Veitch Lister Consulting Pty Ltd

South East Queensland Travel Modelling Report

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PREPARED FOR
Infrastructure Australia

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South East Queensland (SEQ) – Travel modelling report

Project No. 14-011

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16/07/2014	A	MV/MJ/TS	JM	MV	Final Draft Report
13/11/2014	B	MV/MJ/TS	MV	MV	Final Report

Contents

List of Figures

List of Tables

1. Introduction

1.1 Background

In April 2014 Veitch Lister Consulting (VLC) was commissioned by Infrastructure Australia (IA) to produce travel demand forecasts and transport network performance assessments for South East Queensland (SEQ) for 2011 and 2031. This document presents the results of this work.

The 2031 travel predictions and transport network performance assessments have been produced for a low transport investment scenario - i.e. the transport networks (road and public transport) used in the modelling only included current transport network infrastructure and services, supplemented by committed and "highly likely" transport network enhancements.

The travel predictions and transport system performance measures presented in this report have been generated using VLC's Zenith model - a four-step multimodal model of SEQ encompassing the Brisbane region and the Gold and Sunshine Coasts. The area modelled extends from Coolangatta in the south to Noosa in the north.

1.2 Purpose of this investigation

The primary purpose of this consulting commission is to provide input to the Australian Infrastructure Audit (AIA) being conducted by Infrastructure Australia, by:

a) robustly predicting the scale of travel increase in the SEQ region, where it is likely to occur and the modes of travel that will be chosen;
b) assessing the degree to which the performance of the transport network will deteriorate by 2031 under a *low transport investment* scenario - including identification of those elements of the road network that will, by 2031, be generating large economic costs due to congestion, and sections of the rail network that will be subject to severe over-crowding; and
c) providing travel and transport system performance data suitable for input to the ACIL Allen Tasman economic model of the SEQ region.

1.3 Structure of report

The balance of the report is structured as follows:

Section 2: Land use assumptions used in the modelling

Section 3: Assumed 2031 base case transport networks

Section 4: Other modelling assumptions

Section 5: Methodology

Section 6: Travel demand increase in Brisbane, Gold Coast and Sunshine Coast 2011-2031

Section 7: Road network performance

Section 8: Public transport system performance

2. Land use assumptions

Land use and transport system operation are linked by complex, yet identifiable relationships which are investigated through transport modelling activities. It is crucial therefore to utilise the most current, rigorous land use dataset available to underpin the traffic modelling.

In this section, we outline the land use and demographic variables underpinning travel behaviour within the SEQ region, and describe the application of land use projections developed by VLC for the purpose of forecasting travel and the performance of the transport network within the conurbation.

2.1 Demographic dataset development

VLC has developed a current baseline demographic dataset to underpin traffic forecasting for this project. This dataset contains population, employment, education enrolment and visitor data for a base year of 2011 and future year 2031 appropriate for input into VLC's Zenith model. This demographic dataset developed as a result of this project contains the most current and rigorous small area demographic projections which form an essential input into transport modelling and traffic forecasting.

Datasets used as inputs in the development of the baseline demographic dataset include, but are not limited to:

- 2011 Australian Bureau of Statistics (ABS) Census of Population and Housing
- ABS Series B population projections and associated age structure data
- Office of Economic and Statistical Research household projections
- ABS Estimated Resident Population
- Local government land use data
- Enrolment data for primary, secondary and tertiary institutions
- Planning scheme data
- Tourism forecast data

Development has also included advice from local governments in relation to current planning intentions and expectations in the region.

2.1.1 Base year (2011) data development

Base year data has been derived from the 2011 Census of Population and Housing. Population variables have been derived from Estimated Resident Population data, rebased to the 2011 Census. Base year employment has been derived from Place of Work DZN data, with adjustments made to account for Census under-reporting, and "Not Stated" responses.

Enrolment data has been obtained from The Australian Curriculum, Assessment and Reporting Authority (ACARA), as well as contact with various primary, secondary and tertiary institutions to confirm enrolment figures, and associated employment. Visitor data, both domestic and international, has been obtained from the 2011 Census of Population and Housing.

2.1.2 Baseline dataset future year land use projection development

Future year projections for the baseline demographic dataset for the region have been developed using the ABS Series B population projections. The population dataset is constrained to Department of Treasury and Trade (2013 edition) projections at 2031. Base 2031 population projections are adjusted to match ABS Series B 2031 population. ABS population projections are provided at Greater Capital City Statistical Area, therefore the difference between base 2031 projected population and ABS Series B 2031 projected population is apportioned to small areas according to their share of growth between 2011 and 2031.

Future year employment has been based on the 2011 Journey to Work statistical relationships. Employment growth is distributed based on knowledge of known future developments and information obtained from local and regional planning instruments.

The ratio of domestic and international visitors to the number of usual residents at the small area level is assumed to be the same in future years and is applied to future years' total residents to forecast the number of domestic and international visitors.

For future enrolments, an age-cohort model has been used to allocate additional students to existing institutions based on notional capacities of institutions in the future. Any surplus students were then allocated to schools with additional capacity in neighbouring Small Areas at level 2 (SA2s), or new schools allocated to areas of high growth and/or where planning information is available.

Tertiary education centres are expected to experience a capped growth per year.

2.2 The Zenith model and small area demographics

The Zenith model for the region takes into account information describing the location and scale of various land uses, activities and demographics across the region in reflecting the travel choices of households and firms.

When applying the model, the region is divided into a number of zones whose size depends on the scope of impacts being investigated and the resolution of information available. Forecasts of demographic variables for each zone used in the model include:

- Population – number of persons whose usual place of residence is within zone
- Households – number of households including occupied private dwellings and group households
- White Collar Workers – persons employed in occupations classified as ‘white-collar’
- Blue Collar Workers – persons employed in occupations classified as ‘blue-collar’
- Dependants (0-17) – number of non-workers aged up to 17 years
- Dependants (18-64) – number of non-workers aged 18 to 64 years
- Dependants (65+) – number of non-workers aged 65 and over
- Cars – number of private motor vehicles garaged at occupied private dwellings

The model uses this information to generate profiles of households of different structure, the members of which would each make different choices regarding the frequency, purpose, location, period, mode and route of travel.

The model also defines a number of activities for which travel is undertaken. A number of socioeconomic and land use variables are used to determine the level of participation or attraction for each activity in each zone, which influences the number of trips undertaken for a range of purposes.

These activity variables include:

- Employment by industry (14 custom categories based on 1-digit ANZSIC industry divisions)
- Educational enrolment by 3 levels
- Demand information for special generators:
  - Airport passengers (3 categories)
  - Tourism and recreation visitation rates (4 categories)
  - Freight and logistics terminals demand forecasts

VLC have defined a small area cadastre for the region, for which data for all of the land use and demographic variables is maintained for the forecast horizon. This is aggregated as needed to provide an efficient zoning system for application of the Zenith model.

VLC has undertaken extensive data acquisition, research and fieldwork to ensure the accuracy of the demographic and socioeconomic data that underpins the forecasting of travel demand in the region. For the small area cadastre, the data for 2011 is developed from and validated against the Australian Bureau of Statistics Census of Population and Housing.

VLC maintains its own scenarios of land use projections, integrating planning information from various local, state and federal government bureaux, supplemented with its knowledge of proposed developments.

The following sections summarise the population and employment characteristics and forecasts for Brisbane by SA3.

2.3 Population

2.3.1 Population projections for the South East Queensland region

The region as a whole is comprised of approximately 50 SA3's. These areas vary widely in nature, from inner city urban areas with very high population densities to rural-fringe areas characterised by small local centres interspersed with open space and agricultural production areas.

The following sections summarise the population characteristics and projections for SA3's in the region.

Table 2-1 provides population estimates for the Greater Brisbane region by SA3 for 2011 and 2031 (note that Ormeau - Oxenford is not in the Brisbane GCCSA, but Caboolture Hinterland is). Tables 2-2 and 2-3 provide similar estimates for the Gold Coast and Sunshine Coast respectively.

These tables also show the absolute growth in population and the equivalent average annual growth rate.

Table 2-1: Population estimates and projection for the Greater Brisbane Queensland Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Brisbane Inner	61,500	106,100	+44,700	+73%	2.8%
Brisbane Inner - East	39,800	46,800	+6,900	+17%	0.8%
Brisbane Inner - North	79,200	108,400	+29,200	+37%	1.6%
Brisbane Inner - West	56,500	65,300	+8,900	+16%	0.7%
Bald Hills - Everton Park	39,300	55,200	+15,900	+41%	1.7%
Chermside	68,400	79,900	+11,400	+17%	0.8%
Nundah	36,000	50,100	+14,000	+39%	1.7%
Sandgate	54,900	67,600	+12,800	+23%	1.1%
Wynnum - Manly	67,600	78,200	+10,600	+16%	0.7%
Capalaba	72,200	85,500	+13,200	+18%	0.8%
Holland Park - Yeronga	68,400	84,900	+16,500	+24%	1.1%
Carindale	48,500	53,800	+5,300	+11%	0.5%
Mt Gravatt	68,800	103,100	+34,300	+50%	2.0%
Cleveland - Stradbroke	79,000	113,400	+34,400	+43%	1.8%
Nathan	38,100	40,600	+2,500	+7%	0.3%
Sunnybank	48,500	55,700	+7,200	+15%	0.7%
Rocklea - Acacia Ridge	56,000	74,400	+18,400	+33%	1.4%
Sherwood - Indooroopilly	49,900	56,400	+6,500	+13%	0.6%
Centenary	33,400	35,700	+2,300	+7%	0.3%
Kenmore - Brookfield - Moggill	45,400	50,100	+4,700	+10%	0.5%
The Gap - Enoggera	49,200	60,000	+10,800	+22%	1.0%
Springwood - Kingston	78,200	95,000	+16,900	+22%	1.0%
Loganlea - Carbrook	56,800	73,800	+17,000	+30%	1.3%
Beenleigh	39,100	66,500	+27,400	+70%	2.7%
Browns Plains	75,100	113,100	+37,900	+50%	2.1%
Jimboomba	37,800	125,900	+88,100	+233%	6.2%
Beaudesert	13,000	36,100	+23,100	+177%	5.2%
Ipswich Inner	97,800	226,200	+128,400	+131%	4.3%

SA3	2011	2031	Growth	%	AAGR
Springfield - Redbank	68,300	190,400	+122,100	+179%	5.3%
Forest Lake - Oxley	66,000	97,900	+31,800	+48%	2.0%
Ipswich Hinterland	58,600	101,900	+43,300	+74%	2.8%
Ormeau - Oxenford	96,900	226,700	+129,900	+134%	4.3%
Strathpine	36,500	44,200	+7,700	+21%	1.0%
North Lakes	52,900	103,900	+51,000	+96%	3.4%
Hills District	83,100	103,500	+20,400	+25%	1.1%
Redcliffe	57,900	67,300	+9,400	+16%	0.8%
Narangba - Burpengary	60,600	107,600	+46,900	+77%	2.9%
Caboolture	56,200	100,600	+44,400	+79%	3.0%
Bribie - Beachmere	31,700	35,400	+3,700	+12%	0.6%
Greater Brisbane region	***2,227,100***	***3,387,200***	**+1,160,100**	**+52%**	**2.1%**

Table 2-2: Population estimates and projections for the Gold Coast Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Gold Coast - North	*61,700*	*75,000*	+13,300	+22%	1.0%
Southport	*57,700*	*86,300*	+28,600	+50%	2.0%
Surfers Paradise	*36,500*	*49,500*	+13,000	+36%	1.5%
Broadbeach - Burleigh	*61,000*	*74,600*	+13,600	+22%	1.0%
Coolangatta	*52,000*	*68,600*	+16,600	+32%	1.4%
Nerang	*64,000*	*93,200*	+29,200	+46%	1.9%
Robina	*47,200*	*69,000*	+21,800	+46%	1.9%
Mudgeeraba - Tallebudgera	*32,000*	*37,300*	+5,300	+17%	0.8%
Gold Coast Hinterland	*17,700*	*20,800*	+3,100	+17%	0.8%
Gold Coast region	***429,800***	***574,300***	**+144,500**	**+34%**	**1.5%**

Table 2-3: Population estimates and projections for the Sunshine Coast Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Caloundra	*72,300*	*114,200*	+41,900	+58%	2.3%
Buderim	*47,000*	*65,500*	+18,500	+39%	1.7%
Maroochy	*56,600*	*76,500*	+19,900	+35%	1.5%
Noosa	*36,400*	*44,600*	+8,200	+22%	1.0%
Nambour - Pomona	*57,200*	*75,700*	+18,500	+32%	1.4%
Caboolture Hinterland	*15,500*	*28,800*	+13,300	+86%	3.2%
Sunshine Coast Hinterland	*47,300*	*90,500*	+43,100	+91%	3.3%
Sunshine region	***332,300***	***495,800***	**+163,500**	**+49%**	**2.0%**

In 2011, the total population within the entire SEQ region was approximately 3.0 million, growing to 4.5 million by 2031. That is by 50 percent.

This broadly comprises 2.2 million in Brisbane rising to 3.4 million in 2031, 429,800 increasing to 574,300 on the Gold Coast and 332,300 rising to 495,800 on the Sunshine Coast. Within Brisbane, the highest growth rates (in excess of 5 percent AAGR) are expected on the southside (Jimboomba, Beaudesert and Springfield-Redbank). On the Gold Coast the highest growth rates (about 2 percent) are forecast to occur at Southport, Nerang and Robina. On the Sunshine Coast growth rate peaks are expected to occur in Caloundra and in the Caboolture and Sunshine Coast hinterlands (2-3 percent).

Figures 2-1 (Brisbane), 2-2 (Gold Coast) and 2-3 (Sunshine Coast) illustrate the spatial pattern of population growth by small area across the region as a whole.

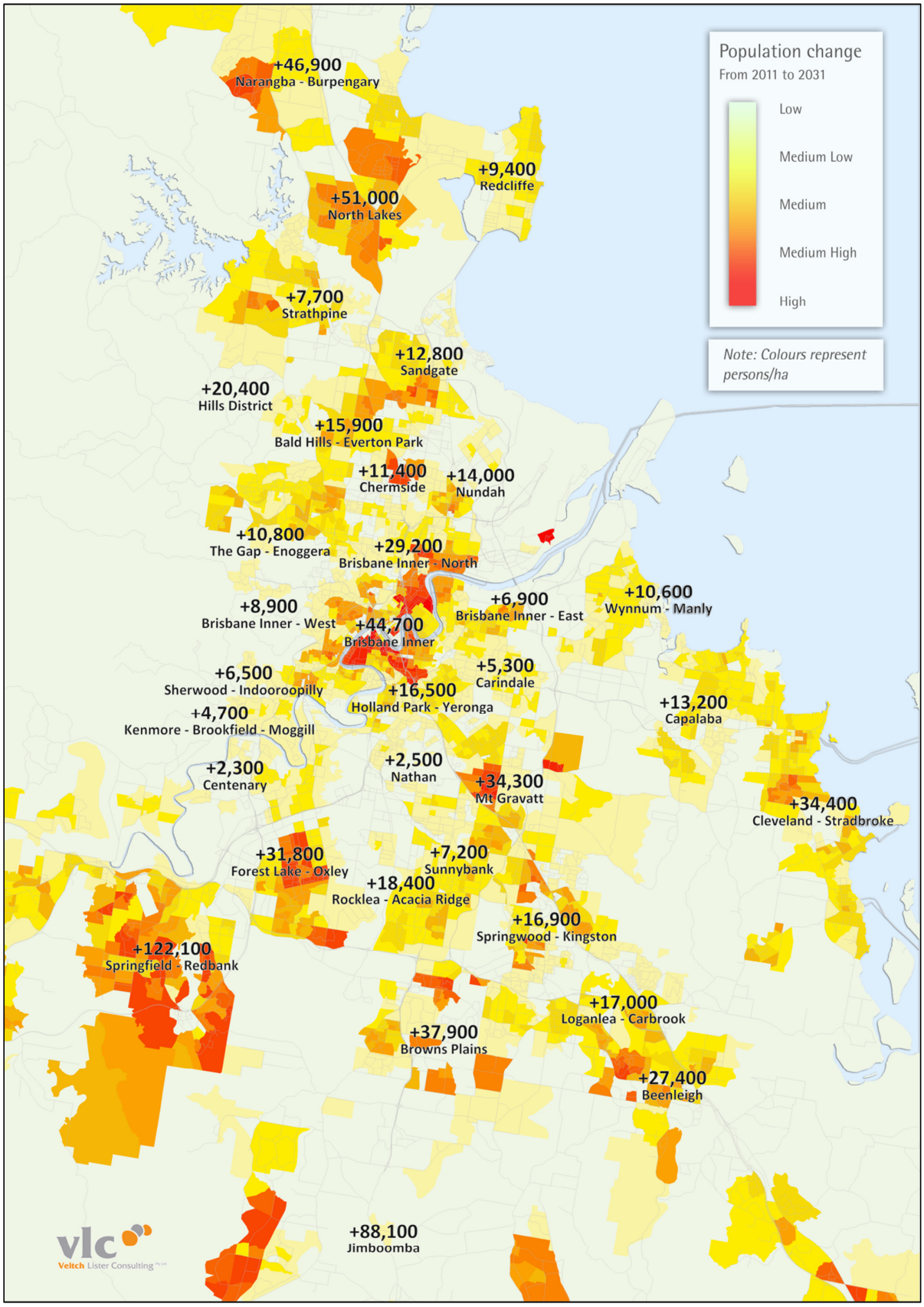

Figure 2-1: Projected population growth in the Brisbane Region (2011 – 2031)

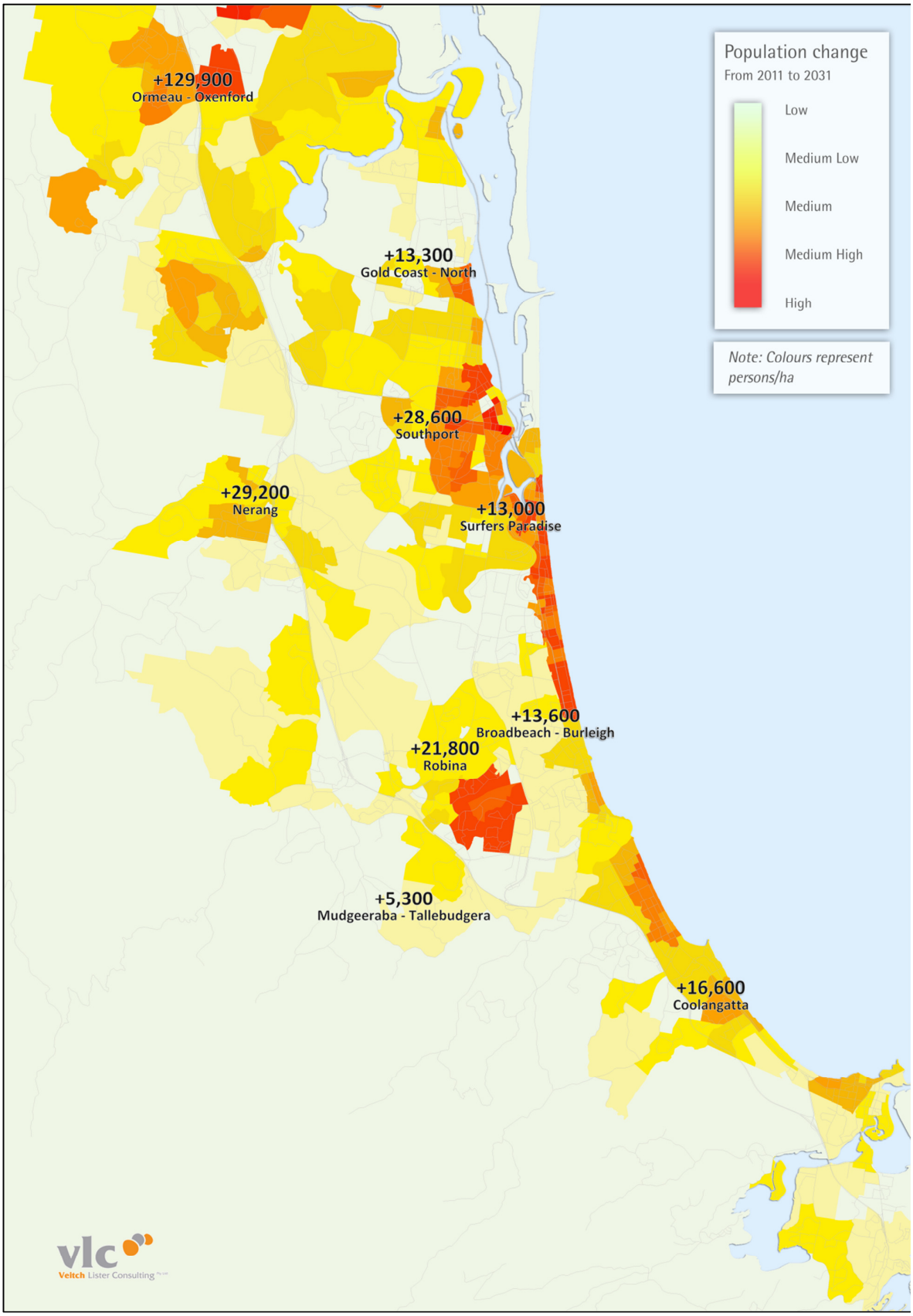

Figure 2-2: Projected population growth in the Gold Coast Region (2011 – 2031)

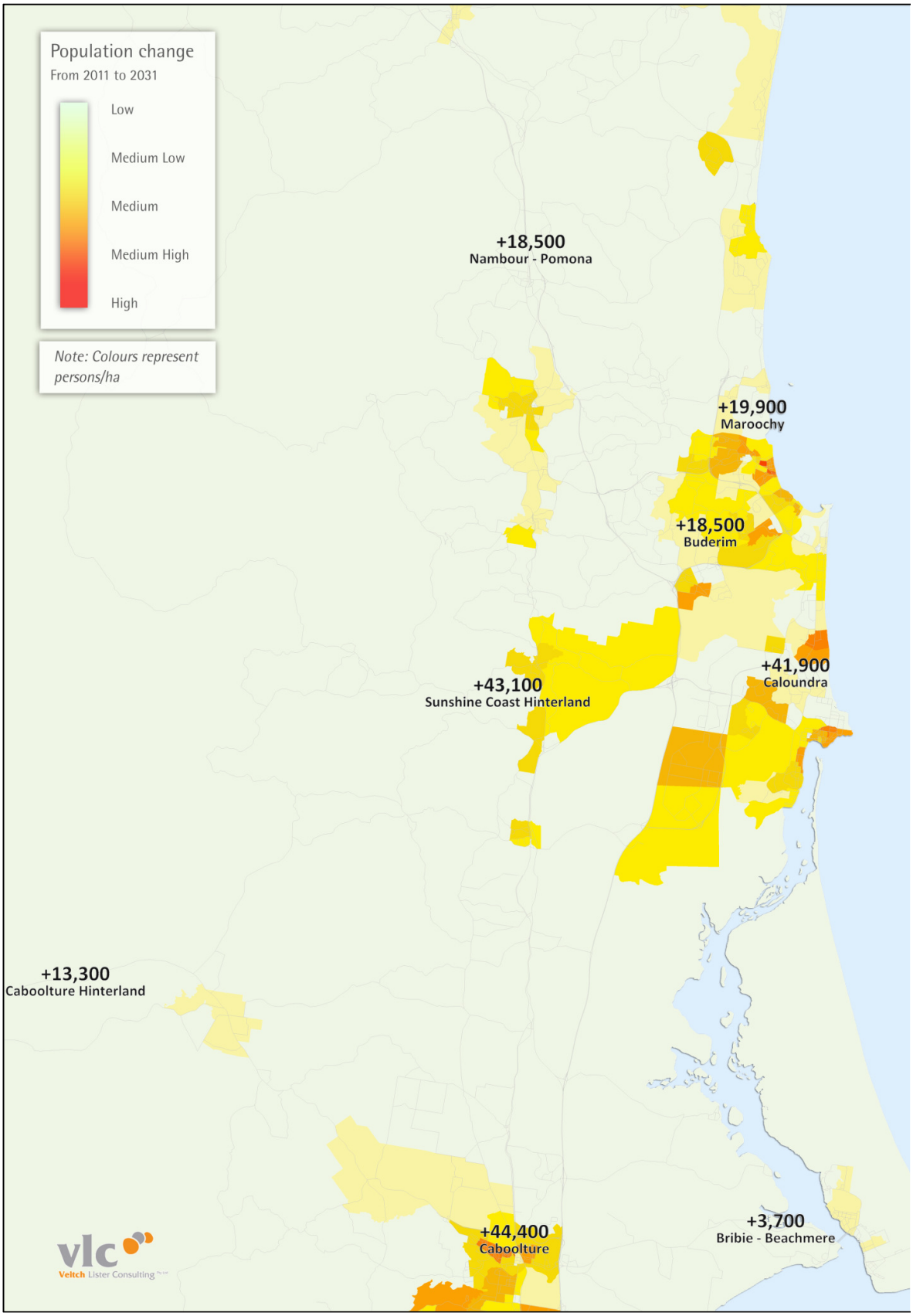

Figure 2-3: Projected population growth in the Sunshine Coast Region (2011 – 2031)

2.4 Employment

VLC has 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 the state government.

2.4.1 Employment characteristics and projections for the South East Queensland region

The Zenith model projects employment across a range of industries and occupations for the region. As well as indicating the number of jobs, this is also indicative of the opportunities to participate in a range of commercial and social activities, such as education, business, shopping, dining and entertainment, health and recreation, as well as activities generating freight.

Tables 2-4, 2-5 and 2-6 summarise the estimates of existing employment levels and growth expectations for Brisbane (note that Ormeau - Oxenford is not in the Brisbane GCCSA, but Caboolture Hinterland is), Gold Coast and Sunshine Coast respectively. Broadly speaking the growth across the entire region is expected to average about 2 percent, more or less uniformly across the region.

Within Brisbane, employment growth peaks exist in the south at Jimboomba, Beaudesert and Ormeau-Oxenford (4-6 percent) and, to a lesser extent in Ipswich and Springfield-Redbank (about 3 percent). In the northern suburbs growth rates of approximately 3 percent are anticipated at North Lakes, Narangba-Burpengary and Caboolture.

On the Gold Coast highest rates are expected in Southport and Robina (approximately 3 percent). On the north coast Caboolture, Caloundra and the Sunshine Coast are expected to experience employment growth rates in excess of 2 percent.

Table 2-4: Employment estimates for the Greater Brisbane Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Brisbane Inner	222,300	320,900	+98,700	+44%	1.9%
Brisbane Inner - East	14,800	17,500	+2,700	+18%	0.8%
Brisbane Inner - North	66,000	94,800	+28,800	+44%	1.8%
Brisbane Inner - West	41,400	52,200	+10,700	+26%	1.2%
Bald Hills - Everton Park	7,300	9,600	+2,400	+33%	1.4%
Chermside	39,300	51,100	+11,800	+30%	1.3%
Nundah	61,000	95,700	+34,700	+57%	2.3%
Sandgate	12,100	15,000	+2,900	+24%	1.1%
Wynnum - Manly	39,300	52,300	+12,900	+33%	1.4%
Capalaba	20,300	30,200	+9,800	+48%	2.0%
Holland Park - Yeronga	40,500	56,300	+15,800	+39%	1.7%
Carindale	16,500	17,700	+1,300	+8%	0.4%
Mt Gravatt	33,500	48,800	+15,300	+46%	1.9%
Cleveland - Stradbroke	24,200	36,300	+12,000	+50%	2.0%

SA3	2011	2031	Growth	%	AAGR
Nathan	24,200	34,900	+10,800	+45%	1.9%
Sunnybank	8,000	10,000	+2,000	+25%	1.1%
Rocklea - Acacia Ridge	41,500	66,800	+25,300	+61%	2.4%
Sherwood - Indooroopilly	25,600	35,700	+10,100	+40%	1.7%
Centenary	9,400	11,400	+2,000	+22%	1.0%
Kenmore - Brookfield - Moggill	8,700	,800	+1,100	+12%	0.6%
The Gap - Enoggera	18,200	21,300	+3,000	+17%	0.8%
Springwood - Kingston	32,000	42,600	+10,600	+33%	1.4%
Loganlea - Carbrook	22,200	33,800	+11,600	+52%	2.1%
Beenleigh	11,100	19,400	+8,400	+76%	2.9%
Browns Plains	19,100	31,800	+12,700	+66%	2.6%
Jimboomba	6,300	19,300	+13,000	+208%	5.8%
Beaudesert	5,500	12,000	+6,500	+117%	4.0%
Ipswich Inner	36,200	66,200	+30,000	+83%	3.1%
Springfield - Redbank	19,900	34,900	+15,000	+75%	2.8%
Forest Lake - Oxley	36,600	59,100	+22,500	+61%	2.4%
Ipswich Hinterland	17,200	26,400	+9,200	+54%	2.2%
Ormeau - Oxenford	39,400	83,000	+43,600	+111%	3.8%
Strathpine	22,100	30,900	+8,900	+40%	1.7%
North Lakes	10,600	19,900	+9,200	+87%	3.2%
Hills District	14,500	17,700	+3,200	+22%	1.0%
Redcliffe	18,500	24,400	+5,900	+32%	1.4%
Narangba - Burpengary	12,900	23,700	+10,800	+84%	3.1%
Caboolture	21,700	39,200	+17,500	+80%	3.0%
Bribie - Beachmere	5,500	6,000	+400	+8%	0.4%
Greater Brisbane region	1,125,400	1,678,600	*+553,200*	*+49%*	*2.0%*

Table 2-5: Employment estimates for the Gold Coast Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Gold Coast - North	17,600	22,900	+5,300	+30%	1.3%
Southport	43,000	75,200	+32,200	+75%	2.8%
Surfers Paradise	25,100	37,300	+12,200	+48%	2.0%
Broadbeach - Burleigh	31,600	37,700	+6,000	+19%	0.9%
Coolangatta	17,000	22,300	+5,300	+31%	1.4%
Nerang	18,100	25,700	+7,500	+42%	1.8%
Robina	22,000	39,100	+17,100	+78%	2.9%
Mudgeeraba - Tallebudgera	6,000	8,100	+2,100	+36%	1.5%
Gold Coast Hinterland	4,600	5,400	+800	+17%	0.8%
Gold Coast region	***185,000***	***273,700***	***+88,700***	***+48%***	***2.0%***

Table 2-6: Employment estimates for the Sunshine Coast Region (at SA3)

SA3	2011	2031	Growth	%	AAGR
Caloundra	26,100	46,300	+20,200	+77%	2.9%
Buderim	17,300	25,300	+8,100	+47%	1.9%
Maroochy	28,700	43,000	+14,300	+50%	2.0%
Noosa	15,400	16,800	+1,400	+9%	0.4%
Nambour - Pomona	25,100	37,400	+12,300	+49%	2.0%
Caboolture Hinterland	4,400	8,700	+4,200	+96%	3.4%
Sunshine Coast Hinterland	13,200	21,600	+8,400	+64%	2.5%
Sunshine region	***130,200***	***199,100***	***+68,900***	***+53%***	***2.1%***

In the entire SEQ region, the total level of employment is forecast to increase from approximately 1.4 million in 2011 to 2.2 million in 2031.

Figure 2-4, 2-5 and 2-6 shows how State and Local Government planning intentions translate into employment growth across the region in the period 2011-2031, by presenting a spatial representation of growth by small areas.

