs and demands for each period of the day.

Raw outputs

The key outputs of the model run are the equilibrium travel costs and travel demands for each origin-destination pair across each period of the day and each travel mode. Given the number of alternative travel options (e.g. walk to rail station 1, bus to rail station 2, car driver, car passenger, etc.) and the number of origin and destination zones, the resulting data is a very large number of matrices ('trip tables' and 'cost skims').

Results

The raw outputs can be adapted to any range of output formats to understand the implications of the modelled scenario, including tables, graphs, static maps and interactive maps. Common measures are total travel time, total vehicle kilometres (by road and vehicle type) and travel time spent in crowded public transport vehicles. Transport network performance measures can be estimated on a stand-alone basis or comparing scenarios across time (time series), across options (comparative), and between with and without-project (incrementally). Outputs can also be further processed to understand the incremental economic benefits of a 'with project' scenario compared to a 'without project' scenario for use in cost-benefit analysis, either within Zenith's economics module or with third-party economics spreadsheets.

D.3 Model inputs

Many of the model inputs described in Section D.2.3 above are specific to each modelled city and will be dealt with in the respective Technical Appendixes. However, there are a number of inputs that have been agreed with Infrastructure Australia and harmonised across all six major city Zenith models. These are assumptions to do with travel costs, technology and the approach to the value of travel time.

D.3.1 Travel costs

Fuel price

There is a range of influences on the unit cost of fuel consumed in urban transport, which can be affected by global and local conditions. The most significant influences on the costs of fuel include:

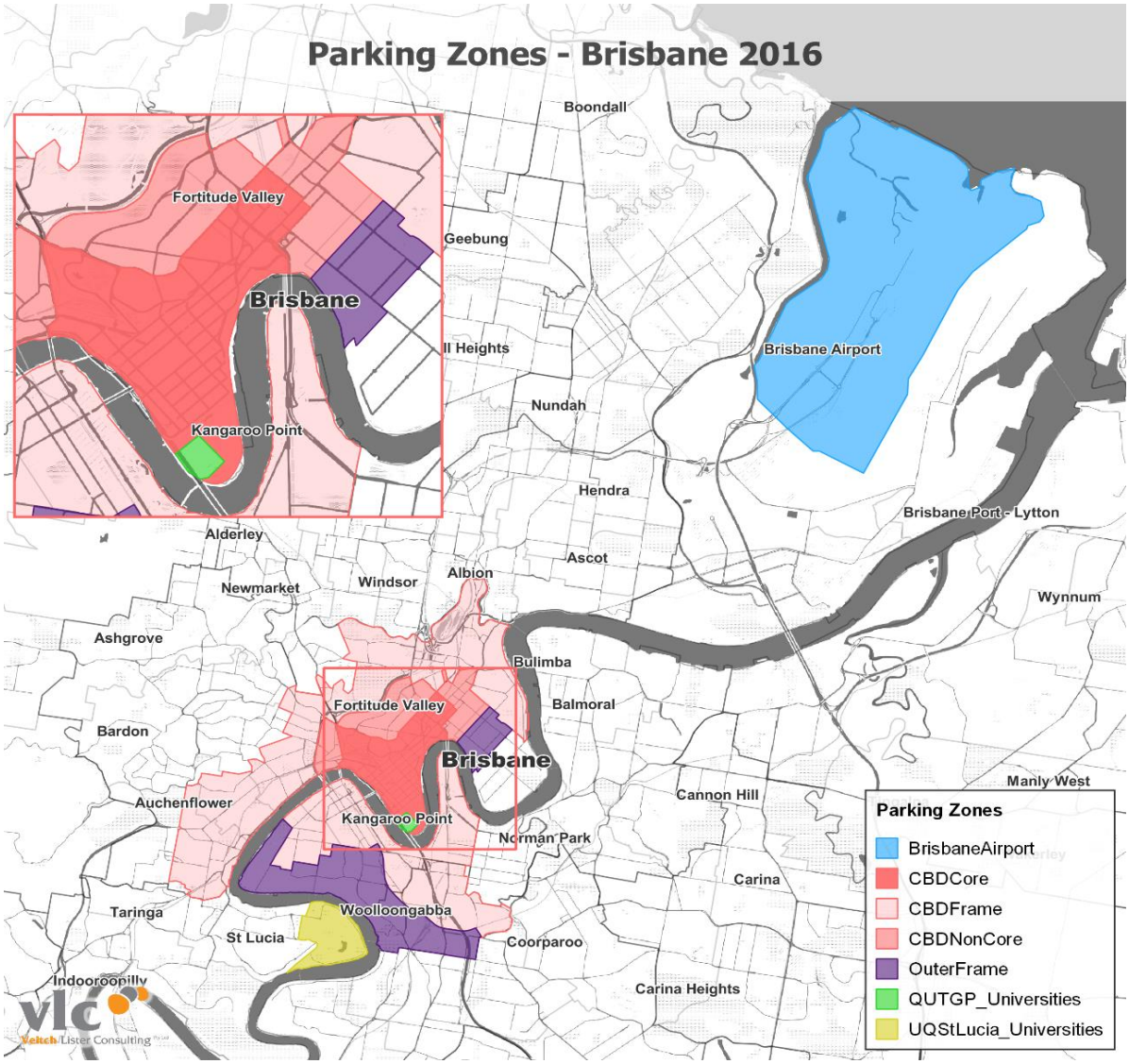
- real increases in the price of transport fuels; and
- reduction in the rate of fuel consumption due to improved vehicle efficiency and increased use of more efficient fuels within the vehicle fleet.

These two factors act to counter each other, and with insufficient evidence to indicate which will dominate in future, may well result in no real change in the average unit costs of fuel. For this work, it has therefore been assumed no real change in the unit of costs of fuel in future (i.e. fuel prices change in line with the Consumer Price Index - CPI).

Parking costs

A real annual increase of 1.5 per cent (i.e. above CPI) in parking charges is assumed. The intention is to represent the strong pressures on price arising from increasing demand and constrained supply of parking in the CBD and major activity centres, as well as the non-linear increase in price associated with moving towards more parking structures rather than surface parking. This is consistent with the assumption applied for the modelling in the first Infrastructure Audit. The parking zones used in the modelling are illustrated in Appendix Figure D-3.

Appendix Figure D-3 – SEQ parking zones



Tolls

Tolls in SEQ have been assumed to grow in line with CPI.

Public transport fares

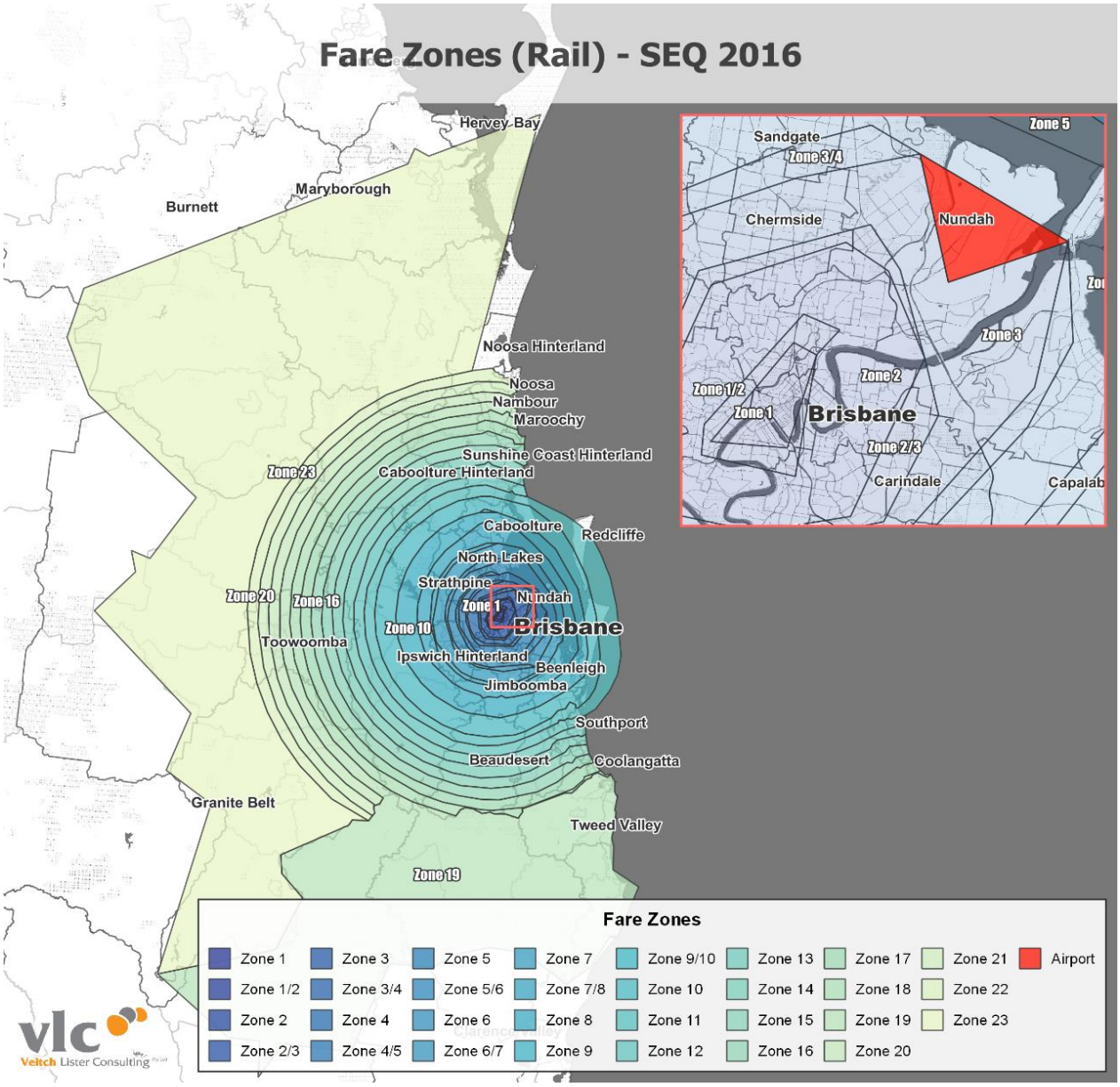
While any observed increases in the cost of public transport fares between 2016 and the time of modelling in 2018 have been factored into all future scenarios, beyond 2018 fares have been assumed to grow in line with CPI. The public transport fares and costs have been documented in Appendix Table D-1 – Public transport costs and fares.

The spatial definition of fare zones changes between 2016 and the forecast scenarios. These are illustrated in Appendix Figure D-4 through Appendix Figure D-6.

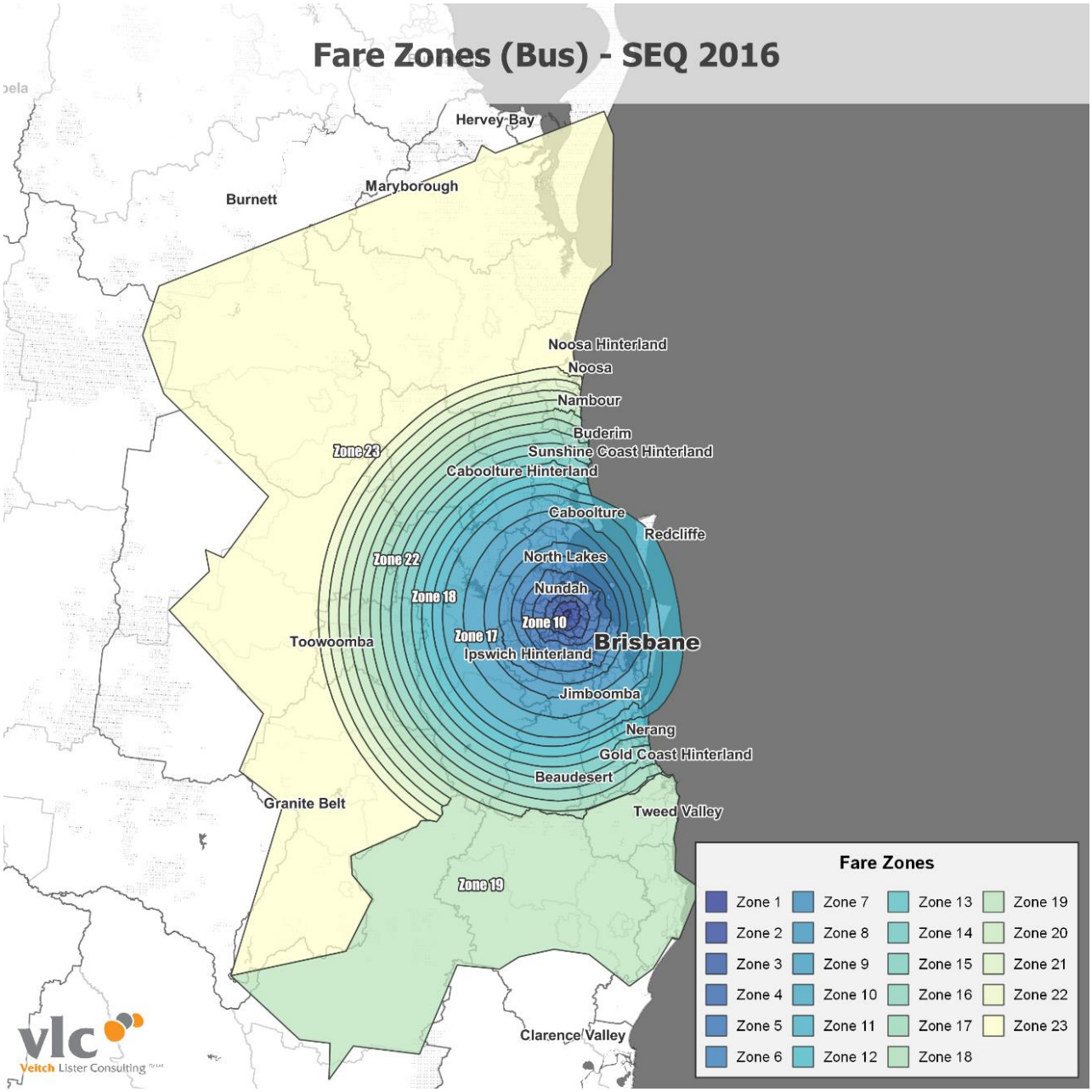
Appendix Table D-1 – Public transport costs and fares

