Appendix E Road User Cost Benefit Analysis

Road User Cost Benefit Analysis

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Created

Updated

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Development

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Revision History

Date	Version	Author	Comments (including Review History)
Nov. 23, 09	0.1	Mark Alexander	Original draft
Oct. 26, 09	0.2	Mark Alexander	Revised for IPA scope and current RTA methodology including the December 2007 Economic Parameters
Nov. 20, 09	0.3	Mark Alexander	Updated with AECOM comments (received 13/11/09)
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Contents

1 Introduction

The purpose of the Road User Cost Benefit Analysis (RUCBA) is to provide an estimate of the various costs and benefits of the M2 Upgrade.

Procedures and parameters used in the RUCBA were based on current RTA evaluation methodology as supported by "National Guidelines for Transport System Management in Australia" (Australian Transport Council - 2006), the RTA Economic Analysis Manual (Version 2 with December 2007 Economic Parameters).

The RUCBA is based on a thirty year evaluation period from the proposed time of commencing construction. The evaluation involves estimation of costs and benefits over the evaluation period and using discounted cash flow methods to determine the Present Value (PV) of the costs and benefits.

The key indicator of the "value to the community", the Benefit-Cost Ratio (BCR) is then determined by dividing the present value of benefits by the present value of costs. A project with a BCR greater than 1 is considered "economically worthwhile".

To ensure that that Privately Financed Projects (PFPs) meet the public interest it is necessary to carry out a "Public Benefits Evaluation" in accordance with the NSW Government's (December 2006) "*Working with Government Guidelines for Privately Financed Projects".* Part of this evaluation includes assessment against "Value for money" criteria. Demonstration that the project meets these criteria is included in *Section 5*.

2 Traffic Inputs

A key input to the RUCBA were outputs from Transurban's strategic traffic model (TUSTM), utilising the Cube Voyager software platform.

The TUSTM is calibrated / validated to a 2006 base year and applied in forecasting mode at 5 year intervals until 2021.

The model outputs used for the RUCBA were network wide Vehicle Kilometres Travelled (VKT) and Vehicle Hours Travelled (VHT) in the Sydney Metropolitan Area. The TUSTM model outputs statistics in terms of average workday traffic volumes (AWDT). It is necessary to convert these model results to annualised figures to reflect lower usage (and benefits) on non workdays. Hence rather than multiply the results by 365, the model outputs are multiplied by 325 to be consistent with the observed ratio of daily to workday traffic volumes on the motorway.

Model results for the base and project cases were extracted for the years 2011 and 2021 and used as the basis for developing annual VKT and VHT profiles with intermediate years interpolated.

Beyond the model end date (2021) VKT and VHT figures for 2021 have been used. That is, there is no further growth in time or distance savings assumed beyond this point. Additional sensitivity testing around this assumption has been included in Section 4.

The 2011 and 2021 modelled VKT and VHT figures used for the RUCBA are included in Table 1below.

Table 1 Forecast VKT and VHT (Sydney Road Network)

Model Output (Annual)	2011 Base	2011 M2 Upgrade	2011 Impact	2021 Base	2021 M2 Upgrade	Impact
VKT (Millions)	30,379	30,376	-0.01%	34,936	34,920	-0.04%
VHT (Millions)	673.80	670.10	-0.6%	853.58	846.07	-0.9%

Items to note in the above figures are as follows:

- An overall reduction in VKT is forecast, though only small in network wide percentage terms, these benefits are significant for new users of the motorway.
- New users will be able to take more direct routes and travel shorter distances to access their destinations. This is particularly the case for the new ramps at Windsor Road and Christie/ Herring Road.
- There would be a significant reduction in vehicle hours travelled. Whilst the majority of benefits for time savings will be M2 users, there will be secondary benefits to

users of the M4 and alternative arterial routes. This is due to traffic vacating these routes to take advantage of the improved service levels on the M2.

Given the project is only scheduled to be completed in the latter part of 2012, the valuation of all benefits and costs are based on their commencement at this time and extending to the latter part of 2042 (the end of the thirty year evaluation period).

3 Valuation of Costs and Benefits

3.1 Project Costs

The project costs include the initial project capital expenditure incurred during the approvals / design process and the construction period and forecast ongoing capital expenditure and operational expenses incurred over the evaluation period.

The total cost estimated for the project has been assumed to be incurred over a two year period (2010 to 2012) for the RUCBA. The assumptions regarding timing of the capital expenditure used in the RUCBA are set out in Table 2 below.

Table 2 Assumed Capital Cost Expenditure

Year	Capital Expenditure ($M)
2010	110
2011	275
2012	165

In addition to the initial capital expenditure other ongoing expenses have been included in the RUCBA to cover the incremental capital expenditure and operating expenses associated with the project over the evaluation period. An annual figure of approximately $1M covers additional routine operational and maintenance costs associated with the project. There are also additional capital costs incurred at 5-10 year intervals. These costs are due to the additional expenditure to resurface increased areas and replacement of systems being installed as part of the project (eg/ tolling systems at the new ramps).

3.2 Vehicle Operating Costs

A weighted vehicle operating costs (VOC) used in the RUCBA was 30.52 cents per vehicle km (in 2007 dollars). This value was taken from *Table 3 of Appendix B "Economic Parameters for 2007"* and escalated to 2009 prices in line with the Consumer Price Index (CPI) for Sydney. This network wide rate for the urban road network was derived on the basis of an average speed of 40km/h (stop-start conditions).

