

Reducing Through Traffic

INNER MELBOURNE ACTION PLAN

Final Report

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Reducing Through Traffic

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Contents

1.	Introduction	1
1.1	Purpose	1
1.2	Background	1
1.3	Study overview	1
2.	Through traffic and its impacts	3
2.1	Definitions	3
2.2	"Acceptable" and "unacceptable" through traffic	3
3.	Spatial analysis of through traffic	5
3.1	Overview	5
3.2	Data source	5
3.3	Spatial analysis methodology	6
3.3.1	Analysis technique	6
3.3.2	Routes on LGA boundaries	6
3.3.3	Tollways	6
3.3.4	Public transport	6
3.4	City of Melbourne	7
3.4.1	Through traffic routes	7
3.4.2	Origins of through traffic	11
3.4.3	Access to rail stations	11
3.4.4	Conclusions	15
3.5	City of Yarra	16
3.5.1	Through traffic routes	16
3.5.2	Origins of through traffic	20
3.5.3	Access to rail stations	20
3.5.4	Conclusions	23
3.6	City of Stonnington (West)	25
3.6.1	Through traffic routes	25
3.6.2	Origins of through traffic	29
3.6.3	Access to rail stations	29
3.6.4	Conclusions from the analysis	32
3.7	City of Port Phillip	34
3.7.1	Through traffic routes	34
3.7.2	Origins of through traffic	37
3.7.3	Access to rail stations	37
3.7.4	Conclusions	41
3.8	City of Maribyrnong	42
3.8.1	Through traffic routes	42
3.8.2	Origins of through traffic	45
3.8.3	Access to rail stations	45
3.8.4	Conclusions from the analysis	49

3.9	IMAP	50
3.9.1	Through traffic routes	50
3.9.2	Truck routes	50
3.9.3	Origins of through traffic	54
3.9.4	Conclusions from the analysis	58
4.	Causes of through traffic.....	59
4.1	Melbourne.....	59
4.2	Yarra	59
4.3	Port Phillip.....	60
4.4	Maribyrnong.....	60
4.5	Stonnington West.....	61
4.6	Behavioural factors.....	61
4.7	Political factors.....	62
5.	Actions	63
5.1	Action Plan.....	63

Appendix A. Review of government policies and strategies

Appendix B. Melbourne Traffic Distribution Maps

Appendix C. Yarra Traffic Distribution Maps

Appendix D. Stonnington West Traffic Distribution Maps

Appendix E. Port Phillip Traffic Distribution Maps

Appendix F. Maribyrnong Traffic Distribution Maps

Appendix G. IMAP Traffic Distribution Maps

Appendix H. City of Stonnington Through Traffic Report

1. Introduction

1.1 Purpose

The purpose of this study is to research the causes and impacts of through traffic in the municipalities of Melbourne, Port Phillip, Stonnington, Yarra and Maribyrnong. The investigation identifies present areas of concern, assesses opportunities and constraints in the local transport network and recommends practical future actions that IMAP councils might consider for reducing the impact of through traffic.

1.2 Background

The original Inner Melbourne Action Plan (IMAP), adopted in December 2005, is a collaborative project between the Cities of Melbourne, Port Phillip, Yarra and Stonnington (west of Kooyong Road). The City of Maribyrnong recently joined IMAP as an associate member. The most recent 2010-11 Inner Melbourne Action Plan contains eleven regional strategies and identifies 57 actions to strengthen the liveability, attractiveness and prosperity of the inner Melbourne region.

In inner Melbourne, as elsewhere, the quality of transport is an important contributor to liveability and productivity, and has a strong influence on the environment as well. The transport system provides access to jobs, family, schools and social activities as well as delivering goods and services. Travel by car accounts for around 77 per cent of all weekday trips in Melbourne. Public transport accounts for eight per cent, walking 12 per cent and cycling two per cent¹. With significant growth forecast in Melbourne's outer suburban growth areas in the coming decades, the number of trips made by private vehicles is also expected to grow significantly (although this expectation is under 'business-as-usual' conditions, which are open to challenge). Outer suburban growth has a flow-on impact on inner suburbs, with central Melbourne maintaining (indeed strengthening) its role as the state's largest employment and activity hub.

Traffic congestion on arterial routes can lead to traffic filtering through residential areas as drivers attempt to bypass peak-period traffic queues, causing annoyance to residents and degrading local amenity. Local governments, including the IMAP municipalities, have traditionally used local area traffic management (LATM) techniques, such as speed humps, reduced speed limits, turn bans and road closures, to discourage 'rat-running'.

While the impacts of traffic intrusion are readily perceived, the origins and destinations of through traffic are less well-understood. With a better understanding of through traffic, this study aims to assist the IMAP councils to develop strategies for dealing with the impacts of traffic originating from outside their municipalities.

1.3 Study overview

The following questions will be addressed by this study:

- What is the nature and extent of through traffic in the member councils' areas?
- Where do the principal through routes clash with local "places" where traffic intrusion is unwelcome?
- What are the economic, social, environmental, and political impacts of through traffic (positive and negative)?
- Which stakeholders would be affected by changes in the management of through traffic?
- What measures could be effective in reducing the negative impacts of through traffic?

The study report is structured as follows:

- Chapter 2 defines the concept of through traffic in the context of this study and discusses its impacts.
- Chapter 3 presents an analysis of the spatial characteristics of through traffic in the IMAP municipalities.

¹ Source: Government of Victoria (2013), *Managing Congestion: Victorian Auditor General's Report*, April 2013.

- Chapter 4 discusses the causes of through traffic, drawing on the spatial analysis of traffic routes and a broader review of the driving forces contributing to growth in vehicular travel.
- Chapter 5 suggests further actions that could be considered by the IMAP councils for addressing through traffic issues in their municipalities.

Appendix A provides further information on current government policies and strategies that are relevant to managing traffic congestion.

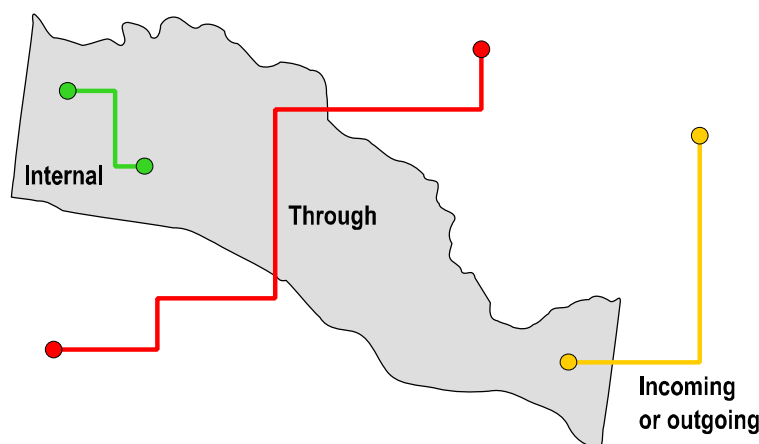
2. Through traffic and its impacts

This chapter provides a definition of through traffic and discusses its impacts in general terms.

2.1 Definitions

When discussing traffic movements in each municipality, we make a distinction between through traffic, internal traffic and incoming and outgoing traffic. In simplest terms, **through traffic** is defined as traffic that has an origin and destination outside the municipality, and passes through the municipality. **Internal traffic** has both its origin and destination within the municipality. **Incoming and outgoing traffic** has one end of its trip inside and the other outside the municipality. These three classifications are shown in Figure 1.

Figure 1: Three types of trips and their classifications



Traffic that passes through a municipality but makes a brief stop en route (e.g. for petrol or a quick shopping task) could also arguably be classified as through traffic. For the purposes of this study, we have used the information contained in the Victorian Integrated Survey of Travel and Activity (VISTA 2009-10) to determine whether a journey should be classified as a through trip. If a survey respondent reported a stop in a municipality, then the journey was not considered to be a through trip. If a stop was not reported in the municipality and the route passed through the municipality, it was considered a through trip.

2.2 “Acceptable” and “unacceptable” through traffic

In considering the impacts of through traffic, participants at an IMAP workshop held in January 2013² posed the question of whether all through traffic was necessarily “bad”. The collective view of the participants was that through traffic using freeways, tollways and primary arterial routes was generally acceptable in terms of limiting the impact on surrounding local areas. However, through traffic that filters through local streets or activity centres was generally thought to be undesirable. The question was also raised about the appropriate classification of roads for example arterial roads that are being managed for through traffic purposes at the expense of local needs.

In any given precinct, it could be argued that through traffic (from the point of view of precinct residents, workers or users) includes traffic with origins and destinations outside that area but still within the municipality. This is especially true of through traffic in local streets. Municipalities are defined by administrative boundaries rather than being a distinct place (it is in fact a collection of distinct places in the wider urban fabric). Identifying all such precincts and analysing through traffic in each one would obviously produce more impacts and effects to consider, but the available data does not really support such a detailed analysis. We will return to this issue later in the report.

² Inner Melbourne Action Plan through-traffic stakeholder workshop held at Melbourne Town Hall on 17 January 2013. The workshop was attended by representatives of the cities of Stonnington, Port Phillip, Yarra, Melbourne and Maribyrnong, as well as VicRoads, Department of Transport and Public Transport Victoria staff.

The analysis of through traffic presented in the following chapter considers the relationship between through traffic routes and the road hierarchy (freeways, primary arterials, secondary arterials, local streets and so on).

3. Spatial analysis of through traffic

3.1 Overview

To provide a more objective basis for assessing through traffic impacts in the IMAP municipalities, a spatial analysis of trip-making in the Melbourne metropolitan area was undertaken. The spatial analysis sought to establish the levels of through traffic, incoming/outgoing traffic and local traffic in each municipality as well as the geographic distribution of these trips.

The analysis used the 2009-2010 Victorian Integrated Survey of Travel and Activity (VISTA) as the primary data source for trip-making behaviour. VISTA is a survey of household travel in Melbourne and several regional Victorian centres. The survey was conducted over a 12-month period, with 10,909 responding metropolitan households and more than 135,000 reported journey segments. It is important to note that VISTA can under represent off peak data by up to 30%.

Traffic routes were modelled by extracting information about car-driver trips from VISTA, and assigning the travel to a detailed road network³. By assessing the roads used by each vehicle trip, estimates of through traffic could be made for each municipality. These were compared with anecdotal evidence of popular traffic routes to determine whether the analysis matched expectations.

This chapter presents the results of the analysis and discusses the implications for each municipality.

3.2 Data source

The VISTA survey was chosen as the source of travel data for this study. Use of VISTA data with a customised route-choice model provided several benefits for the analysis:

- each survey respondent could specify the actual roads used to travel between their origin and destination, allowing traffic routes to be estimated with greater accuracy;
- the vehicle routing model was able to use local streets, not only arterial roads (as is the case with the strategically-oriented Victorian Integrated Transport Model);
- other trip characteristics (such as trip purpose, vehicle type and time of day) could be assessed if required.

There were several limitations to using this approach, however:

- previous experience suggests that VISTA under-represents travel in the off-peak periods by as much as 30 per cent⁴;
- because only a sample of households were surveyed, the origins and destinations reported in the survey tended to be “clumped” near the surveyed households and the activity locations associated with those households⁵;
- where survey respondents did not specify complete routing information (which occurred in 50% of cases), the model used a simple quickest- path procedure to estimate vehicle routes. Congestion effects were not fully considered.

These limitations were handled by aggregating results to the local government area (LGA) level. This ensured sufficient sample size for most metropolitan LGAs. The results have also been released with the proviso that actual volumes will inevitably differ from those shown in the analysis, but the general distribution of traffic should be indicative of the main traffic routes in each municipality and their relative significance for through movement.

³ The road network was based on the VicMap road centre line database adapted for use with the RoadLink model.

⁴ See Veitch Lister Consulting (2013), *Review of VISTA07*, Zenith Model of Victoria Technical Note 2. Available at <http://zenith.veitchlister.com.au/documents>.

⁵ Note that origin and destination information was coded at the census collection district (CD) level, so individual households could not be identified.

3.3 Spatial analysis methodology

3.3.1 Analysis technique

The spatial analysis of routes was conducted using the following procedure:

- the origin and destination of each car-driver trip was extracted from the VISTA dataset along with the names of streets used en route⁶;
- the path used for each journey was assigned to the road network using a customised software package called *RoadLink*⁷;
- each route was analysed to determine in which LGAs the route started and finished, and whether the route passed through the municipality under review;
- through routes, incoming/outgoing routes and local routes were identified;
- the total amount of traffic on each road was calculated for each route type;
- through traffic origins and destinations were aggregated by LGA to determine the biggest contributors to through traffic in the municipality.

3.3.2 Routes on LGA boundaries

Several municipalities have major routes running along their boundaries. For example, City Link runs along the boundary of Stonnington and Yarra, Dandenong Road runs along the boundary between Stonnington and Glen Eira. Punt Road and Hoddle Street border the Cities of Melbourne, Yarra, Stonnington and Port Phillip. Traffic using boundary roads were included in the analysis for all adjacent municipalities, as they form significant through traffic corridors that have an impact upon all adjacent areas.

3.3.3 Tollways

To account for the diversion of traffic from tollways onto arterial roads, a simple assumption was made that 23 per cent of traffic that would otherwise have used a toll road is diverted onto parallel routes. The 23 per cent figure was derived from toll road studies by D'Este (2010) that show around 20 to 30 per cent of toll road traffic diverts to other routes when an initial toll-free period reverts to a full toll⁸. This figure is used to provide a rough estimate of toll effects and has not been verified for the Melbourne context nor tested for sensitivity.

3.3.4 Public transport

In addition to the car driver through-traffic analysis, a similar analysis of public transport trips was carried out (also using VISTA) to determine the relative magnitudes of public transport trips passing through the municipality.

The results from these analyses are presented in the following sections.

⁶ The data was extracted from the VISTA "stops" database which includes car trips made as part of multi-modal journeys (as well as trips made completely by car). For example, if a person drives from home to a local railway station then takes a train to work, the car leg of the journey (home to station) will be included in the analysis.

⁷ See McPherson, C.D. "RoadLink: a Model for Analysing Vehicle Routes from Household Travel Surveys." In Papers of the 23rd Australasian Transport Research Forum. Vol. 2, 1999.

⁸ See D'Este, G. "What happens to toll road ramp-up profile when there is an initial toll-free period, and the broader implications for demand forecasting", Proceedings of the Australasian Transport Research Forum, 2010

3.4 City of Melbourne

3.4.1 Through traffic routes

Figure 2 and Appendix B shows the modelled distribution of through traffic, incoming and outgoing traffic, and local traffic in the City of Melbourne.

The City of Melbourne is located at the centre of the metropolitan transport network, and is spatially analogous to the hub of a wheel, with arterial roads and public transport routes radiating like spokes. The City therefore attracts very large volumes of through traffic, with many high capacity routes passing through the municipality. The analysis indicates that the through main traffic routes are:

- City Link (Tullamarine and Monash sections)
- West Gate Freeway
- Princes Street
- Kings Way (South Melbourne section)
- Hoddle Street and Punt Road
- Elliott Avenue
- Smithfield Road

There are several other routes that carry moderate volumes of through traffic. These include:

- Nicholson Street, Lygon Street and Rathdowne Street (Carlton North)
- Spring Street, Exhibition Street, King Street and Russell Street (CBD)
- Flemington Road, Royal Parade, Curzon Street, Dryburgh Street, Macaulay Road and Boundary Road (North Melbourne)
- Peel Street and Dudley Street (CBD)
- Olympic Boulevard, City Road and Southbank Boulevard (South Melbourne)
- Wellington Parade and Brunton Avenue linking to Flinders Street (CBD)

While these routes carry some through traffic, their primary function is to provide access to destinations within the Melbourne LGA. The analysis shows higher volumes of incoming/outgoing traffic using these routes than through traffic in most cases.

Other major roads in the municipality generally perform an access function for incoming and outgoing traffic, with relatively few internal private car trips being made within the municipality (refer to Table 1).

City of Melbourne - Traffic Distribution

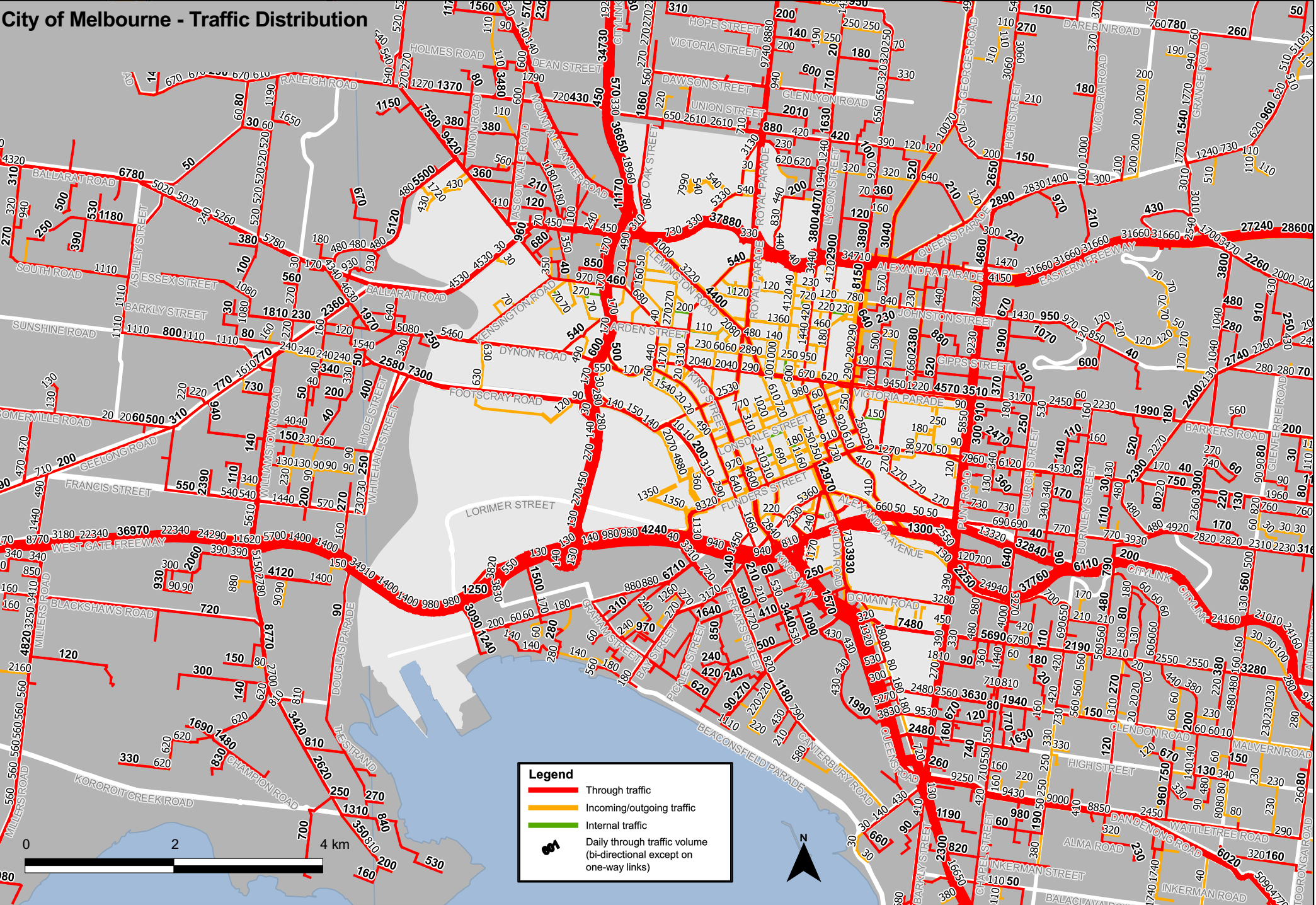


Table 1 : Traffic Volumes (two way) on selected City of Melbourne roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
Melbourne CC	Spring Street	Nicholson St – Collins St	8,740	19,110	250
Melbourne CC	Flinders Street	Spring St – Russell St	5,260 – 5,710	10,920 – 13,290	1,050 – 3,890
		Russell St – Swanston St	13,040	25,140	2,870 – 3,600
		Swanston St – Queens St Bridge	70	4,830 – 14,060	1,660 – 1,730
		Queens St Bridge – King St		2,320 – 6,050	
VicRoads	King Street	Flinders St – Dudley St	9,230 – 9,450	14,660 – 2,4890	1,830 – 5,170
		Dudley St – Victoria St	4,460	5,330 – 8,370	1,460 – 2,010
VicRoads	Dynon Road	Lloyd St – Kensington Rd	4,540	5,320 – 5,860	-
VicRoads	Peel Street	Victoria St – Dudley St	5,700	14,330	2,980
Transurban	Batman Avenue		3,440	11,400 – 16,110	410 - 720
VicRoads	Elliott Avenue	Royal Parade – Flemington Rd	37,880 – 39,400	9,060 – 17,620	330 - 730
VicRoads	Flemington Road	Royal Parade – Elliott Av	4,400 – 8,270	15,570 – 27,550	1,000 – 3,390
VicRoads	Royal Parade	Brunswick Rd – Macarthur Rd	21,550	11,750 – 13,480	540

Table 2 : Percentage of Traffic Type on selected City of Melbourne roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
Melbourne CC	Spring Street	Nicholson St – Collins St	31%	68%	1%
Melbourne CC	Flinders Street	Spring St – Russell St	25 - 31%	58 - 63%	6 - 17%
		Russell St – Swanston St	31 - 32%	60 - 61%	7 - 9%
		Swanston St – Queens St Bridge	0 - 1%	74 - 89%	11 - 25%
		Queens St Bridge – King St	1 - 2%	57 - 77%	22 - 41%
VicRoads	King Street	Flinders St – Dudley St	24 - 36%	57 - 63%	7 - 13%
		Dudley St – Victoria St	30 - 40%	47 - 56%	13 - 14%
VicRoads	Dynon Road	Lloyd St – Kensington Rd	44 - 46%	54 - 56%	0%
VicRoads	Peel Street	Victoria St – Dudley St	25%	62%	13%
Transurban	Batman Avenue		17 - 23%	75 - 79%	3 - 4%
VicRoads	Elliott Avenue	Royal Parade – Flemington Rd	68 - 80%	19 - 31%	1%
VicRoads	Flemington Road	Royal Parade – Elliott Av	21%	70 - 74%	5 - 9%
VicRoads	Royal Parade	Brunswick Rd – Macarthur Rd	61 - 64%	35 - 38%	2%

3.4.2 Origins of through traffic

Figure 3 and Figure 4 show the modelled origins of through traffic and public transport trips respectively passing through the City of Melbourne. Figure 5 and

Figure 6 show the same information expressed as the number of trips per capita originating from each local government area.

