VicRoads

Punt Road Public Acquisition Overlay Review

Expert Witness Report - Jonathan Kinghorn and Paul Carter

REP001

Issue 1 2 February 2016

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 244666-00

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ARUP
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1 Name and address

1. Jonathan Kinghorn, Principal
   Arup
   Level 17, 1 Nicholson Street
   EAST MELBOURNE VIC 3002

2. Paul Carter, Associate
   Arup
   Level 17, 1 Nicholson Street
   EAST MELBOURNE VIC 3002

2 Qualifications and experience

2.1 Jonathan Kinghorn

3. I am a Principal with Arup and a Member of the Planning Institute of Australia. I hold a degree in Urban Planning and a master’s degree in Transport Planning. I have 18 years’ experience in directing and managing a wide range of local and strategic transportation studies involving the evaluation of transport infrastructure in Australia, New Zealand and the UK.

4. I have worked for Arup for the last 18 years having been based in UK, USA and moving to Australia in 2010. I currently lead the firm’s transport planning business in Australasia and I am also responsible for the transport planning team in Melbourne. My qualifications and experience are detailed in Appendix A.

5. My areas of expertise is in the strategic planning and evaluation of transport infrastructure and services. I was the Arup Project Director responsible for preparing the Punt Road Concept Options Report.

2.2 Paul Carter

6. I am an Associate with Arup, a member of Engineers Australia and a Certified Transport Planner with the Chartered Institute of Logistics and Transport Australia. I hold the degrees of Bachelor of Engineering (Civil) as well as a post-graduate Masters of Traffic both from Monash University in Melbourne.

7. For the past 13 years I have been involved in a variety of transport assessment and appraisal studies across a variety of industry sectors throughout Australia. This has included the planning and transport assessment of several major development and infrastructure projects in Victoria as well as elsewhere in Australia. In addition to my experience in consulting, I have also worked within local government and state government. My qualifications and experience are detailed in Appendix A.

8. I was the Arup Project Manager responsible for preparing the Punt Road Concept Options Report.
3  Key contributors

9. There were several key additional contributors to the development of this report and the Punt Road Concept Options Report outlined in Table 1.

Table 1  Key contributors

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce Johnson</td>
<td>Principal</td>
<td>Transport modelling review</td>
</tr>
<tr>
<td>Rob Turk</td>
<td>Associate</td>
<td>Environmental assessments</td>
</tr>
<tr>
<td>Joseph Sweet</td>
<td>Associate</td>
<td>Road and civil design</td>
</tr>
<tr>
<td>Callan Jones</td>
<td>Senior Transport Engineer</td>
<td>Traffic and transport engineering</td>
</tr>
<tr>
<td>Trent Ekanayake</td>
<td>Transport Planner</td>
<td>Transport modelling</td>
</tr>
</tbody>
</table>

10. The qualifications and experience of these key contributors are provided at Appendix B.

4  Scope

4.1  Instructions

11. Arup was engaged by VicRoads on 21 July 2015 to undertake the Streamlining Hoddle Street initiative. This study included two key parts, the first focusing on developing a business case for improvements to the Punt Road-Hoddle Street corridor between the Yarra River and the Eastern Freeway. The second part of this engagement involved the development and appraisal of a series of concepts for the section of the corridor broadly between the Yarra River and St Kilda junction (the Punt Road Concept Options Report).

12. The scope of the Punt Road Concept Options Report was defined by VicRoads. The scope of the study included the investigation, modelling and evaluation of a series of concepts identified by VicRoads and broadly described as follows:
   - Existing configuration with 24 hour clearways;
   - Three five lane concepts (e.g. reversible lanes, central right turn lane); and
   - Three six lane concepts (e.g. localised widening, full corridor widening).

13. Concepts that may include grade separation or major new transit corridors (e.g. new light rail systems) were not part of the scope of the study.

14. The outcomes of the study are summarised in the Punt Road Concept Options Report dated 14 October 2015. The Punt Road Concept Options Report provided input into VicRoads’ Stage 2 responses under the Terms of Reference.

15. The scope of this expert witness report is limited to transport and traffic related matters as defined in the briefing provided by Norton Rose Fulbright dated 24 December 2015.
4.2 The Assessment

16. The Punt Road Concept Options Report is referred to as the ‘Assessment’ throughout the remainder of this expert witness report. The Assessment has been publicly exhibited and is adopted as the basis for this expert witness report.

4.3 Documents that inform the Assessment

17. During the preparation of the Assessment the following documents were used to inform the study:
   - Andrew Long and Associates (2010), Punt Road – Cultural Heritage Desktop Audit Study and Implications For Development;
   - VicRoads, (2012), Punt Road Study - Union Street to City Link Final Report;
   - State Government Victoria, (2014), Plan Melbourne Metropolitan Planning Strategy (currently being refreshed);
   - Traffic Works, (2015), Punt Road Car Parking Assessment - Alexandra Avenue to St Kilda Road, South Yarra; and

18. These reports were supplemented by data for reported casualty crashes for the period January 2009 to December 2013 as well as tram and bus patronage data provided by VicRoads and Public Transport Victoria.

4.4 Process and timeline

19. The process and timeline for undertaking the Assessment is outlined in Table 2.

Table 2 Overview of study process and timelines

<table>
<thead>
<tr>
<th>Key Tasks</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study commencement</td>
<td>21 July 2015</td>
</tr>
<tr>
<td>Review of background documentation</td>
<td>Late July 2015</td>
</tr>
<tr>
<td>Review of existing conditions and possible options with key government stakeholders</td>
<td>Late July 2015</td>
</tr>
<tr>
<td>Establish a draft framework for the appraisal</td>
<td>Mid Aug 2015</td>
</tr>
<tr>
<td>Development of transport modelling tools and peer review</td>
<td>Mid-late Aug 2015</td>
</tr>
<tr>
<td>Development of preliminary draft options for the corridor</td>
<td>Late Aug 2015</td>
</tr>
<tr>
<td>Consideration of community feedback following consultation</td>
<td>Mid Sept 2015</td>
</tr>
<tr>
<td>Options refinement, testing and appraisal</td>
<td>Mid-late Sept 2015</td>
</tr>
<tr>
<td>Draft Punt Road Concept Options Report</td>
<td>Mid-late Sept 2015</td>
</tr>
<tr>
<td>Final Concept Options Report</td>
<td>14 October 2015</td>
</tr>
</tbody>
</table>
5 Further work since the completion of the Assessment

20. In preparation of this report, the drawings forming Appendix A to the Assessment have been updated. The primary changes (drawing numbers CS73 and CS78) are such that the arrangements at the intersection of Punt Road and Alexandra Avenue under ‘Concept 5 Widened Intersections’ have been corrected to show the proposed widening in alignment with the Assessment. A number of minor updates to clarify annotations and labelling have also been undertaken with an updated set of drawings provided at Appendix C to this expert witness report.

21. Following the preparation of the Assessment, further investigations have been undertaken to respond to the issues raised by the community as part of the submissions, to address the commitments outlined by VicRoads and PTV as part of the Part A submission as well as providing support or analysis as requested by PTV and VicRoads as part of the Part B submission.

22. Separately, as outlined in Section 4.1 investigation has also been undertaken on possible treatment options for the Punt Road-Hoddle Street corridor between the Yarra River and the Eastern Freeway. The outcome of this study has been the preparation of a business case for a package of improvement works.

6 Response to Panel Directions

23. We have been requested by Norton Rose Fulbright to provide responses to the Panel Directions dated 10 December 2015, items 12, 14, 17, 20 and 22 (shown in italics below). These matters are largely covered in the Assessment as outlined below with additional discussions provided as required.

6.1 Panel Directions - Item 12

24. The Committee would like VicRoads to take us through a concise description of each of the options in the Options Report, including an overview of the positives and negatives of each option as seen by VicRoads.

25. An overview of the options is provided in Section 6 of the Assessment with the positives and negatives summarised in Section 7.4 of the Assessment.

6.2 Panel Directions – Item 14

26. The Committee would like VicRoads to explain the rationale (including benefits and disbenefits) for each of the alternative treatments for Alexandra Avenue, Toorak Road, High Street and Commercial Road turning movements as proposed in the Options Report. In particular, the Committee would like an understanding of current congestion in the major east-west cross streets and whether or not any upgrade of Punt Road will mitigate these issues.
27. The rationale for each of the intersection treatments is based on the network strategy outlined in Section 4.4 of the Assessment. In developing the intersection treatments, this strategy was combined with a review of the demands, travel patterns and likely diversions that may result from changes at each of the intersections. Examples of the application of this approach are provided below:

- The intersection of Alexandra Avenue and Punt Road involves the confluence of two preferred traffic routes, high traffic demands as well as a bus priority route. The intersection options have sought to increase the capacity of these priority movements (i.e. north-south for buses and traffic as well as traffic movements between the north and east approaches) through a simplification of traffic signal operations as well as infrastructure improvements; and

- The intersection of Toorak Road and Punt Road includes pedestrian priority areas to the east of the intersection, bicycle priority routes east-west, preferred tram routes travelling east-west, preferred bus routes north-south and preferred traffic routes both north-south and between the north approach and west approach. Under each of the intersection options, right turn traffic movements to and from the east (with relatively low volumes) are relocated to the west of the intersection which discourages traffic into the pedestrian priority area on Toorak Road. The relocation of right turns away from the main intersection allows for an improvement to the efficiency of the main intersection. This improved efficiency allows a reduction in the number of westbound traffic lanes which in-turn allows trams dedicated road space. North-south traffic and buses benefit from the improved intersection efficiency.

28. In order to understand the performance of the east-west roads along the corridor, a more detailed review of the SIDRA results presented in Section 7.3 of the Assessment has been undertaken. From this review there is notable congestion under 2015 conditions in the east-west roads with a level of service of E to F for the peak direction of travel with significant deterioration at some intersections under the Base Case in 2031. The analysis also shows that the peak direction delays on the east-west roads will decrease under each of the concept options. When compared to the Base Case:

- Aggregate delays for all westbound movements in the AM peak hour are expected to reduce by between 43% to 59% across each of the concept options; and
- Aggregate delays for all eastbound movements in the PM peak hour are expected to reduce by between 51% and 74% across each of the concept options.

6.3 Panel Directions – Item 17

29. The Committee requests information on how each of the options deals with bicycles, and how each of these treatments (on road lanes, separate bike paths, lanes on crossing roads etc.) fits in with medium and long term broader bike network plans.

30. The network strategy outlined in Section 4.4 of the Assessment highlights the overarching approach to the provision for cyclists along and across the corridor.
Given that Punt Road is not part of the Principal Bicycle Network, the various concept options propose that the more suitable alternative north-south routes (e.g. Chapel Street, St Kilda Road) be developed to provide a safe environment for cyclists. This is with the exception of Concept Option 6 which utilises the space within the public acquisition overlay to include a shared path on the east side of the corridor. Cycling facilities across the corridor would need to be further developed for the routes identified in the network strategy as well as others identified in consultation with stakeholders as part of any specific proposal for Punt Road. This is expected to include the consideration of new signage, cycling head start storage boxes etc, as outlined in Section 6 of the Assessment.

6.4 Panel Directions – Item 20

31. The Committee seeks to fully understand the role that Punt Road plays in the broader Melbourne road network, both now and in the future. This should include an assessment of how the Punt Road-Hoddle Street corridor supports the objectives of Plan Melbourne.

32. An overview of the objectives of Plan Melbourne and how they relate to Punt Road are provided in Section 4.1 of the Assessment. An overview of the role of the Punt Road-Hoddle Street corridor is provided in Section 1.3 of the Assessment.

6.5 Panel Directions – Item 22

33. The Committee seeks an understanding of the types of traffic using Punt Road, including the proportion of commercial vehicles and whether there is evidence of how this has changed over time.

