3.3. Existing Traffic Operation

Site inspections indicate that the signalised intersections along Punt Road are currently operating at or close to capacity in the weekday and weekend peak periods. Traffic operation is also poor in high volume off-peak periods due to on-street parking reducing the midblock sections of Punt Road to one lane each way.

Traffic using the Punt Road/Toorak Road and Punt Road/Alexandra Avenue intersections typically experiences the highest delays. The other intersections have some spare capacity on the Punt Road approaches, due perhaps to the priority given to this road.

Northbound traffic on Punt Road is affected by downstream delays at Punt Road/Swan Street during peak periods. Southbound traffic does not appear to be affected by downstream intersections.

East-west traffic on Toorak Road, Domain Road and Alexandra Avenue typically experiences greater delays than east-west traffic using the other more southerly routes crossing Punt Road.

Pedestrian activity is particularly pronounced at the Punt Road/Moubray Street/Greville Street intersection (during school start and finish times) and Punt Road/Toorak Road intersection, with high pedestrian volumes causing delays to turning traffic.

The existing traffic operation deficiencies at the signalised intersections along Punt Road, within the study area, are shown in Table 1.

Table 2 shows the results of SIDRA analysis of the signalised intersections along Punt Road, and includes the degree of saturation (DOS) and average control delay at each intersection. A DOS greater than 0.95 and/or average control delay greater than 55sec is considered to represent very poor operation (ie. Level of Service E or F). A DOS greater than 1.0 indicates that volumes are in excess of intersection capacity.

As shown in Table 2, all intersections except Punt Road/Domain Road operate at a DOS of around 0.95 or worse in one or both weekday peak periods. The four main intersections along Punt Road at High Street, Commercial Road, Toorak Road and Alexandra Avenue experience average intersection delays around 55sec or worse in one or both weekday peak periods.

The SIDRA analyses are based on the number of vehicles that actually pass through the intersection in an hour, rather than the demand for travel through the intersection. Hence intersections with a DOS around 1.0 may actually have suppressed demand and longer delays than shown.
### Table 1 Traffic Operation Deficiencies

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Movement Provisions</th>
<th>Congestion</th>
<th>Signal Phasing</th>
<th>Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>High St</td>
<td>N/A</td>
<td>Limited congestion. Some pedestrian activity, which delays turning traffic.</td>
<td>N/A</td>
<td>Trams share traffic lanes. Curved alignment on Punt Rd northbound, south of High St.</td>
</tr>
<tr>
<td>Moubray Rd / Greville St</td>
<td>N/A</td>
<td>Punt Rd approaches experience little congestion due to significant green time provided (two phase operation). Moubray Rd approach congested at school start/finish times due to limited capacity. Some pedestrian activity, which delays turning traffic.</td>
<td>N/A</td>
<td>Side streets offset. Narrow approach on Greville St.</td>
</tr>
<tr>
<td>Commercial Rd</td>
<td>N/A</td>
<td>Limited congestion. Some pedestrian activity, which delays turning traffic.</td>
<td>N/A</td>
<td>Trams share traffic lanes on east approach.</td>
</tr>
<tr>
<td>Toorak Rd</td>
<td>Right turn on west approach banned in both peaks, and right turn on east approach banned in PM peak.</td>
<td>All approaches very congested in AM peak due to high traffic volumes, high pedestrian volumes, numerous signal phases, parking on Toorak Rd in off peak direction, etc. Less delays in PM peak than AM peak because both Toorak Rd right turns banned. Right turn on north approach experiences high demand and long queues in AM peak, due to lack of previous turn opportunities.</td>
<td>Numerous phases, resulting in limited green time for some busy movements.</td>
<td>Trams share traffic lanes on both approaches.</td>
</tr>
<tr>
<td>Domain Rd</td>
<td>Shared through/right turn lanes on Punt Rd. Right turn on north approach banned in peaks.</td>
<td>Domain Rd approaches congested due to limited capacity. Punt Rd approaches generally experience little congestion (except when blocked by right turners and downstream traffic) due to significant green time provided (two phase operation). Punt Rd northbound traffic can be delayed by downstream congestion at Punt Rd/Swan St in both peaks.</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Intersection</td>
<td>Movement Provisions</td>
<td>Congestion</td>
<td>Signal Phasing</td>
<td>Geometry</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>------------</td>
<td>----------------</td>
<td>----------</td>
</tr>
<tr>
<td>Alexandra Ave</td>
<td>No right turns on Punt Rd.</td>
<td>All approaches very congested in peaks due to high volumes. Punt Rd northbound traffic delayed by downstream congestion at Punt Rd/Swan St in both peaks. Alexandra Ave eastbound traffic delayed by downstream congestion on Alexandra Ave in PM peak. Some rat running on Dobsons St to turn left into Punt Rd, rather than using Alexandra Ave intersection.</td>
<td>Alexandra Ave split phase.</td>
<td>Curved alignment on Punt Rd south of Alexandra Ave.</td>
</tr>
<tr>
<td>Intersection</td>
<td>AM Peak Hour</td>
<td>PM Peak Hour</td>
<td>Comment</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DOS</td>
<td>Ave. Delay (s/veh)</td>
<td>Critical Movements</td>
<td>DOS</td>
</tr>
<tr>
<td>High St</td>
<td>0.85</td>
<td>41</td>
<td>Punt Rd northbound and High St right turn to north</td>
<td>1.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Parking allowed on High St in off peak direction. Intersection operates better than shown if no cars are parked.</td>
<td></td>
</tr>
<tr>
<td>Moubray Rd/Greville St</td>
<td>0.93</td>
<td>19</td>
<td>Punt Rd right turn into Moubray Rd and east and west approaches</td>
<td>0.59</td>
</tr>
<tr>
<td>Commercial Rd</td>
<td>0.73</td>
<td>36</td>
<td>Punt Rd northbound</td>
<td>0.92</td>
</tr>
<tr>
<td>Toorak Rd</td>
<td>0.96</td>
<td>52</td>
<td>Punt Rd northbound and Punt Rd right turn to west</td>
<td>0.80</td>
</tr>
<tr>
<td>Domain Rd</td>
<td>0.69</td>
<td>25</td>
<td>Punt Rd northbound</td>
<td>0.72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Punt Road northbound traffic affected by downstream delays, causing additional delay in passing through the intersection than shown.</td>
<td></td>
</tr>
<tr>
<td>Alexandra Ave</td>
<td>0.94</td>
<td>62</td>
<td>All approaches</td>
<td>1.00</td>
</tr>
</tbody>
</table>

NB. Analyses based on 130sec cycle time and optimised phase times (which may not reflect existing times).
3.4. Crash Data

Crash data for Punt Road between Union Street and City Link shows that 3 fatal and 135 injury crashes were reported between 1 January 2005 and 31 December 2009.

