

# **Moving Maroondah**

## **Sustainable Transport in Maroondah**

### **Current Conditions and Recommendations**

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Original: Monday, 23 May 2005  
Updated: Monday, 10 October 2005

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## 1.0 Introduction

The City of Maroondah, with a residential population 96,132<sup>1</sup> is located in Melbourne's outer east, 25 kilometres east of the Melbourne CBD. Encompassing many of Melbourne's outer eastern suburbs, the City of Maroondah is one of the faster growing areas in the east. Maroondah includes the suburbs east of Heatherdale Road and Glenvale Road, and the areas north of Dandenong Creek. Suburbs include Bayswater, Heathmont, Ringwood, Croydon, Kilsyth and Warranwood. The two major retail centres at Ringwood and Croydon, as well as an industrial area in the south dominate the economy of Maroondah<sup>2</sup>.

As per the State Government's planning framework Melbourne 2030, The City of Maroondah includes the activity centres of Ringwood and Croydon, with the activity centres of Chirnside Park, Doncaster Shoppingtown (Doncaster Hill), Doncaster East (The Pines), Knox City (Knox Central), Boronia, Bayswater and Lilydale located in close proximity. One of the key principles of Melbourne 2030 is the providing of better public transport links to connect such activity centres<sup>3</sup>.

The Ringwood Transit City Community Coalition (RTCCC) supports an improvement of public transport in Maroondah to make it a practical, accessible and readily available form of transportation consistent with the principles of Melbourne 2030.

The Ringwood Transit City Community Coalition (RTCCC) believes that the recommendations contained within submission will provide for the basis of a suitable 'network' effect of public transport services, which incorporates the concept of integrated public transport as mentioned in Melbourne 2030. In summary, where poor frequencies exist (such as services poorer than 30 minutes) passengers do not transfer between services and thus a route can serve only those trips that both begin and end on that route. With higher frequencies, as well as other integration measures, transfers become attractive and thus a public transport route can serve trips to destinations not only within one route, but also on any route the service connects with. Through permitting 'go anywhere' travel, the network effect is the key to increasing patronage and improving the financial performance of public transport.

This concept of the network effect is crucial through allowing the streamlining of bus routes so that 'principal trunk routes' can connect activity centres in an efficient manner with feeder services connecting with these principal trunk routes.

This recommendations relating to this report includes informal discussions with the following stakeholders:

- Maroondah residents;
- Public transport users of both bus and train services;
- Traders located at Ringwood Station and along Maroondah Highway;
- Bus drivers on routes serving Maroondah;
- Connex staff based at rail stations located in Maroondah;
- Taxi drivers serving Maroondah;

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<sup>1</sup> Australian Bureau of Statistics (2001 Census).

<sup>2</sup> Maroondah Municipality Profile.

<sup>3</sup> Melbourne 2030 'better transport links'.

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- Local police officers patrolling the Ringwood area;
- Residents of other municipalities that travel regularly into Maroondah.

## 2.0 Current Public Transport in Maroondah

While the Belgrave and Lilydale lines provide an east-west connection within Maroondah with the rail junction at Ringwood, the majority of Maroondah residents reside beyond convenient walking distance to these rail stations on these lines. This therefore requires an urgent improvement in bus services since the current level of services lack the ability to allow for convenient travel beyond these rail stations.

Public transport services must be improved to ensure the success of the Melbourne 2030 policy of increasing public transport modal share to 20% by the year 2020. This goal must be supported by the City of Maroondah to ensure the future environmental, social and economic success of the municipality through providing much needed public transport improvements.

Table 2-1 demonstrates average service levels for the three modes of public transport, the train, tram and bus network available within Melbourne:

**Table 2-1** Average service levels mode of public transport (Melbourne wide)<sup>4</sup>

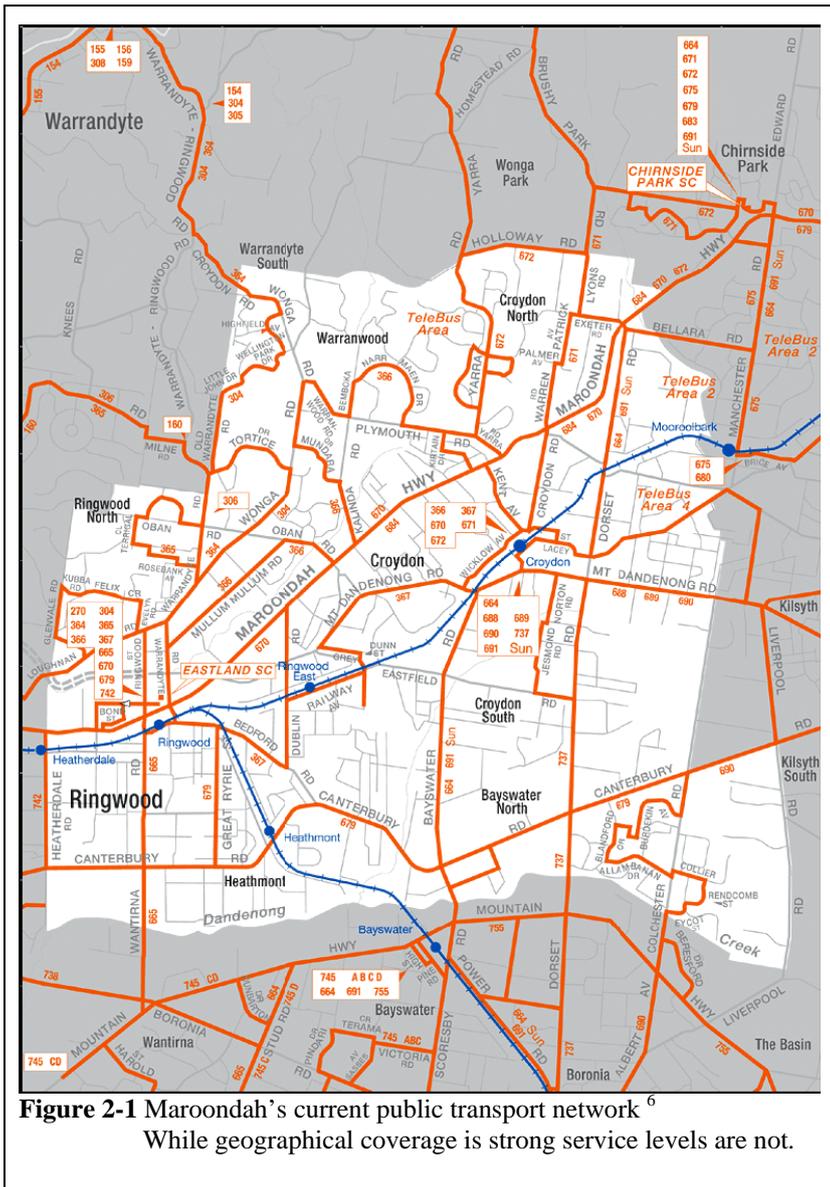
	<b>TRAINS</b>	<b>TRAMS</b>	<b>BUSES</b>
<b>Average weekday peak headways</b>	15 mins	7 mins	40 mins
<b>Average interpeak headways</b>	20 mins	12 mins	50 mins
<b>Weekday average start time</b>	5:00 am	5:00 am	6:46 am
<b>Weekday average finish time</b>	Midnight	Midnight	6:53 pm
<b>Saturday service availability</b>	100%	100%	74%
<b>Saturday average finish time</b>	Midnight	Midnight	5:14 pm
<b>Sunday service availability</b>	100%	100%	18%

As table 2-1 clearly demonstrates the bus network lags behind both the train and tram network in regard to the key indicators service frequencies and operating service spans.

<sup>4</sup> Improving Melbourne's Bus Services (Bus Association of Victoria, 2003) and PTUA data.

Figure 2-1 displays the current coverage and spread of bus services within Maroondah.<sup>5</sup> While on appearance it would appear that Maroondah has good overall public transport coverage the poor service quality, particularly along major roads such as Maroondah Highway and Canterbury Road result in a public transport network that fails to meet the needs of the community.

Additionally several routes are circuitous in nature leading to public transport journeys that are uncompetitive with private car travel.



**Figure 2-1** Maroondah's current public transport network<sup>6</sup>  
 While geographical coverage is strong service levels are not.

Appendices A and B provide current public transport service levels within Maroondah for both weekdays and weekends.

<sup>5</sup> Source: MetLink Melbourne (Various timetables) and discussion with residents.

<sup>6</sup> Source: MetLink Melbourne (Various timetables)

### 3.0 Recommendations

This section contains recommendations relating to sustainable transport within Maroondah, such as bus services improvement to ensure greater mobility and accessibility resulting in public transport patronage increases consistent with Melbourne 2030.

The RTCCC contends that the level of service offered by public transport is directly proportional to the level of patronage it will receive, as such the higher the level of service (in terms of frequency, service span and directness of the route) the higher the patronage of the service.

The correlation between service levels and patronage is confirmed through the 37% increase in patronage experienced on the 888/889 SmartBus, which since August 2002 has provided 15 minute service frequencies during weekdays and weekday service spans to midnight.<sup>7</sup>

In addition, the bulk of this patronage growth was due to an increase in full-fare paying passengers (those more likely to have access to car travel) as represented by 44.5% growth<sup>8</sup> of this segment.