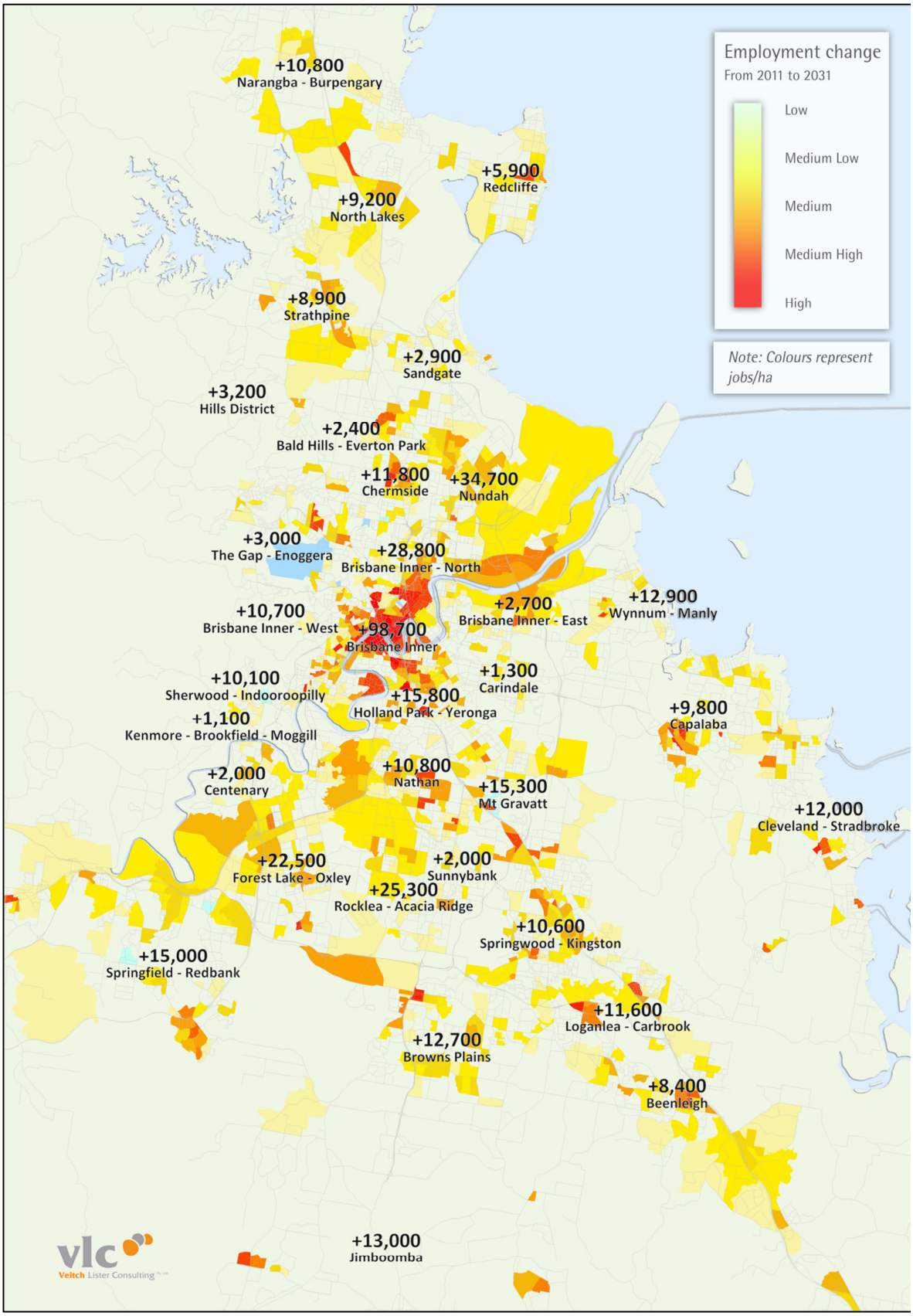

Figure 2-4: Projected employment growth in the Brisbane region between 2011 and 2031

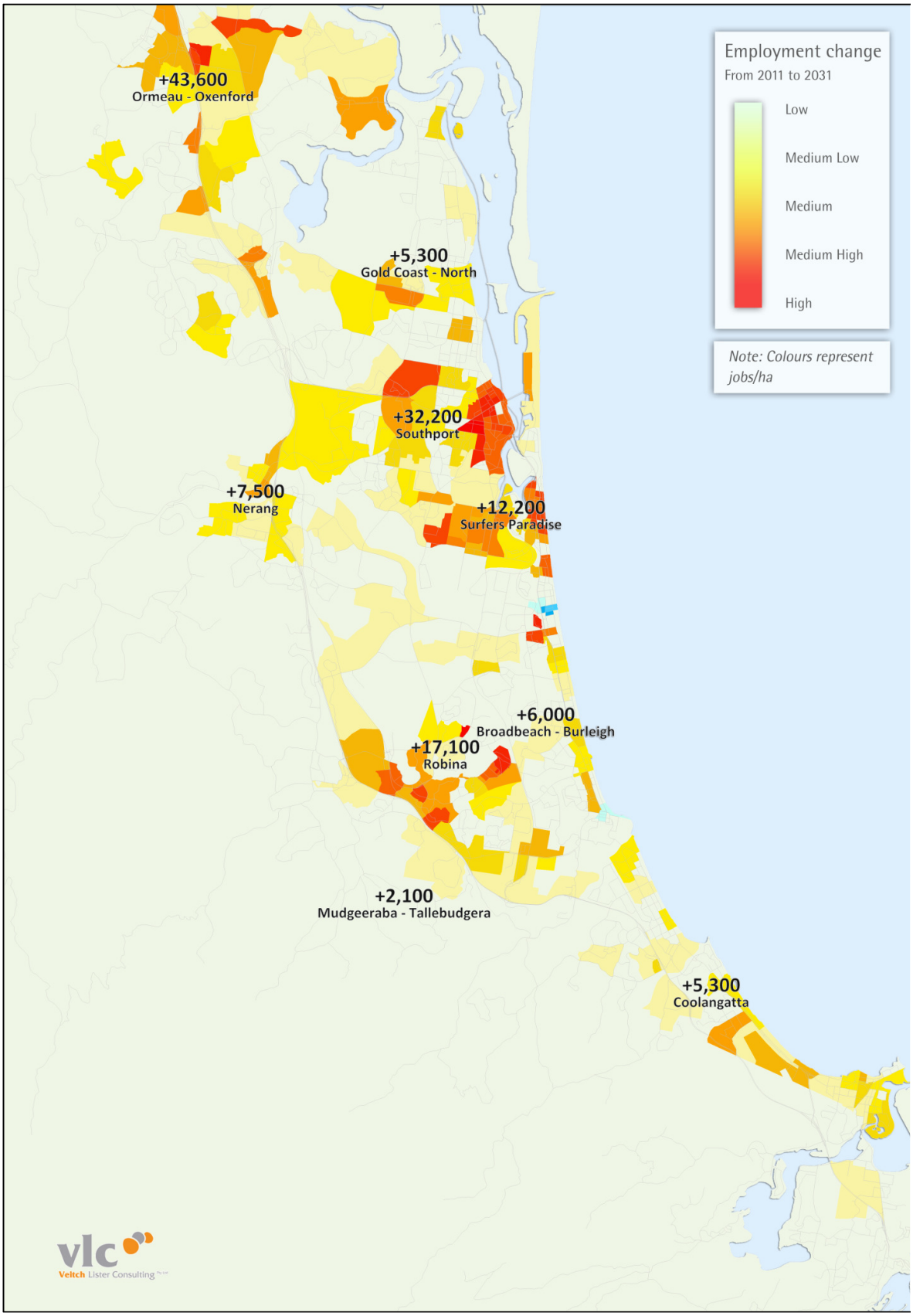

Figure 2-5: Projected employment growth in the Gold Coast region between 2011 and 2031

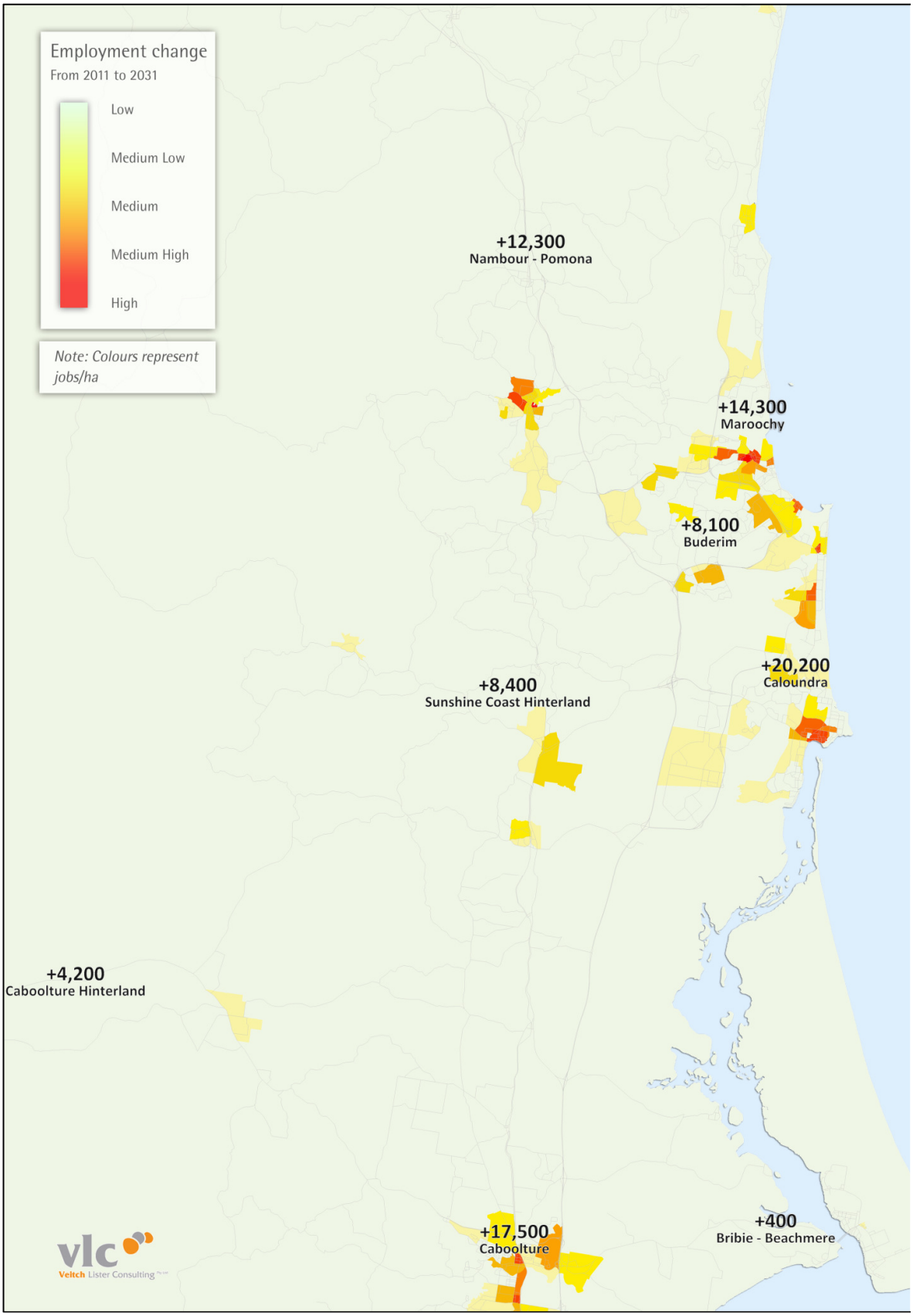

Figure 2-6: Projected employment growth in the Sunshine Coast region between 2011 and 2031

3. Assumed base case transport networks

This section of the report describes the transport network improvements that have been assumed for the AIA base case networks. In order to assess properly the priorities for development of the transport network under the planned strategies for urban growth, the base case assumes a balance of committed future works, as well as those that are required to support the development of urban growth centres.

Table 3-1 summarises the major funded and committed works across the region. A full listing of all works (i.e. including minor projects) is provided in Appendix A of the report. These tables are supported by Figures 3-1 (Brisbane Region), 3-2 (Gold Coast Region) and 3-3 (Sunshine Coast Region) which clearly indicate the location of each of the proposed projects.

3.1 Road network assumptions

Table 3-1: Major new transport infrastructure included in 2031 base case network

Item	Description	Standard
1	Gateway Motorway (Nudgee Road to Deagon Deviation)	6 lane expressway
2	Kingsford Smith Drive (Seymour Road to Theodore Street)	6 lane arterial
3	Legacy Way (Western Freeway to Inner City Bypass)	4 lane expressway
4	Port of Brisbane Motorway (Gateway Motorway to Pritchard Street)	4 lane expressway
5	Ipswich Motorway (Rocklea to Darra)	6 lane expressway
6	Centenary Highway (Logan Motorway to Augusta Parkway)	4 lane expressway
7	Mt Lindesay Highway (Stoney Campy Road to Chambers Flat Road)	4 lane expressway
8	Brisbane Valley Highway (Warrego Highway and Wulkuraka Connection Road)	Improve intersection
9	Cunningham Highway (Ripley Road to Ipswich Western Bypass)	4 lane freeway
10	Pacific Highway (Fitzgerald Avenue to Aranda Street)	8 lane expressway
11	Beenleigh Road (Boundary Road to Warrigal Road Extension)	6 lane aterial
12	Pacific Highway (Mt Gravatt to Eight Mile Plains) – removal of T2 lanes	8 lane expressway
13	Mt Gravatt-Capalaba Road (Broadwater Road to Gardner Road)	Improve intersection
14	Creek Road (Lytton Road to Cavendish Road)	6 lane arterial
15	Logan Road (Cornwell Street to Kessels Road)	6 lane arterial
16	Kingsford Smith Drive (Racecourse Road to Cooksley Street)	6 lane arterial
17	Johnson Road (Southlink Street to Woongaroo Road)	4 lane arterial
18	Park Ridge Road (Mt Lindesay Highway to Beenleigh Road)	4 lane arterial

Note: The full list of projects, including minor works in Council PIPs, is included as Appendix A.

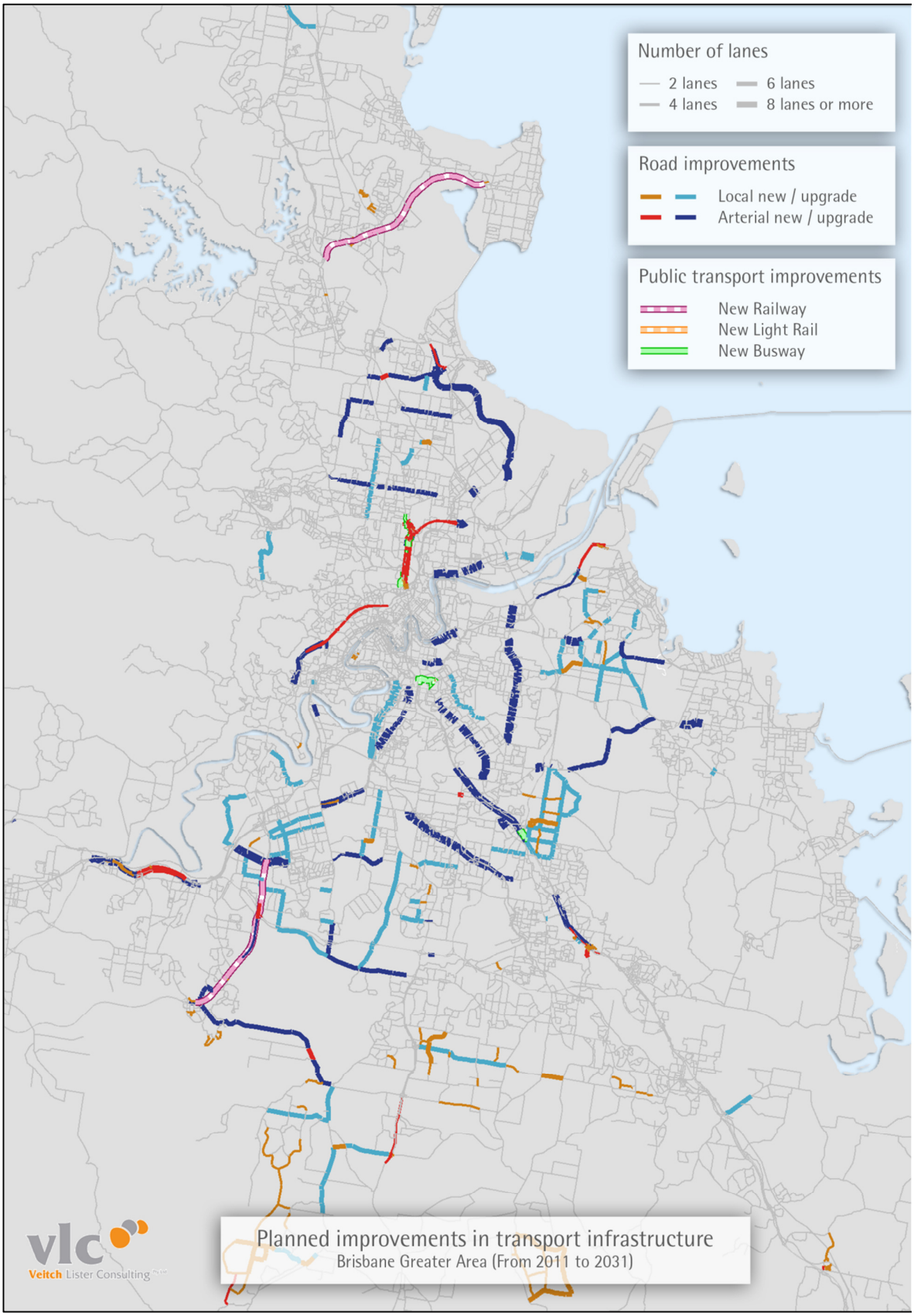

Figure 3-1: New transport infrastructure included in 2031 base case network (Brisbane Region)

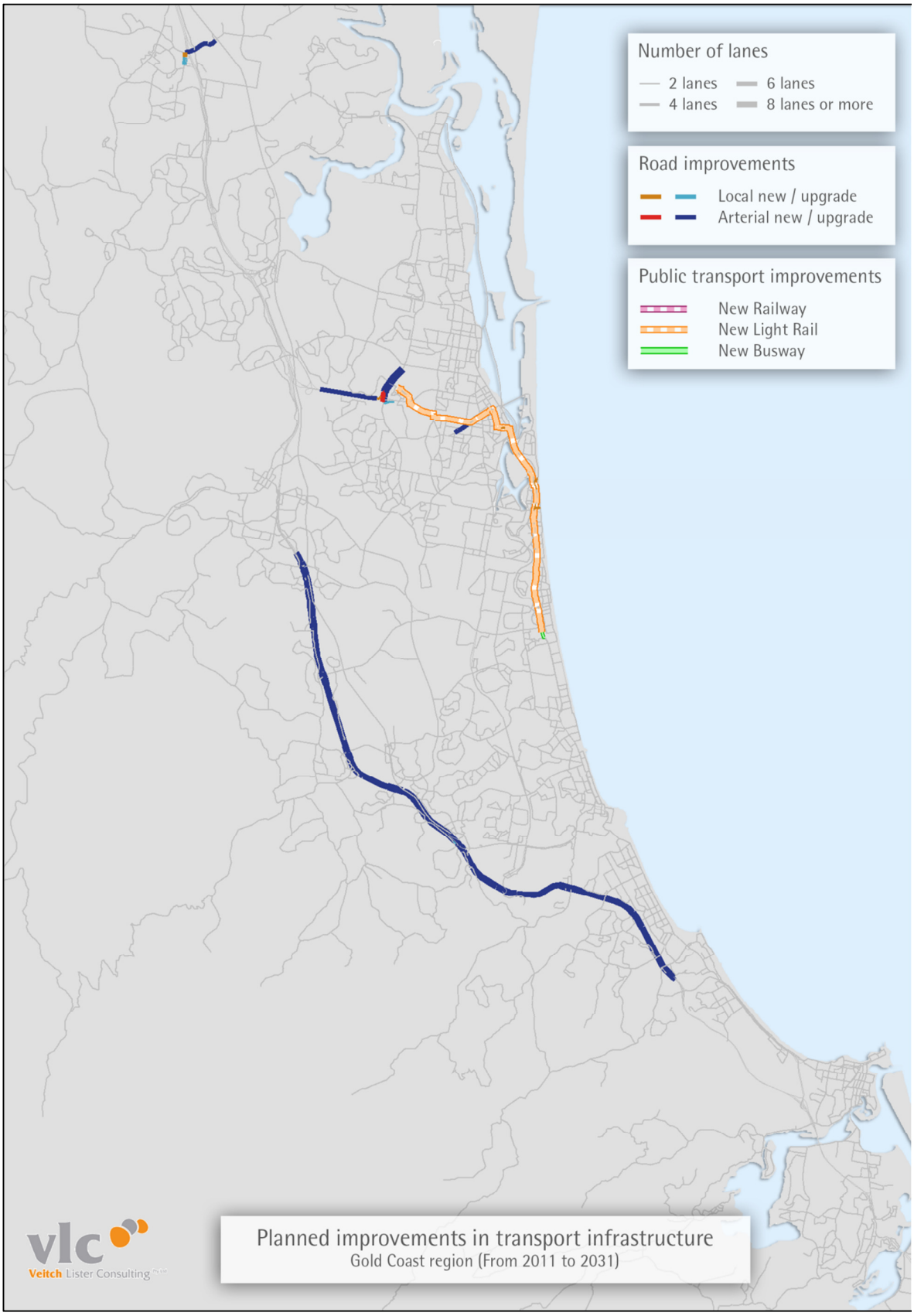

Figure 3-2: New transport infrastructure included in 2031 base case network (Gold Coast Region)

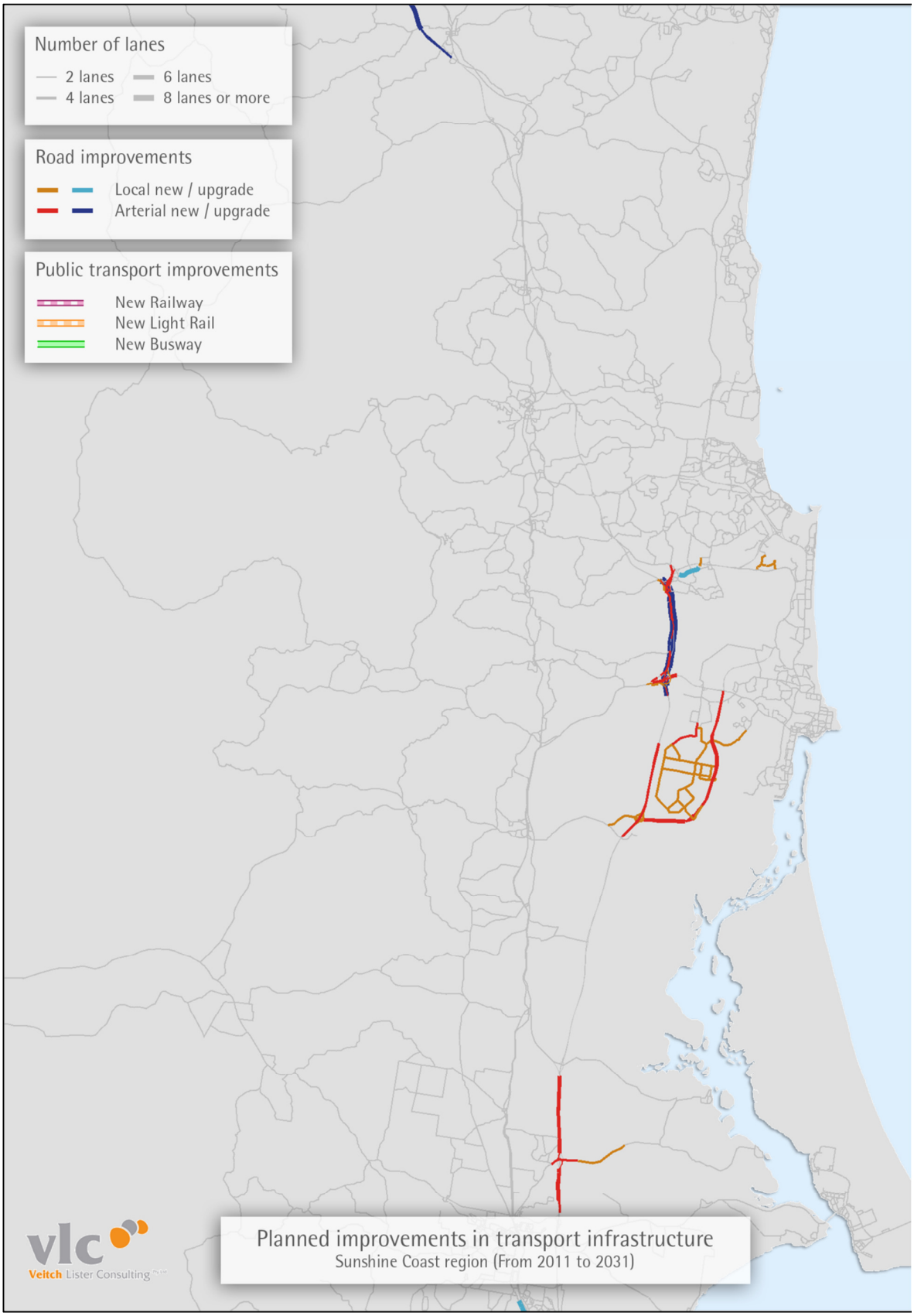

Figure 3-3: New transport infrastructure included in 2031 base case network (Sunshine Coast Region)

3.2 Public transport network assumptions

The major public transport infrastructure enhancements in Table 3-2 are:

- The Redcliffe rail extension
- Springfield Rail from Richlands to Springfield Central
- South East Busway extension from Eight Mile Plains to Priestdale Road.

Table 3-2: Major new public transport infrastructure included in 2031 base case network

Item	Description	Standard
1	Redcliffe Rail extension	New railway
2	Springfield Rail (Richlands to Springfield Central)	New railway
3	South East Busway extension (Eight Mile Plains to Priestdale Road)	New busway

3.2.1 Redcliffe rail extension

This proposed extension is from the existing Petrie railway station to the Redcliffe Peninsula with new stations provided at:

- Kallangur;
- Kingfisher Park;
- Mango Hill;
- Rothwell, and
- Redcliffe

The service frequencies modelled are summarised in Table 3-3.

Table 3-3: Modelled service frequencies – Redcliffe Extension

Time Period	Direction of Travel	
	Northbound (mins)	Southbound (mins)
am peak	15	15
off peak	30	30
pm peak	15	15

3.2.2 Springfield rail extension

The proposed extension branches southward off the Ipswich line west of the existing Darra Station.

Three stations are proposed at:

- Richlands;
- Springfield; and
- Springfield Central.

The service frequencies proposed are as shown in Table 3-4.

Table 3-4: Modelled service frequencies – Springfield Extension

Time Period	Direction of Travel	
	Northbound (mins)	Southbound (mins)

am peak	15	15
off peak	30	30
pm peak	15	15

3.2.3 South East Busway Extension – Eight Mile Plains to Priestdale Road

This segment of infrastructure was completed in 2014 but according to the current timetable it is comparatively under-utilised compared to pre-existing sections of the busway with only 3 services per hour in the am peak and 1 service per hour in the interpeak. This is assumed to also prevail through to 2031.

Table 3-5: Modelled service frequencies in – South East Busway Extension (2031)

Time Period	Direction of Travel	
	Northbound (mins)	Southbound (mins)
am peak	15	15
off peak	30	30
pm peak	15	15

4. Pricing and behavioural assumptions

When individuals make choices regarding how, when and where to travel, they take into account the costs and convenience of each of the options available. These considerations may include the value of time spent travelling, the cost of fuel, public transport fares, parking charges and tolls, as well as longer term costs associated with vehicle ownership and use. Likewise firms that schedule commercial travel take into account the costs associated with operation and maintenance of the vehicle and labour costs of the driver or crew, as well as the efficiency of travel on each route and the cost of tolls.

The modelling of future travel in SEQ for the Australian Infrastructure Audit makes certain assumptions about how these costs will change, and how preferences affecting travel behaviour may evolve over time. These assumptions are based on available evidence and are intended to reflect the current policies of all levels of government.

4.1 Value of travel time

The 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.

There is a significant volume of behavioural research that suggests values of travel time increase with increasing 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 one exception is in relation to peoples' increased willingness to pay tolls in the future, as a result of increasing real average weekly earnings. In this case (i.e. predicting whether people will choose a tolled or untolled route) we have adopted the UK Department for Transport recommendation that an elasticity of 0.8 be used between the value of time and increases in real average weekly earnings. In other words, if real average weekly earnings go up by 10% then it should be assumed that the value of time will go up by 8%.

4.2 Fuel costs

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
- 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. The base case for the AIA has therefore assumed no real change in the unit of costs of fuel in future.

4.3 Public transport fares

While there have been real increases in public transport fares during recent years, there is a growing concern to maintain prices and provide off-peak discounts to encourage greater use of public transport. In order to maintain a neutral position on pricing, the base case for the AIA has assumed no real change in public transport fares.

4.4 Parking charges and supply

The availability and cost of parking can have a strong influence on the choice of destination or mode used for travel, particularly to CBD destinations, where high parking costs and a high level of public transport accessibility contribute to public transport being relatively attractive.

There are however, strong pressures on price arising from increasing demand and constrained supply of parking in the CBD and major activity centres.

With increasing demand and constrained supply of parking spaces, it is reasonable to expect that parking costs within the CBD and at major activity centres in the metropolitan area will experience real increases of 1-2% per annum. The base case modelling for the AIA has assumed a real annual increase of 1.5% in parking charges.

4.5 Toll prices

Table 4-1 summarises the existing level of tolls and those anticipated to prevail in 2031.

Table 4-1: Toll prices in 2011 dollars

Toll Plaza	Year	Cars	LCV	HCV
Gateway Mwy	2011	3.99	5.99	10.57
	2031	3.99	5.99	10.57
Kuraby	2011	2.35	3.53	6.24
	2031	2.35	3.53	6.24
Heathwood	2011	2.49	3.73	6.59
	2031	2.49	3.73	6.59
Loganlea	2011	1.51	2.27	4.01
	2031	1.51	2.27	4.01
Go Between	2011	2.42	3.63	6.41
	2031	2.75	4.12	7.29
Clem7	2011	3.95	6.61	11.66
	2031	4.40	6.61	11.66
Legacy Way	2011	-	-	-
	2031	4.93	7.40	13.06
Airport Link – Bowen Hills –Toombul	2011	4.75	7.12	12.58
	2031	4.75	7.12	12.58
Airport Link – Bowen Hills – Kedron	2011	3.56	5.34	9.44
	2031	3.56	5.34	9.44
Airport Link – Kedron – Toombul	2011	3.56	5.34	9.44
	2031	3.56	5.34	9.44
Moggill Ferry	2011	1.30	22.20	22.20
	2031	1.30	22.20	22.20

The 2011 toll values are those which prevailed at the time; the 2031 tolls are those that apply in 2014 (i.e. existing tolls levels are assumed to be maintained).

4.6 Airport passenger demands

Travel demands associated with the region's airports are based upon forecasts of passenger demand by BITRE, categorised according to whether travel is for business, and for non-business travel, whether by residents of the region, or visitors.

The passenger demand estimates and forecasts assumed within the base case are provided in Table 4-2.

Table 4-2: Air passenger demand estimates and forecasts (average weekday)

Terminal	Year	Business	Local	Visitors	Total
Brisbane Domestic	2011	16,300	7,600	20,500	44,400
	2031	23,500	13,400	40,300	77,200
	(% increase)	+44%	+76%	+97%	+74%
Brisbane International	2011	2,700	1,300	10,600	14,600
	2031	3,900	2,300	20,900	27,100
	(% increase)	+44%	+44%	+97%	+86%
Gold Coast	2011	2,500	2,500	8,200	13,200
	2031	3,800	3,800	12,296	19,896
	(% increase)	+52%	+52%	+50%	+51%
Sunshine Coast	2011	400	400	2,300	3,100
	2031	550	550	5,700	6,800
	(% increase)	+38%	+38%	+148%	+119%

5. Methodology

The use of VLC's Zenith Travel model provides insight into urban transport at a high level of granularity. In order to allow for detailed analyses of the vast amount of data a number of spreadsheets have been created to inform the National Audit of Urban Infrastructure at different levels of data aggregation:

- Metrics from SA3 to SA3
- Key Model Statistics
- Corridor analysis
- CityRail demand and supply analysis

This chapter describes the methodology.

5.1 Description of metrics

The Zenith model contains a wealth of information. This section describes the metrics and where applicable the calculations to generate these metrics.

5.1.1 Network (lane) kilometres

The Zenith model describes travel demands on individual links (sections of road) for roads generally carrying over 3,000 vehicles per day. The total number of kilometres this network encompasses is described in this metric. A link that can be travelled in both directions will be accounted for in each direction. Network lane kilometres describe a similar metric but also take into account the number of lanes for each link and direction.

5.1.2 Demand

Demand is measured in trips. Depending on the mode of travel these trips can be either vehicular trips (car, light or heavy goods vehicles) or person trips (car driver or car passenger, public transport and active transport).

5.1.3 Speeds

Speeds can either be reported under free-flow or under congested conditions. The free-flow speeds are the input speeds to the travel model whereas the congested speeds are a result of traffic impeding on other traffic.

5.1.4 Vehicle Kilometres Travelled (VKT), Passenger Kilometres Travelled (PKT)

The number of vehicle kilometres travelled is a key part of the network performance indicators. This metric is calculated by multiplying the demand on a link by the length of this link. In a similar way passenger kilometres travelled can be calculated.

5.1.5 Vehicle Hours Travelled (VHT), Passenger Hours Travelled (PHT) and Hours of Delay

The number of Vehicle Hours Travelled is calculated by multiplying the demand on a link by the time to traverse that link in the network. This metric can be reported either under free-flow or congested conditions. The difference between the Vehicle Hours Travelled under free-flow and congested conditions result in the Hours of Delay metric. Passenger Hours Travelled is a similar metric which takes the passenger demand on a link.

5.1.6 Traffic Volume over Capacity Ratios

Volume over Capacity ratios or V/C ratios in short are calculated by dividing the vehicular demands by the capacity of a link. For peak periods the maximum peak hour demand is used to calculate the V/C ratios. In the off-peak situation the average demand is used. It is worth noting that goods vehicles are weighted the same as cars. This might cause lower than actual V/C ratio's on roads with high

volumes of goods vehicles. However the weighting of goods vehicles would also be included the capacity of a road, the magnitude of difference therefore is expected to be generally limited. A public transport trip that utilises a car to access a stop is excluded from the vehicular demands. Buses are also excluded from the vehicular demands. This could potentially result in understated V/C ratios around stations and bus corridors.

5.1.7 Public Transport Volume over Capacity Ratios

Determining V/C ratios for public transport take into account the number of passengers on a particular service and the capacity of the vehicle used for that service. This capacity can either be expressed as seated or crush capacity. The seated capacity is total number of seats in a vehicle. The absolute maximum number of passengers a vehicle can (legally) carry is the crush capacity. Depending on the metric either the seated or crush capacity is used. The method to determine seated and crush capacities is described in Appendix B.