The main crash types were as follows:

- Rear end 33% (45No.)
- Off path 14% (20No.)
- Right turn 14% (19No.)
- Pedestrian 14% (19No.)
- Cross traffic 9% (12No.)
- Head-on 5% (7No.)
- Other 12% (16No.)

The worst crash locations were as follows:

- Commercial Road 17 No. (including 7 rear end)
- Toorak Road 16 No. (including 6 pedestrian and 4 rear end)
- Domain Road 13 No. (including 7 right turn and 5 rear end)
- Alexandra Avenue 9 No. (including 3 rear end)
- High Street 8 No. (including 5 cross traffic)
- Dobson Street 6 No. (including 4 off path)
- Just North of Commercial Rd 6 No.

The high number of rear end crashes along the route is likely to be a reflection of the congested conditions along the route, particularly in peak periods.

The high number of right turn crashes, particularly at the Punt Road/Domain Road intersection, is due to the lack of protected right turn lanes or fully controlled right turn facilities.

The high number of off path crashes at the Punt Road/Dobson Street intersection is due to the steep and curved alignment of Punt Road at this location.

Treatments such as extra traffic lanes, fully controlled right turns and improved road alignments are likely to reduce the three predominant crash types. A median could reduce the number of pedestrian and head-on crashes.

3.5. Future Traffic Volumes

Network modelling has been undertaken for different years (2011, 2021, 2031 and 2041) and different network scenarios to determine future traffic volumes on Punt Road and surrounding roads.

The base network assumes no upgrade of Punt Road and Hoddle Street. The only significant road upgrade in the base network in the vicinity of Punt Road is in the 2041 network, which includes a new/upgraded link between the Eastern Freeway and Tullamarine Freeway. Public transport upgrades in the base network include the Blue Orbital Smart Bus Route and Melbourne Metro 1 and 2 (refer Section 4.3 for details), with these upgrades relating to new/changed public transport services rather than any changes to the road network.

The upgrade network assumes six lanes (instead of four lanes) on Punt Road within the study area.
As shown in Table 3, the modelling indicates minimal increase in traffic volumes on Punt Road (if it remains in its existing form) over the next thirty years as Punt Road is currently operating at or close to capacity and cannot carry much additional traffic. Greater increases in traffic volume are forecast on the parallel routes of St Kilda Road, Chapel Street and Williams Road.

Widening of Punt Road from four to six lanes results in a 30% to 40% increase in forecast traffic volumes on Punt Road over the next thirty years, with existing and future traffic across the road network attracted to additional capacity along Punt Road. Parallel north-south routes such as St Kilda Road, Chapel Street and Williams Road benefit from an approximate 10% reduction in traffic volumes due to the Punt Road widening.

**Table 3 Daily Traffic Volumes**

<table>
<thead>
<tr>
<th>Road</th>
<th>2011 Base (Punt Rd – 4 Lanes)</th>
<th>2041 Base (Punt Rd – 4 Lanes)</th>
<th>2041 Upgrade (Punt Rd – 6 Lanes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North-South Roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Queens Rd</td>
<td>75,000</td>
<td>76,800</td>
<td>75,300</td>
</tr>
<tr>
<td>St Kilda Rd</td>
<td>71,000</td>
<td>78,100</td>
<td>74,600</td>
</tr>
<tr>
<td><strong>Punt Rd – south of Toorak Rd</strong></td>
<td>48,400</td>
<td>53,300</td>
<td>73,900</td>
</tr>
<tr>
<td>Punt Rd – south of Swan St</td>
<td>79,200</td>
<td>82,000</td>
<td>83,100</td>
</tr>
<tr>
<td>Chapel St</td>
<td>24,800</td>
<td>31,200</td>
<td>28,300</td>
</tr>
<tr>
<td>Williams Rd</td>
<td>19,000</td>
<td>28,400</td>
<td>26,800</td>
</tr>
<tr>
<td>Orrong Rd</td>
<td>13,500</td>
<td>14,900</td>
<td>14,600</td>
</tr>
<tr>
<td><strong>East-West Roads</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High St</td>
<td>23,700</td>
<td>28,000</td>
<td>28,600</td>
</tr>
<tr>
<td>Commercial Rd</td>
<td>22,200</td>
<td>25,400</td>
<td>25,900</td>
</tr>
<tr>
<td>Toorak Rd</td>
<td>28,200</td>
<td>30,600</td>
<td>30,600</td>
</tr>
<tr>
<td>Alexandra Ave – east of Punt Rd</td>
<td>43,200</td>
<td>47,700</td>
<td>46,400</td>
</tr>
<tr>
<td>Alexandra Ave – west of Punt Rd</td>
<td>28,700</td>
<td>35,600</td>
<td>38,900</td>
</tr>
<tr>
<td>City Link</td>
<td>207,200</td>
<td>218,400</td>
<td>216,300</td>
</tr>
</tbody>
</table>

**NB. Volumes shown for section of north-south roads south of Toorak Rd (except as shown), and for section of east-west roads east of Punt Rd**
4. STRATEGIC CONTEXT

4.1 Land Use and Transport Planning

Melbourne has experienced strong population growth in recent years, which is expected to continue into the future. Population forecasts for Melbourne show an increase from 4.1 million persons in 2011 to 5.5 million persons in 2036. The consequential growth in travel demand will cause increasing pressures on the transport system.

Legislation and land use/transport planning strategies focus on the need to integrate land use and transport planning, to best meet economic and social needs and contribute to environmental sustainability.

Melbourne 2030 and its update Melbourne @ 5 Million provide the former Government’s framework for managing growth and development of the metropolitan area. The plans aim to protect the liveability of established areas and concentrate major growth and change in activity centres and undeveloped land. Transport policies focus on the development of a more sustainable transport system, including upgrade of the public transport network to better connect activity centres and provide more efficient and reliable operation.

Activity centres in the vicinity of Punt Road are as follows:

- Central Activities Area - Melbourne CBD
- Principal Activity Centre - Prahran/South Yarra (Chapel Street/Commercial Road)
- Major Activity Centres - Toorak Village (Toorak Road east of Williams Road)
  - Richmond, Swan Street (Church Street)
  - Richmond, Bridge Road (Church Street)
  - Richmond, Victoria Street (east of Hoddle Street)
- Specialist Activity Centre - Alfred Medical Research and Education Precinct (Punt Road/Commercial Road)

Punt Road – Hoddle Street, Commercial Road and Toorak Road provide direct or indirect access to the above activity centres. Punt Road also indirectly supports access to the activity centres along Chapel Street - Church Street, by diverting traffic away from this route and facilitating more efficient tram operation.

The Victorian Transport Plan provides the former Government’s investment strategy for meeting travel demands associated with future growth and development. The Plan does not include any projects along Punt Road within the study area. Strategies of relevance to any upgrade of Punt Road include:

- Strong emphasis on developing a more sustainable transport system through improvements to public transport, cycling and walking facilities.
- Focus on completing gaps in the arterial road network to better connect communities.
- Recognition of the critical role of Hoddle Street within the transport network.
4.2 Road Network

The arterial road network servicing the inner and middle suburbs of the Melbourne metropolitan area is shown in Figure 6. Distinctive features of the road network from a regional perspective are several freeways/highways radiating from the CBD and a partial orbital freeway network of the CBD.

