



Coffs Harbour Highway Planning

ECONOMIC ANALYSIS UPDATE

NOVEMBER 2007





New South Wales Government



Coffs Harbour Highway Planning

Sapphire to Woolgoolga Section

ECONOMIC ANALYSIS UPDATE

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Appendix A

Traffic volumes

Appendix B

Results of economic analysis

1. Introduction

This report updates the results of the road user benefit cost analysis undertaken for the options that are reported in the *Preferred Options Report, Coffs Harbour Highway Planning Strategy*, November 2004 prepared by Connell Wagner. The cost estimates were prepared in accordance with the standard procedures developed by the RTA's project management office and the road user economic analysis has been undertaken in accordance with the RTA's *Economic Analysis Manual* (2005). This manual incorporates the NSW Treasury Guidelines for Economical Appraisal and Financial Appraisal issued in June and July 1997 respectively. The updated cost estimates are based on 2006 rates and are expressed in 2006 dollars (\$2006).

The economic assessment was undertaken for the following options.

- Far western bypass - A wide bypass of Coffs Harbour and Woolgoolga, generally from Englands Road through the Orara valley to Halfway Creek.
- Coffs Harbour City Council Preferred Corridor - Options within a corridor adopted by Council in late 2003 as its preferred option for a bypass of Coffs Harbour and Woolgoolga. The following options were analysed:
 - Coastal ridge way / Option A – This option was a combination of the Coastal Ridge Way proposal for the Coffs Harbour section and Option A for the Sapphire to Woolgoolga upgrade.
 - Western Bucca valley / Option A – This option traversed the western side of the Bucca valley before joining Option A for the Sapphire to Woolgoolga upgrade near Sherwood Road Ridge.
 - Western Bucca valley / Corindi River – This option traversed the western side of the Bucca valley before crossing Sherwood Road Ridge and running in a northerly direction along the eastern side of the Corindi River valley to rejoin the existing highway near Dirty Creek Range.
 - Western Bucca valley / Sherwood Creek - This option traversed the western side of the Bucca valley before crossing Sherwood Road Ridge to the west of the other three options and running in a northerly direction through the Sherwood Creek valley to rejoin the existing highway south of Halfway Creek.
- Coastal corridor – Options for the announced preferred route along the coastal plain between Englands Road and Arwarra Creek with a future extension to Halfway Creek. The following options were analysed:
 - Low cost option - Combination of Coffs Harbour inner bypass options Inner South 1 and Inner North 2 (with no tunnels) and Option E bypass of Woolgoolga.
 - High cost option – Combination of Coffs Harbour inner bypass options Inner South 1 and Inner North 2 (with two tunnels) and Option E bypass of Woolgoolga.

These alternative routes were previously described in the *Preferred Options Report, Coffs Harbour Highway Planning*, November 2004, prepared by Connell Wagner and detailed in terms of physical design features and estimated costs in Table 4.1 of that report.

The schedule for construction of the project under the Pacific Highway Upgrade Program is yet to be determined. For consistency with previous economic analyses of the corridor options, an opening year of 2024 has been assumed for the analysis. To assess the sensitivity of the results to the assumed opening year, an economic analysis has also been undertaken for an earlier assumed opening year of 2016. For the evaluation, a six-year construction program has been assumed for all of the corridor options.

It should be noted that this economic analysis has been undertaken for strategic purposes only. The travel statistics for the options have been calculated by combining the travel statistics (such as vehicle kilometres of travel and vehicle hours of travel) from independent options assessments for the Coffs Harbour and Sapphire to Woolgoolga sections.

2. Route description and scope outline

A generalised description and key features for each of the route alignments within the three corridor options is outlined below. The route alignments are shown in Figure 2.1. All corridor options analysed in this report extend from Englands Road south of Coffs Harbour to the southern end of the existing Halfway Creek dual carriageway section of the highway.

2.1 Far western bypass

- Englands Road to north of Coramba – 19.4 km of rugged terrain from the Pacific Highway at Englands Road to Karangi and then Coramba, passing over the Coastal Range. Major cut and fill earthworks would be required in this section as well as numerous creek and river crossings near Karangi.
- North of Coramba to north of Glenreagh – 20 km section passing through the Orara valley from Coramba to Nana Glen and then Glenreagh. Route generally parallel with the Orara Way, Orara River and/or North Coast Railway Line. This section would likely require numerous crossings of the Orara Way, North Coast Railway Line, Orara River and other major watercourses.
- North of Glenreagh to Halfway Creek Connection – 15 km section departing the Orara valley north of Glenreagh and passing either adjacent to or through the western edge of the northern sections of the Sherwood Nature Reserve and connecting with the existing Pacific Highway at Halfway Creek. This section would require relatively large earthworks on the western side of Coastal Range and three major watercourses would need to be crossed.

2.2 Coffs Harbour City Council preferred corridor

2.2.1 Coastal Ridge Way / Option A

- Coastal ridge way proposal from Englands Road south of Coffs Harbour to west of Ulidarra National Park – 11.4 km section of the coastal ridge way would be through rugged terrain traversing the coastal range and would cross a number of major ridge lines and deep valleys necessitating four tunnels and two major viaducts over this length. In addition, a long steep climb north from Englands Road would likely require a passing lane for slow moving heavy vehicles.
- Coastal ridge way west of Ulidarra National Park to Bucca Road – 10.2 km section of the coastal ridge way includes another tunnel through the Polyosma ridge line at Central Bucca. This section also traverses rugged terrain over the majority of its length to Bucca Road.
- Option A – Bucca Road to Arrawarra – 16.9 km section of Option A traverses north from the eastern side of the Bucca valley and then climbs to traverse the Sherwood Road ridge line and the Sherwood Nature Reserve. This section of the route features numerous cuttings and deep valleys, two of which would require a viaduct structure rather than conventional fill embankments.
- Arrawarra to Halfway Creek – the 16.5 km section between Arrawarra and the completed Halfway Creek upgrade was, at the time of the preferred option report, characterised as an upgrade of the existing highway for cost comparative purposes. Since that time, the RTA has identified a preferred route for the Pacific Highway from Woolgoolga to Wells Crossing. The preferred route for the upgrade includes a 9 km deviation of the existing highway between Corindi Beach and Dirty Creek Range.

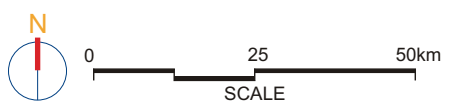
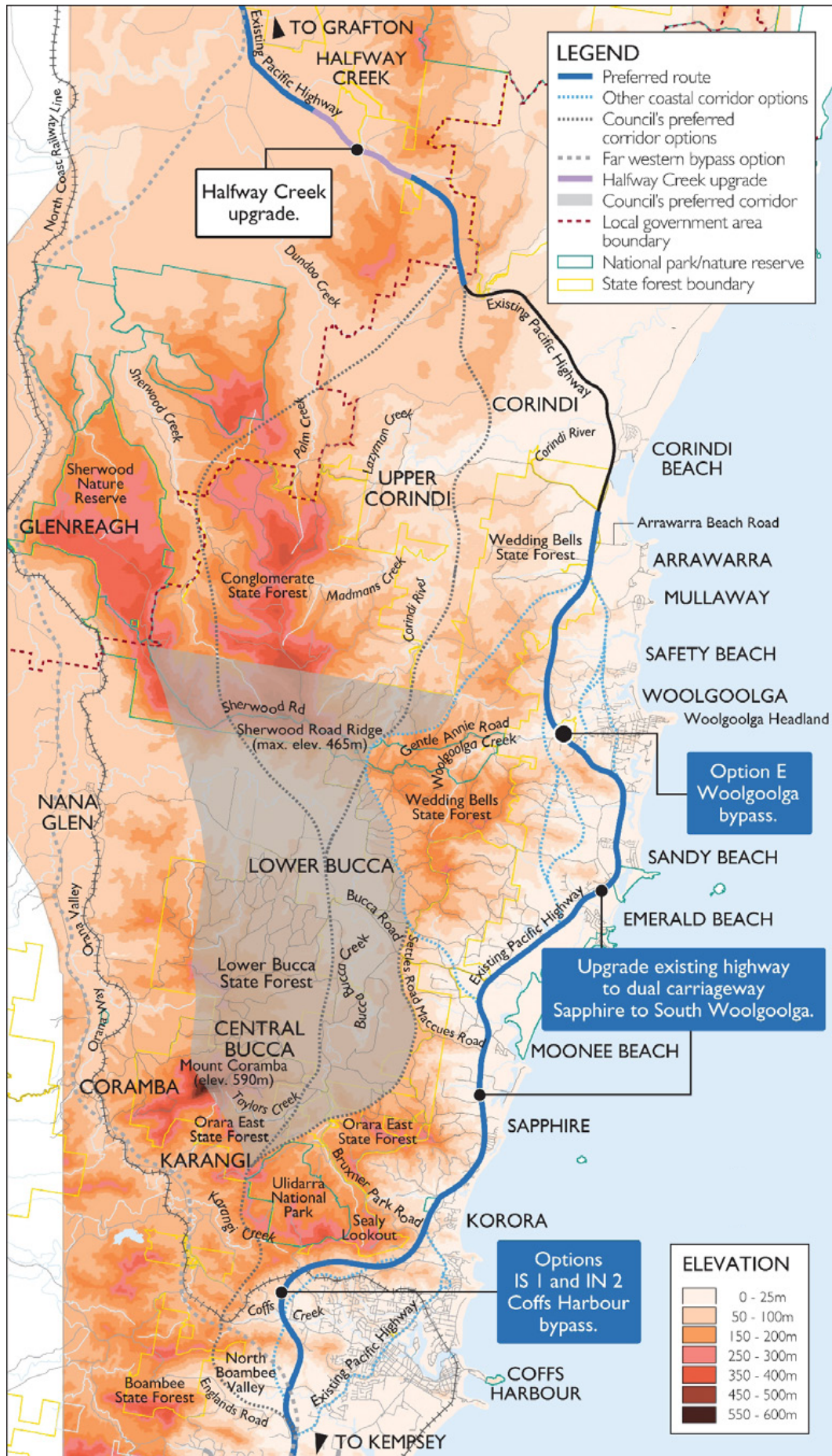


Figure 2.1

Route alignments

2.2.2 Western Bucca valley / Option A

- Coastal ridge way from Englands Road to west of Ulidarra National Park – 11.4 km section as described in Section 2.2.1 above.
- Coastal ridge way to West Bucca valley – this 10.1 km section traverses the western side of the Bucca valley, in undulating terrain through primarily agricultural properties. The West Bucca alignment provides a key connection between the southern section of the coastal ridge way and three of the route options within the Coffs Harbour City Council preferred corridor.
- Connection to Option A – 4 km section connecting the alignment on the western side of the Bucca valley to the Option A alignment at Sherwood Road Ridge. This is in primarily in undulating terrain across the Bucca valley before climbing into more the rugged country associated with Option A.
- Option A – Sherwood Road Ridge to Arrawarra – this 10.1 km northern section of Option A is in rugged terrain and this length includes the two large viaducts identified in Section 2.2.1 above.
- Arrawarra to Halfway Creek – 16.5 km section as described in Section 2.2.1 above.