5.1.8 LOS

An LOS analysis provides an indication of where the road network would fail to meet desired standards of service under the travel demands and traffic volumes forecast. By extension, it illustrates where such behavioural changes are likely to impact on forecasts to some degree, if these levels of congestion result in a change in travel behaviour.

The ability of a road to maintain high levels of service under increasing traffic levels depends upon its design standard and access controls, junction operation and coordination, degree of separation of conflicting movements, as well as its local environment and relation to connecting roads. Higher standards of roads, junctions and network management are able to provide better performance under similar levels of congestion (ratio of volume to capacity) than those of a lower standard. Austroads defines six threshold levels for standardised performance assessment, for which we describe how this affects driver behaviour, and provide typical threshold levels of congestion for three standards of roads.

Table 5-1: AustRoads Level of Service (LOS) definitions

Level of service		Threshold ratio of volume to capacity		
		Motorway	Arterial	Local
A	Drivers may travel at desired speed, and manoeuvre freely, experiencing no delay due to other traffic	0.50	0.40	0.35
B	Drivers will incur occasional minor delays and restrictions to manoeuvre due to other traffic	0.65	0.60	0.50
C	Drivers will experience interrupted travel, with minor delays and stops, but with network operating efficiently providing predictable travel times	0.85	0.75	0.65
D	Drivers will experience occasional major delays, with variable travel times due to conflicting traffic and volumes approaching capacity	1.00	0.90	0.80
E	Drivers will experience frequent major delays, with volumes at or exceeding capacity for short periods, unpredictable travel times	1.15	1.05	0.95
F	Drivers will experience severe congestion and delays, with volumes exceeding capacity for long periods, strong influence on route choice			

5.1.9 Fuel Consumption and Greenhouse Gas Emissions

Vehicle fleet mix can be expected to change reflecting the entry of hybrid, plug in hybrids and electric vehicles challenging the dominant market position of vehicles powered by an internal combustion engine (ICE). Most evidence available today is about hybrid vehicles. Hybrid cars use an ICE engine as well as electrical generators and motors. They are very fuel efficient using around 50 per less fuel in normal use than ICE powered cars and a similar amount less in GHG emissions, with performance differing by make.

The fuel efficiency and fleet mix assumptions used when estimating Greenhouse Gas Emissions in 2011 and 2031 are presented in Tables 5-2 and 5-3.

Table 5-2: Relative fuel intensity assumptions

Year	Mode	ICE	Hybrid	PHEV	Electric
2011	Cars	94.9%	87.1%	42.8%	0.0%
	Commercial vehicles	94.9%	88.4%	42.8%	0.0%
2031	Cars	76.9%	61.4%	22.8%	0.0%
	Commercial vehicles	76.9%	66.3%	22.8%	0.0%

Table 5-3: Fleet mix composition assumptions

Year	ICE	Hybrid	PHEV	Electric
2011	100.0%	0.0%	0.0%	0.0%
2031	80.5%	18.0%	1.5%	0.0%

5.2 Metrics by SA3 to SA3

This analysis disaggregated urban transport activity according to the origin and destination of trips to and from a pair of SA3s (ABS level 3 statistical areas).

Table 5-4 shows an example of the format of the data provided. Metrics are presented in matrix format where the horizontal rows contain the origin SA3 sectors and the vertical columns contain the destination SA3 sectors. A visual representation of the SA3 sectors is provided in Appendix C. For each origin & destination pair metrics are provided for 2011 and 2031 together with the absolute and relative growth between 2011 and 2031.

The full matrix is available at:

vlc_yymmdd_01_SEQ_Tables by SA3.xlsx

Table 5-4: Example of Metrics by SA3 to SA3

To SA3 sector

From SA3 sector	Brisbane Inner				Brisbane Inner - East			
	2011	2031	Diff	%Diff	2011	2031	Diff	%Diff
Brisbane Inner	7,028	9,865	+2,837	+40%	1,097	1,318	+222	+20%
Brisbane Inner - East	1,975	2,115	+140	+7%	3,205	3,451	+246	+8%
Brisbane Inner - North	4,363	5,420	+1,057	+24%	398	524	+126	+32%
Brisbane Inner - West	3,053	3,272	+219	+7%	220	230	+9	+4%
Bald Hills - Everton Park	561	634	+73	+13%	47	61	+14	+29%
Chermside	1,458	1,476	+18	+1%	119	130	+11	+9%
Nundah	1,322	1,937	+614	+46%	170	249	+79	+46%
Sandgate	406	400	-7	-2%	63	69	+6	+9%
Wynnum - Manly	1,026	1,080	+54	+5%	873	1,010	+137	+16%
Capalaba	974	927	-47	-5%	321	329	+9	+3%
Holland Park - Yeronga	4,024	4,897	+874	+22%	1,228	1,374	+146	+12%
Carindale	1,412	1,421	+10	+1%	1,387	1,418	+31	+2%
Mt Gravatt	1,462	1,931	+468	+32%	377	494	+117	+31%
Cleveland - Stradbroke	633	647	+14	+2%	142	168	+26	+18%
Nathan	1,178	1,280	+102	+9%	209	218	+9	+4%
Sunnybank	523	499	-24	-5%	89	92	+2	+3%

* Full table continues down and to the right

All metrics are available for the morning peak (7-9am), the evening peak (4-6pm), off peak and daily. Certain metrics are only available for certain activity and mode combinations. Table 5-5 below details the availability of metrics by activity and mode combination.

Table 5-5: Availability of metrics by activity and mode combination

Metric	Activity	Modes
Demand, VKT, VHT	Work, Business, Other, Total	Car, Person Car, (Light, Heavy) Commercial Vehicles, Public Tranport, Active Transport
Hours of Delay	Work, Business, Other, Total	Car
	Total	Commercial Vehicles
Fuel **Green House Gas Emissions**	Total	Car, Commercial Vehicles

5.3 Corridor Analysis

All of the more major road corridors in SEQ were identified and subjected to more detailed analysis in terms of how they perform in 2011 and 2031. Some corridors include more than one road route when routes are competing. For example, Milton Road and Coronation Drive.

A total of 25 important corridors were identified, as shown in Figure 5-1, 5-2, 5-3..

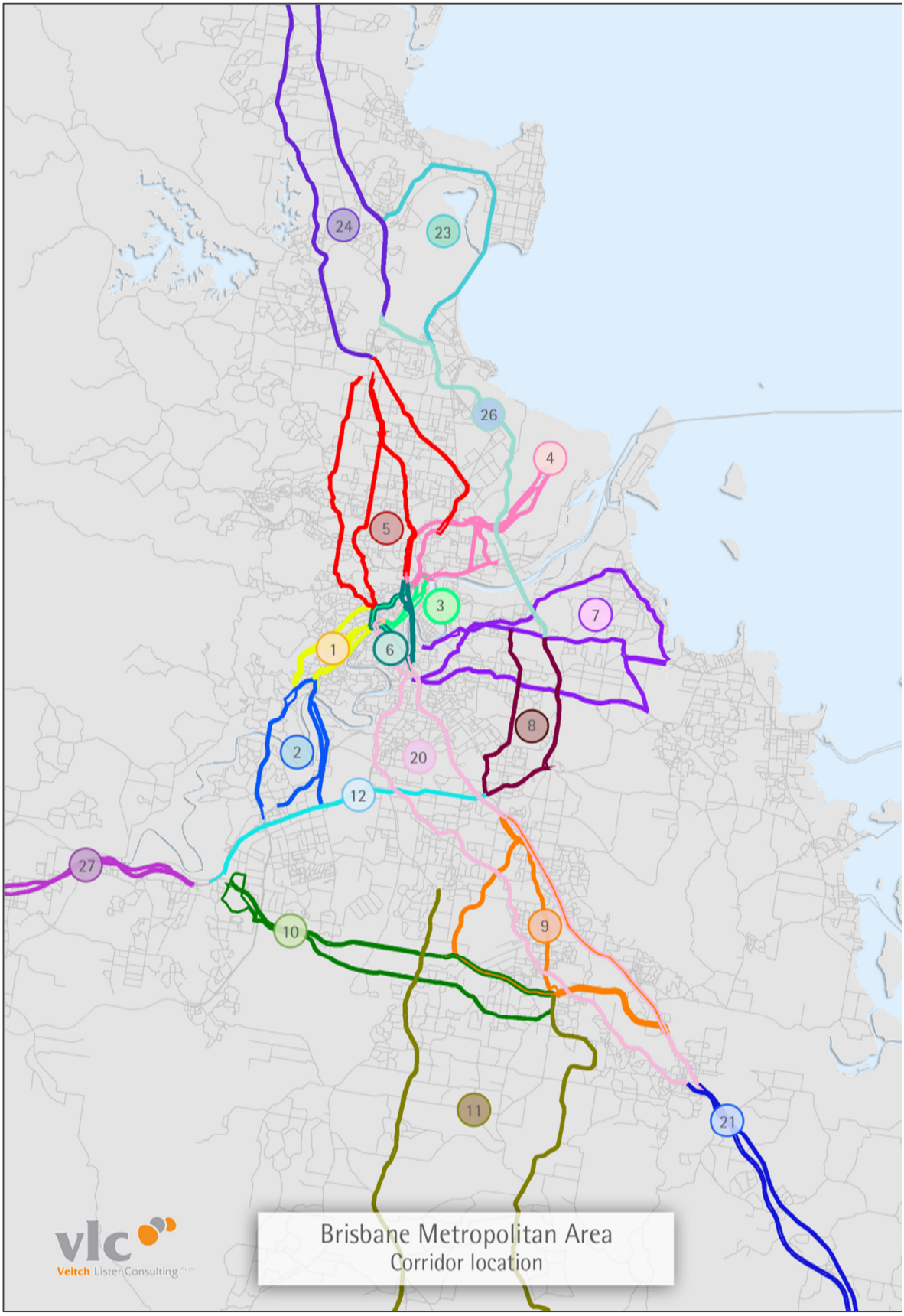

Figure 5-1: Major transport corridors in Brisbane

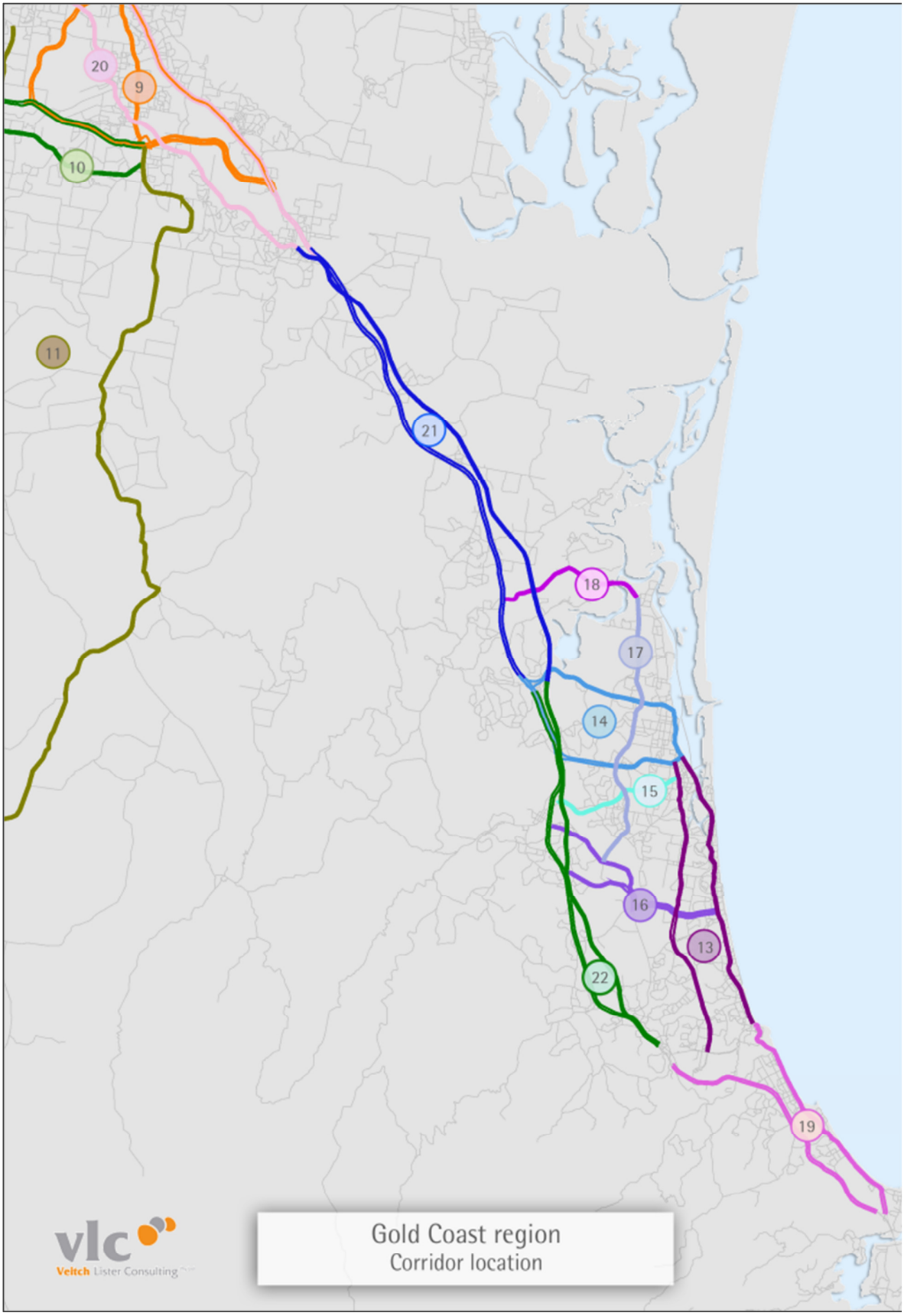

Figure 5-2: Major transport corridors in the Gold Coast

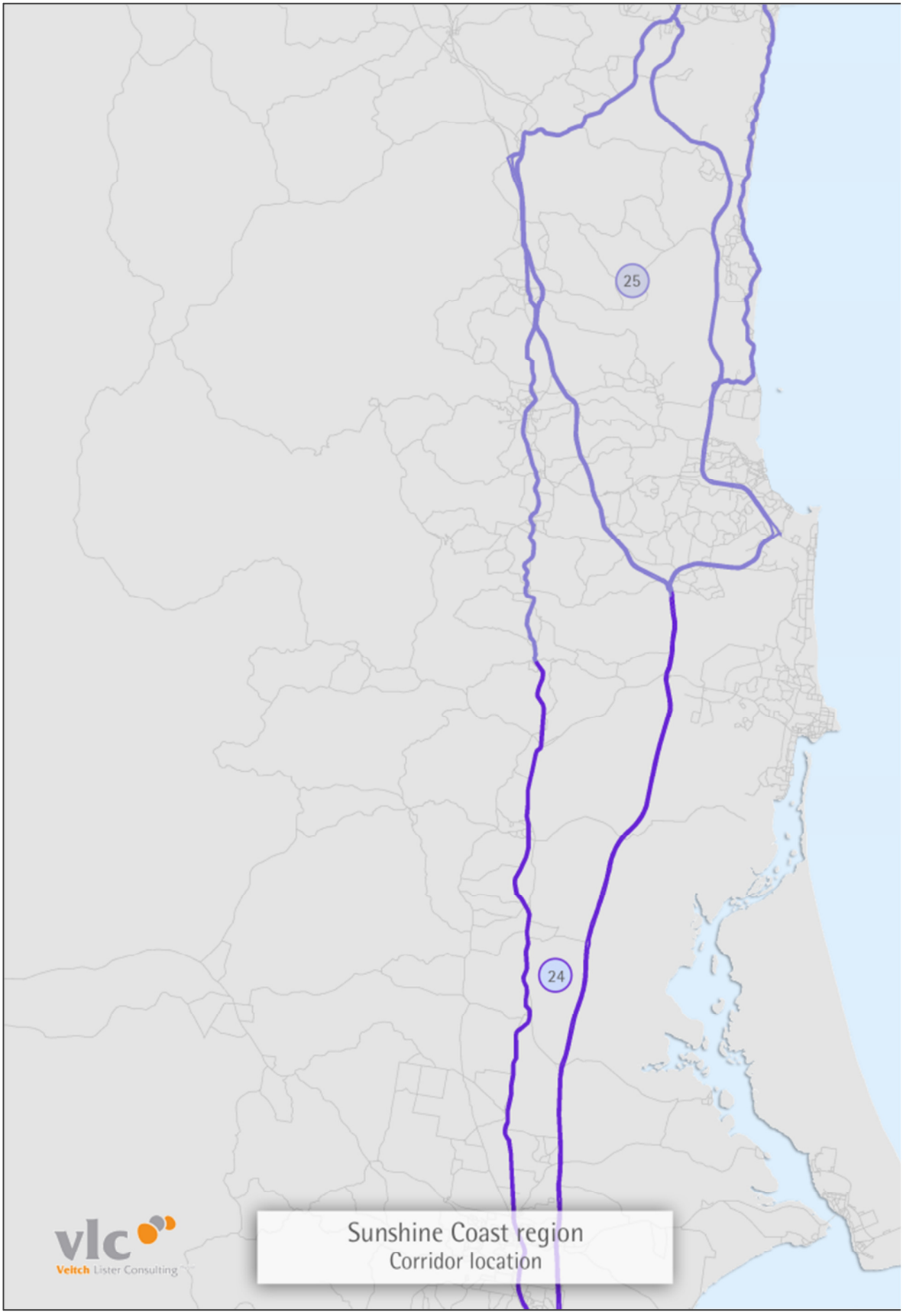

Figure 5-3: Major transport corridors in the Sunshine Coast

Each of the major roads in each corridor was then divided up into subsections, based on variations in the road's characteristics - such as the number of traffic lanes, posted speed and likely changes in traffic demand. How the roads in the inner south west corridor (Milton Road and Coronation Drive) were split into subsections is shown in Figure 5-4.

The Zenith model has then been used to produce a number of metrics that, in combination, help define the importance of the various section of SEQ's higher order road network, their economic contribution and how efficiently they perform in 2011 and 2031. Such information is important, as it guides transport planners to those portions of the road network that will in the future be generating large economic cost due to congestion, yet still be making a large economic contribution as a result of the number of vehicle-kilometres of travel they accommodate each weekday.

The full set of metrics produced for each subsection of road in each corridor are listed in Table 5-6.

The spreadsheet containing the metrics by road subsection for all the identified corridors in SEQ is titled **vlc_yymmdd_02_SEQ_Corridor Analysis.xlsx**

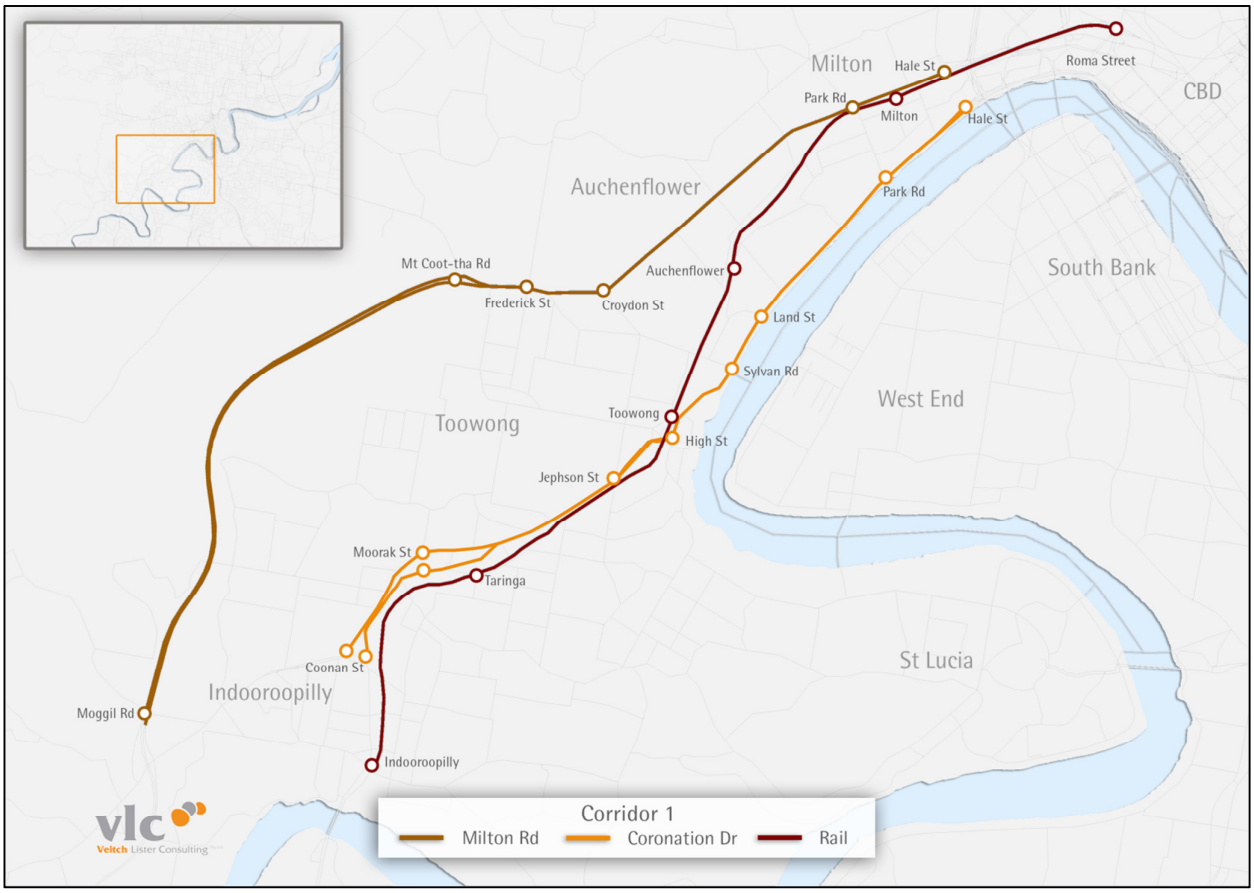

Figure 5-4: Subsections in Corridor 1 - Milton Road and Coronation Drive

Table 5-6: Metrics reported for major road subsections

Type	Metric
Corridor Type	Corridor Type
Length	Total Length (km)
Capacities (veh/hr)	Average Hourly Capacity per km
Traffic volumes weighted by vehicle kilometers (busiest peak hour)	Average Peak Hour Traffic Volumes Average Peak Hour CV Volumes % Average Peak Hour CV Volumes
Traffic speeds under freeflow (modelled) and congested conditions	Average Speed Freeflow (kph) Average Speed Congested (kph)
Travel Times under freeflow (modelled) and congested conditions	Total Travel Time Freeflow (min) Total Travel Time Congested (min)
Network performance daily	Total Vehicle Kilometers Travelled (km) Total Vehicle Hours Travelled Congested (hrs) Total Vehicle Hours Travelled Freeflow (hrs) Total hours of delay (hrs)
Level of Service (Traffic) (busiest peak hour)	Minimum Level of Service Average Level of Service Maximum Level of Service
Traffic V/C (busiest peak hour)	Weighted V/C Traffic

5.4 CityTrain analysis

Based on the seating capacity and crush capacity of QR's trains (as described in Appendix B), the Zenith model has been used to assess the degree of crowding and overcrowding across the entire rail network.

Passenger loading profiles have been produced for all lines in both the AM and PM peaks for both 2011 and 2031. Examples for the Ipswich and Rosewood Line are presented in Figures 5-5 and 5-6.

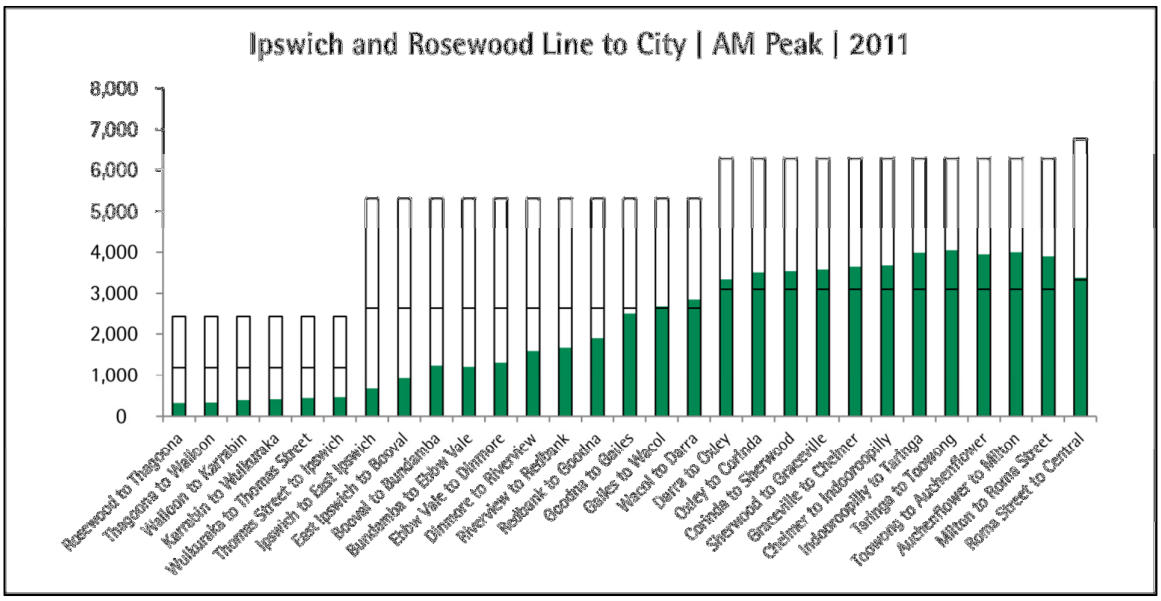

Figure 5-5: Passenger loading profile - Ipswich and Rosewood Line in the AM peak (2011)

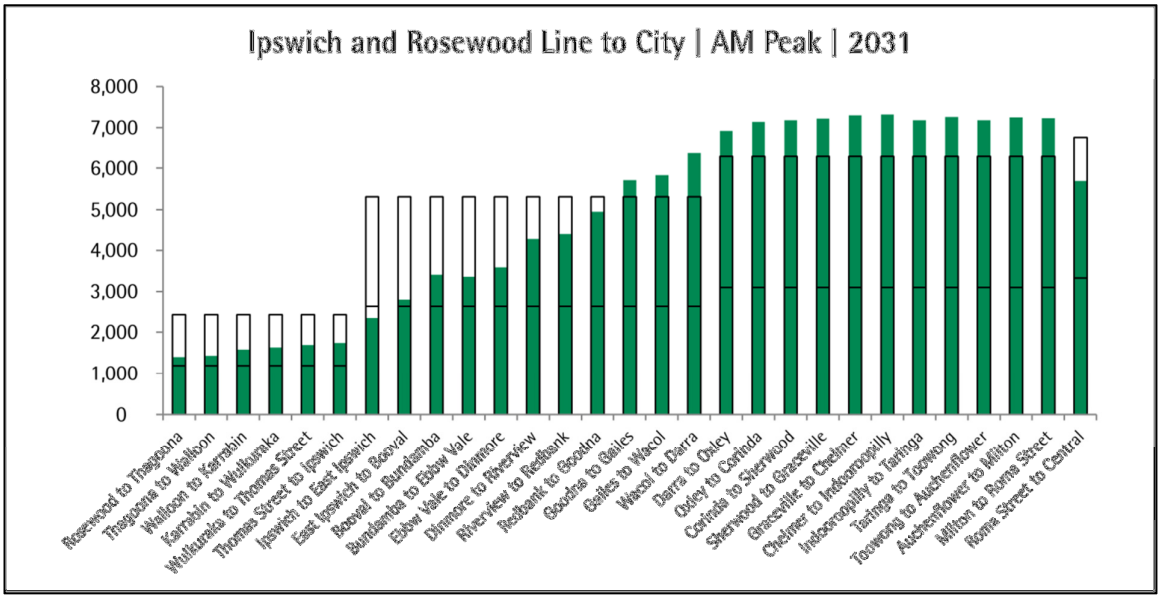

Figure 5-6: Passenger loading profile - Ipswich and Rosewood Line in the AM peak (2031)

6. Travel demand increase in the Region between 2011 and 2031

6.1 Introduction

This section of the report provides the Zenith model's travel estimates and forecasts for 2011 and 2031for the region as well as the model's high level assessment of the performance of the transport network for these two time horizons under a *low transport network investment* scenario. More detailed information on travel demands and network performance at specific locations in the road and public transport networks is provided in Sections 7 and 8 of the report.

6.2 Forecast growth in person travel by mode (2011-2031)

Table 6-1 below shows the Zenith model's forecast growth in person trips between 2011 and 2031. Total person trips made each weekday in the region is forecast to increase from approximately 13.1 million each weekday in 2011 to 19.4 million in 2031 - a 48% increase. As might be expected, the total amount of travel within the region is forecast to increase in line with the projected increase in population.

Under the *low transport network investment* scenario travel by car is forecast to remain the dominant mode in the region, accounting for over 75% of all travel. The percentage of person trips by car is similar in 2031 (though marginally higher); the proportion of trips made by public transport is similarly marginally higher. These increases are at the expense of walk/cycle trips which decline by 1 per cent.

Table 6-1: Growth in person travel in the SEQ Region (2011-2031)

Modal statistics, trips and mode shares		2011		2031		% change
Person car trips	AM	1,665,276	*76.7%*	2,432,194	*76.9%*	*+46%*
	OP	6,959,128	*76.6%*	10,428,468	*77.4%*	*+50%*
	PM	1,450,510	*77.1%*	2,150,485	*77.2%*	*+48%*
	24h	10,074,913	*76.7%*	15,011,147	*77.3%*	*+49%*
PT trips	AM	144,000	*6.6%*	229,620	*7.3%*	*+59%*
	OP	360,995	*4.0%*	585,681	*4.3%*	*+62%*
	PM	106,356	*5.7%*	180,912	*6.5%*	*+70%*
	24h	611,350	*4.7%*	996,213	*5.1%*	*+63%*
Walk / cycling trips	AM	361,083	*16.6%*	501,816	*15.9%*	*+39%*
	OP	1,764,000	*19.4%*	2,466,486	*18.3%*	*+40%*
	PM	324,314	*17.2%*	455,797	*16.4%*	*+41%*
	24h	2,449,398	*18.6%*	3,424,099	*17.6%*	*+40%*
Total trips	AM	2,170,359	*100.0%*	3,163,630	*100.0%*	*+46%*
	OP	9,084,123	*100.0%*	13,480,635	*100.0%*	*+48%*
	PM	1,881,180	*100.0%*	2,787,194	*100.0%*	*+48%*
	24h	13,135,661	*100.0%*	19,431,459	*100.0%*	*+48%*

6.3 Growth in vehicular travel and road network performance in 2011 and 2031

Table 6-2 that follows provides the Zenith models' forecast growth in vehicular travel in the region between 2011 and 2031.

Points to note from this table include:

a) Car trips made each weekday in the region increases from approximately 7.4 million in 2011 to 10.5 million in 2031 - an increase of 42%.

b) Car-kilometres of travel increase by 62% (indicative of longer trip lengths), however, car-hours of travel is predicted to increase by a far larger amount (101%), which is the result of increasing congestion delays on the road network under the assumed *low road network investment* scenario.

c) This has the effect of reducing the average car travel speed on the road network from 54.4 kilometres an hour (kph) in 2011 to 43.8 kph in 2031.

d) Commercial vehicle trips in the region are forecast to increase by 44%.

e) Average commercial vehicle speeds are forecast to reduce from 58.6 kph in 2011 to 49.6 kph in 2031 under the *low road network investment* scenario(that is, by 15 per cent).

Table 6-2: Growth in vehicular travel in the SEQ Region (2011-2031)

Traffic statistics		2011	2031	% change
Car trips	AM	1,170,335	1,642,660	*+40%*
	OP	5,095,695	7,314,783	*+44%*
	PM	1,110,170	1,568,688	*+41%*
	24h	7,376,200	10,526,130	*+43%*
Car kilometres	AM	12,000,945	18,998,482	*+58%*
	OP	52,575,119	85,854,463	*+63%*
	PM	12,547,217	20,005,296	*+59%*
	24h	77,123,281	124,858,241	*+62%*
Car hours	AM	249,627	541,751	*+117%*
	OP	911,056	1,736,754	*+91%*
	PM	257,055	573,691	*+123%*
	24h	1,417,738	2,852,196	*+101%*
Car Average assigned speed (kph)	AM	48.1	35.1	*-27%*
	OP	57.7	49.4	*-14%*
	PM	48.8	34.9	*-29%*
	24h	54.4	43.8	*-20%*
Commercial Vehicle trips	AM	43,529	62,943	*+45%*
	OP	257,584	371,800	*+44%*
	PM	32,243	46,561	*+44%*
	24h	333,357	481,304	*+44%*
Commercial Vehicle kilometres	AM	855,625	1,305,875	*+53%*
	OP	5,139,822	7,797,851	*+52%*
	PM	643,067	977,503	*+52%*
	24h	6,638,513	10,081,229	*+52%*
Commercial Vehicle hours	AM	16,174	32,061	*+98%*
	OP	84,806	146,365	*+73%*
	PM	12,235	24,741	*+102%*
	24h	113,214	203,167	*+79%*

Traffic statistics	2011	2031	% change

Commercial Vehicle Average assigned speed (kph)	AM	52.9	40.7	*-23%*
	OP	60.6	53.3	*-12%*
	PM	52.6	39.5	*-25%*
	24h	58.6	49.6	*-15%*
Total trips	AM	1,213,865	1,705,602	*+41%*
	OP	5,353,279	7,686,582	*+44%*
	PM	1,142,414	1,615,250	*+41%*
	24h	7,709,557	11,007,434	*+43%*
Total kilometres	AM	12,856,570	20,304,356	*+58%*
	OP	57,714,940	93,652,314	*+62%*
	PM	13,190,283	20,982,799	*+59%*
	24h	83,761,794	134,939,469	*+61%*
Total hours	AM	265,801	573,812	*+116%*
	OP	995,861	1,883,119	*+89%*
	PM	269,289	598,432	*+122%*
	24h	1,530,952	3,055,364	*+100%*
Total Average assigned speed (kph)	AM	48.4	35.4	*-27%*
	OP	58.0	49.7	*-14%*
	PM	49.0	35.1	*-28%*
	24h	54.7	44.2	*-19%*

6.4 Growth in public transport ridership (2011-2031)

Table 6-3 below shows the Zenith model's predicted growth in public transport ridership between 2011 and 2031 under the *low transport network investment* scenario. Table 6-4 provides a summary of supply-side statistics.