Public Transport Cost Parameters	Zenith
Public Transport VOT, 2016 (AUD 2011)	$12 / hour
Public Transport Fare Assumptions	
Peak/Off-Peak Fares	The definition of peak times for Translink is DIFFERENT than our model. HOWEVER, we assumed that the definitions were the same and assumed PEAK Go-card fare for AM and PM peaks and OFF-PEAK go-card fares for the other periods
Airport Fares	The two Airtrain stations are assumed to be in a separate zone. A trip from zone 1 to the airport will cost a zone 1 fare + the Airtrain surcharge. You can avoid the typical zone fares between Zone 1 and the airport by boarding at rail stations between Roma Street and Eagle Junction, however this is ignored here. Standard fares are assumed although workers at the airport can get substantial discounts
Zone boundaries	For rail boundary stops have been included, e.g. zone 4/5 (only applies to 2016)

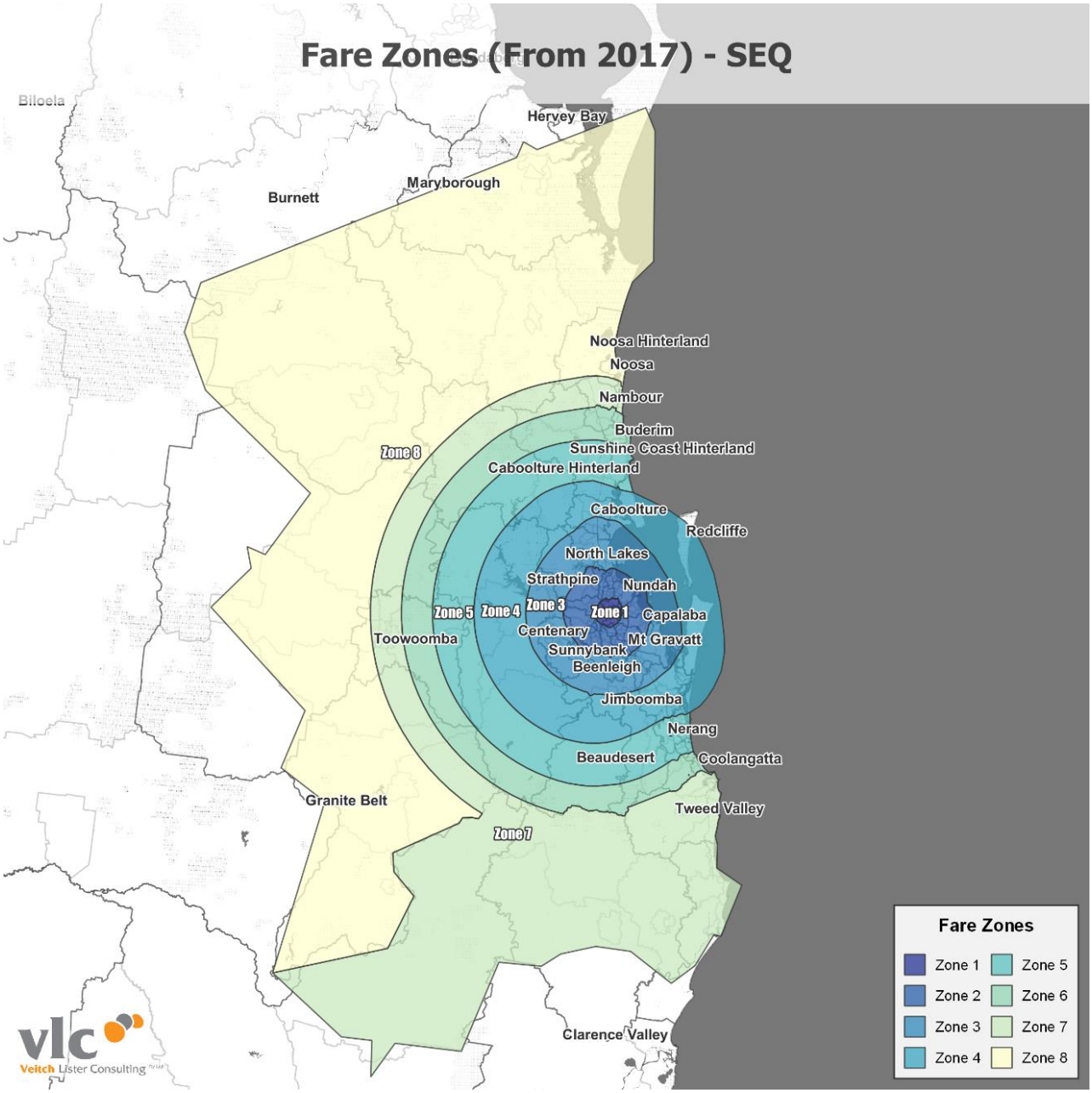
Appendix Figure D-4 – Public transport fare zones for rail, 2016



Appendix Figure D-5 – Public transport fare zones for bus, 2016



Appendix Figure D-6 – Public transport fare zones for SEQ (bus and rail), 2017 and beyond



D.3.2 Value of travel time

There are two approaches to the value of travel time: a 'behavioural' value that is relevant in trying to accurately predict how different market segments will respond to travel options, and an 'economic' value that is relevant for measuring community impacts of travel time. This section relates to the behavioural values used in modelling. Section D.4.1 discusses the relevant values for estimating economic costs of crowding – these values reflect equity values (ensuring infrastructure investment is not focused on areas with high incomes) and resource values (where travel time has real economic opportunity costs, e.g. due to people travelling during the course of their paid work).

The behavioural value of time spent travelling and its influence on travel behaviour depends on a range of factors, such as the reason for travel, and the use to which the time might otherwise be put. The modelling of travel choices reflects preferences that imply different values of travel time for each

trip purpose and for each mode of travel, including walking and waiting associated with using public transport and the use of toll roads.

These behavioural values of time are indirectly estimated for each journey purpose and city travel market through the model estimation process (i.e. statistically estimating the model parameters that best describe traveller choices from household travel surveys). Consequently these parameter values are not drawn directly from guidelines.

The values of time are estimated more or less for the current day, but an assumption is needed for modelling the way that travellers will trade off time and money in the forecast years. There is a significant volume of behavioural research that suggests values of travel time increase with growing average income. For the purposes of the modelling on this project VLC has assumed that values of travel time remain at current levels in the future.

The exception to this assumption is that people are assumed to have an increased willingness to pay tolls in the future. This is reflected in the application of an elasticity of 0.8 between value of time and increases in real average weekly earnings. This assumption is consistent with that applied in the previous Infrastructure Audit modelling.

D.3.3 Public transport frequencies

While public transport frequencies are partly driven by the completion of infrastructure projects, additional services are regularly added to the network. This includes more regular services along established public transport corridors, as well as new routes to growth areas. In both cases, this is generally in response to population growth.

Determining appropriate future public transport frequencies is based on a combination of the following approaches:

- Increasing service kilometres according to planning and policy documents (as documented in the project list for each market);
- Adding new bus routes to growth areas not serviced by other infrastructure proposals; and
- Increasing service kilometres on remaining bus services to bring overall network frequencies to growth rate of 1.5% per annum. This assumption was applied uniformly across jurisdictions based on actual growth in major-city scheduled bus kilometres documented in jurisdictions' budget papers where available over the past five years.

D.3.4 Commercial vehicle definitions

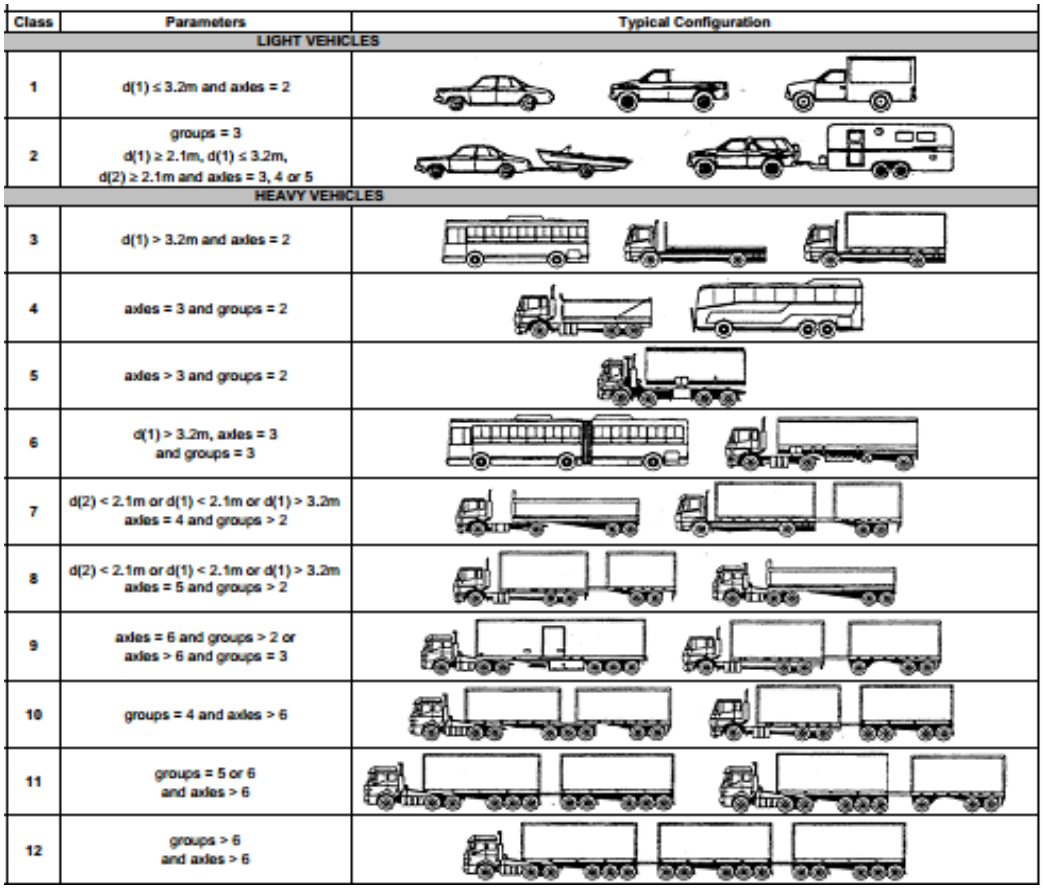
In the Zenith model private vehicle traffic is split into cars and commercial vehicles. Commercial vehicles are further split into sub-categories of light commercial vehicles and heavy commercial vehicles.

Vehicles are classified according to the Austroads Vehicle Classification System (Appendix Table D-2). Appendix Table D-2 details how the VLC vehicle types equate to Austroads vehicle classes.

Appendix Table D-2 – VLC vehicle types with Austroads classes

VLC vehicle type	Sub type	Austroads vehicle class
Car	NA	1 & 2
Commercial vehicles	Light commercial vehicles	3
	Heavy commercial vehicles	3 to 12

Appendix Figure D-7 – Austroads Vehicle Classification System



Source: Austroads

D.4 Economic cost methodology

VLC provides two measures of economic costs associated with the performance of the transport network: cost of road congestion and cost of public transport crowding. This section briefly outlines the methodology and input assumptions applied in all models.

D.4.1 Cost of road congestion

Modelling approach to estimate impacts

Congested travel times are calculated by comparing the total travel time for a road link under congested conditions, with the travel time of the same link under free-flow conditions.

The amount of time spent travelling under congested conditions is then aggregated to the desired geography in order to understand which parts of the network are most heavily affected by excess travel demand. Weekday forecasts of congested travel times are annualised by a factor of 345 in all cities, reflecting the relatively high traffic volumes on weekends (TfNSW 2016).[5]

Method to quantify

A monetary value of travel time factor is applied to the congested hours, distinguishing between business and non-business travel, as well as an additional freight value of time for commercial vehicles, which are separately identified in the model outputs. The values of time applied are estimated relative to average hourly earnings of the traveller or vehicle to reflect the differing economic costs associated with time lost for each type of trip.

The valuation parameters used are consistent with ATAP (2016) guidelines, updated to December 2017 values:

- Value of time per occupant (excluding freight vehicles):
    - Business-related travel (129.8% of hourly earnings = **$53.78/hr**). Applied using an average vehicle occupancy of 1.3 people per car.
    - Non-business travel (40% of hourly earnings = **$16.57/hr**). Applied using an average vehicle occupancy of 1.7 people per car.
- Freight value of time per vehicle (including occupants):
    - Light commercial vehicles = **$38.23/hr** (Austroads class 3 vehicle, two-axle truck)
    - Heavy commercial vehicles = **$71.36/hr** (Austroads classes 4-10, weighted average according to typical urban conditions Australia-wide, with the majority assumed to be within classes 4, 5, 9 and 10).

D.4.2 Cost of public transport crowding

Modelling approach to estimate impacts

[5] Transport for NSW (2016), *Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives - Transport Economic Appraisal Guidelines"*, Sydney, Australia.

The modelling approach to estimating crowding includes three components. These are:

- Measures of service capacity
- Crowding cost function, and
- Linking of outward and return journeys.

Measures of service capacity

Measures of service capacity are provided as a model input, detailing the number of passengers that can be accommodated on each individual service in the modelled public transport network. Seated and standing passenger capacities are specified separately, as passenger comfort levels tend to differ considerably under crowded conditions depending on whether they are travelling in a seat or are standing in passages and doorways.