2.2.3 Western Bucca valley / Corindi River

- Coastal ridge way from Englands Road to west of Ulidarra National Park – 11.4 km section as described in Section 2.2.1 above.
- Coastal ridge way to West Bucca valley – 10.1 km section as described in Section 2.2.2 above.
- Connection to Option A – 4 km section as described in Section 2.2.2 above.
- Corindi River northern extension – 21.3 km section (17.3 km section 1 roadworks and 4 km section 2 roadworks) from north of Sherwood Road Ridge through the Corindi River valley. This section would traverse undulating to rugged terrain to rejoin the existing highway at the Dirty Creek range and continue on to Halfway Creek.

2.2.4 Western Bucca valley / Sherwood Creek

- Coastal ridge way from Englands Road to west of Ulidarra National Park – 11.4 km section as described in Section 2.2.1 above.
- Coastal ridge way to West Bucca valley – 10.1 km section as described in Section 2.2.2 above.
- Sherwood Creek northern extension – this 29.8 km section from north of the West Bucca valley, passing through the Sherwood Road ridgeline would be a major undertaking of greater magnitude and complexity than the coastal ridge way proposal. The section would require three tunnels with a total length of 3 km, the first of which would be 1.5 km long through the Sherwood Road ridge line on a steep grade of 6 per cent. North of Sherwood Road the route alignment would pass through the Sherwood Creek valley, crossing that water course three times before proceeding north-east (passing through another major ridge line) before rejoining the existing highway south of Halfway Creek and continuing on the southern end of the existing dual carriageway section of the highway.

2.3 Coastal corridor

The coastal corridor comprises a combination of new route alignments and upgrades of the existing highway. A description of sections of the coastal corridor is provided below:

2.3.1 Coffs Harbour bypass

The Inner South 1 (IS1) option is the preferred route for the southern section of the inner corridor bypass of Coffs Harbour. The preferred route proceeds in a north / north-westerly direction from Englands Road to cross a low point in Roberts Hill ridge before crossing Coramba Road near the Bennetts Road intersection.

The Inner North 1 (IN2) option is the preferred route for the northern section of the Coffs Harbour bypass. From Coramba Road, the preferred route generally traverses north to cross the North Coast Railway near the northern end of Shephards Lane before proceeding easterly to rejoin the existing highway north of Bruxner Park Road Korora.

2.3.2 Korora to Sapphire

The Korora to Sapphire section is a 2 km upgrade of the existing highway connecting the northern end of the Coffs Harbour bypass to the southern end of the Sapphire to Woolgoolga upgrade. While this section of the highway is currently four-lane dual carriageway, an upgrade is envisaged to allow full separation of highway and local traffic by way of a dedicated local access road between Korora and Sapphire.

This section is very tightly constrained by residential development, the Korora Public School and the Korora Nature Reserve.

2.3.3 Sapphire to South Woolgoolga

The Sapphire to south Woolgoolga section involves a 14 km upgrade of the existing highway. The proposed upgrade through this section would include grade separated interchanges at Sapphire, Moonee Beach, Emerald Beach and South Woolgoolga, numerous local road overpasses and underpasses and a local access road to provide separation of highway and local traffic.

2.3.4 Woolgoolga bypass

Option E is the preferred route for the Woolgoolga bypass. From the junction of the existing highway and Hearnese Lake Road, the preferred route traverses to the west of the township before rejoining the existing highway near Arrawarra Beach Road.

2.3.5 Arrawarra Beach Road to Halfway Creek

The announced preferred route for the Woolgoolga to Wells Crossing upgrade primarily involves upgrading of the existing highway but would include a 9 km dual carriageway deviation between Corindi and Dirty Creek range. The Coastal corridor includes the Arrawarra Beach Road to Halfway Creek section of the Woolgoolga to Wells Crossing upgrade.

3. Economic analysis parameters

3.1 General Parameters

The following general parameter values have been used for the road user benefit cost analysis.

Base year

The base year considered for discounting purposes is 2010. This year corresponds to the assumed year in which construction commences, and has been selected instead of the year of the analysis (2007) in order to minimise the effects of discounting over extended periods of time.

Discount rates

A discount rate of 7 per cent has been used to discount future capital costs and road user costs to the base year.

Evaluation period

An evaluation period of 30 years from opening has been used for the economic analysis.

Annual expansion factor

An annual expansion factor of 350 was used to convert daily travel costs to annual costs.

Network model data

The network model data (vehicle kilometres of travel and vehicle hours of travel) for the options was estimated based on the travel parameters that are reported in the following Coffs Highway Planning reports:

- Far western option - *Pacific Highway Coffs Harbour Highway Planning Strategy Coffs Harbour Bypass Corridor Options Working Paper No. 2 Traffic and Economics Report*, March 2002 (traffic volumes only).
- Coastal ridge way proposal – *Review of the Coastal Ridge Way Proposal, Coffs Harbour Highway Planning*, February 2004.
- Option A of the Sapphire to Woolgoolga upgrade – *Cost estimates and Economic Analysis, Working Paper No 9, Sapphire to Woolgoolga Route Options*, November 2002.
- Coffs Harbour City Council preferred corridor options - *CHCC Preferred Corridor Feasibility Assessment.*, *Coffs Harbour Highway Planning*, June 2004
- Preferred route for the Coffs Harbour inner bypass – *Strategy Report, Coffs Harbour Highway Planning*, February 2004.
- *Coffs Harbour Highway Planning – Sapphire to Woolgoolga section Environmental Assessment*, October 2007.
- *Coffs Harbour Highway Planning – Sapphire to Woolgoolga section Environmental Assessment, Working Paper No. 1, Traffic and Transport Assessment*, October 2007.

The traffic volumes used in the economic analysis are shown in Appendix A. These traffic volumes include provision for the increase in heavy vehicle volumes observed following the opening of the full length of the Pacific Highway to B-double vehicles in August 2002.

3.2 Travel cost parameters

Table 3.1 shows the travel cost parameters that have been used in the economic analysis to estimate vehicle operating, travel time and accident costs. Rural cost parameters have been used to estimate the travel costs for vehicles travelling along the highway, based on the *Economic Parameters for 2005, RTA Economic Analysis Manual*. Copies of the manual can be purchased from the RTA.

Vehicle operating costs were estimated based on Table B1 of Appendix B in the economic analysis manual while the value of travel time was estimated based on the weighted average value of travel time that was derived using the value of travel time by vehicle type on rural roads based on Table 17 of Appendix B in the economic analysis manual and the results of the midblock classification surveys which provided the percentage of vehicle type in vehicle fleet along the Pacific Highway. The average cost of a rural crash based on NSW crash data for 1998-2001 was used for the accident cost per crash.

Table 3.1: Travel cost parameters

Item	Cost
<i>Vehicle operating costs per vehicle kilometres travelled</i>	\$0.33
<i>Value of time per hour</i>	\$30.97
<i>Accident cost per crash (weighted average cost for a road network)</i>	\$50,700

4. Construction costs and cash flow

4.1 Estimate description and methodology

4.1.1 Far western bypass and Coffs Harbour City Council preferred corridor options

Strategic level estimates were prepared for the far western bypass and Coffs Harbour City Council preferred corridor options based on a cost per kilometre basis within various lengths or terrain categories. The strategic costs for each of these terrain categories were cross checked against the cost per kilometre unit rates on the better defined coastal corridor estimates.

The unit rates adopted at the time of preparing the *Preferred Options Report, Coffs Harbour Highway Planning*, November 2004, were formulated in May 2004. These unit rates have been updated to 2006 values based on information on an assessment of annual rate increases as advised by the RTA Project Management Office at a Pacific Highway estimating workshop in early 2006. This advice relayed typical increases in unit rates in recent construction contracts on the Pacific Highway of up to 15 per cent per annum, which was significantly higher than historical road cost indices of approximately 5 per cent.

Consequently, the costing of the far western bypass and Coffs Harbour City Council preferred corridor options has now been revised to March 2006 rates based on:

- Increases in the unit rates for the sectional estimates consistent with the annual rate increases as assessed by the RTA. The following increases were adopted:
 - 30% increase for those sections with a previous (May 2004) unit rate of up to \$20 million per kilometre.
 - 20% increase for those sections with a previous (May 2004) unit rate in excess of \$20 million per kilometre.
- Reality check of highway pavement unit rates and overall costs as a percentage of the total estimated cost for the various sections. Pavement quantities are readily determined from known lengths and widths of carriageways and the unit rates provided by the RTA for this component of the project were used to facilitate this check.

Estimates are expressed in 2006 dollars (\$2006).

The estimated tunnelling costs on the coastal ridge way and the Sherwood Creek sections of the route options within the Coffs Harbour City Council preferred corridor had previously been removed from the overall unit rate for these options. The rate for these routes was then based on a rate without tunnels and then the discrete cost of each tunnel was then added. In this manner the sections without tunnels were not unduly penalised by a higher average unit rate.

The sectional splits for the far western bypass option and each of the Coffs Harbour City Council preferred corridor route options described above are outlined in Tables 4.1, 4.2, 4.3, 4.4 and 4.5 below. For comparative purposes, the cost estimates provided in the *Preferred Options Report, Coffs Harbour Highway Planning*, November 2004, are also shown in the tables.