Punt Road and Hoddle Street form part of an inner orbital arterial/highway route and bypass of the CBD. Punt Road also fulfills a more localised function in providing access to the CBD and nearby areas from the south-eastern suburbs of Melbourne via Princes Highway and Nepean Highway.

The closest north-south highway/freeway routes to Punt Road are City Link (approximately 5km west) and Warrigal Road (approximately 10km east). City Link forms part of the regional freeway network, providing a bypass of the CBD and connecting the north-western and eastern parts of the region. There are no routes east of the CBD that provide a similar function to City Link. Punt Road - Hoddle Street fulfill this function for suburbs within a fairly narrow, centrally located, corridor and Warrigal Road and Springvale Road fulfill this function for suburbs further east.

There are no north-south routes in the vicinity of Punt Road – Hoddle Street that could provide an effective alternative route. Routes to the west such as St Kilda Road and Queens Road – Kings Way are discontinuous and heavily congested with traffic travelling to/from the CBD. Routes to the east such as Chapel Street - Church Street and Williams Street - Burnley Street are discontinuous, and in the case of Chapel Street - Church Street congested by tram operation. Further east of Punt Road, arterial roads such as Glenferrie Road and Bourke Road are also congested by tram operation. There are no PAOs along any of these alternative routes to allow for any upgrade.

The section of Punt Road between Union Street and City Link represents a constraint within the road network, with the sections to the north and south having a greater number of traffic lanes and able to accommodate a far greater volume of traffic.

Punt Road is a very important part of the regional road network. The Punt Road PAO provides an opportunity to maintain and improve the integrity of this network, and is the only means of increasing north-south arterial capacity (at-grade) in the sub region. Removal of the PAO would contribute to Punt Road being an ongoing constraint within the road network, and result in an increasing transfer of traffic to less desirable routes including public transport routes.

4.3 Public Transport Network

Melbourne is serviced by an extensive public transport network, comprising train, tram and bus services. Patronage statistics show strong growth in public transport use over the last five years, which has been supported by improvements to the public transport system.

Statistics show that recent increases in travel demand in inner Melbourne have largely been met by increased public transport use, rather than increased car use. There is considerable pressure to improve the public transport system to meet the ongoing growth in travel demand, both within inner Melbourne and the outer growth areas. Suitable road based improvements include priority treatments for trams and buses to facilitate increased people movement.

The rail network incorporates numerous rail lines radiating from the CBD, as shown in Figure 7. The south-eastern suburbs are well serviced by rail lines, including the Sandringham, Frankston, Dandenong, Glen Waverley, Alamein and Ringwood lines. The Sandringham line is located only 500m east of Punt Road as shown in Figure 4.
Figure 6  Regional Road Network
Figure 7  Existing Train Network and Melbourne Metro Proposals
An extensive upgrade of the rail network is proposed to accommodate travel demands, including Melbourne Metro 1 and 2 and the Regional Rail Link. Melbourne Metro (MM), as shown in Figure 7, is a proposed rail tunnel crossing the CBD and providing improved access to the CBD and St Kilda Road.

MM1 extends from the existing South Kensington Station to a new Domain Station in St Kilda Road. Various options for Domain Station are being considered, including an option that reduces the number of traffic lanes on St Kilda Road between Domain Road and Toorak Road from eight lanes to four lanes. There are two options for MM2 between Domain Station and the Caulfield line, with one option involving a short rail tunnel to South Yarra Station and increased tram services on Dandenong Road and St Kilda Road and the other option involving a long rail tunnel to Caulfield Station. The above proposals for St Kilda Road may result in additional traffic on Punt Road and enhance the need for additional traffic lanes on Punt Road.

The tram network in the inner, eastern and southern suburbs is shown in Figure 8, and generally incorporates services radiating from the CBD. North-south tram routes in the vicinity of Punt Road include St Kilda Road, Chapel Street – Church Street and Glenferrie Road. East-west tram routes crossing Punt Road include Dandenong Road, High Street, Commercial Road, Toorak Road and Swan Street. St Kilda Road is a particularly important tram route within the network, carrying nine tram routes and over 30% of all tram trips.

Punt Road makes an important contribution to north-south tram operation by diverting traffic away from Priority Tram Routes such as St Kilda Road and Chapel Street – Church Street. As discussed in Section 3.5 the traffic volumes on these roads are forecast to increase over time. The Punt Road PAO provides an opportunity to widen Punt Road to six traffic lanes and thereby reduce traffic volumes on parallel public transport routes.

Punt Road, and other north-south roads, are an impediment to tram operation along east-west routes such as High Street, Commercial Road and Toorak Road. The Punt Road PAO provides an opportunity to improve north-south road capacity and thereby allow additional green time to be allocated to east-west roads.

The existing SmartBus network is shown in Figure 9, and includes three orbital bus routes and the Doncaster Area Rapid Transit (DART) system. Punt Road is part of a possible fourth Orbital SmartBus Route (Blue Orbital) connecting inner metropolitan suburbs and activity centres, including St Kilda, Richmond, Moonee Ponds, Footscray and Williamstown. One of the benefits of the Blue Orbital Route is that it provides a bypass of the CBD and thereby relieves overcrowding on train and tram services approaching the CBD from the north and east.

The Punt Road PAO provides an opportunity to introduce bus lanes along its length or bus queue jump lanes at selected intersections, as part of any introduction of a Blue Orbital Route. A significant increase in bus services would likely be required to justify the property impacts of any road widening to provide bus lanes.
Figure 9  SmartBus Network
4.4 Bicycle Network

As discussed in Section 2.1 Punt Road is not currently classified as a Bike Priority Route, with St Kilda Road and Chapel Street classified as Bike Priority Routes and incorporating on-road bicycle lanes.

VicRoads Policy on Bicycle Facilities as Part of Road Projects requires consideration as to whether upgraded roads would be an appropriate addition to the bicycle network and should include bicycle lanes as part of the upgrade works.

St Kilda Road and Chapel Street currently accommodate north-south bicycle demands within the vicinity of Punt Road. Both roads include on-road bicycle lanes, generally located between traffic lanes and parked cars. The cycling experience on Chapel Street is less than ideal, as the bicycle lanes are narrow and there is high level of parking activity that conflicts with cyclists. Chapel Street is primarily an “access route” for cyclists, whereas St Kilda Road is primarily a “through route” for cyclists.

The spacing between St Kilda Road and Chapel Street is well in excess of the spacing between other north-south Bike Priority Routes in the inner suburbs. Punt Road is the only continuous north-south road between these roads.