Appropriate capacities are determined for each city individually. Factors that are considered in specifying service capacities include:

- The rolling stock deployed on particular routes/lines
- The percentage of services run with higher or lower capacity rolling stock to determine 'average' seated and standing capacities (where that level of detail is available)

Appendix Table D-1 sets out the public transport vehicle seated and crush capacities used in the modelling (it is assumed that vehicle capacities remain the same in 2031 as they were in 2016).

Appendix Table D-3 – Public transport vehicle capacities

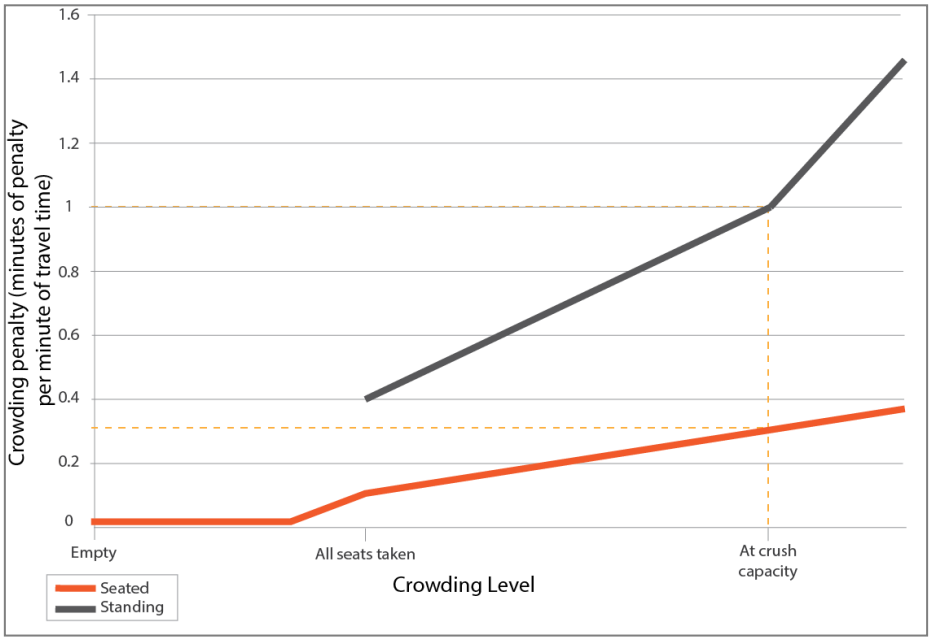
Vehicle	Seated Capacity	Crush capacity
Bus	45	65
Train	200	800
Light Rail	80	304

Crowding cost function

The crowding cost function is an estimate of the level of discomfort experienced by passengers at different levels of crowding, depending on whether passengers are seated or standing. The function is based on parameters provided in Australian Transport Council (ATC) guidelines and is shown in Appendix Figure D-8.[6] These broadly align with the latest guidance from ATAP, though the ATAP guidelines do not provide adequate detail to quantify impacts for seated and standing travellers.

[6] Australian Transport Council. 2006. *Volume 4: Urban Transport*. Canberra: ATC.

Appendix Figure D-8 – Crowding cost function



The crowding cost function works by applying a penalty to journeys that are made under crowded conditions. Based on the function, a 10-minute journey at crush capacity would incur a three-minute penalty for seated passengers and a 10 minute penalty for standing passengers.

Beyond crush capacity, the penalty increases at a rapid rate in order to further deter passengers from boarding extremely crowded services. While loads in excess of crush capacity may seem to contradict the definition of crush capacity, passenger load surveys have observed services operating with passenger volumes significantly higher than their theoretical service capacity.

Linking of outward and return journeys

Zenith links outward and return journeys, ensuring that additional travel costs associated with crowded travel conditions impact on the mode of travel for both inbound and outbound trips. This ensures that the model produces balanced travel demands depending on the time period or direction of travel. This is an important feature, because passenger crowding experiences may be inconsistent depending on the time of day.

For example, in the morning peak passengers living at the end of a train line will generally be able to get a seat. Even if the train gets very crowded as it approaches the inner city, they will have a lower perceived cost of crowding than if they were forced to stand. Returning home in the afternoon, the same passengers may be required to stand for significant lengths of their journey, which is associated with a higher perceived cost of crowding. Using linked outward and return journeys, the likelihood of standing on the return journey will be factored into mode and destination choice decisions made for the outward journey as well. This not only ensures that the model has suitably consistent inbound / outbound passenger demands, but also that it is appropriately responsive to infrastructure and policies aimed at reducing crowding.

Method to quantify

Quantifying the cost of public transport crowding involves estimating traveller outcomes in a capacity constrained model run for current (2016) and future (2031) crowding levels.

The number of daily 'disbenefit' or 'penalty' hours experienced by public transport users due to crowding is first calculated. The number of seating and standing hours at different levels of crowded conditions are combined with the disutilities at each crowding level (Appendix Figure D-8).

For example, in the example in the previous subsection, passengers standing at crowded capacity (e.g. a loading factor (LF) of 200% of seated capacity, where LF is passengers / provided seats on services on a link) for a 10-minute journey would experience a crowding disutility of:

Journey time x crowding penalty (at the relevant load factor) = 10 x 1 = 10 minutes

Seated passengers would experience a crowding disutility of 3 minutes during the same journey in addition to their ordinary (uncrowded) travel time disutility of 10 minutes.

Generalising this calculation for a given link (potentially serving multiple lines) yields:

Link average crowding	Crowding disutility for seated passengers	Crowding disutility for standing passengers
Uncrowded LF < 0.7	0	0
Nearing seated capacity 0.7 < LF < 1.0	JT * Pax * (LF - 0.7) * 1 / 3	0 (or if people stand it is by choice with disutility as per seating passengers)
Crowded 1.0 < LF < Crush	JT * Seats * [0.1 + (Pax – Seats) * 0.2 / (Crush – Seats)]	JT * (Pax – Seats) * [0.4 + (Pax – Seats) * 0.6 / (Crush – Seats)]
Crushed LF > Crush	JT * Seats * [0.1 + (Pax – Seats) * 0.2 / (Crush – Seats)]	JT * (Pax – Seats) * [1 + (Pax – Crush) * 1.2 / (Crush – Seats)]

Notes: 1) Total crowding costs sum the two columns for any given load factor (LF)
2) LF is defined at a link level capturing all services operating on that link and all passengers travelling on the link (Pax) during a time period, such as the 2-hour AM peak
3) JT is the journey time across the link, including travel time and dwell time at stops
4) 'Seats' is the total seated capacity for vehicles operating services on the link during the time period
5) 'Crush' is the total crush capacity for vehicles operating services on the link during the time period.

For national consistency we follow ATAP (2018) guidelines by applying an annualisation factor of 286 to scale up the weekday average estimates, reflecting the perspective that crowding is primarily a weekday phenomenon.[7] Annualised disbenefit hours are multiplied by the value of time for non-business travellers ($16.57/hour from section D.4.1 above) to determine the annual cost.

[7] Australian Transport Assessment and Planning Guidelines (2018), *"M1 – Public Transport"*, ATAP, Canberra, Australia.

Appendix E: Differences between 2015 and current modelling

Modelling undertaken in the 2018-19 Audit differs considerably from work undertaken in 2014-15. Changes have been made to the models themselves as well as to the model inputs and assumptions. This section compares the 2018-19 Audit to the 2014-15 Audit, using the 2014-15 inputs / outputs as a base.

E.1 Changes to the models

Significant changes have been made to the Zenith models across all markets since 2014-15.

Appendix Table E-1 – Changes to the Zenith models since the 2014-15 Audit

Change	Detail	Affected markets
Demand model re-estimation	This is the process of using a household travel survey to estimate parameters used to model the behaviour of trips for different purposes, particularly for mode and destination choice steps. This affects the balance between trip lengths and trip numbers. While trip numbers decrease, network volumes remain broadly unchanged.	• SEQ and Sydney models have both undergone full re-estimation. • Adelaide and Perth models use parameters adapted from the SEQ re-estimation. • Melbourne and ACT models have not been re-estimated
Incorporation of crowding	Additional components were added into the four-step models to capture the perceived cost of travelling under heavily crowded conditions on public transport services. All models were run in 2018 on the basis of crowding levels influencing travel choices; none used this feature in 2014.	• SEQ, Sydney, Perth and Adelaide have undergone software upgrades to include public transport crowding • Melbourne and ACT models were previously public transport crowding-capable, but for consistency reasons this option was not used in 2014-15.
Changing to a 2016 base year	Population and employment inputs were updated to reflect the 2016 Census. Travel costs and transport networks were also updated. Of particular significance was the reduction in fuel price between 2011 and 2016. This was based on a structural decrease observed in fuel retail prices collected by the Australian Competition and Consumer Commission.	• All markets have updated base years • All markets have undergone re-calibration and validation to ensure that changes made to the models are both robust and appropriate.
Model calibration	After model parameters have been estimated (see above) model calibration is the process of adjusting these parameters. The aim is to improve the level of correlation between the model's outputs and observed measures of travel demand (traffic counts, public transport patronage, origin-destination surveys etc.)	

E.2 Changes to model inputs and assumptions

E.2.1 Population and land use

In the 2014-15 Audit, 2031 population projections for all six markets were derived from ABS Series B projections. In the latest work, projections have been provided by each state government. For SEQ, the impact is as follows:

Appendix Table E-2 – Comparison of SEQ 2031 forecast population

	2014-15 Audit	2018-19 Audit	Difference
Brisbane GCCSA, Gold Coast and Sunshine Coast population	4.5 million	4.3 million	-2%

A map showing this change spatially by SA3 is shown in Appendix Figure E-1. In addition to the a slightly higher population and employment, the mapping suggests the following key differences in demographic assumptions between 2014-15 and 2018-19 Audits:

- SA3s in inner Brisbane are forecast to have slightly larger populations than was previously expected.
- The largest difference in forecast population in Brisbane GCCSA is apparent in Springfield Redback (44,000 fewer residents, or 23% less population)
- Sunshine Coast and Caboolture regions also have significantly lower population in the 2018-19 Audit.

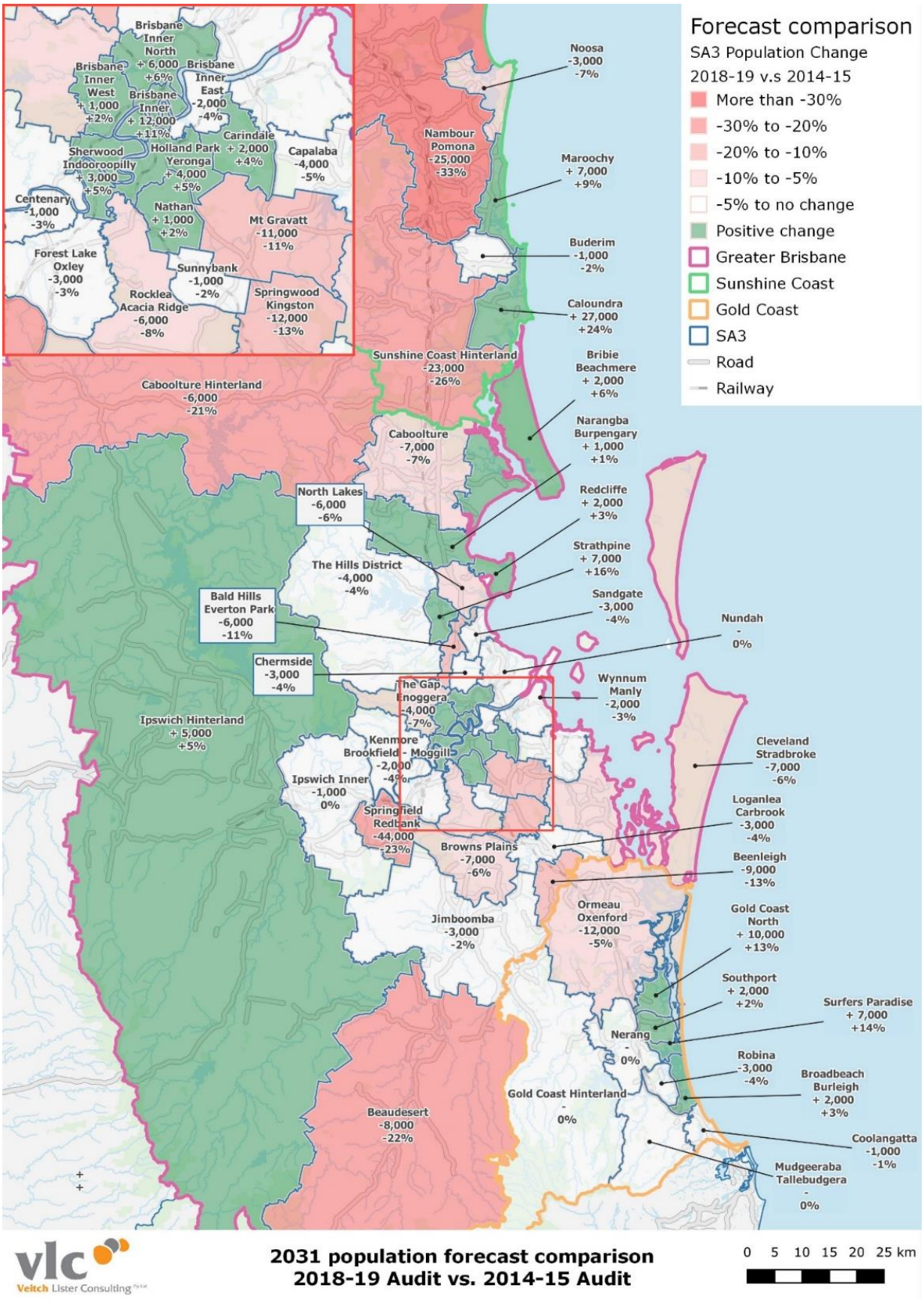
In the 2014-15 Audit, VLC prepared forecasts for employment, consistent with the population projections constrained to the ABS B series forecast. The employment forecasts are based on projected levels of employment self-containment within each LGA, which recognise the structure planning of local authorities and the longer-term infrastructure and development planning by each state government. In the latest work, projections have been provided by each state government. For SEQ, employment assumptions remain largely unchanged:

Appendix Table E-3 – Comparison of SEQ 2031 forecast employment and centralisation

	2014-15 Audit	2018-19 Audit	Difference
Brisbane GCCSA, Gold Coast and Sunshine Coast employment	2.2 million	2.2 million	-%
Proportion of employment in Brisbane Inner SA3	15%	15%	-%

The way in which jobs are distributed across a city is a key determinant of trip destination, and as such mode choice (more jobs in the CBD encourages more PT travel). In strategic modelling, a gravity model is used to distribute trip destinations, with features such as jobs attracting trips. As such the attractiveness of an area is determined by its **share** of total employment rather than the actual **number** of jobs it contains. Thus, the quantum of jobs does not alter the balance between car and PT travel where the distribution of employment remains relatively similar (employment centralisation has been used as a proxy for the overall distribution of trip destinations) (Appendix Table E-3).