Table 4.1 – Far western bypass

Section	Previous estimate	Amount	Updated estimate	Amount
Englands Road to Coramba	19.4 km @ \$24 M/km	\$465 M	19.4 km @ \$28.8 M/km	\$559 M
Coramba to Glenreagh	20.0 km @ \$12 M/km	\$240 M	20 km @ \$15.6 M/km	\$312 M
Glenreagh to Halfway Creek connection	15.0 km @ \$15 M/km	\$225 M	15 km @ \$19.5 M/km	\$293 M
Totals	54.4 km @ \$17.1 M/km	\$930 M	54.4 km @ \$22.2 M/km	\$1164 M

Table 4.2 – Coastal ridge way / Option A

Section	Previous estimate	Amount	Updated estimate	Amount
Englands Road to west of Ulidarra National Park				
- Roadworks	11.4 km @ \$25 M/km	\$285 M	11.4 km @ \$30 M/km	\$342 M
- Tunnels (excl. roadworks)	(1.82 km @ \$135 M/km)	\$246 M	(1.82 km @ \$162 M/km)	\$295 M
West of Ulidarra National Park to Bucca Road				
- Roadworks	10.2 km @ \$25 M/km	\$255 M	10.2 km @ \$30 M/km	\$306 M
- Tunnels (excl. roadworks)	(0.56 km @ \$135 M/km)	\$76 M	(0.56 km @ \$162 M/km)	\$91 M
Option A – Bucca Road to Arrawarra	16.9 km @ \$18 M/km	\$304 M	16.9 km @ \$23.4 M/km	\$395 M
Arrawarra Beach Road to Halfway Creek section				
Upgrade of existing highway	14.5 km @ \$6 M/km	\$87 M	7.5km @ \$11.6M/km (1)	\$87 M
New deviation	2 km @ \$14 M/km	\$28 M	9 km @ \$16.3 M/km (2)	\$147M
Totals	55 km @ \$23.3 M/km	\$1281 M	55 km @ \$30.2 M/km	\$1663 M

(1) Includes provision to upgrade existing highway to provide one carriageway of proposed dual carriageway highway.

(2) Estimated cost of 9 km deviation of the existing highway between Corindi Beach and Dirty Creek Range included in the announced preferred route for the Woolgoolga to Wells Crossing upgrade.

Table 4.3 – Western Bucca valley / Option A

Section	Previous estimate	Amount	Updated Estimate	Amount
Englands Road to west of Ulidarra National Park				
- Roadworks	11.4 km @ \$25 M/km	\$285 M	11.4 km @ \$30 M/km	\$342 M
- Tunnels (excl. roadworks)	(1.82 km @ \$135 M/km)	\$246 M	(1.82 km @ \$162 M/km)	\$295 M
Coastal Ridge Way to West Bucca valley	10.1 km @ \$14 M/km	\$141 M	10.1 km @ \$18.2 M/km	\$184 M
Connection to Option A	4 km @ \$14 M/km	\$56 M	4 km @ \$18.2 M/km	\$73 M
Option A – Sherwood Ridge Road to Arrawarra	10.1 km @ \$18 M/km	\$182 M	10.1 km @ \$23.4 M/km	\$236 M
Arrawarra Beach Road to Halfway Creek section				
Upgrade of existing highway	14.5 km @ \$6 M/km	\$87 M	7.5km @ \$11.6M/km (1)	\$87 M
New deviation	2 km @ \$14 M/km	\$28 M	9 km @ \$16.3 M/km (2)	\$147M
Totals	52.1 km @ \$19.7 M/km	\$1025 M	52.1 km @ \$26.2 M/km	\$1364 M

(1) Includes provision to upgrade existing highway to provide one carriageway of proposed dual carriageway highway.

(2) Estimated cost of 9 km deviation of the existing highway between Corindi Beach and Dirty Creek Range included in the announced preferred route for the Woolgoolga to Wells Crossing upgrade.

Table 4.4 –Western Bucca valley / Corindi River

Section	Previous Estimate	Amount	Updated estimate	Amount
Englands Road to west of Ulidarra National Park				
- Roadworks	11.4 km @ \$25 M/km	\$285 M	11.4 km @ \$30 M/km	\$342 M
- Tunnels (excl. roadworks)	(1.82 km @ \$135 M/km)	\$246 M	(1.82 km @ \$162 M/km)	\$295 M
Coastal Ridge Way to west Bucca valley	10.1 km @ \$14 M/km	\$141 M	10.1 km @ \$18.2 M/km	\$184 M
Connection to Option A	4 km @ \$14 M/km	\$56 M	4 km @ \$18.2 M/km	\$73 M
Corindi River northern extension				
- Section 1 roadworks	17.3 km @ \$18 M/km	\$312 M	17.3 km @ \$23.4 M/km	\$404 M
- Section 2 roadworks	4 km @ \$6 M/km	\$24 M	4 km @ \$7.8 M/km	\$31 M
Totals	46.8 km @ \$22.7 M/km	\$1064 M	46.8 km @ \$28.4 M/km	\$1329 M

Table 4.5 –Western Bucca valley / Sherwood Creek

Section	Previous Estimate	Amount	Updated estimate	Amount
Englands Road to west of Ulidarra National Park				
- Roadworks	11.4 km @ \$25 M/km	\$285 M	11.4 km @ \$30 M/km	\$342 M
- Tunnels (excl. roadworks)	(1.82 km @ \$135 M/km)	\$246 M	(1.82 km @ \$162 M/km)	\$295 M
Coastal Ridge Way to West Bucca valley	10.1 km @ \$14 M/km	\$141 M	10.1 km @ \$18.2 M/km	\$184 M
Sherwood Creek northern extension				
- Section 1 roadworks	6 km @ \$14 M/km	\$84 M	6 km @ \$18.2 M/km	\$109 M
- Section 2 roadworks	13.8 km @ \$25 M/km	\$345 M	13.8 km @ \$30M/km	\$414 M
- Section 3 roadworks	10 km @ \$14 M/km	\$140 M	10 km @ \$18.2 M/km	\$182 M
- Tunnels (excl. roadworks)	(3.04 km @ \$135 M/km)	\$411 M	(3.04 km @ \$162 M/km)	\$492 M
Totals	51.3 km @ \$32.2 M/km	\$1652 M	51.3 km @ \$39.3 M/km	\$2018 M

4.1.2 Coastal corridor route options

The estimates for the options within the coastal corridor have been based on the preliminary concept designs. While the sections of the coastal corridor had varying levels of preliminary concept design development, the extent of the design development for all sections provided adequate scope definition to enable unit rate based estimates with suitable contingencies for uncertainties to be prepared.

The main elements of the unit rates based approach adopted on the coastal corridor alignments are as follows:

- Earthworks.
- Pavement.
- Bridges, tunnels and other structures.
- Inclusion of new or upgraded local access roads (where required) in conjunction with the Pacific Highway upgrade.

Other estimate inputs included investigation and design costs, land acquisition and public utility adjustments.

Overall unit rates for the respective sections of the coastal corridor have been back-calculated from a total cost of each section and its discrete length to provide an overall rate on a per kilometre basis.

For the purposes of this analysis, the following options were analysed:

- **Low cost option** – Combination of Coffs Harbour inner bypass options Inner South 1 and Inner North 2 (with no tunnels) and Option E bypass of Woolgoolga.
- **High cost option** – Combination of Coffs Harbour inner bypass options Inner South 1 and Inner North 2 (with two tunnels) and Option E bypass of Woolgoolga.

As outlined in Section 2.3 above, all other sections of the coastal corridor are common.

The sectional splits for coastal corridor options described above are outlined in Tables 4.6 and 4.7 below. For comparative purposes, the cost estimates provided in the *Preferred Options Report, Coffs Harbour Highway Planning*, November 2004, are also shown in the tables.

Table 4.6– Coastal corridor – low cost option

Section	Previous estimate	Amount	Updated estimate	Amount
Coffs Harbour bypass	11km @ \$25.5M/km (1)	\$280 M	11.4 km @ \$32.9 M/km (2)	\$375 M
Korora to Sapphire section	2 km @ \$0.0 M/km	(3)	2 km @ \$47.5 M/km	\$95 M
Sapphire to Woolgoolga section				
Sapphire to south Woolgoolga	13.9 km @ \$10.4 M/km	\$145 M	14.1 km @ \$18.4 M/km (4)	\$260 M
Allowance for Interchanges between Moonee Beach and south Woolgoolga		\$50 M		(5)
Woolgoolga bypass	9.3km @ \$12.9M/km (6)	\$120 M	10.5km @ \$19.5 M/km (7)	\$205 M
Arararra Beach Road to Halfway Creek section				
Upgrade of existing highway	14.5 km @ \$6 M/km	\$87 M	7.5 km @ \$11.6 M/km (8)	\$87 M
New deviation	2 km @ \$14 M/km	\$28 M	9 km @ \$16.3 M/km (9)	\$147M
Totals	52.7 km @ \$13.5 M/km	\$710 M	54.5 km @ \$21.4 M/km	\$1169 M

Notes:

- (1) Option Inner South 1 and Inner North 1 (No tunnels)
- (2) Option Inner South 1 and Inner North 2 (No tunnels)
- (3) No allowance was made for an upgrade of this section in the previous estimate as it is already duplicated.
- (4) Includes estimated cost of interchanges and continuous alternative local road link between Sapphire and south Woolgoolga.
- (5) Estimated cost of interchanges included in updated estimates for Sapphire to south Woolgoolga section.
- (6) Option C1.
- (7) Option E with extension of upgrade to north of Arararra Beach Road and estimated cost of Arararra interchange and rest area.
- (8) Includes provision to upgrade existing highway to provide one carriageway of proposed dual carriageway highway.
- (9) Estimated cost of 9 km deviation of the existing highway between Corindi Beach and Dirty Creek Range included in the announced preferred route for the Woolgoolga to Wells Crossing upgrade.