This clearly demonstrates that the broader community will utilise public transport when service frequencies and operating spans are competitive with private car travel.

**Table 3-1** Recommended service frequencies for public transport services

Travel Mode	Frequency	Service Span
<b>Principal Bus routes</b>	10 – 15 minutes on weekdays* 15 – 20 minutes on weekends*  Must match train frequencies at off-peak times	5am to midnight seven days per week
<b>Local Bus Routes</b>	15 – 30 minutes*  Must coordinate with PPTN routes	6am to 10pm Seven days per week
<b>Train services</b>	5 – 10 minutes (peak services)10 – 15 minutes weekdays15 – 20 minutes weekends	5am to midnight seven days per week

The list recommendations has also been summarised within Appendix D.

<sup>7</sup> Source: Department of Infrastructure 'What Is SmartBus' [www.doi.vic.gov.au](http://www.doi.vic.gov.au)

<sup>8</sup> Source: Department of Infrastructure 'What Is SmartBus' [www.doi.vic.gov.au](http://www.doi.vic.gov.au)

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### **3.1 Council Initiated Advocacy Program**

As the recent success in securing the Frankston to Ringwood SmartBus demonstrates, the use of council initiated advocacy for public transport does provide results and positive benefits for the community<sup>9</sup>. The Frankston to Ringwood SmartBus was seen as a key priority for both the Cities of Knox and Greater Dandenong as reflected within their respective Integrated Transport Plans as well as planning frameworks including site specific structure plans<sup>10</sup> and a cohesive advocacy strategy ensured this success.

While it is true that Maroondah is a member of the Eastern Region Integrated Transport Group (ERITG) it is crucial for Maroondah to develop its own public transport advocacy program on a municipal wide basis, utilising a cohesive combination of both public advocacy and direct lobbying to Ministers, Members of Parliament and Department personnel. This will ensure that the community is aware of the public transport advocacy efforts undertaken by Maroondah and will also provide the momentum necessary to rectify omissions to the Principal Public Transport Network such as the lack of a continuous service along Maroondah Highway or Canterbury Road.

Given the activity centre status of Ringwood, Croydon and nearby centres such as Doncaster, Chirside Park, Boronia, Bayswater and Knox Central; Maroondah and neighbouring municipalities should be in a strong position to secure public transport improvements through an effective advocacy program.

In many cases such advocacy and lobbying can often be conducted in partnership with neighbouring municipalities. This has been evidenced through the combined efforts Knox and Greater Dandenong in securing the Ringwood to Frankston SmartBus or the ongoing combined advocacy from Knox and Whitehorse for a commitment towards the full Knox tram extension. In all these such combined advocacy operates outside the broader scope of the Eastern Region Integrated Transport Group (ERITG).

Lastly it is imperative that Maroondah Council actively cooperates with community advocacy and lobbyist organisations to ensure a community-wide and cohesive approach to public transport advocacy.

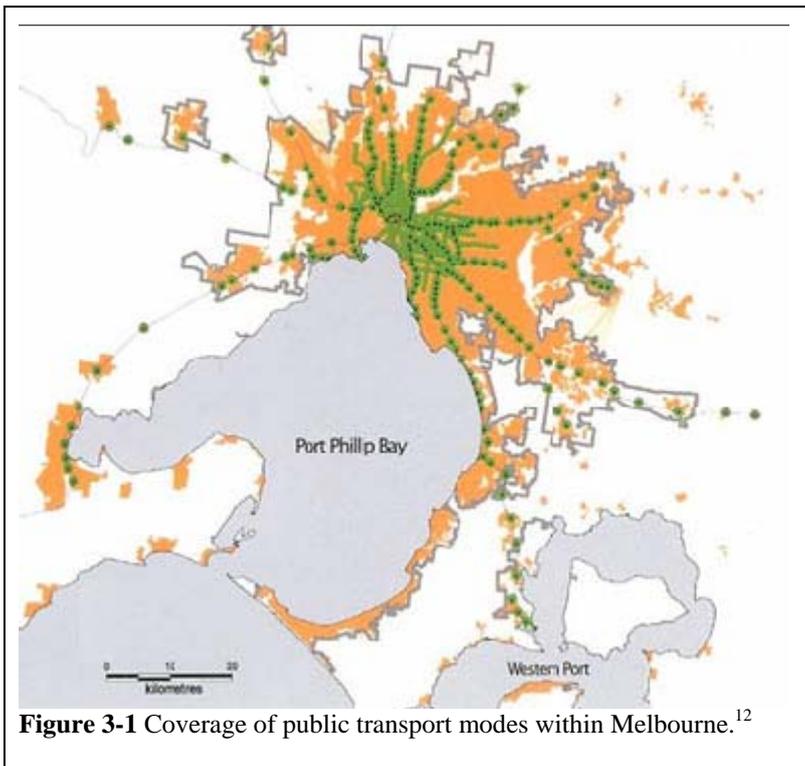
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<sup>9</sup> *Much Needed Ringwood to Frankston SmartBus Welcomed* (PTUA)

<sup>10</sup> City of Knox and City of Greater Dandenong Corporate Plans and Integrated Transport Plans.

### 3.2 Bus Route Improvements

As reflected in figure 3-1, bus services are the most prevalent form of public transport in Melbourne; with two-thirds of Melbourne living beyond reasonable walking distance to the rail network.<sup>11</sup>



Melbourne's bus network is more infrequent and lacks the operational service span of both trams and trains. Bus operating hours must be extended to finish past the average time of 6:53pm,<sup>13</sup> a time that cannot adequately cater for passengers or even regular commuter patterns. Additionally weekend bus services must be expanded as three quarters of all buses do not operate on Sundays<sup>14</sup>. In Maroondah this includes the need for Sunday services on routes such as the 670 along Maroondah Highway and route 679 along Canterbury Road which register good weekday patronage levels and provide direct and efficient public transport services.

Current service levels for Maroondah are listed in Appendices A and B.

Improving bus service frequencies and operating spans is crucial for Maroondah since the majority of residential areas are located beyond reasonable walking distance to the rail network. Principal bus routes

<sup>11</sup> *Improving Melbourne's Bus Services* (Bus Association of Victoria, 2003) and PTUA data.

<sup>12</sup> *Improving Melbourne's Bus Services* (Bus Association of Victoria, 2003) and PTUA data.

<sup>13</sup> *Improving Melbourne's Bus Services* (Bus Association of Victoria, 2003) and PTUA data.

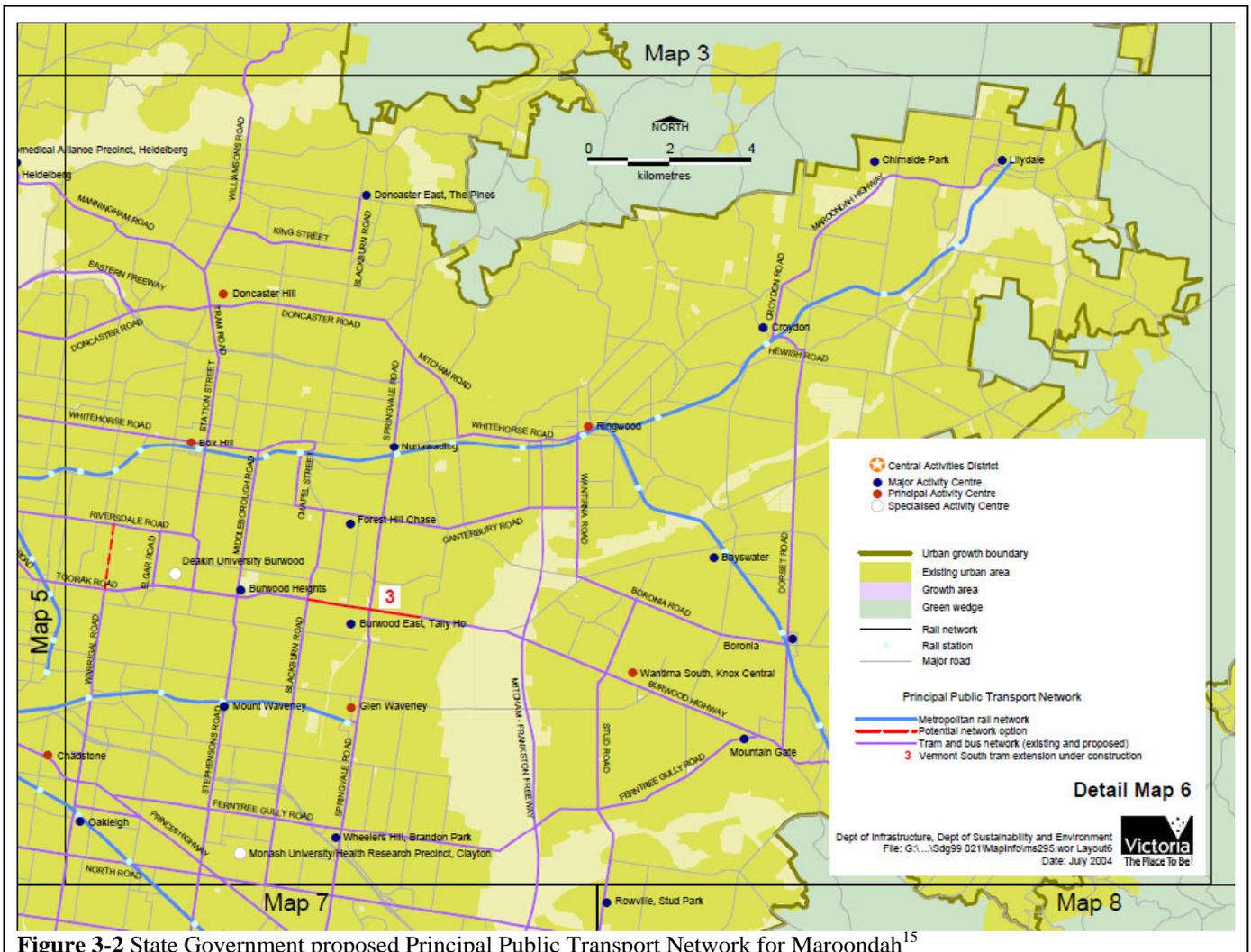
<sup>14</sup> *It's Time to Move* (PTUA, 2002), p. 21.

which form the principal public transport network (PPTN) must be streamlined and implemented to provide direct and efficient travel utilising main roads.