From a network perspective it is considered appropriate for a suitably upgraded Punt Road to be part of the Principal Bicycle Network. A 3km length of bicycle lane/path along Punt Road would provide a very useful addition to the bicycle network as it would:

- Fill a gap in the bicycle network.
- Provide a high standard “through route” for cyclists.
- Connect with other Bike Priority Routes, including High Street, Commercial Road, Toorak Road and Alexandra Avenue within the study area and Fitzroy Street, Barkley Street, St Kilda Road and Dandenong Road south of the study area.

Opportunity possibly exists to extend any bicycle facility on Punt Road within the study area further north to sporting grounds, by providing a 1km long path along the west side of Punt Road.
5 NEEDS AND OBJECTIVES

5.1 Transport Needs

Based on the discussion in Sections 2 to 4, Punt Road has the following key transport needs that should be considered in the development of improvement options:

- **North-south capacity improvement** – Punt Road is a Preferred Traffic Route and Bus Priority Route. It provides an important north-south connection within the declared road network, with no other north-south routes able to provide an effective alternative route. Punt Road requires additional road capacity to cater for existing and future traffic demands and attract traffic away from parallel Tram Priority Routes, particularly St Kilda Road. Such improvements to Punt Road would benefit buses and could potentially include bus priority. Although given the extensive train and tram network, Punt Road may never carry a sufficiently high number of buses to warrant bus lanes.

- **East-west public transport improvements** - High Street, Commercial Road and Toorak Road are Tram and/or Bus Priority Routes and public transport using these routes experiences delays at the Punt Road intersections. Treatments to reduce delays to public transport and/or provide public transport priority are required on these east-west roads.

- **East-west capacity improvement** - Alexandra Avenue is a Preferred Traffic Route east of Punt Road and would benefit from additional capacity at its intersection with Punt Road, particularly associated with traffic movements between the north and east. Such improvements would also benefit buses travelling between the north and east.

- **Safety improvements** – Crash data suggests that treatments such as extra traffic lanes, fully controlled right turns, improved road alignments and a median could significantly reduce the number of crashes on Punt Road.

- **Cyclist/pedestrian improvements** – Punt Road is not a Bike Priority Route or Pedestrian Priority Route. However, Punt Road would provide a useful addition to the bicycle network and any major widening should desirably include bicycle facilities. Pedestrian movements are fairly significant at some intersections, particularly High Street, Greville Street/Moubray Road, Commercial Road and Toorak Road and any works should not disadvantage pedestrians at these intersections.

5.2 Transport Integration Act

The Transport Integration Act 2010 includes several transport system objectives and decision-making principles that should be considered in the development of the transport system. VicRoads has had regard to these objectives and principles as shown in Table 4.

It is apparent that options that provide a major capacity upgrade of Punt Road and significantly improve public transport operation, whilst minimising land use impacts, would best meet the objectives.

5.3 Project Objectives

The objectives for the project, based on consideration of the above transport needs and Transport Integration Act requirements, are shown in Table 5.
## Table 4 Assessment Against Objectives and Principles in Transport Integration Act

<table>
<thead>
<tr>
<th>Transport Integration Act</th>
<th>VicRoads Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport System Objectives</strong></td>
<td></td>
</tr>
<tr>
<td>Provide a means by which persons can access social and economic opportunities to support individual and community wellbeing.</td>
<td>Punt Road is a constraint within the road network and requires a major capacity upgrade to provide better access to social and economic opportunities. Inclusion of improvements to multiple transport modes would enhance access opportunities.</td>
</tr>
<tr>
<td>Facilitate economic prosperity.</td>
<td>A major capacity upgrade of Punt Road would improve access to existing and proposed places of employment, business and service.</td>
</tr>
<tr>
<td>Actively contribute to environmental sustainability.</td>
<td>Inclusion of improvements to public transport, cyclist and/or pedestrian facilities would promote use of more environmentally sustainable transport modes.</td>
</tr>
<tr>
<td>Provide for the effective integration of transport and land use and facilitate access to social and economic opportunities.</td>
<td>A major widening of Punt Road would cause significant adverse impact to adjacent land use. Options that minimise land use impacts are preferred from this perspective.</td>
</tr>
<tr>
<td>Facilitate network-wide efficient, coordinated and reliable movements of persons and goods at all times.</td>
<td>Punt Road is a constraint within the road network and requires a major capacity upgrade to provide more efficient and reliable travel.</td>
</tr>
<tr>
<td>Be safe and support health and wellbeing.</td>
<td>Upgrade of Punt Road is required to improve road safety. Inclusion of cyclist and/or pedestrian facilities would achieve additional health benefits.</td>
</tr>
<tr>
<td><strong>Decision Making Principles</strong></td>
<td></td>
</tr>
<tr>
<td>Integrated Decision Making</td>
<td>VicRoads has consulted with Department of Transport. Consultation with other State and Local Government stakeholders would be required prior to progressing planning scheme changes or project construction.</td>
</tr>
<tr>
<td>Triple Bottom Line Assessment</td>
<td>Consideration has been given to the economic, social and environmental impacts of the options. Benefit cost analysis shows a major upgrade of Punt Road has a BCR around 1.3.</td>
</tr>
<tr>
<td>Equity</td>
<td>A major capacity upgrade of Punt Road is required to address the needs of future generations.</td>
</tr>
<tr>
<td>Transport System User Perspective</td>
<td>A major upgrade of Punt Road is required to address the needs of transport system users.</td>
</tr>
<tr>
<td>Precautionary Principle</td>
<td>The environmental impacts of the options are insignificant.</td>
</tr>
<tr>
<td>Stakeholder Engagement and Community Participation</td>
<td>Engagement with stakeholders and the community would be required prior to progressing planning scheme changes or project construction.</td>
</tr>
<tr>
<td>Transparency</td>
<td>The community would need to be provided with project information prior to progressing planning scheme changes or project construction.</td>
</tr>
</tbody>
</table>
Table 5 Project Objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimise delays to traffic and public transport across the network (and</td>
<td>Accommodate up to a 35% increase in travel (person throughput) demand along Punt Road. Reduce traffic volumes (and hence delays) on nearby Tram/Bus Priority Routes.</td>
</tr>
<tr>
<td>thereby improve access to social and economic activities)</td>
<td></td>
</tr>
<tr>
<td>Facilitate a shift to more sustainable transport modes.</td>
<td>Include improved provisions for public transport, cyclists and pedestrians along Punt Road. Reduce delays to public transport across the network.</td>
</tr>
<tr>
<td>Improve road safety.</td>
<td>Reduce crash rates along Punt Road by 30%.</td>
</tr>
<tr>
<td>Make best use of transport assets, considering transport and land use</td>
<td>Provide priority use of Punt Road according to SmartRoads plans and principles.</td>
</tr>
<tr>
<td>needs.</td>
<td></td>
</tr>
<tr>
<td>Minimise land use and property impacts.</td>
<td>Negligible impact to properties and heritage sites along Punt Road.</td>
</tr>
<tr>
<td>Minimise environmental impacts.</td>
<td>Negligible impact to natural environment (considering flora, fauna and emissions).</td>
</tr>
<tr>
<td>Be economically viable.</td>
<td>Project benefit cost ratio &gt; 1.</td>
</tr>
</tbody>
</table>
6 OPPORTUNITIES AND CONSTRAINTS

6.1 Abutting Land Use

Punt Road is abutted by significant urban development and buildings generally have very limited setback from the road reservation boundary.