Table 4.7– Coastal corridor – high cost option

Section	Previous estimate	Amount	Updated estimate	Amount
Coffs Harbour bypass	11.4km @ \$37.3M/km (1)	\$425 M	11.4 km @ \$42.1 M/km (2)	\$480 M
Korora to Sapphire	2 km @ \$0.0 M/km	(3)	2 km @ \$47.5 M/km	\$95 M
Sapphire to south Woolgoolga section				
Sapphire to south Woolgoolga	13.9 km @ \$10.4 M/km	\$145 M	14.1 km @ \$18.4 M/km (4)	\$260 M
Allowance for Interchanges between Moonee Beach and south Woolgoolga		\$80 M		(5)
Woolgoolga bypass	9.9km @ \$13.6M/km (6)	\$135 M	10.5 km @ \$19.5 M/km (7)	\$205 M
Arararra Beach Road to Halfway Creek section				
Upgrade of existing highway	14.5 km @ \$6 M/km	\$87 M	7.5 km @ \$11.6 M/km (8)	\$87 M
New deviation	2 km @ \$14 M	\$28 M	9 km @ \$16.3 M/km (9)	\$147 M
Totals	53.7 km @ \$16.8 M/km	\$900 M	54.5 km @ \$23.4 M/km	\$1274 M

Notes:

- (1) Option Inner South 2 and Inner North 2 (3 tunnels)
- (2) Option Inner South 1 and Inner North 2 (2 tunnels)
- (3) No allowance was made for an upgrade of this section in the previous estimate since it is already duplicated.
- (4) Includes estimated cost of interchanges and continuous alternative local road link between Sapphire and south Woolgoolga.
- (5) Estimated cost of interchanges included in updated estimates for Sapphire to south Woolgoolga section.
- (6) Option E.
- (7) Option E with extension of upgrade to north of Arararra Beach Road and estimated cost of Arararra interchange and rest area.
- (8) Includes provision to upgrade existing highway to provide one carriageway of proposed dual carriageway highway.
- (9) Estimated cost of 9 km deviation of the existing highway between Corindi Beach and Dirty Creek Range included in the announced preferred route for the Woolgoolga to Wells Crossing upgrade.

4.2 Cost estimate summary

The summaries of estimated construction costs for each upgrade option are shown in Table 4.8.

Table 4.8 – Cost estimate summaries

Corridor / Route Option	Length	Total Cost	Rate \$M/km	Pavement cost	
				Amount	% Total cost
Far western bypass	54.4 km	\$1164 M	\$21.4 M	\$194 M	17%
Coffs Harbour City Council Preferred Corridor					
Coastal Ridge Way / Option A	55 km	\$1663 M	\$30.2 M	\$205 M	12%
Western Bucca valley / Option A	52.1 km	\$1364 M	\$26.2 M	\$192 M	14%
Western Bucca valley / Corindi River	46.8 km	\$1329 M	\$28.4 M	\$174 M	13%
Western Bucca valley / Sherwood Creek	51.3 km	\$2018 M	\$39.3 M	\$201 M	10%
Coastal corridor options					
Low cost option – Coffs Harbour bypass Inner South 1 and Inner North 2 (with no tunnels) and Option E bypass of Woolgoolga.	53.8 km	\$1169 M	\$21.7 M	\$208 M	18%
High cost option – Coffs Harbour bypass Inner South 1 and Inner North 2 (with two tunnels) and Option E bypass of Woolgoolga.	53.8 km	\$1274 M	\$23.7 M	\$208 M	16%

4.3 Comparison of route options

Table 4.9 below shows the comparison of the respective sections of the far western bypass, Coffs Harbour City Council preferred corridor route options and the coastal corridor options.

Both the far western bypass and Coffs Harbour City Council preferred corridor options would also require the duplication of the existing highway between Sapphire and Safety Beach to cater for predicted local traffic volumes along the developing northern beaches area of the Coffs Coast.

Table 4.9 - Preliminary estimated cost - all corridor options (\$2006)

Feature	Far western bypass	Coffs Harbour City Council corridor route options	Coastal corridor route options
Bypass / highway upgrade section length	54.4 km	46.8 km to 55 km	53.8 km
Englands Road to Halfway Creek via Orara valley	\$1164 M		
Englands Road to Halfway Creek via Coffs Harbour City Council's preferred corridor		\$1329 M to \$2018 M	
Inner bypass of Coffs Harbour			\$375 M to \$480 M
Korora to Sapphire			\$95 M
Sapphire to South Woolgoolga			\$205 M
Woolgoolga Bypass			\$260 M
Arwarra Beach Road to Halfway Creek			\$234 M
Total cost for bypass / highway upgrade	\$1164 M	\$1329 M to \$2018 M	\$1169 M to \$1274 M
Average Unit Rate per Kilometre	\$21 M / km	\$26 M to \$39 M / km	\$22 M to \$24 M / km
Duplication of bypassed sections of existing highway between Sapphire and Safety Beach (19.5 km @ \$10M / km)	\$195 M	\$195 M	Nil
Total construction cost	\$1,359 M	\$1,524 M to \$2,213 M	\$1,169 M to \$1,274 M

4.4 Construction cash flows

Total construction cost for the route options shown in Table 4.9 above were used for the economic analysis. The construction costs have been equally distributed to estimate the cash flows during the assumed six-year construction period, with opening to traffic adopted as 2024 for analysis purposes.

To meet this projected cash flow demand of these estimates over the six-year construction period would require annual funding of between \$195M and \$215M for the coastal corridor route options and between \$225M and \$370M for the far western bypass and Coffs Harbour City Council corridor route options.

4.5 Maintenance costs

An allowance for future routine and periodic maintenance has been made in the analysis based on a typical maintenance schedule and associated unit costs for a concrete pavement surface specified in the *RTA Economic Analysis Manual*. The maintenance schedule and unit costs used are summarised in Table 4.10.

Table 4.10: Maintenance schedule and unit costs

Treatment	Year	Cost per m ² of pavement
Routine maintenance	1-30 inclusive	\$0.15
Cross stitching 20m cracks	2, 6, 12, 20	\$0.06
0.5% slab replacement	2, 5, 10, 15, 20, 25, 28, 30	\$1.03
Cross stitching 40m cracks	28	\$0.12
Remove and replace sealant	10, 20, 30	\$2.19
30% retexture	20	\$0.84

The salvage value of the pavement beyond the thirty-year period from opening is assumed to be zero.

The maintenance costs used for the economic analysis do not include cost associated with the operational and maintenance of any required tunnels.

5. Results and conclusions of economic analysis

5.1 Results of economic analysis

Road user benefits for a transport project are measured in terms of the reduction in road user costs that arise from building an option compared to the base case scenario of doing nothing (or doing only minimum improvements in order to allow for necessary safety improvement works which would occur whether or not any of the upgrade options proceed). The road user costs assessed for this purpose include:

- Vehicle operating costs including cost of fuel used and cost of stops.
- Travel time costs.
- Accident costs.

The changes in vehicle operating costs, travel time and accident costs were derived between the base case and each option for the future traffic volume prediction years of 2001 and 2021. Values for intermediate years between 2001 and 2021 were derived by interpolation. Values beyond 2021 were extrapolated by assuming that growth would continue at the same rate as calculated between 2001 and 2021.

The resultant time-stream of road user cost savings (or increases) were discounted and summed over the thirty-year evaluation period from opening, to provide the total present value of benefits for each option present value of benefits. A similar process of discounting and summation was carried out for the capital and maintenance costs previously identified, to provide the equivalent present value of costs for each option present value of costs.

For consistency with previous economic analyses of the corridor options and to assess the sensitivity of the results to the assumed opening year, the economic analysis has been undertaken for assumed opening years of 2016 and 2024. For the evaluation, a six-year construction program has been assumed for all of the corridor options. Details of the analysis are attached as Appendix B.

The comparative results for the benefit cost ratio indicators with assumed opening years of 2016 and 2024 are provided in Table 5.1.

Table 5.1: Comparative assessment of 2016 opening and 2024 opening

Options	Benefit cost ratio 2016 Opening	Benefit cost ratio 2024 opening
Far western bypass		
Far western option	0.36	0.50
Coffs Harbour City Council preferred corridor		
Coastal Ridge Way / Option A	0.25	0.34
Western Bucca valley / Option A	0.36	0.49
Western Bucca valley / Corindi River	0.50	0.67
Western Bucca valley / Sherwood Creek	0.26	0.35
Coastal Corridor		
Low cost option - Coffs Harbour bypass Inner South 1 and Inner North 2 (with no tunnels) and Option E bypass of Woolgoolga.	1.2	1.6
High cost option –Coffs Harbour bypass Inner South 1 and Inner North 2 (with two tunnels) and Option E bypass of Woolgoolga.	1.1	1.5

As the coastal corridor includes a combination of upgrades of the existing highway and new routes, it provides significantly better opportunities to stage the construction of the route than either the Far Western Bypass or Coffs Harbour City Council Preferred Corridor options. Staged construction would

enable sections of the route to be brought forward to provide earlier road safety, transport efficiency and community benefits. While this analysis does not seek to identify any economic benefits that could be obtained by staged construction of the route, it is noted that, based on an assumed opening date of 2011, the Sapphire to Woolgoolga section of the coastal corridor has a benefit cost ratio of 2.0 (*Detailed Traffic and Transport assessment - Pacific Highway Upgrade - Sapphire to Woolgoolga, August 2007*)

5.2 Conclusions of economic analysis

From the above economic analysis, it is concluded that:

- With a benefit cost ratio considerably less than 1, the far western bypass and all of the options with Coffs Harbour City Council's preferred corridor provide very poor value for money.
- The coastal corridor is the only option which provides benefit cost ratios of more than 1 and reasonable value for money.
- The coastal corridor provides greater opportunities for staged construction than the other corridor options and to construct those sections of the corridor that provide better value for money and/or road safety, transport efficiency and community benefits in advance of other sections.
- Delaying construction and opening of the project by 8 years (from 2016 to 2024) increases the benefit cost ratio for all corridor options. However, even with a delayed opening, the coastal corridor remains the only option which provides benefit cost ratios greater than 1 and reasonable value for money.