Local bus services serving suburban side streets should provide a feeder service to transfer passengers onto principal bus routes. Bus routes cannot reliably fulfil both functions and routes will therefore need to be reconfigured to ensure a complimentary and efficient relationship.

This overall streamlining would improve the efficiencies of the bus network, therefore improving financial return as well as increase patronage levels and thus improve passenger confidence in regards to bus based public transport. This will result higher asset utilisation and less route duplication providing improved cost recovery for bus services.

As demonstrated in figure 3-2; the proposed Principal Public Transport Network (PPTN) within Maroondah is largely inadequate. This is due to the failure of including major roads, such as Maroondah Highway, Canterbury Road, Wonga Road, Oban Road and Bayswater Road all of which serve key thoroughfares within the municipality and associated activity centres.



**Figure 3-2** State Government proposed Principal Public Transport Network for Maroondah<sup>15</sup>

<sup>15</sup> Melbourne Principal Public Transport, Melbourne 2030 (Map 6)

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### 3.2.1 Specific Short-Term Bus Improvements

The RTCCC recommends the following as specific short-term improvements to be implemented within the next six to twelve months:

- Accelerated implementation of the Ringwood to Frankston SmartBus including the immediate implementation of increased service spans (to a minimum of 9:30 pm) and public holiday services by the end of 2005. Full implementation of this route should be provided by the end of 2006.
- Immediate introduction of evening and Sunday services for route 670 along Maroondah Highway connecting Ringwood, Croydon, Chirnside Park and Lilydale as well as smaller shopping precincts and Cherry Tree Retirement Village. Route 670 along Maroondah Highway must be included as part of the Principal Public Transport Network (PPTN). The assumption that this route parallels and competes with the rail line is false given the fact that Chirnside Park Shopping Centre and much of the residential population along Maroondah Highway (including Cherry Tree Retirement Village) is located beyond reasonable walking distance to the rail network.
- Immediate introduction of evening, Sunday and improved Saturday services along Canterbury Road from Ringwood to Lilydale via Heathmont, Kilsyth and Mount Evelyn. Along Canterbury/Sawntea Roads, as well as inclusion within the Principal PPTN. This service could later connect with a Canterbury Road service from Ringwood to Camberwell as identified on the PPTN (although this route along currently does not currently exist).
- Introduction of the Ringwood to Doncaster portion of the Yellow Orbital (via Maroondah Highway and Mitcham Road) by the end of 2006. This service should coordinate with the Ringwood to Frankston SmartBus at Ringwood.
- Introduction of services from Ringwood to Camberwell via Forest Hill and Box Hill Station along Canterbury Road. It is envisaged that while this service would be designed to run continually through to Lilydale, coordinated services could be scheduled in the interim at Ringwood.
- Evening services along Dorset Road connecting Croydon to Boronia and terminating at Knox City Shopping Centre. Route 737 would be utilised to connect these activity centres.

### 3.2.2 Specific Medium-Term Improvements

The RTCCC recommends the following as specific medium-term improvements with an implementation timeframe of twelve to twenty four months.

- Extension of route 737 to Chirnside Park travelling along Dorset, Exeter and Lyons Roads providing a linkage between the activity centres of Chirnside Park, Croydon, Boronia and Knox. This extension should be included on the PPTN Network to provide frequent services for Croydon North residents.
- Inclusion of services between Croydon and Bayswater via Bayswater Road onto the PPTN which corresponding service upgrades. This service would also connect the activity centres of Mountain Gate and Knox City.
- Inclusion of route 364 from Ringwood to Doncaster via Park Orchards and Ringwood North (Wonga/Park Roads) onto the PPTN and corresponding bus route improvements, thus providing frequent services for Park Orchards and Ringwood North.

- Introduction of services from Croydon to Lilydale (via Mount Evelyn) along Mt. Dandenong Road on the PPTN and corresponding service upgrades.
- Introduction of services from Chirnside Park Shopping Centre to Boronia (via Mooroolbark) along Manchester and Colchester Roads (located in the Shire of Yarra Ranges).
- Reconfiguration of other bus services to provide general frequency and service span increases and coordination with principal bus routes.

### **3.2.3 Overall Improvements**

Principal bus routes must operate at frequencies of 10 minutes during weekdays (15 minutes for evenings and weekends) with hours of operation between 5am to midnight or the last train (whichever is later). Such service levels are comparable with those experienced on the metropolitan tram system found within the inner and middle suburbs of Melbourne. To further decrease travel time traffic light priority and bus lanes (through the provision of High Occupancy Vehicles lanes) should be provided for bus routes identified on the desired Principal Public Transport Network (PPTN).

Local bus routes should operate with at least 20 or 30 minute frequencies on both weekdays and weekends, although more frequent services should be provided for busier routes. Hours of operation should be between at least 6am and 10pm.

Based on the preceding recommendations the RTCCC recommends a Principal Public Transport Network (PPTN) as demonstrated in figures 3-3 and 3-4 (over on next page):