The Stonnington Planning Scheme includes a 20m wide public acquisition overlay (PAO) along the east side of Punt Road between Union Street and Alexandra Avenue, as shown in Appendix A. The PAO was introduced in the 1950s to cater for a possible widening of Punt Road. There are no PAOs along the east-west roads crossing Punt Road, except within the 20m wide PAO along Punt Road and along the south side of Alexandra Avenue west of Dobson Street.

The Land Acquisition and Compensation Act 1986 provides the procedures for compulsorily acquiring land for public purposes and the means for determining the compensation payable. Generally land can only be compulsorily acquired if it is reserved in the planning scheme with a PAO. Introduction of a PAO into a planning scheme requires an extensive planning, consultation, assessment and approval process.

Approximately 140 properties are affected by the Punt Road PAO, with the vast majority of the buildings on these properties encroaching into the PAO.

22 of the 140 properties affected by the Punt Road PAO are owned by VicRoads, as shown in Appendix A. These properties have an estimated value of around $40M. VicRoads currently leases most of these properties. Three of the properties are boarded up and require significant expenditure (totaling $1M to $2M) to bring them up to a lettable standard.

The Planning and Environment Act 1987 allows owners to claim compensation for financial loss suffered as a result of land being reserved for public purpose. 40 properties within the Punt Road PAO, as shown in Appendix A, have been paid 'loss on sale' compensation totaling nearly $1.5M. The Act allows this compensation to be recovered if the Punt Road PAO is removed from the planning scheme. The amount repayable is the actual amount paid plus GST, and is payable to the authority that paid the compensation (generally being Melbourne Water as successor in law to Melbourne Metropolitan Board of Works).

Kerbside valuations and other assessments indicate that full acquisition of all properties affected by any major widening of Punt Road within the PAO would likely cost around $330M (excluding the cost of VicRoads owned properties). This cost could possibly be reduced by the sale of residual land.

6.2 Heritage Values

Andrew Long and Associates was engaged to undertake a desktop cultural heritage assessment of the Punt Road corridor, including the road reservation, Hoddle Bridge and the PAO.

The main findings of the assessment (refer Appendix B) were as follows:

- There are no Aboriginal and non-Aboriginal heritages sites listed on State and National registers.

- Aboriginal Heritage Regulations 2007 define land within 200m of a waterway as an area of potential cultural heritage sensitivity. As the land along the Punt Road corridor within 200m of the Yarra River is subject to significant ground disturbance it is not likely to be considered an area of Aboriginal cultural heritage sensitivity.
• There are no heritage overlays in the planning schemes for the Cities of Melbourne and Port Phillip.

• The Stonnington Planning Scheme includes five heritage overlays abutting sections of Punt Road, which affect 40 properties within the Punt Rd PAO, as follows:
  - Gladstone Street Precinct (HO134) – includes six properties within the Punt Road PAO.
  - Greville Street (HO126) - includes one property within the Punt Road PAO.
  - Fawkner Street / Davis Avenue Precinct (HO131) - includes twelve properties within the Punt Road PAO.
  - Toorak Road Precinct (HO150) - includes one property within the Punt Road PAO.
  - Alexandra Avenue / Domain Road / Punt Road Precinct (HO122) – includes twenty properties within the Punt Road PAO.

• The Yarra Planning Scheme includes one heritage overlay affecting the corridor as follows:
  - Hoddle Bridge (HO281) – affects the bridge.

• Alteration or demolition of buildings or structures affected by the above heritage overlays requires the approval of the relevant Council. Consultation with the Councils is required to determine whether the Councils would be likely to approve alteration or demolition works.

6.3 Environmental Issues

Environmental assessments have not been undertaken as part of the study.

It is noted that there are no Environmental Significance or Significant Landscape Overlays affecting the study area, except for part of the Yarra River.

Given the extensive urban development along Punt Road, environmental issues are not likely to be significant.
7. IMPROVEMENT OPTIONS

Several improvement options have been investigated for Punt Road, and compared against the do nothing option, as follows:

Major Route Upgrades

- Option 1 – 40m reservation with six lanes and dedicated bicycle lanes or paths (ie. use of all of 20m wide reservation and 20m wide PAO).
- Option 2 – 34m reservation with six lanes.
- Option 3 – 26m reservation midblock and 30m reservation at intersections with six lanes.
- Option 4 – 45m reservation with eight lanes (including bus lanes) and dedicated bicycle lanes.

Major Intersection Upgrades

- Option 5 – Four lane undivided with widening of Punt Road at selected intersections.
- Option 6 – Four lane undivided with widening of Punt Road and east-west cross roads at selected intersections.

Minor Works

- Option 7 – No land acquisition and reversible lanes.
- Option 8 – No land acquisition and parking and right turn bans.

The options are described further in Table 6 and in most cases shown on the concept drawings in Appendix C.

The options include different reservation, lane and median widths, partly to determine the relative property impacts of options with different reservation widths. Other cross-section options are possible and could be considered as part of the refinement of any preferred option.

The options generally focus on providing capacity and/or public transport improvements to the Preferred Traffic Routes, Priority Tram Routes and Priority Bus Routes (ie. Punt Road, High Street, Commercial Road, Toorak Road and Alexandra Avenue east of Punt Road). Left turn slip lanes are not proposed to avoid adverse impact to pedestrians.

Building setbacks along Punt Road are minimal and in many cases the whole property would need to be acquired rather than just the land within the 20m wide PAO. Acquisition of the whole property may provide some opportunities for additional works at intersections, however, for the purposes of this study Options 1 to 3 and 5 confine all works to the PAO. Option 4 includes works outside the PAO along Punt Road and Option 6 includes works outside the PAO along some east-west cross roads.