Table 6-3: Predicted growth in public transport ridership (2011-2031)

Public transport statistics		2011	2031	% change
Total PT boardings	AM	164,762	272,248	*+65%*
	OP	404,259	663,283	*+64%*
	PM	122,235	218,167	*+78%*
	24h	691,255	1,153,698	*+67%*
In vehicle passenger kilometres	AM	1,939,737	3,752,289	*+93%*
	OP	4,110,151	7,591,213	*+85%*
	PM	1,561,449	3,311,523	*+112%*
	24h	7,611,337	14,655,024	*+93%*
In vehicle passenger hours	AM	48,938	92,764	*+90%*
	OP	103,595	187,963	*+81%*
	PM	38,831	78,353	*+102%*
	24h	191,363	359,080	*+88%*
Total Rail boardings	AM	70,414	133,455	*+90%*
	OP	142,461	272,123	*+91%*
	PM	52,987	111,015	*+110%*
	24h	265,863	516,593	*+94%*
Total Bus boardings	AM	91,053	130,449	*+43%*
	OP	249,253	359,462	*+44%*
	PM	65,863	98,853	*+50%*
	24h	406,168	588,764	*+45%*
Total Ferry boardings	AM	3,295	5,348	*+62%*
	OP	12,545	20,420	*+63%*
	PM	3,385	5,572	*+65%*
	24h	19,224	31,341	*+63%*
Total Light Rail boardings	AM		2,997	
	OP		11,278	
	PM		2,727	
	24h	-	17,001	

It should be appreciated that, under the *low transport network investment* scenario, the existing frequencies of currently operating public services have been retained in the 2031 model run. It has not been assumed that frequencies will be increased in the future.

However, in-service public transport vehicle kilometres are higher in 2031 due to committed extensions of the rail network, expansion of the LRT network and expansion of bus services in the growth areas, as described in Section 3 of this report.

Table 6-4 that follows shows the extent to which in-service public transport vehicle-kilometres have been increased when performing the 2031 Zenith model run.

Table 6-4: Increase in in-service public transport vehicle-kilometres (2011-2031)

Public transport statistics		2011	2031	% change
In-Service Kilometres by Rail	AM	5,447	7,041	*+29%*
	OP	24,645	27,163	*+10%*
	PM	4,774	6,582	*+38%*
	24h	34,865	40,786	*+17%*
In-Service Kilometres by Bus	AM	48,350	57,670	*+19%*
	OP	186,613	218,574	*+17%*
	PM	48,443	57,343	*+18%*
	24h	283,406	333,587	*+18%*
In-Service Kilometres by Ferry	AM	537	575	*+7%*
	OP	2,872	3,024	*+5%*
	PM	531	606	*+14%*
	24h	3,940	4,205	*+7%*
In-Service Kilometres by LRT	AM		584	
	OP		2,920	
	PM		584	
	24h		4,088	

Points to note from Tables 6-3 and 6-4 are as follows:

a) As indicated in Table 6-1 the total daily increase in trips by public transport is from about 0.6m in 2011 to 1.0m in 2031. That is by over 60 percent (cf. the population increase of 50 per cent). Note that there is a distinction between public transport boardings and trips (a trip may involve multiple boardings – bus/rail for example).

b) In vehicle passenger kilometres and hours both increase disproportionately (at 93 per cent and 88 per cent respectively) which is clearly indicative of longer trips as well as increased patronage.

c) The increase in rail patronage is most pronounced at 94 per cent daily probably reflecting its relative insulation from increased road congestion.

d) Bus patronage, on the other hand, increases (more or less) in line with population movements.

e) Predicted light rail patronage on the Gold Coast is 17,000 per day.

f) Patronage on the Brisbane cross-river ferries is forecast to increase by over 60 per cent.

7. Road network performance

7.1 Introduction

This section of the report presents the Zenith model's predictions as to how traffic demand in the Region will increase between 2011 and 2031, and how these predicted increases will affect the performance of the road network under a *low road network investment* scenario that assumes only committed and "highly likely" road projects will be initiated in the future.

The results depicted cover an extensive area so the graphics presented are for the three regions separately (i.e. Brisbane, Gold Coast, and Sunshine Coast).

7.2 Increase in traffic (2011-2031)

Figure 7-1 shows the Zenith model's predicted increases in weekday traffic flows in Brisbane (shown in dark green) between 2011 and 2031.

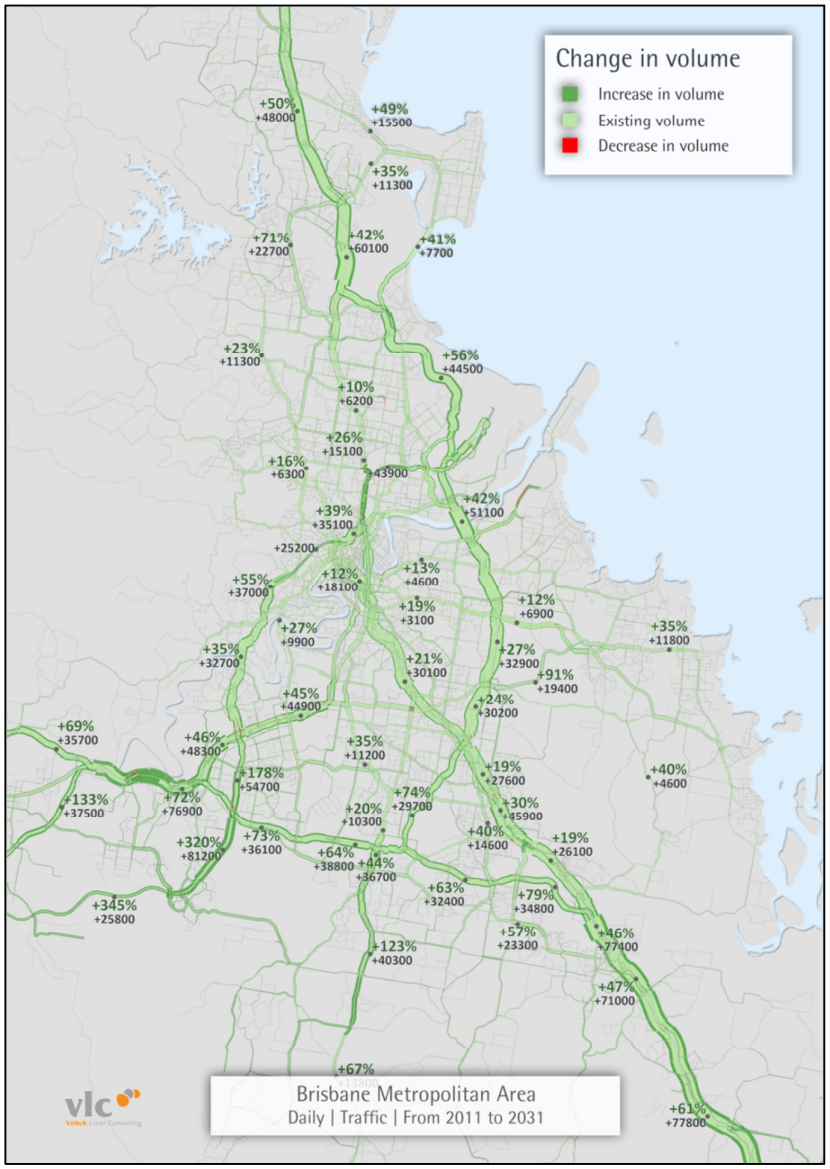

Figure 7-1: Predicted increase in Brisbane weekday traffic (2011-2031)

The most important absolute increases in daily traffic are predicted to occur on the Bruce Hwy, the Gateway Mwy, Centenary Mwy and Ipswich Mwy.

The predicted changes in traffic volume (2011-2031) in the AM and PM peaks are shown in Figures 7-2 and 7-3. These changes largely reflect the daily traffic movement changes.

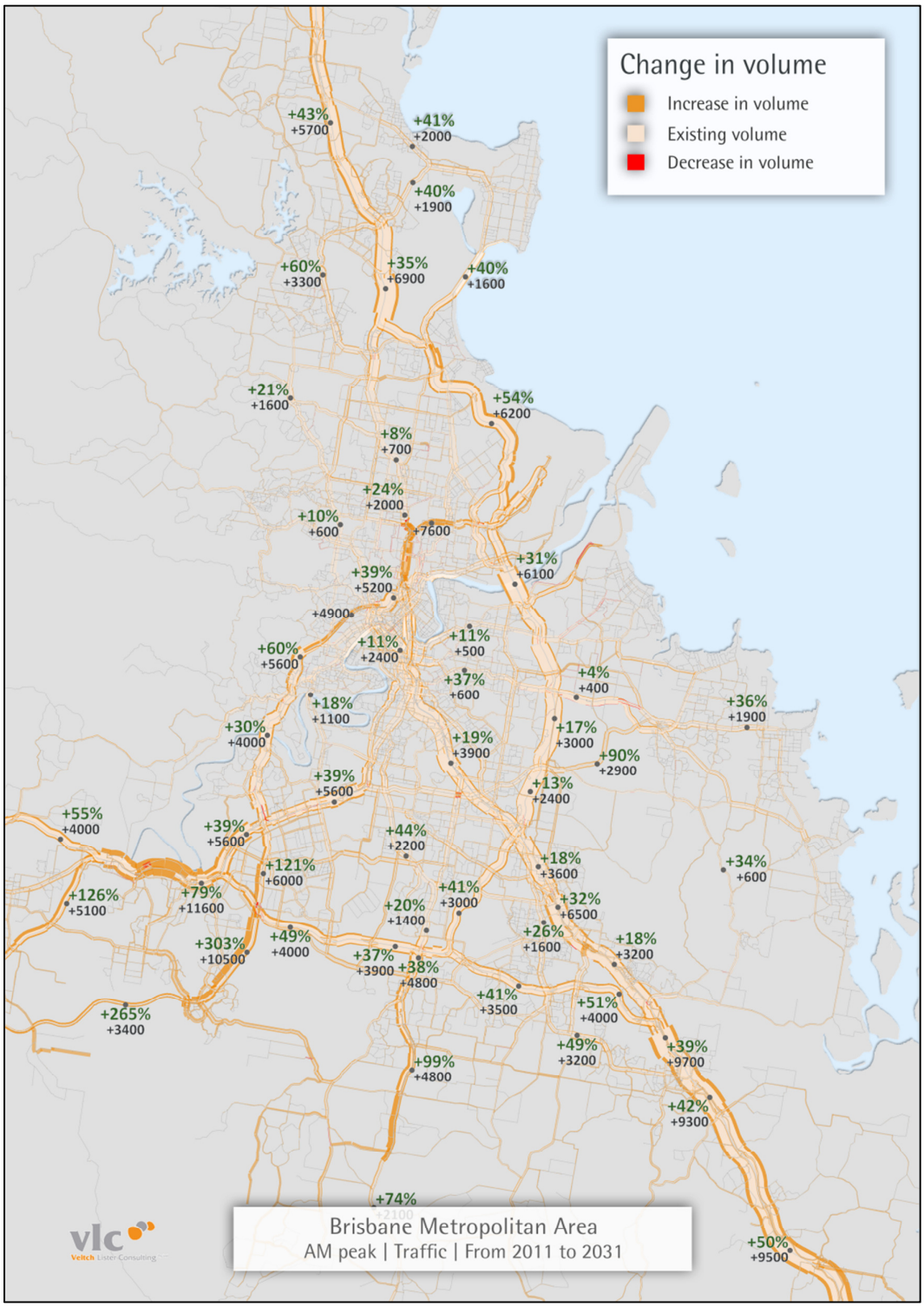

Figure 7-2: Predicted increase in Brisbane weekday AM peak traffic (2011-2031)

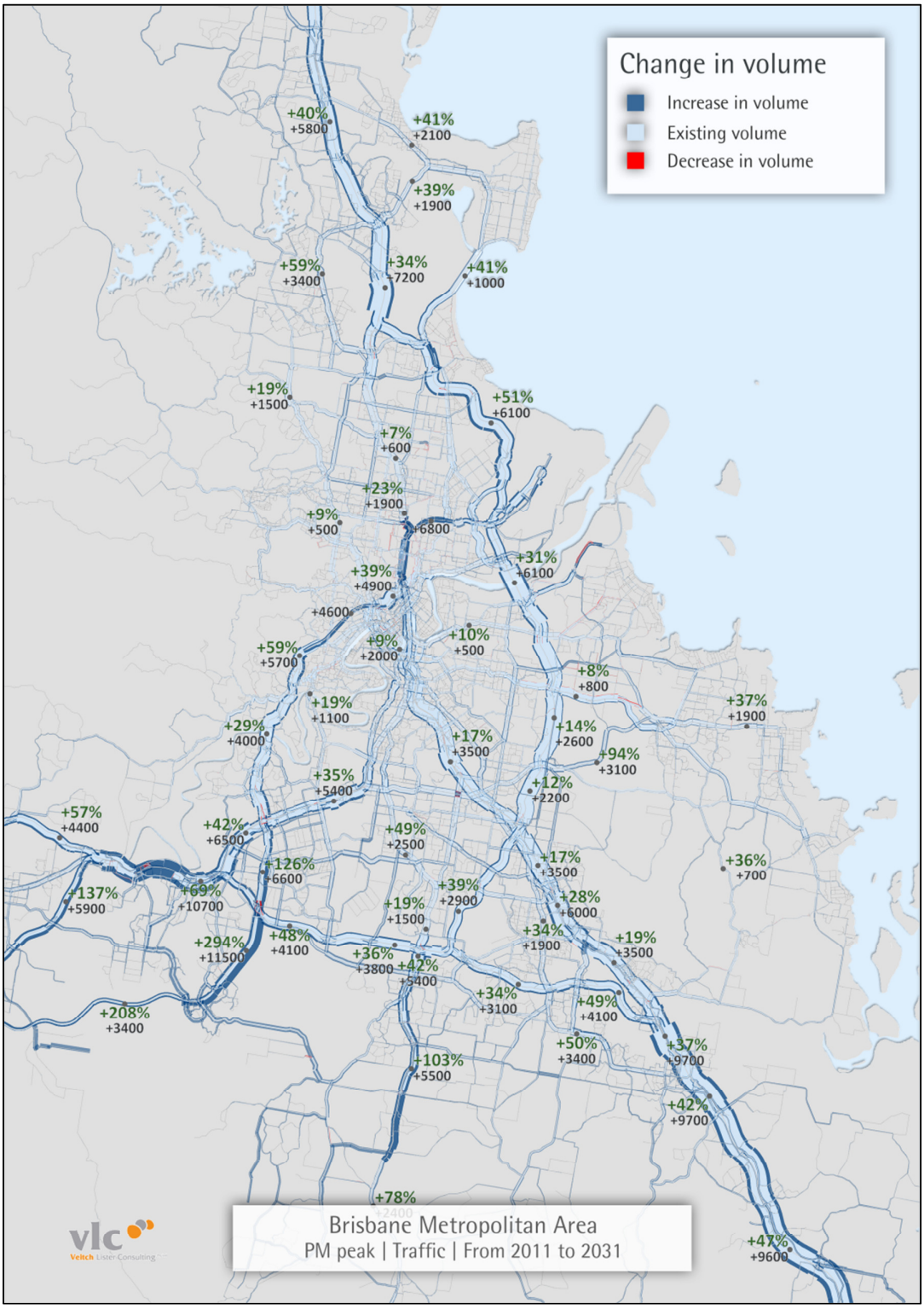

Figure 7-3: Predicted increase in Brisbane weekday PM peak traffic (2011-2031)

Figures 7-4 and 7-5 depict the predicted increases in traffic (daily) on the Gold Coast and Sunshine Coast networks respectively. On the Gold Coast the most significant increase are expected to occur on the Pacific Hwy. Similarly on the Sunshine Coast the highest rate of growth will occur on the Bruce Hwy.

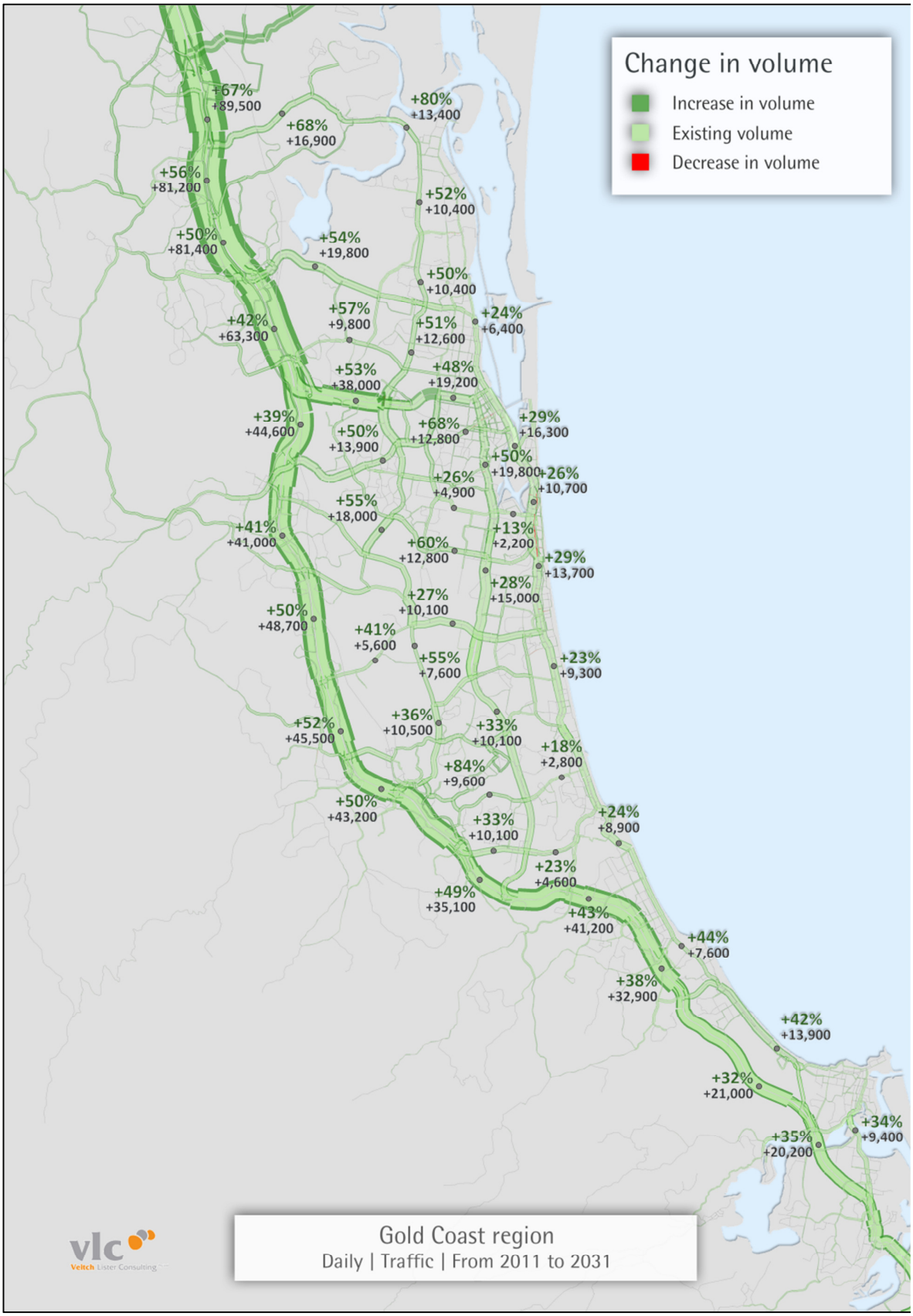

Figure 7-4: Predicted increase in Gold Coast Region weekday traffic (2011-2031)

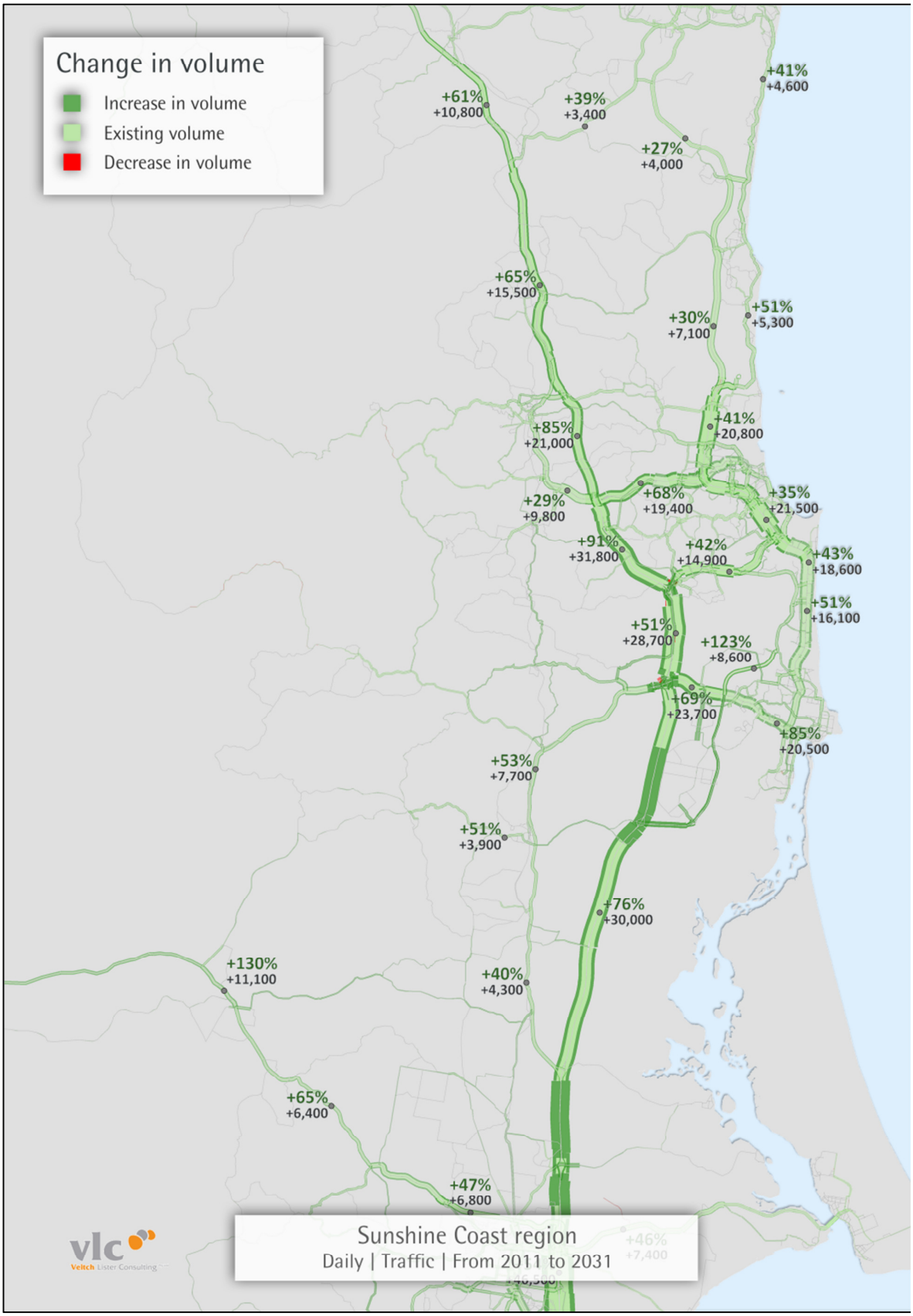

Figure 7-5: Predicted increase in Sunshine Coast Region weekday traffic (2011-2031)

7.3 Volume/capacity ratios (V/C)

The Zenith model's assessment of the performance of the road network in 2011 and 2031 can be gauged from volume/capacity ratio plots (V/C).

V/C ratios are used to gauge the level of congestion in the road network. Significant congestion and delays occur as the V/C ratio approaches unity. Should the V/C ratio exceed unity then the excess demand can only be accommodated by drivers choosing to switch to the shoulders of the peak thereby extending the duration of the peak, changing their destination, changing mode, or not making the journey at all.

The results of the analysis for the Brisbane Region are presented in the following sequence:

- Figure 7-6: Road network volume/capacity ratios in 2011 – AM peak
- Figure 7-7: Road network volume/capacity ratios in 2011 – daytime off peak
- Figure 7-8: Road network volume/capacity ratios in 2011 – PM peak
- Figure 7-9: Road network volume/capacity ratios in 2031 – AM peak
- Figure 7-10: Road network volume/capacity ratios in 2031 – daytime off peak
- Figure 7-11: Road network volume/capacity ratios in 2031 – PM peak

Figures 7-12 through to 7-17 present the results relevant to the Gold Coast in the same sequence. Figures 7-18 through to 7-23 present the corresponding data for the Sunshine Coast.

Referring to Brisbane. In 2011 (AM peak) the network performance is generally satisfactory with relatively few "hot spots". V/C ratios in excess of 1.0 are calculated to occur in parts of the network (e.g. Ipswich Mwy, the Gateway, and on parts of the Pacific Motorway). PM peak network performance is at a similar level. However, with the infrastructure investment strategy modelled (see Figure 7-9), network performance is expected to deteriorate significantly by 2031. A similar observation applies to the PM peak (see Figure 7-11). V/C ratios approaching or in excess of 1.0 are almost the norm in 2031.

On the Gold Coast, a similar general trend is expected to occur. That is from a generally satisfactory level of performance in 2011 to significant network deficiencies in 2031. This is especially true of the Pacific Motorway.

On the Sunshine Coast there is a similar general trend but to nowhere near that expected on the Gold Coast. The exception is the Sunshine Motorway (with an estimated V/C ratio of 1.2 in 2031).