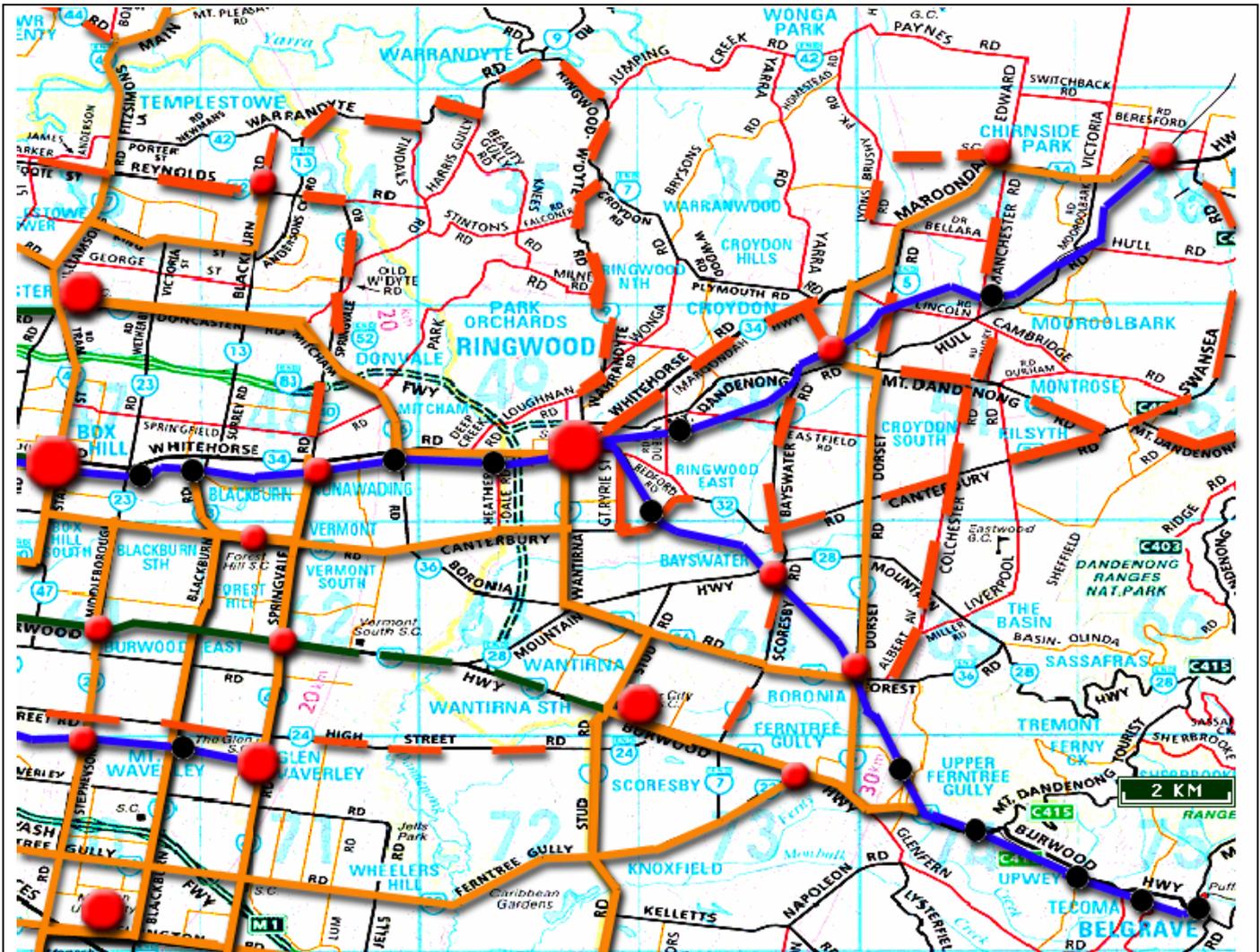
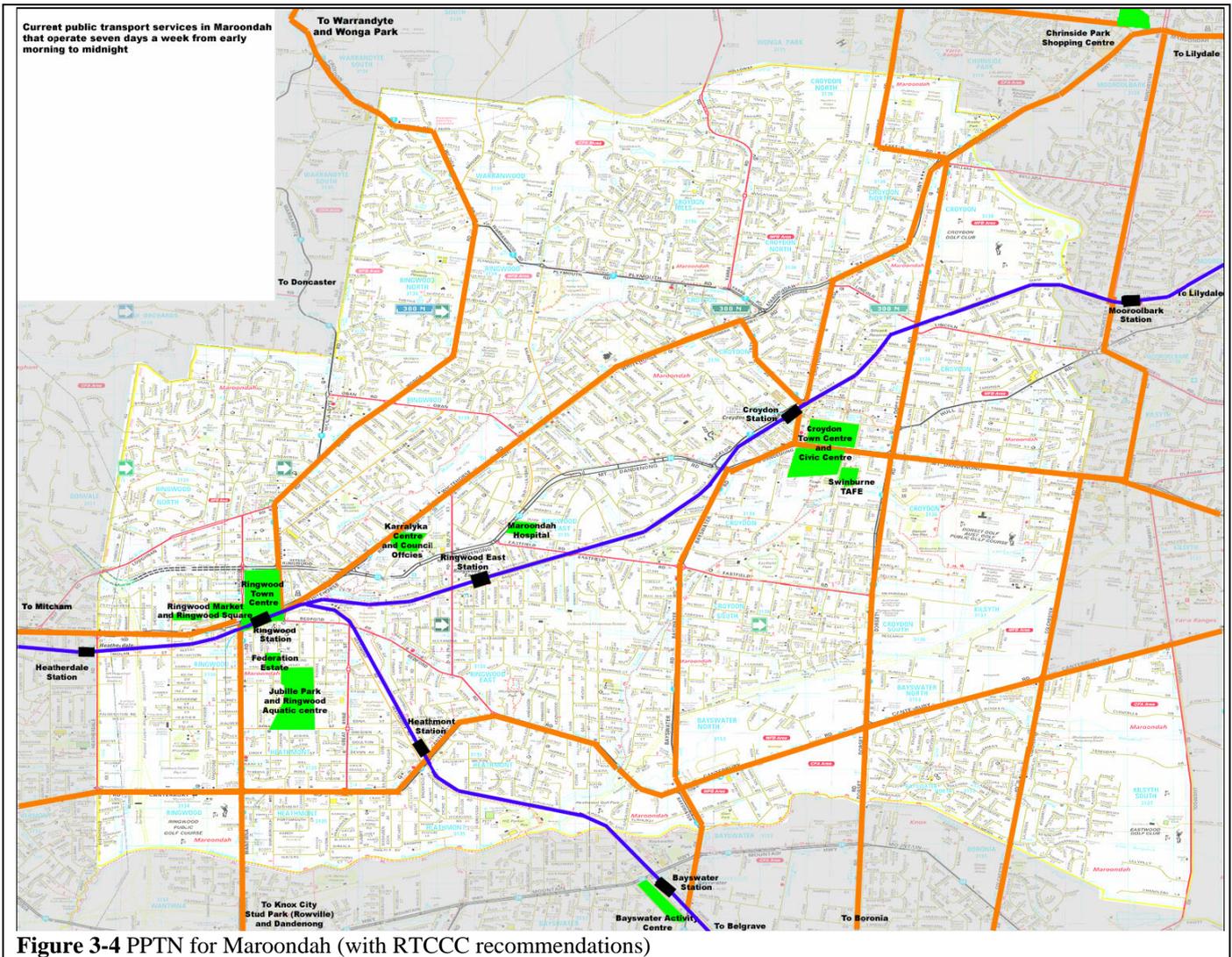


Figure 3-3 Regional Principal Public Transport Network (with RTCCC recommendations)<sup>16</sup>

- Note:**
- Dashed line represent recommendations outlined in this and other submissions (red represent bus improvements)
  - Red circles represent activity centres (larger the circle the more prominent the activity centre).
  - Blue and green lines represent the train and tram network respectively.
  - Solid orange lines represent services identified on the Principal Public Transport Network.
  - Black circles represent rail stations.

<sup>16</sup> Melway edition 28 (used with permission) and Melbourne Principal Public Transport, Melbourne 2030.



### 3.3 Rail frequency Improvements

During off-peak times and weekends services from Belgrave or Lilydale alternate between terminating at Ringwood which the other allowing for a connecting service through to the City. The use of this interchanging system provides half hourly (or forty-minute services on Sunday evenings) services to stations past the Ringwood junction.

Thirty minute or forty minute rail frequencies are not conducive to encouraging public transport patronage or providing accessibility for residents. The ultimate aim should include train frequencies of between 10 and 15 minutes in off-peak times, such increased services would also provide a flow-on effect for passengers further towards the city and would improve passenger patronage. This was demonstrated on the Sandringham rail line in 1992 where rail frequencies were increased from 20 minutes to 15 minutes during the day and from 30 minutes to 20 minutes during the evening, as well as increased bus coordination with rail timetables. The PTC at the time reported that patronage had increased by 38%,

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while costs had only increased in the vicinity of 20%<sup>17</sup>, providing a positive net result in operating surplus.

In the short-term however off-peak rail service should be provided at 20 minute frequencies along the Belgrave and Lilydale lines beyond Ringwood and 10 minute service frequencies along the rail line to Ringwood, consistent with the designation of Ringwood as a Transit City. This is entirely feasible given that weekend services currently operate at 20 minute frequencies on both lines beyond Ringwood. Additionally Sunday and Saturday services should operate with a consistent timetable, operating at a consistent 20 minute service.

### **3.4 Timetable and Service Coordination**

Since the majority of residents within Maroondah live beyond walking distance to a rail station it is imperative that bus and train timetables are coordinated, ensuring a convenient transfer between the two public transport modes. Furthermore ‘local’ bus services need to coordinate with principal route services. As a general rule passengers should be provided with a two to five minute interval between services to provide convenient yet prompt transfers.

Services identified on the Principal Public Transport Network must operate with a consistent service frequency and service span to the rail network thus ensuring coordination of services. As a typical rule the more frequent a service is the greater the opportunity that exists for timetable coordination. For example on weekends, this will require services such as the Ringwood to Frankston SmartBus and other PPTN routes to operate at 20 minute service intervals coordinating with rail services which likewise operates on 20 minute frequencies.

### **3.5 Infrastructure Improvements**

In addition to the improvement of public transport services there are a number of infrastructure improvements that are also required. This section examines these necessary infrastructure based improvements relevant to Maroondah.

#### **3.5.1 Redevelopment of Ringwood Station**

Currently the only access to Ringwood Station is via ramps that fail DDA compliance and of which are too steep and narrow to provide convenient and quick access between the station and beyond. These ramps need to be upgraded into an interchange similar to Dandenong station, which includes convenient escalator and elevator access inside an enclosed building. The enclosing of Ringwood Station would increase the general perception of safety around this precinct and reinforce the station as a ‘world class’ integrated town centre bus/rail interchange.

Platforms one and two located on the southern side of Ringwood Station provide city bound services during the week and both inbound and outbound services on weekends. Despite the predominance of

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<sup>17</sup> *Public Transport in Crisis* (PTUA, 1993)

these platforms they currently lack general amenities for people with and without disabilities. The lack of amenities such as passenger restrooms, public telephones and a comfortable enclosed waiting area cause discomfort to both staff and passengers alike. Current arrangements require passengers to cross the ramps joining the three platforms to use station restrooms and to access the main station office and public telephone booths.

The upgrading of Ringwood Station must include facilities for people with and without disabilities, such as restrooms and public telephones on platforms one and two. Furthermore access to platform one needs to be improved to provide immediate access to the platform when entering via the ticket barriers. The issue of the heritage listed weatherboard platform building and corresponding signal box must also be resolved within the short-term to ensure that this does not delay the essential upgrades. These heritage listed buildings can either be relocated or incorporated into the new station design.

Additionally Ringwood Station is perceived by the Maroondah community as the most unsafe area within the municipality. The redevelopment of Ringwood Station into a truly world class and DDA compliant station would assist in improving its perception of safety.