34. An overview of the types of vehicles using Punt Road is provided in Figure 1. This is based on data provided by VicRoads for an automatic traffic count survey undertaken north of the Hoddle Bridge in 2010. This shows that commercial vehicles comprise approximately 4.7% of average weekday daily traffic along Punt Road with a majority of these vehicles being small trucks.

Figure 1  Punt Road Daily Classification Summary - Weekday Average - 2010
35. We have not been provided with information that specifically measures the volume of commercial vehicles along Punt Road over an extended timeframe. However, traffic data available through VicRoads website includes estimates of commercial vehicles along Punt Road based on commercial vehicle volumes on surrounding roads. This data suggests that percentage of commercial vehicles using Punt Road has on average remained consistent from 2003 to 2013 (noting that the total traffic demands have decreased).

7 Response to submissions

36. We and the team at Arup have read all submissions relating to the Punt Road Public Acquisition Overlay Review that were provided and potentially containing comments relevant to the Assessment. In total, 121 submissions have been reviewed and consideration has been given to the issues raised as they relate to the Assessment. A full list of the submissions that have been reviewed and the categorisation of the issues raised is provided in Appendix D.

37. From a review of these submissions, the key issues raised relating to transport and traffic matters are described in Table 3 including the number of times each of the issues was raised. Our responses and clarification in relation to these key issues are provided in Appendix E.

Table 3 Key issues raised in submissions reviewed

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Issues raised in relation to transport and traffic matters</th>
<th>Number*</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increasing road capacity will add more traffic to Punt Road and not resolve congestion</td>
<td>80</td>
<td>14.3%</td>
</tr>
<tr>
<td>2</td>
<td>Historically traffic volumes on Punt Road are decreasing and improvement is not required</td>
<td>58</td>
<td>10.3%</td>
</tr>
<tr>
<td>3</td>
<td>Transport modelling indicates marginal travel time improvement</td>
<td>58</td>
<td>10.3%</td>
</tr>
<tr>
<td>4</td>
<td>School speed zones of 40km/h limit the achievable benefits</td>
<td>55</td>
<td>9.8%</td>
</tr>
<tr>
<td>5</td>
<td>Safety of pedestrians including school children and the elderly would be impacted by road widening</td>
<td>38</td>
<td>6.8%</td>
</tr>
<tr>
<td>6</td>
<td>In the short term clearways should be implemented</td>
<td>27</td>
<td>4.8%</td>
</tr>
<tr>
<td>7</td>
<td>Public transport improvements should be implemented in preference to road widening in the short term</td>
<td>22</td>
<td>3.9%</td>
</tr>
<tr>
<td>8</td>
<td>Other (changes to signals, remove right turns, broader strategy required, further detailed assessments required)</td>
<td>27</td>
<td>4.8%</td>
</tr>
</tbody>
</table>

Issues raised outside of our transport and traffic expertise or scope of the Assessment

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Issues raised</th>
<th>Number*</th>
<th>Percentage*</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Widening the road would result in significant social and environmental impacts (heritage, noise, air quality, liveability, severance etc)</td>
<td>109</td>
<td>19.4%</td>
</tr>
<tr>
<td>10</td>
<td>Public acquisition overlay provides uncertainty</td>
<td>60</td>
<td>10.7%</td>
</tr>
<tr>
<td>11</td>
<td>A road tunnel should be assessed</td>
<td>16</td>
<td>2.9%</td>
</tr>
<tr>
<td>12</td>
<td>Road tolling should be implemented</td>
<td>11</td>
<td>2.0%</td>
</tr>
</tbody>
</table>

*Note: Submissions generally raised a number of issues within the one submission and therefore the number of issues raised is greater than the number of submissions.
38. It is recognised that Section 7.4 of the Assessment included an analysis of social and environmental impacts under a range of criteria. These qualitative assessments were undertaken drawing upon range of specialists within Arup to highlight the outcomes of each of the options. These issues are relevant to the consideration of the future outcome for the Punt Road-Hoddle Street corridor. Further detailed social and environmental assessments should be undertaken as the part of the development of a specific proposal for the Hoddle Street-Punt Road corridor. Similarly, the consideration of issues in relation to the introduction of tolling or road tunnel treatments is outside the scope of the Assessment as outlined in Section 4.1.

39. Having reviewed the submissions received, we consider that the transport and traffic issues that have been raised have been addressed within the Assessment or are most appropriately addressed through subsequent planning, investigation and design. Accordingly, we considered that the assessment that has been undertaken is appropriate for informing the process to review the Punt Road public acquisition overlay.

8 Declaration

40. We have made all the inquiries that we believe are desirable and appropriate and no matters of significance which we regard as relevant have to our knowledge been withheld from the Panel.

..............................................  ..............................................
Jonathan Kinghorn  Paul Carter
2 February 2016  2 February 2016
Appendix A

Jonathan Kinghorn and Paul Carter - Curriculum Vitae
Jonathan Kinghorn

Jonathan is a Principal with Arup. He has over 17 years of international experience working on a range of diverse projects across the built environment in Australasia, Europe and North America. He currently leads the Transport Planning Group in Victoria and South Australia and in the Australasia region.

Jonathan has a proven track record of managing and directing multi-disciplinary projects from inception and planning through to design and implementation. He has considerable experience in infrastructure planning and in the formulation and appraisal of strategies for urban areas. Jonathan has a particular interest in the safe and efficient movement of people and freight within urban environments and has been responsible for several high profile projects.

Jonathan has wide experience gained from working on a broad range of commercial development, transport and civil engineering projects as well as master planning and urban regeneration schemes and leads integrated teams for private and public sector clients.

Jonathan has extensive expertise in strategy and policy development, airport access studies, demand forecasting and transport modelling, appraising the economic, environmental, social and financial impacts of project, stakeholder engagement and public consultation, public transport networks and operations, development planning and sustainable transport planning.

Jonathan is a strategic thinker who leads in developing, planning and implementing city and regional integrated transport strategies.

Streamlining Hoddle Street - Punt Road Transport Investigation, Victoria

Project Director for this initiative to explore a range of innovative ideas to increase the movement of people who journey along and/or across Hoddle Street-Punt Road corridor. Undertaken as two inter-related studies, separated at the Yarra River, this project included review of improvements that could be implemented in both the short and long term. This has involved exploring a number of strategies and innovative solutions from around the world including enhancing computerised traffic management systems, revising operations at intersections, prioritising public transport and exploring the use of continuous flow intersections, which are designed to improve traffic flow through intersections by reducing delays caused by right-turning traffic.
East West Link Tender Services for the Ferrovial Samsung Ghella Construction JV (FSGJV) as part of the Inner Link Group (ILG) Consortia PPP bid to Linking Melbourne Authority.

Stage 1 of the East West Link comprised of a 6 kilometre freeway standard road link between Eastern Freeway Clifton Hill and CityLink in Parkville. The proposal included a twin 4.4 kilometre three lane tunnels, reconfigured Hoddle Street / Eastern Freeway interchange, a tunnel interchange at Elliott Avenue, a CityLink interchange, access ramps to Ormond Road and additional traffic lanes to Eastern Freeway.

The SMEC Arup Design JV (SAJV) design team undertook an assessment of the LMA Reference Design and performed extensive optioneering of viable alternative designs in collaboration with FSGJV. Progressive positive guidance workshops were undertaken by the ILG, FSGJV and SAJV team with LMA that resulted in the adoption of a robust Conforming Design and a viable Variant Design. The SAJV team completed the production of all drawings, reports and submission documentation within the tight tender timeframes.

Jonathan was the transport planning discipline leader within the SAJV undertaking the Tender Services for the FSGJV. This involved developing a transport model, reviewing the reference design, developing new connections and interchange arrangements and the assessment of options.

Maribyrnong Defence Site, Melbourne, Australia

Project Director responsible for the development of a transport and sustainable infrastructure strategy to support the redevelopment of the Maribyrnong Defence Site. Unlocking the riverfront and improving access to the site for the surrounding communities via new open spaces and pedestrian, cycle and public transport links, will contribute to greater integration and community strength. Jonathan was responsible for coordinating the technical requirements with the design team, engaging with external stakeholders and leading the assessment of transport measures and infrastructure provision.

Northern Horizons – 50 Year Infrastructure Strategy for Melbourne’s North, Australia

Project Director for a landmark regional project involving eight northern Melbourne metropolitan councils, representing 1 million residents, that developed a comprehensive infrastructure scorecard assessing the current provision and access to social, transport, environmental economic and utility infrastructure. This analysis, together with demographic projects and transport modelling and a triple bottom line assessment in accordance with Infrastructure Australia’s framework informed the short, medium and long terms projects and programs for the region.
Essendon Airport, Melbourne, Australia
Project Director to provide technical advice regarding the proposed development of the Bulla Road Retail Precinct. The study involved investigating options into alternate access arrangements to improve the existing operation of the interchange – including the innovative concept of a Diverging Diamond Interchange. During this study, Jonathan was involved in design development, transport modelling, SmartRoads network fit assessment and consultation with VicRoads.

Melbourne Airport - Landside Movement Master Plan
Project Director for this study that developed an integrated transport network that will address the transport needs for Melbourne Airport for the next 20 years. Jonathan was responsible for developing the master plan through a robust process of stakeholder engagement, transport modelling, option development and option appraisal against a series of criteria that considered both the airport’s objectives as well as broader economic, social and environmental and integration drivers. The master plan sets out a clear vision and provides a strategic direction for landside access that is essential to support the future growth aspirations of the airport.

Melbourne Airport – Landside Movement Feasibility Study
Transport Planning Team leader for this study which followed on from the Landside Movement Master Plan. The feasibility study carried out a range of assessments to develop and recommend a preferred option for an elevated road one way loop system – this involved transport modelling, option development and appraisal, stakeholder consultation and the development of a phasing and implementation plan.

Auckland Airport – Transport Strategy
Project Director to develop a transport strategy for Auckland Airport. The objective of the transport strategy is to take a holistic view of all forms of transport to, from and around Auckland Airport and establish a clear strategy to implement transport initiatives in line with the Masterplan’s objectives and to meet growth in demand. The plan that establishes clear strategic principles to guide the future development of transport to, from and within Auckland Airport, combined with a comprehensive set of projects and initiatives that, taken over the next 30 years, will enable Auckland Airport to ensure that the transport needs of all users are satisfied.

North West Rail Link, Sydney, Australia
Jonathan was part of the review team to challenge the design of the proposal to provide a rail link to North West Sydney. In order to ensure that scheme is in-line with current best practice and fulfils the project objectives, Jonathan was involved in undertaking an independent review of the design, focusing on strategic fit, travel demand, station location and functionality and interchange and connectivity.
Public Transport Authority, Bus Priority Guidelines, Perth, Australia
Specialist Advisor for this project which involved updating the current guidelines for planning and providing public transport infrastructure and services in Western Australia. The update involved a review of international best practice in order to establish operational benefits for public transport services and contribute to a more comprehensive and integrated approach to sustainable transport planning.

Victoria Harbour Access and Movement Study, Melbourne, Australia
Project Director to undertake site inspections and prepare a report on traffic movement and access issues within the Melbourne Docklands precinct. The work was an extension on an original commission undertaken in 2010 which culminated in a report and workshop presentation to Melbourne Docklands stakeholders. The study reviewed the status of issues and recommendations previously identified in 2010 as well as identifying new issues arising from new site observations of current traffic conditions within the Docklands precinct.

Camberwell Junction Access Study, Melbourne
Project Director for this study provided an important planning tool to inform decision making on future projects and developments. The core aim of the study was to maximise access through supporting greater transport choice. This required identifying and balancing mobility networks and amenity needs. The study considered the requirements and dynamics of each respective transport mode in order to develop a balanced and prioritised framework.

St Kilda Triangle Car Park Investigation Study, Melbourne
Project Director for this study that provided strategic direction to Council about the future construction, management and operation of an underground car park structure in the St Kilda Triangle precinct. The study involved preparation of a business case to ensure the preferred option was based on robust technical, financial and operational findings.