The options are described and in part assessed in Sections 7.1 to 7.3. Further assessment of the options is provided in Section 7.4.
### Table 6 Improvement Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Key Intersection Improvements</th>
<th>Other Improvements</th>
<th>Property Impact</th>
</tr>
</thead>
</table>
| 1A     | 40m reservation - 6 lane divided with exclusive bicycle lanes | • All intersections – extra traffic lane on all Punt Rd approaches.  
• Domain Rd intersection - exclusive right turn lanes on Punt Rd approaches, in addition to above.  
• Alexandra Ave intersection - extra traffic lanes on east approach, in addition to above. | Median – safety benefit  
New cyclist provisions | Approximately 130 properties, including 100 buildings |
| 1B     | 40m reservation - 6 lane divided with wide kerbside lanes | | | |
| 1C     | 40m reservation - 6 lane divided with separated bicycle lanes | | | |
| 1D     | 40m reservation - 6 lane divided with two way bicycle path on east side | | | |
| 2A     | 34m reservation - 6 lane undivided | As above | Nil | Approximately 130 properties, including 100 buildings |
| 2B     | 34m reservation - 6 lane divided | | | Median – safety benefit |
| 3      | 26m to 30m reservation - 6 lane divided | As above | Median – safety benefit | Approximately 130 properties, including 85 buildings |
| 4      | 45m reservation - 8 lane divided with exclusive bicycle lanes | As above | Median – safety benefit  
New bicycle lanes  
New bus lanes | Approximately 180 properties |
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Key Intersection Improvements</th>
<th>Other Improvements</th>
<th>Property Impact</th>
</tr>
</thead>
</table>
| 5      | Major intersection upgrade with 4 lane undivided midblock | • High Street and Commercial Road intersections – “short” extra traffic lane in each direction on Punt Rd.  
• Greville St intersection – minor widening on Greville St approach (making use of VicRoads owned property).  
• Toorak Rd intersection – “short” extra traffic lane in each direction on Punt Rd and extra right turn on Punt Rd north approach.  
• Domain Rd intersection - exclusive right turn lanes on Punt Rd approaches.  
• Alexandra Ave intersection – extra traffic lanes on south and east approaches. | Median at selected locations – safety benefit | Approximately 72 properties, including 45 buildings |
| 6      | Major intersection upgrade plus works outside PAO | As above for Option 5 plus the following.  
• High St intersection – short left turn lane on east approach.  
• Commercial Rd intersection – short left turn lane and tram/traffic separation on east approach. | Median at selected locations – safety benefit  
Tram priority on Commercial Road | Approximately 78 properties, including 51 buildings |
| 7      | Reversible lane                                   | All intersections - extra traffic lane on Punt Rd approaches in peak direction (by providing one less lane on approaches in counter peak direction).                          | Nil                                        | Nil. |
| 8      | Parking and right turn bans                       | • High St, Commercial Rd and Toorak Rd intersections - lengthy parking bans (or clearways) in counter peak direction (in addition to the existing peak direction clearways) and right turn bans on east-west roads.  
• Domain Rd intersection – exclusive right turn lanes on Punt Road approaches (including optional peak period right turn bans) by introducing very narrow and substandard lane and footpath widths.  
• Alexandra Ave intersection – lengthy parking ban on west approach. | Nil                                        | Nil. |
7.1 **Major Route Upgrades**

7.1.1 **Option 1**

Options 1A to 1D (collectively called Option 1) make use of all of the approximate 40m wide reservation and PAO along Punt Road, and include a six lane divided cross-section (six traffic lanes or four traffic lanes and two bus lanes) along the full length of Punt Road.

The widths adopted for the cross-sectional elements are consistent with normal design domain (NDD) standards in Guide to Road Design, Part 3: Geometric Design, which specify traffic lane widths of 3.3m (constrained location) to 3.5m (desirable). Extended design domain (EDD) standards, which allow a minimum through lane width of 3.0m in constrained urban areas with a design speed at or less than 70km/hr, have not been adopted.

Options 1B to 1D include a wider median and urban border (and narrower traffic lanes) than Option 1A to accommodate a tree lined boulevard and/or other urban design treatments to minimise amenity impacts. A minimum 3m clearance is provided to trees, which is far less than clear zone requirements (6.5m for 70km/h design speed) but possibly acceptable in an urban environment. Clear zone requirements do not apply if trees have a diameter less than 100mm.

The existing Punt Road reservation between Toorak Road and Alexandra Avenue is around 17m wide rather than 20m wide, and some adjustment to the widths of the cross-section elements in this section would be required.

Options 1A to 1D allow for the outer lanes to be designated as either general traffic lanes or bus lanes (full time or part time), with some options better managing the conflict between buses and cyclists than other options as discussed below.

Inclusion of bus lanes is not supported as it would generally provide worse operation for traffic than the do nothing option (refer Section 7.4.2). Although buses along Punt Road would benefit from bus lanes, there are far more bus and tram services on the east-west cross roads and parallel north-south roads that would be disadvantaged. Given the extensive train and tram network surrounding Punt Road, it is highly unlikely that Punt Road would ever be a critical bus route within the network and warrant bus lanes from a person throughput perspective. An additional traffic lane would carry an extra 960 persons/hour in cars compared to an extra 120 persons/hour in buses (assuming six buses per hour as currently occurs).

As discussed in Section 4.4 cycling provisions are considered desirable along Punt Road. All options accommodate cyclists in some form, as follows:

- **Option 1A** includes on road bicycle lanes, which is considered to be the minimum acceptable treatment for cyclists, but the option does not allow for any on-street parking in off peak periods unless the lanes are designated for use by cyclists in peak periods only.

- **Option 1B** includes wide kerbside lanes, which provides the least safety for cyclists of the four options and hence is not supported.

- **Option 1C** includes separated bicycle lanes (and conventional on road bicycle lanes at intersection approaches), which generally provide greater safety than Option 1A but can contribute to conflict between cyclists and entering/exitng vehicles at driveways/minor roads and between cyclists and pedestrians at bus stops. Such an option would require further investigation and development to confirm that it is preferable to Option 1A.
Option 1D includes a two-way bicycle path on the east side of Punt Road, which is compatible with the significant reduction in driveways on the east side (due to building acquisition) and generally provides greater safety than Option 1A. Such an option can contribute to conflict at intersections (between cyclists and pedestrians and between cyclists and left turning vehicles) and would require further investigation and development to confirm that it is preferable to Option 1A.

The preferred option for accommodating cyclists, as part of Option 1, is subject to more detailed design and cannot be confirmed as part of this study. Preliminary investigations suggest that Option 1D is likely to be the most appropriate treatment, as it provides the greatest safety benefits for cyclists.

Option 1 would be expected to reduce crash rates by 30% due to the additional traffic lanes, median and fully controlled right turns on Punt Road.

Option 1 impacts approximately 130 properties, including 21 properties owned by VicRoads. Buildings on approximately 100 of the 130 properties are likely to be affected by acquisition, resulting in the likely need to acquire the whole of most of the properties.

7.1.2 Option 2

Options 2A and 2B (collectively called Option 2) are based on a 34m wide reservation and include six lanes (six traffic lanes or four traffic lanes and two bus lanes) along the full length of Punt Road. The options do not include any on-road cyclist provision, which is considered undesirable.

Option 2A includes 3.5m wide traffic lanes and hence has insufficient width for a median. Option 2A would result in more crashes than options with a median, and hence is not supported.

Option 2B includes 3.2m wide traffic lanes and a slightly narrower urban border so that a median can be provided. The traffic lane widths are less than NDD values, but fall within EDD values. A width of 3.2m, rather than the minimum EDD width of 3.0m, has been adopted as it provides greater clearance to buses and trucks.