### **3.5.2 Accessibility Improvements**

Estimated at 13,500 residents, approximately 14% of Maroondah residents have a form of disability<sup>18</sup> and this figure being expected to increase due to the ageing population within Maroondah. As such it is imperative that bus stops are accessible including the use of tactile flooring and shelters that can cater to the needs of wheelchair and scooter users. Additionally low-floor buses need to be readily available particularly along principal bus routes to ensure maximum accessibility for all residents. Accessibility improvements also include the need for more frequent and later running services as outlined previously.

It has been estimated that an inaccessible environment costs the community \$4000 per person per annum<sup>19</sup>. As such the economic benefits of an accessible environment within Maroondah would amount to \$54 million per annum. These benefits are recognised through additional community participation and economic consumption.

### **3.5.3 Rail triplication from Box Hill to Ringwood**

Rail triplication from Box Hill to Ringwood will provide the capacity required for frequent 'flier' trains between Ringwood and the CBD, allowing for express services between Ringwood and Box Hill then stopping at Camberwell, Glenferrie, Richmond and continuing to the CBD. Express services should also be provided during off-peak times to ensure fast and efficient travel along the Belgrave and Lilydale rail lines. Additionally rail transfer interchanges should be provided at both Box Hill and Ringwood to allow for the transfer between express and non-express services. The introduction of this express pattern would eliminate at least five minutes from the current times into the CBD.

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<sup>18</sup> Maroondah Disability Policy and Action Plan.

<sup>19</sup> Report 30, Productivity Commission Inquiry Report, 30 April 2004 (p 194) .

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Significant signal upgrades and track maintenance are required to enhance the speed of Melbourne's suburban rail network, which is currently the slowest within urbanised Australia<sup>20</sup>. Such upgrades would allow trains the potential to operate at 80km/h and would provide much improved travel speeds.

Rail triplication may also require the grade separation of level crossings located in Mitcham, Rooks and Springvale Road. Maroondah Council should advocate collectively with Whitehorse Council for the rail triplication and the elimination of these level crossings.

### 3.5.4 Ringwood and Croydon Bus Interchanges

The bus interchanges at Croydon and Ringwood need to be physically integrated with the respective rail facilities as well as provide direct access to nearby residential and commercial/retail areas.

The Ringwood bus interchange needs to be designed with bus entry and exit facilities from both the east and west approaches of the interchange. This would allow buses to easily and conveniently enter the interchange from both directions allowing a streamlining of bus routes that travel eastwards from Ringwood Station (such as route 670 and 679).

Additionally taxi and 'kiss and ride' facilities must enter and depart Ringwood Station from separate points compared to bus services to avoid potential delays and collisions with buses. The current exit point from the Ringwood Station interchange onto Maroondah Highway is a major source of delay for bus services and a major bottleneck for the efficient operation of this interchange.

Concerns have been raised over the lack of effectiveness of the bus shelters at both Croydon and Ringwood in their ability to protect passengers from the weather. Bus shelters must be designed to ensure protection from rain and heat and designs need to be subjected to community consultation to ensure maximum effectiveness.

### 3.5.5 Bus Priority for Principal Routes

Principal bus routes as part of the Principal Public Transport Network need to be provided with traffic light priority at all major intersections to avoid delays at traffic lights. Likewise High Occupancy Vehicle Lanes (HOV lanes being defined as lanes that accept buses or vehicles with two or more passengers) should be provided along major roads to ensure increased visibility for bus services and quicker journey times. This will provide an efficiency saving for bus services thorough providing higher utilisation of bus infrastructure assets and allowing for a greater return of investment in bus services.

Buses in particular require traffic light priority exiting Ringwood Station onto the Maroondah Highway. This is a major source of delay for bus services particularly during peak hour and makes public transport a less attractive mode of travel relative to private vehicle travel.

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<sup>20</sup> *It's Time to Move* (PTUA, 2002), p. 21.

### **3.6 Public Transport Signage**

Easily identifiable signage reduces the current confusion that exists at bus stops and at interchanges and train platforms. Such signage can also be used to identify the proximity of nearby facilities such as TAFEs, shopping centres, health and recreational services that are located near rail stations or bus stops.

There is significant scope to utilise such signage at Ringwood and Ringwood East Stations identifying the proximity of the Ringwood Aquatic Centre and nearby shopping and civic facilities, as well as in Croydon to identify nearby educational and civic facilities.

Furthermore through the streamlining of bus routes as identified previously within this report passengers and the community will understand directly where a bus travels as route structures will avoid deviations from major roads (similar to the direct structure provided by tram routes).

There is currently much confusion caused due to the indirect and circuitous nature of bus services within Maroondah. While it may be appropriate for local services to follow such a structure, principal public transport routes must travel directly along main roads with little or no deviation, unless it to service a nearby activity centre (such as route 670 along Maroondah Highway deviating slightly to serve the activity centre of Croydon).

### **3.7 Fare Restructuring**

Ringwood is currently located at the beginning of zone three within the Melbourne metropolitan rail network. This is a contradiction with other parts of Melbourne, such as Hurstbridge which are considered part of zone two yet are at a greater distance to the CBD than Ringwood.

It is therefore recommended that Melbourne's public transport zone system needs to be applied from uniform intervals originating from the CBD to ensure fairer distribution of fares. Additionally activity centres should be located fully within a zone to encourage travel to such centres from nearby areas. In the case of Maroondah it is recommended that Ringwood be placed within zone two (while allowing for a zone two/three overlap through to Croydon) and that zone two is extended to Ringwood East and Heathmont to encourage park and ride at these stations rather than at the activity centre of Ringwood.

### **3.8 Pedestrian and Bicycle Facilities**

This will allow travel within Maroondah to consist fully of a single zone (comprising of either zone two or zone three).

Sustainable transport also needs to include comprehensive pedestrian and cycling facilities. As such Maroondah needs to be provided with a comprehensive bicycle network including bicycle lanes along or in parallel to major roads.

Both pedestrian and cycling paths need to be well maintained to ensure easy access throughout the municipality and strengthen the ability to walk from a bus stop located on a principal public transport

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route to respective destinations. In most circumstances pedestrians are likely to walk 400 to 500 metres (5 to 10 minutes walk) to a principal public transport service or to nearby facilities.

As such easily discernable walking and cycling paths must be provided from stops located on principal public transport routes to nearby educational, civic, residential and commercial facilities. In particular improved pedestrian access is required from Eastland to Ringwood Station across the Maroondah Highway. This is currently a pedestrian hostile environment due to the long delay in pedestrian crossing sequences and short amount of time provided to cross the road.

## 4.0 Park and Ride – Is It Effective?

There are significant positive community benefits, such as an increased perception of safety, through facilitating commercial, community and residential development in closer proximity to rail stations. This would also reinforce the Melbourne 2030 design specifications for activity centres.

For example this includes facilitating retail development closer to Croydon Station to improve the physical integration between the Station and the Main Street Precinct. While this would require a net reduction in car parking spaces such methodology is consistent with Melbourne 2030, assuming that public transport improvements are immediately forthcoming. ‘Park and Ride’ facilities are best provided in areas that are not designated activity centres such as Ringwood East or Heathmont and would allow scarce real estate within activity centres to be utilised towards economic and community beneficial purposes.

Expecting people to drive to railway stations places an artificial limit on the number of passengers the train system can support. Car parks are expensive to build and maintain, are space-intensive, lock up valuable real estate near stations, and do not reduce net dependence on private vehicle travel. In well patronised rail systems around the world, most train passengers arrive at the station by feeder bus or tram, not by car; as it would simply be impossible to provide enough car parking facilities to cater for these passengers.

According to the 2001 Census, around 120,000 journeys to work are made by train each working day in Melbourne. Table 4-1 shows how these commuters travelled to the station on Census day:

**Table 4-1** Method of travel to Work (2001 Census)<sup>21</sup>

<b>Access mode</b>	<b>Passengers</b>	<b>Percent</b>
Walk	68,682	58.0
Feeder bus or tram	22,201	18.7
Car driver	19,274	16.3
Car passenger	6,493	5.5
Bicycle	1,110	0.9
Other (mainly taxi)	733	0.6
<b>Total</b>	<b>118,493</b>	<b>100.0</b>

As the figures show, barely one in five Melbourne rail commuters travel to stations by car. On the other hand, a clear majority of train travellers walk to a station, while a comparable number arrive by bus or tram as by car.

This is in contrast to cities such as Toronto where over 75% of passengers use a feeder bus or tram service to travel to and rail stations. This is made possible due to readily available and frequent feeder services<sup>22</sup>.

<sup>21</sup> Source: Australian Bureau of Statistics, Census Classification Counts 2001: Melbourne Statistical Division, Method of travel to work.

<sup>22</sup> Paul Mees, A Very Public Solution, p.232, (2000).

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## 5.0 Urban Density and Public Transport – Is There A Link?

It is often claimed that Melbourne and in particular the outer suburbs have too low a population density to support public transport. The Ringwood Transit City Community Coalition (RTCCC) contends that this notion is incorrect and that it is ultimately public transport services levels that determine potential public transport patronage.