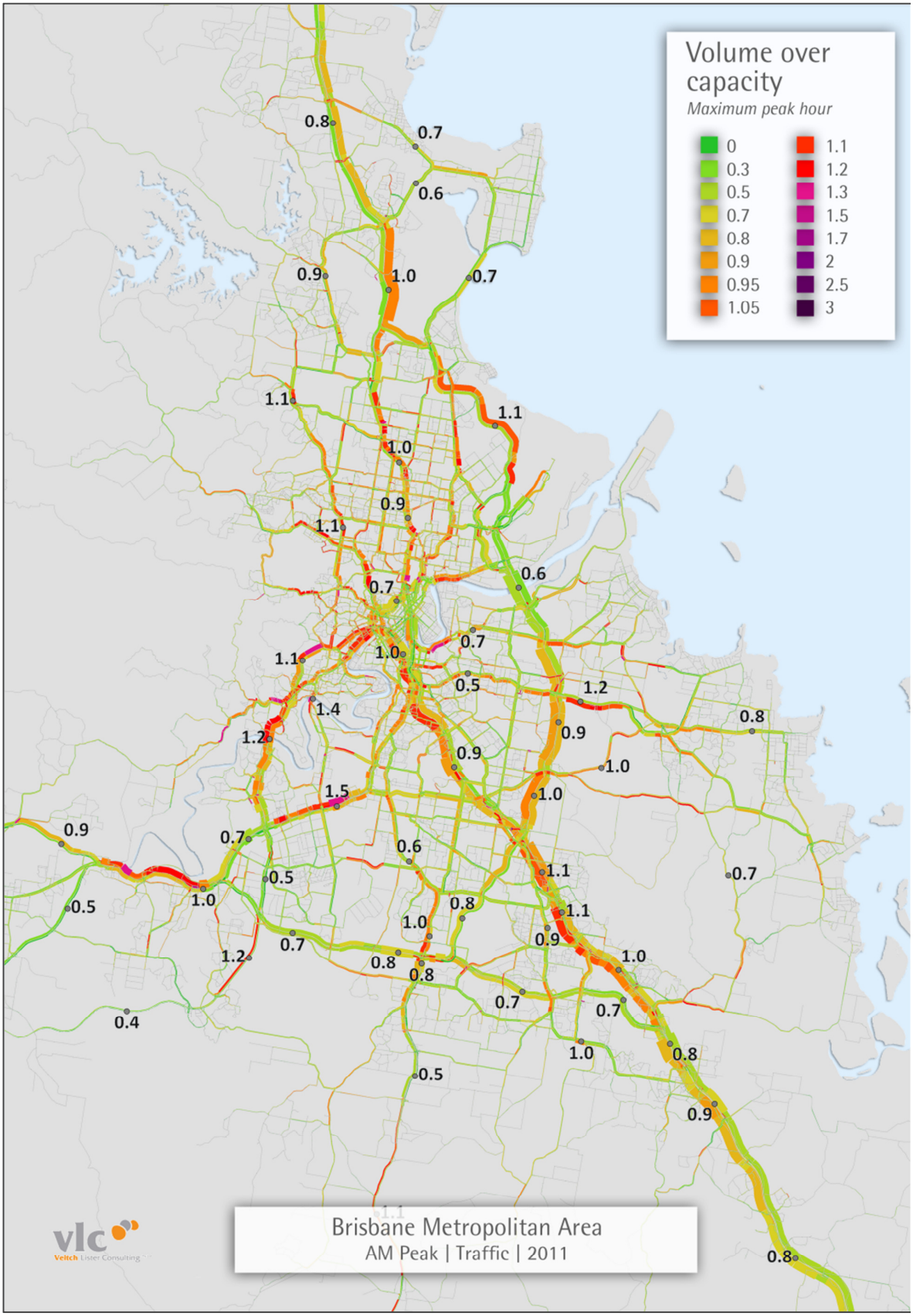

Figure 7-6: Road network volume/capacity ratios in 2011 - AM maximum peak hour

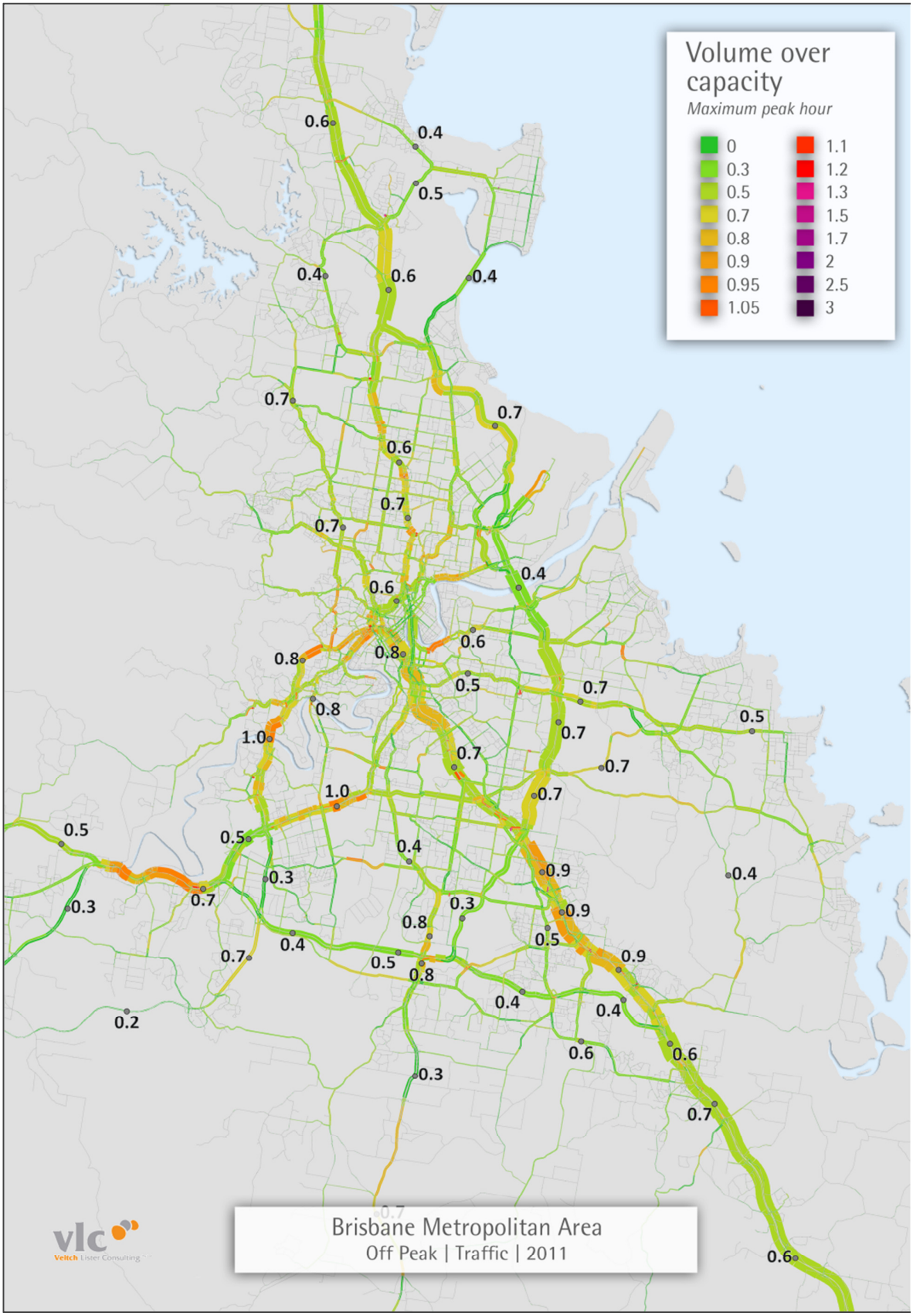

Figure 7-7: Road network volume/capacity ratios in 2011 - daytime off-peak

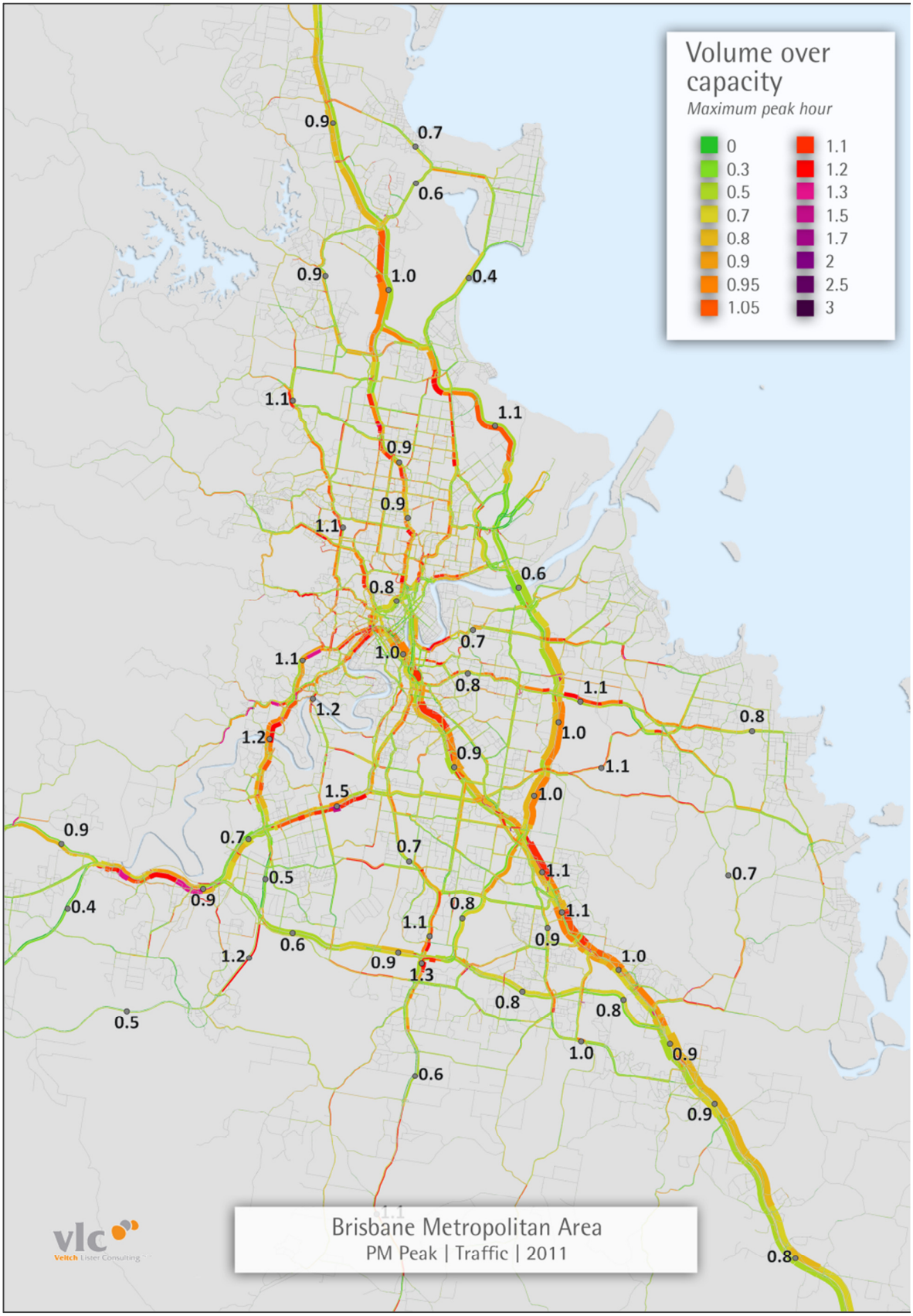

Figure 7-8: Road network volume/capacity ratios in 2011 - PM maximum peak hour

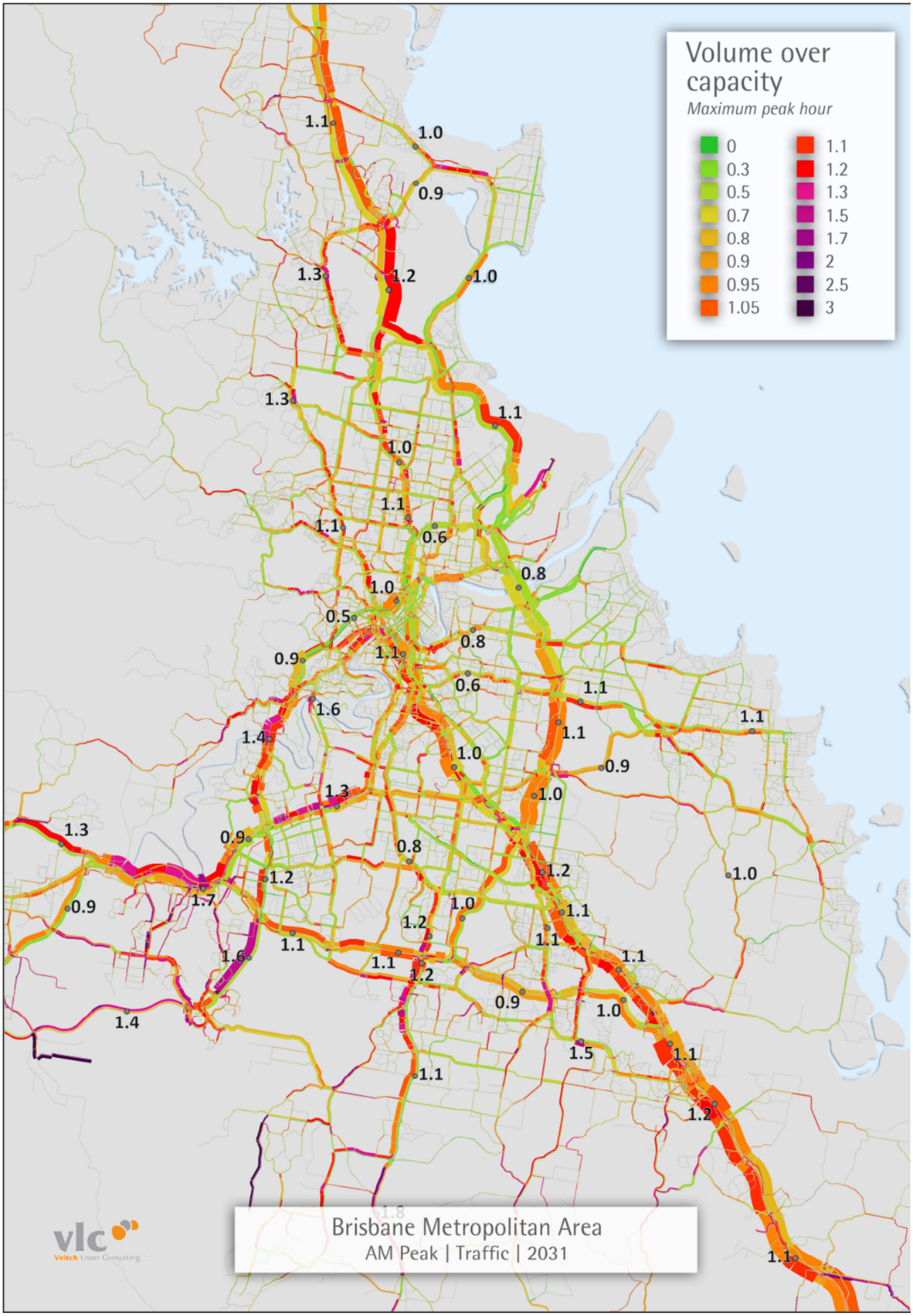

Figure 7-9: Road network volume/capacity ratios in 2031 - AM maximum peak hour

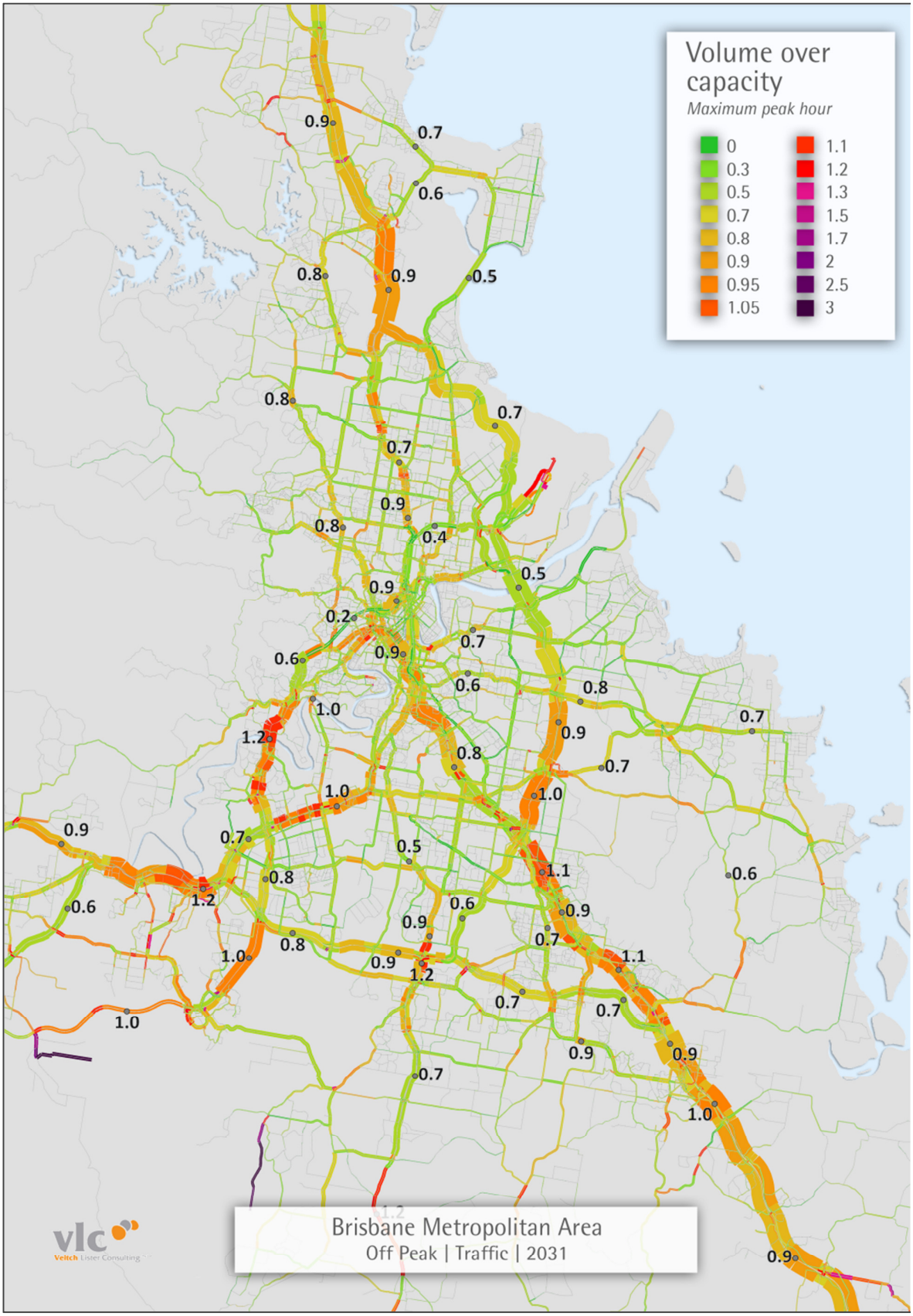

Figure 7-10: Road network volume/capacity ratios in 2031 - daytime off-peak

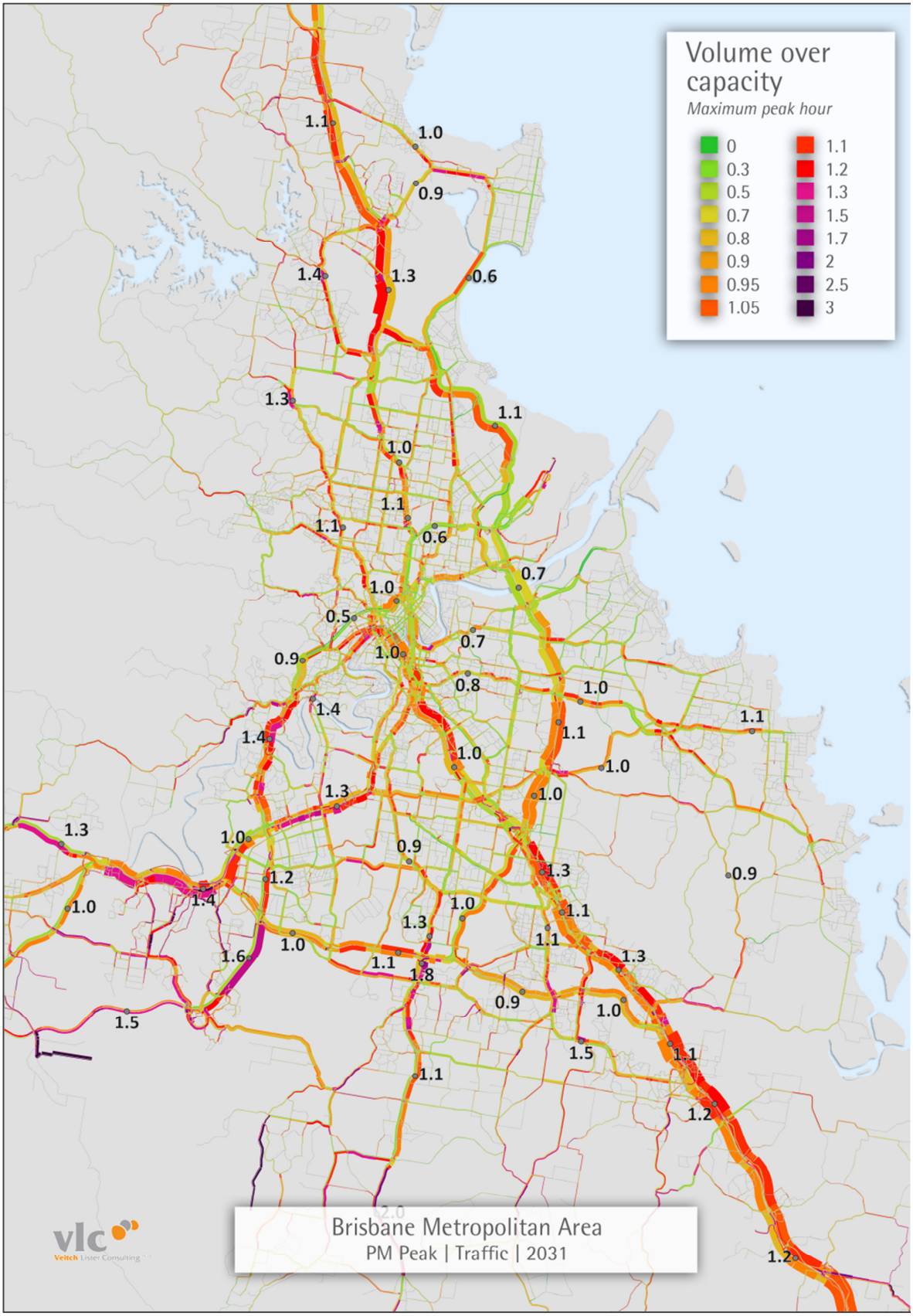

Figure 7-11: Road network volume/capacity ratios in 2031 - PM maximum peak hour

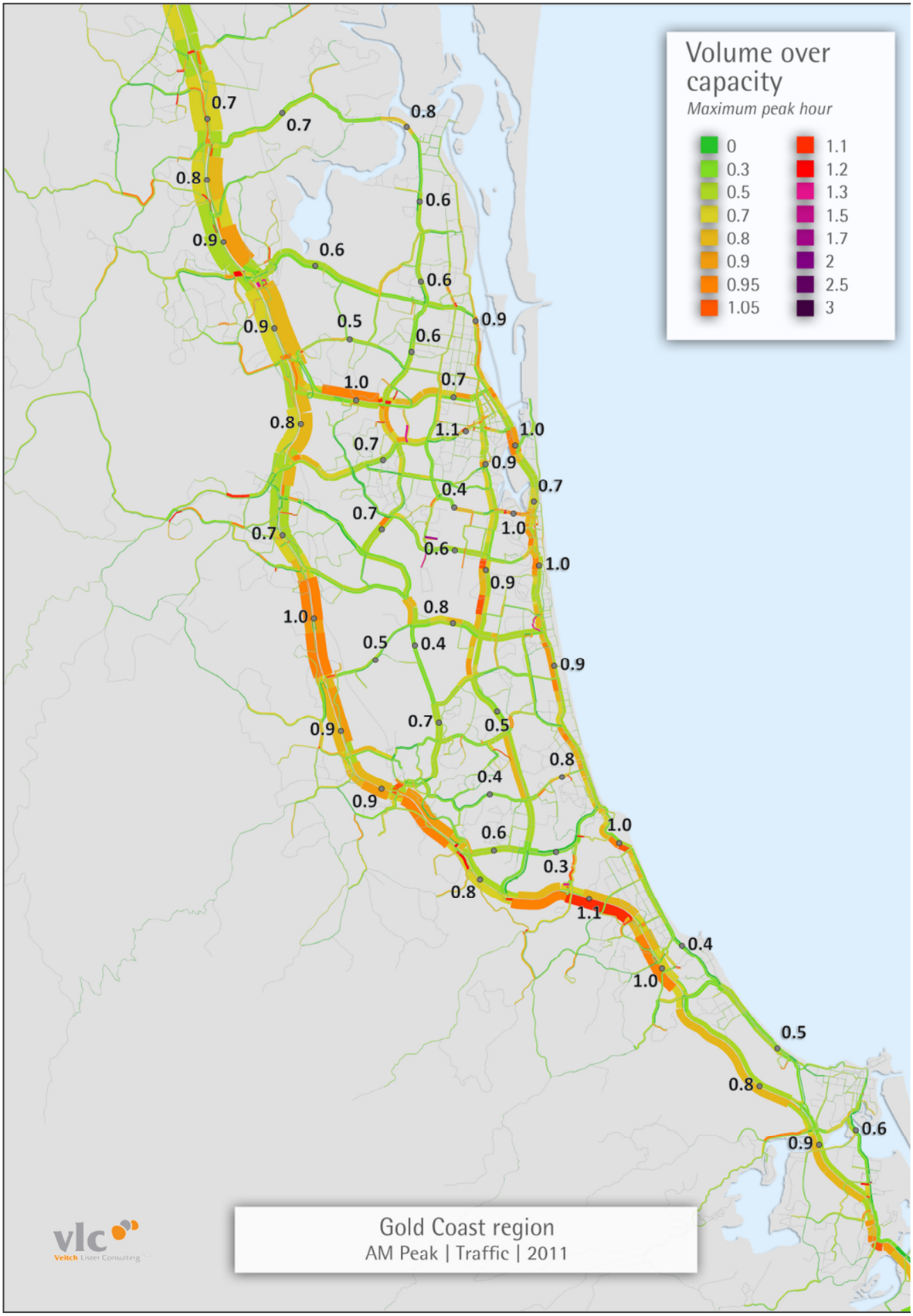

Figure 7-12: Road network volume/capacity ratios in 2011 - AM maximum peak hour

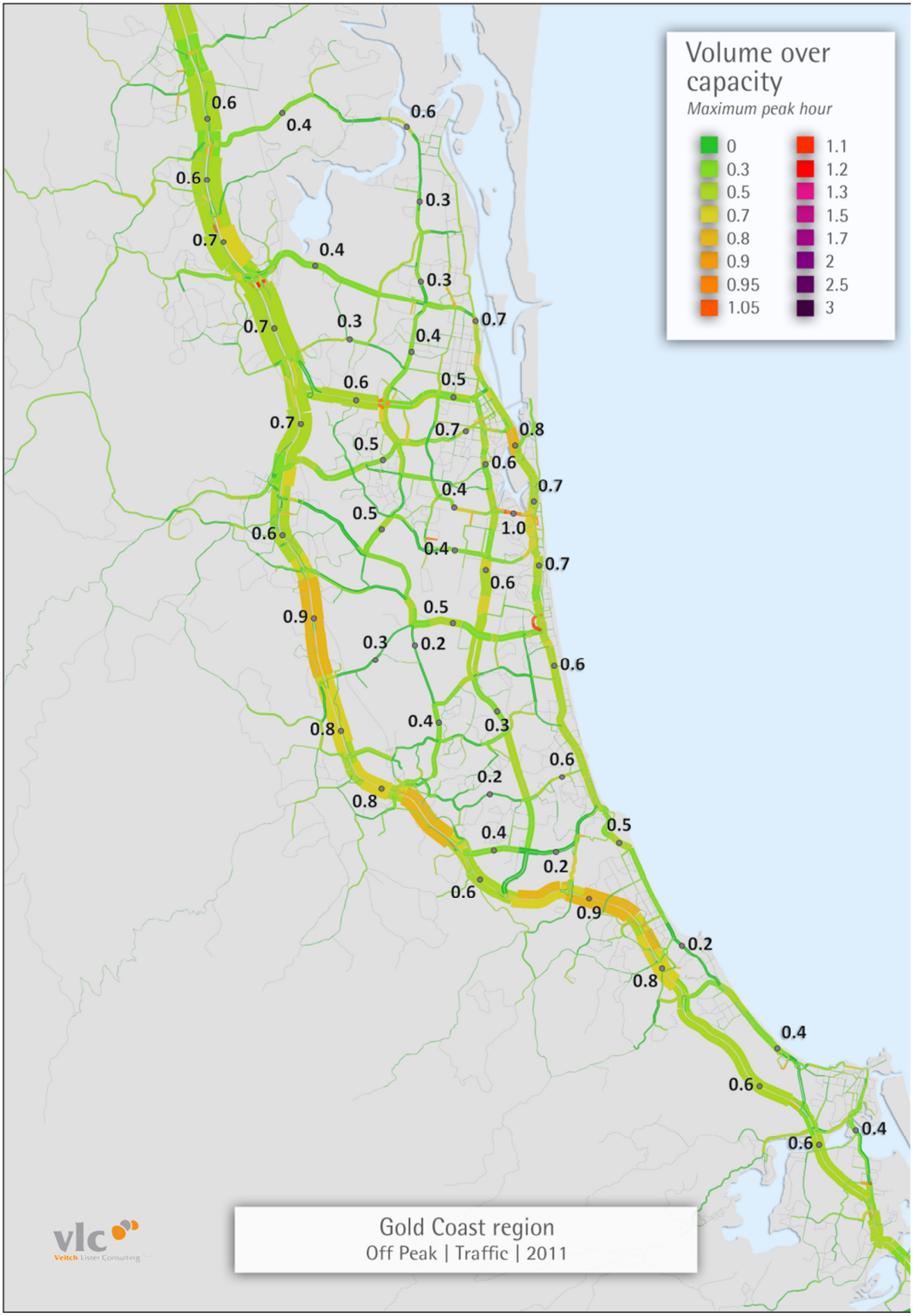

Figure 7-13: Road network volume/capacity ratios in 2011 - daytime off-peak

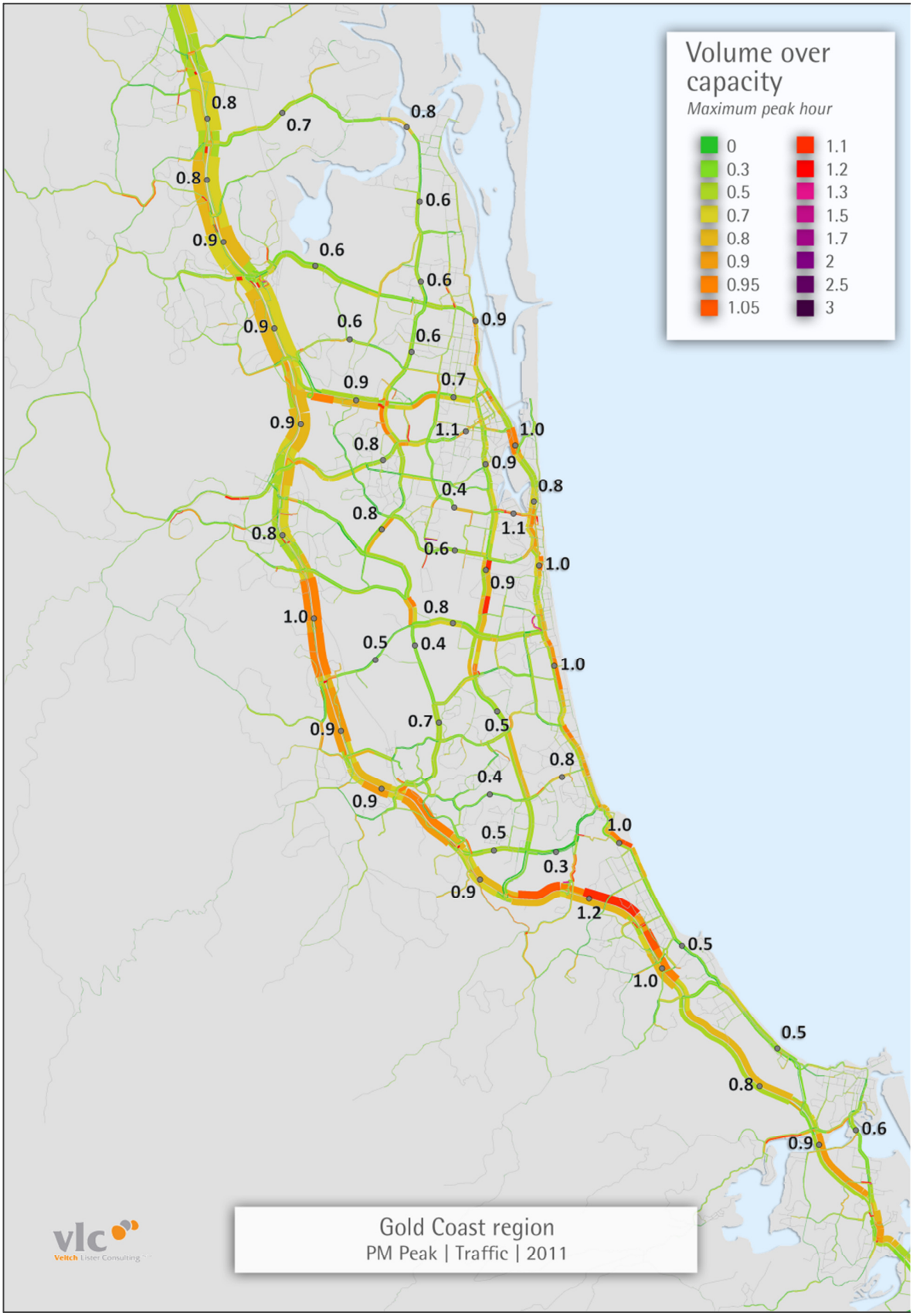

Figure 7-14: Road network volume/capacity ratios in 2011 - PM maximum peak hour

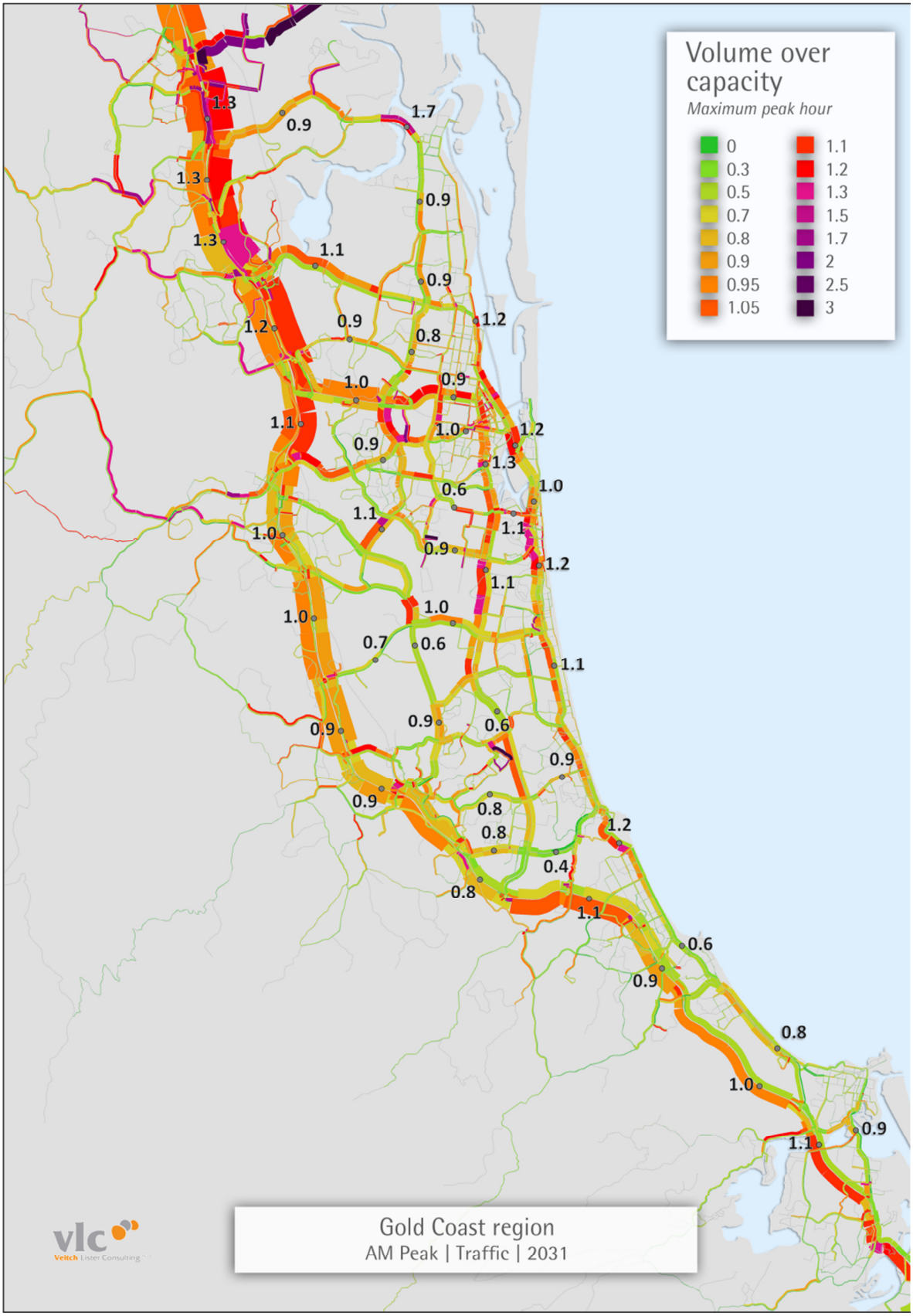

Figure 7-15: Road network volume/capacity ratios in 2031 - AM maximum peak hour

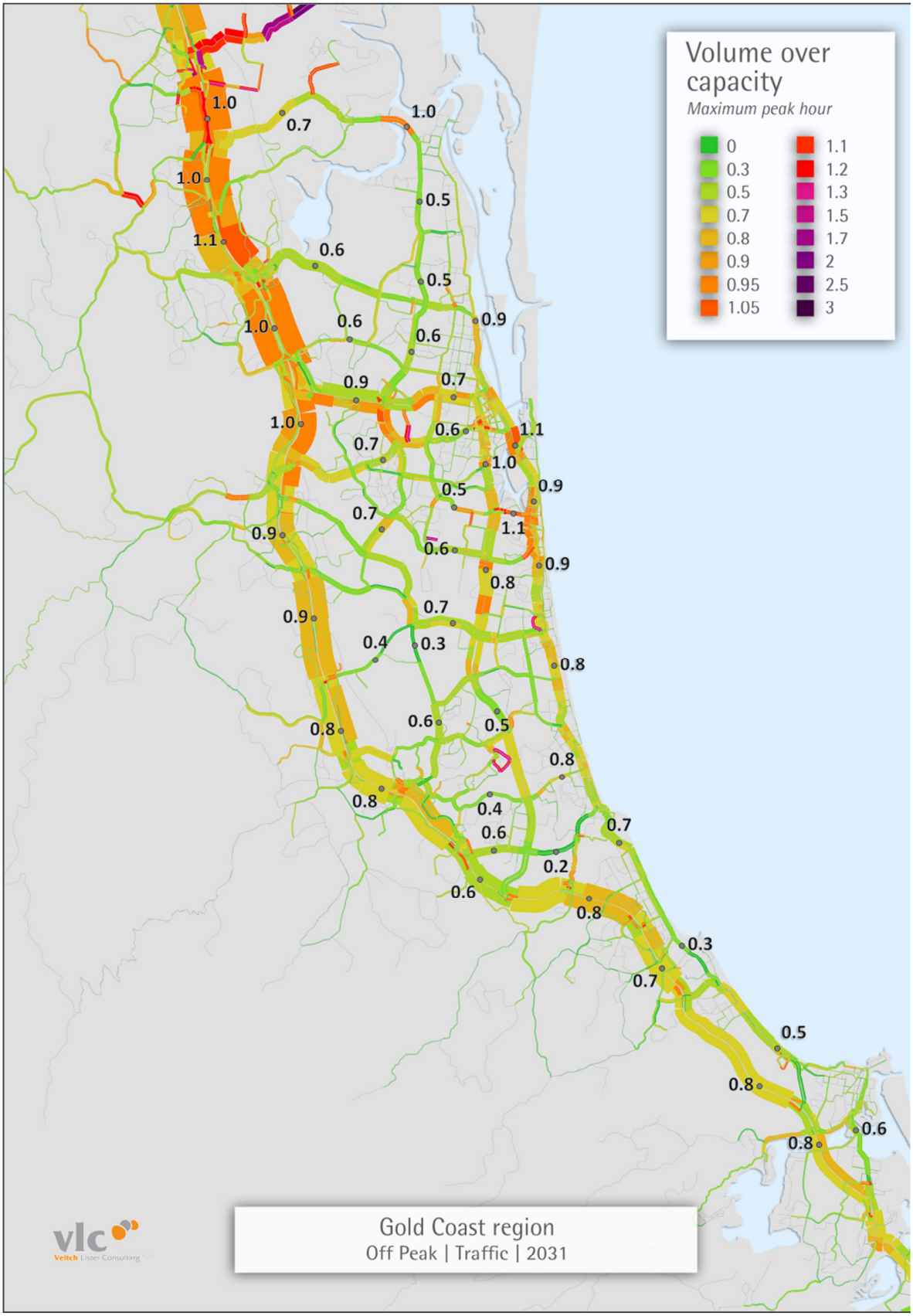

Figure 7-16: Road network volume/capacity ratios in 2031 - daytime off-peak

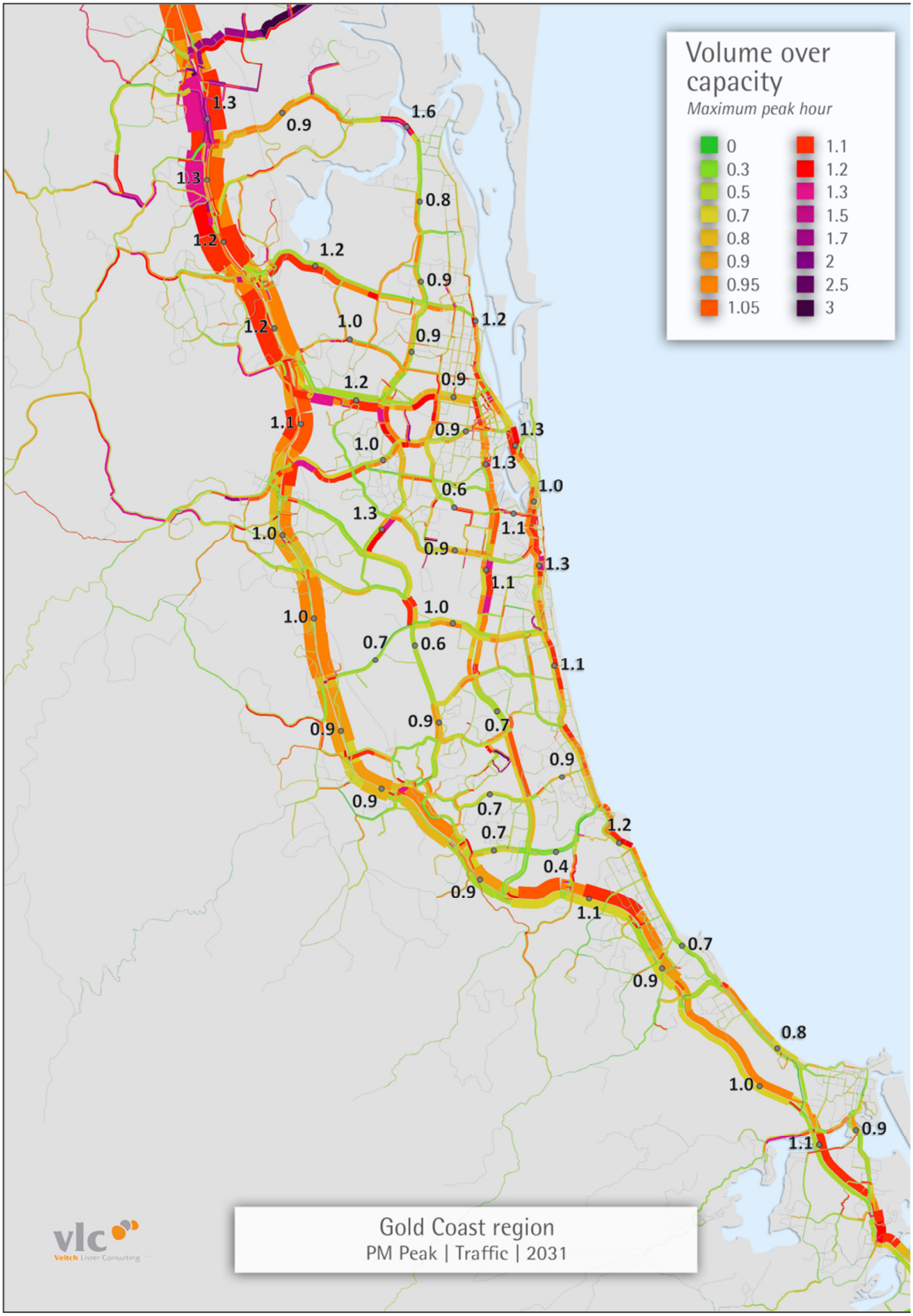