Most through traffic originates from the neighbouring municipalities, notably Port Phillip (52,000vpd⁹) and Yarra (43,700vpd), but also Moreland, Moonee Valley, Maribyrnong, Hobson's Bay and Stonnington. This is likely to be caused by simple proximity effects; the Melbourne LGA has a higher probability of intercepting traffic originating from nearby municipalities than more distant areas.

Apart from the higher contributions from adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the metropolitan area. The public transport patterns show a similar pattern, with slightly higher contributions from municipalities that have high access to public transport including Yarra (53,800ppd¹⁰), Stonnington (35,100ppd) and Moonee Valley (24,300ppd).

3.4.3 Access to rail stations

Table 3 shows the proportional Estimated Weekday Entries by Access Mode (2011-12). There are 11 train stations in City of Melbourne which have varying levels of access by different modes. Due to the fact most stations do not have station car parks access by car is very low. The predominant mode of transport to access the station is walking (refer to Table 3) or public transport. Access by bicycle is very low to all stations in the municipality.

Table 3 – Access to rail stations in Melbourne by mode

Proportional Estimated Weekday Entries by Access Mode FY2011-12 (%)							
Station	Bus	Car	Cycled	Other	Train	Tram	Walked all the way
Flagstaff	0.5%	0.5%	0.5%	0.0%	22.4%	4.9%	71.2%
Flemington Bridge	0.0%	1.0%	0.0%	0.0%	0.0%	5.0%	94.1%
Flinders Street	0.3%	0.8%	0.9%	0.0%	33.4%	16.4%	48.2%
Kensington	4.1%	11.5%	0.0%	0.0%	0.0%	0.0%	84.4%
Macaulay	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Melbourne Central	0.3%	0.6%	0.0%	0.0%	16.9%	17.6%	64.6%
North Melbourne	15.3%	3.0%	0.7%	0.4%	66.0%	0.0%	14.6%
Parliament	0.0%	2.0%	0.0%	0.0%	12.6%	14.6%	70.7%
Royal Park	2.7%	4.1%	0.0%	0.0%	0.0%	25.7%	67.6%
South Kensington	0.0%	17.5%	2.1%	0.0%	0.0%	0.0%	80.4%
Southern Cross (Spencer St.)	3.8%	2.3%	0.5%	1.8%	25.1%	10.0%	56.5%

⁹ VPD – Vehicles per day

¹⁰ PPD – persons per day

Figure 3: City of Melbourne through traffic origins

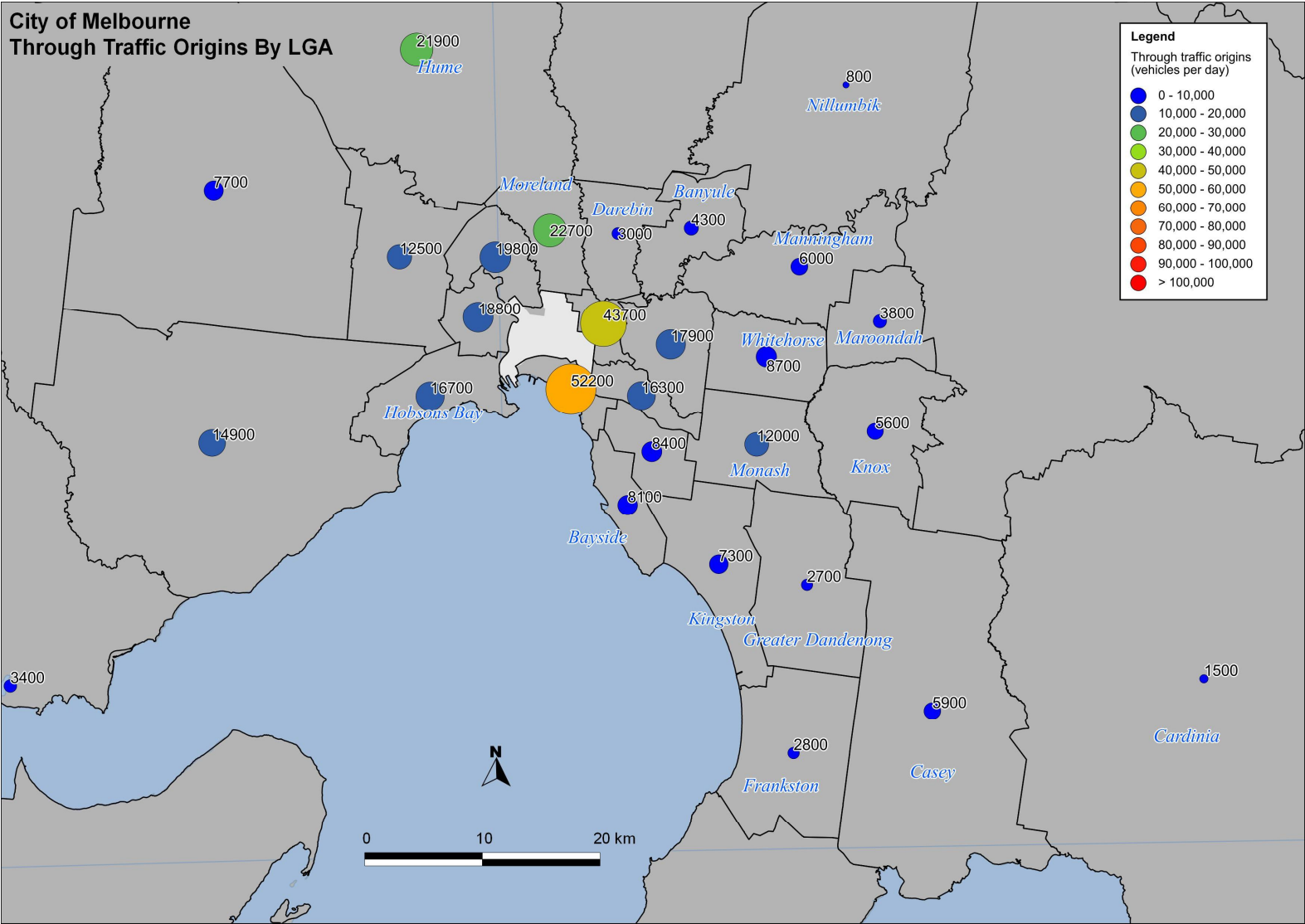


Figure 4: City of Melbourne through public transport origins

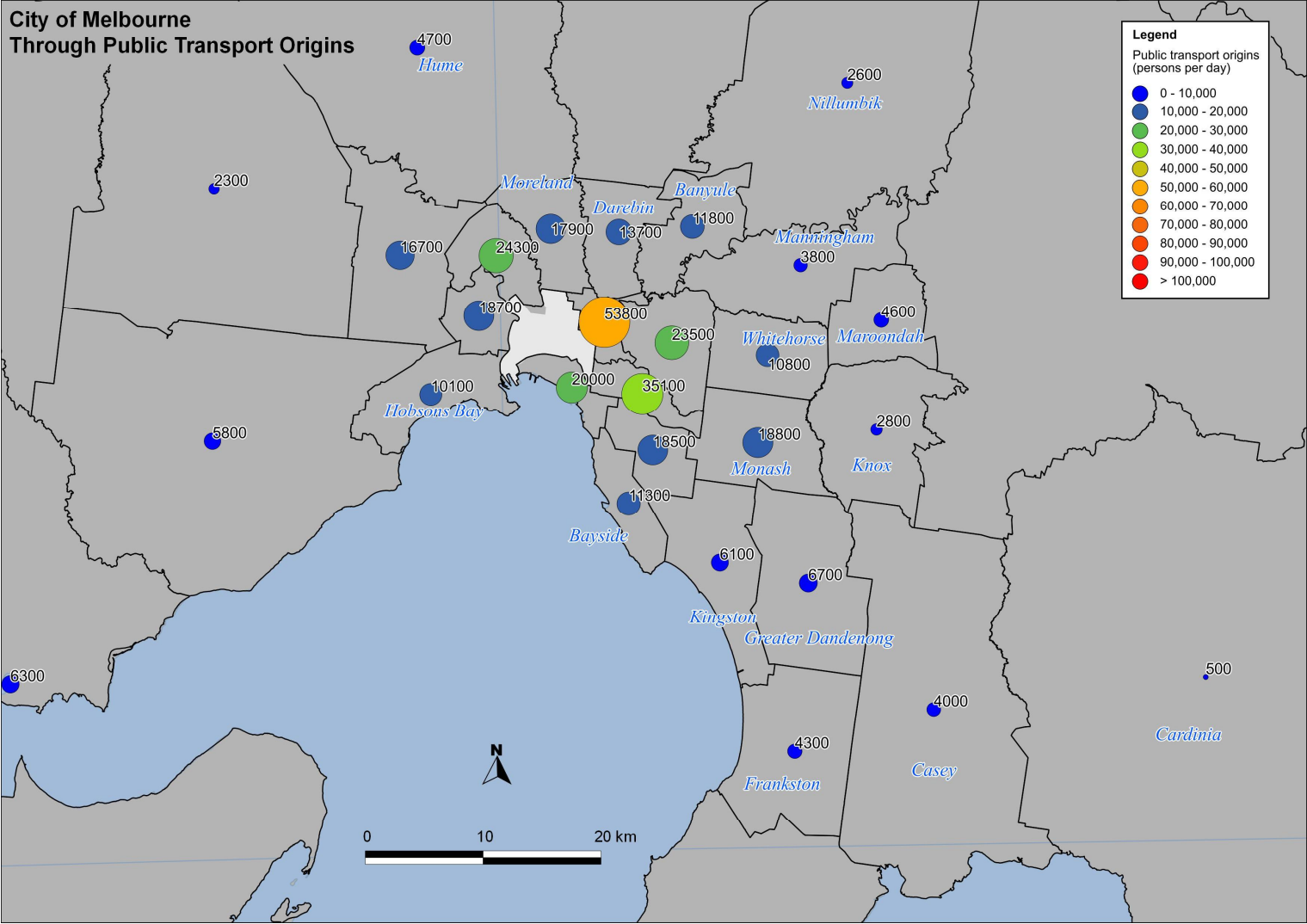


Figure 5: City of Melbourne through traffic volumes per capita by origin LGA

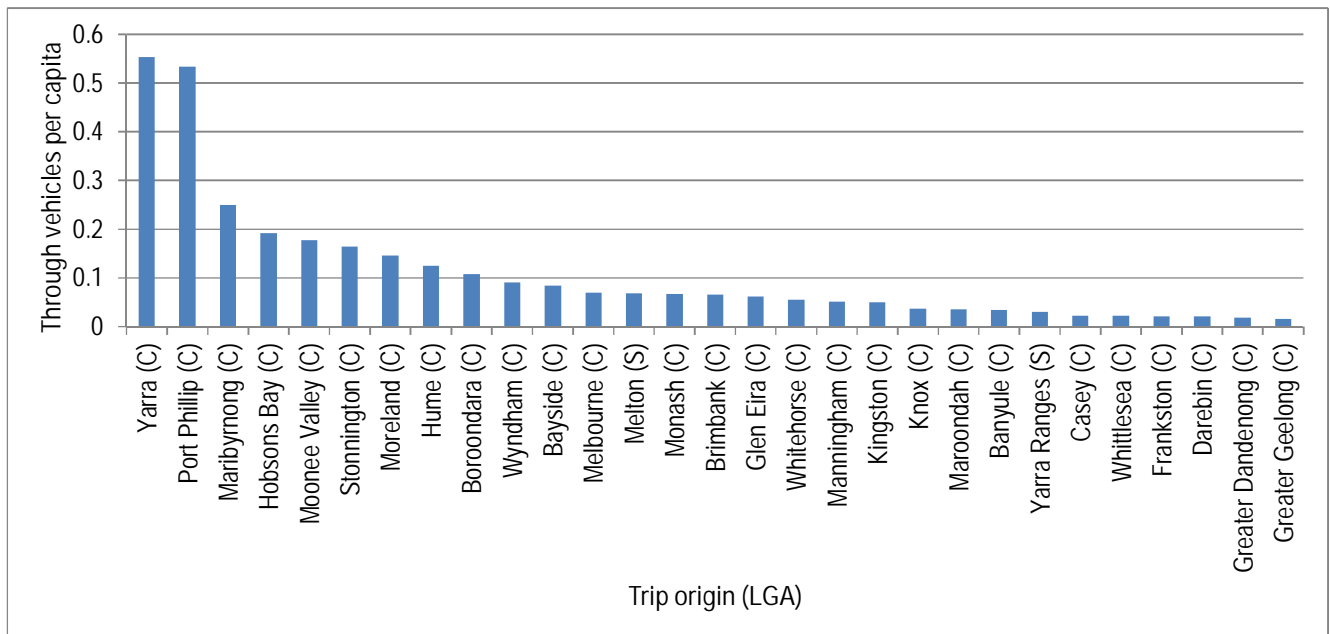
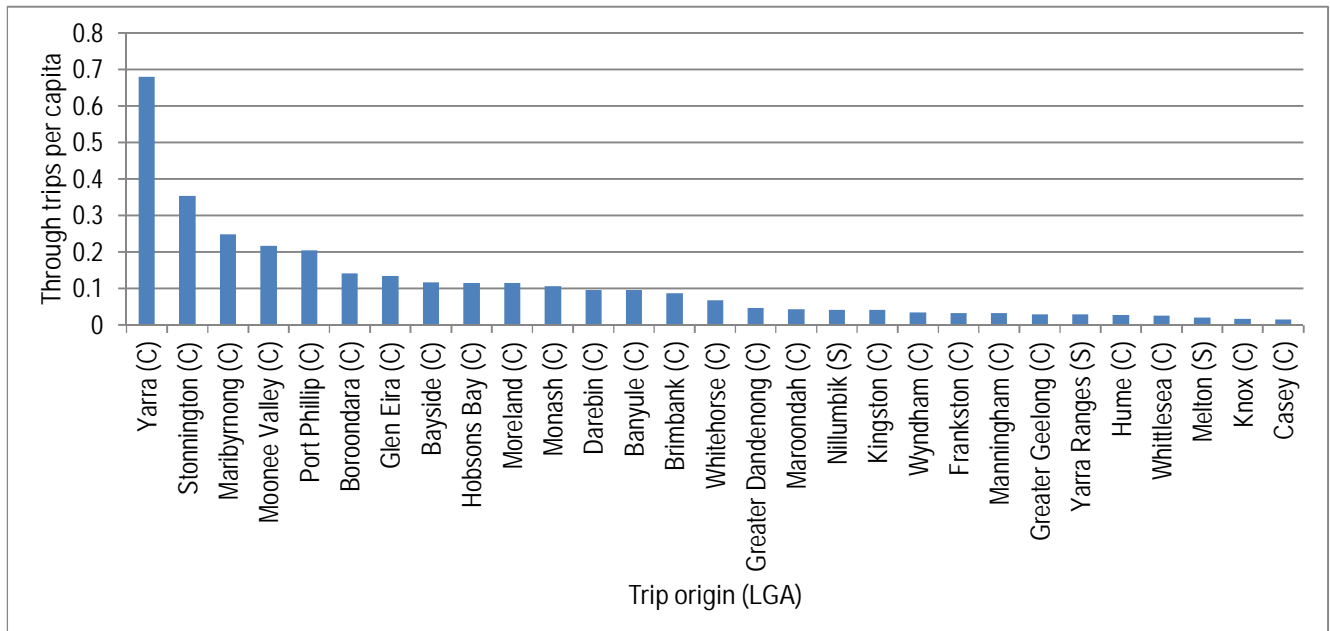


Figure 6: City of Melbourne through public transport trips per capita by origin LGA



3.4.4 Conclusions

The following conclusions were drawn from the Melbourne analysis:

- The Melbourne LGA attracts large volumes of through traffic, most of which is carried by the major freeways and City Link, but also by Kings Way, and Hoddle Street/Punt Road.
- City of Melbourne also attracts through traffic due to its geographic location at the northern end of Port Phillip Bay.
- Secondary routes, generally skirting the Melbourne CBD, also carry moderate volumes of through traffic, but these roads play a more significant role in providing access for vehicles to destinations in and around the CBD.
- The informal “ring road” formed by the Bolte Bridge, West Gate Freeway, Kings Way, Punt Road, Hoddle Street and Alexandra Parade stands out as being critical to the movement of through traffic in the Melbourne LGA. Tolls and congestion on this ring will cause some traffic to divert to internal secondary routes – however, through traffic presently using these secondary routes appears to be fairly moderate.
- Due to the radial nature of the public transport network feeding into the CBD, public transport origins are widespread although levels reduce the longer the travel journey.

3.5 City of Yarra

3.5.1 Through traffic routes

Figure 7 and Appendix C shows the distribution of through traffic, incoming and outgoing traffic, and local traffic in Yarra. The analysis indicates that the main through traffic routes in Yarra are the Eastern Freeway, Alexandra Parade, Monash (City Link) corridor, Hoddle Street and Punt Road. Being the highest capacity radial road routes in Yarra, these roads carry a significant proportion of traffic moving between the eastern suburbs and central city area.

In the north-western quadrant of Yarra, there are several north-south arterials that carry moderate volumes of through traffic; including Nicholson Street, Queens Parade, St Georges Road and Smith Street (refer to Tables 4 and 5). In the eastern part of Yarra, all of the east-west arterials carry moderate volumes of through traffic, including Johnston Street, Victoria Street, Bridge Road and Swan Street. Anecdotally, there is evidence that parallel east-west routes such as Elizabeth Street and Highett Street are also used by through traffic. Most traffic on secondary arterial roads and local streets appears to have local destinations within Yarra.

Table 4 : Traffic Volumes (two way) on City of Yarra roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Alexandra Parade	Nicholson St – Hoddle St	47,680 – 64,560	7,140 – 16,630	790 – 1,740
VicRoads	Hoddle Street	Queens Parade- Alexandra Pd	4,520	9,020 – 9,510	1,660 – 2,660
		Alexandra Parade – Victoria Pd	24,170 – 25,440	20,160 - 23,600	2,580 – 2,720
		Victoria Parade – Bridge Road	22,940	18,220 – 23,740	1,660 – 2,250
VicRoads	Punt Road	Bridge Road – Swan St	23,170 – 30,400	20,760 – 21,990	750 - 890
VicRoads	Burnley Street	Bridge Rd – Swan St	3,110	5,750	550 - 830
Yarra	Smith Street	Alexander Parade – Victoria Parade	5,500	3,200 – 7,110	310
VicRoads	Bridge Road	Punt Rd – Burnley St	5,760 – 6,720	4,660 – 7,990	570 – 1,880
		Burnley St – Yarra Blvd	9,700	8,600	960
Yarra	Brunswick Street / St Georges Rd	Alexandra Parade – Holden St	10,360	6,270 – 7,340	730
VicRoads	Queens Parade	Alexandra Parade – Hoddle Street	6,740 - 7350	5,560 – 7,390	1,390 – 2,500
Yarra	Barkly Avenue	Burnley St – Loyola Gv	22,710 – 23,640	9,270 – 9,930	-