Public transport runs successfully in many cities with similar or lower population densities than Melbourne. Any city with sufficient population density to cause traffic congestion has sufficient population to support a first-rate public transport alternative. As shown in table 5-1 while Melbourne's population density did decline somewhat after World War II, current trends demonstrate that urban density is in fact increasing.

**Table 5-1** Population density within Melbourne.

Year	Overall urban density(people/ha)	Data source
1951	23.4	Melb. Metro. Planning Scheme 1954, p. 23
1961	21.4	Australian Bureau of Statistics
1971	18.1	A.B.S.
1976	16.75	Melbourne Social Atlas, 1976 (A.B.S.)
1981	15.9	Social Atlas, 1981
1986	16.05	Social Atlas/"Supermap" Census Data, 1986
1991	16.8	Social Atlas/Supermap, 1991
1996	17.9	Department of Infrastructure, 1998

Table 5-2 compares a combination of inner, middle and outer suburbs in terms of urban density. While houses do tend to be larger in the outer suburbs, they also typically have more people living in them. This results in an overall population density comparable to the inner and middle suburbs.

**Table 5-2** Population densities within specific suburbs of Melbourne.

Suburb	Period of settlement	Gross residential density (per ha)
Yarraville	1890s-1920s	25.4
Balwyn	1910s-1940s	24.9
Gardenvale	1880s-1920s	21.7
Keysborough	1960s-1980s	36.7
Wheelers Hill	1970s-1990s	26.0
Bayswater	1960s-1970s	22.8

This data demonstrates that any location in the Melbourne urban area can support a bus service running every ten minutes throughout the day, assuming just 20 per cent of people make just one return journey by public transport per day. This is verified through sources that state between 12.5 people per hectare<sup>23</sup> or 14 people per hectare<sup>24</sup> are required to support service frequencies of 10 minutes for bus services.

<sup>23</sup> Brisbane Transportation Study (1965)

<sup>24</sup> Paul Mees, A Very Public Solution, (2000)

The situation in Melbourne contrasts markedly with most United States cities, which remained relatively compact until well into the twentieth century, then spread outwards rapidly under the influence of the car.

Urban development in these cities proceeded in a haphazard manner, with new residential subdivisions springing up in rural locations quite remote from the existing urban area. The term 'urban sprawl' was originally coined to describe this kind of unplanned, non-contiguous development.

By comparison, Melbourne's urban development is quite orderly. The spread of the urban area occurred much earlier than in US cities, and under the influence of public transport rather than car travel. Even when Melbourne's urban planning became influenced by private vehicle transport, the city continued to develop as a contiguous built-up area, and with block sizes smaller than their US equivalents. As a result, Melbourne retains an urban form in which large-scale public transport networks are viable.

As outlined previously the correlation between service levels and patronage is confirmed through the 37% increase in patronage experienced on the 888/889 SmartBus which since it began operation in 2002 provided 15 minute service frequencies during weekdays and weekday service spans to midnight<sup>25</sup>.

With proper attention to service frequencies and connections the public transport network in Maroondah could form a network that will result in high patronage and high cost recovery.

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<sup>25</sup> Source: Department of Infrastructure 'What Is SmartBus' [www.doi.vic.gov.au](http://www.doi.vic.gov.au)

## 6.0 Public Transport and Sustainability – Economic Benefits

It must be noted that there are substantial economic benefits in supporting an increase in public transport service provision and therefore an increase in patronage.

As demonstrated within Appendix C traffic congestion is a major economic burden costing the economy approximately \$12 billion per annum<sup>26</sup>. Long-term research has demonstrated that the building of additional roads does not reduce traffic in the longer term. The Organisation for Economic Cooperation and Development (OECD) has stated that ‘building more roads has not noticeably reduced congestion – new road space is quickly filled’<sup>27</sup>.

Additionally road trauma and accidents cost the Maroondah community \$38 million per year<sup>28</sup>. This is an economic cost that the Maroondah community faces in lost productivity and damage to infrastructure, as well as also the social impact and corresponding lost productivity.

These are economic costs borne by the community due to the lack of readily accessible public transport network. This view is confirmed through the Department of Infrastructure commenting on the yet unreleased ‘Bus Plan’, which mentioned that Melbourne-wide patronage would increase up to 308% with an economic benefit estimated at \$3.7 billion over 20 years<sup>29</sup> should fundamental bus service improvements be provided.

The most common reasons given for not using public transport are the lack of frequent and readily available service and the length of travel times. This is consistent with the findings of a report prepared for the Victorian Department of Infrastructure that shows commuters are willing to make the switch from cars to public transport where the services are<sup>30</sup>:

- Extensive in coverage;
- Frequent;
- Reliable;
- Well publicised, and
- Well integrated.

Despite the long accepted mantra that roads are good for the economy and employment, this association appears unsupported by evidence and ambiguous at best. Whitelegg (1994) could not demonstrate any positive connection between roads, jobs and the economy, the UK Standing Advisory Committee on Trunk Road Assessment found no discernible effect on economic growth from road building whilst leaving open the possibility of negative economic impacts<sup>31</sup>, and a 1997 study for the World Bank found a negative correlation between car use and per capita income in high income economies<sup>32</sup>.

<sup>26</sup> Appendix D – The Road Deficit.

<sup>27</sup> Melbourne Metropolitan Strategy, Technical Report No.1, 2001.

<sup>28</sup> Casualty Crash Costs, Metropolitan Melbourne 2000 – Australian Transport Safety Bureau Blackspot Program.

<sup>29</sup> Melbourne Bus Plan (Department of Infrastructure, 2003).

<sup>30</sup> Booz, Allen & Hamilton, 2001.

<sup>31</sup> SACTRA 1999.

<sup>32</sup> Kenworthy, Laube, Newman & Barter 1997.

Much of the theoretical benefit from road building is a reduction in traffic congestion allowing shorter travel times and lower fuel consumption. In reality a wide body of research from around the world has demonstrated that time and fuel savings are frequently over-estimated since additional road capacity quickly induces further demand and congestion returns to the levels that existed prior to the addition of new road capacity<sup>33</sup>.

A study by the OECD found that “[a]s soon as new road space becomes available in large cities, it is quickly filled.”. “While congestion might spread in cities which make little or no attempt to increase road capacity in line with demand, such cities will not “grind to a halt”. People and firms adapt. Travellers change either mode or destination”<sup>34</sup>.

The value of land under roads was estimated at around \$100-120 billion in 1996<sup>35</sup>. Adjusting these figures for inflation suggests a current value in the range \$120-145 billion which is roughly equivalent to the total assets reported in the Commonwealth government's financial statements.

Indexation in line with house prices would suggest a land value around \$222-267 billion. A figure closer to those obtained by indexing in line with house prices (as opposed to CPI) is supported by subsequent research that valued the land provided for cars in Sydney alone at over \$90 billion<sup>36</sup>.

As figure 6-1 demonstrates the economic cost of private car dependence also affects individuals as they struggle with the financial burden of excessive car usage such as the continuing rise in petrol prices. It is estimated that a typical household is now spending around an extra \$16 per month on petrol compared to just three months ago. If a barrel of oil doubles in price to US\$105 in the medium term as has been predicted the typical outer eastern household spending about \$300 a month on petrol alone<sup>37</sup>. This increased financial burden will reduce household disposable household expenditure resulting in lower household economic activity.

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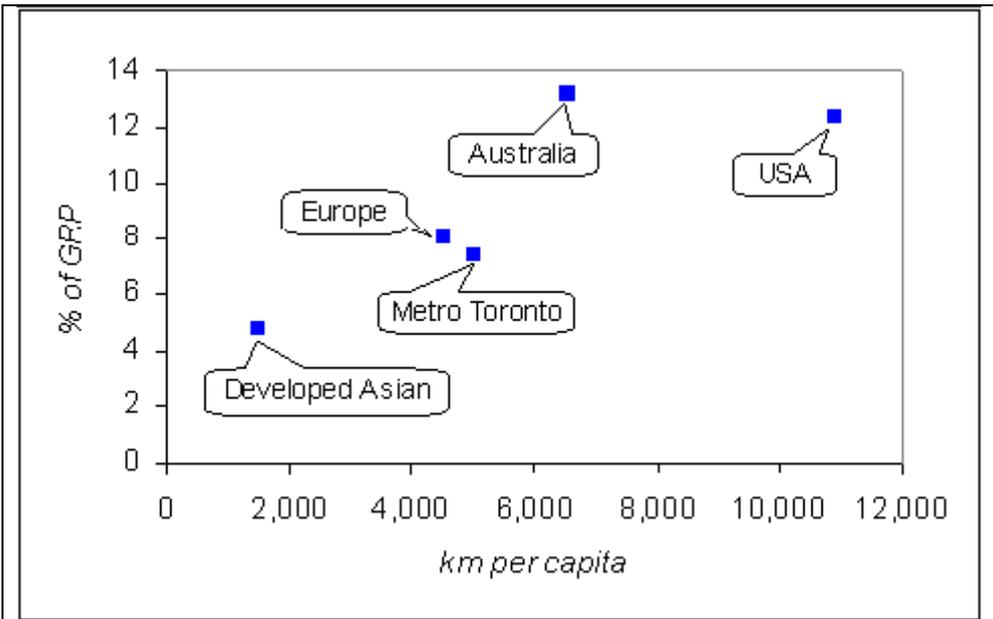
<sup>33</sup> SACTRA 1994; Institution of Engineers 1990; Pfleiderer & Dieterich 1995; Luk & Chung 1997.