Appendix Figure E-1– SEQ 2031 Population forecast - 2018-19 Audit compared to 2014-15 Audit base



E.2.2 Network assumptions

Both Audits use a similar approach to developing network assumptions – i.e. a 'minimal intervention' approach, that assumes only projects with funding or significant levels of political commitment will be completed by 2031. For SEQ, key differences in network assumptions are as follows:

Appendix Table E-4 – Comparison of SEQ 2031 major project assumptions

Major projects in 2014-15 NOT in 2018-19	Major projects in 2018-19 NOT in 2014-15
• N/A	• Cross River Rail • Brisbane Metro • Gold Coast Light Rail Stage 2

E.2.3 Cost assumptions

Cost assumptions in SEQ (public transport fares and parking charges) and are consistent between 2014-15 Audits and 2018-19 Audits.

E.3 Impacts on model metrics and outputs

Model metrics and outputs are impacted by the changes made to the model inputs and model calibration.

Appendix Table E-5 compares the following high-level outputs:

- Total trips
- Car trips
- Car vehicle kilometres travelled
- Public transport trips.

The 2018-19 modelling forecasts lower 2031 travel demand across all four metrics. Details are provided in Appendix Table E-5.

Appendix Table E-6 compares corridor-level average traffic and delay hours for the AM peak for the 15 most delayed corridors in the 2018-19 Audit. It also shows the corridor ranking from the 2014-15 Audit. As is expected, given the large reduction in population forecasts, traffic volumes and delays have decreased. The worst-performing corridors are largely consistent between the Audits.

In general, Appendix Table E-6 shows that vehicle delays are forecast to decrease by more than the corresponding change in traffic volumes. This is a function of the underlying dynamics of traffic flow (when additional traffic is added to an already congested road, the resultant delay is disproportionately higher than in less congested conditions).

Appendix Table E-5 – Changes in model inputs and key outputs between the 2014-15 and 2018-19 Audit modelling

		Demographic assumptions		Network assumptions		Travel cost assumptions				Model Parameters
		Population	*Jobs*	*Road investment*	*Public transport investment*	*Fuel*	*PT Fares*	*Parking*	*Tolls*	
	Change in inputs	⇩ **Population forecasts are similar (-2%)**	⇩ **Employment forecasts are similar and proportion of jobs in Brisbane Inner SA3 remains stable**	⇧ **More investment in the road network (+5% network lane km)**	⇧ **More investment in the PT network (~+22% service kms)**	⇩ **Reduction in fuel price (140 c/L to 104 c/L AUD 2011)**	**-** **No change in other transport costs**			• **Recalibrated models have lower fuel prices (per observed reduction in fuel prices between 2011 and 2016)** • **Recalibrated models include capacity-constrained public transport networks**
Impact on output (AM peak)	Total trips (-34%)	⇩ Slightly lower total population reduces total modelled trips	**-** Total trips are generated by population assumptions and model parameters only.							• Changes to the model calibration have reduced the number of trips produced in the model – in the SEQ model more than in any other market. • Recalibration resulted in longer trip lengths, bringing the model closer to trips observed in the Journey To Work data from the 2016 ABS Census • The change in balance between trip lengths and trip numbers leaves network volumes broadly unchanged (see Appendix Table E-6).
	Car trips (-24%)	⇩ Slightly lower total population reduces total modelled car trips	**-** The distribution of employment is similar between the audits, as such a decline in overall employment does not substantially alter the balance between car and PT travel	⇧ Better roads encourage car travel	⇩ Better PT can encourage more PT travel and fewer car trips	⇧ Lower fuel prices encourage car travel	**-** No change = no impact			• Changes to the model calibration results in fewer trips in the mode. By extension, this results in fewer car trips.
	Car vehicle kms travelled (-4%)	⇩ An overall reduction in population reduces car kilometres. Lower population growth in urban fringe and peri-urban areas also causes a reduction in this metric	**-** The distribution of employment is similar between the audits, as such a decline in overall employment does not substantially alter the balance between car and PT travel	⇧ Better roads encourage car travel	⇩ Better PT can encourage more PT travel and fewer car kms	⇧ Lower fuel prices encourage car travel	**-** No change = no impact			• Changes to the model calibration results in fewer trips in the model, but slightly longer trip lengths. Both factors impact on car vehicle kilometres travelled
	Public transport trips (-24%)	⇩ Slightly lower total population reduces total modelled PT trips	**-** The distribution of employment is similar between the audits, as such a decline in overall employment does not substantially alter the balance between car and PT travel	⇩ Better roads encourage car travel and fewer PT trips	⇧ Better PT can encourage more PT travel	⇩ Lower fuel prices encourage car travel and reduce PT travel	**-** No change = no impact			• Capacity constraining public transport networks would reduce demand for services where crowding occurs • The model recalibration will also affect the number of public transport trips.

Appendix Table E-6 – 2031 top ten most delayed road corridors for SEQ - AM peak (ranked by total delay)

Rank IA Audit 2018-19	Direction	Corridor Name	Corridor	Average Peak Hour Traffic 2031 forecasts			Total Delay Hours 2031 forecasts			Rank IA Audit 2014-15
				IA Audit 2014-15	IA Audit 2018-19	% Diff	IA Audit 2014-15	IA Audit 2018-19	% Diff	
1	NB	Pacific Mwy (City - Beenleigh)	20	6,500	7,300	13%	7,500	11,700	55%	1
2	NB	Pacific Mwy (Beenleigh - Helensvale)	21	7,600	8,200	8%	4,800	9,300	94%	5
3	SB	Bruce Hwy (Mango Hills - Sippy Downs)	24	3,900	3,900	1%	5,200	6,700	28%	3
4	EB	Ipswich Mwy - Kessels Rd (Goodna - Mt Gravatt)	12	4,000	4,600	16%	3,400	5,700	67%	8
5	EB	Ipswich Mwy - Brisbane Rd (Ipswich - Goodna)	27	4,000	4,300	7%	3,900	5,600	43%	7
6	NB	Mt Lindesay Hwy (Beaudesert - North Logan)	11	2,000	1,900	-4%	5,000	5,200	4%	4
7	NB	Pacific Mwy (Loganholme - Mt Gravatt)	9	6,400	7,300	15%	4,300	4,900	14%	6
8	SB	Gateway Mwy (Wynumm - M3)	26	4,900	5,300	10%	2,200	4,200	89%	10
9	SB	Pacific Mwy (Beenleigh - Helensvale)	21	7,400	7,100	-5%	5,800	4,100	-30%	2
10	NB	Centenary Hwy (Ipswich Mwy - Indooroopilly)	2	3,900	3,900	0%	2,700	3,400	26%	9
11	SB	Pacific Mwy (City - Beenleigh)	20	5,200	5,800	11%	1,900	3,300	75%	14
12	NB	WTR (Beaudesert - North Logan)	11	900	1,100	16%	2,100	2,900	37%	13
13	SB	Lutwiche Rd - Gympye Rd (ICB - M1)	5	3,100	3,400	10%	1,700	2,700	55%	15
14	WB	Old Cleveland Rd (Thornside - The Gabba)	7	1,900	2,100	13%	1,100	2,200	96%	23
15	WB	Wynnum Rd (Thornside - The Gabba)	7	2,100	2,300	13%	1,100	2,100	98%	24

Appendix F: Additional Outputs

Although the body of this report has focussed on the Brisbane GCCSA, the Zenith model extent also includes the Gold and Sunshine Coast regions. This appendix contains a summary snapshot of key performance indicators of these regions.

Appendix Table F-1 SEQ public transport in vehicle service kilometres

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Rail	AM peak (7-9AM)	6,100	17,600	+11,500	+190%
	Inter-peak (9AM-4PM)	13,500	19,500	+6,000	+44%
	PM peak (4-6PM)	6,100	17,600	+11,500	+189%
	Off-peak (6PM-7AM)	16,400	25,400	+9,000	+55%
	Daily total	**42,100**	**80,000**	**+38,000**	**+90%**
Bus	AM peak (7-9AM)	41,400	50,000	+8,500	+21%
	Inter-peak (9AM-4PM)	93,900	119,000	+25,100	+27%
	PM peak (4-6PM)	40,000	47,900	+7,900	+20%
	Off-peak (6PM-7AM)	54,700	82,500	+27,800	+51%
	Daily total	**230,000**	**299,400**	**+69,300**	**+30%**
Total	AM peak (7-9AM)	48,000	68,100	+20,100	+42%
	Inter-peak (9AM-4PM)	109,200	140,200	+31,100	+28%
	PM peak (4-6PM)	46,600	66,000	+19,400	+42%
	Off-peak (6PM-7AM)	72,200	109,000	+36,800	+51%
	Daily total	**276,000**	**383,300**	**+107,300**	**+39%**
Gold Coast Region					
Rail	AM peak (7-9AM)	1,300	7,800	+6,500	+518%
	Inter-peak (9AM-4PM)	3,000	7,600	+4,600	+155%
	PM peak (4-6PM)	1,500	7,800	+6,400	+437%
	Off-peak (6PM-7AM)	3,900	10,600	+6,800	+174%
	Daily total	**9,600**	**33,800**	**+24,300**	**+254%**
Bus	AM peak (7-9AM)	5,200	7,700	+2,400	+46%
	Inter-peak (9AM-4PM)	20,500	25,600	+5,100	+25%
	PM peak (4-6PM)	6,100	8,500	+2,500	+40%
	Off-peak (6PM-7AM)	9,000	17,300	+8,300	+92%
	Daily total	**40,800**	**59,100**	**+18,200**	**+45%**
Light rail	AM peak (7-9AM)	400	600	+200	+59%
	Inter-peak (9AM-4PM)	1,400	2,200	+800	+61%
	PM peak (4-6PM)	400	600	+200	+61%
	Off-peak (6PM-7AM)	1,000	1,500	+600	+60%
	Daily total	**3,100**	**4,900**	**+1,900**	**+61%**
Total	AM peak (7-9AM)	6,900	16,100	+9,200	+133%
	Inter-peak (9AM-4PM)	24,800	35,300	+10,500	+42%
	PM peak (4-6PM)	7,900	17,000	+9,000	+114%
	Off-peak (6PM-7AM)	13,800	29,400	+15,600	+112%
	Daily total	**53,500**	**97,800**	**+44,300**	**+83%**
Sunshine Coast Region					
Rail	AM peak (7-9AM)	600	3,400	+2800	+482%
	Inter-peak (9AM-4PM)	1,200	3,700	+2500	+202%
	PM peak (4-6PM)	700	3,400	+2600	+350%
	Off-peak (6PM-7AM)	1,600	3,400	+1,800	+113%
	Daily total	**4,100**	**13,800**	**+9,700**	**+234%**
Bus	AM peak (7-9AM)	3,200	4,000	+800	+25%
	Inter-peak (9AM-4PM)	11,300	13,400	+2,100	+18%
	PM peak (4-6PM)	3,400	4,300	+800	+24%
	Off-peak (6PM-7AM)	5,200	8,200	+3,000	+59%
	Daily total	**23,200**	**29,900**	**+6,700**	**+29%**
Total	AM peak (7-9AM)	3,800	7,400	+3,600	+94%
	Inter-peak (9AM-4PM)	12,600	17,100	+4,500	+36%
	PM peak (4-6PM)	4,200	7,600	+3,400	+82%
	Off-peak (6PM-7AM)	6,800	11,600	+4,800	+72%
	Daily total	**27,300**	**43,700**	**+16,400**	**+60%**
Total Region*					
Rail	AM peak (7-9AM)	6,100	17,600	+11,500	+190%
	Inter-peak (9AM-4PM)	13,500	19,500	+6,000	+44%
	PM peak (4-6PM)	6,100	17,600	+11,500	+189%
	Off-peak (6PM-7AM)	16,400	25,400	+9,000	+55%
	Daily total	**42,100**	**80,000**	**+38,000**	**+90%**
Bus	AM peak (7-9AM)	49,600	61,000	+11,400	+23%
	Inter-peak (9AM-4PM)	124,800	155,700	+30,900	+25%
	PM peak (4-6PM)	49,100	59,900	+10,800	+22%
	Off-peak (6PM-7AM)	68,400	105,100	+36,700	+54%
	Daily total	**292,000**	**381,800**	**+89,800**	**+31%**
Light rail	AM peak (7-9AM)	400	600	+200	+59%
	Inter-peak (9AM-4PM)	1,400	2,200	+800	+61%
	PM peak (4-6PM)	400	600	+200	+61%
	Off-peak (6PM-7AM)	1,000	1,500	+600	+60%
	Daily total	**3,100**	**4,900**	**+1,900**	**+61%**
Total	AM peak (7-9AM)	56,600	79,700	+23,100	+41%
	Inter-peak (9AM-4PM)	141,500	179,200	+37,700	+27%
	PM peak (4-6PM)	56,100	78,700	+22,500	+40%
	Off-peak (6PM-7AM)	86,900	133,100	+46,300	+53%
	Daily total	**341,100**	**470,700**	**+129,600**	**+38%**