Table 5 : Percentage of Traffic Type on City of Yarra roads

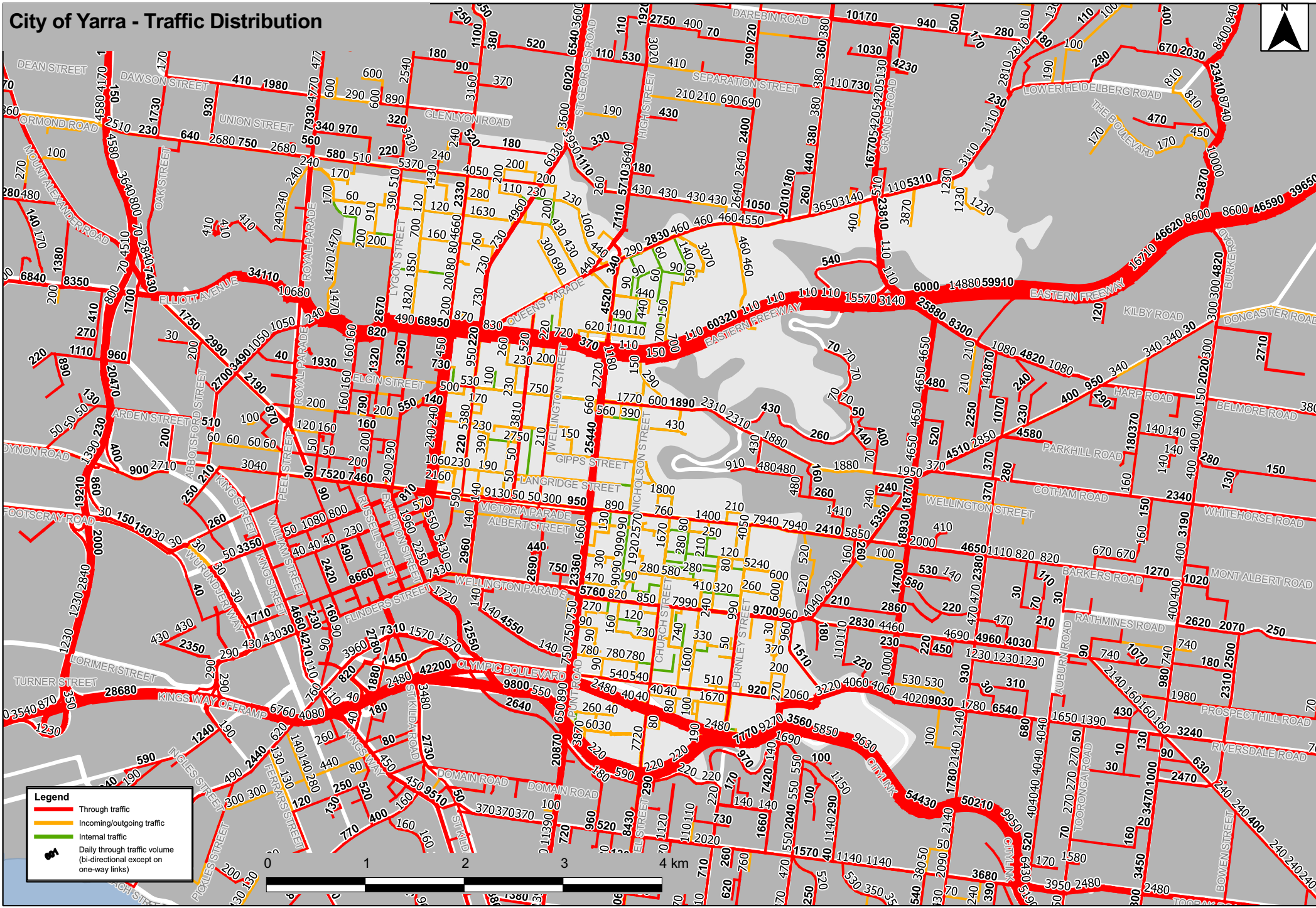
Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Alexandra Parade	Nicholson St – Hoddle St	78 - 86%	13 - 20%	1 - 2%
VicRoads	Hoddle Street	Queens Parade- Alexandra Pd	27 - 30%	57 - 59%	11 - 16%
		Alexandra Parade – Victoria Pd	49 - 52%	43 - 46%	5%
		Victoria Parade – Bridge Road	47 - 54%	43 - 49%	4 - 5%
VicRoads	Punt Road	Bridge Road – Swan St	52 - 57%	41 - 46%	2%
VicRoads	Burnley Street	Bridge Rd – Swan St	32 - 33%	59 - 61%	6 - 9%
Yarra	Smith Street	Alexander Parade – Victoria Parade	43 - 61%	36 - 55%	2 - 3%
VicRoads	Bridge Road	Punt Rd – Burnley St	41 - 52%	42 - 48%	5 - 11%
		Burnley St – Yarra Blvd	50%	45%	5%
Yarra	Brunswick Street / St Georges Rd	Alexandra Parade – Holden St	56 - 60%	36 - 40%	4%
VicRoads	Queens Parade	Alexandra Parade – Hoddle Street	43 - 49%	41 - 43%	10 - 15%
Yarra	Barkly Avenue	Burnley St – Loyola Gv	70 - 71%	29 - 30%	0%

City of Yarra - Traffic Distribution

This map illustrates the traffic distribution within the City of Yarra, showing daily through traffic volume (bi-directional except on one-way links) across various road segments. The roads are color-coded based on their traffic type:

- Through traffic:** Red lines
- Incoming/outgoing traffic:** Yellow lines
- Internal traffic:** Green lines

The map includes a legend, a scale bar (0 to 4 km), and a north arrow. Major roads and freeways are labeled, and traffic volume data is provided for numerous segments, indicating high concentrations of traffic along major thoroughfares like the Eastern Freeway and various city streets.



3.5.2 Origins of through traffic

Figure 8 and Figure 9 show the modelled origins of through traffic and public transport trips respectively passing through Yarra. Figure 10 and Figure 11 show the same information expressed as the number of trips per capita originating from each local government area.

Most through traffic originates from the neighbouring municipalities, with Boroondara and the City of Melbourne being the major contributors. As the City of Yarra sits on the eastern and northern boundaries of Melbourne's inner city, it has a high probability of intercepting traffic originating from the inner northern and eastern suburbs (e.g. Darebin, Whitehorse, Monash and Banyule).

Apart from the focus on the Melbourne CBD and adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the metropolitan area, although more heavily weighted towards the north eastern suburbs.

The public transport patterns are distinctly different from traffic patterns, with a very strong focus on the Melbourne CBD and eastern suburbs. This is likely to be due to the Clifton Hill, Burnley and Caulfield Group train lines passing through Yarra en route to the City Loop.

3.5.3 Access to rail stations

Table 6 shows the proportional Estimated Weekday Entries by Access Mode (2011-12). There are 9 train stations in City of Yarra which have varying levels of access by different modes. Clifton Hill has over 15% of people accessing the station by car. Other stations which are closer to the city with either none or limited parking have very high pedestrian and public transport usage to access the station. Collingwood has the highest walking percentage at 96% and over 16% of North Richmond station users access the station by tram or bus. Rushall Station (on the Merri Creek Train) has the highest number of cyclists (5%).

Table 6 – Access to rail stations in Yarra by mode

Proportional Estimated Weekday Entries by Access Mode FY2011-12 (%)							
Station	Bus	Car	Cycled	Other	Train	Tram	Walked all the way
Burnley	0.0%	10.6%	0.8%	0.0%	23.6%	5.7%	59.3%
Clifton Hill	2.1%	15.2%	1.4%	0.0%	40.7%	0.0%	40.7%
Collingwood	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	96.0%
East Richmond	0.0%	1.8%	0.0%	0.0%	3.7%	0.9%	93.6%
North Richmond	0.0%	7.1%	0.8%	0.0%	1.6%	16.7%	73.8%
Richmond	2.8%	3.9%	2.5%	0.6%	62.5%	3.3%	24.5%
Rushall	1.7%	1.7%	5.0%	0.0%	3.3%	0.0%	88.3%
Victoria Park	0.8%	7.6%	0.0%	0.0%	1.7%	0.0%	89.8%
West Richmond	0.0%	5.6%	0.0%	0.0%	0.0%	0.0%	94.4%

Figure 8: Yarra through traffic origins

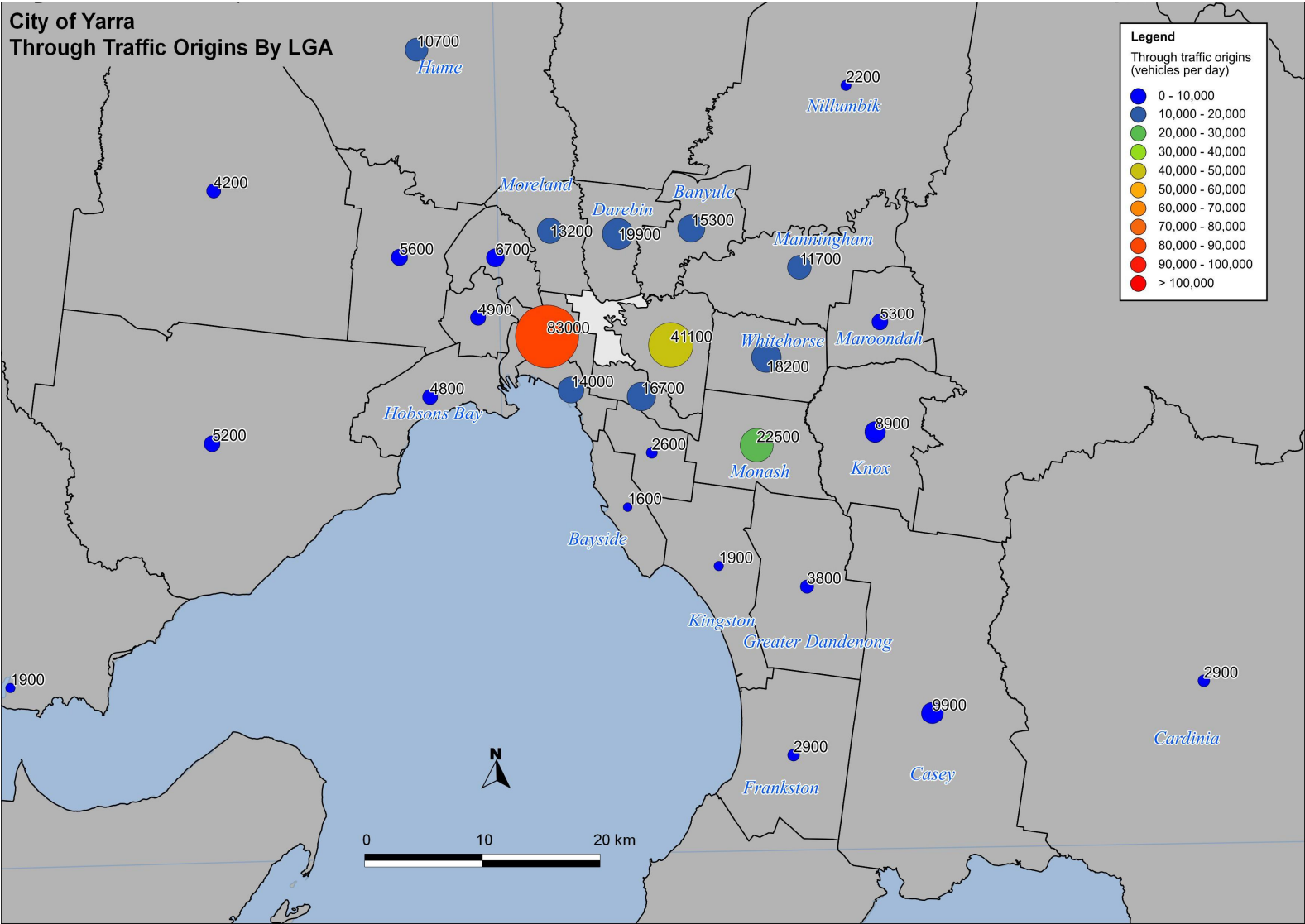


Figure 9: Yarra through public transport origins

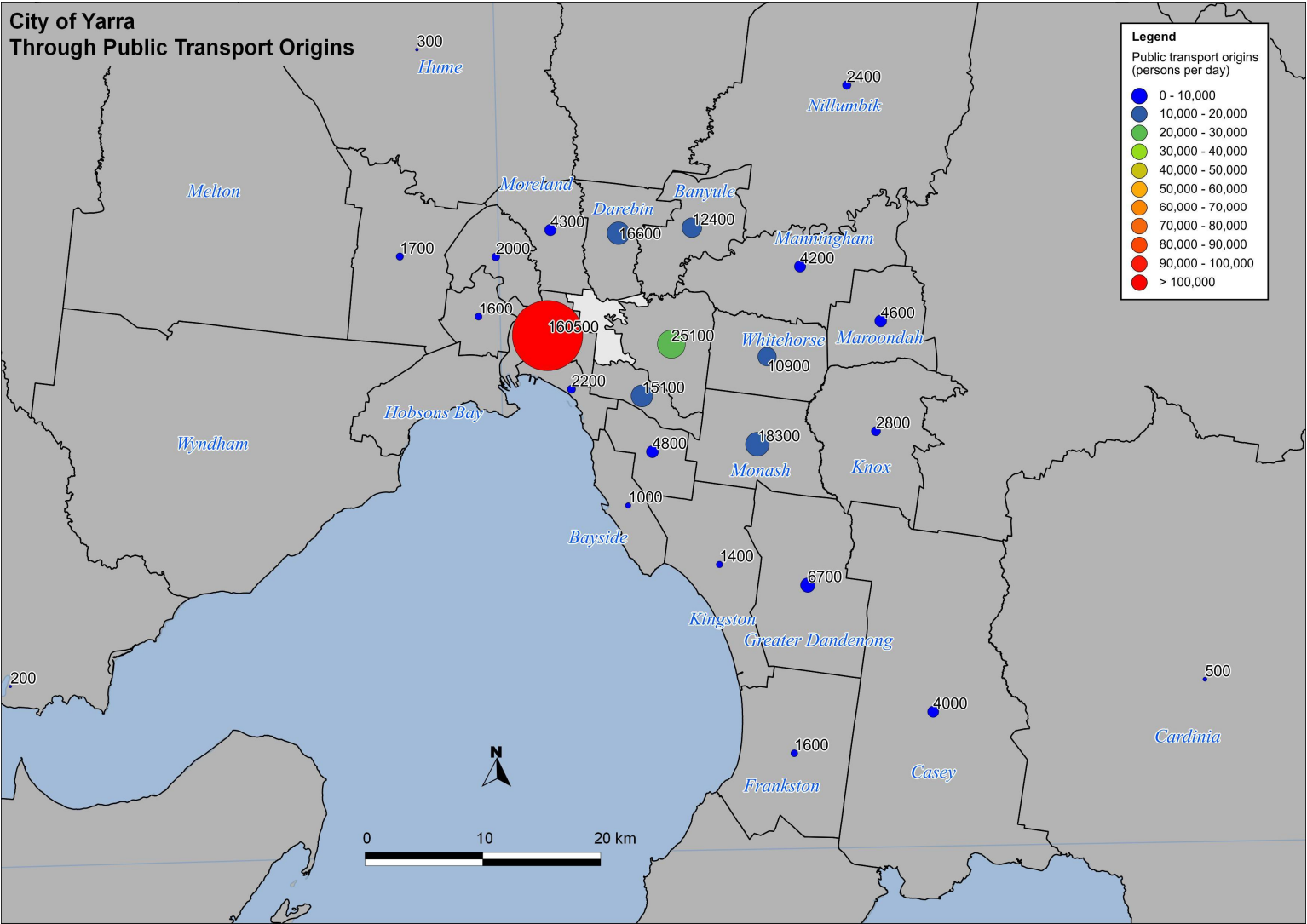


Figure 10: Yarra through traffic volumes per capita by origin LGA

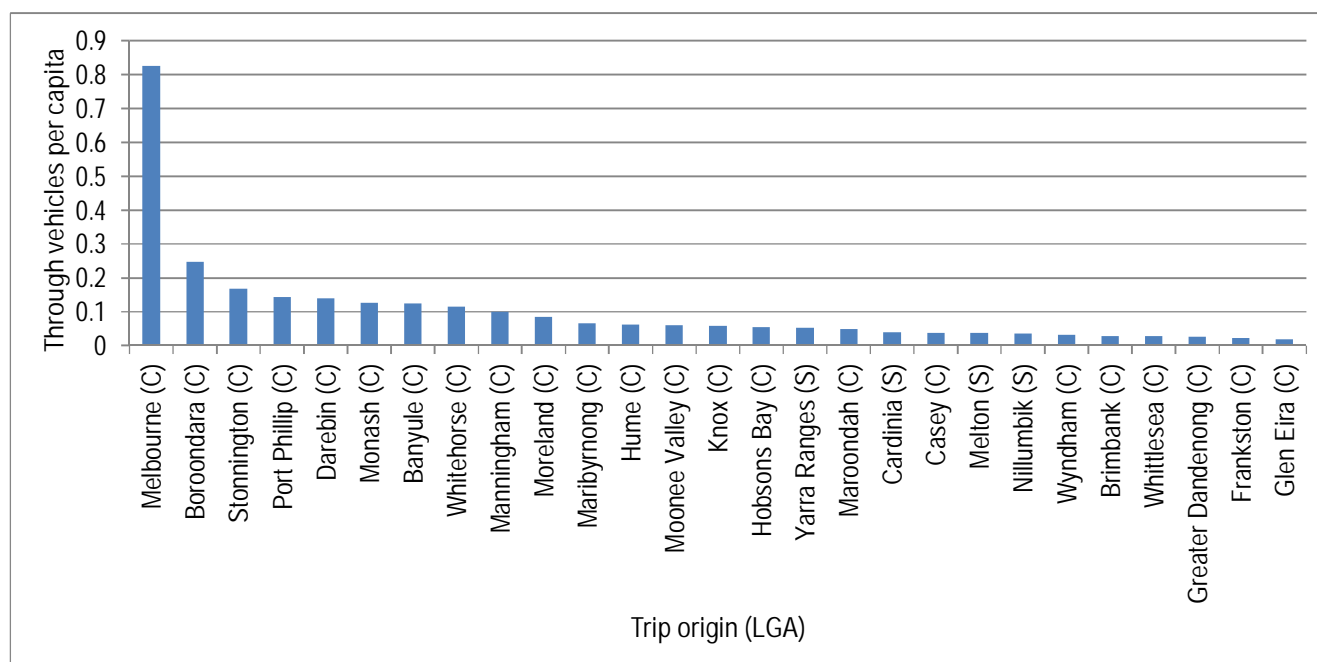
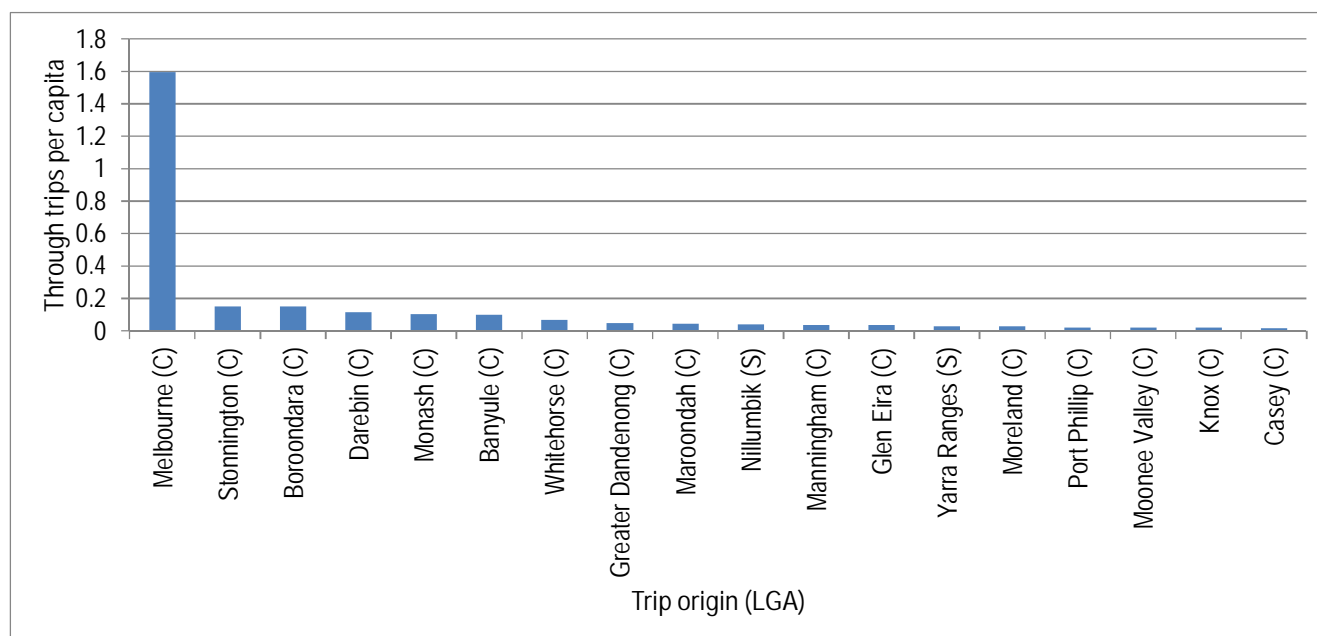


Figure 11: Yarra through public transport trips per capita by origin LGA



3.5.4 Conclusions

The following conclusions were drawn from the Yarra analysis:

- Most through traffic in Yarra uses the Eastern Freeway, Monash (City Link) corridor and Hoddle Street. East-west arterials in the eastern half of Yarra and north-south arterials in the northern part of Yarra also carry moderate through traffic volumes.

- In comparison to other IMAP municipalities (except perhaps for the City of Melbourne), through traffic is dispersed more widely in Yarra, with nearly all major arterials in the municipality carrying moderate volumes of through traffic.
- Most through traffic originates from neighbouring municipalities, notably Boroondara and the City of Melbourne.
- Public transport plays a critical role in reducing the amount of through traffic on Yarra's roads, particularly in radial travel to the Melbourne CBD. Improved public transport linkages between the eastern, north eastern and western suburbs could help to reduce some trips that are presently more convenient by car.

3.6 City of Stonnington (West)

3.6.1 Through traffic routes

Figure 12 and Appendix D shows the distribution of through traffic, incoming and outgoing traffic, and local traffic in Stonnington West.

The analysis indicates that the primary through traffic routes in Stonnington West are the Monash (City Link) corridor and Dandenong Road. Being the highest capacity radial road routes in the IMAP section of Stonnington, these roads attract a significant proportion of traffic moving between the south eastern outer suburbs and central city area. Toorak Road also carries a moderate amount of through traffic that appears to use it as an alternative to the tolled City Link (refer to Tables 7 and 8).

The analysis suggests that other east-west arterials in Stonnington West carry relatively little through traffic; most traffic on Malvern Road and High Street, for example, appears to be bound for local destinations.

Stonnington's north-south arterials attract moderate amounts of through traffic. This is largely due to only a small section of Stonnington falling within the IMAP area, which means that even short north-south journeys may pass through Stonnington West from one side to the other. The routes that provide connections across the Yarra River and City Link corridor (i.e. Chapel Street) tend to carry higher volumes of traffic. Most traffic on other arterial and local routes appears to have local destinations within Stonnington West.