Option 2 has virtually the same property impacts as Option 1 and provides a lower standard of transport provision. Hence Option 2 is not supported.

7.1.3 Option 3

Option 3 is based on a 26m wide reservation in the midblock sections and 30m wide reservation at intersections, and includes a six lane divided cross-section (six traffic lanes or four traffic lanes and two bus lanes) along the full length of Punt Road.

Option 3 adopts minimum acceptable widths, including 3.0m wide lanes, in an attempt to minimise property impacts. The option does not include any on-road cycling provisions, and the footways provided are narrower than the other major route upgrade options.

Option 3 provides almost the same capacity and safety benefits as Option 1.

Option 3 impacts approximately 130 properties, including 21 properties owned by VicRoads. Buildings on approximately 85 of the 130 properties are likely to be affected by acquisition. Although Option 3 impacts 15% less buildings than Option 1, the property impacts of Option 3 are still very significant.
It is considered that the marginal saving in property impacts of Option 3 compared to Option 1 do not justify implementation of Option 3 in preference to Option 1. Option 1 provides a higher standard of provision for all transport users and far greater opportunity for landscape and other urban design treatments.

7.1.4 Option 4

Option 4 makes use of the redundant land associated with acquisition of the whole of the property, not just the 20m wide PAO, and is based on a 45m wide reservation.

It includes an eight lane divided cross-section (six traffic lanes and two bus lanes) and exclusive bicycle lanes along the full length of Punt Road. The widths adopted are based on NDD values.

Option 4 provides similar capacity and safety benefits to Option 1, but includes additional benefits for buses along Punt Road.

Option 4 impacts approximately 50 more properties than the other major route upgrade options, with all these properties outside the PAO, and is not supported.

7.2 Major Intersection Upgrades

Options focused on intersection upgrades only are discussed below.

These options include major upgrade works to the High Street, Commercial Road, Toorak Road and Alexandra Avenue intersections with Punt Road. Limited improvements are proposed at the Moubray Street/Greville Street and Domain Road intersections with Punt Road, as these roads are not Priority Traffic/Tram/Bus Routes and carry fairly low traffic volumes.

The options do not allow for bus lanes or bicycle lanes along the length of Punt Road, as midblock widening is not possible within the existing road reservation.

7.2.1 Option 5

Option 5 makes use of the Punt Road PAO to provide an additional traffic lane on both Punt Road approaches to High Street, Commercial Road and Toorak Road and the south approach to Alexandra Avenue. New right turn lanes are provided on the Punt Road approaches to Domain Road, with sufficient width available to also provide an additional traffic lane on both approaches if considered necessary in the future.

Bus queue jump lanes could be provided instead of the additional traffic lane. However, such lanes would be of limited benefit as the queues on Punt Road would be so long that buses would experience long delays getting to the lanes. Allowing the additional lane to be used by general traffic would provide benefits for traffic and buses along the whole route.

Provision of a short third traffic lane on selected Punt Road intersection approaches provides fairly significant capacity benefits. However, traffic using these lanes is generally required to merge past the intersection, making the lanes unattractive to some users and increasing the risk of side swipe crashes. Also, the option results in a ‘wiggly’ alignment along Punt Road southbound.

Option 5 includes minor improvement to the Greville Street eastern approach to Punt Road and major improvement to the Alexandra Avenue eastern approach to Punt Road. Improvements to other eastern approaches and any western approaches to intersections
are not proposed due to the lack of any PAO.

Virtually all the properties owned by VicRoads are located in the midblock sections rather than at the intersections. However, the option makes use of most of these properties due to the extended length of road widening required to accommodate additional approach lanes and associated tapers.

Option 5 impacts approximately 72 properties, including 16 properties owned by VicRoads. Buildings on approximately 45 of the 72 properties are likely to be affected by acquisition.

The property impacts of Option 5 are only about half of the property impacts of Option 1.

7.2.2 Option 6

The Punt Road PAO does not allow for any road widening along High Street, Commercial Road and Toorak Road. Hence Options 1 to 5 provide little improvement to these roads, except to allow additional green time to be allocated due to the capacity improvements provided to Punt Road.

Option 6 includes additional land acquisition outside the Punt Road PAO to provide improvements in east-west operation, as follows:

- High Street - Acquisition of extra land from a property affected by the PAO allows for a short left turn lane on the east approach.
- Commercial Road - Acquisition of extra land from a property affected by the PAO and six properties unaffected by the PAO on the south-east corner of the intersection allows separation of traffic and tram movements on the east approach (as currently occurs on the west approach).

Widening of the High Street and Toorak Road approaches to Punt Road to provide tram/traffic separation could also be included in the option. However, it would require acquisition of several properties outside the PAO on both the east and west approaches to Punt Road.

The property impacts of widening the east-west roads outside the PAO are not considered justified, as these roads currently only carry one tram route and delays to trams could be reduced by providing right turn bans (as currently occurs part time at the Punt Road/Toorak Road intersection). Also, tram/traffic separation is generally not provided elsewhere along these roads and hence other roads may be better candidates for increased tram services.

Option 6 impacts six more properties than Option 5, with all of these properties affected by building demolition.

7.3 Minor Works

Options involving no land acquisition are discussed below.

7.3.1 Minor Route Upgrade - Option 7

Option 7 involves a reversible lane and lane use management system along Punt Road to provide three lanes in the peak direction and one lane in the counter peak direction, to reduce delays in the peak direction.
Such a treatment has been adopted on Queens Road and Johnston Street in inner Melbourne, which have sufficient width to accommodate a five lane cross-section. The existing road reserve along Punt Road is narrower and can only accommodate four lanes.

VicRoads Traffic Engineering Manual indicates that such a treatment may be effective if the traffic volume in the counter peak direction is less than one third of the traffic volume in the peak direction. This is not the case on Punt Road, with the volume in the counter peak direction varying from around two thirds to slightly more than the traffic volume in the peak direction.

SIDRA analysis shows that such an option would provide far worse operation than the existing lane configuration along Punt Road. Delays and queues on Punt Road in the counter peak direction and on the east-west cross roads would increase significantly and reach unacceptably high levels.

Such a treatment would require right turns to be banned along Punt Road to support the lane use management system, which would cause increased turn demands and delays elsewhere on the road network.

Option 7 is not supported as it would provide worse operation overall.

### 7.3.2 Minor Intersection Upgrade - Option 8

Option 8 involves the following minor works to improve road capacity:

- Introducing full time clearways along Punt Road (in addition to the weekday peak period clearways in both directions) to improve operation in the off-peak and weekend periods.

- Introducing lengthy peak period parking bans (or clearways) in the counter peak direction (in addition to the existing peak direction clearways) on High Street, Commercial Road and Toorak Road.

- Banning the right turns on the High Street and Commercial Road approaches to Punt Road in peak periods (to reduce delays to traffic and trams).

- Banning the right turn on the Toorak Road east approach in the AM peak (as currently occurs on this approach in the PM peak and on the west approach in both peaks).