Waterfront Auckland, Transport Strategy Peer Review, Auckland New Zealand
Project Director to undertake a peer review of the proposed transport strategy to support the development of the future 25,000 workers and 3,500 residents on the site. The peer review focused on understanding scale, defining the waterfront corridors, defining the interchange, managing travel demand, and phasing and implementation. Jonathan has also developed a public transport implementation plan, which considers a progressive strategy for introducing rapid transit, and a framework for assessing the proposed bus interchange.
Belfast City Centre Transport Master Plan, Belfast, Northern Ireland

Project Director for developing a bus strategy and infrastructure implementation plan for central Belfast. The aim of the project was to reorganise traffic management within Belfast city centre to facilitate a reduction in general traffic levels and encourage greater walking, cycling and public transport use. This required the redistribution of available road space in favour of public transport and cyclists and improvements to the road network to the west of the city centre to provide an alternative and attractive route for northbound traffic. The study involved option development, developing plans for Bus Rapid Transit, consulting with key stakeholders, assessing and appraising the options against government objectives, transport modelling and environmental and economic assessment. The scheme was implemented during 2013 and has dramatically improved access to the city centre.

Transport Strategy Study, Newport, Wales

Project Manager to develop transportation strategies and measures to help regenerate the city and to facilitate wider economic regeneration in the surrounding catchment area. The overall aim of this study was to identify a balanced transport strategy that will meet the economic growth potential of the city over the next 20 years. The study considered all types of transport including new and improved bus and rail services, providing better roads and creating a safe and attractive environment for pedestrians and cyclists. As part of the study Jonathan coordinated the development of an accessibility model to assist with the strategy appraisal and formulation process. In addition, he managed an extensive consultation exercise to gain the views of key stakeholders to feed into the strategy development process.

M4 Corridor Enhancement Measures, Newport, Wales

Transportation Team Leader responsible for the development of a range of potential corridor enhancement measures to improve the operation of the existing M4 around Newport. Such measures include making best possible use of the existing capacity, improving the resilience of the transport network and improving public transport. The study involved SATURN modelling, micro-simulation modelling, option appraisal and economic assessment.

A545 Menai Bridge to Beaumaris, Isle of Anglesey, Wales

Transport Reviewer for this study to promote sustainable transport along the A545 with a series of improvement measures. The aim was to ensure that walking and cycling are safe, attractive mode choices for residents, employees and visitors alike, to encourage modal shift away from the private car.
Port Talbot Peripheral Distributor Road – Business Case
Talbot, Wales
Project Director responsible for the production of a business case for Port Talbot Peripheral Distributor Road, to assist Neath Port Talbot County Borough Council application for EU convergence funding. The business case for the scheme incorporated the financial and economic assessment and also the likely productivity effects and wider economic benefits of the scheme.

A465 Dualling Section 3: Brynmawr to Tredegar, Wales
Transportation Team Leader to develop the design of the A465 Heads of the Valleys Dualling Section 3 up to publication of draft Orders and Public Inquiry. This has involved testing alternative options for the improvement scheme, with traffic forecasts produced by the model - which was also used to provide an input to the environmental and economic assessment of the scheme. Jonathan was also involved in preparing the business case for the scheme to support an application for European funding through the Convergence Programme for West Wales and the Valleys.

Fabian Way Transport Corridor Study, Swansea, Wales
Project Director for this strategic assessment of the transportation options for the A483 Fabian Way corridor. The corridor is scheduled to experience significant development in the next 25 years, generating increased travel demand. A balanced transport strategy was developed to support the sustainable development of the corridor and to facilitate wider economic regeneration in the surrounding catchment area.

A8 Dualling – Belfast to Larne, Northern Ireland
The A8 is a strategic link between Belfast, via the M2, to the regional gateway of Larne. Jonathan was the Transportation Team Leader responsible for developing a transport model to inform the upgrading of the route. This involved model validation, option development, forecasting, economic assessment and option appraisal.
Paul Carter

Paul is one of the leaders of Arup’s transport team in Melbourne. He has a wide range of experience and has worked in both the consulting and government sectors. His broad experience includes transport strategy, master plans, business case development, transport impact assessments for large development projects as well as multi-modal interchange design for stations and airports. In these projects he has used a sound understanding of transport planning and traffic engineering principles to deliver innovative outcomes for a variety of industry sectors.

Paul is a Certified Transport Planner and has a Masters of Traffic for which he won the VicRoads prize for the highest average mark in coursework units. He is an excellent communicator having performed the role of Expert Witness and presented to a number of Technical Reference Groups. Throughout his career Paul has always sought out challenging projects, which has been driven out of a desire for understanding and demonstrating innovation and best practice within the transport field.

Paul’s key strengths lie in his ability to develop, coordinate and deliver sound solutions to complex transport challenges, in alignment with the client’s needs.

Streamlining Hoddle Street and Punt Road Transport Investigation, Victoria

Project Manager for this major initiative to explore a range of innovative ideas to increase the movement of people who journey along and/or across Hoddle Street-Punt Road corridor. This is arguably the most important arterial road within Melbourne and has a number of challenges in balancing competing priorities for pedestrians, cyclists, buses, trams, freight and private vehicles. Undertaken as two inter-related studies, separated at the Yarra River, this project included review of improvements that could be implemented in both the short and long term. This involved exploring a number of strategies and innovative solutions from around the world including enhancing intelligent transport systems, revising operations at intersections, prioritising public transport and exploring the use of continuous flow intersections, which are designed to improve traffic flow through intersections by reducing delays caused by right-turning traffic.

This study also involved the development of a network strategy and operating plan to identify how the network should operate in the future. Options were then developed and tested with strategic demand forecasts providing input into a mesoscopic model (VISUM) and intersection models. Through a process of appraisal relative to social, environmental and economic criteria as well as assessments of risk and stakeholder acceptance, a preferred option was identified. The business case for the Streamlining Hoddle Street Initiative will be considered as part of the 2016/2017 budget deliberations.

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Package 1 Business Case (Confidential), Victoria

The Package 1 project involved the preparation of a full business case that met the requirements of both VicRoads and the Department of Treasury and Finance. The project included a road duplication over a length of approximately 1km as well as reconstruction and widening of an existing road/rail grade separation to increase the capacity for all road users crossing the existing rail corridor. The project was identified as a High Value, High Risk project with a capital value in excess of $150 million.

Paul was the primary author of the business case. The role included working within the VicRoads team for 6 months, steering the business case development through the stages of problem and benefits identification, strategic options testing, triple bottom line project options appraisal and the development of a recommended solution. As part of the role, Paul provided oversight in the development of the demand forecasting, local area transport modelling, engineering design, environmental assessments, economic, risk, cost, program and constructability assessments. Paul also led discussions with key stakeholders and consultants throughout the business case development.

In addition to the business case, Paul authored the VicRoads Project Review Committee report as well as presenting the business case to VicRoads Project Review Committee and VicRoads Regional Review committee.

The business case was successfully submitted for government consideration as part of the 2015/2016 budget deliberations.

Melbourne Airport Landside Movement Master Plan, Victoria

Paul was the project manager for this project that developed an access plan to support the development of the airport precinct over the next 20 years. This involved establishing the current landside transport network operations and required capacity and functionality of the future transport network. The study included the development of a series of concept designs and appraisal of these network options against a series of criteria. These criteria considered both the airport’s objectives as well as broader economic, social, environmental and integration drivers. The appraisal and assessment process was used to identify a preferred master plan option. The master plan provides a clear direction for landside access that is essential to support the future growth aspirations of the airport. The preferred concept design has since been progressed into preliminary and detailed design.

In addition, Paul was also involved in preparing the concept layout plan as part of the Southern Precinct Program (SPP). This included identifying the required transport infrastructure changes within the new terminal forecourt, the design of a new multi-level car parking facility as well as identifying the improvements that are required for the surrounding road network.
Shaw River Power Station, Victoria
Paul was the project manager for the delivery of the Roads, Traffic and Infrastructure Impact Assessment Study for the EES being prepared for the Shaw River Power Station in south western Victoria. This assessment included a review of the existing road network, assessment of intersection operation, intersection concept design, traffic flow assessments and identification of required road improvements. This role also included presentation to the Technical Reference Group which included a number of government stakeholders. Paul also prepared and performed the role of Expert Witness at the Panel Hearing for the project.

Sydney Road Streetscape Investigation, Victoria
Paul was the project manager for the delivery of the investigation for concept options for changes to the streetscape in Sydney Road. This investigation included concept development for alternative accessible tram stops, footpath widening and street tree configurations. Paul coordinated the urban design, traffic engineering, micro simulation modelling disciplines to assess traffic, public transport, cycling and pedestrian impacts for various concept layouts.

Smith Street Activity Centre Transport and Access Study, Victoria
Paul was a key team member for this study and was responsible for the identification of strategic gaps in the transport network for the Smith Street Activity Centre Structure Plan. Paul’s role focused on the interactions between land use and the transport network, particularly for pedestrians and cyclists.

Noonamah Ridge Estate Transport Impact Assessment, Northern Territory
As Project Director, Paul was responsible for overseeing the TIA that supported the EIS of the regional Darwin development. The development proposed to consist of 2,062 hectares of residential area, a 1.6 hectare village centre and 192 hectares of commercial area. It is arguably one of Darwin’s largest residential developments with potentially significant transport related impacts. The Arup submission was regarded by the Northern Territory Government as a new benchmark for development transport assessments in Darwin.

East West Link Tender Design, Victoria
Paul was the transport planning and modelling technical lead for the Arup and SMEC Joint Venture (SAJV) tender design for the Ferrovial Samsung Ghella Construction JV (FSGJV) for the East West Link Project. These design and construction joint ventures form part of as part of the Inner Link Group (ILG) Consortia PPP bid to Linking Melbourne Authority. Stage 1 of the East West Link comprises a 6 kilometre freeway standard road link between Eastern Freeway Clifton Hill and CityLink in Parkville. The project includes:
- Twin 4.4 kilometre three lane tunnels;
- Reconfigured Hoddle St / Eastern Fwy interchange;
- A tunnel interchange at Elliott Avenue;
- A CityLink interchange;
- Access ramps to Ormond Road; and
- Additional traffic lanes to the Eastern Freeway

This five month tender design involved extensive option testing and an iterative refinement of the two separate design schemes to minimise the project cost and maximise the performance of the proposed transport network. The design development included extensive assessment of the freeway network performance, intersection performance as well as the design of new pedestrian and cycling and public transport linkages.

In this role, Paul also presented on behalf of the Inner Link Group consortium to the executive team of the Linking Melbourne Authority at the positive guidance interactive workshops.

**Monash-CityLink-Westgate Freeway Management System, Victoria**

Paul coordinated aspects of the project to carry out scheme design for the advanced FMS and on-road improvements including new systems not installed elsewhere in Australia. The freeway management system includes 64 coordinated ramp metering sites, integrated control systems, communications systems, and infield devices such as lane use signs, CCTV and wireless vehicle detection.

**Hampton Station Precinct Future Use Study, Victoria**

Paul performed the role of project manager for this study for VicTrack. Phase 1 of this study included the concept design of potential future Rail over Road and Rail under Road grade separation options at Hampton Street, significant stakeholder consultation and appraisal to identify a preferred option. Phase 2 of this study included the development and appraisal of a series of transport interchange options to identify a preferred transport interchange for Hampton.

Under a compressed time frame, the study successfully identified the land required for transport purposes and established the remaining VicTrack envelope for potential future development and revitalisation of the precinct. This facilitated the land clearance approval with Public Transport Victoria and has facilitated the release of this land for development.

As part of this project, Paul chaired a series of workshops with DTPLI, PTV, VicRoads, Victrack and local government as well as presenting to the VicRoads Regional Review Committee.
Regional Rail Link, Victoria

Paul was the transport planning and traffic engineering technical lead associated with the preparation of concept and then preliminary design for Regional Rail Link Project in Victoria.