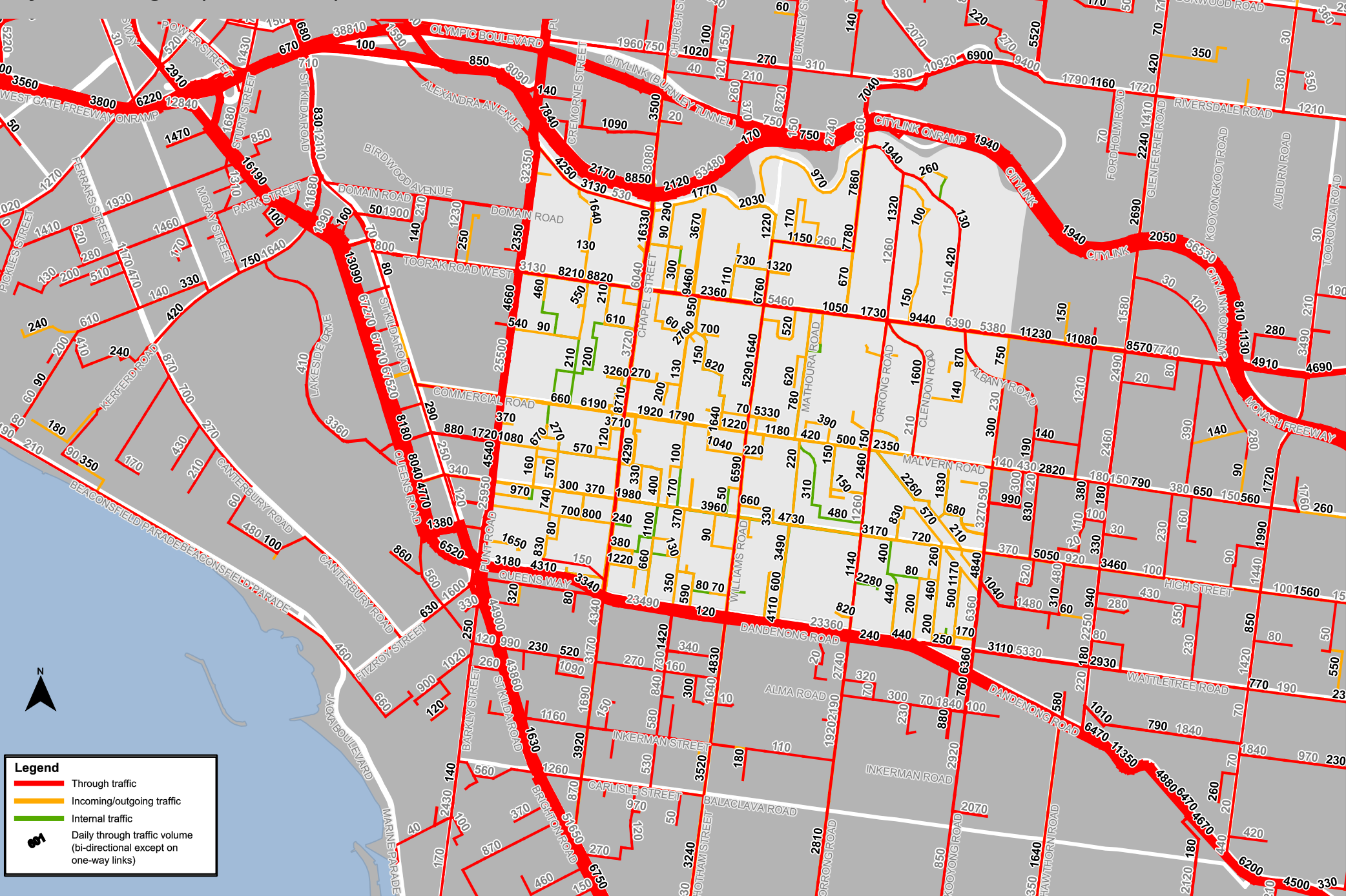
Table 7 : Traffic Volumes (two way) on Stonnington West roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Toorak Road	Punt Rd – Williams Rd	3,130	7,150 – 11,990	460 – 3,980
		Williams Rd – Kooyong Rd	5,240 – 6,390	8,740 – 11,600	1,050 – 1,730
Stonnington	Chapel Street	Alexandra Ave – Toorak Rd	4,670	17,550 – 18,560	60 – 2,320
		Malvern/ Commercial Rd – High St	3,720	6,410 – 9,800	4,240 – 5,350
		High St – Dandenong Rd		10,250 – 13,770	3,440 – 3,770
VicRoads (Dandenong Rd – Toorak Rd) Stonnington (Toorak Rd – St Georges Rd)	Orrong Road	Dandenong Rd – St Georges Rd	1,260	1,660 – 3,290	260 – 2,620
VicRoads	Williams Road	Dandenong Rd – Alexandra Av	260	4,840 – 6,180	1,690 – 2,530
VicRoads	High Street	Punt Rd – Kooyong Rd	0	750 – 4,480	300 – 5,850
Stonnington	Kooyong Road	Malvern Rd – High St	590 – 3,270	1,920 – 5,200	300
		High St – Dandenong Rd	2,940 – 6,360	4,840 - ,6360	170 - 420
Stonnington	Chatsworth Road	High St – Malvern Rd	0	220	350
Stonnington	Chomley Street	Dandenong Rd – High St	0	220	2,380 – 4,360
Stonnington	Clendon Street	Malvern Rd – Toorak Rd	0	780 - 920	2,270
Stonnington	Bruce Street		260	5,540	1,150
Stonnington	Grange Road	Toorak Rd – Alexandra Av	2040	1,860 – 7,630	230 – 1,130
Stonnington	Surrey Road	Malvern Rd – Cromwell Rd	0	2,200 – 2,760	190
Stonnington	Cromwell Road	Surrey Rd – Toorak Rd	0	3,700	950
Stonnington	St George's Road	Grange Rd – Toorak Rd	1,150 – 2,410	420 – 1,940	130

Table 8 : Percentage of traffic type on Stonnington West roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Toorak Road	Punt Rd – Williams Rd	16 - 29%	63 - 67%	4 - 21%
		Williams Rd – Kooyong Rd	32 - 35%	58 - 59%	7 - 9%
Stonnington	Chapel Street	Alexandra Ave – Toorak Rd	18 - 21%	73 - 79%	0 - 9%
		Malvern/ Commercial Rd – High St	20 - 26%	45 - 52%	28 - 30%
		High St – Dandenong Rd	17 - 21%	59 - 65%	18 - 20%
VicRoads (Dandenong Rd – Toorak Rd) Stonnington (Toorak Rd – St Georges Rd)	Orrong Road	Dandenong Rd – St Georges Rd	18 - 40%	46 - 52%	8 – 36%
VicRoads	Williams Road	Dandenong Rd – Alexandra Av	3 – 4%	69 - 71%	25 – 31%
VicRoads	High Street	Punt Rd – Kooyong Rd	0%	47 - 71%	29 - 53%
Stonnington	Kooyong Road	Malvern Rd – High St	21 - 37%	59 - 68%	3 - 11%
		High St – Dandenong Rd	37 - 48%	48 - 61%	2 - 3%
Stonnington	Chatsworth Road	High St – Malvern Rd	0%	39%	61%
Stonnington	Chomley Street	Dandenong Rd – High St	0%	5 - 85%	15 - 95%
Stonnington	Clendon Street	Malvern Rd – Toorak Rd	0%	4 - 5%	95 - 96%
Stonnington	Bruce Street		4%	80%	16%
Stonnington	Grange Road	Toorak Rd – Alexandra Av	19 - 49%	45 - 71%	6 - 10%
Stonnington	Surrey Road	Malvern Rd – Cromwell Rd	0%	92 - 94%	6 - 8%
Stonnington	Cromwell Road	Surrey Rd – Toorak Rd	0%	80%	20%
Stonnington	St George's Road	Grange Rd – Toorak Rd	54 - 68%	25 - 43%	3 - 8%

City of Stonnington (West Section) - Traffic Distribution



3.6.2 Origins of through traffic

Figures 13 and 14 show the modelled origins of through traffic and public transport trips respectively passing through Stonnington West. Because municipalities with larger populations will generally produce larger trip totals, figures 15 and 16 show the same information expressed as the number of trips per capita originating from each local government area.

The majority of through traffic originates from the neighbouring municipalities (Melbourne, Port Phillip Monash, and Yarra in that order). This is due to simple proximity effects; traffic originating from nearby municipalities is much more likely to have to travel through Stonnington West than that from more distant areas especially as there are two major east-west road corridors that travel through Stonnington West.

There are also over 17,000 vehicles per day travelling through Stonnington West from the part of Stonnington not in IMAP. This is on a par with the number of vehicles originating in Boorondara and Glen Eira. Apart from the focus on the Melbourne CBD and adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the metropolitan area, including the western suburbs.

The public transport patterns are distinctly different, with a much stronger focus on the Melbourne CBD, and eastern suburbs (i.e. Stonnington – 15,800ppd, Monash – 18,400ppd) and very little movement to the western suburbs. This is due to the large number of public transport corridors travelling through Stonnington West.

3.6.3 Access to rail stations

Table 9 shows the proportional Estimated Weekday Entries by Access Mode (2011-12). There are 7 train stations in Stonnington West which have varying levels of access by different modes. Over 17% of people access Heyington Station by car. Other stations which are closer to the city with either none or limited parking have very high pedestrian and public transport usage to access the station. Prahran has the highest walking percentage at 90.8% and over 17% of Windsor station users access the station by tram or bus.

Table 9– Access to rail stations in Stonnington West by mode

Proportional Estimated Weekday Entries by Access Mode FY2011-12 (%)							
	Walked all the way	Car	Cycled	Other	Tram	Bus	Train
Hawkesburn	84.8%	12.7%	1.3%	0.0%	1.3%	0.0%	0.0%
Prahran	90.8%	0.9%	0.0%	0.0%	5.5%	0.9%	1.8%
Windsor	78.5%	1.7%	0.8%	0.0%	15.7%	1.7%	1.7%
Heyington	74.0%	17.8%	0.0%	0.0%	0.0%	0.0%	8.2%
Toorak	86.2%	6.9%	0.0%	0.0%	4.6%	1.1%	1.1%
Armadale	77.3%	11.3%	0.0%	1.0%	10.3%	0.0%	0.0%
South Yarra	50.0%	3.8%	0.8%	0.0%	10.4%	0.0%	35.0%

Figure 13: Stonnington (West) through traffic origins

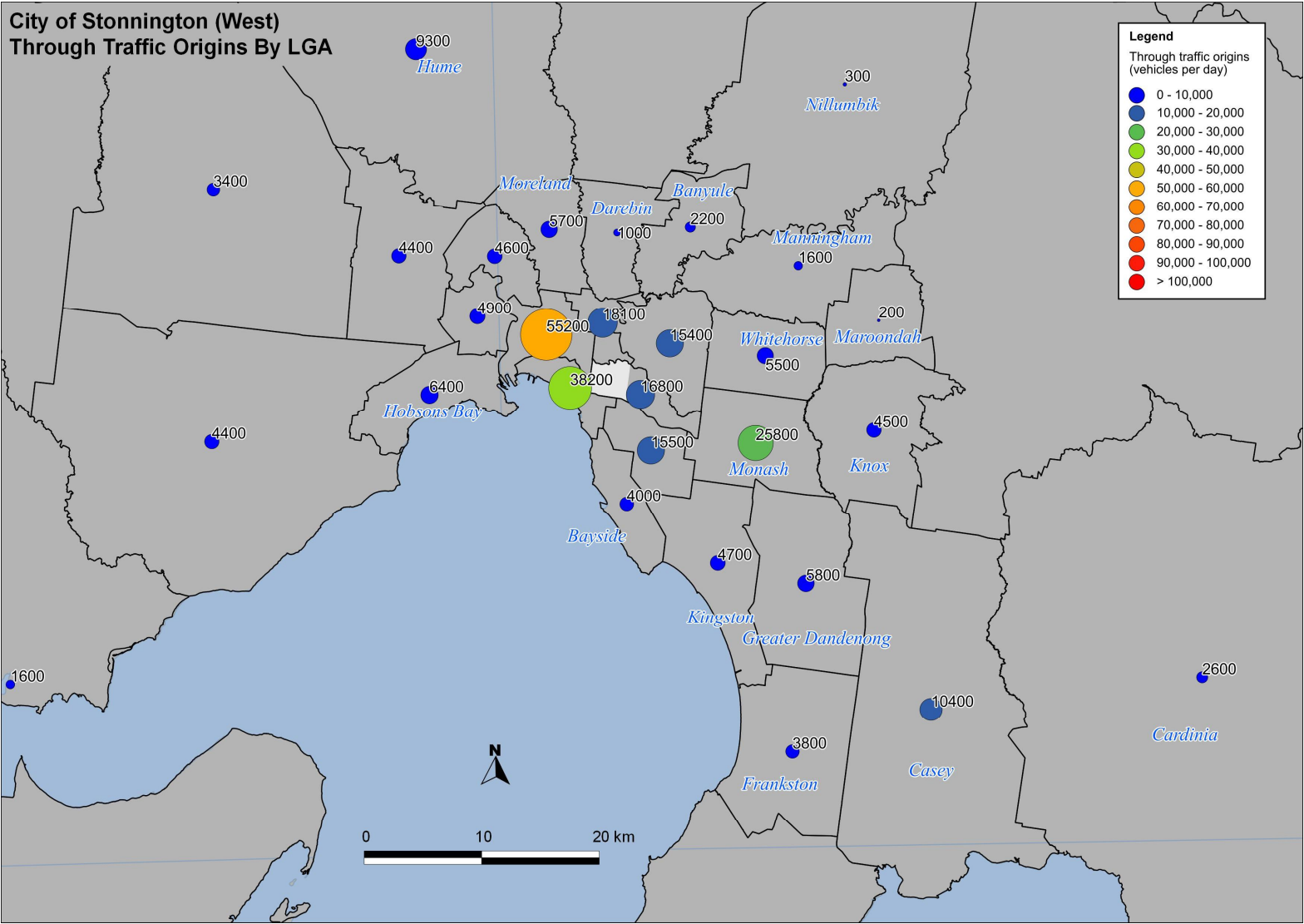


Figure 14: Stonnington (West) through public transport origins

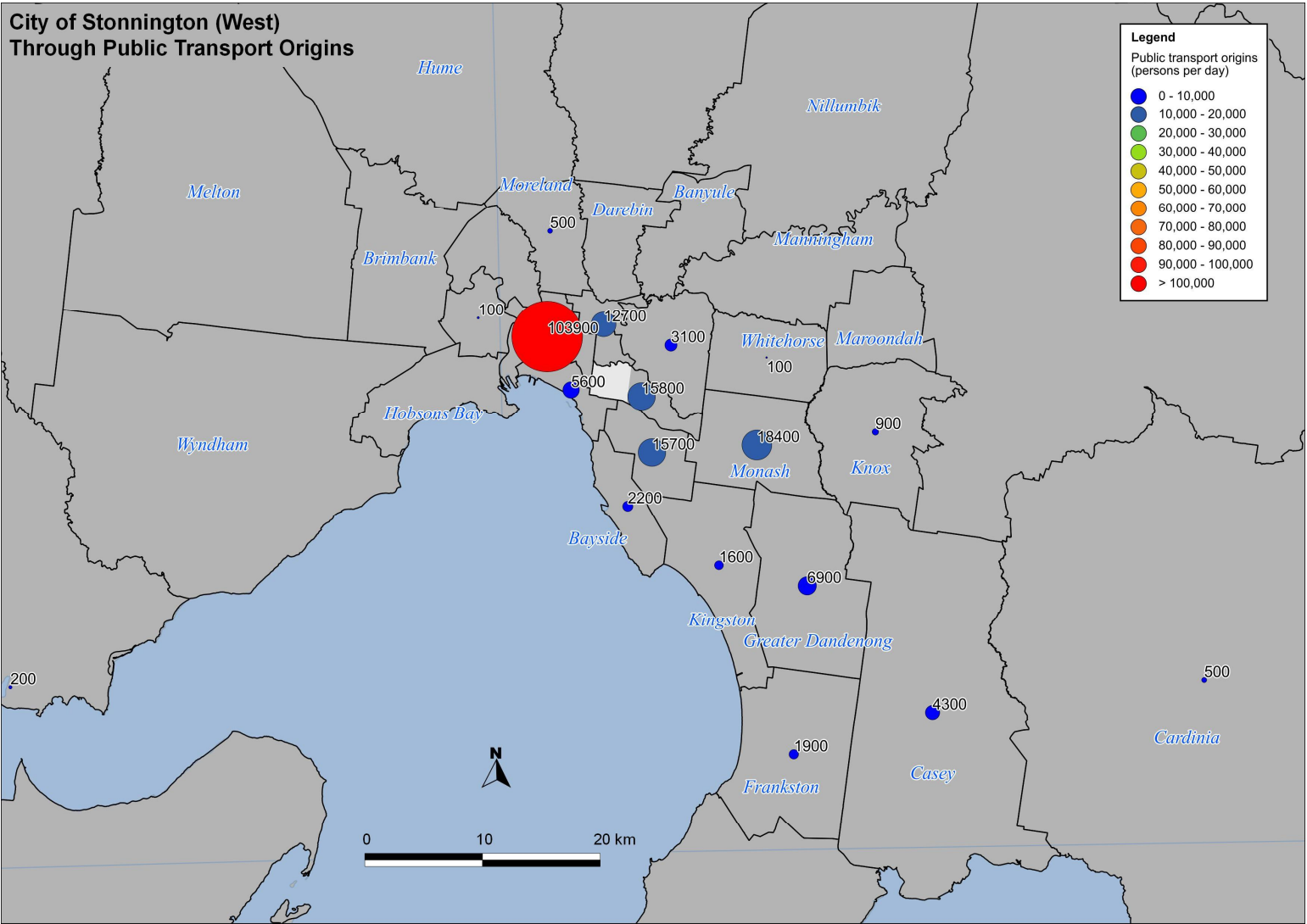


Figure 15: Stonnington (West) through traffic volumes per capita by origin LGA

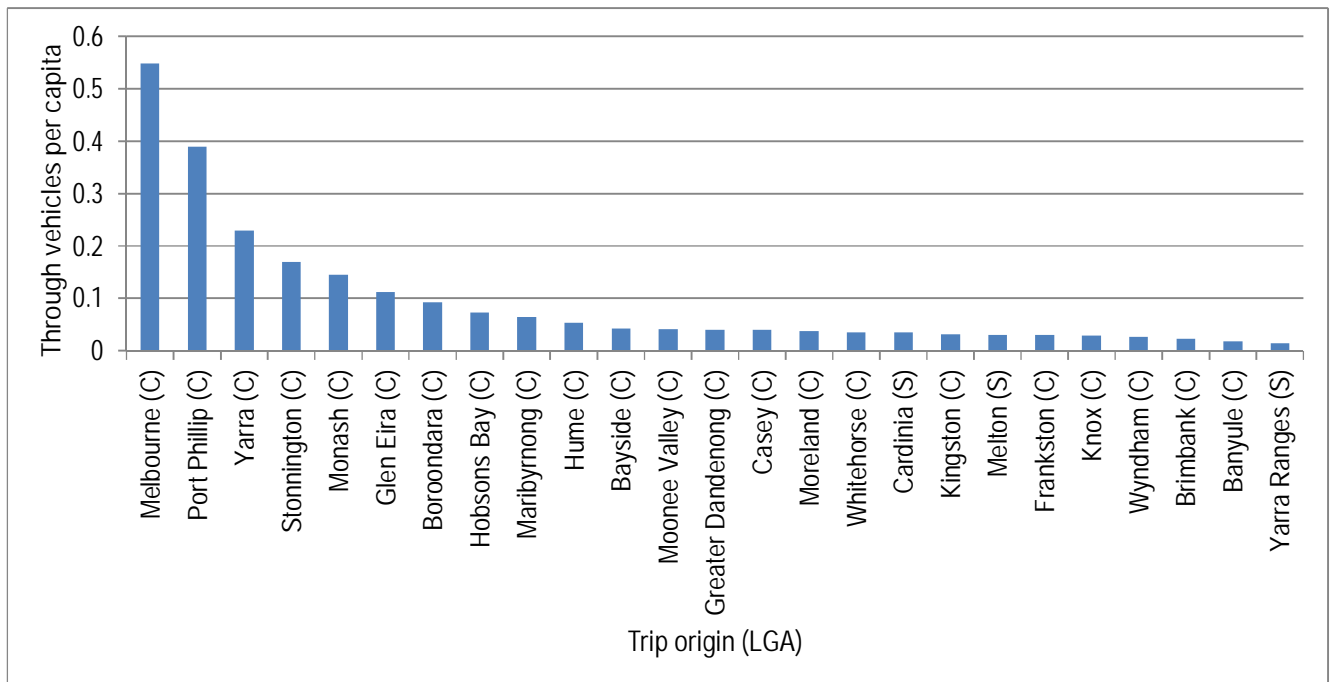
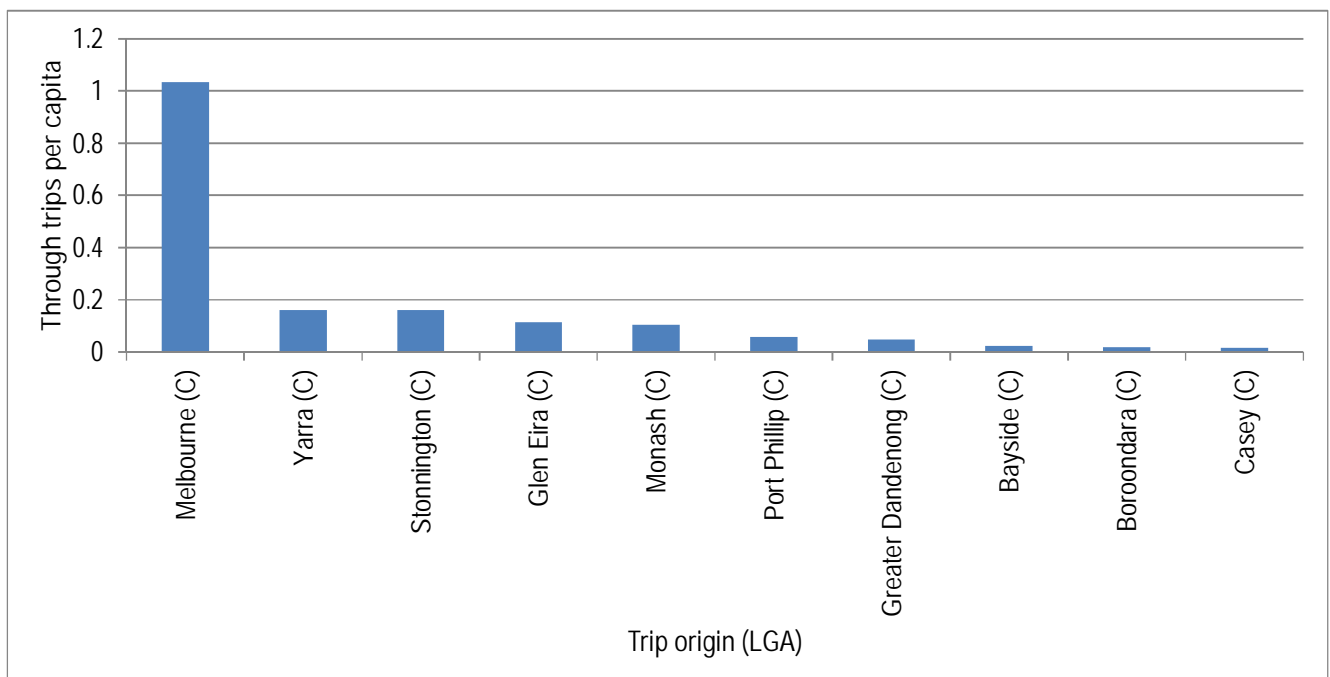


Figure 16: Stonnington (West) through public transport trips per capita by origin LGA



3.6.4 Conclusions from the analysis

The following conclusions are drawn from the Stonnington West analysis:

- Most through traffic in Stonnington West uses the Monash (City Link) corridor and Dandenong Road and, to a lesser extent, Toorak Road, Chapel Street and Kooyong Road on the eastern boundary.
- Most traffic using local streets and other arterial roads in Stonnington West has a local destination in this part of Stonnington. In other words, what may be perceived as "through traffic" in a local precinct may in fact be largely due to residents or visitors and this includes those from the part of Stonnington not within the IMAP boundary.
- Most through traffic originates from neighbouring municipalities and from the part of Stonnington not within the IMAP boundary.
- Public transport carries a significant amount of through movement in Stonnington West, particularly in radial travel to the Melbourne CBD. If public transport was to play a greater role in reducing Stonnington's through traffic, it appears that improved rail linkages to the western and northern suburbs, and better cross-town public transport options could help to reduce trips that are presently quicker or more convenient to undertake by car.