Figure 7-17: Road network volume/capacity ratios in 2031 - PM maximum peak hour

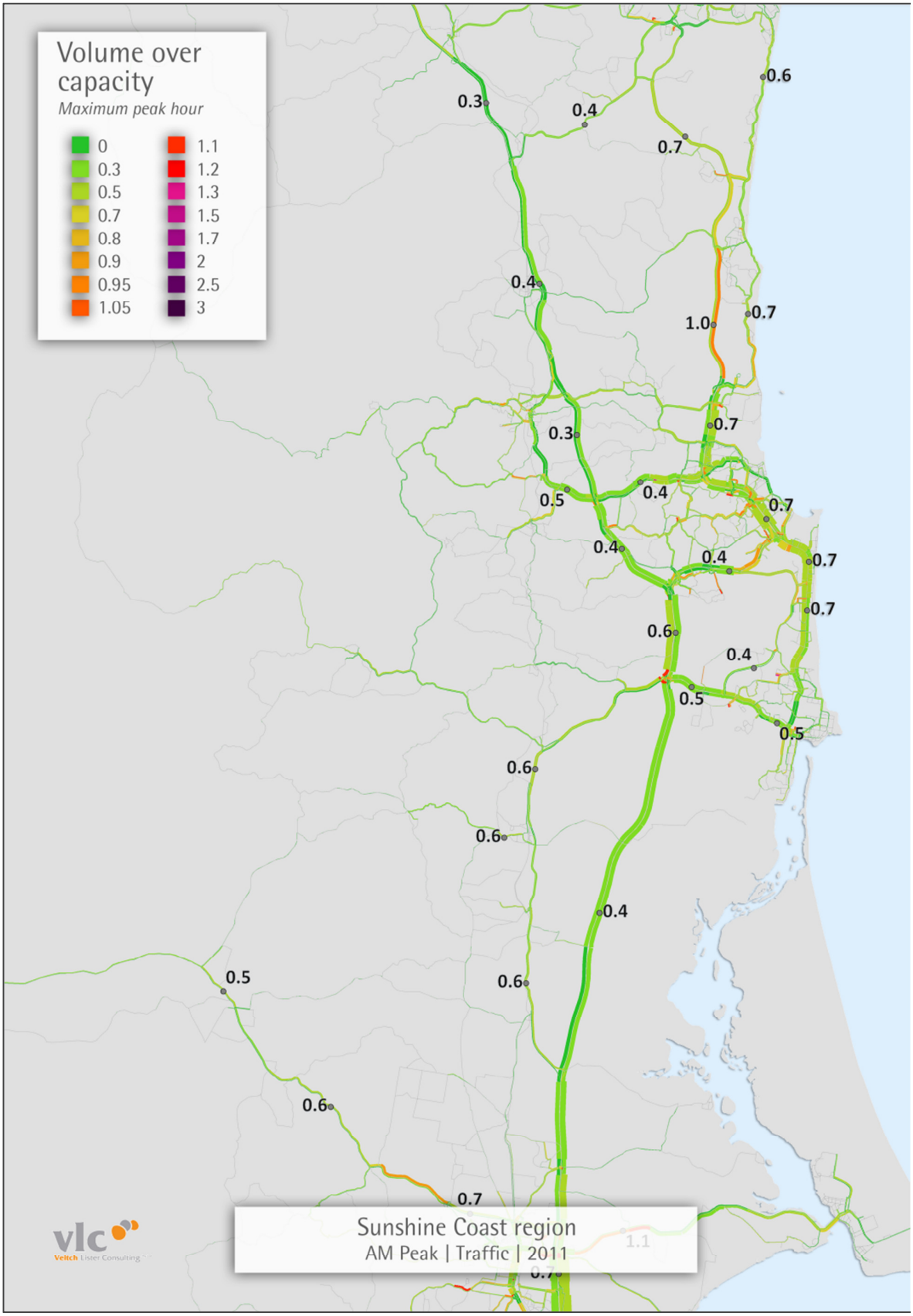

Figure 7-18: Road network volume/capacity ratios in 2011 - AM maximum peak hour

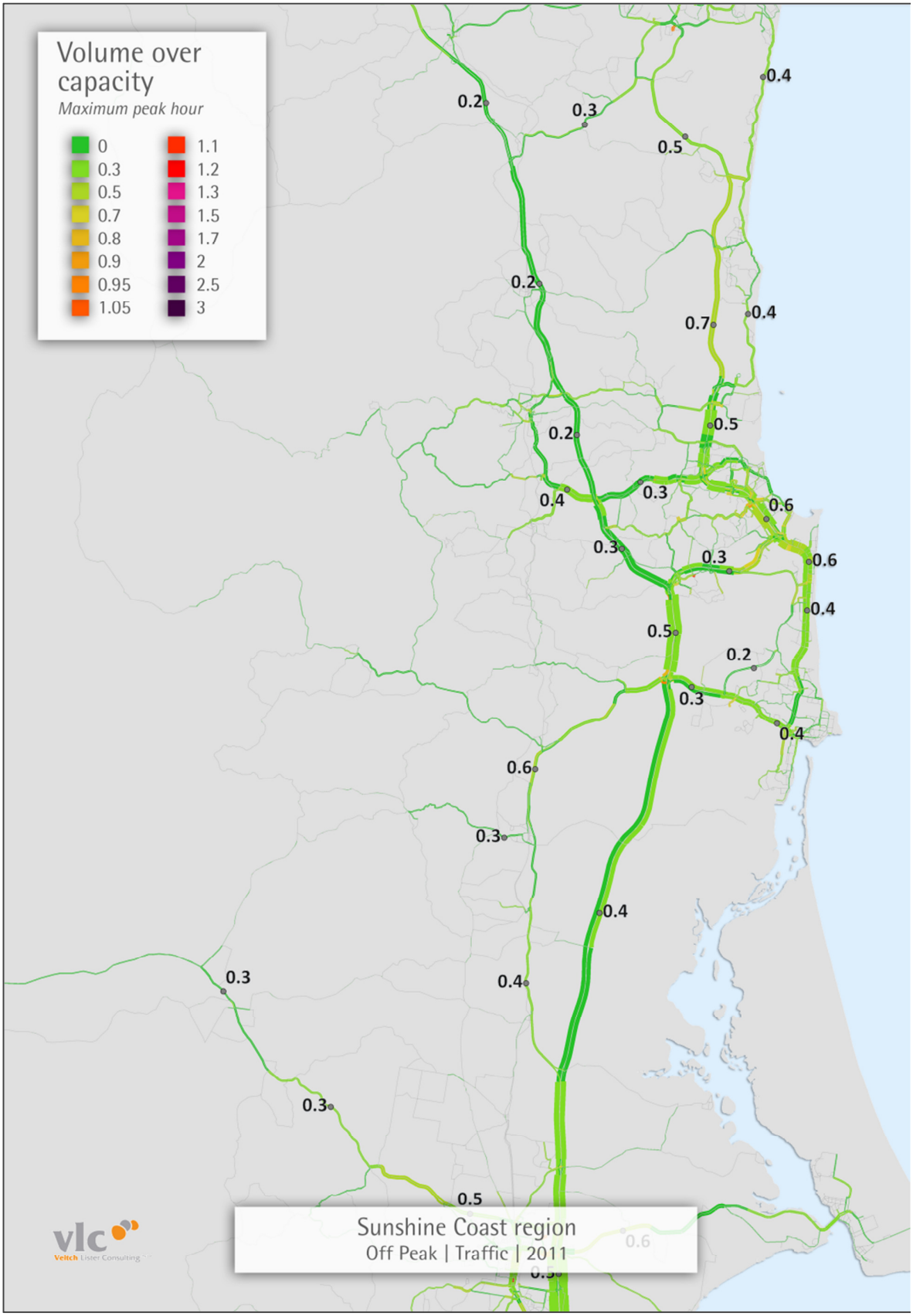

Figure 7-19: Road network volume/capacity ratios in 2011 - daytime off-peak

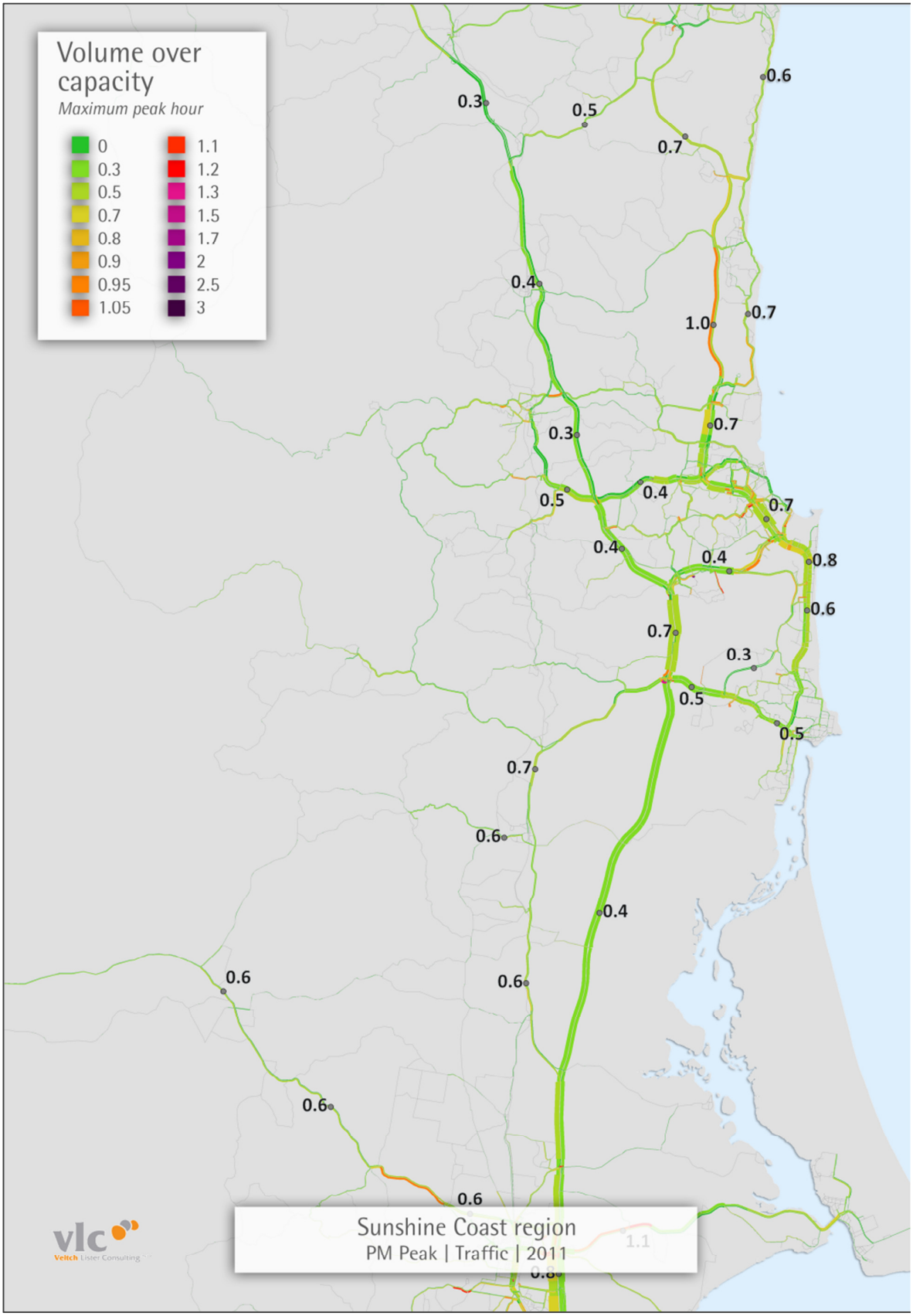

Figure 7-20: Road network volume/capacity ratios in 2011 - PM maximum peak hour

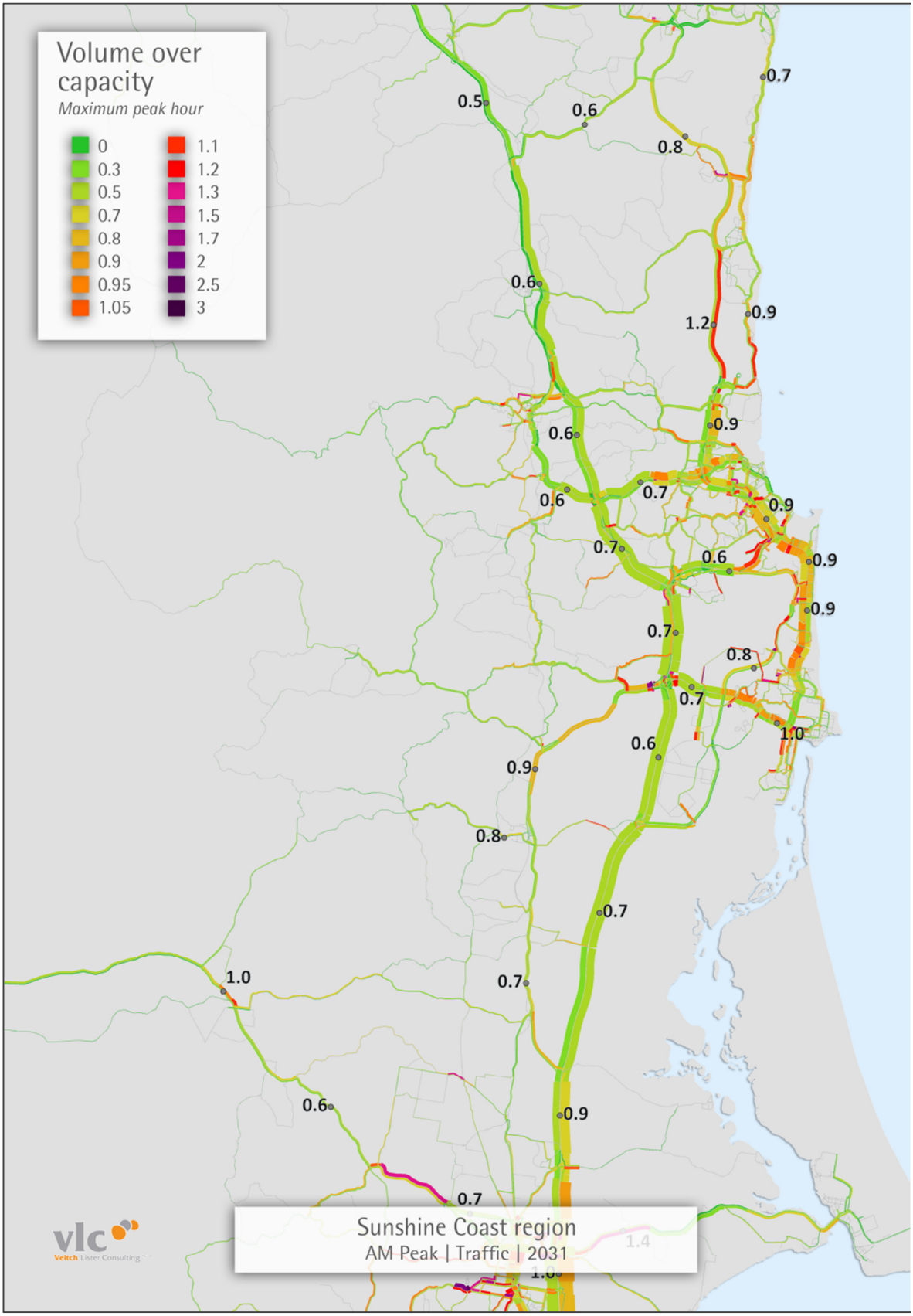

Figure 7-21: Road network volume/capacity ratios in 2031 - AM maximum peak hour

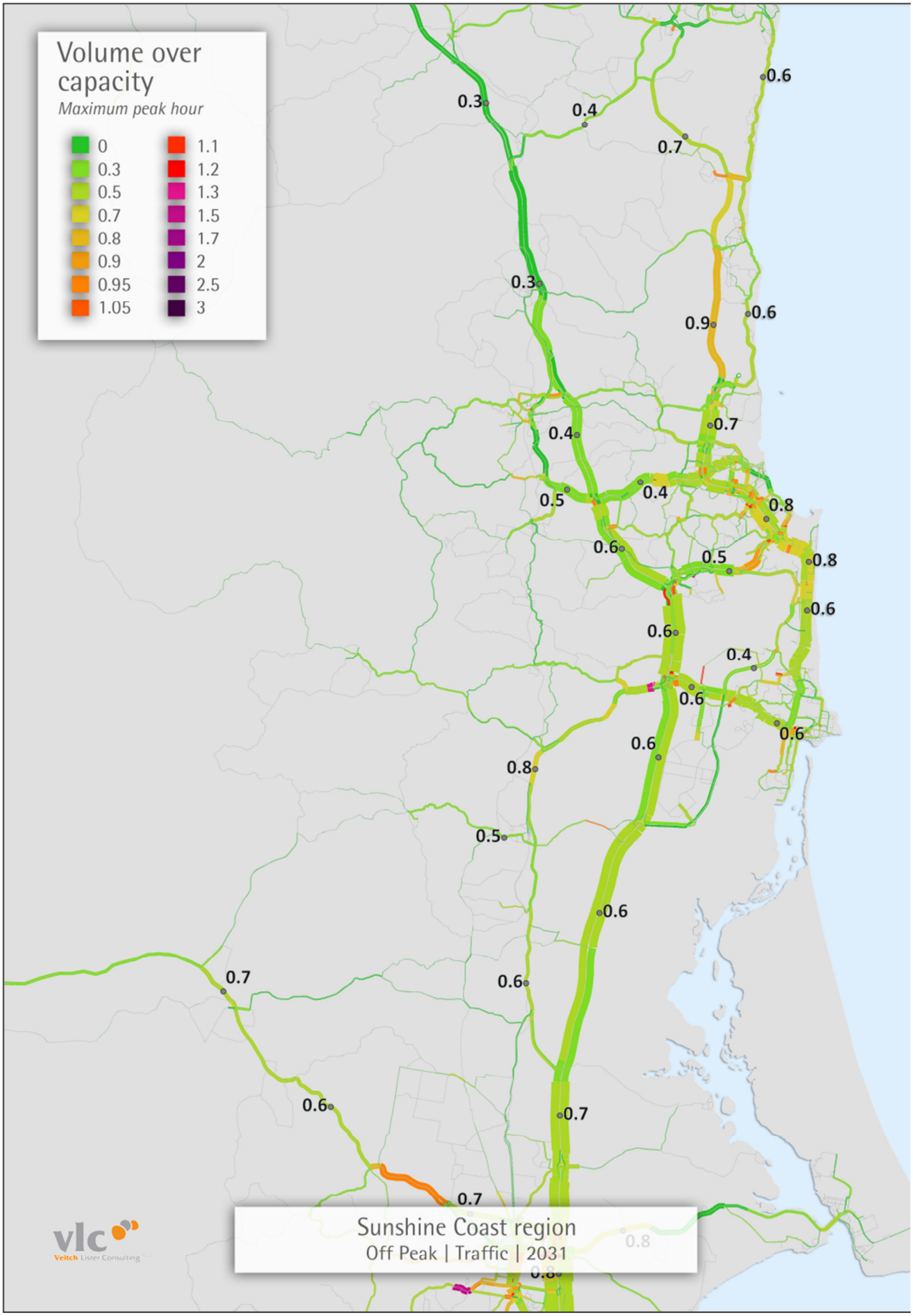

Figure 7-22: Road network volume/capacity ratios in 2031 - daytime off-peak

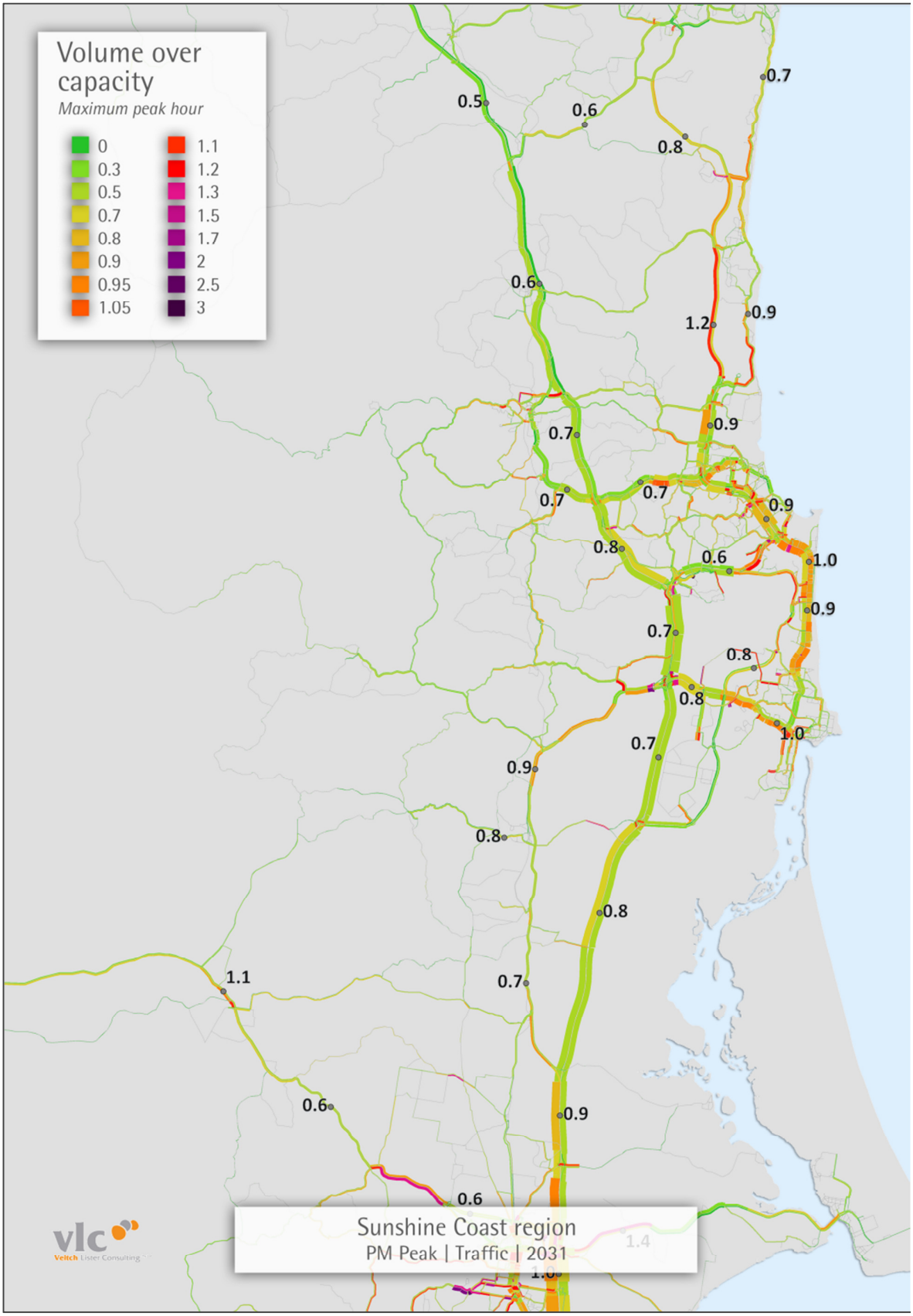

Figure 7-23: Road network volume/capacity ratios in 2031 - PM maximum peak hour

7.4 Change in travel times (2011-2031)

Figures 7-24 and 7-25 depict the travel times by car to the Brisbane CBD in 2011 and 2031 respectively. Figures 7-26 and 7-27 present the corresponding results for the Brisbane Airport. These relate to the AM peak.

In both cases there is a significant contraction of the contours for car; that is, travel times to each of these locations is predicted to worsen measurably.

On the Gold Coast a similar contraction of the contours for car is also expected to occur.

On the Sunshine Coast (not pictured) these is no evident likelihood that the travel times by car will increase dramatically.