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-2 – SEQ person trips by mode

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Person car trips	AM peak (7-9AM)	957,000	1,235,000	+278,000	*+29%*
	Inter-peak (9AM-4PM)	2,722,000	3,551,000	+829,000	*+30%*
	PM peak (4-6PM)	866,000	1,119,000	+253,000	*+29%*
	Off-peak (6PM-7AM)	1,230,000	1,615,000	+385,000	*+31%*
	Daily total	**5,775,000**	**7,520,000**	**+1,745,000**	***+30%***
Public transport trips	AM peak (7-9AM)	102,000	159,000	+57,000	*+56%*
	Inter-peak (9AM-4PM)	166,000	265,000	+98,000	*+59%*
	PM peak (4-6PM)	87,000	138,000	+51,000	*+59%*
	Off-peak (6PM-7AM)	80,000	126,000	+46,000	*+57%*
	Daily total	**434,000**	**687,000**	**+252,000**	***+58%***
Walk/cycling trips	AM peak (7-9AM)	83,000	113,000	+30,000	*+36%*
	Inter-peak (9AM-4PM)	275,000	385,000	+110,000	*+40%*
	PM peak (4-6PM)	73,000	99,000	+26,000	*+35%*
	Off-peak (6PM-7AM)	111,000	154,000	+43,000	*+38%*
	Daily total	**543,000**	**751,000**	**+208,000**	***+38%***
Total trips	AM peak (7-9AM)	1,142,000	1,507,000	+365,000	*+32%*
	Inter-peak (9AM-4PM)	3,163,000	4,200,000	+1,037,000	*+33%*
	PM peak (4-6PM)	1,026,000	1,356,000	+330,000	*+32%*
	Off-peak (6PM-7AM)	1,421,000	1,895,000	+474,000	*+33%*
	Daily total	**6,752,000**	**8,958,000**	**+2,205,000**	***+33%***
Gold Coast Region					
Person car trips	AM peak (7-9AM)	270,000	369,000	+99,000	+37%
	Inter-peak (9AM-4PM)	833,000	1,136,000	+303,000	+36%
	PM peak (4-6PM)	261,000	356,000	+94,000	+36%
	Off-peak (6PM-7AM)	377,000	516,000	+139,000	+37%
	Daily total	**1,740,000**	**2,376,000**	**+636,000**	**+37%**
Public transport trips	AM peak (7-9AM)	11,000	22,000	+10,000	+92%
	Inter-peak (9AM-4PM)	29,000	43,000	+15,000	+51%
	PM peak (4-6PM)	9,000	18,000	+9,000	+92%
	Off-peak (6PM-7AM)	9,000	15,000	+6,000	+60%
	Daily total	**58,000**	**97,000**	**+39,000**	**+67%**
Walk/cycling trips	AM peak (7-9AM)	27,000	35,000	+8,000	+31%
	Inter-peak (9AM-4PM)	93,000	122,000	+29,000	+31%
	PM peak (4-6PM)	28,000	36,000	+8,000	+28%
	Off-peak (6PM-7AM)	41,000	54,000	+13,000	+32%
	Daily total	**189,000**	**247,000**	**+58,000**	**+31%**
Total trips	AM peak (7-9AM)	308,000	426,000	+118,000	+38%
	Inter-peak (9AM-4PM)	954,000	1,301,000	+347,000	+36%
	PM peak (4-6PM)	298,000	409,000	+111,000	+37%
	Off-peak (6PM-7AM)	427,000	585,000	+158,000	+37%
	Daily total	**1,987,000**	**2,721,000**	**+734,000**	**+37%**
Sunshine Coast Region					
Person car trips	AM peak (7-9AM)	158,000	209,000	+51,000	+32%
	Inter-peak (9AM-4PM)	499,000	661,000	+162,000	+32%
	PM peak (4-6PM)	154,000	204,000	+50,000	+32%
	Off-peak (6PM-7AM)	223,000	298,000	+74,000	+33%
	Daily total	**1,035,000**	**1,372,000**	**+337,000**	**+33%**
Public transport trips	AM peak (7-9AM)	5,000	8,000	+3,000	+70%
	Inter-peak (9AM-4PM)	14,000	20,000	+7,000	+48%
	PM peak (4-6PM)	4,000	6,000	+2,000	+66%
	Off-peak (6PM-7AM)	3,000	5,000	+2,000	+56%
	Daily total	**25,000**	**39,000**	**+14,000**	**+56%**
Walk/cycling trips	AM peak (7-9AM)	13,000	18,000	+5,000	+40%
	Inter-peak (9AM-4PM)	47,000	66,000	+19,000	+39%
	PM peak (4-6PM)	14,000	20,000	+5,000	+37%
	Off-peak (6PM-7AM)	22,000	29,000	+7,000	+29%
	Daily total	**97,000**	**133,000**	**+36,000**	**+37%**
Total trips	AM peak (7-9AM)	176,000	236,000	+60,000	+34%
	Inter-peak (9AM-4PM)	560,000	747,000	+187,000	+33%
	PM peak (4-6PM)	172,000	229,000	+58,000	+33%
	Off-peak (6PM-7AM)	249,000	331,000	+82,000	+33%
	Daily total	**1,157,000**	**1,543,000**	**+386,000**	**+33%**
Total Region*					
Person car trips	AM peak (7-9AM)	1,343,000	1,756,000	*+413,000*	*+31%*
	Inter-peak (9AM-4PM)	3,931,000	5,176,000	*+1,245,000*	*+32%*
	PM peak (4-6PM)	1,238,000	1,618,000	*+381,000*	*+31%*
	Off-peak (6PM-7AM)	1,767,000	2,336,000	*+570,000*	*+32%*
	Daily total	**8,278,000**	**10,886,000**	***+2,609,000***	***+32%***
Public transport trips	AM peak (7-9AM)	112,000	176,000	*+63,000*	*+56%*
	Inter-peak (9AM-4PM)	197,000	308,000	*+111,000*	*+56%*
	PM peak (4-6PM)	96,000	151,000	*+55,000*	*+58%*
	Off-peak (6PM-7AM)	89,000	140,000	*+50,000*	*+56%*
	Daily total	**495,000**	**775,000**	***+280,000***	***+57%***
Walk/cycling trips	AM peak (7-9AM)	123,000	167,000	*+44,000*	*+35%*
	Inter-peak (9AM-4PM)	415,000	572,000	*+157,000*	*+38%*
	PM peak (4-6PM)	116,000	155,000	*+39,000*	*+34%*
	Off-peak (6PM-7AM)	174,000	237,000	*+62,000*	*+36%*
	Daily total	**828,000**	**1,131,000**	***+302,000***	***+36%***
Total trips	AM peak (7-9AM)	1,578,000	2,098,000	*+520,000*	*+33%*
	Inter-peak (9AM-4PM)	4,543,000	6,057,000	*+1,513,000*	*+33%*
	PM peak (4-6PM)	1,449,000	1,924,000	*+475,000*	*+33%*
	Off-peak (6PM-7AM)	2,031,000	2,713,000	*+682,000*	*+34%*
	Daily total	**9,601,000**	**12,792,000**	***+3,191,000***	***+33%***

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-3 – SEQ car traffic statistics

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Car trips	AM peak (7-9AM)	678,000	877,000	*+198,000*	*+29%*
	Inter-peak (9AM-4PM)	1,981,000	2,591,000	*+610,000*	*+31%*
	PM peak (4-6PM)	666,000	860,000	*+194,000*	*+29%*
	Off-peak (6PM-7AM)	932,000	1,226,000	*+294,000*	*+32%*
	Daily total	**4,258,000**	**5,554,000**	***+1,296,000***	***+30%***
Car kilometres	AM peak (7-9AM)	9,521,000	12,968,000	*+3,447,000*	*+36%*
	Inter-peak (9AM-4PM)	26,398,000	36,424,000	*+10,026,000*	*+38%*
	PM peak (4-6PM)	9,678,000	13,160,000	*+3,482,000*	*+36%*
	Off-peak (6PM-7AM)	14,129,000	19,769,000	*+5,639,000*	*+40%*
	Daily total	**59,726,000**	**82,321,000**	***+22,595,000***	***+38%***
Car hours	AM peak (7-9AM)	228,000	422,000	*+194,000*	*+85%*
	Inter-peak (9AM-4PM)	475,000	736,000	*+262,000*	*+55%*
	PM peak (4-6PM)	215,000	381,000	*+167,000*	*+78%*
	Off-peak (6PM-7AM)	225,000	319,000	*+93,000*	*+41%*
	Daily total	**1,142,000**	**1,858,000**	***+716,000***	***+63%***
Car Average assigned speed (kph)	AM peak (7-9AM)	42	31	*-11*	0
	Inter-peak (9AM-4PM)	56	49	*-6*	0
	PM peak (4-6PM)	45	35	*-11*	0
	Off-peak (6PM-7AM)	63	62	*-1*	0
	Daily total	**52**	**44**	***-8***	**0**
Gold Coast Region					
Car trips	AM peak (7-9AM)	194,000	265,000	+71,000	+37%
	Inter-peak (9AM-4PM)	616,000	842,000	+227,000	+37%
	PM peak (4-6PM)	202,000	277,000	+75,000	+37%
	Off-peak (6PM-7AM)	289,000	398,000	+109,000	+38%
	Daily total	**1,301,000**	**1,782,000**	**+482,000**	**+37%**
Car kilometres	AM peak (7-9AM)	2,405,000	3,338,000	+933,000	+39%
	Inter-peak (9AM-4PM)	7,127,000	9,946,000	+2,820,000	+40%
	PM peak (4-6PM)	2,507,000	3,524,000	+1,018,000	+41%
	Off-peak (6PM-7AM)	3,672,000	5,228,000	+1,556,000	+42%
	Daily total	**15,710,000**	**22,037,000**	**+6,327,000**	**+40%**
Car hours	AM peak (7-9AM)	44,000	88,000	+45,000	+102%
	Inter-peak (9AM-4PM)	110,000	179,000	+69,000	+62%
	PM peak (4-6PM)	44,000	89,000	+45,000	+101%
	Off-peak (6PM-7AM)	52,000	74,000	+22,000	+42%
	Daily total	**251,000**	**431,000**	**+180,000**	**+72%**
Car Average assigned speed (kph)	AM peak (7-9AM)	55	38	-17	-31%
	Inter-peak (9AM-4PM)	65	56	-9	-14%
	PM peak (4-6PM)	57	40	-17	-30%
	Off-peak (6PM-7AM)	70	70	0	0%
	Daily total	**63**	**51**	**-12**	**-18%**
Sunshine Coast Region					
Car trips	AM peak (7-9AM)	113,000	149,000	+37,000	+33%
	Inter-peak (9AM-4PM)	366,000	485,000	+119,000	+32%
	PM peak (4-6PM)	119,000	157,000	+38,000	+32%
	Off-peak (6PM-7AM)	170,000	226,000	+57,000	+33%
	Daily total	**767,000**	**1,018,000**	**+251,000**	**+33%**
Car kilometres	AM peak (7-9AM)	1,588,000	2,106,000	+517,000	+33%
	Inter-peak (9AM-4PM)	4,736,000	6,314,000	+1,578,000	+33%
	PM peak (4-6PM)	1,670,000	2,205,000	+535,000	+32%
	Off-peak (6PM-7AM)	2,497,000	3,343,000	+846,000	+34%
	Daily total	**10,491,000**	**13,967,000**	**+3,476,000**	**+33%**
Car hours	AM peak (7-9AM)	25,000	41,000	+15,000	+60%
	Inter-peak (9AM-4PM)	70,000	103,000	+33,000	+46%
	PM peak (4-6PM)	27,000	41,000	+15,000	+55%
	Off-peak (6PM-7AM)	34,000	47,000	+13,000	+37%
	Daily total	**156,000**	**232,000**	**+75,000**	**+48%**
Car Average assigned speed (kph)	AM peak (7-9AM)	63	52	-11	-17%
	Inter-peak (9AM-4PM)	67	61	-6	-9%
	PM peak (4-6PM)	63	54	-9	-15%
	Off-peak (6PM-7AM)	73	71	-2	-2%
	Daily total	**67**	**60**	**-7**	**-10%**
Total Region*					
Car trips	AM peak (7-9AM)	951,000	1,244,000	+294,000	*+31%*
	Inter-peak (9AM-4PM)	2,867,000	3,783,000	+916,000	*+32%*
	PM peak (4-6PM)	951,000	1,243,000	+292,000	*+31%*
	Off-peak (6PM-7AM)	1,339,000	1,775,000	+436,000	*+33%*
	Daily total	**6,108,000**	**8,045,000**	**+1,938,000**	***+32%***
Car kilometres	AM peak (7-9AM)	13,435,000	18,297,000	+4,862,000	*+36%*
	Inter-peak (9AM-4PM)	38,033,000	52,358,000	+14,325,000	*+38%*
	PM peak (4-6PM)	13,769,000	18,768,000	+4,999,000	*+36%*
	Off-peak (6PM-7AM)	20,173,000	28,154,000	+7,982,000	*+40%*
	Daily total	**85,409,000**	**117,577,000**	**+32,167,000**	***+38%***
Car hours	AM peak (7-9AM)	296,000	548,000	+252,000	*+85%*
	Inter-peak (9AM-4PM)	653,000	1,014,000	+361,000	*+55%*
	PM peak (4-6PM)	284,000	508,000	+224,000	*+79%*
	Off-peak (6PM-7AM)	311,000	438,000	+127,000	*+41%*
	Daily total	**1,544,000**	**2,508,000**	**+965,000**	***+63%***
Car Average assigned speed (kph)	AM peak (7-9AM)	45	33	-12	-27%
	Inter-peak (9AM-4PM)	58	52	-7	-11%
	PM peak (4-6PM)	48	37	-12	-24%
	Off-peak (6PM-7AM)	65	64	-1	-1%
	Daily total	**55**	**47**	**-8**	**-15%**