Appendix A

Traffic volumes

APPENDIX A PREDICTED DAILY TRAFFIC VOLUMES

LOCATION	2006		2021	
	Annual average daily traffic volume (veh/day)	Average daily heavy traffic volume (veh/day)	Annual average daily traffic volume (veh/day)	Average daily heavy traffic volume (veh/day)
FAR WESTERN BYPASS				
Far Western Option	4,500	1,300	6,750	2,200
COFFS HARBOUR CITY COUNCIL PREFERRED CORRIDOR				
Coffs Harbour City Council Preferred Corridor Options	5,872	1,300	9,948	2,200
COASTAL CORRIDOR				
Coffs Harbour Bypass				
- Southern end.	9,561	1,311	13,994	2,112
- Northern end.	9,702	1,291	15,002	2,205
Sapphire (south of Headlands Road).	20,508	2,353	35,264	3,988
Emerald Beach (north of Fiddaman Road).	17,775	1,974	25,286	3,391
Woolgoolga Bypass.	6,805	1,499	11,377	2,443
North of Mullaway Drive	10,773	1,788	17,999	3,042

Appendix B

Results of economic analysis

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: COFFS HARBOUR STRATEGY-FAR WESTERN OPTION

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2010
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

Far Western Option
\$1,164

NETWORK MODEL DATA (Average Weekday)

	Base		Far Western Option	
	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)				
Vehicle Travel	2,441,110	3,484,013	2,463,523	3,500,476
Vehicle Hours of Travel (VHT)				
Vehicle Hours	46,262	67,637	45,758	64,632
Average Speed (km/hr)	51.8	50.0	53.8	54.2

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
Far Western Option	6.08	5.22	3.59

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
Far Western Option	\$989	\$361	-\$634.69	0.36	\$273	-\$721.53	0.27	\$149	-\$844.03	0.15	1.5%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		Far Western Option	
	2006	2021	2006	2021
Vehicle Operating Costs	\$0.806	\$1.150	\$0.813	\$1.155
Travel Time Costs	\$1.433	\$2.095	\$1.417	\$2.002
Accident Costs	\$0.124	\$0.177	\$0.125	\$0.177
Daily Travel Costs	\$2.362	\$3.421	\$2.355	\$3.334
Annual Travel Costs	\$835	\$1,212	\$832	\$1,180

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base Discounted	Far Western Option	
				Discounted
2006	\$835		\$832	
2007	\$860		\$855	
2008	\$885		\$878	
2009	\$910		\$901	
2010	\$935		\$925	
2011	\$961		\$948	
2012	\$986		\$971	
2013	\$1,011		\$994	
2014	\$1,036		\$1,018	
2015	\$1,061		\$1,041	
2016	\$1,086	\$724	\$1,064	\$709
2017	\$1,111	\$692	\$1,087	\$677
2018	\$1,137	\$661	\$1,110	\$646
2019	\$1,162	\$632	\$1,134	\$617
2020	\$1,187	\$603	\$1,157	\$588
2021	\$1,212	\$576	\$1,180	\$561
2022	\$1,237	\$549	\$1,203	\$534
2023	\$1,262	\$524	\$1,227	\$509
2024	\$1,287	\$499	\$1,250	\$485
2025	\$1,313	\$476	\$1,273	\$461
2026	\$1,338	\$453	\$1,296	\$439
2027	\$1,363	\$431	\$1,320	\$418
2028	\$1,388	\$411	\$1,343	\$397
2029	\$1,413	\$391	\$1,366	\$378
2030	\$1,438	\$372	\$1,389	\$359
2031	\$1,463	\$353	\$1,413	\$341
2032	\$1,489	\$336	\$1,436	\$324
2033	\$1,514	\$319	\$1,459	\$308
2034	\$1,539	\$303	\$1,482	\$292
2035	\$1,564	\$288	\$1,506	\$277
2036	\$1,589	\$274	\$1,529	\$263
2037	\$1,614	\$260	\$1,552	\$250
2038	\$1,639	\$247	\$1,575	\$237
2039	\$1,665	\$234	\$1,599	\$225
2040	\$1,690	\$222	\$1,622	\$213
2041	\$1,715	\$211	\$1,645	\$202
2042	\$1,740	\$200	\$1,668	\$191
2043	\$1,765	\$189	\$1,692	\$181
2044	\$1,790	\$179	\$1,715	\$172
2045	\$1,815	\$170	\$1,738	\$163
Discounted Costs				
10 Year Period		\$5,937		\$5,788
20 Year Period		\$9,594		\$9,321
30 Year Period		\$11,779		\$11,419
Present Value of Benefits				
10 Year Period				\$149
20 Year Period				\$273
30 Year Period				\$361

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	Far Western Option	
		Discounted
2010	\$194.0	\$194.0
2011	\$194.0	\$181.3
2012	\$194.0	\$169.4
2013	\$194.0	\$158.4
2014	\$194.0	\$148.0
2015	\$194.0	\$138.3
Total	\$1,164	\$989

Notes:

- 1 This benefit cost analysis has been carried out for strategic purposes only
- 2 The analysis of Far Western Option has been calculated from the results for the the CRW/Option A by reducing the VHT and VKT travel statistics by 0.6km.

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: COFFS HARBOUR STRATEGY-FAR WESTERN OPTION

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2018
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

Far Western Option
\$1,164

NETWORK MODEL DATA (Average Weekday)

	Base		Far Western Option	
	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)				
Vehicle Travel	2,441,110	3,484,013	2,463,523	3,500,476
Vehicle Hours of Travel (VHT)				
Vehicle Hours	46,262	67,637	45,758	64,632
Average Speed (km/hr)	51.8	50.0	53.8	54.2

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
Far Western Option	6.08	5.22	3.59

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
Far Western Option	\$989	\$495	-\$500.17	0.50	\$388	-\$606.68	0.39	\$225	-\$767.89	0.23	2.5%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		Far Western Option	
	2006	2021	2006	2021
Vehicle Operating Costs	\$0.806	\$1.150	\$0.813	\$1.155
Travel Time Costs	\$1.433	\$2.095	\$1.417	\$2.002
Accident Costs	\$0.124	\$0.177	\$0.125	\$0.177
Daily Travel Costs	\$2.362	\$3.421	\$2.355	\$3.334
Annual Travel Costs	\$835	\$1,212	\$832	\$1,180

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base Discounted	Far Western Option	
				Discounted
2006	\$835		\$832	
2007	\$860		\$855	
2008	\$885		\$878	
2009	\$910		\$901	
2010	\$935		\$925	
2011	\$961		\$948	
2012	\$986		\$971	
2013	\$1,011		\$994	
2014	\$1,036		\$1,018	
2015	\$1,061		\$1,041	
2016	\$1,086		\$1,064	
2017	\$1,111		\$1,087	
2018	\$1,137		\$1,110	
2019	\$1,162		\$1,134	
2020	\$1,187		\$1,157	
2021	\$1,212		\$1,180	
2022	\$1,237		\$1,203	
2023	\$1,262		\$1,227	
2024	\$1,287	\$858	\$1,250	\$833
2025	\$1,313	\$817	\$1,273	\$793
2026	\$1,338	\$779	\$1,296	\$755
2027	\$1,363	\$741	\$1,320	\$718
2028	\$1,388	\$706	\$1,343	\$683
2029	\$1,413	\$671	\$1,366	\$649
2030	\$1,438	\$639	\$1,389	\$617
2031	\$1,463	\$607	\$1,413	\$586
2032	\$1,489	\$577	\$1,436	\$557
2033	\$1,514	\$549	\$1,459	\$529
2034	\$1,539	\$521	\$1,482	\$502
2035	\$1,564	\$495	\$1,506	\$477
2036	\$1,589	\$470	\$1,529	\$452
2037	\$1,614	\$446	\$1,552	\$429
2038	\$1,639	\$424	\$1,575	\$407
2039	\$1,665	\$402	\$1,599	\$386
2040	\$1,690	\$381	\$1,622	\$366
2041	\$1,715	\$362	\$1,645	\$347
2042	\$1,740	\$343	\$1,668	\$329
2043	\$1,765	\$325	\$1,692	\$312
2044	\$1,790	\$308	\$1,715	\$295
2045	\$1,815	\$292	\$1,738	\$280
2046	\$1,841	\$277	\$1,761	\$265
2047	\$1,866	\$262	\$1,785	\$251
2048	\$1,891	\$248	\$1,808	\$237
2049	\$1,916	\$235	\$1,831	\$225
2050	\$1,941	\$223	\$1,854	\$213
2051	\$1,966	\$211	\$1,878	\$201
2052	\$1,991	\$200	\$1,901	\$190
2053	\$2,017	\$189	\$1,924	\$180
Discounted Costs				
10 Year Period		\$6,944		\$6,719
20 Year Period		\$11,114		\$10,726
30 Year Period		\$13,559		\$13,064
Present Value of Benefits				
10 Year Period				\$225
20 Year Period				\$388
30 Year Period				\$495

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	Far Western Option	
		Discounted
2018	\$194.0	\$194.0
2019	\$194.0	\$181.3
2020	\$194.0	\$169.4
2021	\$194.0	\$158.4
2022	\$194.0	\$148.0
2023	\$194.0	\$138.3
Total	\$1,164	\$989

Notes:

- 1 This benefit cost analysis has been carried out for strategic purposes only
- 2 The analysis of Far Western Option has been calculated from the results for the the CRW/Option A by reducing the VHT and VKT travel statistics by 0.6km.

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: CHCC PREFERRED CORRIDOR OPTIONS

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2010
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

CRW/Option A	Western Bucca Valley/ Option A	Western Bucca Valley/ Sherwood Creek	Western Bucca Valley/ Corindi River
\$1,663	\$1,364	\$2,018	\$1,329

NETWORK MODEL DATA (Average Weekday)

	Base		CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
	2006	2021	2006	2021	2006	2021	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)										
Vehicle Travel	2,441,110	3,484,013	2,466,073	3,504,376	2,449,769	3,476,252	2,445,272	3,468,494	2,419,973	3,424,853
Vehicle Hours of Travel (VHT)										
Vehicle Hours	46,262	67,637	45,781	64,669	45,629	64,406	45,587	64,334	45,741	63,926
Average Speed (km/hr)	51.8	50.0	53.9	54.2	53.7	54.0	53.6	53.9	52.9	53.6

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
CRW/Option A	6.16	5.28	3.64
Western Bucca Valley/Option A	5.83	5.01	3.45
Western Bucca Valley/Sherwood Ck	5.74	4.93	3.39
Western Bucca Valley/Corindi River	5.39	4.62	3.17

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
CRW/Option A	\$1,414	\$350	-\$1,069.39	0.25	\$265	-\$1,154.22	0.19	\$144	-\$1,273.42	0.10	1.0%
Western Bucca Valley/Option A	\$1,159	\$424	-\$741.66	0.36	\$323	-\$841.03	0.28	\$179	-\$983.59	0.15	1.5%
Western Bucca Valley/Sherwood Ck	\$1,715	\$444	-\$1,277.29	0.26	\$340	-\$1,380.67	0.20	\$189	-\$1,529.67	0.11	1.0%
Western Bucca Valley/Corindi River	\$1,130	\$569	-\$565.76	0.50	\$436	-\$698.60	0.38	\$243	-\$890.22	0.21	2.0%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
	2006	2021	2006	2021	2006	2021	2006	2021	2006	2021
Vehicle Operating Costs	\$0.806	\$1.150	\$0.814	\$1.156	\$0.808	\$1.147	\$0.807	\$1.145	\$0.799	\$1.130
Travel Time Costs	\$1.433	\$2.095	\$1.418	\$2.003	\$1.413	\$1.995	\$1.412	\$1.992	\$1.417	\$1.980
Accident Costs	\$0.124	\$0.177	\$0.125	\$0.178	\$0.124	\$0.176	\$0.124	\$0.176	\$0.123	\$0.174
Daily Travel Costs	\$2.362	\$3.421	\$2.357	\$3.337	\$2.346	\$3.318	\$2.343	\$3.313	\$2.338	\$3.284
Annual Travel Costs	\$835	\$1,212	\$832	\$1,181	\$828	\$1,174	\$827	\$1,172	\$825	\$1,161