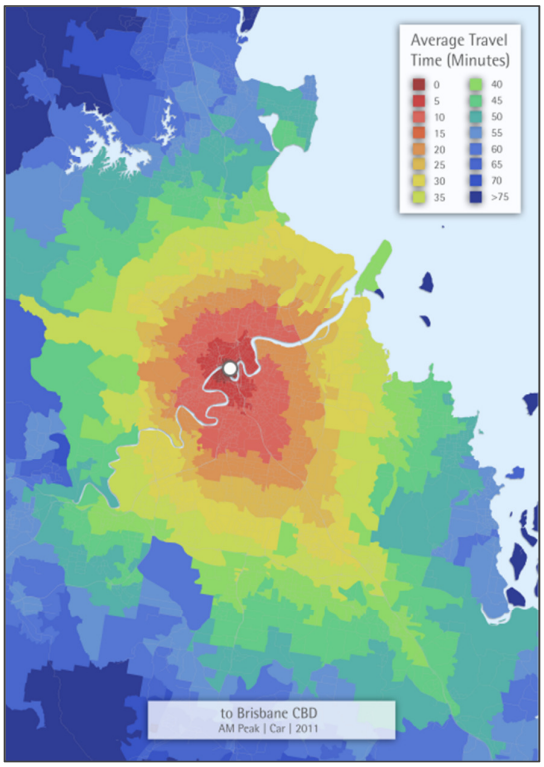

Figure 7-24: To CBD | Road | AM Peak | 2011

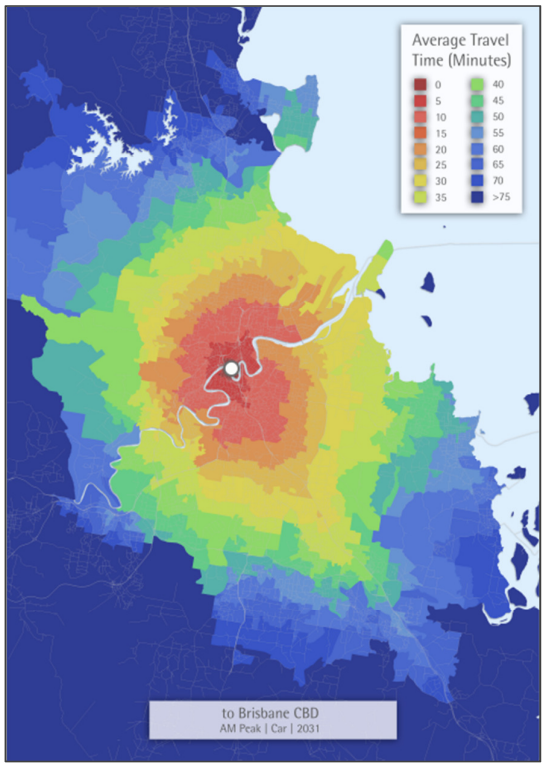

Figure 7-25: To CBD | Road | AM Peak | 2031

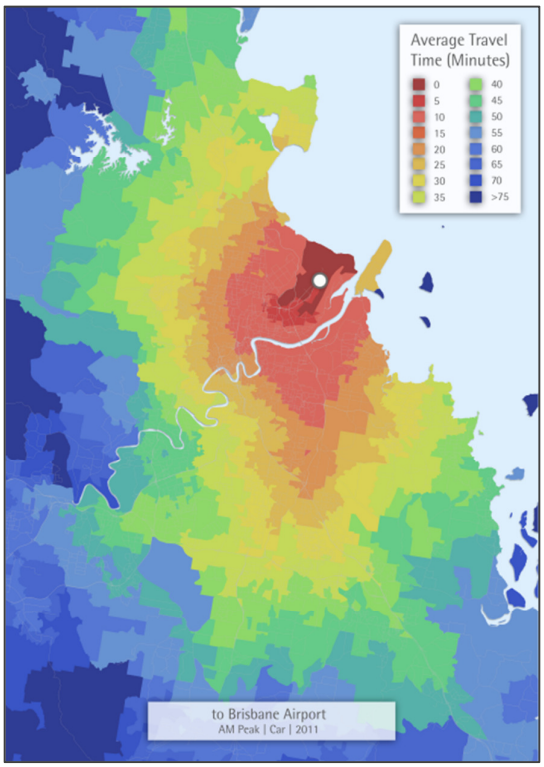

Figure 7-26: To Airport | Road | AM Peak | 2011

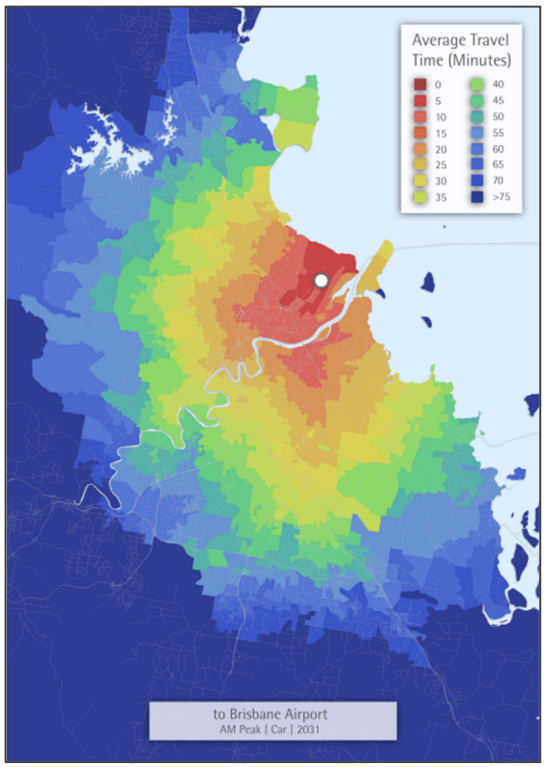

Figure 7-27: To Airport | Road | AM Peak | 2031

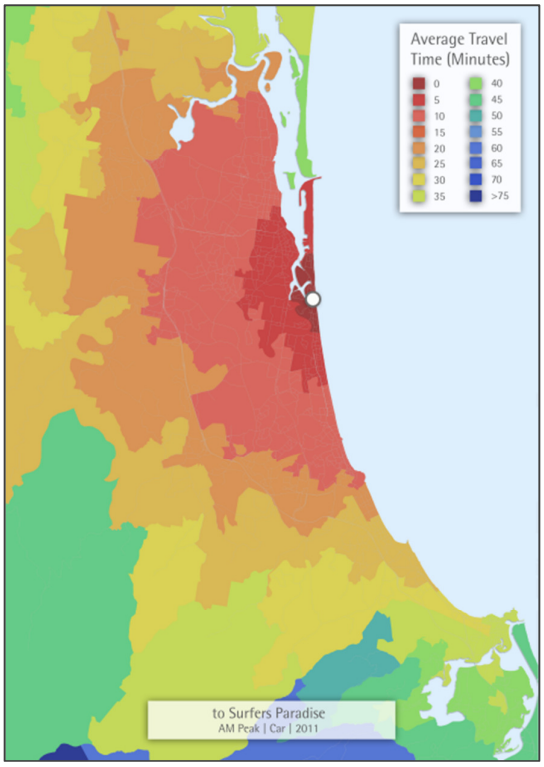

Figure 7-28: Surfers Paradise | Road | AM Peak | 2011

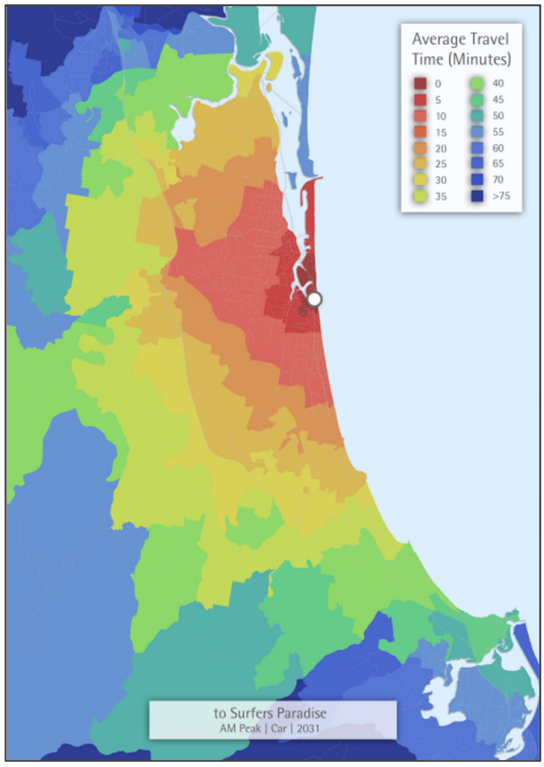

Figure 7-29: Surfers Paradise | Road | AM Peak | 2031

8. Public transport system performance

8.1 Introduction

This section of the report presents the Zenith model's predictions as to the extent that public transport ridership will increase in the future in SEQ between 2011 and 2031, and how these predicted increases will affect the performance of the public transport system under a *low public transport investment* strategy, that only includes committed and "highly likely" public transport projects.

A conservative assumption has also been adopted regarding public transport service frequencies.

8.2 Forecast increase in demand on the public transport system (2011-2031)

8.2.1 Demand on the CityTrain Network

Figure 8.1 depicts the forecast growth in rail patronage to 2031.

Clearly there is significant patronage growth on all lines in the network in both absolute and proportional terms with the most significant growth occurring on the segment between Northgate and Central. Growth on the Cleveland line is more subdued than on other parts of the network.

8.2.2 Demand on the Bus and Ferry System Network

Figure 8-2 summarises the increase in patronage on bus and ferry services in the metropolitan area. The most significant growth occurs in the inner city area particularly in the South Brisbane area.

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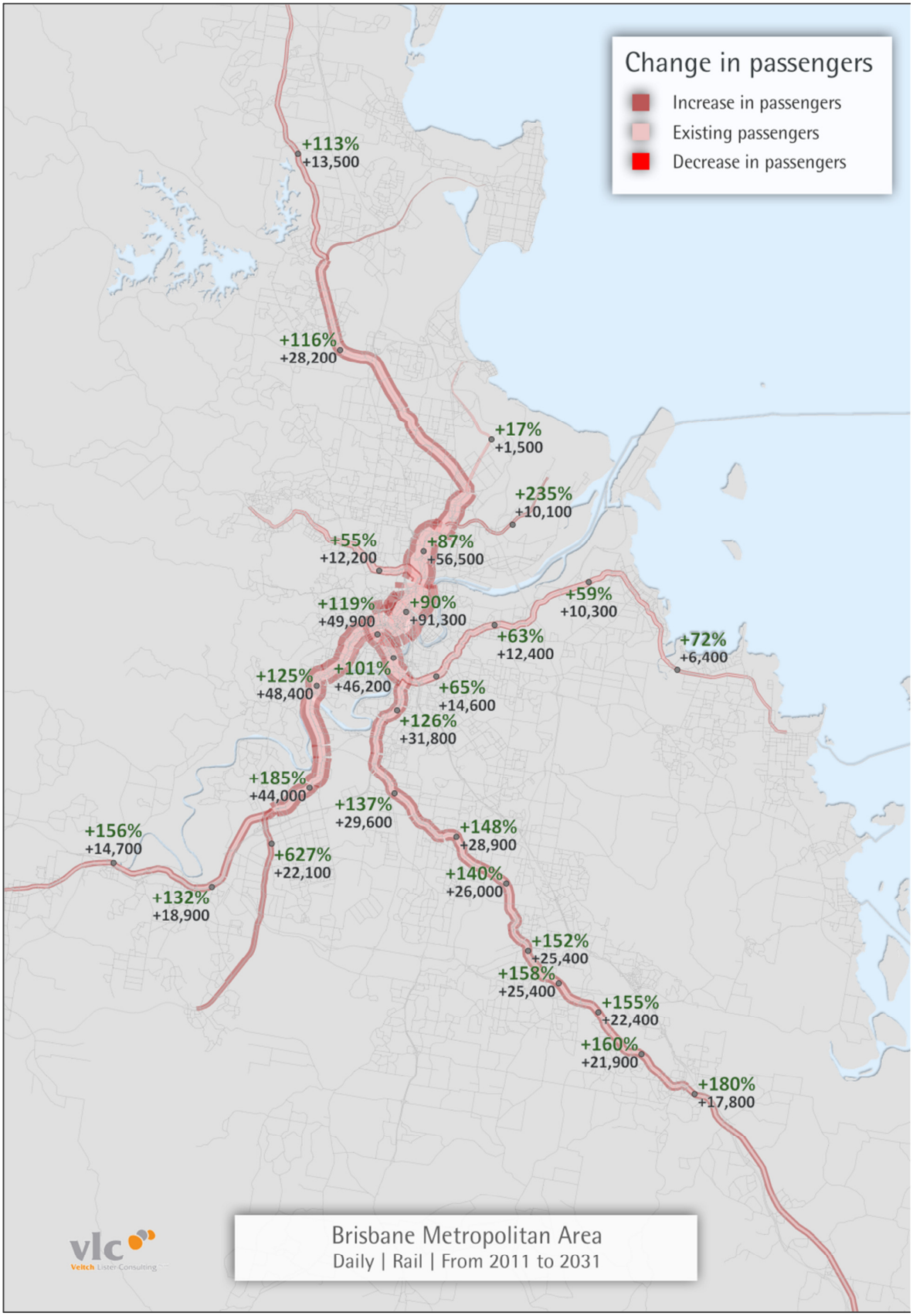

Figure 8-1: Increase in weekday CityTrain passenger loading (2011-2031)

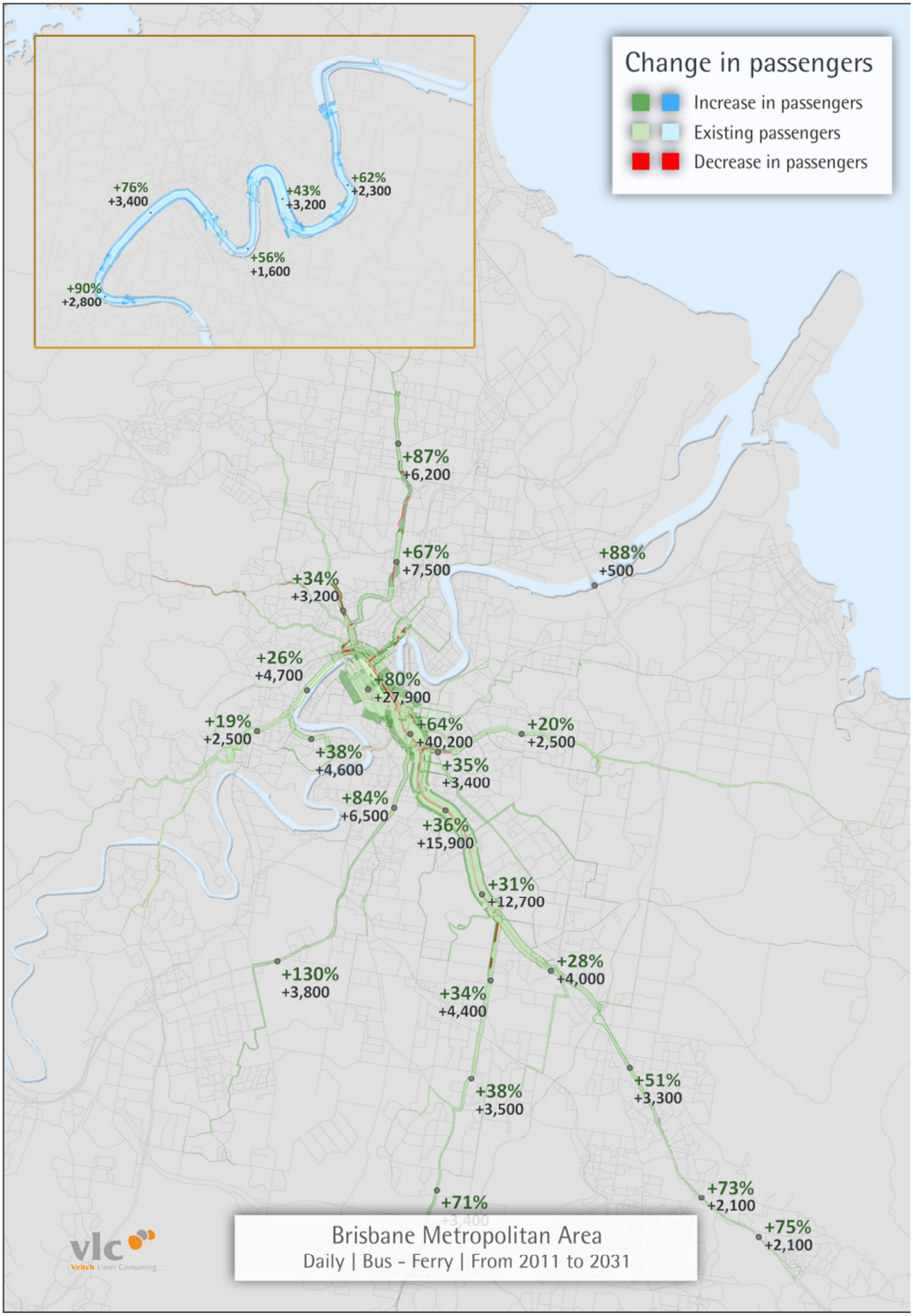

Figure 8-2: Increase in bus and ferry weekday passenger loading (2011-2031)

8.3 Capacity analysis

8.3.1 CityTrain line loadings relative to seating and crush capacity

The capacities assumed in the analysis are outlined in Appendix B.

Figures 8-3 and 8-4 summarise the capacity analysis for Brisbane in terms of seating and crush capacity respectively in the AM peak hour (the peak hour was calculated as 65 per cent of the peak 2 hours).

In terms of seating capacity, in 2011, ratios in the inner part of the network are typically of the order of 1.2 which would generally be regarded as quite acceptable in the peak hour. However, in 2031 ratios in excess of 2.0 have been calculated. Many of the trips on the rail network are quite long and many passengers would be required to stand for relatively long periods.

Relative to crush capacity, the system performs adequately in 2011 but by 2031 even crush capacity is exceeded on parts of the network. This largely reflects the assumption that the 2031 network would be operated at 2011 frequency levels.

Figures 8-5 and 8-6 summarise the corresponding analysis for services on the Gold Coast. In short, some strains in seating capacity begin to occur in 2031. Crush capacity would not be regarded as an acceptable loading standard on this line given the length of trips but is not exceeded in the analysis.

Figures 8-7 and 8-8 prevent the corresponding results for the Sunshine Coast Region. Strains in seating availability are predicted to emerge in 2031 and would generally be regarded as unacceptable for longer trips. Again the analysis reflects the assumption that existing service frequencies would be maintained in the 2031 network.

8.3.2 Analysis of Bus Network Capacity

Figures 8-9 and 8-10 present the results of this analysis in Brisbane in terms of seating capacity in 2011 and 2031 respectively. Figures 8-11 and 8-12 provide the analysis in terms of crush capacity. Again these results are for the peak hour.

Seating capacity is exceeded in many parts of the network in 2031 but this again reflects the assumption that service frequencies would not be increased between 2011 and 2031.

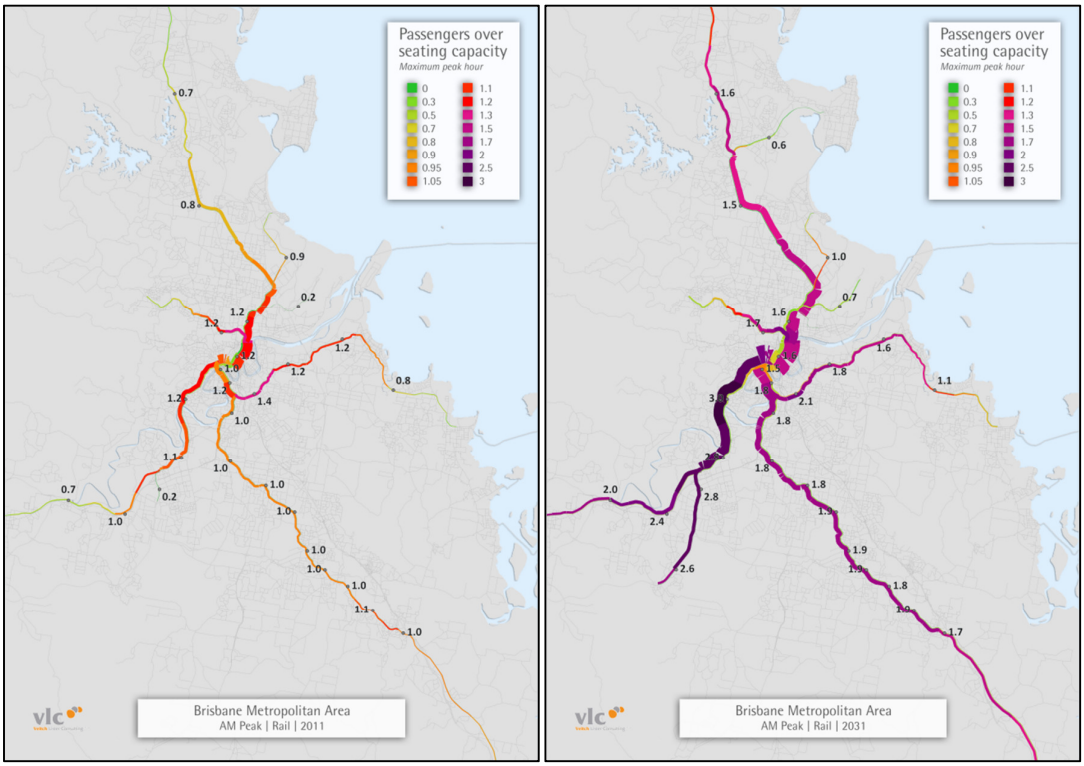

Figure 8-3: CityTrain weekday passenger demand relative to seating capacity (2011 and 2031 Brisbane Region)

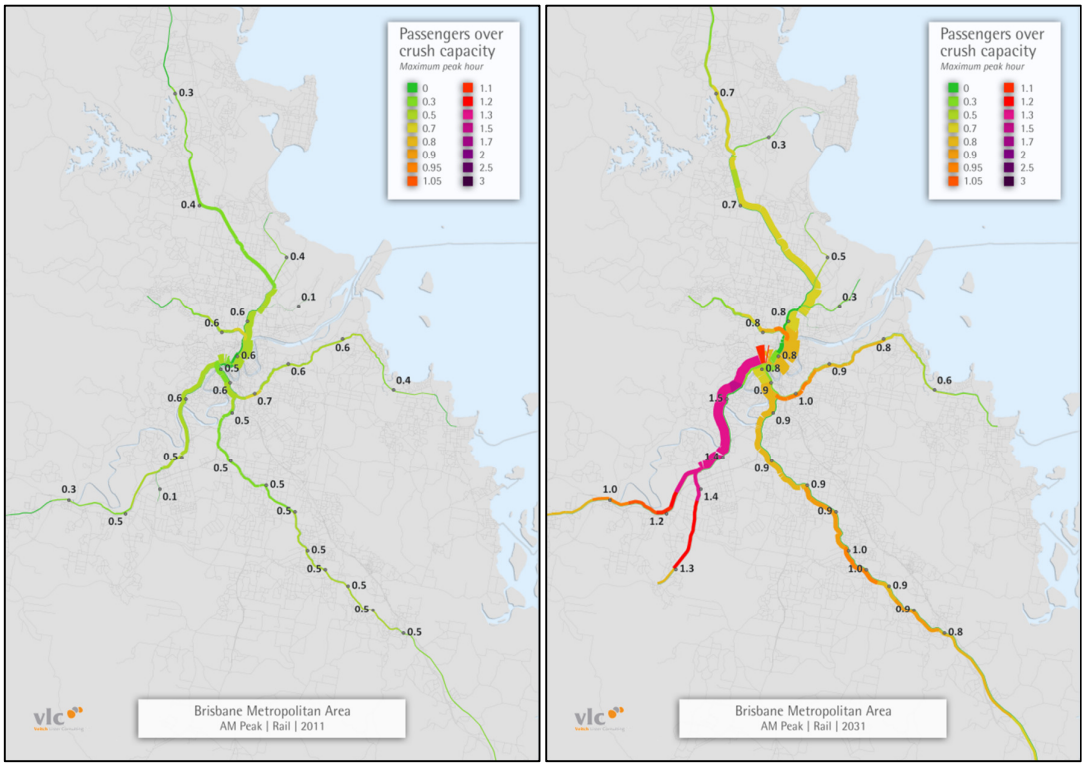

Figure 8-4: CityTrain weekday passenger demand relative to crush capacity (2011 and 2031 Brisbane Region)

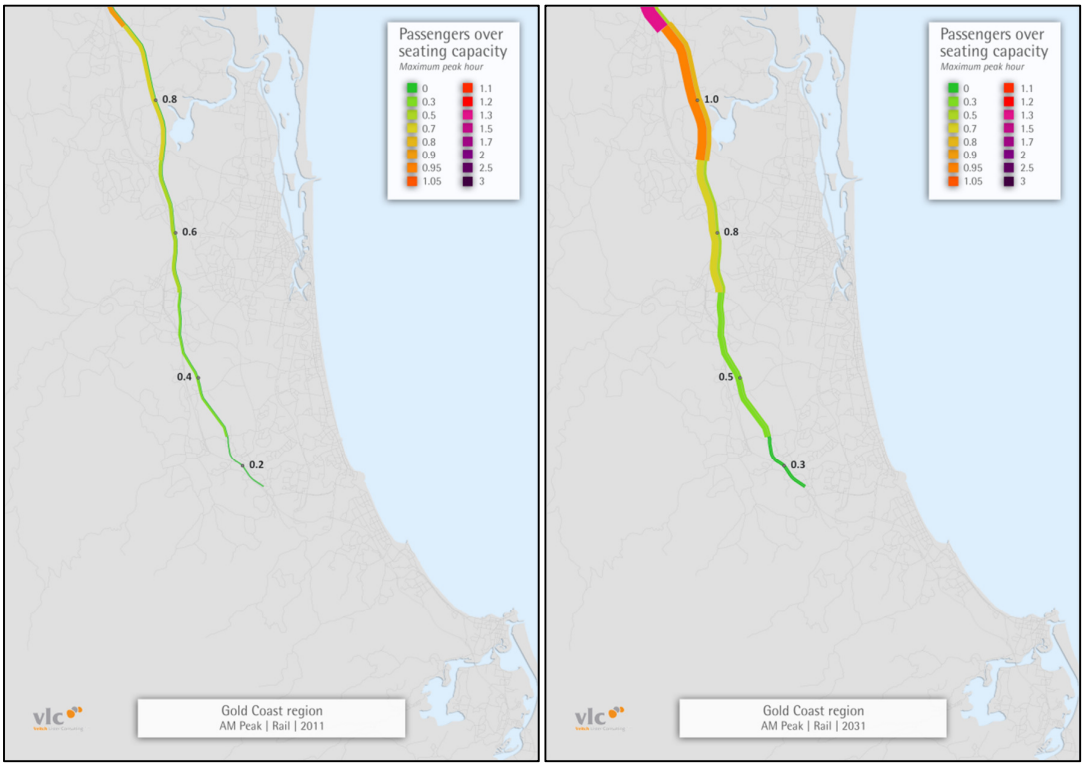

Figure 8-5: CityTrain weekday passenger demand relative to seating capacity (2011 and 2031 Gold Coast Region)

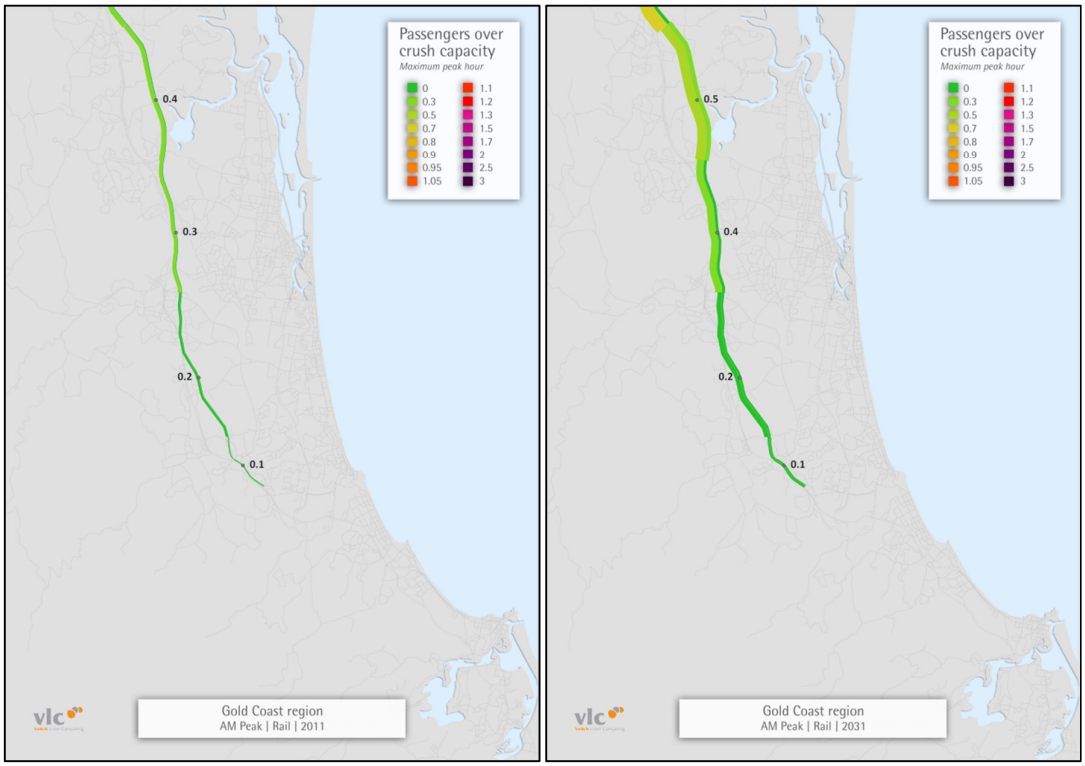

Figure 8-6: CityTrain weekday passenger demand relative to crush capacity (2011 and 2031 Gold Coast Region)

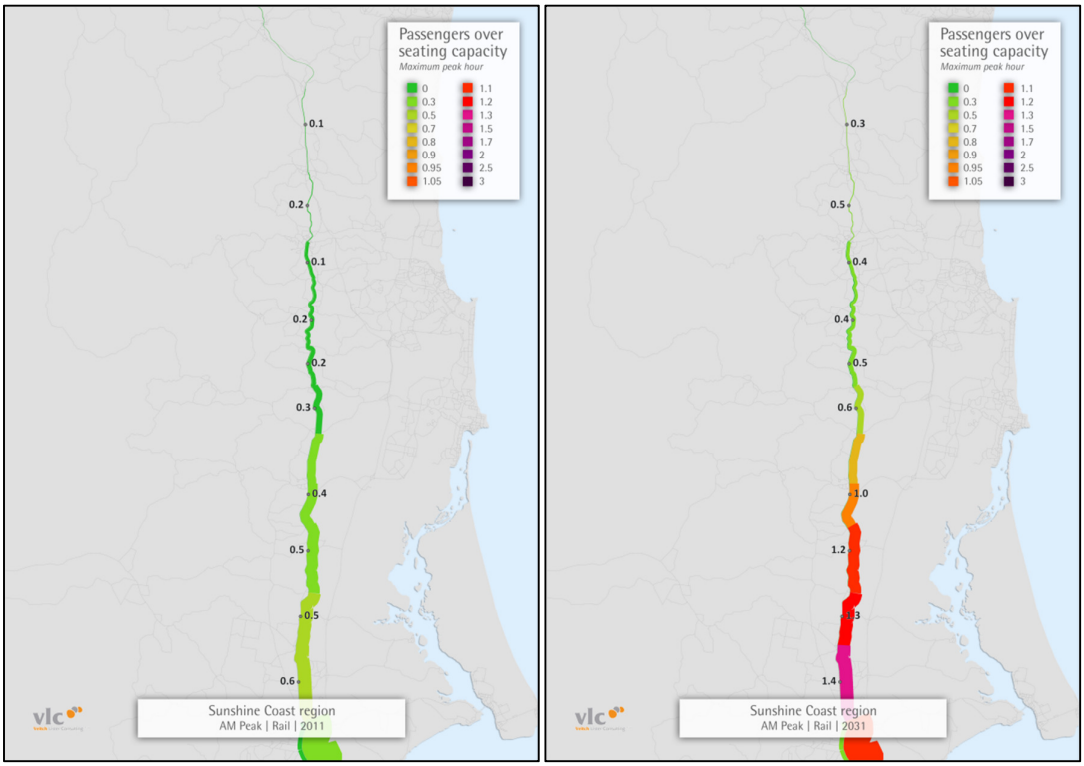

Figure 8-7: CityTrain weekday passenger demand relative to seating capacity (2011 and 2031 Sunshine Coast Region)

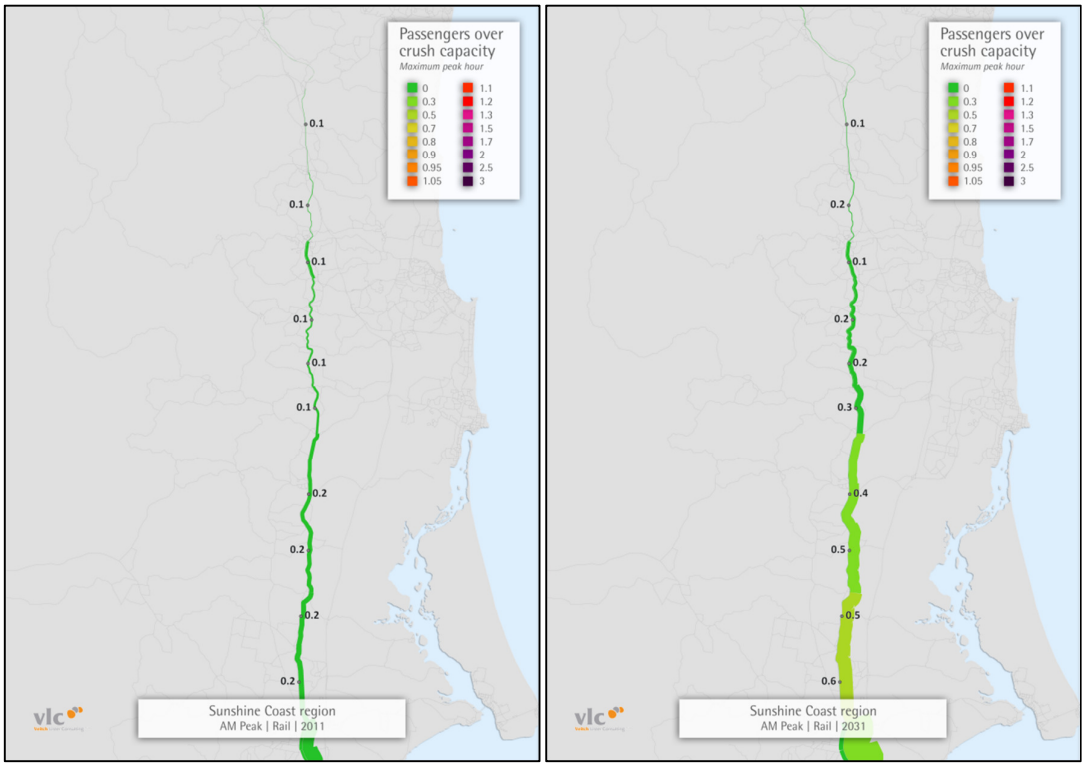

Figure 8-8: CityTrain weekday passenger demand relative to crush capacity (2011 and 2031 Sunshine Coast Region)