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-4 – SEQ commercial vehicle traffic statistics

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Commercial Vehicle trips	AM peak (7-9AM)	43,000	57,000	+15,000	*+34%*
	Inter-peak (9AM-4PM)	136,000	183,000	+47,000	*+35%*
	PM peak (4-6PM)	48,000	66,000	+17,000	*+36%*
	Off-peak (6PM-7AM)	63,000	86,000	+22,000	*+36%*
	Daily total	**290,000**	**392,000**	**+102,000**	***+35%***
Commercial Vehicle kilometres	AM peak (7-9AM)	640,000	908,000	+268,000	*+42%*
	Inter-peak (9AM-4PM)	2,079,000	2,860,000	+781,000	*+38%*
	PM peak (4-6PM)	731,000	1,036,000	+305,000	*+42%*
	Off-peak (6PM-7AM)	1,151,000	1,597,000	+446,000	*+39%*
	Daily total	**4,601,000**	**6,401,000**	**+1,800,000**	***+39%***
Commercial Vehicle hours	AM peak (7-9AM)	14,000	25,000	+12,000	*+86%*
	Inter-peak (9AM-4PM)	35,000	54,000	+19,000	*+56%*
	PM peak (4-6PM)	15,000	27,000	+12,000	*+81%*
	Off-peak (6PM-7AM)	17,000	24,000	+7,000	*+41%*
	Daily total	**80,000**	**130,000**	**+50,000**	***+62%***
Gold Coast Region					
Commercial Vehicle trips	AM peak (7-9AM)	11,000	15,000	+4,000	+38%
	Inter-peak (9AM-4PM)	37,000	51,000	+14,000	+37%
	PM peak (4-6PM)	12,000	17,000	+5,000	+40%
	Off-peak (6PM-7AM)	17,000	24,000	+7,000	+40%
	Daily total	**78,000**	**108,000**	**+30,000**	**+38%**
Commercial Vehicle kilometres	AM peak (7-9AM)	136,000	188,000	+52,000	+39%
	Inter-peak (9AM-4PM)	468,000	643,000	+175,000	+37%
	PM peak (4-6PM)	154,000	216,000	+62,000	+40%
	Off-peak (6PM-7AM)	264,000	360,000	+97,000	+37%
	Daily total	**1,022,000**	**1,408,000**	**+386,000**	**+38%**
Commercial Vehicle hours	AM peak (7-9AM)	2,000	5,000	+3,000	+114%
	Inter-peak (9AM-4PM)	7,000	11,000	+4,000	+64%
	PM peak (4-6PM)	3,000	5,000	+3,000	+109%
	Off-peak (6PM-7AM)	3,000	5,000	+1,000	+39%
	Daily total	**15,000**	**25,000**	**+11,000**	**+74%**
Sunshine Coast Region					
Commercial Vehicle trips	AM peak (7-9AM)	5,000	8,000	+2,000	+43%
	Inter-peak (9AM-4PM)	18,000	25,000	+7,000	+39%
	PM peak (4-6PM)	7,000	9,000	+2,000	+36%
	Off-peak (6PM-7AM)	8,000	12,000	+3,000	+38%
	Daily total	**39,000**	**54,000**	**+15,000**	**+39%**
Commercial Vehicle kilometres	AM peak (7-9AM)	95,000	129,000	+34,000	+36%
	Inter-peak (9AM-4PM)	291,000	370,000	+79,000	+27%
	PM peak (4-6PM)	104,000	144,000	+41,000	+39%
	Off-peak (6PM-7AM)	164,000	225,000	+60,000	+37%
	Daily total	**654,000**	**868,000**	**+214,000**	**+33%**
Commercial Vehicle hours	AM peak (7-9AM)	1,000	2,000	+1,000	+61%
	Inter-peak (9AM-4PM)	4,000	6,000	+2,000	+41%
	PM peak (4-6PM)	1,000	2,000	+1,000	+62%
	Off-peak (6PM-7AM)	2,000	3,000	+1,000	+39%
	Daily total	**9,000**	**13,000**	**+4,000**	**+47%**
Total Region*					
Commercial Vehicle trips	AM peak (7-9AM)	56,000	76,000	+20,000	*+35%*
	Inter-peak (9AM-4PM)	183,000	247,000	+64,000	*+35%*
	PM peak (4-6PM)	65,000	88,000	+23,000	*+36%*
	Off-peak (6PM-7AM)	83,000	113,000	+30,000	*+36%*
	Daily total	**387,000**	**524,000**	**+137,000**	***+35%***
Commercial Vehicle kilometres	AM peak (7-9AM)	863,000	1,213,000	+350,000	*+41%*
	Inter-peak (9AM-4PM)	2,814,000	3,840,000	+1,026,000	*+36%*
	PM peak (4-6PM)	981,000	1,384,000	+403,000	*+41%*
	Off-peak (6PM-7AM)	1,565,000	2,160,000	+596,000	*+38%*
	Daily total	**6,223,000**	**8,598,000**	**+2,375,000**	***+38%***
Commercial Vehicle hours	AM peak (7-9AM)	17,000	32,000	+15,000	*+87%*
	Inter-peak (9AM-4PM)	45,000	70,000	+25,000	*+55%*
	PM peak (4-6PM)	19,000	34,000	+16,000	*+83%*
	Off-peak (6PM-7AM)	22,000	31,000	+9,000	*+40%*
	Daily total	**103,000**	**167,000**	**+64,000**	***+63%***

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-5 – SEQ total public transport, key metrics

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Total PT boardings	AM peak (7-9AM)	135,000	232,000	+97,000	*+72%*
	Inter-peak (9AM-4PM)	237,000	382,000	+145,000	*+61%*
	PM peak (4-6PM)	117,000	200,000	+83,000	*+71%*
	Off-peak (6PM-7AM)	99,000	159,000	+60,000	*+60%*
	Daily total	**588,000**	**972,000**	**+384,000**	***+65%***
Total in vehicle passenger kilometres	AM peak (7-9AM)	1,973,000	3,968,000	+1,994,000	*+101%*
	Inter-peak (9AM-4PM)	3,399,000	6,341,000	+2,942,000	*+87%*
	PM peak (4-6PM)	1,590,000	3,305,000	+1,715,000	*+108%*
	Off-peak (6PM-7AM)	1,186,000	2,281,000	+1,095,000	*+92%*
	Daily total	**8,148,000**	**15,894,000**	**+7,746,000**	***+95%***
Total in vehicle passenger hours	AM peak (7-9AM)	52,000	100,000	+48,000	*+93%*
	Inter-peak (9AM-4PM)	81,000	142,000	+61,000	*+75%*
	PM peak (4-6PM)	42,000	80,000	+39,000	*+92%*
	Off-peak (6PM-7AM)	30,000	52,000	+23,000	*+77%*
	Daily total	**204,000**	**374,000**	**+170,000**	***+83%***
Gold Coast Region					
Total PT boardings	AM peak (7-9AM)	19,000	52,000	+33,000	+173%
	Inter-peak (9AM-4PM)	47,000	92,000	+45,000	+95%
	PM peak (4-6PM)	16,000	43,000	+26,000	+161%
	Off-peak (6PM-7AM)	15,000	32,000	+17,000	+112%
	Daily total	**97,000**	**218,000**	**+121,000**	**+124%**
Total in vehicle passenger kilometres	AM peak (7-9AM)	387,000	1,665,000	+1,278,000	+331%
	Inter-peak (9AM-4PM)	857,000	3,028,000	+2,171,000	+253%
	PM peak (4-6PM)	312,000	1,429,000	+1,117,000	+358%
	Off-peak (6PM-7AM)	235,000	851,000	+615,000	+262%
	Daily total	**1,791,000**	**6,972,000**	**+5,181,000**	**+289%**
Total in vehicle passenger hours	AM peak (7-9AM)	7,000	28,000	+21,000	+294%
	Inter-peak (9AM-4PM)	16,000	51,000	+35,000	+217%
	PM peak (4-6PM)	6,000	24,000	+18,000	+311%
	Off-peak (6PM-7AM)	5,000	15,000	+10,000	+217%
	Daily total	**34,000**	**118,000**	**+84,000**	**+249%**
Sunshine Coast Region					
Total PT boardings	AM peak (7-9AM)	7,000	19,000	+12,000	+165%
	Inter-peak (9AM-4PM)	19,000	36,000	+17,000	+92%
	PM peak (4-6PM)	7,000	15,000	+9,000	+132%
	Off-peak (6PM-7AM)	5,000	9,000	+4,000	+89%
	Daily total	**37,000**	**79,000**	**+42,000**	**+113%**
Total in vehicle passenger kilometres	AM peak (7-9AM)	257,000	766,000	+509,000	+198%
	Inter-peak (9AM-4PM)	672,000	1,632,000	+960,000	+143%
	PM peak (4-6PM)	233,000	696,000	+463,000	+198%
	Off-peak (6PM-7AM)	135,000	336,000	+200,000	+148%
	Daily total	**1,298,000**	**3,429,000**	**+2,131,000**	**+164%**
Total in vehicle passenger hours	AM peak (7-9AM)	5,000	13,000	+8,000	+164%
	Inter-peak (9AM-4PM)	12,000	28,000	+15,000	+121%
	PM peak (4-6PM)	5,000	12,000	+7,000	+155%
	Off-peak (6PM-7AM)	3,000	6,000	+3,000	+124%
	Daily total	**24,000**	**58,000**	**+33,000**	**+136%**
Total Region*					
Total PT boardings**	AM peak (7-9AM)	151,000	257,000	+107,000	*+71%*
	Inter-peak (9AM-4PM)	280,000	440,000	+160,000	*+57%*
	PM peak (4-6PM)	129,000	219,000	+90,000	*+70%*
	Off-peak (6PM-7AM)	110,000	176,000	+65,000	*+59%*
	Daily total	**671,000**	**1,093,000**	**+422,000**	***+63%***
Total in vehicle passenger kilometres**	AM peak (7-9AM)	2,087,000	4,166,000	+2,079,000	*+100%*
	Inter-peak (9AM-4PM)	3,716,000	6,789,000	+3,073,000	*+83%*
	PM peak (4-6PM)	1,681,000	3,462,000	+1,780,000	*+106%*
	Off-peak (6PM-7AM)	1,261,000	2,400,000	+1,139,000	*+90%*
	Daily total	**8,746,000**	**16,817,000**	**+8,071,000**	***+92%***
Total in vehicle passenger hours**	AM peak (7-9AM)	55,000	107,000	+51,000	*+93%*
	Inter-peak (9AM-4PM)	90,000	155,000	+65,000	*+73%*
	PM peak (4-6PM)	44,000	86,000	+41,000	*+92%*
	Off-peak (6PM-7AM)	32,000	56,000	+24,000	*+76%*
	Daily total	**222,000**	**404,000**	**+182,000**	***+82%***

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

**Total PT metrics include data for ferry. However, analysis of ferry network performance is not provided in this report due to the small role it plays in the overall transport task.