3.3 Travel Time Savings

A weighted travel time value of $23.08 per hour (in December 2007 prices) was used for valuation of travel time savings in the RUCBA. This value was escalated to a 2009 value in line with the Average Weekly Earnings (AWE). It is derived in *Tables 7 to 10 of Appendix B "Economic Parameters for 2007"* and is based on various studies on traffic composition by time of day and vehicle class, trip purpose, vehicle class, vehicle occupancy and value of time.

3.4 Accidents

Accident costs used in the RUCBA are based on the values contained in *Table 13 of Appendix B "Economic Parameters for 2007"* as reproduced below. These costs have been escalated to 2009 prices based on the Sydney CPI. The VKT statistics from the model were aggregated to each of the three road classes in Table 3 and the relevant crash cost rate applied for the base and project cases.

Table 3 Accident Costs

Local/Sub-arterial	Average Crash Cost ($/MVKT) – 2007 Prices
Local/Sub-arterial	62,800
Arterial	45,800
Freeway	14,300

3.5 Environmental Costs

Environmental externality values for urban travel conditions are contained in *Table 18 of Appendix B "Economic Parameters for 2007".* These have been reproduced below and have been used to value the environmental cost for the base and project cases. All values were escalated to 2009 prices in line with CPI.

Table 4 Environmental Externalities

Item	Urban (c/km) – 2007 A$
Noise	0.83
Air	2.58
Water	0.39
Greenhouse	2.03
Nature and Landscape	0.05
Urban Separation	0.60
Upstream and Downstream	3.48
Total	**9.96**

4 Results

Based on the TUSTM outputs and derivation of costs as discussed above the present values (PVs) were calculated using a discount rate of 7% over a 30 year evaluation period for base and project cases. The net value (project case minus base case) for each item is presented in Table 5 below.

Table 5 RUCBA Summary

Item	Net Present Value (NPV) ($M at 7% discount rate)
Capex and Opex	-496
Vehicle Operating Costs	41
Travel Time Savings	1609
Accidents	33
Environmental Costs	14
Net Present Value - NPV ($M)	**1202**
BCR	**3.4**

It is therefore concluded that on the basis of the RUCBA the project is economically worthwhile with the benefits to the community being estimated to be 3.4 times greater than the costs.

To test the impact on the BCR in the event of the actual costs and benefits varying to those calculated from traffic model outputs and project cost estimates, the following sensitivity tests were run.

- Variation in RUCBA discount rate.
- Variation in project costs (+/- 20%).
- Variation in project benefits (+/- 20%).
- Diminishing travel time savings.

Given the model outputs only extend to 2021, there is more uncertainty around travel time savings beyond this time. Hence as a test to understand the impact on the BCR if travel time savings were to gradually diminish beyond this date. The last sensitivity test includes reducing the travel time savings to zero over a ten year period from 2021.

The results of these sensitivity tests are included in Table 6 below.

Table 6 Sensitivity Test Results

Sensitivity Test	BCR	NPV ($M)
10% Discount Rate	2.5	697
4% Discount Rate	4.9	2,103
20% higher costs	2.9	1,103
20% lower costs	4.3	1,301
20% lower benefits	2.7	863
20% higher benefits	4.1	1,542
Diminishing Travel Time Savings	2.3	629

5 Public Interest Evaluation – Value for Money

In December 2006 the NSW Government introduced new "*Working with Government Guidelines for Privately Financed Projects".* All asset enhancement and Greenfield projects need to address the Government's requirements in this regard.

As part of the public interest evaluation, projects need to meet "Value for Money" criteria as demonstrated for the M2 Upgrade below.

Value for Money Criteria

- *Does the project offer better value for money than the best practicable public sector delivery model? This would include consideration of any proposed upfront fees?*
- *Where the project involves a user charge to be paid by the public, is the level of user charge appropriate and related to the benefits to be received by the user under the project?*
- *Where the project involves a contribution by taxpayers, is the level of contribution reasonable?*

- It is proposed all the benefits of the M2 Upgrade including new access ramps, reduced congestion for cars and buses, and improved safety will be funded and delivered by the Hills Motorway Limited with no upfront funding contribution required from Government. M2 Enhancements would be funded through a combination of sources including net cash flow from new toll points, toll increases at existing toll points and extension of Hills Motorway's concession period for the M2.
- Motorists who use Hills M2 pay a user charge in the form of a toll. This would remain consistent under the enhancement works, that is, every motorist who uses new ramps at either Windsor Road (west facing) or Herring Road (east facing) would pay a toll. The toll level would be set under a contract with the Government.
- The proposed tolls for the new Herring Road (east facing) ramps are determined based on toll rates for the section east of Beecroft Road which reflect the level of congestion on the alternative route for this segment of the corridor. The section between Lane Cove Tunnel and Herring Road is approximately half the distance from Lane Cove Tunnel to Beecroft Road hence the toll is set to be half the main plaza. The toll rate per kilometre is on par with the Beecroft Rd ramps.
- The proposed tolls for the new Windsor Road (west facing) ramps are approximately 30% lower than the Pennant Hills Road tolls. This toll rate was determined based on rates that minimise adverse traffic impacts on longer motorway trips and alternative routes including Old Northern Road and Castle Hill Road.