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base Discounted	CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
				Discounted		Discounted		Discounted		Discounted
2006	\$835		\$832		\$828		\$827		\$825	
2007	\$860		\$856		\$851		\$850		\$847	
2008	\$885		\$879		\$874		\$873		\$869	
2009	\$910		\$902		\$897		\$896		\$892	
2010	\$935		\$925		\$920		\$919		\$914	
2011	\$961		\$949		\$943		\$942		\$937	
2012	\$986		\$972		\$966		\$965		\$959	
2013	\$1,011		\$995		\$989		\$988		\$981	
2014	\$1,036		\$1,018		\$1,013		\$1,011		\$1,004	
2015	\$1,061		\$1,042		\$1,036		\$1,034		\$1,026	
2016	\$1,086	\$724	\$1,065	\$710	\$1,059	\$705	\$1,057	\$704	\$1,049	\$699
2017	\$1,111	\$692	\$1,088	\$678	\$1,082	\$674	\$1,080	\$673	\$1,071	\$667
2018	\$1,137	\$661	\$1,111	\$647	\$1,105	\$643	\$1,103	\$642	\$1,093	\$636
2019	\$1,162	\$632	\$1,135	\$617	\$1,128	\$613	\$1,126	\$612	\$1,116	\$607
2020	\$1,187	\$603	\$1,158	\$589	\$1,151	\$585	\$1,149	\$584	\$1,138	\$579
2021	\$1,212	\$576	\$1,181	\$561	\$1,174	\$558	\$1,172	\$557	\$1,161	\$551
2022	\$1,237	\$549	\$1,205	\$535	\$1,197	\$532	\$1,195	\$531	\$1,183	\$525
2023	\$1,262	\$524	\$1,228	\$510	\$1,220	\$506	\$1,218	\$505	\$1,205	\$500
2024	\$1,287	\$499	\$1,251	\$485	\$1,243	\$482	\$1,241	\$481	\$1,228	\$476
2025	\$1,313	\$476	\$1,274	\$462	\$1,266	\$459	\$1,264	\$458	\$1,250	\$453
2026	\$1,338	\$453	\$1,298	\$440	\$1,289	\$437	\$1,287	\$436	\$1,273	\$431
2027	\$1,363	\$431	\$1,321	\$418	\$1,312	\$415	\$1,310	\$415	\$1,295	\$410
2028	\$1,388	\$411	\$1,344	\$398	\$1,335	\$395	\$1,333	\$394	\$1,317	\$390
2029	\$1,413	\$391	\$1,367	\$378	\$1,358	\$376	\$1,356	\$375	\$1,340	\$370
2030	\$1,438	\$372	\$1,391	\$359	\$1,382	\$357	\$1,379	\$356	\$1,362	\$352
2031	\$1,463	\$353	\$1,414	\$341	\$1,405	\$339	\$1,402	\$339	\$1,385	\$334
2032	\$1,489	\$336	\$1,437	\$324	\$1,428	\$322	\$1,425	\$322	\$1,407	\$318
2033	\$1,514	\$319	\$1,461	\$308	\$1,451	\$306	\$1,448	\$305	\$1,430	\$302
2034	\$1,539	\$303	\$1,484	\$293	\$1,474	\$291	\$1,471	\$290	\$1,452	\$286
2035	\$1,564	\$288	\$1,507	\$278	\$1,497	\$276	\$1,494	\$275	\$1,474	\$272
2036	\$1,589	\$274	\$1,530	\$264	\$1,520	\$262	\$1,517	\$261	\$1,497	\$258
2037	\$1,614	\$260	\$1,554	\$250	\$1,543	\$248	\$1,540	\$248	\$1,519	\$244
2038	\$1,639	\$247	\$1,577	\$237	\$1,566	\$236	\$1,563	\$235	\$1,542	\$232
2039	\$1,665	\$234	\$1,600	\$225	\$1,589	\$223	\$1,586	\$223	\$1,564	\$220
2040	\$1,690	\$222	\$1,623	\$213	\$1,612	\$212	\$1,609	\$211	\$1,586	\$208
2041	\$1,715	\$211	\$1,647	\$202	\$1,635	\$201	\$1,632	\$200	\$1,609	\$198
2042	\$1,740	\$200	\$1,670	\$192	\$1,658	\$190	\$1,655	\$190	\$1,631	\$187
2043	\$1,765	\$189	\$1,693	\$182	\$1,681	\$180	\$1,678	\$180	\$1,654	\$177
2044	\$1,790	\$179	\$1,716	\$172	\$1,704	\$171	\$1,701	\$170	\$1,676	\$168
2045	\$1,815	\$170	\$1,740	\$163	\$1,728	\$162	\$1,724	\$161	\$1,698	\$159
Discounted Costs										
10 Year Period		\$5,937		\$5,793		\$5,757		\$5,747		\$5,694
20 Year Period		\$9,594		\$9,330		\$9,271		\$9,255		\$9,159
30 Year Period		\$11,779		\$11,429		\$11,356		\$11,336		\$11,210
Present Value of Benefits										
10 Year Period				\$144		\$179		\$189		\$243
20 Year Period				\$265		\$323		\$340		\$436
30 Year Period				\$350		\$424		\$444		\$569

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
		Discounted		Discounted		Discounted		Discounted
2010	\$277.2	\$277.2	\$227.3	\$227.3	\$336.3	\$336.3	\$221.5	\$221.5
2011	\$277.2	\$259.0	\$227.3	\$212.5	\$336.3	\$314.3	\$221.5	\$207.0
2012	\$277.2	\$242.1	\$227.3	\$198.6	\$336.3	\$293.8	\$221.5	\$193.5
2013	\$277.2	\$226.3	\$227.3	\$185.6	\$336.3	\$274.5	\$221.5	\$180.8
2014	\$277.2	\$211.4	\$227.3	\$173.4	\$336.3	\$256.6	\$221.5	\$169.0
2015	\$277.2	\$197.6	\$227.3	\$162.1	\$336.3	\$239.8	\$221.5	\$157.9
Total	\$1,663	\$1,414	\$1,364	\$1,159	\$2,018	\$1,715	\$1,329	\$1,130

Notes:

- This benefit cost analysis has been carried out for strategic purposes only
- The analysis of CRW/Option A has been calculated by combining the travel statistics from the independent assessments for each option, with additional allowance for the section from Arrawarra Creek to Halfway Creek
- The analysis of Western Extension/Option A has been calculated from the results for the the CRW/Option A by reducing the VHT and VKT travel statistics by 2.9km.
- The analysis of Western Extension/Sherwood Creek has been calculated from the results for the CRW/Option A by reducing the VHT and VKT travel statistics by 3.7km.
- The analysis of Western Extension/Corindi River has been calculated from the results for the CRW/Option A by reducing the VHT and VKT travel statistics by 8.2km.

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: CHCC PREFERRED CORRIDOR OPTIONS

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2018
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

CRW/Option A	Western Bucca Valley/ Option A	Western Bucca Valley/ Sherwood Creek	Western Bucca Valley/ Corindi River
\$1,663	\$1,364	\$2,018	\$1,329

NETWORK MODEL DATA (Average Weekday)

	Base		CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
	2006	2021	2006	2021	2006	2021	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)										
Vehicle Travel	2,441,110	3,484,013	2,466,073	3,504,376	2,449,769	3,476,252	2,445,272	3,468,494	2,419,973	3,424,853
Vehicle Hours of Travel (VHT)										
Vehicle Hours	46,262	67,637	45,781	64,669	45,629	64,406	45,587	64,334	45,741	63,926
Average Speed (km/hr)	51.8	50.0	53.9	54.2	53.7	54.0	53.6	53.9	52.9	53.6

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
CRW/Option A	6.16	5.28	3.64
Western Bucca Valley/Option A	5.83	5.01	3.45
Western Bucca Valley/Sherwood Ck	5.74	4.93	3.39
Western Bucca Valley/Corindi River	5.39	4.62	3.17

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
CRW/Option A	\$1,414	\$483	-\$936.67	0.34	\$378	-\$1,040.91	0.27	\$219	-\$1,198.30	0.15	1.7%
Western Bucca Valley/Option A	\$1,159	\$571	-\$594.38	0.49	\$449	-\$715.29	0.39	\$263	-\$900.22	0.23	2.5%
Western Bucca Valley/Sherwood Ck	\$1,715	\$595	-\$1,125.99	0.35	\$469	-\$1,251.49	0.27	\$275	-\$1,444.03	0.16	1.8%
Western Bucca Valley/Corindi River	\$1,130	\$763	-\$371.89	0.67	\$601	-\$533.08	0.53	\$352	-\$780.49	0.31	3.5%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
	2006	2021	2006	2021	2006	2021	2006	2021	2006	2021
Vehicle Operating Costs	\$0.806	\$1.150	\$0.814	\$1.156	\$0.808	\$1.147	\$0.807	\$1.145	\$0.799	\$1.130
Travel Time Costs	\$1.433	\$2.095	\$1.418	\$2.003	\$1.413	\$1.995	\$1.412	\$1.992	\$1.417	\$1.980
Accident Costs	\$0.124	\$0.177	\$0.125	\$0.178	\$0.124	\$0.176	\$0.124	\$0.176	\$0.123	\$0.174
Daily Travel Costs	\$2.362	\$3.421	\$2.357	\$3.337	\$2.346	\$3.318	\$2.343	\$3.313	\$2.338	\$3.284
Annual Travel Costs	\$835	\$1,212	\$832	\$1,181	\$828	\$1,174	\$827	\$1,172	\$825	\$1,161