Paul also performed the role of Technical Advisor to the Regional Rail Link Authority as the project progressed through further design stages and into construction. This advisor role included detailed review and comment on the tender submissions and design drawings from a traffic and transport perspective as well as review and advice on critical issues during the design and construction stages.

The project includes 45km of twin rail track from West Werribee to Southern Cross Station in the west of Melbourne. Paul has been responsible for:

- Establishing a strategic framework for transport issues that interface with the rail corridor,
- Design of 2 new stations, redesign of 4 existing stations and design of the associated multi-modal transport interchanges. These designs responded to the requirements for pedestrians and cyclists as well as providing for large bus interchanges (up to 8 bay capacity), kiss and ride, taxi and commuter car parking facilities.
- Identification of conceptual requirements and intersections arrangements associated with 14 grade separations;
- Assessment of the remaining level crossing performance, development of mitigating options as well as a project appraisal to identify the preferred treatments measures;
- Design of pedestrian and cycling facilities along the corridor including a significant section of shared path in Melbourne’s growth areas;
- Parking supply and demand studies for the corridor as well as detailed studies within the Footscray activity centre; and
- Advice on the potential transport requirements to facilitate a shutdown of the rail corridor during construction. This included establishing the necessary modification at stations to provide convenient interchange, estimate of the number of buses required for rail replacement and the traffic impact of additional buses along the surrounding road network.

Springvale Road Grade Separation Project, Victoria

As part of the Springvale Road Alliance design team, Paul provided technical advice for the redesign of the Nunawading station precinct as part of the Springvale Road Grade Separation Project. This precinct design includes the car parking layout, public transport access and interchange requirements for the local bus and Smartbus services operating along Springvale Road, cyclist access and facilities design, traffic movement and heavy vehicle circulation.
Appendix B

Key Contributors - Curriculum Vitae
Bruce Johnson is a Principal in Arup’s Planning Group and has regional responsibility for the group’s strategic transport planning activities. He has 29 years of experience in the transport planning and infrastructure sector.

Bruce is a strategic transport planner, experienced in the planning and operations of transport infrastructure across many modes. Bruce has expertise in strategic transport planning, demand assessment, network modelling for roads and public transport, economic assessment, and traffic engineering and management.

His project experience includes management of and key technical input to significant road and public transport planning projects, research and policy assessment throughout Australia and overseas. This work has included extensive involvement in stakeholder and community consultation. Bruce has significant privately funded infrastructure experience including responsibility for demand forecasting on Australian and international toll road projects.

Major technical strengths are Bruce’s project assessment, economic evaluation and transport network modelling skills. He is an expert user of key specialist transport planning software including EMME, Cube Voyager, Transyt, Paramics, and SIDRA.

Bruce’s project experience includes periods working in all states of Australia and in New Zealand, China, Hong Kong, Papua New Guinea, Thailand, United Arab Emirates, United Kingdom and the United States.

Bruce draws on his extensive experience across many facets of the transport sector to deliver insight, innovation and sound advice to clients.

Streamlining Hoddle Street - Punt Road Transport Investigation, Victoria

Transport Modelling Lead for this corridor study for VicRoads which has explored a range of innovative ideas to increase the movement of people who journey along and/or across Punt Road. This has involved exploring a number of strategies and innovative solutions including enhancing computerised traffic management systems, revising operations at intersections, prioritising public transport and use of innovative intersection designs.

Melbourne City Link Docklands Road Network MAE Arbitration, Victoria

Burwood Square Development Plan, Victoria
Transport planning input associated with this significant multiuse development. The site is one of the first in Victoria to have required submission of an Integrated Transport Plan under new planning provisions. Bruce provided evidence at the Priority Development Panel hearing for the project.

Queenscliff Harbour Development, Victoria
Traffic engineering and parking assessment for multiuse harbour based development. Included input to site masterplanning and assessment of parking demands associated with the development and the nearby ferry terminal. Bruce provided evidence at the Planning Panel hearing for the project.

Shepparton Bypass Planning Study, Victoria
Responsible for transport planning and economic evaluation components of the EES. Developed an EMME/2 demand model for the study area and undertook economic evaluation to assess options for major freeway bypass of the city.

As input to preparation of the EES for the bypass consulted extensively with local freight operators to establish freight demand and operations characteristics in the study area.

Bruce appeared as an expert witness for the EES Panel hearing.

Echuca – Moama Traffic Study, Victoria and NSW
Development of an EMME/2 model for assessment of needs and options for a new Murray River Crossing. Undertook economic evaluation of options and presented evidence at a panel hearing.

Regional Rail Link, Victoria
Transport Planning Discipline Lead for the concept design development of the $4.3 billion rail project for the Regional Rail Link Authority. The project provides for 50km of new rail alignment running from west of Werribee to Southern Cross Station, enhancing rail capacity and reliability by separation of regional and metropolitan services. Contributing as part of the KBR Arup Joint Venture, the transport planning team led by Bruce comprehensively addressed a range of planning and stakeholder issues including:

- Refinement of patronage forecasts for the project, including development of enhancements to the MITM strategic transport model
- Pedestrian planning and capacity assessment for station concept development, including simulation modelling
- Station access and mobility plans for new stations at Tarneit and Wyndhamvale, and significant alterations to stations at Footscray, West Footscray and Sunshine.
- Investigation and analysis of traffic issues, including microsimulation modelling, and evaluation of options to upgrade level crossings, extend existing bridges or grade separate numerous arterial roads crossing the corridor.
- Strategic planning associated with linear bicycle routes, pedestrian crossings and urban design strategies for sections of the corridor.
- Development of a bussing operations strategy and associated infrastructure planning to provide for replacement services for extended rail shuts during construction.

**Canberra Light Rail Master Plan, ACT**
Project Manager leading a multidiscipline team preparing this master plan. Involves identification, investigation and assessment of LRT route options across the Canberra network and incorporates significant stakeholder consultation. The work includes a strong focus on land use and transport integration, with consideration of renewal opportunities and land value uplift impacts of LRT.

**NSW Long Term Transport Master Plan**
Technical Director for Arup’s role where he worked in-house with Transport for NSW over a four month period as part of a team to develop a long term transport master plan for New South Wales. Contributed to development of the overall master plan with particular focus on integrated planning, international benchmarking and rail components of the plan as well as overall document review. For the rail component he contributed to key strategic discussions in relation to major proposals outlined in Sydney’s Rail Future and to shorter term rail system improvements.

**Abu Dhabi Integrated Public Transport Network Phase 1 Business Case, UAE**
Project Manager leading preparation of the business case for the feasibility study of a proposed 18 km Metro line and three LRT lines (41 km in total) to serve the Abu Dhabi CBD. Working within the Project Management Consultancy for the Department of Transport coordinated technical inputs from external consultants, prepared economic evaluation and developed the overall business case.

**Northern Horizons Strategy, Victoria**
Bruce led transport planning input to this major study for the seven Northern Melbourne metropolitan councils, which strategically identified and addressed crucial infrastructure issues associated with projected regional growth. The study included the use of VITM to inform short, medium and long term transport infrastructure needs for Melbourne’s north and prioritisation of key major projects.

**Melbourne Metro Demand Forecasting, Victoria**
Provision of transport modelling services to PTV, assisting with the preparation of the business case for this project. Modelling involved refinement and application of VITM. Bruce was also involved in the related previous work undertaken for the Melbourne Rail Link project.
On Road Public Transport Network Development Plan, Victoria
Project Director for this PTV strategic study implementing draft future year public transport networks in VITM to test and inform the refinement of the On-road Network Development Plan.

Melbourne Airport Rail Options Study, Victoria
Bruce provided transport planning input to Arup’s role in identifying and assessing rail link and station options at Melbourne Airport. This involved significant liaison with PTV and airport stakeholders.

Springvale Road Rail Grade Separation Project, Victoria
Transport Planning Leader for the Springvale Road Rail Alliance that designed and constructed grade separation of Springvale Road and a new Nunawading Station. Bruce contributed to development of an innovative island platform and pedestrian underpass design that delivered improved functionality and assisted in minimising construction conflicts with train operations.

South Morang Rail Extension Project, Victoria
Transport Planning Leader for the SMREP Alliance delivering duplication of 5 km of existing track between Keon Park and Epping, 3.5 km of new rail line from Epping to South Morang, a major upgrade to the station at Thomastown and new stations at Epping and South Morang. Extensive planning was involved in the development of concepts for modal interchanges at the two new stations and included microsimulation modelling and significant consultation with a range of key stakeholders.

Growth Areas Stations Program, Victoria
Bruce led the integrated planning team for delivery of preliminary designs for new rail stations at Caroline Springs, Cardinia, Lynbrook and Williams Landing. Planning of the intermodal transport interchanges at each station addressed development of options and design of a range of bus terminal facilities.

Dandenong Rail Corridor Strategy, Victoria
Arup was appointed by DOI as Project Manager to coordinate this major study into capacity relief options for this busy corridor. Bruce reviewed demand forecasts, economic evaluations, risk studies and reporting for the study.

Metropolitan Rail Network Project Feasibility Study – Project Prioritisation, Victoria
Project Director for this DOI study assessing 10 year investment priorities for the rail network. The work involved passenger demand and capacity assessment and development of an evaluation framework for prioritisation of projects addressing various network needs. The outcomes formed a key input to the Government’s Meeting Our Transport Challenges strategy.
Melbourne Integrated Transport Model, Victoria

Project Director, leading the development of a new TRIPS public transport model of Metropolitan Melbourne for the Department of Infrastructure, the MITM. Model development involved many complex technical tasks and created the model as the key platform for the government’s strategic transport planning. Bruce has subsequently been involved in numerous studies applying and upgrading the model which has now been transformed to the Victorian Integrated Transport Model.

Metropolitan Bus Plan, Victoria

Bruce led Arup’s contribution to this project for the Department of Infrastructure. The work involved development of a comprehensive GIS database of all bus routes in the metropolitan area, and demand assessment of bus services improvement proposals, using the MITM.

Outer Western Suburbs Public Transport Strategy, Victoria

Project Director for the development of this strategy in a rapidly developing urban area. Applied the MITM, developed by Arup, to assess potential bus and train improvement projects. The assessment addressed demand projections, operational issues and economic evaluation. Responsible for the overall delivery of the strategy and development of assessment techniques which provided, in the Melbourne context, a new approach to this issue.

Tram 109 Urban Design Project Boroondara, Victoria

Bruce led Arup’s extensive work covering the entire Tram 109 Route in Boroondara. This included development of innovative traffic engineering concepts and a comprehensive stakeholder and public consultation process associated with improvements to tram operations and tram stops.

Springvale and Blackburn Road Smart Bus Project, Victoria

Building on the approach developed by Arup for the Cross-Town bus priority study assisted the Department of Infrastructure in developing, costing and evaluating over 20 specific bus priority treatments for these routes. Managed Arup’s involvement and developed a spreadsheet based analysis tool to analyse priority benefits and impacts on other road users.

In a separate project Arup also collected and analysed traffic and bus performance data for assessment of before and after conditions.

Review of Tram Priority on Principal Traffic Routes, Victoria

Project Manager of a major review of priority operations of Melbourne’s tram network. The review focussed on the East Burwood route as an example, and a new sophisticated computer based data collection technique was developed specifically for the project. A new data management software tool was developed to provide easy access and maximum benefit from the extensive information derived. His technical expertise ensured a pertinent and comprehensive review was prepared.
Traffic Management for Bus Operations, Victoria
Preparation of guidelines for use by the Public Transport Corporation. Included comprehensive literature review of international practice, preparation of design guidelines, development of signal priority principles and a project assessment methodology.

Traffic Engineering for Public Transport Corporation, Victoria
Bruce was seconded to the Traffic Engineering Group in the PTC to assist with development and monitoring of tram and bus traffic engineering projects.