<sup>34</sup> OECD 1995.

<sup>35</sup> NIEIR 1996.

<sup>36</sup> Banfield, Hutabarat & Diesendorf 1999.

<sup>37</sup> PTUA 2004.



**Figure 6-1** Car travel & share of income consumed by transport<sup>38</sup>

**Note:** As car dependency rises, as shown by the amount of travel undertaken by car, so too does the proportion of income (or a city's Gross Regional Product) that is consumed by transport. Despite higher fuel taxation, European households only need spend two thirds as much as Australian households on transport thanks to superior public transport

Reducing the extent to which this land is made available for free to motorists particularly within designated activity centres in the form of high capacity roads and parking, combined with increased provision for public transport and balanced urban consolidation practices, could encourage more rational use of this land and reduce the amount of energy consumed by transport.

<sup>38</sup> Newman, P., 2000, Sustainable Transportation and Global Cities, Institute for Sustainability and Technology Policy, Perth.

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## 7.0 Conclusion

The Ringwood Transit City Community Coalition (RTCCC) believes that Maroondah is poised with a significant opportunity to demand and expect a public transport network that is competitive with private vehicle travel ensuring the continued social, economic and environmental success of the municipality.

As such the Ringwood Transit City Community Coalition (RTCCC) believes that only through better service levels and better integration of the rail and bus services will the municipality and the activity centres of Ringwood and Croydon reach their full potential consistent with the Melbourne 2030 goal of reducing car dependence and improving accessibility.

It must be noted that overall public transport modal share has remained static over the previous three years due to the lack of a fundamental improvement in bus service frequencies and operating spans. The Ringwood Transit City Community Coalition (RTCCC) is willing to cooperate and assist a supportive Maroondah Council that undertakes a comprehensive and cohesive public advocacy and lobbying campaign to provide the pressure necessary to ensure the creation of a viable and readily accessible public transport network within Maroondah.

**Table 7-1** Recommended service levels for public transport services

<b>Travel Mode</b>	<b>Frequency</b>	<b>Service Span</b>
Principal Bus routes	10 – 15 minutes on weekdays 15 – 20 minutes on weekends	5am to midnight sevens days per week
Local Bus Routes	15 – 30 minutes	6am to 10pm sevens days per week
Train services	5 – 10 minutes (peak services) 10 – 15 minutes weekdays 15 – 20 minutes weekends	5am to midnight seven days per week

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## 8.0 Appendix A – Weekday Bus Services

The following tables summarise the average bus starting and finishing times, as well as average service frequencies during peak, off-peak, evening and weekend times (if applicable).

**Table 8-1** Summary of bus routes serving Maroondah during weekdays

Bus Route	Description	Start time	Finish time	Peak frequency	Off-peak frequency
270	Ringwood to Box Hill (via Mitcham)	6:21am	6:37pm	30 mins	30 mins
304	City to Warrandyte (via Eastern Freeway and Blackburn Road)	6:23am	10:36pm	30 – 60 mins	No service ex Ringwood
306	City to North Ringwood (via Eastern Freeway and Wetherby Road)	6:31am	6:11pm	20 – 30 mins	No service
364	Ringwood to Doncaster Shopping Town (via Warrandyte) – The Pines	7:22am	11:20pm	30 mins	30 mins
	Doncaster to Ringwood	8:28am	5:21pm	30 mins	30 mins
365	Ringwood to Doncaster Shoppingtown (via Park Orchards) – Tunstall Square	7:00am	8:35pm	30 mins	30 mins
	Doncaster to Ringwood	9:27am	5:15pm	30 mins	30 mins
366	Ringwood to Croydon (via Croydon Hills)	6:15am	11:00pm	20 mins	30 - 60 mins
	Croydon to Ringwood	6:02am	11:30pm	20 mins	30 - 60 mins
367	Ringwood to Croydon (via Ringwood East)	6:15am	7:30pm	15 – 20 mins	25 mins
664	Lilydale Station – Chirnside Park – Knox City (via Croydon and Bayswater)	6:38am	7:38pm	20 mins	20 mins
665	Ringwood to Dandenong (via Knox City and Stud Park)	6:11am	7:39pm	30 mins	30 mins
670	Ringwood to Lilydale (via Chirnside Park)	6:40am	7:20pm	20 mins	30 mins
671	Croydon to Chirnside Park	6:55am	7:25pm	60 mins	60 mins
672	Croydon to Chirnside Park (and Croydon Hills)	7:10am	6:52pm	60 mins	60 mins
679	Chirnside Park to Ringwood	5:50am	5:50pm	20 mins	30 mins
688	Croydon to Olinda (via Montrose)	5:52am	8:08pm	30 mins	40 mins
689	Croydon to Montrose (via Durham Road)	7:25am	6:55pm	60 mins	120 mins
690	Croydon Station to Boronia Station	5:51am	7:25pm	30 mins	30 - 60 mins
737	Croydon to Monash University (via Boronia, Knox City and Glen Waverley)	6:12am	7:10pm	30 mins	30 mins
742	Eastland to Chadstone (via Vermont South, Glen Waverl Oaklei	7:40am	6:12pm	30 mins	30 – 40 mins

### Key findings:

- Eighteen bus routes currently service Maroondah.
- Only three bus routes provide evening services in Maroondah (304, 365 and 366).
- Only one service provides better than a 20 minute frequency during peak times (367).

## 9.0 Appendix B – Weekend Bus Services

**Table 9-1** Summary of bus routes serving Maroondah during weekends

Bus Route	Description	Start time	Finish time	Saturday Frequency	Sunday Frequency
270	Ringwood to Box Hill (via Mitcham)	8:15am	6:15pm	60 mins	NO SERVICE
304	City to Warrandyte (via Eastern Freeway and Blackburn Road)	<b>DOES NOT SERVICE MAROONDAH ON WEEKENDS</b>			
306	City to North Ringwood (via Eastern Freeway and Wetherby Road)	<b>NO SERVICE ON WEEKENDS</b>			
364	Ringwood to Doncaster Shopping Town (via Warrandyte) – The Pines	7:55am 8:05 (Sun)	5:55pm	60 mins	120 mins
365	Ringwood to Doncaster Shoppingtown (via Park Orchards) – Tunstall Square	8:02am	6:02pm	60 mins	NO SERVICE
366	Ringwood to Croydon (via Croydon Hills)	8:00am	6:00pm	60 mins	120 mins
367	Ringwood to Croydon (via Ringwood East)	8:30am	6:00pm	60 mins	120 mins
664	Lilydale Station – Chirnside Park – Knox City (via Croydon and Bayswater)	7:45am 8:34 (Sun)	6:05pm	30 mins	60 mins
665	Ringwood to Dandenong (via Knox City and Stud Park)	8:30am	5:30pm	60 mins	60 mins
670	Ringwood to Lilydale (via Chirnside Park)	7:38am	6:18pm	40 mins	<b>NO SERVICE</b>
671	Croydon to Chirnside Park	8:47am	11:42am	60 mins	<b>NO SERVICE</b>
672	Croydon to Chirnside Park (via Croydon Hills)	9:27am	12:22pm	120 mins	<b>NO SERVICE</b>
679	Chirnside Park to Ringwood	8:15am	12:37pm	60 mins	<b>NO SERVICE</b>
688	Croydon to Olinda (via Montrose)	6:40am	6:48pm	60 mins	<b>NO SERVICE</b>
689	Croydon to Montrose (via Durham Road)	8:39am	5:00pm	60 mins	<b>NO SERVICE</b>
690	Croydon Station to Boronia Station	7:08am	5:26pm	60 mins	<b>NO SERVICE</b>
737	Croydon to Monash University (via Boronia, Knox City and Glen Waverley)	6:35am 8:40 (Sun)	7:15pm	40 mins	60 mins
742	Eastland to Chadstone (via Vermont South, Glen Waverl Oaklei)	8:50am	5:15pm	40 – 60 mins	<b>NO SERVICE</b>

### Key Findings:

- Over half of the bus routes serving Maroondah do not run on a Sunday
- No route provides evening services on the weekends.

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## 10.0 Appendix C - The Road Deficit

The Road Deficit describes the extent in which society subsidises private motor vehicle users<sup>39</sup>. The figures quoted are from various sources.