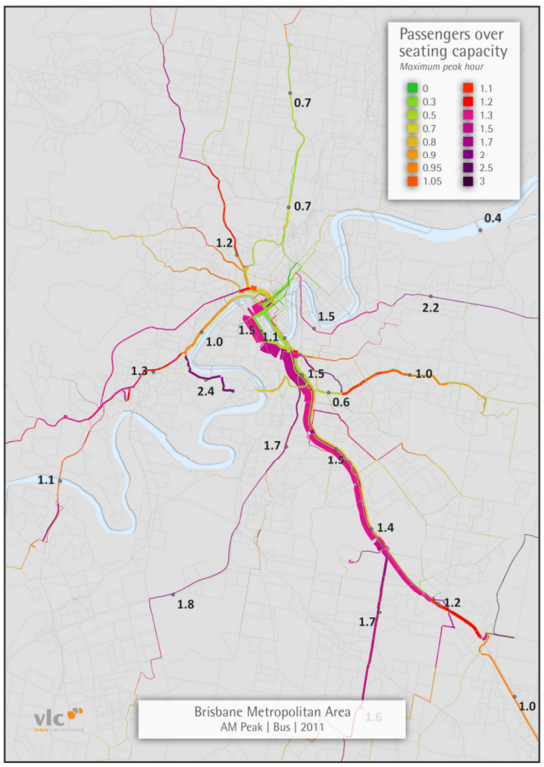

Figure 8-9: Brisbane Metropolitan Area | AM Peak | Bus | 2011

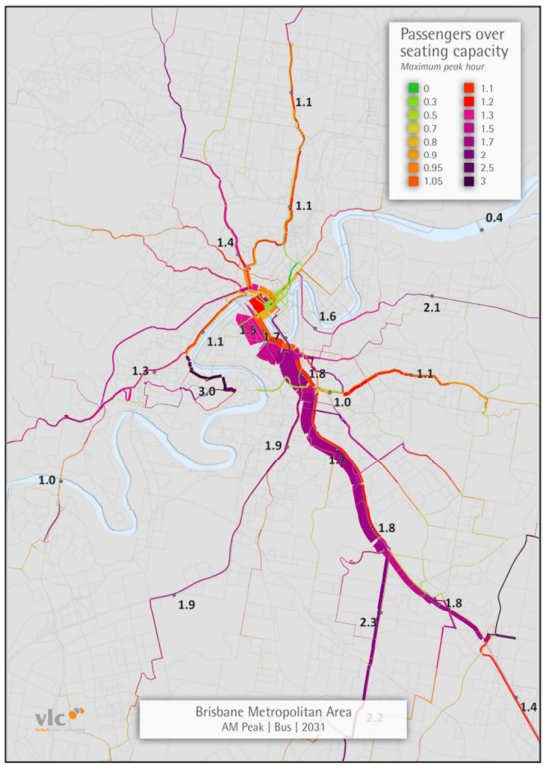

Figure 8-10: Brisbane Metropolitan Area | AM Peak | Bus | 2031

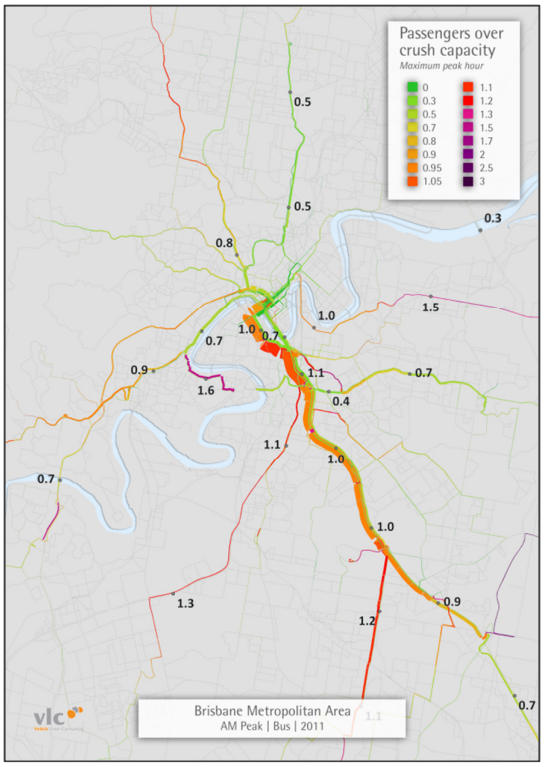

Figure 8-11: Brisbane Metropolitan Area | AM Peak | Bus | 2011

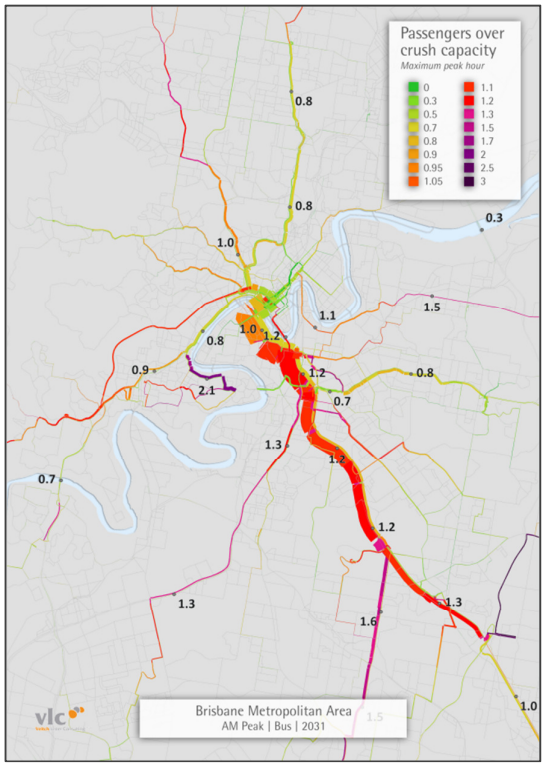

Figure 8-12: Brisbane Metropolitan Area | AM Peak | Bus | 2031

Appendix A:
Transport Infrastructure Improvements
2031 Base Case Network

Full list of transport infrastructure improvements included in the 2031 base case network

Item	Road
1.	RCM CLEM7 - AL Connections (City Ramps)
2.	Northern Busway: RBH to Kedron to Bracken Ridge - INB to Federation St
3.	Airport Link Reference Design Sandgate Road interchange
4.	Airport Link Ancillary Works - Northern Busway Staging : Interim - RCM NSBT
5.	Airport Link Tunnels
6.	Kingsford Smith Drive - Theodore St to French St => 6 lanes Divided
7.	Beckett Rd - Rode Rd to Albany Creek Rd => 4 lane divided; signals except roundabout at Rode Rd..
8.	Bridgeman Road - Albany Creek Rd to Millar Rd => 4 lane Divided, Speed Limit 70 kph.
9.	Kerners Road Deviation - Warwick Rd to Kerners Rd. (Include reclassification of Kerners Rd-Deebing Creek Rd - Ash St to Pisale Dr as collector)
10.	Third Avenue Extension - Bardon Rd - Wembley Rd. New 4 lane Road - Part 1
11.	Eastern Busway: Buranda to Capalaba, Stage 1 - Buranda to Main Ave
12.	Ipswich Motorway upgrade: Dinmore to Darra to Rocklea, Goodna to Dinmore_Part 1
13.	Ipswich Motorway upgrade: Dinmore to Darra to Rocklea, Goodna to Dinmore_Part 2
14.	Miscellaneous North Lakes Area Roads completed by July 2012.
15.	Reclassify selected North Lakes Roads as collectors, including: Endeavour Bvd; Bounty Bvd (northern section); Discovery Dr (northern section); and Memorial Dr connection to Kinsellas Rd W.
16.	Pimpama Area Roads as at end June 2012
17.	Pacific Mwy Interchanges and added lanes, Nerang to Gooding Rd
18.	Bundilla Area Roads Completed by 30/06/2012
19.	Bruce Highway - Kidgell St to Oak St => 4 lane arterial (+ Hughes Tce Interchange at 2 lanes)
20.	Noosa Junction Bus Station
21.	Sumners Road - Spine St to Tomkins Rd => 4 lanes divided throughout.
22.	Deebing Creek Connection Road - Kerners Rd to Lakeview Dr to Centenary Hwy. New 2 lane sub-arterial.
23.	Francis Road - Rail overpass, Gympie Rd to Tarandi St as 2 lane divided + upgrade to collector to Ellis St.
24.	Sippy Downs Drive - University Way to Dixon Rd Interchange => 4 lane collector + 2 lane connection to Power Rd.
25.	Stringy Bark Road - Jorl Ct to Sippy Downs Dr => 2 lane collector.
26.	Bruce Highway realignment between Sankeys Road (Cooran) to Traveston Road (Traveston)
27.	Pacific Mwy Interchanges (Loganlea Rd and Paradise Rd)
28.	Port of Brisbane Motorway - Gateway Mwy to Boat Passage => 4 lane divided (North of Pritchard St not grade sep)
29.	Brisbane Urban Corridor - Mains Rd/Kessels Rd grade seperation
30.	Removal of T2 lanes on Pacific Highway between Mt Gravatt and Eight Mile Plains (2 lanes + T2 lane => 4 lanes)
31.	Mt gravatt Capalaba Rd (Broadwater Rd to Gardner Rd - 6L)
32.	Gateway Mwy Southbound onramp extention to pacific Mwy
33.	Western Arterial Rd (Jindalee - Everton Park) - Wardell St / Samford Rd (Improve intersection)
34.	Light Rail - Griffith University to Pacific Fair.
35.	Northern Link - Western Freeway to ICB. New 4 lane tunnel.
36.	Telegraph Rd 4L (from Linkfield Rd to Norris Rd)
37.	Removal of Rail crossing at Robinson Road in Geebung - building a 4 lane bridge
38.	Gateway Motorway Northbound - Sandgate Rd to depot Rd on Ramp => 6 lanes

39.	Gateway Motorway - Nudgee Rd to Deagon Deveiation => 6 lane freeway.
40.	Ipswich Motorway - Rocklea to Darra => 6 lane Freeway/Expressway. (Oxley to Granard)
41.	Brisbane Valley Highway Interchange at Warrego Hwy and Wulkuraka Connection Rd. (include northern service road, as 2 lane collector, and Bayley Rd-Pine Mountain Rd link.)
42.	SE Busway - Extension to Priesdale St
43.	Mount Crosby Road - Warrego Hwy intersection (WB off-ramp to Mt Crosby Rd) - Construct auxiliary lanes
44.	Springfield Rail - Richlands to Carole Park/Camira
45.	Cunningham Highway - Ripley Rd to Ipswich Western Bypass => 4 lane Freeway. (Include 2 lane Western Bypass Connection to Ipswich-Rosewood Rd).
46.	Centenary Highway - Logan Mwy to Augusta Pwy => 4 lane freeway.
47.	Springfield Rail - Carole Park/Camira to Springfield
48.	Mount Lindesay Arterial Rd (Nottingham Rd / Honeysuckle) - 2700cap
49.	Sandgate Sub - Arterial Rd (Northumbria Rd / Garozzo Rd) - Improve intersection
50.	Logan Sub - Arterial Road (Miles Platting Rd / Padstow / Logan
51.	Capalaba - Victoria Point Rd (Vienna Rd - Redland Bay Rd) - Improve intersection
52.	Capalaba - Cleveland Road (Abelia st - imporve intersection)
53.	Capalaba - Cleveland Road (Finucanne Road / Willard Road) - Improve intersection
54.	Pacific Motorway - Gooding Rd to Varsity Lakes => 6 lane freeway.
55.	Pacific Motorway - Varsity Lakes to Stewart Rd => 6 lane freeway.
56.	Foxwell Road - Abraham Rd to Cunningham Dr South => 4 lanes Divided
57.	Abraham Road - Days Rd to BP service road connection => 4 lane divided sub-arterial
58.	Pacific Hwy (Fitzerald Avenue - Aranda st) - Construct additional lane
59.	Brisbane - Beenleigh Rd (paradise rd) - Improve intersection
60.	Brisbane - Beenleigh Rd (Muchow Road) - Improve intersection
61.	Brisbane - Beenleigh Rd (Muchow road) - Improve intersection
62.	Brisbane - Beenleigh Rd (Monash Road) - Improve intersection
63.	Logan Motorway upgrade (Ipswich Mwy to Pacific Mwy) - Mt Lindsay to Gateway 8L, East of Gateway 4L
64.	Gold Coast Hwy - Hope Island Road (improve intersection)
65.	Labrador - Carrara Rd (Smith St / Olsen Avenue interchange) - from 4 to 6 lanes
66.	Smith Street Eastbound - Pacific Mwy Ramp to Olsen Ave Ramp => 3 lanes.
67.	IRTC - Foxwell Rd to Nerang-Broadbeach Rd. New 2 lane
68.	Southport-Nerang Road - Minnie St to Queen St => 4 Lane divided arterial.
69.	Stapylton-Jacobs Well Rd - Pacific Mwy to Quinns Hill Rd => 4 lane divided sub-arterial.
70.	Redcliff rail extension
71.	Interim future plan on Yarrabilba for 2021
72.	Other Jimboomba/Greenbank Area Roads, including: Homestead Drive (LCC_050) - Teviot Rd to Rail Bridges => 4 lane sub-arterial; Pub Lane - Teviot Rd to Equestrian Dr => 4 lane collector; Fraser Road-Red Gum Road Connection as new 2 lane collector.
73.	Teviot Road - Homestead Dr to Cusack Ln => 4 lane. Sub-arterial.
74.	Homestead Drive - Railway Bridges (2) + extension to Flagstone West N-S Collector as 4 lane sub-arterial.
75.	Flagstone Western Collector - Mountain Ridge Rd to Homestead Dr as new 2 lane sub-arterial.
76.	Mountain Ridge Road - Teviot Rd to Flagstone Western Collector => 2 lane sub-arterial.
77.	Silverwood Drive - Extesion to Paula Rd as 2 lane collector. (Flagstone East N-S Collector)
78.	Teviot Road - Crowson lane extension to Mountain Ridge Rd (SIC) => 4 lane divided

	sub-arterial.
79.	Interim future plan on Flagstone for 2026
80.	Mt Lindesay Highway - Rosia Rd to Chambers Flat Rd => 4 lane freeway (incl interchange at Chambers Flat Rd)
81.	Crowson Lane - Teviot Rd to Mt Lindesay Hwy => 2 lane sub-arterial.
82.	Crawson Lane - Teviot Rd to Mt Lindesay Hwy => 4 lane divided sub-arterial.
83.	Pub Lane (Teviot Road - Equestrian Dr.) - 4L
84.	New Beith Area Collectors - Boyd Rd-Equestrian Dr and Cunningham Dr-Portland Rd
85.	Teviot Road - Pub Lane to Stoney Camp Rd => 4 lane divided sub-arterial.
86.	Goodna Road - Teviot Rd to Springfield => 4 lane divided arterial
87.	Springfield-Greenbank Arterial - Springfield Pwy to Springfield TC Distributor to Sinnathamby Bvd to Beaudesert Boundary => 4 lane divided arterial.
88.	Other Springfield Area Roads as per QML Job.
89.	Other Springfield Area Roads as per QML Job.
90.	(UA1) Jedfire Street NS Extension - Park Ridge Rd to Green Rd as 2 lane collector.
91.	(UA2) - Park Ridge Rd to Bumstead Rd as 2 lane collector.
92.	Murphy Rd - Handford Rd - Lemke Rd Stage 1 (Ellison Road to Gympie Road) 4L divided
93.	Maundrell Terrace-Appleby Road - Stafford Rd to Albany Creek Rd => 4 lane sub-arterial.
94.	Rode Road - Glenrowan St to Hilltop Ave => 4 lane divided.
95.	Rode Road - Old Northern Rd to Glenrowan St + Hilltop Ave to Gympie Rd=> 4 lane divided.
96.	Ormskirk St extension (from Harmish St to Benhiam St) - 2L divided collector
97.	Benhiam St (from Nottingham Rd to Formby St) - 4L collector
98.	Benhiam St (from Formby st to Ormskirk St) - 4L collector
99.	Benhiam St (Omskirk St to Benhiam rd extension) - 4L collector
100.	Benhiam St (Benhiam Rd extension to Beaudesert Rd) - 4L collector
101.	Benhiam St Extension (Benhiam St to Higland Dv) - 2L divided access street
102.	Formby St (algester Rd to Benhiam St) - 2L arterial
103.	Ormskirk St (Algester Rd to Benhiam St) - 4L divided collector
104.	Crossacres (Blunder Rd to Rockfield Rd) - 4L divided
105.	Crossacres St (joseph Banks Av to Rockfield Rd) - 2L divided
106.	Wynnum Road (Inbound lane (3L) Scanlan St to Wellington Road)
107.	Waterford Road (Considine St to Woogaroo St) -2L divided
108.	Woogaroo St (Waterford Rd to Johnson Rd)-4L
109.	Jesmond Road Extension (Gunning Road to Fig Tree Pocket Rd)-2L
110.	Fig Tree Pocket Road (Kenmore Road to Gunnin Street)-4L divided
111.	Murphy Rd/Handford Rd (Ellison Rd to Zilmere Rd) - 4L
112.	Tilley Road Extension - Lytton Rd to Wondall Rd and Manly Rd to Old Cleveland Rd=> 2 lane sub-arterial.
113.	Kingsford Smith Drive - Seymour Rd to Theodore St (to Links Ave) => 6 Lanes Divided
114.	Stapylton Rd Stage 1 (Wadeville St to Logan Mwy) - 4L divided
115.	Paradise Rd stage 1 (Adjacent Kulcha St to Radius Drive) - 4L collector
116.	Manly Rd (Whites Rd to Preston Rd) - 4L
117.	Rickertt Road - Green Camp Rd to Thorneside Rd => 4 lane arterial, 80 kph speed limit.
118.	Pine Rd (form Garden Rd to Archerfield Rd - 4L
119.	Ford Rd Extension (Gardner Rd to Rochedale Rd) - 2L collector
120.	Gardner Road (Prebble St to Ford Rd Extension) - 2L undivided
121.	Gardner Rd extension (Miles Platting Rd to Priesdale Rd) - 2L collector
122.	Greenwoood Street-Prebble Street - Mt Gravatt-Capalaba Rd to Gardner Rd. 2 lane collectors

123.	Wacol Station Rd (Wolston Ck Bridge to Sumners Rd) - sub-arterial 4L divided (1600cap)
124.	Sumners Road - Spine St to Tomkins Rd => 4 lanes divided throughout.
125.	Beenleigh Road (Boundary Road to Warrigal Rd Extension) - 6L
126.	Kianawah (Wondall Rd to Wynnum Rd, bridge over Hemmants Drain at the end of Millennium place) - access St 2L
127.	Wondall Road - Manly Rd to Randall Rd => 4 lane divided sub-arterial
128.	Bognor St (Wynnum Rd to Wondall Rd) - 2L divided collector
129.	Kianawah Rd (Wondall Rd to Wynnum Rd) - New rd sub arterial 2L
130.	Green Camp Road (Rickertt Rd to New Cleveland Road) - Upgrade to 4L divided.
131.	Tilley rd upgrade (new Cleveland Rd to Green Camp rd) - 4L divided
132.	Arenga St upgrade (Basella St to Manly Rd) - Collector 2lane divided
133.	Basella St Upgrade (Caladium St to Dianthus St) - Collector 2L divided
134.	Caladium St (Basella St to New Cleveland Rd) - Collector 2L divided
135.	Boundary Road - Bukulla St to Kelliher Rd. New 2 lane through Wacol Army Barracks. Including Bridge
136.	Wacol Station Rd Stage 1 (Interim upgrade) (Wolston Rd to Wolston Ck) - sub-arterial 4L divided (1600cap)
137.	Wacol Station Road - Ipswich Mwy to Sumners Rd => 4 lane divided sub-arterial
138.	Tile St (Boundary Rd to Clendon St) - collector 4L divided
139.	Clendon St (Tile St to Considine St) - collector 4L divided
140.	Boundary Rd (Tile St to Progress Rd) - 4 lane divided sub-arterial throughout.
141.	Rogers St (Montague Rd to Riverside Dr) - new access st 2L
142.	Filmer St (Beesley St to Filmer St end) - collector rd 2L divided
143.	Beesley St (Montague Rd to Riverside Dr) -collector 2L divided
144.	Pidgeon Close (Beesley St to Pigeon Close end) - collector 2L divided
145.	Duncan Street (Duncan Street Extension 1 to Duncan Street Extension 2) - collector 2L divided
146.	Buchanan Street (Jane Street to Donkin Street) - collector 2L divided
147.	Ferry Road (Montague Road to Riverside Drive) - collector 2L divided
148.	Musgrave Street (Montague Road to Buchanan Street) - collector 2L divided
149.	Tondara Lane (Kurilpa Street to Rogers Street Extension) - collector 2L divided
150.	Victoria St (Montague Rd to Duncan St Extension 1) - Collector 2L divided
151.	Jane St (Montague Rd to Riverside Dr) - Collector2L divided
152.	Anthony Street (Montague Road to Buchanan Street) - collector 2L divided
153.	Donkin Street (Montague Road to Buchanan Street) - collector 2L divided
154.	Kurilpa Street (Montague Road to Riverside Drive) - collector 2L divided
155.	Filmer Street Extension (Filmer Street end to Victoria Street) - collector 2L divided
156.	Duncan Street Extension 1 (Victoria Street to Duncan Street (north end) - collector 2L divided) - collector 2L divided
157.	Duncan Street Extension 2 (Duncan Street (south end) - collector 2L divided to Ferry Road) - collector 2L divided
158.	Tondara Lane Extension 1 (Victoria Street to Kurilpa Street) - collector 2L divided
159.	Tondara Lane Extension 2 (Rogers Street Extension to Ferry Road) - collector 2L divided
160.	Pandorea St (School Rd to Manettia St) - 2 lane divided (700cap)
161.	Pandorea St (Manettia Rd to Wynnum Rd) - 2 lane divided (700cap)
162.	Craword Rd (Kianawah Rd to School Rd) - 4L undivided
163.	School Rd (New Lindum Rd to Ropley Rd) - 2L divided
164.	Extension 2L from From Bradman St/Learoyd Rd/McCotter St to Delathin Rd
165.	Ermelo Road-Dairy Swamp Road - New Cleveland Rd to Belmont Rd => 4 lane divided sub-arterial
166.	Linkfield Road 2L (from Gympie arterial Rd to Lacey Rd) -4L divided
167.	Telegraph Rd 4L - From Quinlan st to Mustang St

168.	Creek Rd 6L (Lytton Rd to Cavendish Rd)
169.	Meadowlands Road - Belmont Rd to Preston Rd => 4 lanes throughout. Including bride widening
170.	Stanley St - Cavendish Rd Stage 3 (Caswell St to Cavendish Rd)-6L
171.	Inala Avenue - King Avenue - Learoyd Road Stage 2 (Blunder Rd to King Av) - 4L divided
172.	Stanley St - Cavendish Rd Stage 2 (Wellington St to Caswell St) - 6L
173.	New bridge. Telegraph Rd - Depot rd Corridor Stage4 (Lemke Rd Bridge at cabbage Tree Ck) - 4L divided
174.	Telegraph Rd (Norris Rd to Mustang St) - 4L
175.	New Cleveland Road - Green Camp Rd to Old Cleveland Rd=> 4 lane divided sub-arterial.
176.	New Cleveland Road - Manly Rd to Green Camp Rd => 4 lane divided sub-arterial.
177.	Shafston Ave - Lytton Rd - Wynnum Rd stage : Balmoral St (from Hawthorne Rd to Riding Rd) - 6L
178.	Wadeville Street - Stapylton Rd to Forest Lake Bvd => 4 lanes divided
179.	South-western side of Finney Road/Woodville Street (Moggill Road to Woodville Street) - Collector 2L divided
180.	Logan Rd (Cornwall St to Kessels Rd) - 6L
181.	Toombul Road - Nudgee Rd to Melton Rd => 6 lane divided arterial.
182.	Shafston Ave - Lytton Rd - Wynnum Rd stage 2 : Balmoral St (Overend St to Riding Rd) - 6L
183.	Shafston Ave - Lytton Rd - Wynnum Rd stage4: Laidlaw Parade to Overend St - 6L
184.	Boundary Road (Kelliher Road to Blunder Road) - 4L divided
185.	Kinsford Smith Dve (Sugarmill Rd to Eagle Farm Rd) - 6Lanes divided
186.	Progress Rd Stage 5 (Ipswich Mwy to Archerfield Rd) - 6L (2700cap)
187.	Miles Platting Rd (School Rd to Gardner Rd) - 4L
188.	Miles Platting Rd (Gardner Rd to Rochedale Rd) - 4L
189.	School Road (Miles Platting Rd to Underwwod Rd)- 4L
190.	School Road Extension (Miles Platting Road to Rochedale Road) - 2L undivided
191.	Gardner Road (Ford Road Extension to Miles Platting Road) - 4L
192.	Gardner Rd (southern boundary of landfill site to Prebble St) - 4L
193.	Gardner Rd (Mount Gravatt Capalaba Rd to Southern Boundary of Landfill) - 4L
194.	Grieve Rd (Mount Gravatt Capalaba Rd to Rochedale Rd) - 4L
195.	Priestdale Rd (School Rd to Rochedale Rd) - 4L
196.	Murphy Rd - Handford Rd - Lemke Rd Stage 2 (Taigum Place to Cabbage Tree Creek Bridge) - 4L
197.	Wynnum Rd/Manly Rd Interim Upgrade (Wynnum Rd to New Cleveland Rd) - 6L
198.	Newnham Road (Creek Road to Logan Road) - Upgrade to 4L divided
199.	Tilley Road Extension (New Cleveland Road to Kianawah Road) - New 2 lane road
200.	Green Camp Road Stage 1 (Manly Rd to Rickertt Rd) - 4L
201.	Inala Av - King Av - Learoyd Rd stage 4 (Sherbrooke Rd to Watson Rd) - 4Lane divided. Including Bridge (Oxley Ck)
202.	Inala Avenue-King Avenue-Learoyd Road - Inala Av to Sherbrooke Rd => 4 lane divided.
203.	Lutwyche Road (Enoggera Ck to Gympie Rd) - 6L most of it (3300capacity)
204.	Rode Road (Gympie Road to Bilsen Road) - 4L divided
205.	Lindum Rd Open Level Crossing (Crawford Rd to Inghams Pl). Includes Lindum Rd Duplication and Rail Grade sep.
206.	Kinawah Rd Extension Stage 3 (Crawford Rd to Wynnum Rd) - 2L divided
207.	Beams Road - Handford rd to Sandgate Rd => 4 lane divided arterial.
208.	Newbeith Road - Pub Lane to Goodna Rd (Springfield-Greenbank Arterial) => 2 lane sub-arterial.
209.	Pub Lane - Equestrian Dr to Newbeith Rd => 4 lane collector.
210.	FlagstoneWest NS Collector - Boyd Rd to Mountain Ridge Rd => 2 lane sub-

	arterial/collector.
211.	Granger Road-Sungold Road - Chambers Flat Rd to Mt Lindesay Hwy=> 4 lane sub-arterial.
212.	Chambers Flat Road - Kenny Rd to Mt Lindesay Hwy => 2 lane sub-arterial.
213.	Other Logan projects for 2031
214.	Beatty Road-Sherbrooke Road - Granard Rd to King Av = 4 lane divided sub-arterial.
215.	Hoyland Street - Kluver St to Bracken Ridge Rd => 4 lane arterial
216.	Mt Gravatt-Capalaba Road - Mt Cotton Rd to Old Cleveland Rd => 4 lane divided arterial.
217.	Beams Rd Stage1 (from Gympie Rd to Balcara av) - 4L divded
218.	Cavendish Rd (From Old Cleveland Rd to Creek Rd)-4L all way long
219.	Nottingham Road - Algester Rd to Beaudesert Rd => 4 lane divided sub-arterial.
220.	depot Road (Quinlan St to Braun St) - 4L divided
221.	Shafston Av - Lytton Road - Wynnum Rd stage6 (Scanlan St to Laidlaw St) - 3L inbound
222.	Underwood Road - Warrigal Rd to Millers Rd => 4 lane divided sub-arterial.
223.	Fairfield Road (Sheerwood Road to annerley Road)-3L all the way long. Include upgrade on Home St till Annerley Rd
224.	Beams Road Stage 2 (Carselgrove Av to Handford Rd) 4L divided
225.	Kingsford Smith Dr (Stage 3: Race Course Road to Cooksley Street) - 6L
226.	Johnson Road - Southlink St to WoogarooRd => 4 lane divided arterial/sub-arterial
227.	Settlement Road - Samford Rd to Waterworls Rd => 4 lane divided sub-arterial
228.	Beenleigh Road - Warrigal Rd to Stiller Dr => 4 Lane Divided.
229.	Freeman Road - Garden Rd to Blunder Rd => 4 lane Divided collector.
230.	Archerfield Road - Ipswich Rd to Poinsettia St => 4 lane divided sub-arterial.
231.	Seventeen Mile Rocks Road - Goggs Rd to Kingsgate St => 4 lane divided sub-arterial.
232.	Hellawell Road - Beaudesert Rd to Gowan Rd =. 4 lane divided sub-arterial.
233.	Belmont Road - Manly Rd to Meadowlands Rd => 4 lane divided collector.
234.	Dianthus St upgrade (Basella St to New Cleveland Rd) - Collector 2L divided
235.	Murphy Rd- Handford Rd -Lemke Rd Stage4 (Coxen st to Zillmere Rd) - 4L divided
236.	Updated Ipswich Rd 3L all way long from O'Keefe St to Keats St
237.	Beams Road - Bridgeman Rd to Gympie Rd => 4 lane divided arterial.
238.	Stanley St - Cavendish Rd Stage 4 (Stanley St to Old Cleveland Rd)-6L
239.	Stapylton Road - Logan Mwy to Johnson Rd => 4 lanes divided
240.	Coonan St (Moggill Road to Westminster St) - Upgrade to 4L divided
241.	Paradise Road (Johnson Rd to Radius Dve)
242.	Oxley Road (Walter Taylor Bridge to Sherwood Rd) - 4 L divided arterial
243.	Paradise Rd (south of Beaudesert Rd intersection to area adjacent to Kulcha St)
244.	Prebble St Extension (Gardner Rd to Rochedale Rd)-2L
245.	Rochedale Rd - Grieve Rd (Underwood Rd to Priestdale Rd)-4L undivided
246.	Rochedale Rd - Grieve Rd (Priesdale Rd to School Rd extension)-4L divided
247.	Rochedale Rd - Grieve Rd (Prebble St to School Rd extension)-4L undivided
248.	Rochedale Rd - Grieve Rd (Grieve Rd to Prebble st extension)-4L undivided
249.	Gardner Rd Extension (Priestdale Rd to School Rd)
250.	Grieve Road (Extent of very low density (24m reserve) to Ford Road) - 4L undivided
251.	Grieve Road (Rochdale Road to Extent of very low density (24m reserve))-4L undivided
252.	Ford Road extension (Rochedale Road to Grieve Road)
253.	Underwood Rd (School Rd to Rochedale Rd)
254.	New Road (Ford Road Extension) (Miles Platting Road to School Road Extension)-2L divided
255.	RCM CLEM7 - AL Connections (City Ramps)
256.	Northern Busway: RBH to Kedron to Bracken Ridge - INB to Federation St

257.	Airport Link Reference Design Sandgate Road interchange
258.	Airport Link Ancillary Works - Northern Busway Staging : Interim - RCM NSBT
259.	Airport Link Tunnels
260.	Kingsford Smith Drive - Theodore St to French St => 6 lanes Divided
261.	Beckett Rd - Rode Rd to Albany Creek Rd => 4 lane divided; signals except roundabout at Rode Rd..
262.	Bridgeman Road - Albany Creek Rd to Millar Rd => 4 lane Divided, Speed Limit 70 kph.
263.	Kerners Road Deviation - Warwick Rd to Kerners Rd. (Include reclassification of Kerners Rd-Deebing Creek Rd - Ash St to Pisale Dr as collector)
264.	Third Avenue Extension - Bardon Rd - Wembley Rd. New 4 lane Road - Part 1

Appendix B:
Public transport capacity assumptions

CityTrain Capacity Coding

General

Coding of Queensland Rail fleet capacities was based on information provided by the Queensland Rail website. Information for each class was sourced from; http://www.queenslandrail.com.au/AboutUs/MediaCentre/Fleet/Pages/Fleet.aspx. Queensland Rail provides explicit seating and crush capacity information for each class of train; the capacity of a typical service was therefore calculated by combining this information with information on the proportion of each class in the entire fleet.

All services in both years were assumed to run as full-length six-car sets. The exception to this was the Gympie North line – the express services on this line were assumed to exclusively run as five-car InterCity Express trains, with a corresponding reduction in seating and crush capacity.

Rail Capacity (3-car set)	Delivery of Fleet	Units	Seating capacity	Crush capacity
Suburban Multiple Unit (SMU200)	1994-1995	12	240	500
Suburban Multiple Unit (SMU220)	1999-2001	29	236	502
Suburban Multiple Unit (SMU260)	2008-2011	35	236	458
Electric Multiple Unit (EMU)	1979-1987	88	248	500
Interurban Multiple Unit (IMU100)	1996-1997	10	224	478
Interurban Multiple Unit (IMU120)	2001-2002	4	215	441
Interurban Multiple Unit (IMU160)	2004-2011	27	217	440
InterCity Express (ICE)	1988-1989	8	180	524

Source: http://www.queenslandrail.com.au/AboutUs/MediaCentre/Fleet/Pages/Fleet.aspx

Bus Service Capacities

An analysis of seating and crush capacities in the fleet yielded estimates of 45 seated capacity and 65 crush capacity.

Appendix C:
ABS Statistical Areas level 3

Brisbane Metropolitan Area SA3s

Gold Coast Region SA3s

Sunshine Coast Region SA3s