Wellington Public Transport Model Development, New Zealand
Bruce was Technical Director for this project which developed a new detailed public transport model for Greater Wellington Regional Council. The project utilised a new approach using electronic ticketing data that significantly enhanced the capability of an existing strategic model known as WTSM. Bruce also provided technical oversight to the updating of WTSM.

Auckland Rail Business Plan Review, New Zealand
For Transfund New Zealand led a high level review of the business plan for a $NZ760M proposal to upgrade rail passenger services in Auckland. Arup identified key risks and issues associated with the plan and reported to the Transfund Board.

Auckland Public Transport Model: Review of mode specific constant, New Zealand
Led Arup’s work recommending an appropriate rail mode specific constant to use for the Auckland Public Transport model to support the business case for the proposed Auckland City Rail Link. The study considered international experience and model performance.

Auckland City Traffic Model Development, New Zealand
Provided technical input to development of an innovative approach to incorporate junction delay procedures in the EMME/2 model used by Auckland City Council.

Northbourne Avenue Traffic Management Study, ACT
Included dense network modelling of junctions with the TRIPS package. Undertook extensive model development in TRIPS and TRANSTEP to create a unique hybrid 3-step traffic model.

East West Link Tender Services, Victoria
Member of SMEC Arup Design JV (SAJV) undertaking the Tender Services for the Ferrovial Samsung Ghella Construction JV (FSGJV) as part of the Inner Link Group (ILG) Consortia PPP bid to Linking Melbourne Authority. Undertook review of transport and traffic engineering aspects of the bid.
East West Link patronage review, Victoria
Led the review of patronage forecasts for East West Link in Melbourne for the Department of Transport to support the business case preparation.

Peninsula Link, Victoria
Provided operations and maintenance advice as part of Arup’s Independent Technical Advisor role on behalf of the sponsors and financiers associated with the Connect11 consortium’s bid. The project is a new 25km freeway facility being delivered under a PPP availability framework.

Brisbane North South Bypass Tunnel, Queensland
Technical Director for Arup’s role as traffic patronage consultant for the BrisConnections consortium (Macquarie Bank, Thiess, John Holland and Hochtief) bid. The project involved a new 5 km tolled link, predominantly in tunnel, providing a bypass of the Brisbane CBD.

Cross City Tunnel Refinancing, NSW
Project Director for Arup’s role as traffic patronage consultant for the Babcock & Brown consortium bid for the equity refinancing of the toll road concession lease.

Indiana Toll Road, USA
Project Director for Arup’s role as traffic patronage consultant for the Babcock & Brown consortium bid for the toll road concession lease. The toll road is an existing 157 mile long facility, spanning east-west across the north of the State of Indiana. As part of the project developed a hybrid demand modelling approach drawing on and enhancing elements of existing regional transport demand models.

Melbourne City Link Project, Victoria
CHART Roads, 1994-95. Responsible for traffic forecasting and traffic engineering design for the consortium’s tender bid for this $A 1700M project. Assessments involved use of TRIPS and EMME/2 models and included toll revenue projections including extensive liaison with financial advisors for the bid.

Transurban, 1999-2000. Principal for review of operation and maintenance procedures for all project infrastructure.

Lane Cove Tunnel Patronage Study, NSW
On behalf of Transurban led the patronage team preparing traffic forecasts for the tender bid to RTA NSW for the Lane Cove Tunnel toll road project.

Toll Roads in Guangdong and Shandong Provinces, China
Transport and revenue assessment for South-East Asia Investment Holding Company. Assessment of eight roads for inclusion in a Hong Kong share market prospectus.
Port and Inner West Precinct Strategic Road Network Study, Victoria
Bruce undertook the role of Strategic Technical Advisor providing advice to VicRoads and Department of Transport in relation to transport planning and demand modelling aspects of this study considering future options for the Melbourne ports area. Developed a multi-criteria assessment of alternative options.

Transport Modelling Services for Strategic Investment Outlook Study, Victoria
Secondment to the Strategic Planning Division, DOI to assist with TRIPS modelling and process review for road and public transport project evaluation.

Cube/TRIPS Training for VicRoads, Victoria
Developed and presented training sessions for VicRoads staff in the use of Cube/TRIPS software for four-step strategic traffic modelling.

Northern Metropolitan Traffic Study, Victoria
For VicRoads prepared a comprehensive strategic review of existing and future road, network performance across a broad region of Melbourne’s northern suburbs. Included TRIPS forecasts and extensive use of GIS for reporting.

Werribee Employment Precinct Transport Study, Victoria
Project Director for this project involving the identification of options for a major mixed land use development on a greenfield site in a rapidly developing area. Transport planning involved recommendations for supportive transport infrastructure framed by strong transit and active transport orientated principles. Included strategic demand modelling that demonstrated the region wide benefits of a new employment centre.

Docklands Projects, Victoria
Bruce directed Arup’s traffic engineering input to the Charles Grimes Bridge realignment, the Collins Street extension project and the Victoria Harbour redevelopment. Bruce also provided traffic engineering advice to bidders for precincts in the Docklands redevelopment.

Models for Predicting Vehicle Operating Costs in Urban Areas, Australia
This research project for Austroads, the association of Australian Road authorities, included a review of literature and current practice for VOC models. New VOC - speed relationships were developed for Australian urban areas for application in economic evaluations.
Highway Corridor Strategy Studies, Victoria
Bruce was project director for the Princes Highway West (364 km), Mallee Highway (230 km), Murray Valley Highway (630 km) and Docklands Highway (12 km) strategy studies for VicRoads. Each of these studies produced a strategy providing a statement of management plans and actions required to achieve the intended long term function and performance of the highway. Each study applied a systematic data collection, GIS reporting, analysis and evaluation methodology developed by Arup. This included economic assessment of improvement proposals. The strategies involved assessment of regional economics and freight generators.

Freight Planning
Bruce has provided key input to numerous freight and intermodal related projects across Australia. His experience covers policy, strategic planning, demand assessment, operations and traffic engineering issues.

Bruce has undertaken numerous strategic transport planning and demand forecasting projects that have included consideration of freight issues as part of their overall scope. In particular his work on toll roads in Brisbane, Melbourne, Sydney and other cities internationally has considered demand forecasting in relation to freight movements. This work has also included specification of data collection for freight studies.

Freeway Management System for Monash CityLink West Gate Upgrade Project, Victoria
Project Director leading Arup’s development of the Freeway Management System (FMS) for VicRoads. Arup was contracted to deliver the technical requirements specifications for all elements of the FMS, including:

- a Coordinated Ramp Metering scheme - involving the installation and co-ordination, along a 75km corridor, of 64 Ramp Metering sites and all related devices
- 75km of Managed Motorway- incorporating the design of an advanced lane use management system

Potential Benefits for Freight Operations from Intelligent Transport Systems, Australia
Undertaken for ITS Australia this study involved an international review of the context of ITS applications in the overall transport and logistics scene and the extent of benefits from these applications. Estimates of benefit levels were made and issues affecting the development and deployment of the technology were identified. Recommendations for strategic actions and specific demonstration projects were developed.

Bruce managed the study, was responsible for co-ordinating the inputs of a sub-consultant team, and provided technical input to the report.
Paired Intersections Project, Australia
Review of issues and testing of existing analysis software for the Australian Road Research Board.

Unconventional Intersection Design, Victoria
For VicRoads investigated types of unconventional intersection that have been successfully implemented overseas to assess their suitability for Victorian traffic conditions. Assessed the advantages and disadvantages of these designs and developed warrants for application of the alternative designs. The project included testing of alternatives using Paramics microsimulation.

Traffic Signals Operations
Bruce’s expertise in the traffic signals and traffic control technology field was initially developed through his employment in the Signal Operations Group of the Road Traffic Authority, Victoria (now VicRoads) over a four year period. Experience with the SCATS system was gained, including design of signal personalities, implementation of SCATS signal coordination, use of monitoring software, implementation of tram priority and fine tuning of signal systems together with overall control centre and road operations experience. This experience has been extended with projects undertaken with Arup.

Traffic Signal Design
Traffic signal layout design, traffic signal personality design, and signal system linking design for VicRoads. Across numerous commissions Bruce has had a direct role and managed the work of Arup team members in the design of many sites.
Rob Turk

Robert is an Associate and the Environment and Sustainability Leader of Arup’s Victorian office and has over 18 years experience in a range of sustainable development and environmental management projects within the UK, Australia and Abu Dhabi. He has qualifications in Environmental Science and Environmental Law and was on the inaugural Board of the Infrastructure Sustainability Council of Australia (ISCA) and part of its Global Review Panel and an Infrastructure Sustainability Accredited Professional (ISAP).

He has direct experience of environmental approvals for large infrastructure projects. As an example Rob was the Sustainability Manager and Environmental Coordinator for Regional Rail Link. As part of this role Robert managed all the contaminated land and air quality investigations for the project, including liaison with impacted stakeholders, and reviewed key environmental approval documents, such as the Environment Effects Statement referral.

More recently he has been working closely with Melbourne Airport on the approval process and preparation of the Commonwealth and Victorian approval pathway, referral documentation and technical scopes for the proposed development of a third runway.

Robert has specific experience with port infrastructure, with environmental and sustainability roles on the assessment processes for the Port Bonython bulk freight jetty in South Australia, Port of Ashburton in Western Australia and Mornington Safe Harbour in Victoria.

**Special Fields of Competence**

- Environmental Impact Assessments and Approvals
- Environmental Management Plans
- Strategic Environment and Sustainability Assessments
- Carbon Strategies and Management
- Climate Change Adaptation Assessments

Rob has developed an intimate knowledge of the environmental approval processes and management approaches for linear infrastructure projects in Australia through his recent project experience.

**2015, Streamlining Hoddle Street - Punt Road Environmental Investigation, Victoria, Melbourne, Australia**

Client: VicRoads

Environmental lead for this initiative to explore a range of innovative ideas to increase the movement of people who journey...
along and/or across Hoddle St-Punt Road Corridor. Undertaken as two inter-related studies, separated at the Yarra River, this project included review of improvements that could be implemented in both the short and long term. Rob led the environmental input to the multi-criteria analysis, a high level determination of potential environmental impacts associated with each of the concept design options and provided environmental input into the business case.

2015, Project Manager, Ballarat Greenfields Investigations
Client: Hansen Partnership Pty / City of Ballarat

Project Manager for the provision of specialist services to Hansen Partnership who were engaged by Ballarat City Council to identify the future growth area for the next 25 years for the City of Ballarat. Arup’s services have involved environmental and heritage review, infrastructure requirements assessment for both utility and social infrastructure, transport planning assessment and GIS.

2014 - 2015, Project Manager, Runway Development Program Major Development Plan, VIC, Australia
Client: Melbourne Airport

Delivery Lead for preparation of the Runway Development Program (new runway and extension to the existing east west) Major Development Plan (MDP) for Melbourne Airport. Preparation of the MDP has involved project management, identification of relevant consultation stakeholders and the preparation of technical scopes for specialist studies.

2013 - 2015, Project Manager, Third Runway Referrals Preparation, VIC, Australia
Client: Melbourne Airport

Project Manager and secondee to prepare the technical environmental scopes, the Commonwealth referral under the Environment Protection and Biodiversity Conservation Act 1999 and Major Development Plan table of contents for the Runway Development Program (new runway and extension to the existing east west) at Melbourne Airport.

2013, Project Manager, Third Runway Approvals Strategy, VIC, Australia
Client: Melbourne Airport

Project Manager to develop a strategy for achievement of the approvals for the Third Runway at Melbourne Airport. The Strategy considers the applicability of Federal and State legislation under different land tenure scenarios within the context of known environmental and heritage values on and surrounding Melbourne Airport.
2013, Environmental Lead, Hampton Station, VIC, Australia
Client: VicTrack

Environmental lead to identify the environmental and heritage constraints associated with an optioneering exercise on future designs for Hampton Station.