3.7 City of Port Phillip

3.7.1 Through traffic routes

Figure 17 and Appendix E shows the distribution of through traffic, incoming and outgoing traffic, and local traffic in Port Phillip.

The analysis indicates that the primary through traffic routes in Port Phillip is Brighton Road / St Kilda Road. Being the highest capacity radial road routes in Port Phillip, this road attracts a significant proportion of traffic moving between the Bayside suburbs, south eastern outer suburbs and central city area.

The only other roads in Port Phillip that appear to carry through traffic are to the east of the municipality. These include Hotham Street (up to 3,680vpd), Chapel Street (3,460vpd) and St Kilda St (refer to Tables 10 and 11).

The analysis suggests that other roads in Port Phillip, for example Beaconsfield Parade and Canterbury Road appears to be bound for local destinations.

Table 10 : Traffic Volumes (two way) on selected Port Phillip roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	St Kilda Road	Queensway – Balaclava Rd	31,930	13,260 – 13,890	2,210 – 2,910
VicRoads	Brighton Road	Balaclava Rd – Glen Huntly Rd	68,090 – 71,560	4,3500	2,910
Port Phillip	Chapel Street	Dandenong Rd – Carlise Rd	3,460	1,620	800
VicRoad	Hotham Street	Dandenong Rd – Brighton Rd	2,920 – 3,680	2,150 – 4,150	180 - 670
VicRoads	Glen Eira Road	Brighton Rd – Hotham St	3,820	7,180	650
VicRoads	St Kilda St	Glen Huntley Rd – Esplanade	2,720	1,640	1,760

Table 11 : Type of Traffic (%) on selected Port Phillip roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	St Kilda Road	Queensway – Balaclava Rd	66 - 67%	28 - 29%	5 - 6%
VicRoads	Brighton Road	Balaclava Rd – Glen Huntly Rd	59 - 61%	37 - 38%	2 - 3%
Port Phillip	Chapel Street	Dandenong Rd – Carlise Rd	59%	28%	14%
VicRoad	Hotham Street	Dandenong Rd – Brighton Rd	43 - 56%	41 - 49%	3 - 8%
VicRoads	Glen Eira Road	Brighton Rd – Hotham St	33%	62%	6%
VicRoads	St Kilda St	Glen Huntley Rd – Esplanade	44%	27%	29%

City of Port Phillip - Traffic Distribution

This map illustrates the traffic distribution across the City of Port Phillip, showing the volume of traffic on various roads. The roads are color-coded based on their traffic type:

- Through traffic:** Red lines
- Incoming/outgoing traffic:** Orange lines
- Internal traffic:** Green lines

The map also displays the daily through traffic volume (bi-directional except on one-way links) for each road segment. The volume is indicated by numbers along the roads. The map includes a scale bar (0 to 4 km) and a north arrow.

Legend

- Through traffic
- Incoming/outgoing traffic
- Internal traffic
- Daily through traffic volume (bi-directional except on one-way links)



3.7.2 Origins of through traffic

Figure 18 and 19 show the modelled origins of through traffic and public transport trips respectively passing through Port Phillip. Figure 20 and figure 21 show the same information expressed as the number of trips per capita originating from each local government area.

Most through traffic originates from the neighbouring municipalities, notably Melbourne, Stonnington (24,300vpd), Glen Eira and Kingston (13,100vpd). This is likely to be caused by nature of the key road and public transport corridors travelling through Port Phillip.

Apart from the higher contributions from adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the metropolitan area. The public transport patterns show a similar pattern, with slightly higher contributions from municipalities that have high access to public transport such as the inner south eastern and Bayside suburbs including Stonnington (24,900ppd) and Glen Eira (19,600ppd).

3.7.3 Access to rail stations

Table 12 shows the proportional Estimated Weekday Entries by Access Mode (2011-12). There are just 2 train stations in Port Phillip. Both Ripponlea and Balaclava have high walking catchments with 86% and 78% respectively. Balaclava also has 10% of weekday entry arrivals by tram. As with the majority of stations, cycle access to stations is very low at between 1 – 1.5%.

Table 12– Access to rail stations in Port Phillip by mode

Station	Proportional Estimated Weekday Entries by Access Mode FY2011-12 (%)						
	Bus	Car	Cycled	Other	Train	Tram	Walked all the way
Balaclava	0.0%	9.7%	1.5%	0.5%	0.0%	10.2%	78.1%
Ripponlea	1.1%	11.7%	1.1%	0.0%	0.0%	0.0%	86.2%

Figure 18: Port Phillip through traffic origins

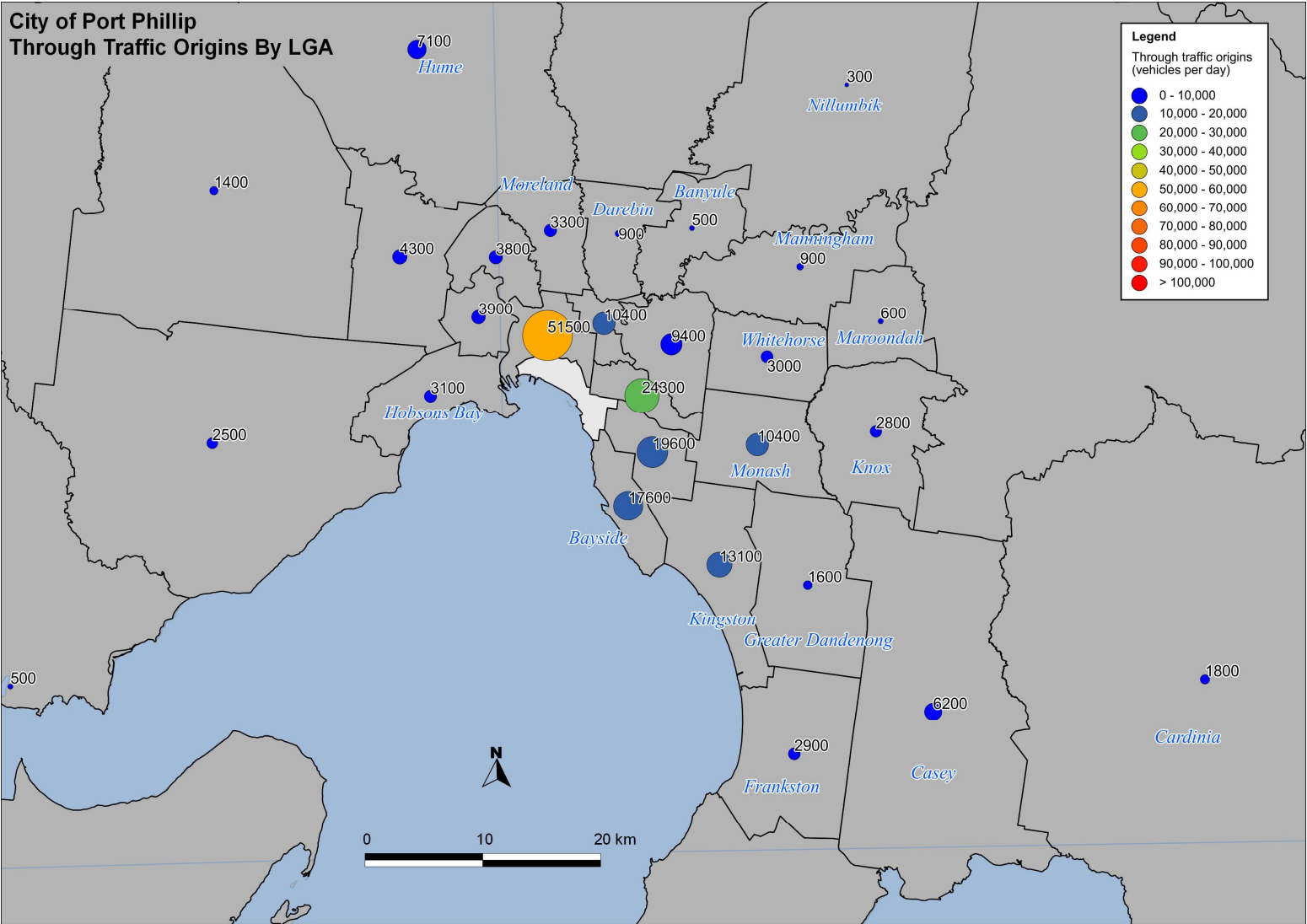


Figure 19: Port Phillip through public transport origins

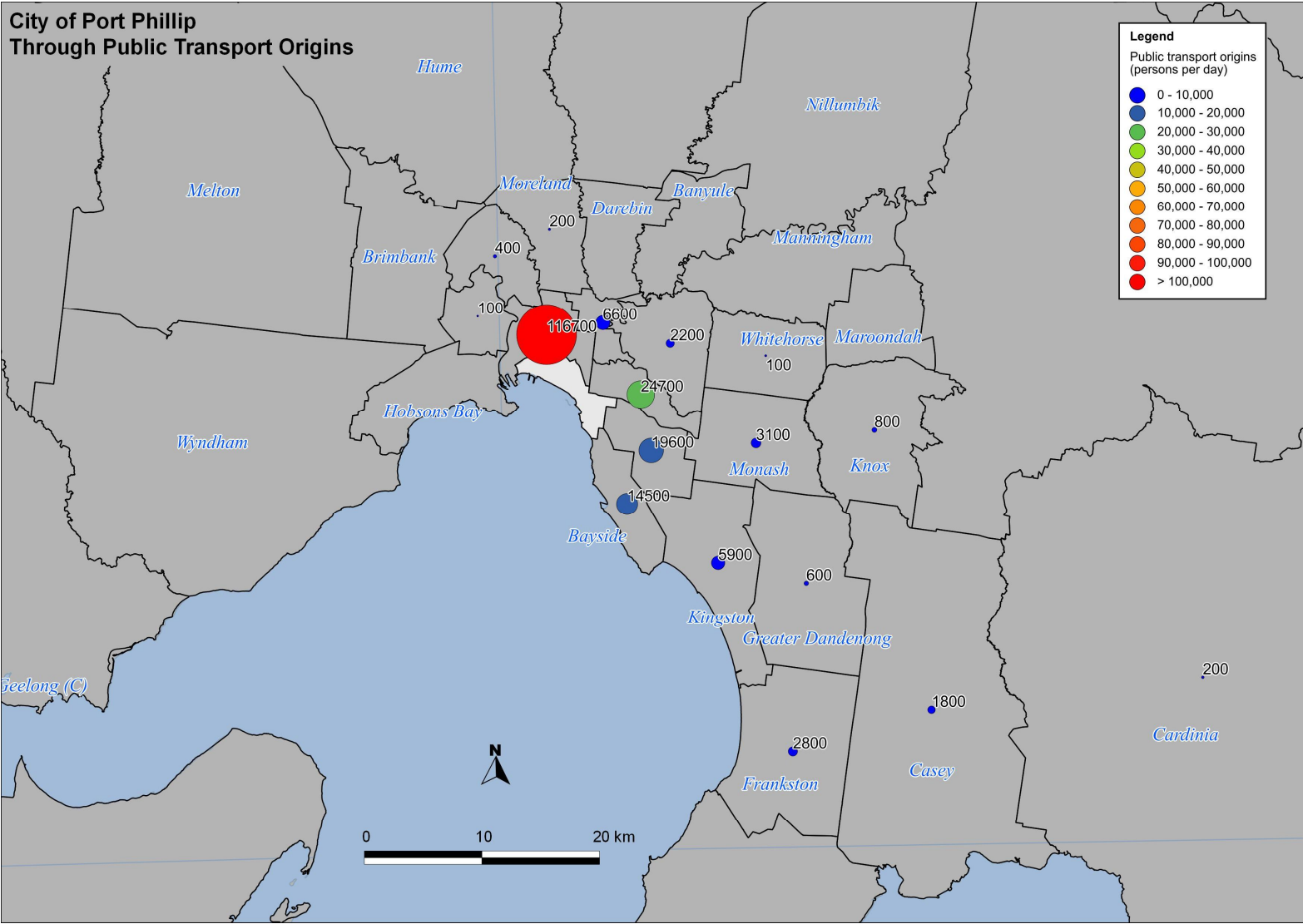


Figure 20: Port Phillip through traffic volumes per capita by origin LGA

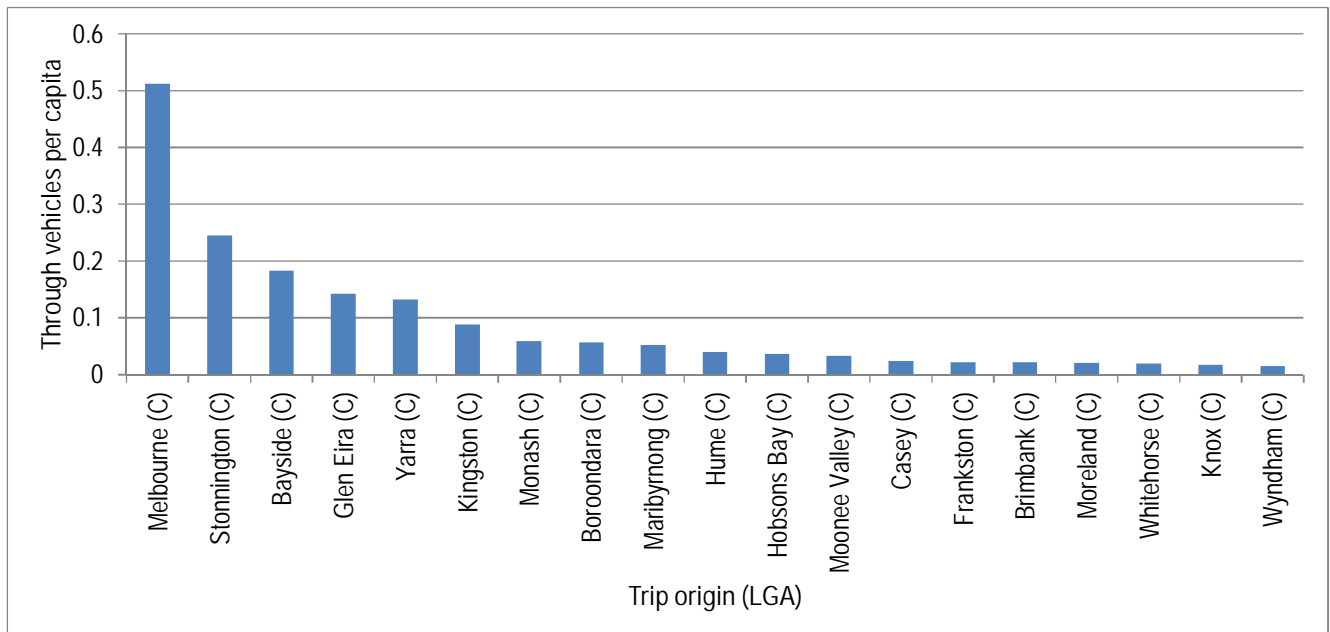
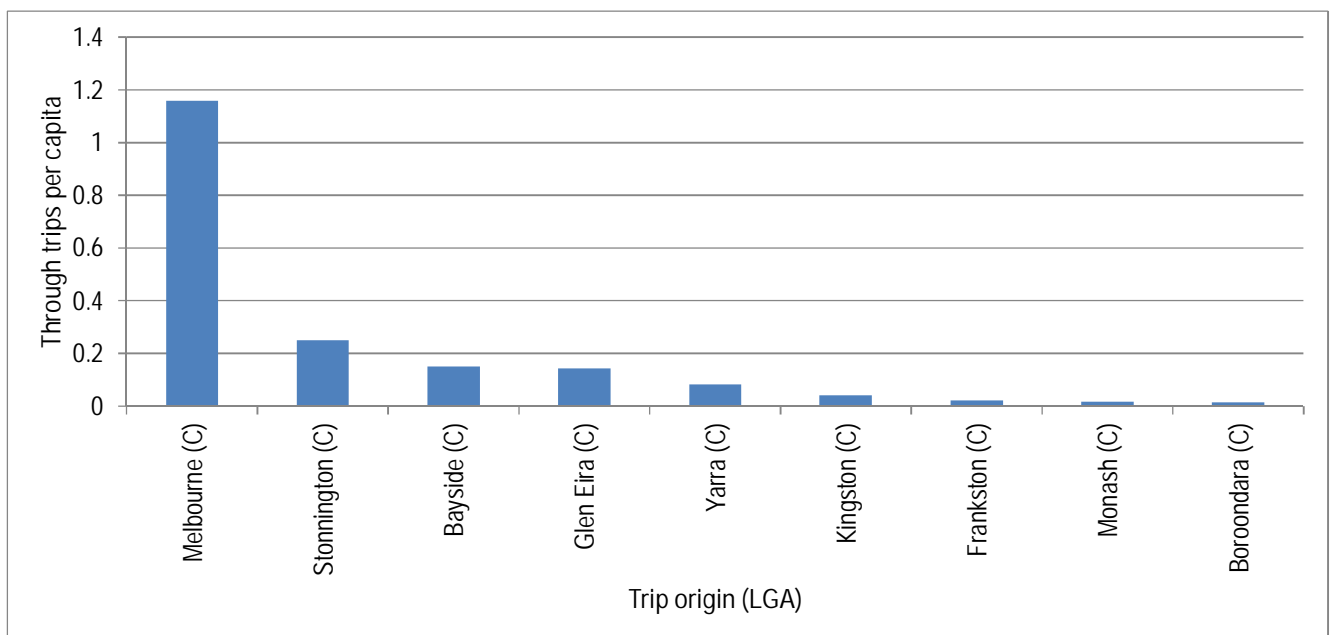


Figure 21: Port Phillip through public transport trips per capita by origin LGA



3.7.4 Conclusions

The following conclusions are drawn from the Port Phillip analysis:

- Most through traffic in Port Phillip uses the Brighton Road / St Kilda Road corridor and, to a lesser extent, Chapel Street and Glen Eira Road to the east of the municipality.
- Most traffic using local streets and other arterial roads in Port Phillip has a local destination in Port Phillip including Beaconsfield Parade. In other words, what may be perceived as "through traffic" in a local precinct may in fact be largely due to residents or visitors to Port Phillip especially as it is a key tourism destination.
- Most through traffic originates from neighbouring eastern and Bayside municipalities.
- Public transport carries a significant amount of through movement in Port Phillip, particularly in radial travel to the Melbourne CBD on rail and trams. If public transport was to play a greater role in reducing Port Phillips through traffic, it appears that additional public transport services to the CBD and better cross-town public transport options could help to reduce trips that are presently quicker or more convenient to undertake by car.

3.8 City of Maribyrnong

3.8.1 Through traffic routes

Figure 22 and Appendix F show the distribution of through traffic, incoming and outgoing traffic, and local traffic in the City of Maribyrnong. The analysis indicates that the primary through traffic routes in Maribyrnong are the Westgate Freeway corridor and Ballarat Road being the highest capacity radial road routes in Maribyrnong. Geelong Road (2,210vpd) and Raleigh Road (refer to Tables 13 and 14) also carry a moderate amount of through traffic.

Maribyrnong's north-south arterials attract small amounts of through traffic (e.g. Paramount Rd – 470vpd). This is largely due to a large proportion of residents travelling to the CBD for work (east–west) rather than north-south. Most traffic on other local routes appears to have local destinations within Maribyrnong. Particular areas of note include Footscray and Yarraville where incoming / outgoing and internal traffic is high in relation to through traffic movements.