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base Discounted	CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
			Discounted	Discounted	Discounted	Discounted	Discounted	Discounted		
2006	\$835		\$832		\$828		\$827		\$825	
2007	\$860		\$856		\$851		\$850		\$847	
2008	\$885		\$879		\$874		\$873		\$869	
2009	\$910		\$902		\$897		\$896		\$892	
2010	\$935		\$925		\$920		\$919		\$914	
2011	\$961		\$949		\$943		\$942		\$937	
2012	\$986		\$972		\$966		\$965		\$959	
2013	\$1,011		\$995		\$989		\$988		\$981	
2014	\$1,036		\$1,018		\$1,013		\$1,011		\$1,004	
2015	\$1,061		\$1,042		\$1,036		\$1,034		\$1,026	
2016	\$1,086		\$1,065		\$1,059		\$1,057		\$1,049	
2017	\$1,111		\$1,088		\$1,082		\$1,080		\$1,071	
2018	\$1,137		\$1,111		\$1,105		\$1,103		\$1,093	
2019	\$1,162		\$1,135		\$1,128		\$1,126		\$1,116	
2020	\$1,187		\$1,158		\$1,151		\$1,149		\$1,138	
2021	\$1,212		\$1,181		\$1,174		\$1,172		\$1,161	
2022	\$1,237		\$1,205		\$1,197		\$1,195		\$1,183	
2023	\$1,262		\$1,228		\$1,220		\$1,218		\$1,205	
2024	\$1,287	\$858	\$1,251	\$834	\$1,243	\$828	\$1,241	\$827	\$1,228	\$818
2025	\$1,313	\$817	\$1,274	\$794	\$1,266	\$789	\$1,264	\$787	\$1,250	\$779
2026	\$1,338	\$779	\$1,298	\$755	\$1,289	\$750	\$1,287	\$749	\$1,273	\$741
2027	\$1,363	\$741	\$1,321	\$718	\$1,312	\$714	\$1,310	\$713	\$1,295	\$704
2028	\$1,388	\$706	\$1,344	\$683	\$1,335	\$679	\$1,333	\$678	\$1,317	\$670
2029	\$1,413	\$671	\$1,367	\$650	\$1,358	\$645	\$1,356	\$644	\$1,340	\$637
2030	\$1,438	\$639	\$1,391	\$617	\$1,382	\$613	\$1,379	\$612	\$1,362	\$605
2031	\$1,463	\$607	\$1,414	\$587	\$1,405	\$583	\$1,402	\$582	\$1,385	\$575
2032	\$1,489	\$577	\$1,437	\$557	\$1,428	\$554	\$1,425	\$553	\$1,407	\$546
2033	\$1,514	\$549	\$1,461	\$529	\$1,451	\$526	\$1,448	\$525	\$1,430	\$518
2034	\$1,539	\$521	\$1,484	\$503	\$1,474	\$499	\$1,471	\$498	\$1,452	\$492
2035	\$1,564	\$495	\$1,507	\$477	\$1,497	\$474	\$1,494	\$473	\$1,474	\$467
2036	\$1,589	\$470	\$1,530	\$453	\$1,520	\$450	\$1,517	\$449	\$1,497	\$443
2037	\$1,614	\$446	\$1,554	\$430	\$1,543	\$427	\$1,540	\$426	\$1,519	\$420
2038	\$1,639	\$424	\$1,577	\$407	\$1,566	\$405	\$1,563	\$404	\$1,542	\$398
2039	\$1,665	\$402	\$1,600	\$386	\$1,589	\$384	\$1,586	\$383	\$1,564	\$378
2040	\$1,690	\$381	\$1,623	\$366	\$1,612	\$364	\$1,609	\$363	\$1,586	\$358
2041	\$1,715	\$362	\$1,647	\$347	\$1,635	\$345	\$1,632	\$344	\$1,609	\$339
2042	\$1,740	\$343	\$1,670	\$329	\$1,658	\$327	\$1,655	\$326	\$1,631	\$322
2043	\$1,765	\$325	\$1,693	\$312	\$1,681	\$310	\$1,678	\$309	\$1,654	\$305
2044	\$1,790	\$308	\$1,716	\$296	\$1,704	\$293	\$1,701	\$293	\$1,676	\$289
2045	\$1,815	\$292	\$1,740	\$280	\$1,728	\$278	\$1,724	\$277	\$1,698	\$273
2046	\$1,841	\$277	\$1,763	\$265	\$1,751	\$263	\$1,747	\$263	\$1,721	\$259
2047	\$1,866	\$262	\$1,786	\$251	\$1,774	\$249	\$1,770	\$249	\$1,743	\$245
2048	\$1,891	\$248	\$1,810	\$238	\$1,797	\$236	\$1,793	\$236	\$1,766	\$232
2049	\$1,916	\$235	\$1,833	\$225	\$1,820	\$223	\$1,816	\$223	\$1,788	\$220
2050	\$1,941	\$223	\$1,856	\$213	\$1,843	\$211	\$1,839	\$211	\$1,810	\$208
2051	\$1,966	\$211	\$1,879	\$202	\$1,866	\$200	\$1,862	\$200	\$1,833	\$197
2052	\$1,991	\$200	\$1,903	\$191	\$1,889	\$189	\$1,885	\$189	\$1,855	\$186
2053	\$2,017	\$189	\$1,926	\$180	\$1,912	\$179	\$1,908	\$179	\$1,878	\$176
Discounted Costs										
10 Year Period		\$6,944		\$6,725		\$6,681		\$6,669		\$6,591
20 Year Period		\$11,114		\$10,736		\$10,665		\$10,645		\$10,513
30 Year Period		\$13,559		\$13,076		\$12,988		\$12,964		\$12,796
Present Value of Benefits										
10 Year Period				\$219		\$263		\$275		\$352
20 Year Period				\$378		\$449		\$469		\$601
30 Year Period				\$483		\$571		\$595		\$763

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	CRW/Option A		Western Bucca Valley/ Option A		Western Bucca Valley/ Sherwood Creek		Western Bucca Valley/ Corindi River	
	Discounted	Discounted	Discounted	Discounted	Discounted	Discounted	Discounted	
2018	\$277.2	\$277.2	\$227.3	\$227.3	\$336.3	\$336.3	\$221.5	\$221.5
2019	\$277.2	\$259.0	\$227.3	\$212.5	\$336.3	\$314.3	\$221.5	\$207.0
2020	\$277.2	\$242.1	\$227.3	\$198.6	\$336.3	\$293.8	\$221.5	\$193.5
2021	\$277.2	\$226.3	\$227.3	\$185.6	\$336.3	\$274.5	\$221.5	\$180.8
2022	\$277.2	\$211.4	\$227.3	\$173.4	\$336.3	\$256.6	\$221.5	\$169.0
2023	\$277.2	\$197.6	\$227.3	\$162.1	\$336.3	\$239.8	\$221.5	\$157.9
Total	\$1,663	\$1,414	\$1,364	\$1,159	\$2,018	\$1,715	\$1,329	\$1,130

Notes:

- This benefit cost analysis has been carried out for strategic purposes only
- The analysis of CRW/Option A has been calculated by combining the travel statistics from the independent assessments for each option, with additional allowance for the section from Arrawarra Creek to Halfway Creek
- The analysis of Western Extension/Option A has been calculated from the results for the CRW/Option A by reducing the VHT and VKT travel statistics by 2.9km.
- The analysis of Western Extension/Sherwood Creek has been calculated from the results for the CRW/Option A by reducing the VHT and VKT travel statistics by 3.7km.
- The analysis of Western Extension/Corindi River has been calculated from the results for the CRW/Option A by reducing the VHT and VKT travel statistics by 8.2km.

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: COMBINED COASTAL ROUTE

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2010
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

Inner (A-0T)/ Option E	Inner (A-2T)/ Option E
\$1,169	\$1,274

NETWORK MODEL DATA (Average Weekday)

	Base		Inner (A-0T)/Option E		Inner (A-2T)/Option E	
	2006	2021	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)						
Vehicle Travel	2,386,301	3,306,546	2,401,324	3,328,588	2,401,324	3,328,588
Vehicle Hours of Travel (VHT)						
Vehicle Hours	45,863	69,566	43,917	59,601	43,917	59,601
Average Speed (km/hr)	52.0	47.5	54.7	55.8	54.7	55.8

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
Inner (A-0T)/Option E	6.16	5.29	3.64
Inner (A-2T)/Option E	6.16	5.29	3.64

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
Inner (A-0T)/Option E	\$994	\$1,186	\$186.06	1.2	\$906	-\$92.67	0.9	\$503	-\$493.98	0.5	4.8%
Inner (A-2T)/Option E	\$1,083	\$1,186	\$96.81	1.1	\$906	-\$181.93	0.8	\$503	-\$583.23	0.5	4.4%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		Inner (A-0T)/Option E		Inner (A-2T)/Option E	
	2006	2021	2006	2021	2006	2021
Vehicle Operating Costs	\$0.787	\$1.091	\$0.792	\$1.098	\$0.792	\$1.098
Travel Time Costs	\$1.420	\$2.154	\$1.360	\$1.846	\$1.360	\$1.846
Accident Costs	\$0.121	\$0.168	\$0.122	\$0.169	\$0.122	\$0.169
Daily Travel Costs	\$2.329	\$3.413	\$2.274	\$3.113	\$2.274	\$3.113
Annual Travel Costs	\$823	\$1,209	\$803	\$1,103	\$803	\$1,103