2011 - 2013, Internal Environmental Reviewer, Environmental surveys and approvals strategy, VIC, Australia
Client: Department of Justice

Rob provided strategic procurement advice to the Department, liaising with regulatory authorities, preparing scope of works for the ecology and contaminated land investigations.

2013, Environmental Lead, E-Gate Business Case
Client: Major Projects Victoria

Rob provided comment on the implications of the contaminated land investigations for the smart infrastructure strategy.

2012, Internal Environmental Reviewer, Environmental and planning approvals strategy, Maribyrnong Defence Site, VIC, Australia
Client: Places Victoria

Rob was a contributing author and reviewer to the final report to Places Victoria environmental and planning approvals strategy for a significant and complex brownfield Masterplan.

2010 – 2013, Sustainability Manager and Environmental Coordinator, Regional Rail Link, VIC
Client: Victorian Department of Transport

Sustainability Manager and Environmental Coordinator for the $4.3billion Regional Rail Link project to construct a new regional rail line from central Melbourne, through Footscray to Werribee. Scope of work involves development of a sustainability framework for the project to inform the design and apply to each design and construction package. Also responsible for management and review of the contaminated land assessment and air quality assessment across the project and review of key environmental approval documents.

2011 - 2012, Internal Environmental Adviser, Port Bonython Freight Port, SA, Australia
Client: Spencer Port Gulf Link

Internal environmental reviewer and adviser for the preparation of an environmental impact assessment for a new bulk freight terminal, deep water jetty and 30km rail line in the Spencer Gulf.
Joseph Sweet

Joseph is an experienced civil engineer who specialises in site development and multidisciplinary projects. He maintains a broad knowledge across the engineering field providing him with the skills required to be a key member of a project team. Joseph’s experience is primarily in the civil engineering field but has also gained multidiscipline experience through involvement with building services and structures projects.

Throughout his time with Arup, Joseph has been Project Manager on varying scale projects giving him a good understanding of the project delivery process. He has experience in all phases of projects from initial site investigations studies to delivery of detailed designs. Joseph also has experience in carrying out site inspection services during construction in order to provide quality control, independent verification and certification services.

Joseph has been involved in projects throughout Queensland, Victoria, South Australia and New Zealand. Joseph has been responsible for the design and management of a number of challenging projects requiring collaboration with key stakeholders. His multidisciplinary expertise has enabled him to communicate the constraints of the design and appreciate the client and stakeholders needs.

Joseph’s Key Skills Include:

- Project / Design management
- Roads, car park design and site development design
- Utilities and storm water design and coordination
- Preparation of contract documentation and specifications
- Site inspection services

Joseph’s experience working on projects of a varying scale provides him with the knowledge and expertise to integrate a multidisciplinary team.

Streamlining Hoddle Street, VIC

Infrastructure Lead for this initiative to explore a range of innovative ideas to increase the movement of people who journey along and/or across Hoddle Street-Punt Road corridor. Undertaken as two inter-related studies, separated at the Yarra River, this project included review of improvements that could be implemented in both the short and long term. This has involved exploring a number of strategies and innovative solutions from around the world including enhancing computerised traffic management systems, revising operations at intersections, prioritising public transport and exploring the use of continuous flow intersections, which are designed to improve traffic flow through intersections by reducing delays caused by right-turning traffic.
Melbourne Airport - Southern Precinct Program (SPP), VIC
The Southern Precinct Program covers the expansion of the Melbourne Airports Domestic Terminal Facilities including a new terminal building, multi-level car park, upgraded road network, utilities and a utilities tunnel. During the design development phase Joseph took on the role of project and design manager for the roads and utilities works associated with the new Multi-level car park. This included upgrades of all major services, widening and strengthening of access roads and signalisation of 3 intersections. Joseph continues on this project now taking on the role of Infrastructure manager across the wider scope. In his role Joseph is responsible for the management of the completion of the design and construction phase services.

Bruce Highway Upgrade (Uhlmann Road to Caboolture River), QLD
A section of the Bruce Highway was upgraded from two to three lanes in each direction near the district of Caboolture. Joseph has dealt in depth with the design of both the subsoil drainage and emergency stopping bays. These designs involved producing designs outside of existing specification for the Department of Transport and Main Roads (TMR). He has also been involved in making sure each construction set of drawings is submitted on time and to Arup standard.

Lomandra Drive / Sugarmill Road Intersection, QLD
Arup was commissioned by BAC to undertake the planning, design and documentation of the upgrade of the intersection at Lomandra Drive and Sugarmill Road. Joseph was jointly responsible for the capacity analysis of the intersection using SIDRA 3.1. The analysis was completed using traffic counts Arup conducted on the intersection and predicted growths expected from infrastructure upgrades and construction. These growths were developed using strategic EMME/2 models, Saturn Models and traffic counts. Using the analysis, several interim solutions were devised to increase efficiency until the proposed ultimate solution designed by Arup could be implemented.

Hale Street Link / Go Between Bridge, QLD
Hale Street Link is a new four-lane tolled cross river connection from Coronation Drive and Hale Street in Milton to Montague Road, Merivale and Cordelia streets in South Brisbane. The project also features a two lane overpass on Coronation Drive taking traffic from the Riverside Expressway, over the Hale Street intersection and onto Coronation Drive towards Toowong. Arup was commissioned as the independent verifier on behalf of the Brisbane City Council (BCC) to make sure construction proceeded in accordance with design and without delay. On this project Joseph was involved in the site inspection and verification works. The project gave him valuable exposure to both civil and structural design procedures and the importance of design compliance.
Callan has over eight years of transport engineering experience from Arup’s Melbourne and London offices. Callan has significant experience in large rail and airport related projects in both Australia and the UK.

His experience on projects such as the High Speed 2: Euston Station Design, Regional Rail Link, Growth Area Stations and Springvale Road Grade Separation shows his wide ranging experience on major rail projects providing transport advice around station design, highway improvements and sustainable travel modes.

Callan has significant experience in airports through various projects at Melbourne and Gatwick Airport. His knowledge and understanding in landside transport access is vast providing sound solutions to challenging issues.

Through his experience in both Australia and UK, he has gained skills in numerous transport modelling software suites, GIS and graphical tools.

Callan has excellent communication skills and undertaken public consultation for various strategies and studies for local government

Callan creates better transport solutions for clients with improved outcomes for people, communities and cities

Streamlining Hoddle Street – Punt Road Transport Investigation, Victoria
Traffic engineering lead for the Hoddle Street – Punt Road Transport Investigation. Callan was responsible for exploring a range of innovative options to increase the movement of people, reduce delays and improve the urban realm for people who travel along and/or across the Hoddle Street – Punt Road corridor. The key innovative options that were considered for implementation included:

- continuous flow intersections;
- diverging diamond interchanges;
- protected intersections for cyclists;
- green wave cycling lights; and
- pedestrian crossing countdown timers.

Essendon Fields Access and Feasibility Study
Project Manager for an access and feasibility study of a new retail development surrounded by Essendon Airport and Tullamarine Freeway. Callan managed the team providing a range of access options and their expected capital costs despite significant airdside and freeway restrictions. Off-site measures such as the freeway...
interchange (main access) required total re-design to accommodate the additional traffic generated by the site. Callan and his team developed an interchange layout, optimising the signal operation and capacity to cater for traffic generated by the site. The innovative interchange design (only ever built in USA and France) was analysed using SIDRA Intersection which showed the intersection tolerated the significant traffic demand providing a path for future investment and feasible development of the site.

**VicRoads Secondment: M80 Upgrade Post-Completion Evaluation**

Callan was seconded to the VicRoads M80 project office to manage and evaluate the M80 Upgrade project. This was a new federal requirement and included completing a project cost breakdown report and a project Post Completion Report (PCR). The PCR evaluated the project as a whole and compared the performance of the upgraded road against the previous un-upgraded road. Through Callan’s work, VicRoads made amendments to the financial systems and project structure of projects improving the efficiency of future project evaluations.

**MCG Gate 6 Intersection Upgrade**

Callan managed the preliminary assessment to upgrade Gate 6 / Punt Road intersection. Callan’s role was to assess the existing junction performance, to provide concepts to improve the performance during MCG events and to manage the environmental and infrastructure assessments. Through the analysis and option assessment, Callan recommended a low cost solution that removed the underlying issues.

**Warrego Highway / Brisbane Valley Highway Intersection Upgrade**

The road planning study involved developing a short term solution due to nearing operational capacity prior to the ultimate interchange being developed. Over the project, Callan’s major tasks included:

- Strategic modelling (using software emme/3) to forecast future year demands;
- Modelling over 20 interchange options using SIDRA Intersection software suite; and
- Detailed microsimulation using both VISSIM and Q-Paramics on three short listed options.

Based on Callan’s transport analysis, he demonstrated a solution was financially viable now and would continue to function in the long term future – eventually becoming Arup’s ultimate design.

**Collingwood Town Hall Strategic Transport Study**

Yarra City Council commissioned Arup to undertake a transport study as part of the Collingwood Town Hall Strategic Urban Design Framework. In particular, as project engineer Callan assessed the overall precinct which encompassed the pedestrian environment, bicycle environment, public transport and traffic
management for the study area.

**Regional Rail Link (RRL)**

As part of the KBR Arup Joint Venture (KAJV) team, Callan’s role as a transport engineer included retro-fitting Footscray Station, West Footscray Station and Sunshine Station and designing new stations in Tarneit and Wyndham Vale. Callan was the key design transport engineer working alongside Cox Architects to adequately achieve necessary pedestrian connections, commuter car parking layouts, kiss and ride and bus interchange design. Callan’s other key tasks included:

- Transport assessment as part of the Environmental Effects Statement on the grade separation of level crossings on the Anderson Road corridor in Sunshine using Q-Paramics for the transport analysis;
- Pedestrian and Cyclist study into the connections along and across the rail corridor in vicinity of West Footscray Station;
- Intersection analysis – Future proofing of intersections within the RRL study boundaries for RRL ultimate configuration and intersection requirements on Day1 of RRL;
- Traffic Impact Analysis – Removing a key road overpass over Sunshine Station which included a detailed VISSIM micro-simulation model; and

**Gatwick Airport Surface Access Strategy**

Callan led the ‘road access’ component of the Gatwick surface access strategy which supported Gatwick’s submission to the Airports Commission for airport growth through a second additional runway. This project involved numerous teams within Arup including teams from airport planning, rail and architects.

Although an additional runway created significant growth in vehicular traffic, Callan demonstrated that a road option was feasible with only minor changes to the motorway. The road network option required several road interchanges and large infrastructure upgrades. However these road upgrades were significantly less when comparing against other airports submissions. Callan validated the road network using a dynamic VISSIM model broadly showing future delays would be comparable to existing conditions.

**Melbourne Airport Landside Movement Project**

Callan’s role included developing an access plan to support the development of the airport precinct over the next 20 years. This involved establishing the ultimate capacity and functionality of the transport network based on expected airport growth or regional transportation projects. This involved Callan analysing key parts of the road network using SIDRA Intersection and Q-Paramics Micro-simulation to ensure the concept layout plan would support the Major Development Plan (MDP) and Southern Precinct Program (SPP).
Trent Ekanayake

Trent Ekanayake has over four years’ experience in transport planning, traffic engineering and transport modelling. He has worked in both consulting for the private sector and traffic engineering for the public sector. He holds a Bachelor of Civil Engineering, a Master of Transport and is a Member of the Institute of Engineers Australia.

Trent’s modelling experience incorporates an array of analytical modelling through software platforms and spreadsheet interfaces. His expertise in specific modelling packages comprises the full spectrum of transport modelling, including macroscopic (Cube Voyager), mesoscopic (Visum), microscopic (Vissim) and intersection analysis (SIDRA). Furthermore, Trent possesses intimate knowledge of the Melbourne wide transport models including the VicRoads Melbourne Mesoscopic Transport Model and the Victorian Integrated Transport Model (VITM).

Trent is also a skilled GIS user and proficient in Excel/VBA for spreadsheet automation and interfacing, as well as advanced data analytics.