- Providing right turn lanes on the Punt Road approaches to Domain Road by introducing very narrow and substandard lane and footpath widths, including possible peak period right turn bans on Punt Road (as proposed for construction in 2010/11).

- Banning additional parking on the Alexandra Avenue west approach to Punt Road.

Although the above option provides benefits for Punt Road, the right turn bans on High Street, Commercial Road and Toorak Road would divert traffic to Chapel Street, Williams Road and other roads. Any increased turning demand on these roads would adversely affect tram operation on High Street, Commercial Road, Toorak Road and Chapel Street.
7.4 Options Assessment

7.4.1 Network Modelling

Network modelling of Option 1, or a similar option with a six lane divided cross-section, shows that such an option would provide substantial travel time and distance savings across the road network as shown in Table 7.

The option provides increasing travel savings over time, with the travel time savings in 2041 eight times greater than in 2011 due to ongoing growth in travel demand.

Table 7 Network Benefits (7am to 9am)

Legend - VHT = vehicle hours of travel, VKT = vehicle kilometres of travel

<table>
<thead>
<tr>
<th>Year</th>
<th>Do Nothing Option (Base Network)</th>
<th>Option 1 (Upgrade Network)</th>
<th>Travel Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VHT VKT</td>
<td>VHT VKT</td>
<td>Time (hrs)</td>
</tr>
<tr>
<td>2011</td>
<td>577,155 19,919,547</td>
<td>576,769 19,920,323</td>
<td>386</td>
</tr>
<tr>
<td>2021</td>
<td>652,430 22,695,194</td>
<td>651,121 22,694,801</td>
<td>1,310</td>
</tr>
<tr>
<td>2031</td>
<td>761,219 24,766,669</td>
<td>760,357 24,764,230</td>
<td>863</td>
</tr>
<tr>
<td>2041</td>
<td>859,895 27,211,928</td>
<td>856,722 27,210,185</td>
<td>3,173</td>
</tr>
</tbody>
</table>

7.4.2 SIDRA Analysis

SIDRA has been used to assess the effectiveness of the options in accommodating future traffic demands.

As discussed in Section 4.1, Melbourne’s population is forecast to grow by 35% over the next 25 years. A similar level of growth in travel demand could be expected, which does not necessarily correlate to a similar level of growth in traffic demand across the network or along Punt Road.

The modelling discussed in Section 3.5, shows a 37% increase in travel kilometers across the road network and a 53% increase in traffic volumes on Punt Road (if it is upgraded to six lanes) over the next thirty years. Much less growth in traffic volumes on Punt Road occurs if it remains as a four lane road.

For analysis purposes a 35% increase in the 2009 traffic volume shown in Figure 5 has been assumed in the SIDRA analyses. Also, the analyses have assumed that all lanes are used by general traffic (except Option 4 which has two additional lanes for buses).

The analyses, as shown in Table 8, highlight the following:

Do nothing option

- Extremely poor operation at the High Street, Commercial Road, Toorak Road and Alexandra Avenue intersections and some form of upgrade is required to accommodate traffic demands.
Major route upgrades (Option 1 or similar)

- Generally provides an acceptable level of operation along Punt Road, except at the Alexandra Avenue intersection which requires further upgrade.
- Provides an approximate 60% saving in average intersection delays compared to the do nothing option.

Major intersection upgrades (Options 5 and 6)

- Provides an approximate 40% saving in average intersection delays compared to the do nothing option.
- Does not fully accommodate design traffic volumes, with further upgrades required at most intersections.

Minor intersection upgrades (Option 8)

- Provides an acceptable level of operation at the High Street and Commercial Road intersections in both peaks and Toorak Road intersection in AM peak (because one less signal phase is required and partial controlled right turns are assumed on a four lane Punt Road, rather than the fully controlled right turns in the six lane options).
- Provides acceptable operation at Domain Road intersection if peak period right turn bans are provided on Punt Road.
- Provides extremely poor operation at the Alexandra Avenue intersection, with a major upgrade required.

Table 8 SIDRA Analyses – Options

Legend - * assumes existing parking allowed on east-west cross road in off peak direction.

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Option</th>
<th>AM Peak Hour DOS</th>
<th>AM Peak Hour Ave. Delay(s/veh)</th>
<th>PM Peak Hour DOS</th>
<th>PM Peak Hour Ave. Delay(s/veh)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High St</td>
<td>Do Nothing *</td>
<td>1.30</td>
<td>182</td>
<td>1.43</td>
<td>298</td>
<td>Banning parking and right turns (RTs) on High St is just as effective as a major upgrade.</td>
</tr>
<tr>
<td></td>
<td>1 *</td>
<td>1.07</td>
<td>90</td>
<td>1.28</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.93</td>
<td>57</td>
<td>1.01</td>
<td>73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 &amp; bus lanes</td>
<td>1.37</td>
<td>217</td>
<td>1.57</td>
<td>345</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1.01</td>
<td>76</td>
<td>1.13</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>1.01</td>
<td>58</td>
<td>1.09</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 minus RT bans</td>
<td>1.25</td>
<td>148</td>
<td>1.29</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>0.96</td>
<td>55</td>
<td>1.00</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Moubray Rd/ Greville St (all options retain existing parking on east-west roads)</td>
<td>Do Nothing</td>
<td>1.00</td>
<td>27</td>
<td>0.83</td>
<td>24</td>
<td>Do nothing option accommodate traffic demands.</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.73</td>
<td>36</td>
<td>0.69</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 &amp; bus lanes</td>
<td>0.94</td>
<td>48</td>
<td>0.93</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1.00</td>
<td>27</td>
<td>0.83</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>1.00</td>
<td>27</td>
<td>0.83</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Commercial Rd</td>
<td>Do Nothing *</td>
<td>1.12</td>
<td>134</td>
<td>1.32</td>
<td>228</td>
<td>Banning parking and RTs on Commercial</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0.89</td>
<td>53</td>
<td>0.97</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 &amp; bus lanes</td>
<td>1.07</td>
<td>108</td>
<td>1.20</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1.00</td>
<td>80</td>
<td>1.16</td>
<td>113</td>
<td></td>
</tr>
</tbody>
</table>
### 7.4.3 Economic Assessment

It is estimated that Option 1 would cost in the order of $450M to $500M (say $370M for land acquisition, $80M for design, construction and service relocations, and up to $50M for estimate uncertainty).

Although the cost of Option 1 is relatively high, it is far less than a new tunnel which appears to be the only other option for increasing north-south capacity within the sub region.

A preliminary economic assessment of Option 1 (or similar six lane option) shows that it has a benefit cost ratio (BCR) of 1.3 (at a cost $500M), indicating that the project is worthwhile. The assessment was based on traffic savings only, with a greater BCR achieved if public transport savings had also been considered.

The assessment has been based on network modelling of route upgrade options. A similar assessment could not be undertaken for intersection upgrade options, as the network model is not particularly sensitivity to intersection capacity changes.