**Table 10-1** The Road Deficit

Revenue/Cost Item	Amount (\$ billion p.a.)
Revenue	
Fuel excise	8.5 to 12
Registration fees	2.2 to 3.8
Tolls	6
Insurance premiums	80
<b>Total Revenue</b>	<b>19.3 to 24.4</b>
<b>Expenditure, subsidies &amp; externalities</b>	
Road construction & maintenance <i>Spending by all tiers of government fluctuates, however BTRE figures suggest average annual expenditure in the region of billions.</i>	4.6 to 7.58
Land use (land under roads) <i>The value of land under roads was estimated at around \$100-120 billion in 1996, suggesting a current value of at least \$120 billion adjusting for inflation or as much as \$267 billion after indexing in line with house prices. Assuming a 5% return on assets, this equates to over \$6 billion p.a.</i>	6 to 13
Congestion <i>Congestion on urban roads is a growing problem which is forecast to cost \$30 billion p.a. by 2015. Much research shows that road building does little, if anything, to alleviate congestion in the long-term.</i>	11 to 12.8
Air pollution <i>Motor vehicles are a key source of urban air pollution, causing and aggravating respiratory diseases.</i>	3.3 to 4.3
Climate change <i>The transport sector is one of the main sources of carbon emissions.</i>	2.4
Noise <i>The primary source of urban noise pollution is motor vehicles.</i>	1.2
Accidents <i>The human cost of traffic accidents includes loss of life and productivity and significantly exceeds the insurance premiums paid by motorists.</i>	5 to 15
Tax deductions for car use <i>Deductibility of motor vehicle expenses reduces taxation revenues for government, and the current tax system includes perverse incentives to excessive vehicle travel such as the statutory method under the Fringe Benefits Tax regime.</i>	2.8
Queensland fuel subsidy <i>The fuel subsidy provided by the Queensland government represents funds that could have been allocated to schools, hospitals, police, etc or not taken from Victoria under horizontal fiscal equalisation.</i>	0.5
<b>Total costs</b>	<b>36.8 to 59.58</b>
<b><u>Road deficit (in billions of dollars per annum)</u></b>	<b><u>17.5 to 35.18</u></b>

<sup>39</sup> PTUA Submission to the Productivity Commission Inquiry into the Economic and Environmental Potential offered by Energy Efficiency.

## 11.0 Appendix D – List of Recommendations

**Table 11-1** List of recommendations (summary)

<ul style="list-style-type: none"> <li>• Maroondah Council to embark upon a continued public transport advocacy and lobbying campaign that includes a public campaign for improved public transport services within the municipality.</li> <li>• Inclusion of Maroondah Highway, Canterbury/Swansea Road, Bayswater Road and Wonga/Warrandyte Roads on the PPTN Network with corresponding service upgrades.</li> <li>• Priority implementation for the Ringwood to Frankston SmartBus to ensure service upgrades by the end of 2006. Evening and public holiday services to be introduced by the end of 2005.</li> <li>• Priority upgrades of routes 670 and 679 to provide evening and comprehensive weekend services by the end of 2005.</li> <li>• Introduction of PPTN services along Bayswater Road connecting Croydon and Bayswater.</li> <li>• Introduction of PPTN services from Mooroolbark to Boronia along Manchester and Colchester Roads.</li> <li>• Introduction of PPTN services from Croydon to Lilydale via Mt. Evelyn along Mount Dandenong Road.</li> <li>• Inclusion of route 737 into the PPTN with an extension to Chirnside Park along Dorset and Lyons Road.</li> <li>• Weekday off-peak rail timetables frequencies of 20 minutes to and from Ringwood.</li> <li>• Inclusion of Ringwood within Metropolitan Zone Two with the zone overlap extended to Croydon.</li> <li>• Redevelopment of Ringwood Station to ensure DDA compliance and increased perception of safety thereby encouraging public transport usage and increasing the perception of Ringwood.</li> <li>• Accessible bus stops and low floor buses to provided along routes identified within the PPTN to ensure DDA compliance.</li> <li>• Signalling improvements along the Ringwood and Belgrave/Lilydale lines providing safety benefits and faster journey times.</li> <li>• Improvement of timetable coordination between bus and train services including frequency improvements along the PPTN bus routes so that they operate at the same frequency as rail services.</li> <li>• Rail triplication from Ringwood to Box Hill allowing the introduction of flier trains from Ringwood.</li> <li>• Traffic priority for PPTN bus services including the use of HOV lanes along major roads.</li> </ul> <p><b>Network wide recommendations:</b></p> <ul style="list-style-type: none"> <li>• Principal bus routes must operate at frequencies of 10 minutes during weekdays (15 minutes for evenings and weekends) with hours of operation between 5am to midnight or the last train (whichever is later).</li> <li>• Local bus routes should operate with at least 30 minute frequencies on both weekdays and weekends, although more frequent services should be provided for busier routes. Hours of operation should be between at least 5am and 10pm.</li> <li>• Comprehensive pedestrian and bicycle paths linking public transport stops and key destinations.</li> </ul>
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**Table 11-2** Recommended service levels

Travel Mode	Frequency	Service Span
Principal Bus routes	10 – 15 minutes on weekdays 15 – 20 minutes on weekends	5am to midnight sevens days per week
Local Bus Routes	15 – 30 minutes	6am to 10pm sevens days per week
Train services	5 – 10 minutes (peak services) 10 – 15 minutes weekdays 15 – 20 minutes weekends	5am to midnight seven days per week

See figure 11-1 (on next page) for a diagrammatic representation of the stated PPTN bus service improvements.

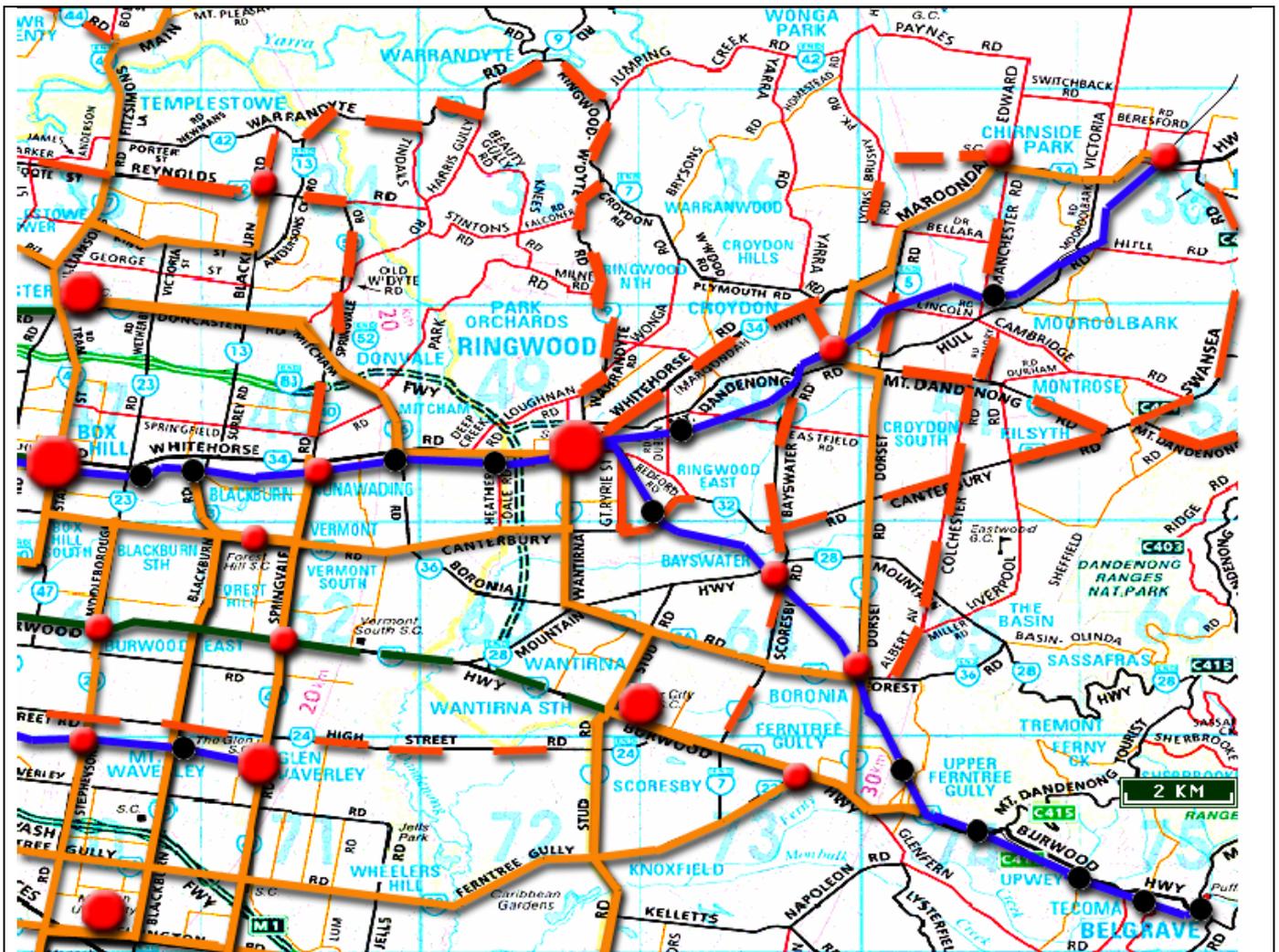


Figure 11-1 Regional public transport network (with recommendations)

**Note:** Dashed lines represent recommendations outlined in this and other submissions (red represent bus improvements)  
 Red circles represent activity centres (larger the circle the more prominent the activity centre).  
 Solid orange lines represent services identified on the Principal Public Transport Network.  
 Blue and green lines represent the rail and tram network respectively.  
 Black circles represent rail stations.