Streamlining Hoddle Street – Punt Road Transport Investigation, VicRoads, Victoria

Trent was responsible for strategic and mesoscopic modelling for this initiative, which consisted of implementing new innovative intersection treatments (e.g. continuous flow intersections) along one of the most congested arterials in Melbourne.

On the strategic modelling level, Trent completed demand forecasting using the Victorian Integrated Transport Model and subarea matrix extraction for subsequent import into Visum. On the mesoscopic modelling level, Trent completed fine grained mesoscopic modelling in Visum, utilising matrix estimation processes for demand calibration, as well as Intersection Capacity Analysis (ICA) for detailed network intersection assessment.

As part of this project, he validated and calibrated models at both the strategic and mesoscopic levels, with high level validation undertaken in Cube and detailed validation/calibration conducted in Visum. Trent also completed options testing and evaluation for these new treatments, including undertaking network wide intersection optimisation for all future year scenario project options.
Melbourne Mesoscopic Transport Model Review, VicRoads, Victoria
Trent was part of a small specialised team commissioned by VicRoads to undertake a detailed review of their metropolitan wide mesoscopic model currently under development. Trent worked through a process of clarifying the model architecture and model implementation, prior to documenting critical issues requiring resolution and providing suitable recommendations for further model development best practice.

Melbourne Mesoscopic Transport Model Network Coding, VicRoads, Victoria
Trent was part of a project team seconded into VicRoads and tasked with coding all signalised intersections within the Melbourne Metropolitan area. This task included coding of the geometry and signal phase plans from SCATS into the model on an LGA by LGA basis.

Level Crossing Removal Projects, VicRoads, Victoria
Trent completed mesoscopic modelling using a subarea extract of the Melbourne mesoscopic model. This was commissioned to evaluate the effect of closing a number of road-rail level crossings during construction, to determine traffic re-routing and identify intersection impacts. The results for this fed into traffic management planning, to ensure the network can operate adequately during such time without breakdown of traffic flow.

Calder Park Drive Interchange Business Case, VicRoads, Victoria
Trent was the transport lead for the development and calibration of a multi-modal dynamic Vissim model in the vicinity of Calder Park and the Calder Freeway in Melbourne’s west. This included modelling of a complex freeway interchange with ramp metering, in addition to an at grade road-rail level crossing adjacent to the Calder Park Raceway.

Trent undertook strategic demand modelling as part of this project using the Victorian Integrated Transport Model, to aid in the development of demand matrices. A number of different configurations of interchanges were tested and evaluated to determine the optimal option for network implementation. As part of this project, Trent developed a number of automated processes for Vissim utilising Excel and VBA. This included an automated demand matrix generation spreadsheet feeding inputs from Cube and exporting for direct use in Vissim. He also created an output summarisation spreadsheet that allow for outputs of multiple Vissim runs to be imported and summarised.

Caulfield Dandenong Grade Separation Bid, Victoria
Trent completed strategic transport modelling for this bid to grade separate a number of rail/road level crossings in Melbourne. This was conducted in Cube Voyager (the Victorian Integrated Transport Model) and included the development of a road network assignment only intrastep cluster distribution Cube module, allowing for enhanced model speed run time and faster provision of model results.
**Bus and Train Services Upgrade Business Case, Public Transport Victoria**

Trent was the primary transport modeller for this strategic public transport network development planning project, undertaking model validation and calibration of the Victorian Integrated Transport Model. This was done for all public transport modes across the entire network, as well as highly detailed validation/calibration in specific study areas. Trent then conducted a comparative analysis of project options for changes to the entire public transport network across Melbourne, with results ultimately feeding into an economic evaluation to quantify and assess the benefits of each project.

**Hume Freeway Strategy, Metropolitan Planning Authority (VicRoads) Victoria**

Trent was responsible for strategic transport modelling of the Hume Freeway and its associated interchanges utilising the Victorian Integrated Transport Model. This involved completing demand forecasting for multiple forecast years and development scenarios to 2046, focusing on car and freight demands along a key freight corridor in Melbourne. Within this project Trent undertook testing and application of a strategy to combat insufficient freight demand matrices and worked on an extensive global review and updating of the transport network within the three municipalities adjacent to the Hume Freeway. Multiple options for the project were assessed, including provision of new intermodal freight terminal in the region and its effect on freight distribution throughout the network.

**Whittlesea Strategic Transport Modelling, City of Whittlesea**

Trent completed strategic transport modelling for Whittlesea using the Victorian Integrated Transport Model, to enable the council to assess transport provisions resultant of major anticipated growth in the region. He completed detailed model disaggregation to create a fine grained zonal model for the city to better reflect land use. Road and public transport networks were also verified in this process. Validation and calibration of traffic flows, validation of bus and train patronages and validation of land use assumptions were also carried out. A subarea assignment model was also built into the broader metropolitan model to allow for scenario testing of a large range of forecasting scenarios.

**Princes Bridge VISSIM Modelling, City of Melbourne, Victoria**

Trent completed work on the development and calibration of a multi-modal VISSIM model of St Kilda Road, Princes Bridge and the Swanston & Flinders Street intersection. This was completed to investigate the impact on the road network due to proposed bicycle lane upgrades and tram stop widening. As part of this project, Trent developed and validated the model to travel times and intersection performance, prior to testing the removal of a traffic lane and implementation of cyclist lanes.
Quarry Hills/Rockbank/Plumpton-Kororoit PSP, Metropolitan Planning Authority, Victoria

Trent was responsible for the strategic modelling and demand forecasting using Cube Voyager (the Victorian Integrated Transport Model) for numerous precinct structure plans for greenfields sites in the north and west of Melbourne. This included reviewing the current state of the 2046 models and disaggregating the coarse zoning system in the area to a higher resolution, whilst also updating the land use forecasts in conjunction with land use planners. Road and public transport networks were also developed and evaluated for their ability to adequately accommodate the new structure of the area and ensure good network connectivity and public transport accessibility for new residents. Trent also undertook SIDRA intersection modelling and optimisation for new key intersections in the receipts, to determine the intersection footprint required and hence land use layouts for the precinct.

La Trobe Street VISSIM Model, City of Melbourne, Victoria

Trent worked on the development of a VISSIM model to support the proposal of bicycle lane upgrading along La Trobe Street in Melbourne’s CBD.

King Street / Collins Street VISSIM Modelling, City of Melbourne, Victoria

Trent completed an investigation into testing the impact of altering signal phasing to relieve congestion on these key inner city corridors during peak hour periods.

Palmers Road Corridor SIDRA Intersection Modelling, VicRoads, Victoria

Trent completed SIDRA intersection modelling of key intersections along the proposed Palmers Road corridor. This included signal time optimisation and identification of required changes to the geometry to accommodate future forecasted traffic demand.

Melbourne Metro– Demand Forecasting, Melbourne VIC

Trent has been involved in the strategic transport modelling of this major city shaping rail project using Cube Voyager (the Victorian Integrated Transport Model). This included assisting in the development of transport modelling inputs for future elements of the public transport network and production of model outputs.

Docklands Strategic Transport Model, Places Victoria, Victoria

Trent undertook the development of integrating the Docklands Strategic Transport Model (Excel) with SIDRA Intersection software using Visual Basic. The integration allowed for multiple intersections, time periods and scenarios to be run simultaneously.
Appendix C

Punt Road Concept Options Drawings (Updated)
Appendix D

List of Submissions Reviewed and Key Issues Raised
## List of submissions and summary of issues raised

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**Issues Raised:**

- **Short Term - Clearways:**
  - Short Term - Clearways - Offroad parking
  - Short Term - Clearways - Improvements
  - Short Term - Clearways - Changing signal phasing

- **Short Term - Offroad parking:**
  - Short Term - Offroad parking - Offroad parking
  - Short Term - Offroad parking - Changes

- **Short Term - Other:**
  - Short Term - Other - Other issues raised

- **Long Term - Public Transport:**
  - Long Term - Public Transport - Public Transport
  - Long Term - Public Transport - Climate change

- **Long Term - Environmental:**
  - Long Term - Environmental - Environmental
  - Long Term - Environmental - Traffic

- **Long Term - Heritage:**
  - Long Term - Heritage - Heritage

- **Long Term - Traffic:**
  - Long Term - Traffic - Traffic
  - Long Term - Traffic - Traffic

- **Long Term - Other:**
  - Long Term - Other - Other issues raised

**Specific Issues:**

- **Increasing Capacity:**
  - Increasing capacity will add more traffic to Punt Road

- **Historic Traffic Decline:**
  - Historic traffic decline - Short-term measures
  - Historic traffic decline - Long-term measures

- **Short-term Measures:**
  - Short-term measures for improving traffic

- **Long-term Measures:**
  - Long-term measures for improving traffic

- **Safety:**
  - Safety of school children/pedestrians affected
  - Safety of school children/pedestrians affected

- **Economic Impact:**
  - Economic impact of proposed measures
  - Economic impact of proposed measures

- **Other:**
  - Other issues raised

**Submission Details:**

- **ID:**
  - PUN001 - Marcelle Damioucas
  - PUN002 - George Damioucas
  - PUN003 - Daniel Lehrer
  - PUN004 - Deborah Claydon
  - PUN005 - Loyd Chen
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**Punt Road Public Acquisition Overlay Review**

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Appendix E

Responses to Key Issues Raised in Submissions
E1 Responses to Key Issues

41. The submissions raised a number of issues in relation to the Punt Road public acquisition overlay and the Punt Road Concept Options Report (the Assessment). The key issues that we have identified as part of the scope of this expert witness report are outlined in Table 3. The responses and clarifications for the key issues raised are provided in the following sections.

Key Issue 1: Increasing road capacity will add more traffic Punt Road and not resolve congestion

42. Numerous submissions (80) raised concerns that increasing the capacity of the Punt Road-Hoddle Street corridor will not solve the congestion problems and will generate more traffic along the corridor.

43. We note that the network strategy developed for the Assessment is based around a multi-modal transport system as described in detail in Section 4.4. In this Section, we are suggesting that an integrated approach to transport provision is required for the corridor and surrounding network in order to respond to congestion along the corridor. This includes improved walking connections, enhanced facilities for bicyclists, increased priority and capacity for buses and trams and providing additional traffic capacity for the Punt Road-Hoddle Street corridor.

44. In terms of traffic performance, the Assessment investigated a range of ideas for possible changes to the operation of the corridor. As discussed in Section 7 of the Assessment, transport modelling has estimated that all the concepts will result in increased traffic volumes (and therefore person throughput) along the Punt Road-Hoddle Street corridor. The increases vary between the concepts:
   - with the concepts that are contained within the existing road reserve (1, 2 and 3) showing a 30%; increase south of Toorak Road; and
   - the concepts that require utilisation of the public acquisition overlay showing a 65% increase south of Toorak Road.

45. As shown in Table 3 of the Assessment, while the traffic volumes along the Punt Road-Hoddle Street corridor will increase under the concepts, conditions will improve on parallel north-south routes such as St Kilda Road and Chapel Street. This provides the opportunity to reallocate road space on these routes to pedestrians, cyclists and public transport in line with the network strategy and VicRoads’ Smartroads Network Operating Plans.

46. The analysis summarised in Section 7.2 and Tables 4, 5 and 6 shows that the mean speed improves for each of the concepts relative to the Base Case in the year 2031. This demonstrates that while Punt Road is carrying higher traffic volumes, the traffic movements along and across the corridor are benefiting slightly in each of the concepts tested. Similarly, the results shown in Section 7.3 indicate that the level of service at the individual intersections under each of the concepts are expected to improve during the AM and PM peak hour indicating that some relief in delays at intersections can be expected.
47. In conclusion, in our opinion, providing additional road capacity will only offer slight improvements to congestion along the corridor. An integrated approach is required which enhances the Punt Road-Hoddle Street corridor and the wider network for pedestrians, cyclists and public transport users. As part of this integrated approach, capacity enhancements to the corridor will be required with the higher capacity improvements increasing the opportunity for wider transformation of the surrounding road network to better align with the developed network strategy and VicRoads’ Smartroads Network Operating Plans.