Appendix Table F-6 – SEQ in-vehicle passenger kilometres

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Rail passenger kilometres	AM peak (7-9AM)	1,235,000	2,867,000	+1,633,000	*+132%*
	Inter-peak (9AM-4PM)	2,154,000	4,402,000	+2,248,000	*+104%*
	PM peak (4-6PM)	1,001,000	2,422,000	+1,421,000	*+142%*
	Off-peak (6PM-7AM)	712,000	1,604,000	+892,000	*+125%*
	Daily total	**5,102,000**	**11,295,000**	**+6,194,000**	***+121%***
Bus passenger kilometres	AM peak (7-9AM)	729,000	1,087,000	+358,000	*+49%*
	Inter-peak (9AM-4PM)	1,221,000	1,902,000	+681,000	*+56%*
	PM peak (4-6PM)	576,000	863,000	+287,000	*+50%*
	Off-peak (6PM-7AM)	465,000	664,000	+199,000	*+43%*
	Daily total	**2,990,000**	**4,515,000**	**+1,525,000**	***+51%***
Gold Coast Region					
Rail passenger kilometres	AM peak (7-9AM)	313,000	1,528,000	+1,215,000	+388%
	Inter-peak (9AM-4PM)	661,000	2,742,000	+2,081,000	+315%
	PM peak (4-6PM)	252,000	1,320,000	+1,068,000	+423%
	Off-peak (6PM-7AM)	188,000	765,000	+577,000	+307%
	Daily total	**1,414,000**	**6,356,000**	**+4,941,000**	**+349%**
Light rail passenger kilometres	AM peak (7-9AM)	13,300	44,100	+30,800	+231%
	Inter-peak (9AM-4PM)	35,100	100,300	+65,100	+185%
	PM peak (4-6PM)	12,500	42,000	+29,500	+237%
	Off-peak (6PM-7AM)	15,300	40,500	+25,300	+165%
	Daily total	**76,200**	**226,900**	**+150,700**	**+198%**
Bus passenger kilometres	AM peak (7-9AM)	60,000	92,000	+32,000	+53%
	Inter-peak (9AM-4PM)	161,000	186,000	+25,000	+15%
	PM peak (4-6PM)	47,000	66,000	+19,000	+40%
	Off-peak (6PM-7AM)	32,000	45,000	+13,000	+41%
	Daily total	**301,000**	**389,000**	**+89,000**	**+29%**
Sunshine Coast Region					
Rail passenger kilometres	AM peak (7-9AM)	211,000	694,000	+483,000	+229%
	Inter-peak (9AM-4PM)	528,000	1,450,000	+922,000	+175%
	PM peak (4-6PM)	200,000	640,000	+440,000	+220%
	Off-peak (6PM-7AM)	106,000	295,000	+189,000	+177%
	Daily total	**1,045,000**	**3,079,000**	**+2,034,000**	**+195%**
Bus passenger kilometres	AM peak (7-9AM)	46,000	72,000	+25,000	+55%
	Inter-peak (9AM-4PM)	144,000	182,000	+38,000	+26%
	PM peak (4-6PM)	34,000	56,000	+23,000	+68%
	Off-peak (6PM-7AM)	29,000	40,000	+12,000	+40%
	Daily total	**253,000**	**350,000**	**+97,000**	**+38%**
Total Region*					
Rail passenger kilometres	AM peak (7-9AM)	1,235,000	2,867,000	+1,633,000	*+132%*
	Inter-peak (9AM-4PM)	2,154,000	4,402,000	+2,248,000	*+104%*
	PM peak (4-6PM)	1,001,000	2,422,000	+1,421,000	*+142%*
	Off-peak (6PM-7AM)	712,000	1,604,000	+892,000	*+125%*
	Daily total	**5,102,000**	**11,295,000**	**+6,194,000**	***+121%***
Light rail passenger kilometres	AM peak (7-9AM)	13,000	44,000	+31,000	*+231%*
	Inter-peak (9AM-4PM)	35,000	100,000	+65,000	*+185%*
	PM peak (4-6PM)	12,000	42,000	+30,000	*+237%*
	Off-peak (6PM-7AM)	15,000	41,000	+25,000	*+165%*
	Daily total	**76,000**	**227,000**	**+151,000**	***+198%***
Bus passenger kilometres	AM peak (7-9AM)	829,000	1,240,000	+411,000	+50%
	Inter-peak (9AM-4PM)	1,503,000	2,250,000	+747,000	+50%
	PM peak (4-6PM)	655,000	977,000	+323,000	+49%
	Off-peak (6PM-7AM)	525,000	743,000	+218,000	+41%
	Daily total	**3,512,000**	**5,211,000**	**+1,699,000**	**+48%**

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-7 – SEQ in-vehicle passenger hours

Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Rail passenger hours	AM peak (7-9AM)	27,000	56,000	+29,000	*+108%*
	Inter-peak (9AM-4PM)	45,000	84,000	+39,000	*+87%*
	PM peak (4-6PM)	22,000	48,000	+26,000	*+115%*
	Off-peak (6PM-7AM)	17,000	34,000	+17,000	*+102%*
	Daily total	**111,000**	**223,000**	**+111,000**	***+100%***
Bus passenger hours	AM peak (7-9AM)	24,000	43,000	+19,000	*+76%*
	Inter-peak (9AM-4PM)	35,000	56,000	+21,000	*+61%*
	PM peak (4-6PM)	19,000	31,000	+13,000	*+68%*
	Off-peak (6PM-7AM)	12,000	18,000	+5,000	*+43%*
	Daily total	**90,000**	**148,000**	**+58,000**	***+64%***
Gold Coast Region					
Rail passenger hours	AM peak (7-9AM)	5,000	23,000	+19,000	+394%
	Inter-peak (9AM-4PM)	10,000	42,000	+32,000	+319%
	PM peak (4-6PM)	4,000	20,000	+16,000	+422%
	Off-peak (6PM-7AM)	3,000	12,000	+9,000	+292%
	Daily total	**22,000**	**97,000**	**+76,000**	**+350%**
Light rail passenger hours	AM peak (7-9AM)	600	1,600	+1000	+152%
	Inter-peak (9AM-4PM)	1,700	3,800	+2100	+122%
	PM peak (4-6PM)	600	1,600	+1000	+164%
	Off-peak (6PM-7AM)	700	1,600	+900	+115%
	Daily total	**3,700**	**8,600**	**+4900**	**+133%**
Bus passenger hours	AM peak (7-9AM)	2,000	3,000	+1,000	+84%
	Inter-peak (9AM-4PM)	4,000	5,000	+1,000	+23%
	PM peak (4-6PM)	1,000	2,000	+1,000	+64%
	Off-peak (6PM-7AM)	1,000	1,000	0,000	+39%
	Daily total	**8,000**	**12,000**	**+4,000**	**+44%**
Sunshine Coast Region					
Rail passenger hours	AM peak (7-9AM)	4,000	11,000	+7,000	+187%
	Inter-peak (9AM-4PM)	9,000	23,000	+14,000	+150%
	PM peak (4-6PM)	4,000	10,000	+6,000	+170%
	Off-peak (6PM-7AM)	2,000	5,000	+3,000	+147%
	Daily total	**18,000**	**48,000**	**+30,000**	**+161%**
Bus passenger hours	AM peak (7-9AM)	1,000	2,000	+1,000	+89%
	Inter-peak (9AM-4PM)	3,000	5,000	+1,000	+43%
	PM peak (4-6PM)	1,000	2,000	+1,000	+91%
	Off-peak (6PM-7AM)	1,000	1,000	0,000	+52%
	Daily total	**6,000**	**10,000**	**+4,000**	**+60%**
Total Region*					
Rail passenger hours	AM peak (7-9AM)	27,000	56,000	+29,000	*+108%*
	Inter-peak (9AM-4PM)	45,000	84,000	+39,000	*+87%*
	PM peak (4-6PM)	22,000	48,000	+26,000	*+115%*
	Off-peak (6PM-7AM)	17,000	34,000	+17,000	*+102%*
	Daily total	**111,000**	**223,000**	**+111,000**	***+100%***
Light rail passenger hours	AM peak (7-9AM)	1,000	2,000	+1,000	*+152%*
	Inter-peak (9AM-4PM)	2,000	4,000	+2,000	*+122%*
	PM peak (4-6PM)	1,000	2,000	+1,000	*+164%*
	Off-peak (6PM-7AM)	1,000	2,000	+1,000	*+115%*
	Daily total	**4,000**	**9,000**	**+5,000**	***+133%***
Bus passenger hours	AM peak (7-9AM)	27,000	48,000	+21,000	*+77%*
	Inter-peak (9AM-4PM)	42,000	66,000	+24,000	*+56%*
	PM peak (4-6PM)	21,000	35,000	+14,000	*+68%*
	Off-peak (6PM-7AM)	14,000	20,000	+6,000	*+43%*
	Daily total	**104,000**	**168,000**	**+65,000**	***+62%***

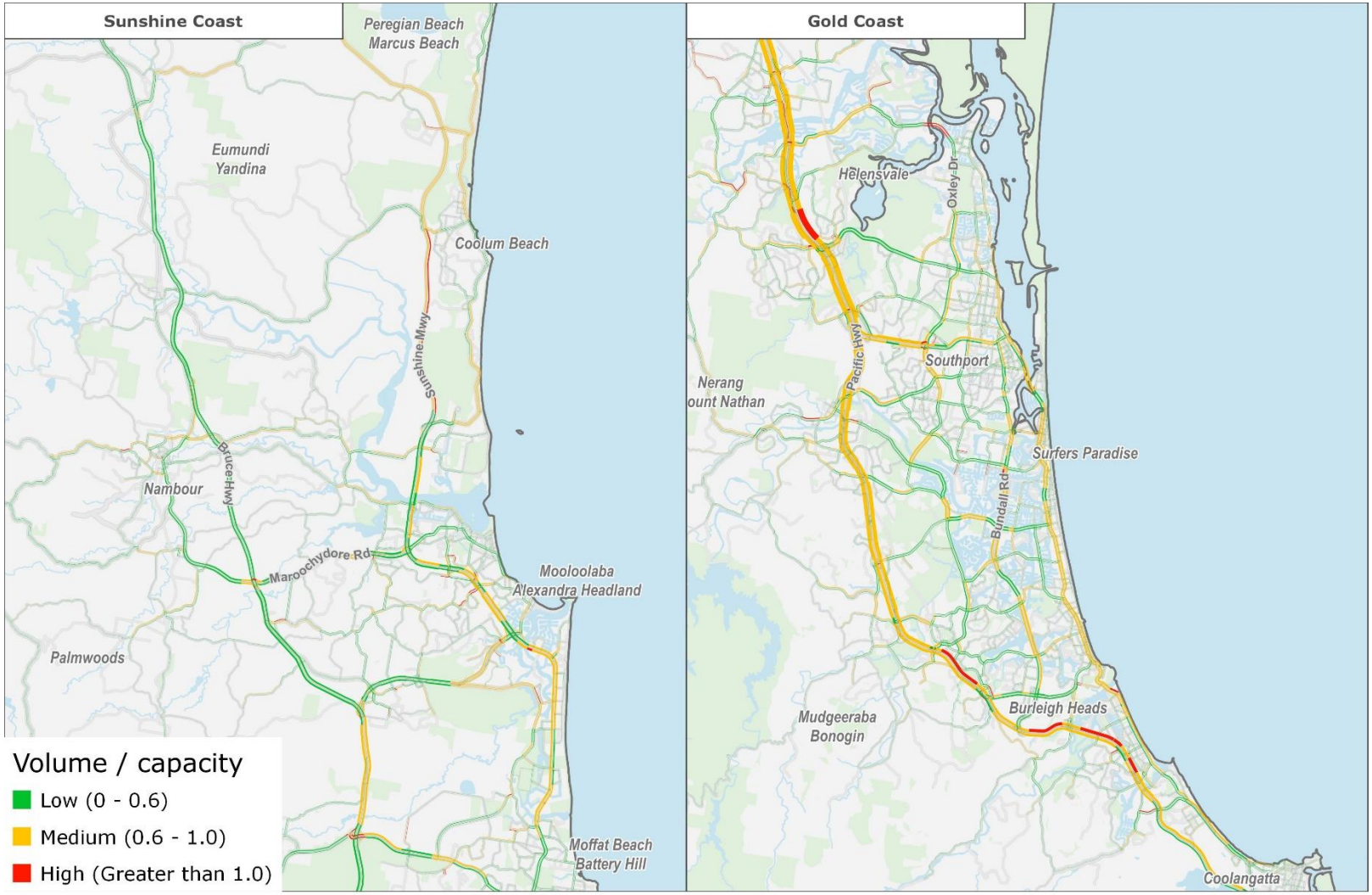
* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