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base	Inner (A-0T)/Option E		Inner (A-2T)/Option E	
		Discounted		Discounted		Discounted
2006	\$823		\$803		\$803	
2007	\$849		\$823		\$823	
2008	\$875		\$843		\$843	
2009	\$900		\$863		\$863	
2010	\$926		\$883		\$883	
2011	\$952		\$903		\$903	
2012	\$978		\$923		\$923	
2013	\$1,003		\$943		\$943	
2014	\$1,029		\$963		\$963	
2015	\$1,055		\$983		\$983	
2016	\$1,081	\$720	\$1,003	\$668	\$1,003	\$668
2017	\$1,106	\$689	\$1,023	\$637	\$1,023	\$637
2018	\$1,132	\$659	\$1,043	\$607	\$1,043	\$607
2019	\$1,158	\$630	\$1,063	\$578	\$1,063	\$578
2020	\$1,183	\$602	\$1,083	\$550	\$1,083	\$550
2021	\$1,209	\$574	\$1,103	\$524	\$1,103	\$524
2022	\$1,235	\$548	\$1,123	\$498	\$1,123	\$498
2023	\$1,261	\$523	\$1,143	\$474	\$1,143	\$474
2024	\$1,286	\$499	\$1,163	\$451	\$1,163	\$451
2025	\$1,312	\$476	\$1,182	\$429	\$1,182	\$429
2026	\$1,338	\$453	\$1,202	\$407	\$1,202	\$407
2027	\$1,364	\$432	\$1,222	\$387	\$1,222	\$387
2028	\$1,389	\$411	\$1,242	\$368	\$1,242	\$368
2029	\$1,415	\$391	\$1,262	\$349	\$1,262	\$349
2030	\$1,441	\$372	\$1,282	\$331	\$1,282	\$331
2031	\$1,467	\$354	\$1,302	\$315	\$1,302	\$315
2032	\$1,492	\$337	\$1,322	\$298	\$1,322	\$298
2033	\$1,518	\$320	\$1,342	\$283	\$1,342	\$283
2034	\$1,544	\$304	\$1,362	\$269	\$1,362	\$269
2035	\$1,570	\$289	\$1,382	\$255	\$1,382	\$255
2036	\$1,595	\$275	\$1,402	\$241	\$1,402	\$241
2037	\$1,621	\$261	\$1,422	\$229	\$1,422	\$229
2038	\$1,647	\$248	\$1,442	\$217	\$1,442	\$217
2039	\$1,672	\$235	\$1,462	\$205	\$1,462	\$205
2040	\$1,698	\$223	\$1,482	\$195	\$1,482	\$195
2041	\$1,724	\$212	\$1,502	\$184	\$1,502	\$184
2042	\$1,750	\$201	\$1,522	\$175	\$1,522	\$175
2043	\$1,775	\$190	\$1,542	\$165	\$1,542	\$165
2044	\$1,801	\$181	\$1,562	\$157	\$1,562	\$157
2045	\$1,827	\$171	\$1,582	\$148	\$1,582	\$148
Discounted Costs						
10 Year Period		\$5,920		\$5,416		\$5,416
20 Year Period		\$9,584		\$8,678		\$8,678
30 Year Period		\$11,780		\$10,594		\$10,594
Present Value of Benefits						
10 Year Period				\$503		\$503
20 Year Period				\$906		\$906
30 Year Period				\$1,186		\$1,186

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	Inner (A-0T)/Option E		Inner (A-2T)/Option E	
	Discounted	Discounted	Discounted	Discounted
2010	\$194.8	\$194.8	\$212.3	\$212.3
2011	\$194.8	\$182.1	\$212.3	\$198.4
2012	\$194.8	\$170.2	\$212.3	\$185.5
2013	\$194.8	\$159.0	\$212.3	\$173.3
2014	\$194.8	\$148.6	\$212.3	\$162.0
2015	\$194.8	\$138.9	\$212.3	\$151.4
Total	\$1,169	\$994	\$1,274	\$1,083

Notes:

- 1 This benefit cost analysis has been carried out for strategic purposes only
- 2 The analysis of options has been calculated by combining the travel statistics from the independent assessments for each option, with additional allowance for the section from Arrawarra Creek to Halfway Creek

DETAILED ECONOMIC ANALYSIS

PROJECT NAME: COMBINED COASTAL ROUTE

PARAMETER VALUES

General	
Base Year (for Discounting Purposes)	2018
Modelling Period (years)	20
Annual Expansion Factor	350
Discount Rate	7%
Evaluation Period (years from opening)	30
Travel Cost Parameters	
VOC per Vehicle Km	\$0.33
Value of Time per hour	\$30.97
Accident Costs per MVKT	
Weighted Average Cost for a road network	\$50,700

CAPITAL COST (\$M)

Inner (A-0T)/ Option E	Inner (A-2T)/ Option E
\$1,169	\$1,274

NETWORK MODEL DATA (Average Weekday)

	Base		Inner (A-0T)/Option E		Inner (A-2T)/Option E	
	2006	2021	2006	2021	2006	2021
Vehicle Kilometres of Travel (VKT)						
Vehicle Travel	2,386,301	3,306,546	2,401,324	3,328,588	2,401,324	3,328,588
Vehicle Hours of Travel (VHT)						
Vehicle Hours	45,863	69,566	43,873	59,526	43,873	59,526
Average Speed (km/hr)	52.0	47.5	54.7	55.9	54.7	55.9

PRESENT VALUE OF CHANGE IN MAINTENANCE COSTS (\$M)

Scenario	30 Year Period	20 Year Period	10 Year Period
Inner (A-0T)/Option E	6.16	5.29	3.64
Inner (A-2T)/Option E	6.16	5.29	3.64

RESULTS OF ECONOMIC ANALYSIS

Scenario	PVC (\$M)	30 Year Period			20 Year Period			10 Year Period			FYRR
		PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	PVB (\$M)	NPV (\$M)	BCR	
Inner (A-0T)/Option E	\$994	\$1,604	\$604.62	1.6	\$1,263	\$264.26	1.3	\$740	-\$257.71	0.7	8.4%
Inner (A-2T)/Option E	\$1,083	\$1,604	\$515.37	1.5	\$1,263	\$175.01	1.2	\$740	-\$346.96	0.7	7.7%

TRAVEL AND ACCIDENT COSTS (\$M)

	Base		Inner (A-0T)/Option E		Inner (A-2T)/Option E	
	2006	2021	2006	2021	2006	2021
Vehicle Operating Costs	\$0.787	\$1.091	\$0.792	\$1.098	\$0.792	\$1.098
Travel Time Costs	\$1.420	\$2.154	\$1.359	\$1.844	\$1.359	\$1.844
Accident Costs	\$0.121	\$0.168	\$0.122	\$0.169	\$0.122	\$0.169
Daily Travel Costs	\$2.329	\$3.413	\$2.273	\$3.111	\$2.273	\$3.111
Annual Travel Costs	\$823	\$1,209	\$803	\$1,102	\$803	\$1,102

YEARLY CASH FLOWS (\$M) - BENEFITS

Year	Base	Base	Inner (A-0T)/Option E		Inner (A-2T)/Option E	
		Discounted		Discounted		Discounted
2006	\$823		\$803		\$803	
2007	\$849		\$823		\$823	
2008	\$875		\$843		\$843	
2009	\$900		\$863		\$863	
2010	\$926		\$883		\$883	
2011	\$952		\$902		\$902	
2012	\$978		\$922		\$922	
2013	\$1,003		\$942		\$942	
2014	\$1,029		\$962		\$962	
2015	\$1,055		\$982		\$982	
2016	\$1,081		\$1,002		\$1,002	
2017	\$1,106		\$1,022		\$1,022	
2018	\$1,132		\$1,042		\$1,042	
2019	\$1,158		\$1,062		\$1,062	
2020	\$1,183		\$1,082		\$1,082	
2021	\$1,209		\$1,102		\$1,102	
2022	\$1,235		\$1,122		\$1,122	
2023	\$1,261		\$1,142		\$1,142	
2024	\$1,286	\$857	\$1,162	\$774	\$1,162	\$774
2025	\$1,312	\$817	\$1,182	\$736	\$1,182	\$736
2026	\$1,338	\$779	\$1,202	\$699	\$1,202	\$699
2027	\$1,364	\$742	\$1,221	\$664	\$1,221	\$664
2028	\$1,389	\$706	\$1,241	\$631	\$1,241	\$631
2029	\$1,415	\$672	\$1,261	\$599	\$1,261	\$599
2030	\$1,441	\$640	\$1,281	\$569	\$1,281	\$569
2031	\$1,467	\$609	\$1,301	\$540	\$1,301	\$540
2032	\$1,492	\$579	\$1,321	\$512	\$1,321	\$512
2033	\$1,518	\$550	\$1,341	\$486	\$1,341	\$486
2034	\$1,544	\$523	\$1,361	\$461	\$1,361	\$461
2035	\$1,570	\$497	\$1,381	\$437	\$1,381	\$437
2036	\$1,595	\$472	\$1,401	\$414	\$1,401	\$414
2037	\$1,621	\$448	\$1,421	\$393	\$1,421	\$393
2038	\$1,647	\$426	\$1,441	\$372	\$1,441	\$372
2039	\$1,672	\$404	\$1,461	\$353	\$1,461	\$353
2040	\$1,698	\$383	\$1,481	\$334	\$1,481	\$334
2041	\$1,724	\$364	\$1,501	\$317	\$1,501	\$317
2042	\$1,750	\$345	\$1,521	\$300	\$1,521	\$300
2043	\$1,775	\$327	\$1,540	\$284	\$1,540	\$284
2044	\$1,801	\$310	\$1,560	\$269	\$1,560	\$269
2045	\$1,827	\$294	\$1,580	\$254	\$1,580	\$254
2046	\$1,853	\$279	\$1,600	\$241	\$1,600	\$241
2047	\$1,878	\$264	\$1,620	\$228	\$1,620	\$228
2048	\$1,904	\$250	\$1,640	\$215	\$1,640	\$215
2049	\$1,930	\$237	\$1,660	\$204	\$1,660	\$204
2050	\$1,956	\$224	\$1,680	\$193	\$1,680	\$193
2051	\$1,981	\$212	\$1,700	\$182	\$1,700	\$182
2052	\$2,007	\$201	\$1,720	\$172	\$1,720	\$172
2053	\$2,033	\$190	\$1,740	\$163	\$1,740	\$163
Discounted Costs						
10 Year Period		\$6,951		\$6,211		\$6,211
20 Year Period		\$11,139		\$9,876		\$9,876
30 Year Period		\$13,602		\$11,997		\$11,997
Present Value of Benefits						
10 Year Period				\$740		\$740
20 Year Period				\$1,263		\$1,263
30 Year Period				\$1,604		\$1,604

YEARLY CASH FLOWS (\$M) - CAPITAL COSTS

Year	Inner (A-0T)/Option E		Inner (A-2T)/Option E	
		Discounted		Discounted
2018	\$194.8	\$194.8	\$212.3	\$212.3
2019	\$194.8	\$182.1	\$212.3	\$198.4
2020	\$194.8	\$170.2	\$212.3	\$185.5
2021	\$194.8	\$159.0	\$212.3	\$173.3
2022	\$194.8	\$148.6	\$212.3	\$162.0
2023	\$194.8	\$138.9	\$212.3	\$151.4
Total	\$1,169	\$994	\$1,274	\$1,083

Notes:

- 1 This benefit cost analysis has been carried out for strategic purposes only
- 2 The analysis of options has been calculated by combining the travel statistics from the independent assessments for each option, with additional allowance for the section from Arrawarra Creek to Halfway Creek