48. Of the 77 submissions, 19 submissions raised the issue about the impact of induced traffic. For clarification, we have used the Victorian Integrated Transport Model (VITM) in order to estimate the changes in travel demand on the transport network which captures some of the potential causes of induced traffic.

49. The VITM is the Government’s recognised model for assessing the implications of transport interventions. The VITM considers the following changes to travel resulting from enhancements to the transport network:

- changing routes;
- changing destination; and
- changing mode of travel.

The VITM does not incorporate the following travel demand effects:

- changing time of travel;
- new trips; and
- demographic and land use changes as a result of transport improvements.

50. In our opinion, the VITM is the most suitable tool to use to inform the network wide implications of the developed concepts. While this model incorporates major elements relating to induced traffic, it remains important that any future changes to the Punt Road-Hoddle Street corridor are combined with initiatives on the surrounding transport network such that any increase in road capacity does not add extra traffic to the network through mode switch or new trips.

Key Issue 2: Historically traffic volumes on Punt Road are decreasing and improvement is not required

51. Numerous submissions (58) note that traffic volumes have been decreasing over the years 2003 to 2013 as outlined in the Background Report (VicRoads, 2015) with these submissions indicating that on this basis, improvements to the corridor are not required.

52. The historic trend in traffic demands along the southern section of the Punt Road-Hoddle Street corridor is recognised. As shown in Figure 2, traffic volumes along the corridor between St Kilda Junction and Alexandra Avenue have decreased by an average of 17% between 2003 and 2013. However, it is noted that the decrease has been most substantial between 2003 and 2010 decreasing by an average 2% per annum. Between 2010 and 2013 the average decrease has been 0.9% per annum.
Figure 2 Punt Road historical traffic volumes

53. The specific reasons for changes in traffic volumes along Punt Road would require, separate and further detailed investigation. However, in our opinion some of the causes may include more parking on Punt Road during the day creating reliability issues, longer term effects of the reputation of Punt Road for unreliable and slow journeys, implications of parking pricing within central Melbourne, increasing car ownership costs, PT service improvements on parallel routes, improvements to the Monash Freeway/CityLink, changing attitudes to tolling or public transport, potential changes in activity or change in land use on Chapel Street or in St Kilda, to name a few – it is likely that these have all contributed to some degree. However, the rate of decline in recent years has slowed and it appears that traffic volumes have largely stabilised.

54. As outlined in Plan Melbourne, population is forecast to grow significantly from 4.3 million to 7.7 million in 2051. Similarly, the number of jobs in Melbourne are expected to increase from approximately 2.2 million to 3.9 million over the same period. This will mean that there will be an increased need to travel in the future. While public transport will have a key role in accommodating this travel demand, there are some trips where private and commercial vehicle travel will remain more attractive. In this context, the Punt Road-Hoddle Street corridor is a strategically significant route providing a bypass of central Melbourne and it is expected that it will continue to have an important role to play in facilitating access for private vehicles between some particular origins and destinations as well as providing for commercial vehicle trips.
55. The Victorian government forecasts for land use, population, employment change and future transport projects are considered in the VITM. The forecast change in traffic demands on the Punt Road-Hoddle Street corridor to the year 2031 are outlined in Section 7.1, Table 3 of the Assessment. This shows that there is forecast to be some growth in traffic volumes along the corridor south of Toorak Road from 32,000 vehicle trips per day in 2013 to 34,000 vehicle trips per day in 2031 under the Base Case scenario. This increase in trips is to be reasonably expected in the context of the forecast growth for Melbourne outlined above.

56. Assessments in Section 7.2 and 7.3 highlight the changes in network performance that would be anticipated with moderate changes in demand. As shown in Table 4, 5 and 6 these anticipated changes in demand result in a further deteriorating in mean speeds from the existing to the Base Case in 2031. Similarly, as shown in Table 8 and 9, the increases in demand result in a considerable reduction in the level of service at intersections. On this basis, improvements to the corridor are required.

57. To summarise, in our opinion, while the historical decrease in traffic demands are noted, the Punt Road-Hoddle Street corridor is strategically significant meaning that, in combination with the forecast growth in population and employment, it will have a role to play in accommodating increased travel demands. Using the Governments travel demand forecasting models, some growth in traffic demands in the corridor can be expected to the year 2031. On this basis, it is considered that the forecasting adopted in the Assessment is appropriate for the purpose of the study undertaken. Based on the forecast demands, improvements to the corridor are required to avoid further significant reduction in vehicle speeds along the corridor, reduced travel time reliability and increased delays at intersections.

**Key Issue 3: Transport modelling indicates marginal travel time improvement**

58. Numerous submissions (58) made reference to the fact that increasing the capacity of corridor will only achieve slight travel time improvement.

59. As noted in our response to Key Issue 1, our analysis shows that the concepts will offer slight improvement in mean speed when compared to the 2031 Base Case. However, all the concepts allow for additional demand to be accommodated along the corridor, provide improved traffic conditions on key parallel roads and improve the reliability of public transport services both along and across the corridor. In particular, Concept 7 includes dedicated bus lanes which would provide significant travel time and reliability benefits for buses travelling along the Punt Road-Hoddle Street corridor. The concepts that utilise the public acquisition overlay provide the opportunity to improve north-south travel as well as promoting east-west travel across the corridor for key public transport movements (e.g. Toorak Road, Commercial Road and High Street). There would also be the opportunity to provide added public transport or bicycle priority on parallel routes such as Chapel Street and St Kilda Road as a result of the reduction in traffic demands on these routes.
Key Issue 4: School speed zones of 40km/h limits the achievable benefits

60. Numerous submissions (55) raised concern that the school speed zones along the corridor would limit the achievable travel time benefits.

61. School speed zones of 40km/h apply along two sections of the Punt Road-Hoddle Street corridor (south of the Yarra River) including:
   - Between the points approximately 140m north of Toorak Road (Mona Place) and approximately 380m south of Toorak Road (Fawkner Street) and;
   - Between the points approximately 390m north of High Street (Athol Street) and approximately 160m south of High Street (Raleigh Street).

62. School speed zones apply 8:00am-9:30am and 2:30pm-4pm on school days. The traffic data that VicRoads provided for the Assessment includes measurements of speeds during the AM and PM peak hour. Therefore, in terms of reviewing the affect on existing travel speeds along the corridor, school speed zones only impact the AM peak hour as a 60km/h speed limit applies during the PM peak hour. While these speed limits are noted, the existing average speeds along the corridor during the peak hours are less than 40km/h as shown in the Assessment in Section 2.4, Figures 11 and 12. This is to be expected as the travel speeds along the corridor during peak hours are primarily impacted by the delays at intersections.

63. In terms of the performance of the concepts, the influence of school speed zones has been incorporated into the transport modelling undertaken to assess travel times and therefore travel speeds. The travel time results for the operation of the corridor under each of the concepts are shown in the Assessment in Section 7.2, Table 4. Based on the travel time results in Table 4, the average travel speeds during the AM peak hour along the corridor are between 15km/h and 23 km/h under the 2031 Base Case and improve to between 18km/h to 25km/h under the various concepts. While the operation of the intersections improve, they remain the main constraint on average travel speeds along the corridor.

64. On the basis of the above, it is our opinion that 40km/h speed limits only have a very minor impact on the achievable benefits of the concepts and that it is the multiple signalised intersections along the corridor that are controlling the achievable speeds.

Key Issue 5: Safety of pedestrians including school children and the elderly would be impacted by road widening

65. A total of 38 submissions raised concerns that widening the corridor will have safety implications for pedestrians and especially children that access the schools in the area and the elderly.

66. As set out in Table 10 of the Assessment, it is acknowledged that Concepts 5, 6 and particularly Concept 7 will increase the total distance for pedestrians crossing the corridor. The number of pedestrians that would be affected during the peak hours is outlined in Section 2.4 of the Assessment.
67. Whilst pedestrian crossing distances have increased in some of the concepts pedestrian wait times have reduced as a result of the simplification of traffic signal phasing. Also, the introduction of central medians and traffic islands will provide for the storage of pedestrians assisting those that are unable to cross the corridor in one pedestrian phase. At midblock locations the central median and traffic island treatments would provide, additional crossing opportunities for those pedestrians choosing to cross away from formal signalised facilities. Concepts 2 to 7 also involve the removal of some right turning traffic movements at key intersections. This will reduce the conflict between these movements and pedestrians providing an improvement to safety.

68. During any future design stages to develop a specific proposal for the corridor it is expected that the government agencies would work with the schools and the local community to improve the safety of pedestrians. This would be expected to occur through a combination of engineering, enforcement and education measures identifying and treating key routes for access across the corridor. Road safety audits would also be expected to be undertaken as a part of the development of the proposal for the corridor.

69. In summary, on the basis of the analysis undertaken to date, it is recognised that the concepts utilising the public acquisition overlay will increase pedestrian crossing distances, particularly Concept 7. However, the various concepts include a number of measures to reduce delays and enhance safety for pedestrians crossing the corridor including a reduction in pedestrian wait times, additional informal crossing opportunities and a reduction in conflicts with right turn movements. When combined with additional consultation and education, engineering and enforcement treatment measures, there is not expected to be a notable decrease in safety as part of the concepts proposed.

**Key Issue 6: In the short term clearways should be implemented**

70. A total of 27 submissions recommend introducing 24 hour clearways along the corridor.

71. This is in-line with Concept 1 in the Assessment. Our analysis in Section 7.4, Table 10 shows that this concept provides benefits to users of the Punt Road-Hoddle Street corridor outside of the commuter peak hours including an improvement in travel speeds and reliability as well as an improvement to safety. However, this concept does not address congestion issues during the peak periods or offer significant benefits for other modes of transport.
Key Issue 7: Public transport improvements should be implemented in preference to road widening in the short term

72. A total of 22 submissions highlighted that public transport improvements should be implemented in preference to the widening of the corridor.

73. The improvement to public transport both along and across the corridor is supported as outlined in the network strategy in Section 4.4 of the Assessment. The strategy highlights a multi-modal approach for transport provision. For example, the network strategy notes that St Kilda Road and Chapel Street as tram priority routes as well as the tram routes crossing the corridor at Toorak Road, Commercial Road and High Street. The Punt Road-Hoddle Street corridor is also identified as a bus priority route.

74. The application of the network strategy to Punt Road is demonstrated in Concepts 2, 3, 5, 6 and 7 which provide part-time (or potentially full time) tram lanes as well as upgraded tram stops. As indicated in Section 7.4 of the assessment, each of the concepts would provide some benefits for buses travelling along the corridor given the general reduction in travel times; service reliability would also be improved. However, the major opportunity for improving public transport along the corridor would be through the introduction of Concept 7 (or similar) which provides dedicated road space for public transport (though it requires utilisation of the Public Acquisition Overlay). It is expected that as part of the development of a specific proposal for improvement to the corridor, additional analysis would be undertaken to quantify the public transport benefits.

75. Concepts 5, 6 and 7 provide a reduction in traffic demands to some degree on competing routes such as Chapel Street and St Kilda Road as shown in Table 3 of the Assessment. This would provide the opportunity to change the operation of these routes to further promote public transport along these corridors as outlined in the response to Key Issue 3.

76. To summarise, in our opinion an integrated approach is needed for transform the network to better align with the network strategy developed and VicRoads’ Smartroads Network Operating Plan. Public transport improvements are incorporated into each of the concepts that have been assessed. In subsequent stages to develop a specific proposal for the Punt Road-Hoddle Street corridor, it is expected that further analysis would be undertaken to quantify the public transport demands and benefits of each of the concepts. This would include giving further detailed consideration to the differences between concepts and the likely market response based on additional transport modelling and case studies of the implementation of improvements elsewhere in Melbourne and also other cities.