Appendix Table F-8 – SEQ public transport boardings

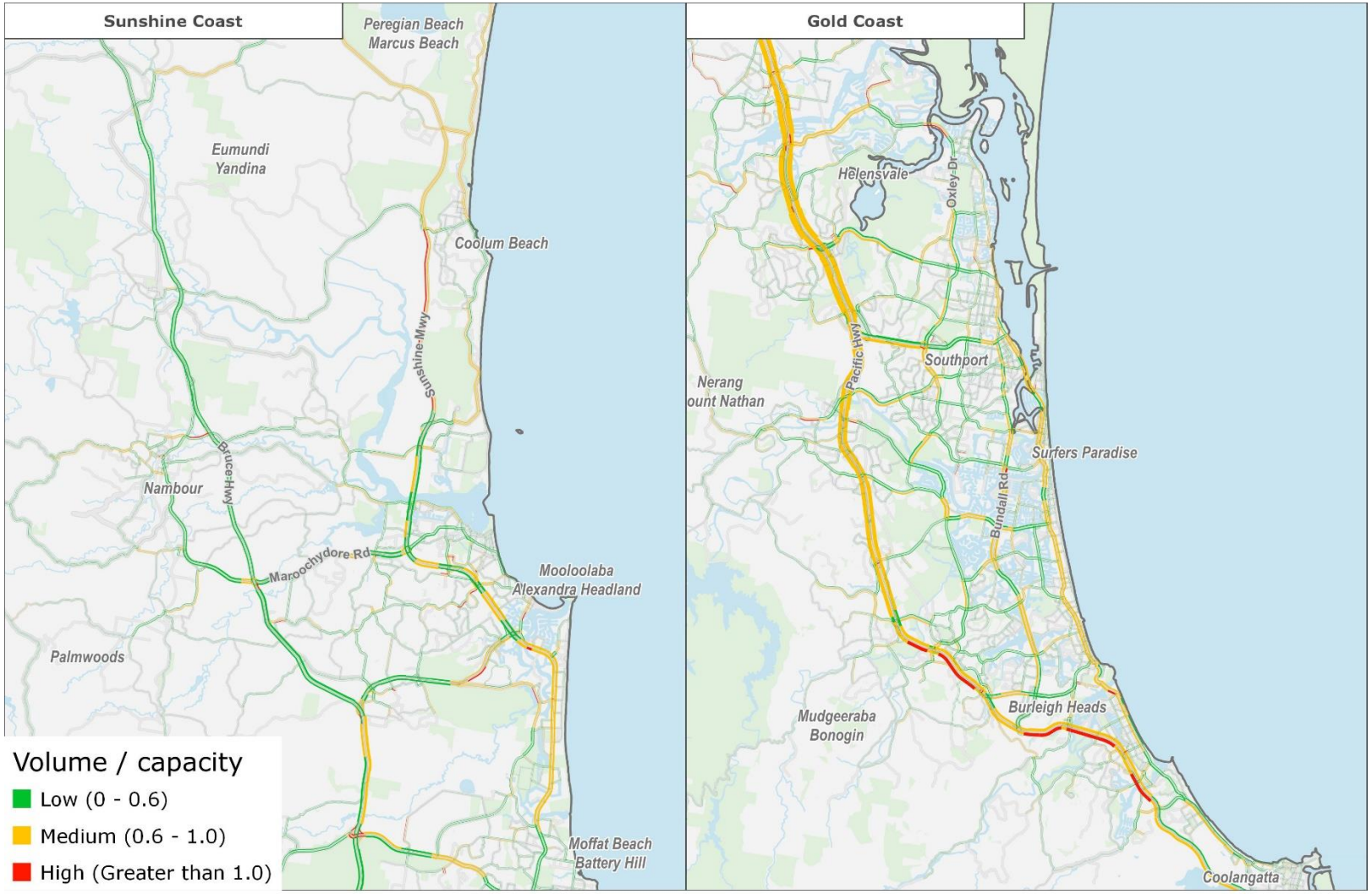
Metric	Time period	2016	2031	Change	% change
Brisbane GCCSA					
Rail boardings	AM peak (7-9AM)	54,000	111,000	+57,000	*+105%*
	Inter-peak (9AM-4PM)	86,000	155,000	+69,000	*+80%*
	PM peak (4-6PM)	47,000	96,000	+48,000	*+102%*
	Off-peak (6PM-7AM)	43,000	79,000	+36,000	*+84%*
	Daily total	**231,000**	**441,000**	**+210,000**	***+91%***
Bus boardings	AM peak (7-9AM)	78,000	118,000	+39,000	*+50%*
	Inter-peak (9AM-4PM)	145,000	218,000	+73,000	*+50%*
	PM peak (4-6PM)	66,000	99,000	+33,000	*+51%*
	Off-peak (6PM-7AM)	54,000	77,000	+23,000	*+43%*
	Daily total	**343,000**	**512,000**	**+169,000**	***+49%***
Gold Coast Region					
Rail boardings	AM peak (7-9AM)	7,000	32,000	+25,000	+356%
	Inter-peak (9AM-4PM)	15,000	49,000	+34,000	+221%
	PM peak (4-6PM)	7,000	27,000	+21,000	+317%
	Off-peak (6PM-7AM)	6,000	18,000	+12,000	+200%
	Daily total	**35,000**	**126,000**	**+92,000**	**+262%**
Light rail boardings	AM peak (7-9AM)	3,800	7,000	+3,200	+83%
	Inter-peak (9AM-4PM)	11,100	17,900	+6,800	+61%
	PM peak (4-6PM)	3,900	7,100	+3,200	+81%
	Off-peak (6PM-7AM)	4,700	7,600	+2,900	+62%
	Daily total	**23,600**	**39,600**	**+16,100**	**+68%**
Bus boardings	AM peak (7-9AM)	8,000	13,000	+4,000	+55%
	Inter-peak (9AM-4PM)	21,000	25,000	+4,000	+21%
	PM peak (4-6PM)	6,000	9,000	+3,000	+44%
	Off-peak (6PM-7AM)	4,000	6,000	+2,000	+40%
	Daily total	**39,000**	**52,000**	**+13,000**	**+34%**
Sunshine Coast Region					
Rail boardings	AM peak (7-9AM)	3,000	12,000	+9,000	+303%
	Inter-peak (9AM-4PM)	6,000	19,000	+12,000	+191%
	PM peak (4-6PM)	4,000	11,000	+7,000	+185%
	Off-peak (6PM-7AM)	2,000	5,000	+3,000	+130%
	Daily total	**15,000**	**46,000**	**+31,000**	**+202%**
Bus boardings	AM peak (7-9AM)	4,000	7,000	+3,000	+65%
	Inter-peak (9AM-4PM)	12,000	17,000	+5,000	+40%
	PM peak (4-6PM)	3,000	5,000	+2,000	+66%
	Off-peak (6PM-7AM)	3,000	4,000	+1,000	+54%
	Daily total	**22,000**	**33,000**	**+11,000**	**+50%**
Total Region*					
Rail boardings	AM peak (7-9AM)	54,000	111,000	+57,000	*+105%*
	Inter-peak (9AM-4PM)	86,000	155,000	+69,000	*+80%*
	PM peak (4-6PM)	47,000	96,000	+48,000	*+102%*
	Off-peak (6PM-7AM)	43,000	79,000	+36,000	*+84%*
	Daily total	**231,000**	**441,000**	**+210,000**	***+91%***
Light rail boardings	AM peak (7-9AM)	4,000	7,000	+3,000	*+83%*
	Inter-peak (9AM-4PM)	11,000	18,000	+7,000	*+61%*
	PM peak (4-6PM)	4,000	7,000	+3,000	*+81%*
	Off-peak (6PM-7AM)	5,000	8,000	+3,000	*+62%*
	Daily total	**24,000**	**40,000**	**+16,000**	***+68%***
Bus boardings	AM peak (7-9AM)	90,000	136,000	+46,000	*+51%*
	Inter-peak (9AM-4PM)	177,000	259,000	+82,000	*+46%*
	PM peak (4-6PM)	74,000	112,000	+37,000	*+50%*
	Off-peak (6PM-7AM)	61,000	87,000	+26,000	*+42%*
	Daily total	**403,000**	**593,000**	**+191,000**	***+47%***

* Total values do not sum due to cross-region trips (e.g. Brisbane to Gold Coast) being counted once in each Brisbane GCCSA and Gold Coast Region. 'Total Region' measures unique trips made within the three combined regions, i.e. without double counting of cross-region trips.

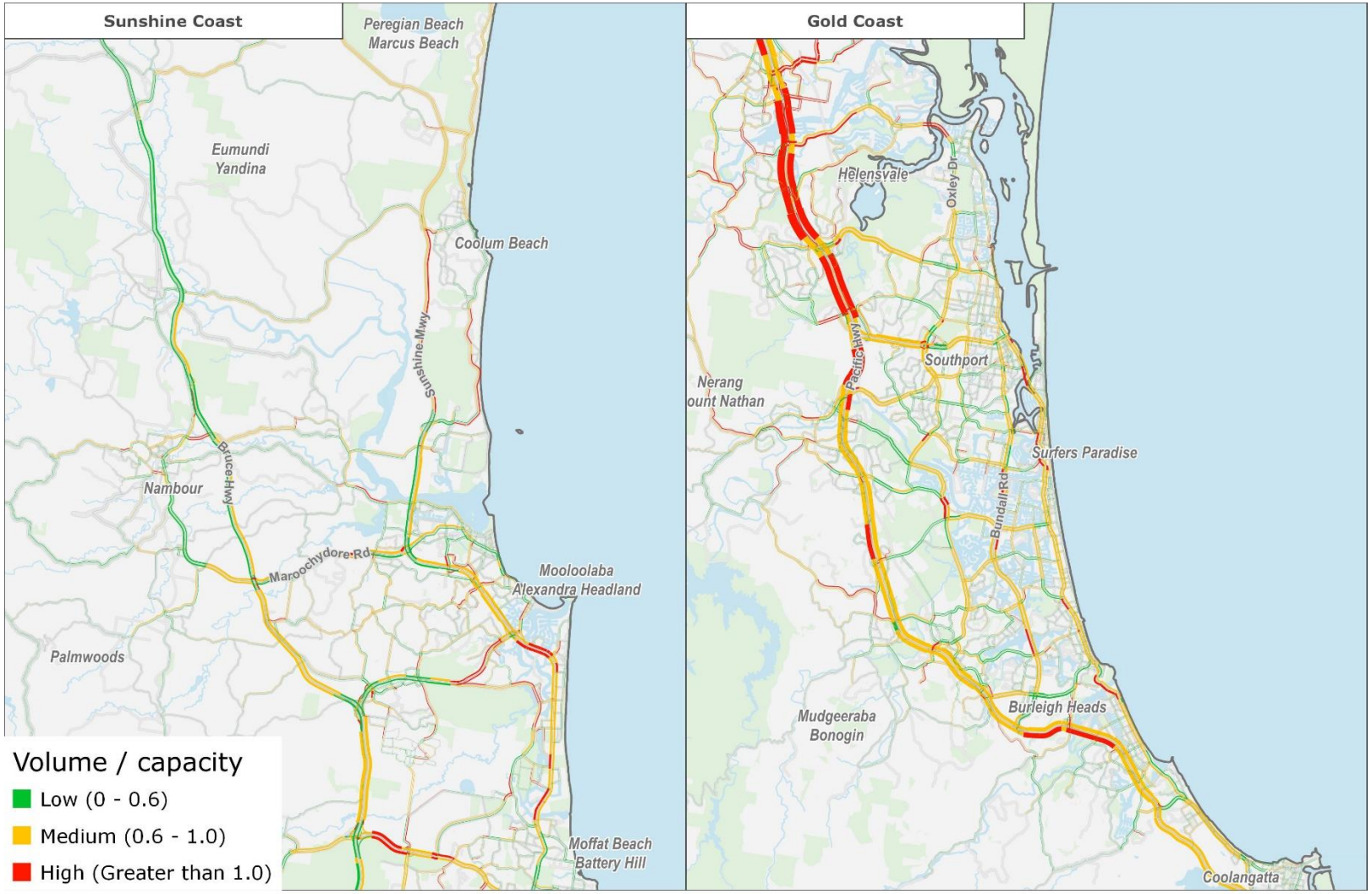
Appendix Figure F-1 – Gold Coast and Sunshine Coast weekday traffic volume / road capacity - 2016 1-hour AM peak



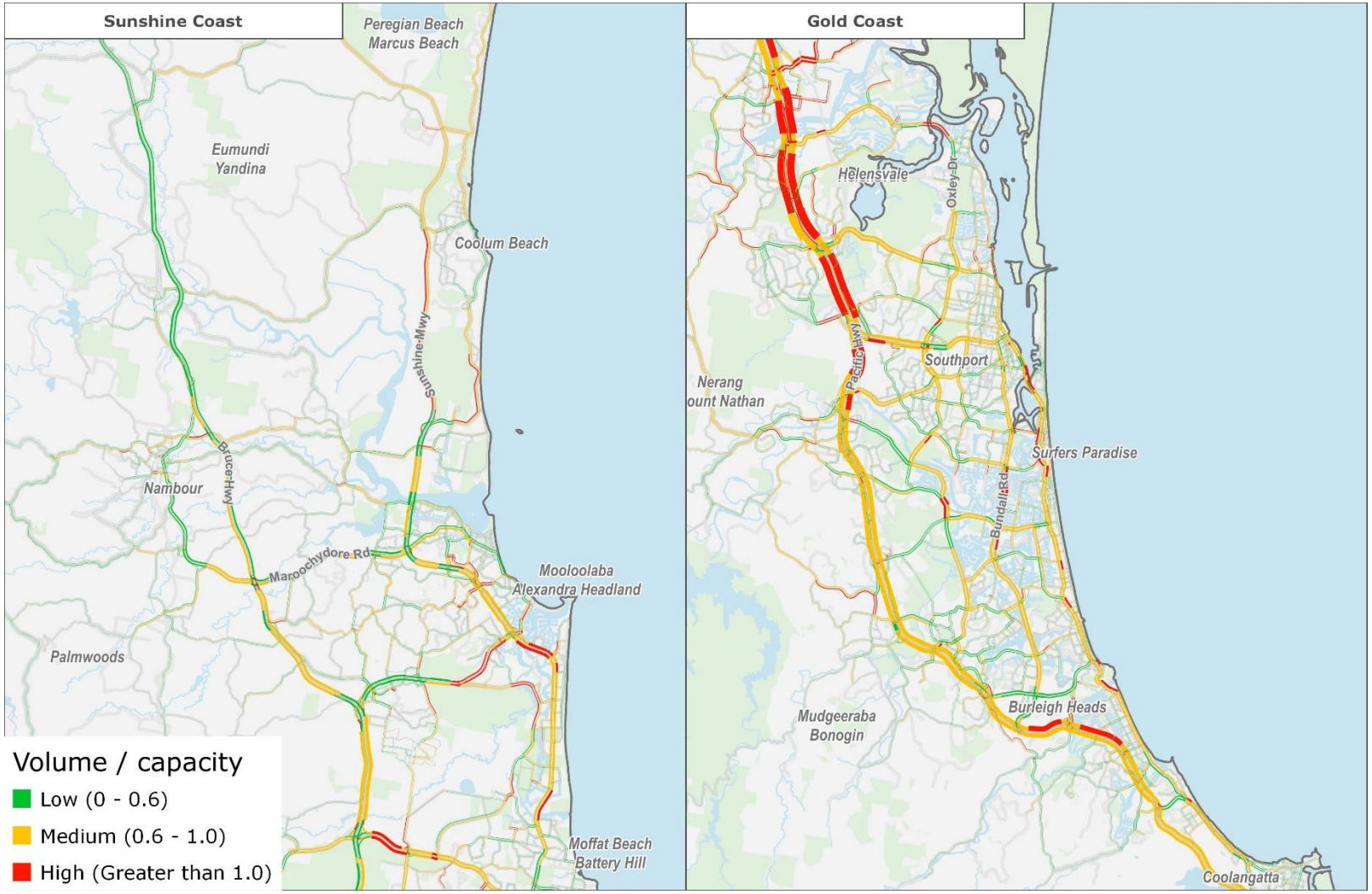
Appendix Figure F-2 – Gold Coast and Sunshine Coast weekday traffic volume / road capacity - 2016 1-hour PM peak



Appendix Figure F-3 – Gold Coast and Sunshine Coast weekday traffic volume / road capacity - 2031 1-hour AM peak



Appendix Figure F-4 – Gold Coast and Sunshine Coast weekday traffic volume / road capacity - 2031 1-hour PM peak



In the Gold Coast, significant levels of congestion are observed on the Pacific Motorway connecting with Brisbane, particularly in 2031 (Appendix Figure F-1 to Appendix Figure F-4). There are very limited sections of the road network on the Sunshine Coast operating under congested conditions.