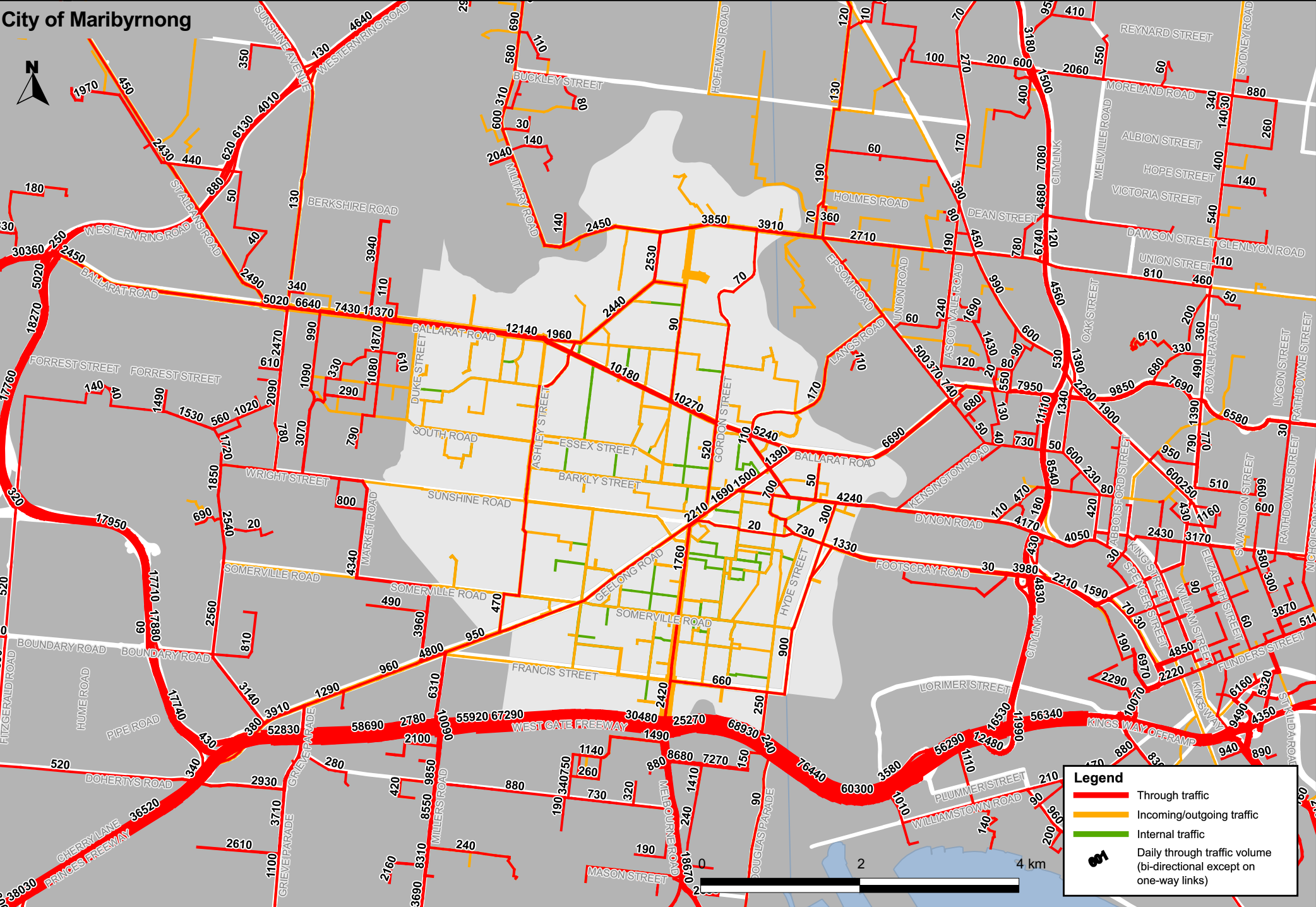
Table 13 : Traffic Volumes (two way) on selected Maribyrnong roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Ballarat Road	Ashley St – Duke St	12,140	28,470 – 32,020	1,150 – 3,240
		Churchill Av – Gordon St	10,180	14,050 – 15,100	2,130 – 3,320
		Geelong Rd – Farnsworth Av	5,240	7,860	-
VicRoads	Geelong Road	Gordon Av – Somerville Rd	2,210	7,650	2,470 – 4,170
VicRoads	Dynon Road	Whitehall St – Moore St	4,050	4,510 – 6,190	460
VicRoads	Raleigh Road	Van Ness Av – Wests Rd	3,910	6,890	80
VicRoads	Hampstead Road	Mitchell St – Williamson Rd	2,440	11,210 - 11,650	1,830
Council	Whitehall Street	Footscray Rd - Francis St	900	2,950	710

Table 14 : Traffic Volumes (two way) on selected Maribrynong roads

Responsibility	Road	Location	Through Traffic	Incoming / Outgoing Traffic	Internal Traffic
VicRoads	Ballarat Road	Ashley St – Duke St	26 - 29%	68%	3 - 7%
		Churchill Av – Gordon St	36 - 39%	53%	8 - 12%
		Geelong Rd – Farnsworth Av	40%	60%	0%
VicRoads	Geelong Road	Gordon Av – Somerville Rd	16 - 18%	55 - 62%	20 - 30%
VicRoads	Dynon Road	Whitehall St – Moore St	38 - 45%	50 - 58%	4 - 5%
VicRoads	Raleigh Road	Van Ness Av – Wests Rd	36%	63%	1%
VicRoads	Hampstead Road	Mitchell St – Williamson Rd	15 - 16%	72 - 73%	11 - 12%
Council	Whitehall Street	Footscray Rd - Francis St	20%	65%	16%

City of Maribyrnong



3.8.2 Origins of through traffic

Figure 23 and 24 show the modelled origins of through traffic and public transport trips respectively passing through Maribyrnong. Because municipalities with larger populations will generally produce larger trip totals, figure 25 and figure 26 show the same information expressed as the number of trips per capita originating from each local government area.

The majority of through traffic originates from the neighbouring municipalities;

- Melbourne – 38,900vpd
- Wyndham – 28,000vpd
- Hobson's Bay - 32,500vpd

This is due to simple proximity effects; traffic originating from nearby municipalities is much more likely to have to travel through Maribyrnong than that from more distant areas or from the eastern suburbs.

Apart from the focus on the Melbourne CBD and adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the western suburbs. The public transport patterns are quite similar, with a much stronger focus on the Melbourne CBD and western rail corridors in particular Hobson's Bay (12,500ppd).

3.8.3 Access to rail stations

Table 15 shows the proportional Estimated Weekday Entries by Access Mode (2011-12). There are 6 train stations in Maribyrnong which have varying levels of access by different modes. Tottenham and West Footscray have access via car and walking with greater than 29% of people accessing the station by car. Other stations in more residential areas with smaller car parks have very high pedestrian usage to access the station. Middle Footscray has the highest walking percentage at 93.4% and over 87% of Seddon station users access the station by walking. Yarraville has the highest rate of cyclists at 2.7%.

Table 15– Access to rail stations in Maribyrnong by mode

Proportional Estimated Weekday Entries by Access Mode FY2011-12 (%)							
Station	Bus	Car	Cycled	Other	Train	Tram	Walked all the way
Footscray	17.6%	17.6%	1.4%	0.0%	14.8%	4.6%	44.0%
Middle Footscray	2.5%	1.6%	0.0%	0.0%	2.5%	0.0%	93.4%
Seddon	1.1%	10.0%	1.1%	0.0%	0.0%	0.0%	87.8%
Tottenham	0.0%	33.0%	1.1%	0.0%	3.4%	0.0%	62.5%
West Footscray	2.4%	29.1%	0.8%	0.0%	0.0%	0.0%	67.7%
Yarraville	8.7%	18.1%	2.7%	0.0%	0.0%	0.0%	70.5%

Figure 23: Maribyrnong through traffic origins

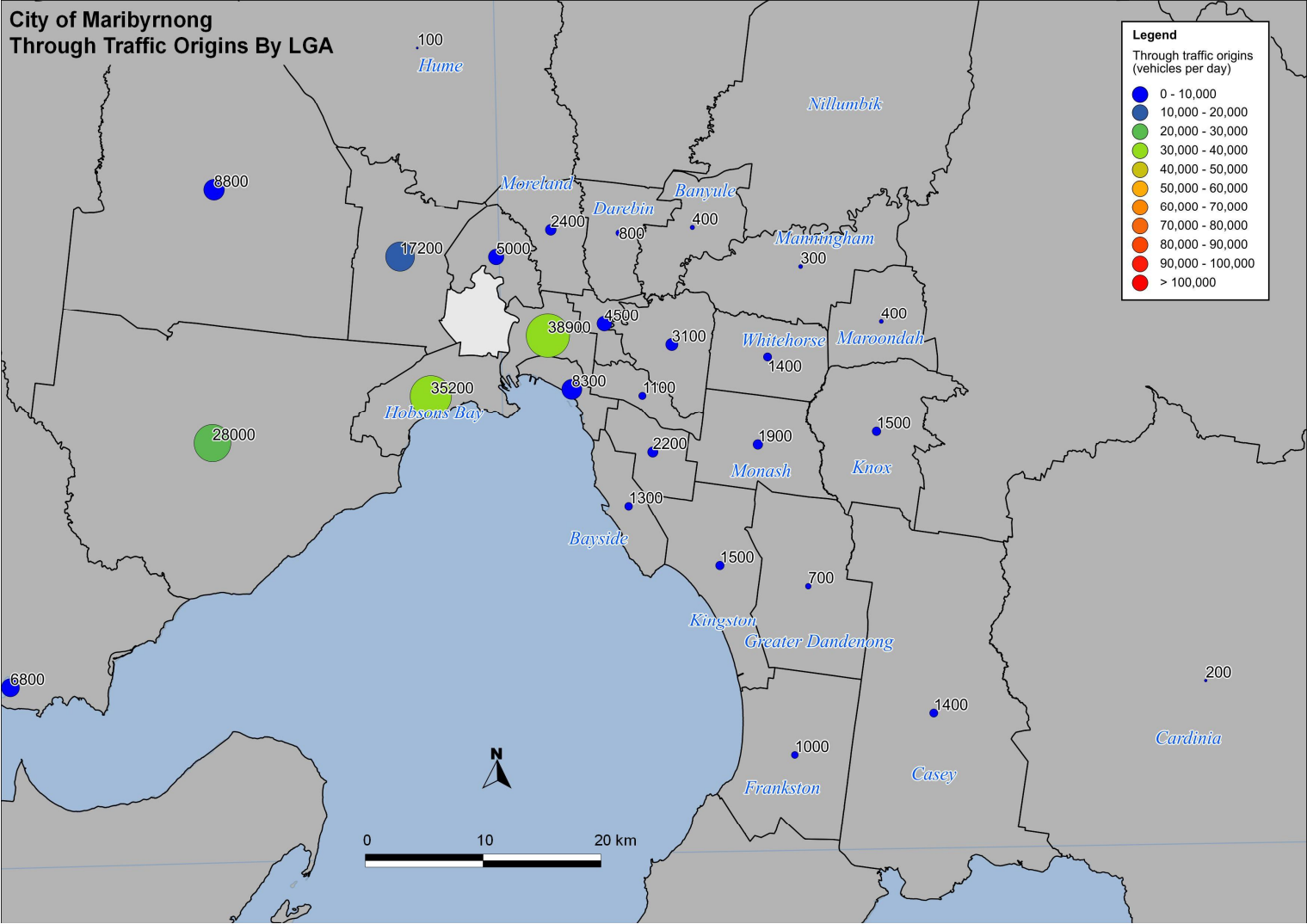


Figure 24: Maribyrnong through public transport origins

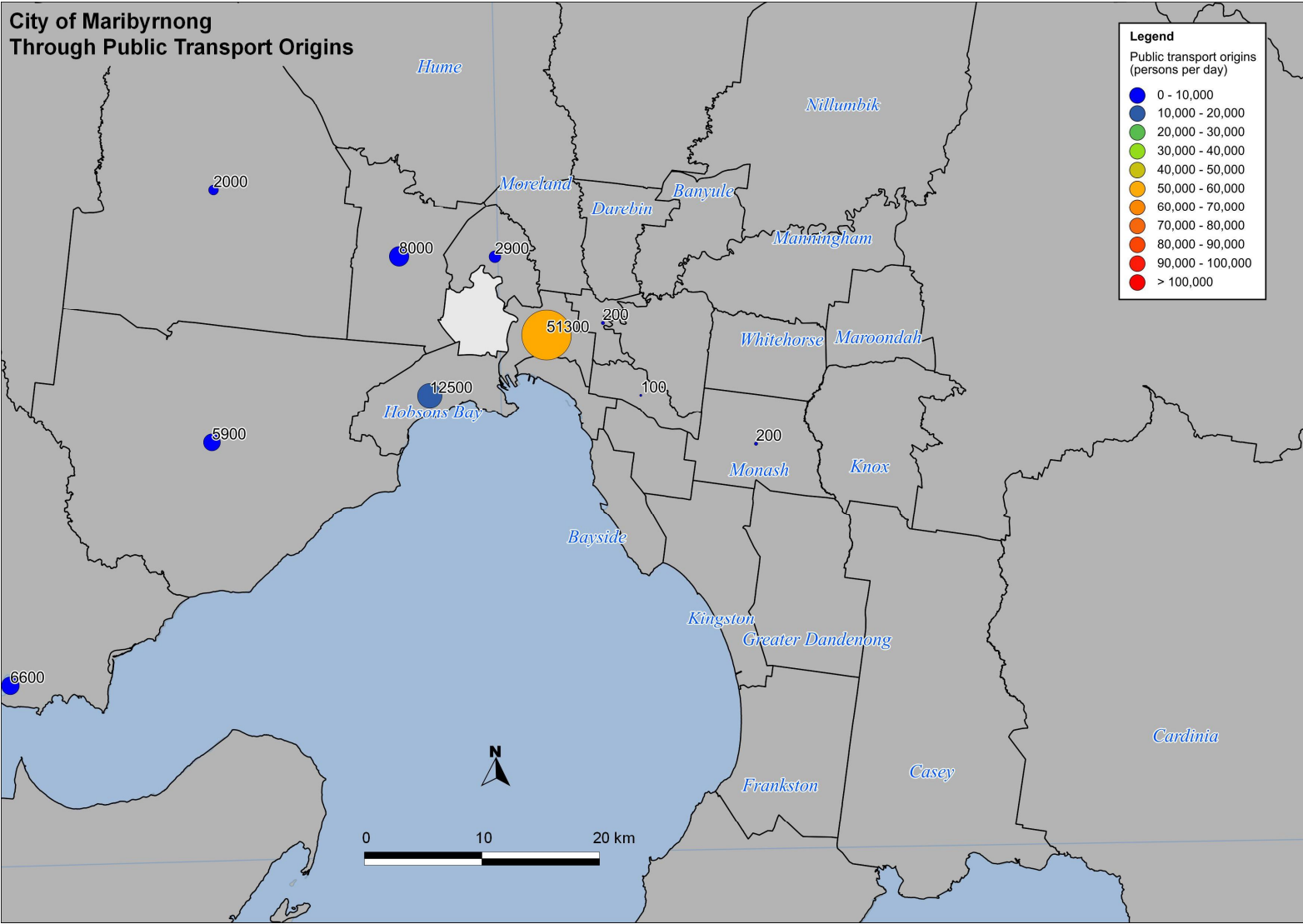


Figure 25: Maribyrnong through traffic volumes per capita by origin LGA

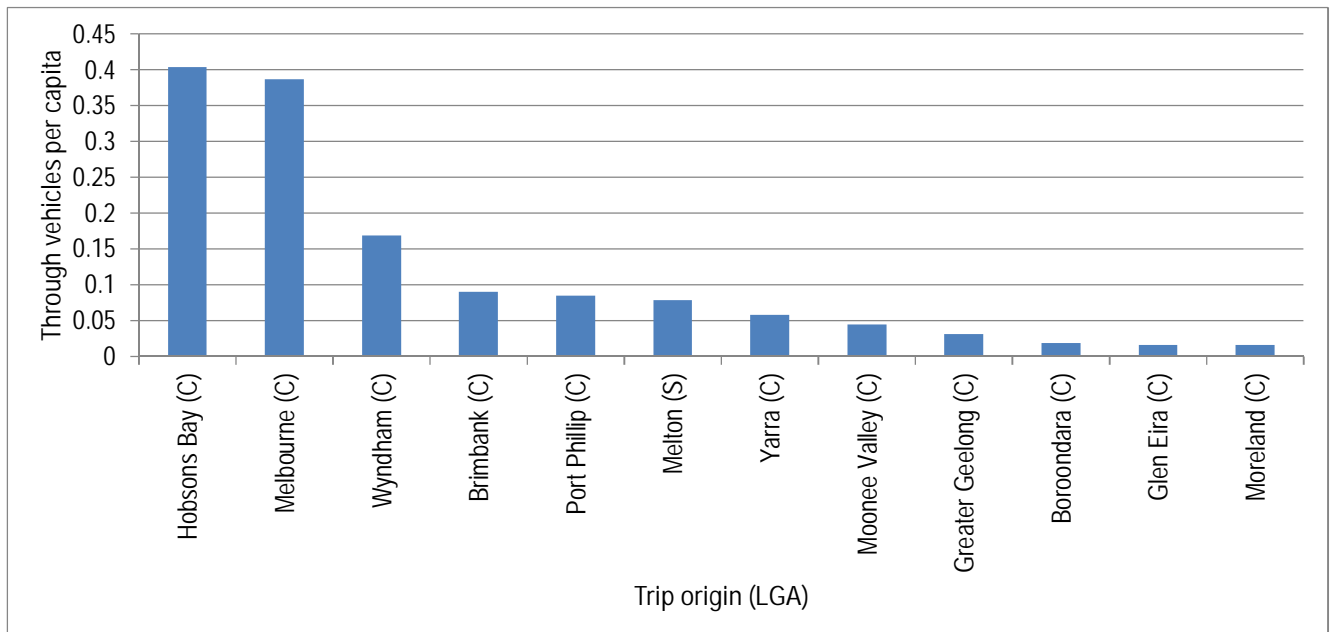
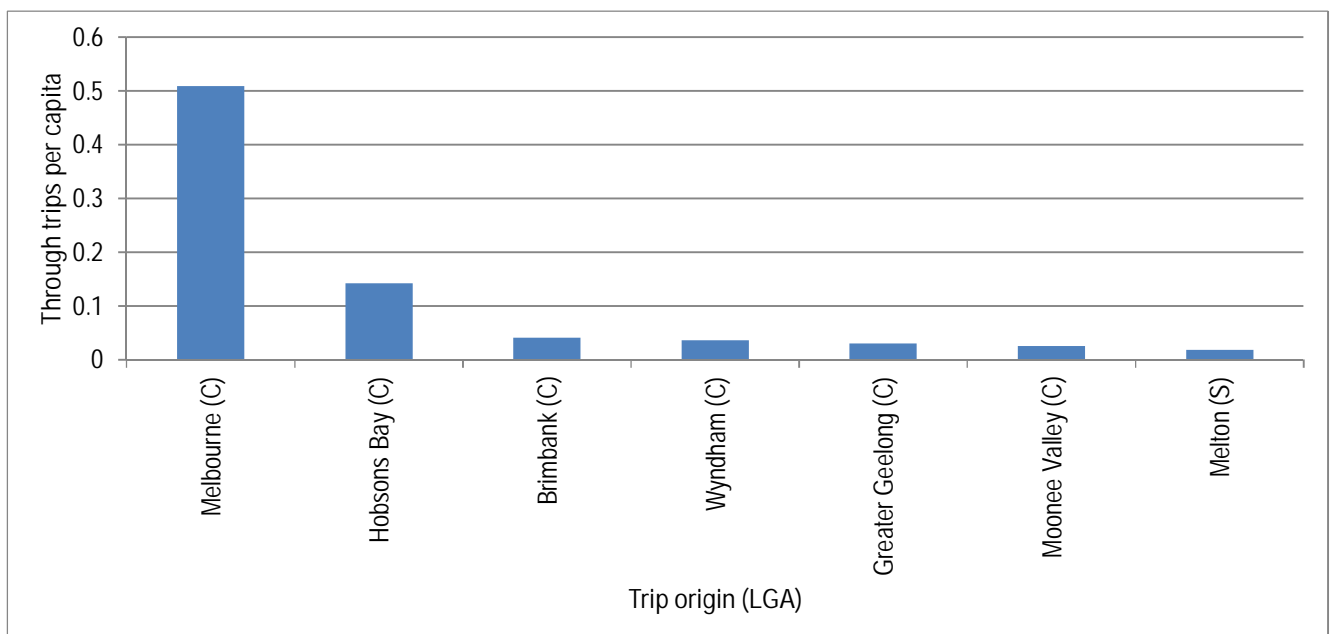


Figure 26: Maribyrnong through public transport trips per capita by origin LGA



3.8.4 Conclusions from the analysis

The following conclusions are drawn from the Maribyrnong analysis:

- Most through traffic in Maribyrnong uses the Westgate Freeway corridor and Ballarat Road.
- Dynon Road and Raleigh Road all do carry moderate through traffic levels of between 35 - 45% of all traffic using the road.
- Most traffic using local streets and other arterial roads in Maribyrnong has a local destination in Maribyrnong. In other words, what may be perceived as "through traffic" in a local precinct may in fact be largely due to residents or visitors to Maribyrnong.
- Most through traffic originates from the municipalities of Wyndham, Hobsons Bay and City of Melbourne.
- Public transport carries a smaller amount of through movement in Maribyrnong than other IMAP municipalities largely due to the nature of the rail network. If public transport was to play a greater role in reducing Maribyrnong through traffic, it appears that improved rail linkages to the western suburbs, and better cross-town public transport options could help to reduce trips that are presently quicker or more convenient to undertake by car.
- A number of train stations have a reasonably high percentage of users accessing the station by car due to their location away from key residential areas.

3.9 IMAP

3.9.1 Through traffic routes

Figure 27 and Appendix G show the distribution of through traffic, incoming and outgoing traffic, and local traffic in IMAP.

The analysis indicates that the primary through traffic routes in IMAP are the City Link corridors, Eastern Freeway (including Alexandra Parade / Cemetery Road/ Tullamarine Freeway and St Kilda Road. Being the highest capacity radial road routes in IMAP, these roads attract a significant proportion of traffic moving across the IMAP municipalities. Hoddle Street, Ballarat Road and Dandenong Road also carry a moderate amount of through traffic.

The analysis suggests that other arterials in the IMAP carry relatively little through traffic; most traffic on Geelong Road and Dynon Road, for example, appears to be bound for local destinations.

3.9.2 Truck routes

The Victorian Integrated Transport Model (VITM) is DTPLI's in-house strategic transport demand model. VITM is a multi-modal analytical tool which forecasts travel and can be used to look at alternate 'current' travel by private vehicles and public transport in response to various transport infrastructure and land use planning scenarios. Operating alongside the VITM, the Freight Movement Model (FMM) generates forecasts of freight vehicle movements throughout the metropolitan area.

Transport demand models are a systematic representation of the large and complex real-world transport system as it exists, and as it might be. Transport demand models provide an analytical framework to understand and assess the performance of the transport system under existing and future demands. VITM is used to test and assess transport policies and strategies, predict future demands on the transport network, and analyse the potential impacts of road, public transport and land-use planning projects.

Truck volumes were extracted from the Victorian Integrated Transport Model (VITM), as commercial vehicle trips were not recorded in the VISTA survey. The VITM volumes were obtained on a per-link basis, rather than as complete routes, so the distinction between through and local truck movements could not be made. Figure 28 shows the distribution of truck routes in and around IMAP as modelled in VITM. The modelling shows that the Monash (City Link) / Westgate Freeway corridors carries the overwhelming majority of trucks.

Secondary truck routes travelling through IMAP include;

- Greater than 2,000 vehicles – Alexandra Parade, Footscray Road, and St Kilda Road
- Greater than 1,000 vehicles – Hoddle Street, Ballarat Road, Geelong Road and Dandenong Road.

The modelling suggests that most other arterial roads carry only small numbers of trucks, many of which would be engaged in local deliveries. Detailed survey of truck movements are undertaken by some organisations but are very location specific and resource intensive to undertake.

Annual surveys of truck movements around the Port of Melbourne precinct have been undertaken since 2002, with a particular emphasis on measuring truck productivity at port cordon points. In late 2012, Port of Melbourne Corporation (PoMC) commissioned a Port Traffic Survey and Analysis Study¹¹. The objective was to give a clearer understanding of truck and traffic movements, in and around the port, over a typical day. The survey and subsequent analysis assesses truck movements:

- into and out of Webb Dock
- between Webb Dock and the Swanson-Dynon precinct

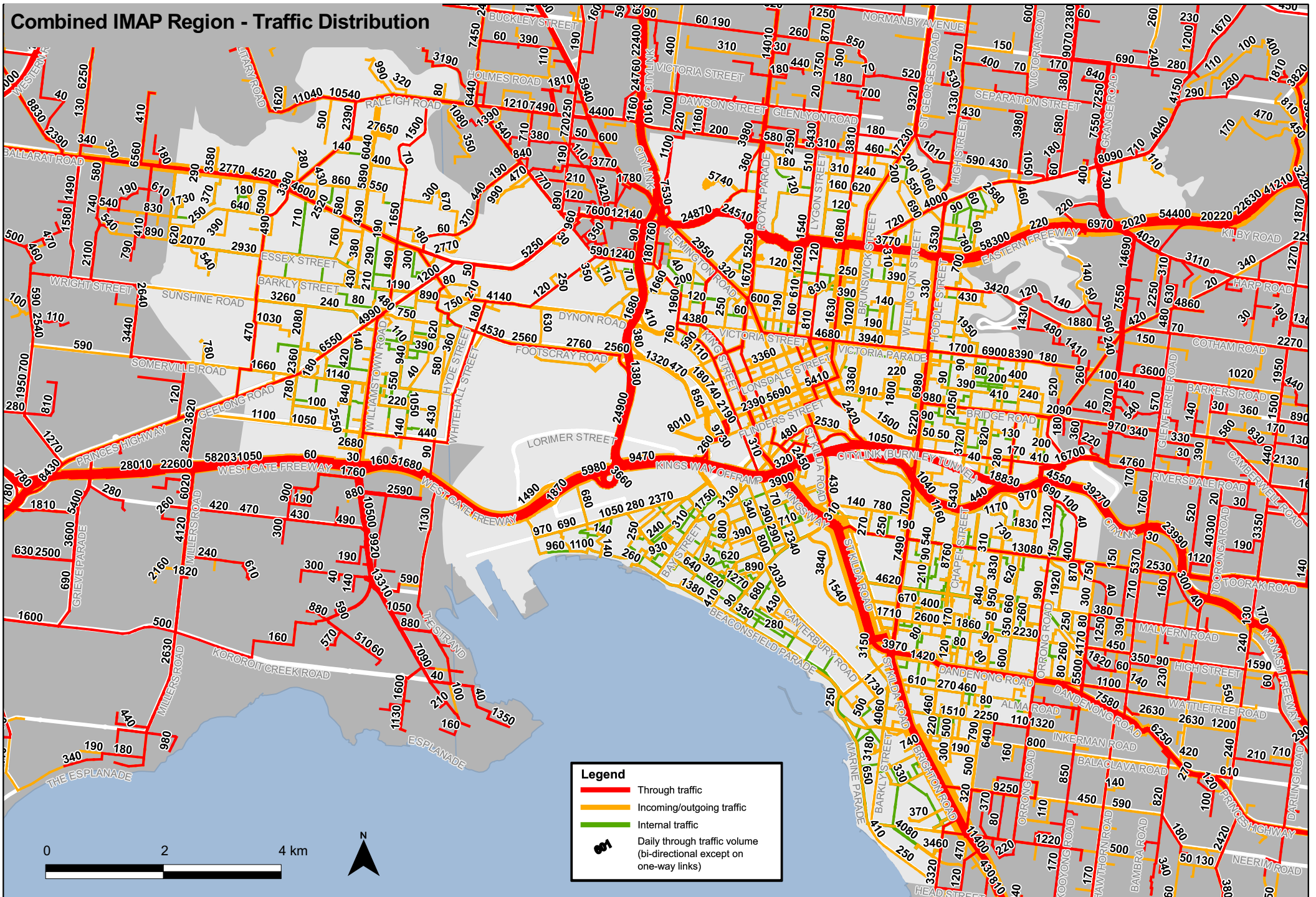
¹¹ <http://www.portofmelbourne.com/publications/traffic-surveys>

- between the Swanson-Dynon precinct and freight and transport-related businesses located to the west of the port.

The survey was conducted over a 24 hour period on a typical weekday in September 2012. The survey utilised specialist video cameras, suitable for day and night observations, which were set up at key locations across the survey cordon area to record trucks travelling in both directions. Truck data observed at survey points across the cordon were matched with data collected at other survey locations to build an understanding of truck trips by origin and destination.

This type of detailed origin-destination study is a very localised and gives a snapshot of what is happening on specific streets given a particular survey date and time. VITM is a systematic representation of the large and complex real-world transport system as it exists, and as it might be. The VITM volumes were obtained on a per-link basis, rather than as complete routes, so the distinction between through and local truck movements could not be made and compared with the PoMC study.

Combined IMAP Region - Traffic Distribution



VITM Daily Truck Volumes



3.9.3 Origins of through traffic

Figure 29 and figure 30 show the modelled origins of through traffic and public transport trips respectively passing through IMAF. Because municipalities with larger populations will generally produce larger trip totals, figure 31 and figure 32 show the same information expressed as the number of trips per capita originating from each local government area.

The highest levels of through traffic originate from the neighbouring and northern municipalities including

- Boroondara – 21,700vpd
- Hobsons Bay – 23,200vpd
- Moonee Valley – 15,700vpd
- Moreland – 15,600vpd

This is due to simple proximity effects; traffic originating from nearby municipalities is much more likely to have to travel through IMAF than that from more distant areas although there is a moderate level of through traffic from City of Monash.

Apart from the focus on the adjacent municipalities, the plots show a reasonably broad dispersal of traffic across the metropolitan area, including the western suburbs. The public transport patterns are fairly similar, with a strong focus on Moonee Valley (24,900ppd), Boroondara (25,100ppd) in addition to Glen Eira (22,100ppd).

Figure 29: IMAP through traffic origins

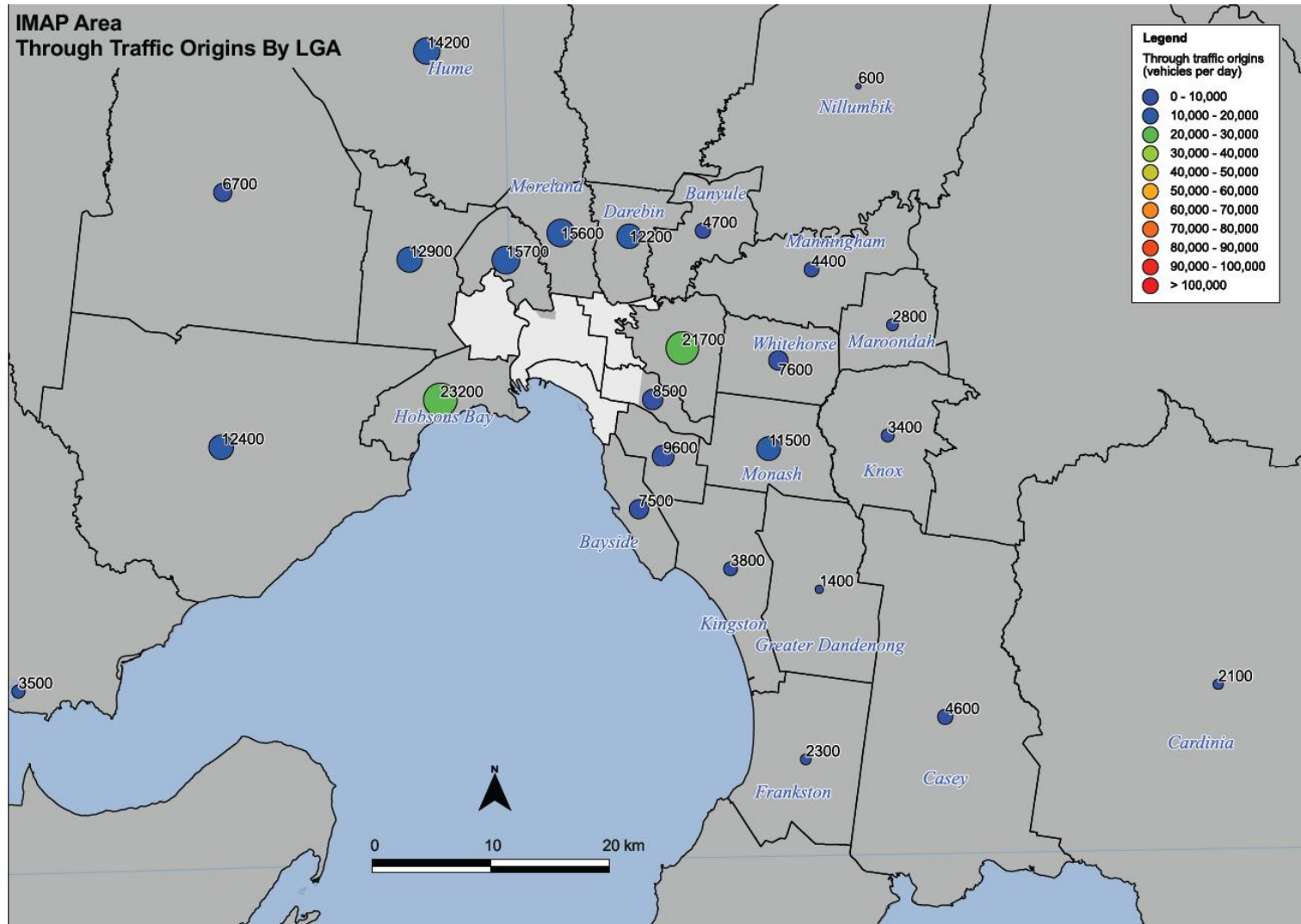


Figure 30: IMAP through public transport origins

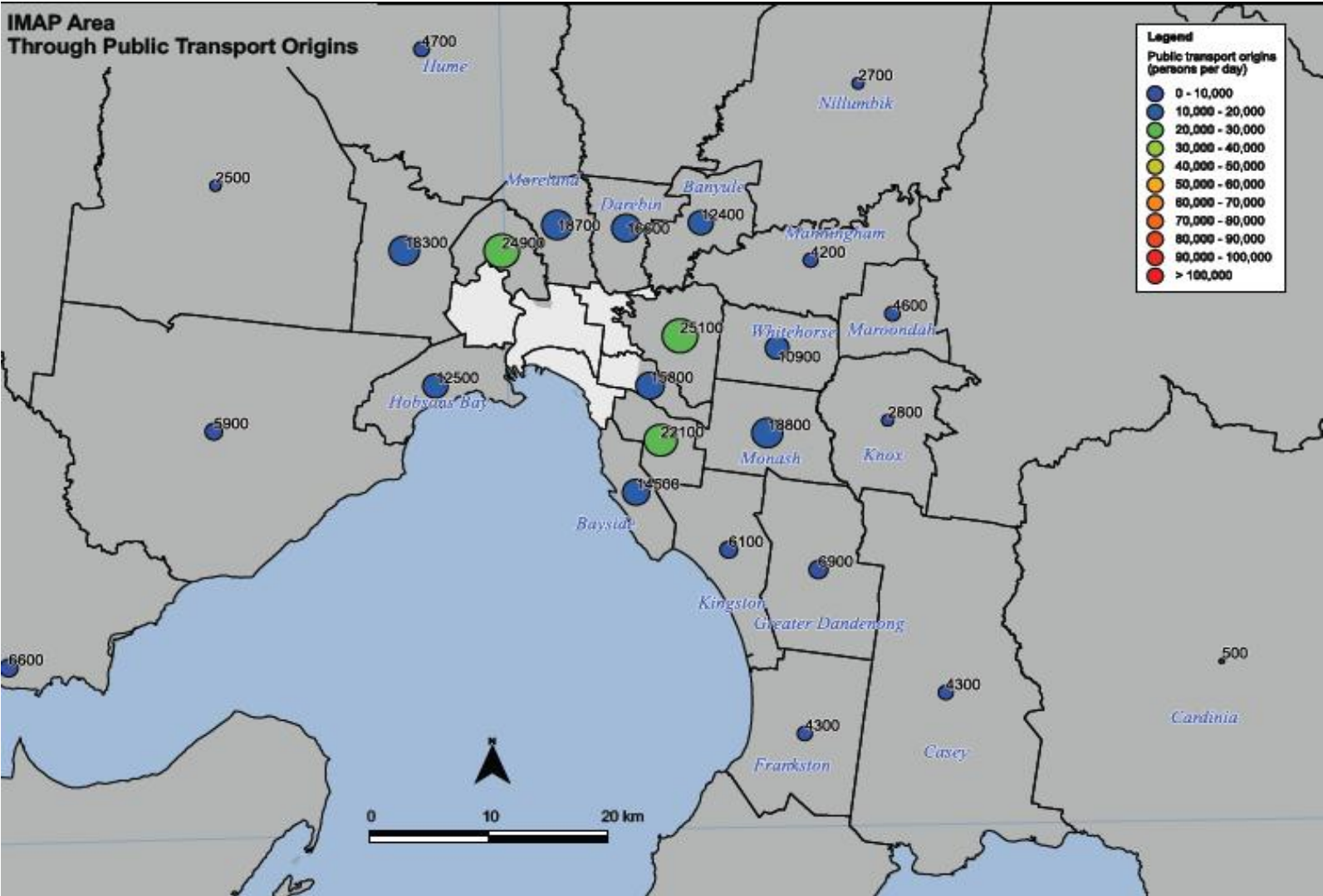


Figure 31: IMAP through traffic volumes per capita by origin LGA

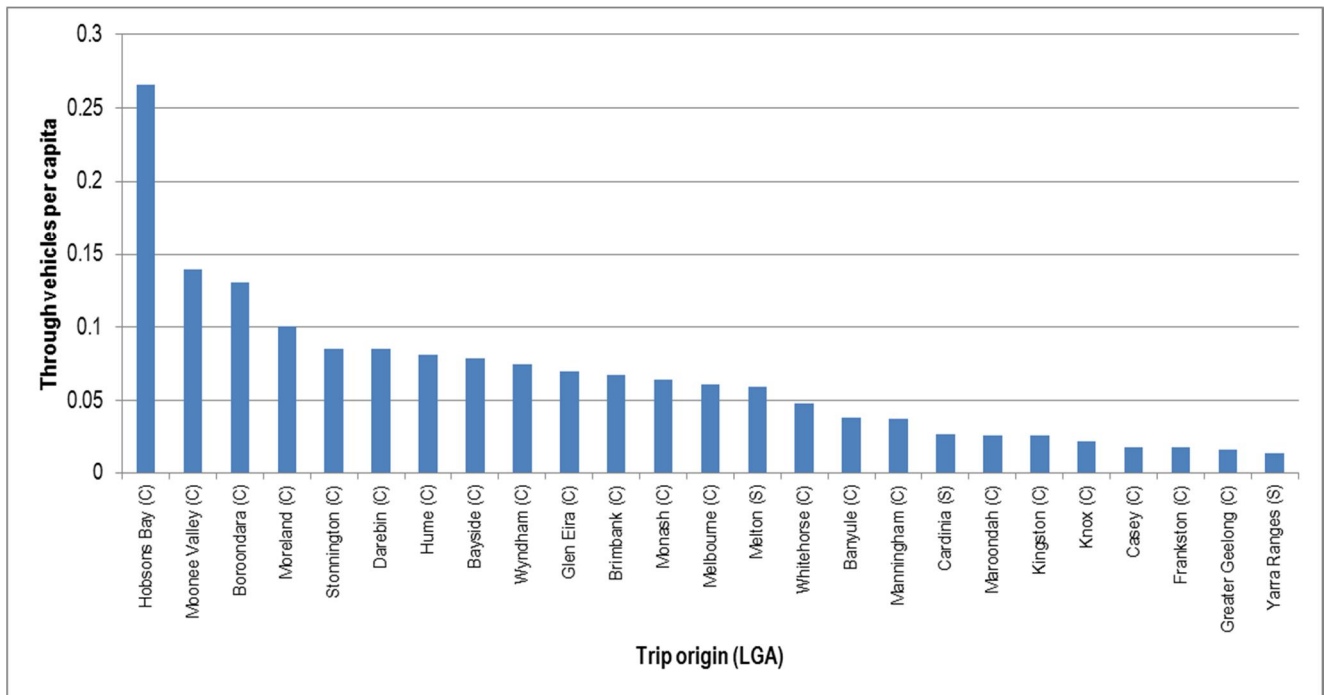
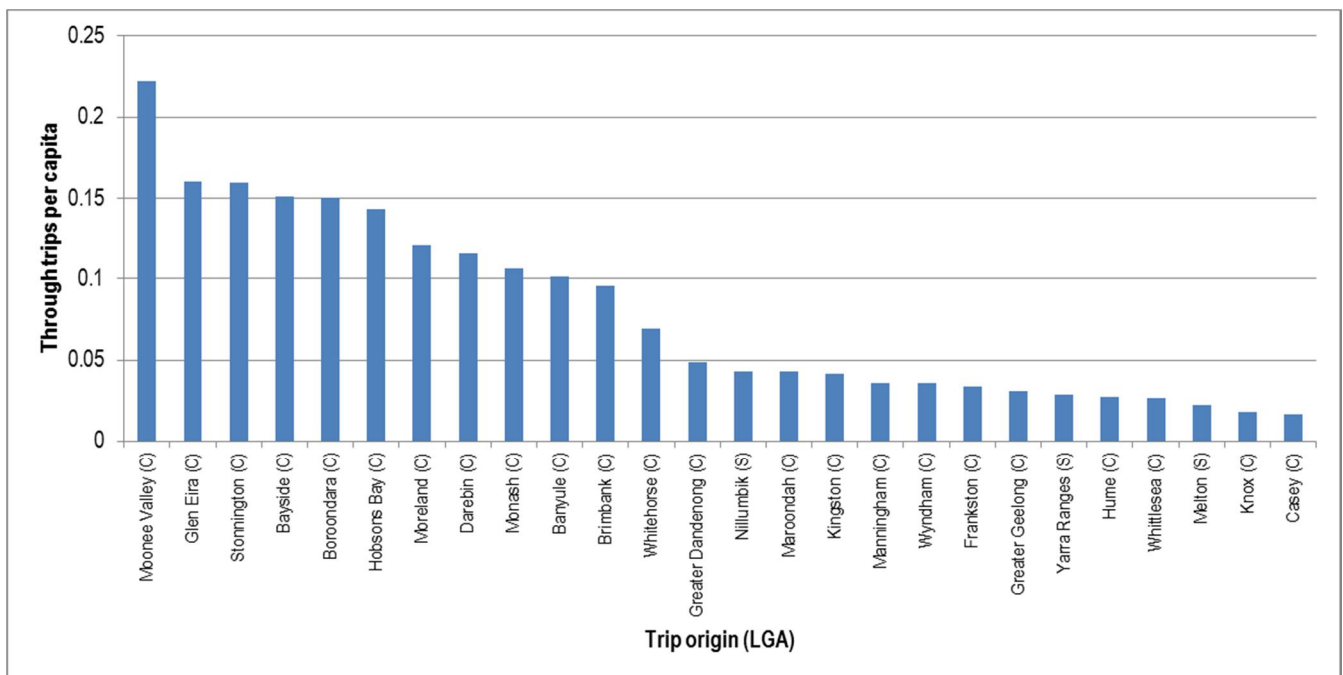


Figure 32: IMAP through public transport trips per capita by origin LGA



3.9.4 Conclusions from the analysis

The following conclusions are drawn from the IMAP analysis:

- There are only a small number of major through traffic corridors in IMAP namely City Link, Eastern Freeway and St Kilda Road.
- Hoddle Street, Ballarat Road and Dandenong Road all do carry moderate through traffic levels of between 10 - 20% of all traffic using the road.
- Most traffic using local streets and other arterial roads in IMAP has a local destination in IMAP. In other words, what may be perceived as "through traffic" in a local precinct may in fact be largely due to residents or visitors to IMAP.
- Most through traffic originates from neighbouring municipalities including Boorondara and Hobsons Bay.
- Given the size of the IMAP area, public transport carries a significant amount of through movement in IMAP. If public transport was to play a greater role in reducing IMAP's through vehicle traffic, it appears that a better cross-town public transport options could help to reduce trips that are presently quicker or more convenient to undertake by car.

4. Causes of through traffic

This chapter considers the factors that may contribute to the growth of through traffic in the IMAP area. Many of these factors are well-known and are generally applicable to the metropolitan region, while some are specific to particular municipalities. Factors that can influence through traffic include geography, land uses, transport options, and road capacity.

4.1 Melbourne

Melbourne is the centre of the transport network with the overwhelming majority of tram, bus and rail services either terminating or crossing and serving the municipality although capacity is increasingly a problem at peak times. There are also a number of arterial roads radiating out which attract very large volumes of through traffic including City Link and the Westgate Freeway.

The City of Melbourne is also the central municipality in IMAP with north-south and east-west journeys to pass through Melbourne from one side to the other although the majority of these are fairly long trips. There are a couple of roads where there are relatively short trips (for example Ballarat Road and Alexander Parade) to be classified as “through traffic”. However the total amount of north-south through journeys is lower than the east-west movement, and they are generally located near the periphery of the municipality rather than impacting on key activity centres.

As the dominant employment destination in Victoria, Melbourne will continue to attract a large number of daily commuters from surrounding and outer suburbs. Major off street car parks also contribute to commuters driving in addition to the limited capacity of the rail network. Proposed growth areas including the continuing expansion of Docklands as well as plans for Fishermen’s Bend, Webb Dock and E-Gate will reinforce City of Melbourne as the primary employment hub in Victoria and an international city for business.

Alongside employment growth, City of Melbourne is also expanding its residential population. A significant number of residential buildings are proposed, focused on high density apartment living. This population are generally travelling by non-car modes with parking spaces at a premium in the city.

Transport movements in Melbourne are also heavily influenced by the sporting precincts. These peak events are significant attractors of public transport and car borne trips with peaks in through traffic movements for surrounding suburbs. Melbourne also is a tourist and cultural hub with many significant exhibition and music venues as well as popular parklands which attract people from across Victoria.

The distribution of road capacity, congestion and tolls may also influence through traffic growth. As traffic volumes on major routes such as Elliott Avenue rise, congestion on these roads may encourage diversion onto parallel routes, and also a shift to public transport, provided improvements are made to accommodate the demand. Similarly, the tolls on City Link cause some diversion of traffic onto alternative corridors.

City of Melbourne Transport Strategy is heavily focused on reducing car dependency and encouraging walking and cycling. With the continuing expansion of safe and segregated cycle routes, viable alternatives to short public transport and car trips become more attractive.

4.2 Yarra

The spatial analysis of through traffic routes showed that a large proportion of Yarra’s north-south and east-west through traffic is generated by neighbouring municipalities, more so than other IMAP Councils. In most cases, this is simply due to the proximity effect: traffic originating from nearby municipalities is much more likely to have to travel through Yarra than that from more distant areas.

The Melbourne CBD and immediate surrounds are significant trip attractors, and Yarra tends to attract through trips originating from the immediate east and northern suburbs (the City of Boorondara in particular) and bound for the central city. The majority of these through trips use the City Link corridor, Eastern Freeway and the Clifton Hill and Burnley group rail lines.

There are a couple of short journeys that pass through Yarra from one side to the other, causing even relatively short trips (along Chandler Highway and Wallan Road) to be classified as “through traffic”. However the total amount of north-south through journeys is lower than the east-west movement, and is also spread amongst more road links, thus reducing its overall impact and significance.

The continuing expansion of Melbourne has meant that residents of growth areas working in the inner city need to travel relatively long distances in their daily commute. Yarra is well served by public transport, with a dense network of train, tram and bus routes crossing and serving the municipality but with public transport often at capacity, and key tram and bus corridors competing with traffic, car use is increasingly favoured.

City of Yarra is within an easy walking and cycling distance to Melbourne CBD and has a very proactive cycle policy. There are a high number of good quality off and on road bike corridors which although can become congested during the summer months show that there people do want to use alternative modes of travel from the car.

4.3 Port Phillip

As with the majority of IMAP Councils the spatial analysis of through traffic routes showed that a large proportion of Port Phillips through traffic is generated by neighbouring municipalities although it tends to skirt the northern and eastern edges of the municipality.

The Melbourne CBD and immediate surrounds are significant trip attractors, and Port Phillip tends to attract through trips originating from the immediate south east and east although there are a relatively high number of trips originating from City of Yarra. The majority of these through trips use the St Kilda Road corridor, Westgate Freeway, Dandenong Road and the Sandringham rail line. Port Phillip is unusual in that there are no significant east-west or north-south corridors on local roads, only the major arterials networks already mentioned.

The City of Port Phillip is itself a significant attractor of trips especially during the evening and weekends with Luna Park, St Kilda foreshore and the Acland and Fitzroy Street precincts. Visitors travel from across Melbourne which can result in congestion on public transport and the roads outside typical peak hours especially during the summer and holiday months.

Port Phillip is relatively well served by public transport, with a good network of tram and bus routes crossing and serving the municipality and two rail stations. Port Phillip is very proactive in its encouragement of cycling and walking and given its proximity to the CBD and St Kilda Road employment precinct has the potential to encourage people to use alternative modes of transport.

4.4 Maribyrnong

Maribyrnong through traffic routes are predominantly east-west with only one freeway standard corridor to the south of the municipality (Westgate Freeway). The key movements are from Melbourne and the western and northern growth suburbs including the Werribee and Sunbury rail corridors.

Only Raleigh Road in the north of Maribyrnong causes relatively short through traffic trips although only a small number compared to the other key east-west corridors such as Ballarat Road. There are only a couple of roads that carry a significant amount of through traffic but these are away from key activity centres and local Council roads.

The Wyndham growth corridor is recognised as being one of the fastest growing placing increasing pressure on Maribyrnong's transport network. Although significant residential and employment precincts are proposed (for example Werribee Employment Precinct), a large proportion of travel long distances to the CBD for work. The Central Activity Area of Footscray also has significant residential growth forecasts along with the expansion employment and retail hubs which could increase the amount of traffic and public transport movements. Regional Rail Link is under construction and is due to open in 2016. This will add capacity to the public transport network in Maribyrnong and hopefully encourage people to shift from travelling by car.

Maribyrnong is relatively well served by public transport, with a dense network of train and bus routes crossing and serving the municipality. However, some stations have a high percentage of car travel to access them as they are not conveniently located near residential areas (i.e. Tottenham).

Encouragement of cycling and walking is part of Maribyrnong's strategy to reduce car dependence although its distance from Melbourne CBD is too great for walking (except to train stations such as Footscray and Seddon), good bike networks are slowly encouraging a modal shift to cycling.

4.5 Stonnington West

The spatial analysis of through traffic routes showed that a large proportion of Stonnington West's through traffic is generated by neighbouring municipalities and the section of Stonnington not within the IMAP boundary. In most cases, this is simply due to the proximity effect: traffic originating from nearby municipalities is much more likely to have to travel through Stonnington West than that from more distant areas.

The Melbourne CBD and immediate surrounds are significant trip attractors, and Stonnington West tends to attract through trips originating from the immediate south east (the City of Monash and City of Stonnington in particular) and bound for the central city. The majority of these through trips use the Monash (City Link) corridor, Dandenong Road and the Dandenong rail line.

As Stonnington West is only a small section of Stonnington both east-west and north-south through traffic movements are relatively short. However due to the grid nature of the road network the total amount of through movement is also spread amongst more road links, thus reducing its overall impact and significance.

The continuing expansion of Melbourne's south eastern growth corridor has meant that residents of growth areas working in the inner city need to travel relatively long distances in their daily commute. As the population in these areas increases, the demand for long-distance travel along radial routes such as the Monash Freeway and Dandenong Road is expected to rise, causing a corresponding increase in through traffic on these routes along Stonnington's boundaries.

Other land use changes, such as the expansion of retail and employment hubs may also have an impact on through traffic (and indeed on incoming and outgoing traffic), as is the case with the expansion of Chadstone Shopping Centre.

The distribution of road capacity, congestion and tolls may also influence through traffic growth. As traffic volumes on major routes such as the Monash Freeway and Dandenong Road rise, congestion on these roads may encourage diversion onto parallel routes, and also a shift to public transport, provided improvements are made to accommodate the demand. Similarly, the tolls on City Link cause some diversion of traffic onto parallel routes (notably Toorak Road).

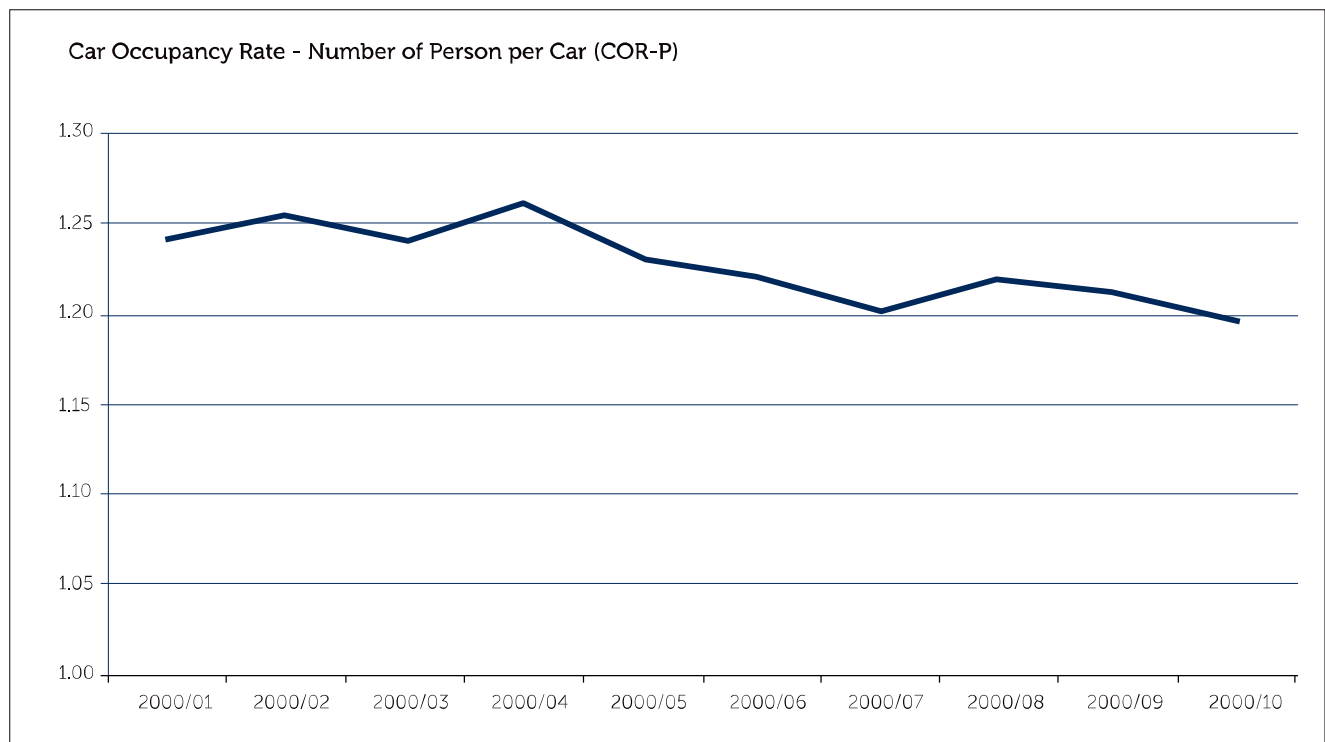
Stonnington is relatively well served by public transport, with a dense network of train, tram and bus routes crossing and serving the municipality. However, travel from the middle and outer suburbs (particularly areas distant from rail corridors) is less well-served, resulting in higher proportions of car use.

Encouragement of cycling and walking is also part of Stonnington's strategy to reduce car dependence, although it is recognised that much of Stonnington's through traffic travels distances beyond the range of most walkers and some cyclists (the east-west length of the municipality is about 10 kilometres).

4.6 Behavioural factors

Published car occupancy statistics indicate a steady decline in car occupancy rate in Melbourne (i.e. the number of people travelling in each vehicle). This suggests that the efficiency of people movement may also have declined, with an average occupancy slightly below 1.2 persons per vehicle (see Figure 33), and lower values during the peak periods.

Figure 33: Trend in car occupancy rate (source: VicRoads Traffic Monitor 2009-10)



Other behavioural factors, such as the increasing propensity of children to be driven to school also contribute to general traffic growth.

4.7 Political factors

The 2013 Victorian Auditor-General's report into road congestion¹² noted that travel demand management measures in Victoria have often been "implemented in an ad hoc, uncoordinated manner, rather than as part of an integrated statewide demand management strategy". The Victorian State Budget 2014 has provided some certainty about funding for major transport infrastructure projects; positive actions for reducing traffic congestion through co-ordinated means have been limited.

Residential growth in the Growth Areas is continuing to increase at a rapid rate and this is forecast to continue for the next 30 years. Infrastructure spending for public transport upgrades is not focused in these areas forcing people to use their car for commuting, and recreational travel. This has a significant impact on Inner Melbourne Councils as the CBD is still a significant destination for work and recreation. Traffic volumes are set to increase without significant commitment and funding to alternative modes of travel for those that live in these areas. This will increase the volume of through traffic in Inner Melbourne and potentially result in alternate routes running through local Council areas if the arterial network is congested.

¹² Government of Victoria (2013), *Managing Congestion: Victorian Auditor General's Report*, April 2013.

5. Actions

This chapter reviews the need for through traffic mitigation measures and suggests actions that the IMAP councils might consider to help limit the future impacts of through traffic in their municipalities.

While IMAP and its individual municipalities attract large volumes of through traffic, the analysis in this study suggests that the bulk of this traffic uses designated arterial roads. Given that these roads are designed to convey large traffic volumes and are somewhat separated from local areas, this might be considered “acceptable” through traffic with minimal direct impact on Councils.

The analysis also suggests that most of the traffic using IMAP Councils distributor roads and local streets is generated by car drivers who have an origin or destination within each municipality. While not classified as through traffic using the formal definition in this study, some of this traffic will encroach into local areas and will be perceived as unwelcome “through” traffic originating from outside the area.

In considering responses to through traffic, the recommendations will focus on “genuine” through traffic passing through the municipality from one side to another. However, some of these actions may also help to reduce the impacts of other traffic intrusion caused by internal travel.

5.1 Action Plan

Table 11 lists a range of actions that might be considered by all municipalities to reduce the impacts of through traffic. Approximate timeframes are also listed, with **short term** referring to actions to be taken in the next year (2013-14), **medium term** referring to the next three to five years, and **long term** referring to ongoing actions continuing beyond five years.

Actions such as these could be woven into each council’s strategies and plans, such as structure plans, integrated transport strategies and bicycle plans. This would probably be more effective than having a separate through traffic strategy, because of the varied and inclusive initiatives required to deal with through traffic effectively.

Table 16: Suggested actions

Area	Action	Responsibility	Timeframe
Local activity centres (these could include Neighbourhood, Major or Principal Activity Centres for examples)	<ul style="list-style-type: none"> • Prioritise local activities over through traffic in each activity centre (e.g. enforcement of 40 km/h speed limits, priority for public transport, cycling and walking). • Extend 40km/h speed zones through all activity centres. • Individual municipalities should work with VicRoads to refine network operating plans for activity centres and implement the changes identified by the plans. This should include developing a program of works required to implement their SmartRoads Network Operating Plans which require a clear timeline and responsibilities. • Develop a SmartRoads NOP for IMAP in conjunction with VicRoads • Advocate that priority should be given to pedestrians and public transport and safe cycle corridors where there is sufficient road space. • Ongoing discussions are required with traders to discuss on street parking. An analysis of turnover is required to assess demand. Signage to off street parking areas should be reviewed to ensure adequate information is available to encourage their use. • IMAP along with the municipalities should investigate the economic impact of parking v's public transport and walking in local activity centres • Municipalities should share the results of studies which identify where measures have been successful and where they need to be adapted. 	<ul style="list-style-type: none"> • Councils • Councils • Councils • IMAP • IMAP • Councils • IMAP • Councils / IMAP 	Short to medium term
Land use	<ul style="list-style-type: none"> • Monitor and contribute to the Metropolitan Planning Strategy when it is released, and assess the potential consequences of further metropolitan population growth. • Consider how land use changes can influence travel demand and ensure that land uses are managed to avoid or minimise the effects of traffic on adjacent areas within each municipality. • Consider developing policies on car free housing or restricting parking at high density residential developments where good public transport, walking and cycling networks exist. • Establish working groups to develop corridor approach to managing through traffic. These should involve municipalities outside IMAP as well as transport agencies (i.e. VicRoads and PTV) • Liaise with DTPLI to and Growth Areas Authority to share information about the impact of through traffic growth on IMAP by continued expansion of Melbourne without supporting infrastructure. 	<ul style="list-style-type: none"> • Councils / IMAP • Councils • Councils • IMAP • IMAP 	Short term
Local Arterials	<ul style="list-style-type: none"> • Identify preferred routes north-south and east-west corridors and facilitate efficient access to these routes while discouraging access to other routes that serve activity centres, local precincts and/or are used by trams. 	<ul style="list-style-type: none"> • Councils 	Medium term

Area	Action	Responsibility	Timeframe
Road pricing	<ul style="list-style-type: none"> • Become informed about road pricing strategies and how implementation of road pricing could affect IMAP and individual municipalities. • With this knowledge, advocate for strategies that will help to address through traffic. Hypothetical examples might include: an inner-Melbourne congestion charge, tolls on existing roads, broader network-wide charges). • This should only be considered with a significantly upgrade public transport system. The extent of any pricing scheme will need to be determined. 	<ul style="list-style-type: none"> • IMAP • IMAP 	Long term
Public transport	<ul style="list-style-type: none"> • Advocate for improved public transport capacity – both increase in service frequency and new corridors in particular Melbourne Metro and rail corridor improvements to growth areas • Work with VicRoads and PTV to increase priority for and access to on road public transport services where not segregated. • Proactively promote public transport to residents, commuters and visitors to IMAP (i.e. IMAP Map) • Councils should develop maps that show the level of PT accessibility in their municipality and seek information from PTV on public transport patronage levels. This can then be used alongside future population / land use developments information to advocate for improvements to local public transport services • Assess the impact of developments by identifying the Level of Public Transport Service required for each development. 	<ul style="list-style-type: none"> • IMAP • IMAP • Councils • Councils • Councils 	<p>Ongoing</p> <p>Medium to long term</p>
Freight vehicles	<ul style="list-style-type: none"> • Assess the major freight destinations in IMAP and develop a strategy for influencing the routes, frequency and timing of freight vehicle trips • Undertake study which investigates last km freight trips 	<ul style="list-style-type: none"> • IMAP • IMAP 	Medium term
Local area traffic management	<ul style="list-style-type: none"> • Keep local area traffic management measures under constant review for their effectiveness in protecting the subject areas from the impacts of through traffic in general whilst also facilitating ease of local access by all modes of transport. • Share information about which measures have been (un) successful and collectively identify ways to trial measures in different areas 	<ul style="list-style-type: none"> • Councils • IMAP 	Short to medium term

Area	Action	Responsibility	Timeframe
Cycling and Walking	<ul style="list-style-type: none"> Distribute the IMAP Map to key destinations in IMAP municipalities and make available to residents Establish working groups to develop, seek funding for and implement new and improved bicycle and walking corridors Define key bicycle corridors through SmartRoads Network Operational Plans and develop a program of works to see their implementation 	<ul style="list-style-type: none"> Councils IMAP IMAP 	Short term - ongoing
Behaviour change	<ul style="list-style-type: none"> IMAP should develop and support well thought-out and co-ordinated campaigns to manage travel demand and encourage greater mode share for public transport, walking and cycling – particularly for commuting and school trips. <ul style="list-style-type: none"> The development of travel plans should be encouraged for schools as part of the curriculum to encourage children to be healthy and learn about road safety The development of travel plans should be encouraged for employers to link into the corporate sustainability policies Establish carpooling schemes for key employment hubs Distribute IMAP and other transport maps promoting alternative transport options to the car Encourage the use of electric cars and Car Share. Advocate for Park and Ride outside IMAP so that all Councils achieve the benefits. Focus should be on encouraging waking and cycling to train stations – TravelSmart campaign 	<ul style="list-style-type: none"> IMAP Councils Councils Councils IMAP Councils / IMAP 	Short term - ongoing
Community engagement	<ul style="list-style-type: none"> Undertake continued community engagement about transport and traffic issues in general and through traffic in particular, to develop a deeper understanding of and more effective response to community perceptions about the issue in IMAP. 	<ul style="list-style-type: none"> Councils 	Short to medium term
Infrastructure Investments	<ul style="list-style-type: none"> Establish a policy position on key infrastructure improvements IMAP will support in terms of priorities required to reduce through traffic growth for example Melbourne Metro and regional Rail Link. 	<ul style="list-style-type: none"> IMAP 	Medium term
IMAP Policies	<ul style="list-style-type: none"> IMAP municipalities should seek support from their relevant Councils to recognise IMAP and integrate IMAP policies into Council strategies to ensure policy continuity 	<ul style="list-style-type: none"> Councils 	Ongoing

Appendix A. Review of government policies and strategies

Appendix B. Melbourne Traffic Distribution Maps

Appendix C. Yarra Traffic Distribution Maps

Appendix D. Stonnington West Traffic Distribution Maps

Appendix E. Port Phillip Traffic Distribution Maps

Appendix F. Maribyrnong Traffic Distribution Maps

Appendix G. IMAP Traffic Distribution Maps

Appendix H. City of Stonnington Through Traffic Report