A ‘back of the envelope’ Cost Benefit Analysis of the *Daintree River Crossing Options Assessment Report*

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1. Introduction and proposal overview

Douglas Shire Council has released a high-level *Daintree River Crossing - Options Assessment* report (the Options report) which assesses benefits and challenges associated with a two-ferry service or a bridge, against the existing single-ferry service across the Daintree river.

As the Options report is very light on information or data that can be used to undertake a full cost benefit analysis (CBA) of the three river crossing options, this imposes a limit on how detailed a CBA can be undertaken.

For instance, the Options report:

- does not provide sufficient information to adequately quantify the benefits of a bridge or two-ferry options compared to the single-ferry option
    - a major benefit is the use of the bridge when river levels prevent ferry operation
- excludes major costs associated with the bridge option – for example, it:
    - does not include costs of raising approach roads to match the height of the bridge
        - without raising approach roads, the potential benefit of bridge use when river levels are high is reduced or lost entirely
    - assumes there are no environmental impact or hydrological issues – any of which will increase the cost of the bridge option
    - does not include any land-based infrastructure costs associated with electronic tolls – as a result the Options report assumes that toll revenue of $1.15 million will be lost (this is the amount of Council revenue captured under the current 1 ferry situation)
- does not consider the impact of the bridge option on river use by local community members or businesses – alternative bridge designs that would avoid this issue are not considered
- does not consider cumulative impacts and costs arising from environmental impacts arising from the bridge or two-ferry options. Alternative bridge designs that reduce the environmental impact are not considered.
- implicitly assumes that the bridge and two-ferry options will not increase traffic volumes, which means the potential for increased tourist flows are ignored
    - increased tourist flows potentially provide benefits of increased tourist spend in the Shire but also impose additional costs associated with increased costs of road maintenance and repair, and an increase in accidents leading to higher vehicle costs and an increase in disability and loss of lives
- provides no information on how much time will be saved in crossing the river, for what number of people, and at what times of the year or day
    - the associated Daintree River Ferry Traffic Assessment Traffic Modelling Report (prepared by GHD in June 2019) similarly does not provide enough information to calculate travel time savings of the bridge or two-ferry options

By contrast, the two-ferry option is based on the preferred tender previously submitted, and accepted, by the Council. Therefore, it is assumed that capital and operating costs associated with a two-ferry option have been fully specified and include costs of land-based infrastructure required to support ferry services.

The 'back of the envelope' nature of the Options report necessarily means only a 'back of the envelope' CBA is feasible. Nevertheless, a 'back of the envelope' CBA should still provide enough insight into the

broad costs and benefits of the various options – enough to determine whether it is worth exploring a bridge option in more detail.

The above critique of the Options report is not a reflection on the capabilities of the Council staff involved in its preparation. Rather it reflects the complexity of the issues to be considered and is a strong argument to support Council staff be provided with resources needed to undertake a full CBA, supported by necessary data and information. This is especially the case given one of the options (and potentially the more contentious option) costs significantly more than $53 - $75 million.

2. Approach to cost benefit analysis (CBA)

The approach undertaken in this CBA conforms with Federal and State CBA guidelines (including NSW and Queensland jurisdictions). The lack of information in the Options report necessarily requires an assumptions-based approach to the analysis.

Wherever possible, assumptions will be based off available official documents and reports. Where this is not possible, any bias introduced through use of assumptions will be highlighted. For example, if travel time estimates favour either the bridge or the two-ferry option, this will be stated explicitly.

3. Methodology

In conducting this CBA, the following steps were included:

- Comparison between the two-ferry service and bridge options.
- Estimation of likely key option impacts such as:
    - travel time savings
- Comparison of option benefits with cost estimates
- Assessment of potential economic indicators (jobs, tourism numbers)
- Sensitivity testing of results

Analytical Parameters

Key analytical parameters underpinning the CBA are outlined in Table 1.

Table 1: Key analytical parameters

PARAMETER	VALUE	SOURCE
Discount rate	7%, with sensitivities for 4% and 10%	Building Queensland, Infrastructure Australia, Department of Transport and Main Roads
Price year	2020	Daintree River Crossing - Options Assessment Report
Capital investment period	100 years (2020 – 2120)	Daintree River Crossing - - Options Assessment Report
Indexation	Consumer Price Index (CPI) and Producer Price Index (PPI)	Australian Transport Assessment and Planning (ATAP)
Travel time	Value of vehicle occupant time	Department of Transport and Main Roads Cost Benefit Analysis Guidelines

Notes on key parameters

Critical data is not available to allow the application of travel-time equations to estimate travel time savings and associated vehicle operating cost savings (as per guidelines from the Queensland Department of Transport and Main Roads).

For example, the *Daintree River Ferry Traffic Assessment - Traffic Modelling Report June 2019* (the Ferry Traffic report) estimates congestion on the basis of queue length and does not provide an estimate of how much time is spent in the queue. While it has vehicle numbers using the current one-ferry service, it is not clear from available data in the report what the queueing time is over the course of the year.

It may be that a more extensive search for relevant documentation will provide the necessary information and data. Anecdotally, significant queueing (of up to 2 hours) during the peak morning and afternoon periods during the winter months of June, July and August is common.

4. Benefits and costs

The costs and benefits considered in this analysis are outlined in Table 2. These are drawn (predominantly but not only) from the Council's Options report.

Table 2: Costs and benefits of the various options

COSTS	BENEFITS

• Whole-of-life asset costs
  ○ Capital costs
  ○ Operating costs
  ○ Financing costs
 	
• Externalities
  ○ Increased environmental damage
  ○ Increased motor vehicle accidents
 	
• Economic costs
  ○ Loss of jobs
  ○ Loss of business income
  ○ Reduced tourism
	• Travel time savings
	  ○ Time saving for private users
	  ○ Time savings for commercial users
	  ○ Improved river crossing across whole-of-year
	
	• Externalities
	  ○ Improved access to emergency services (for north-of-Daintree residents/businesses)
	
	• Economic benefits
	  ○ Increased jobs
	  ○ Increased business income
	  ○ Increased tourism

Notes on key costs and benefits

Asset Costs

The complete asset lifecycle costs should be incorporated in a CBA. These include the costs of building an asset, maintaining and repairing an asset, and the demolition and (where appropriate) replacement of an asset at the end of its useful life.

It is not clear from the Options report whether the two-ferry option has incorporated asset replacement costs at the end of its useful life. For the purpose of the CBA, ferry replacement costs have been included.

With respect to the bridge option, while it is assumed to have a 100-year lifespan, the methodology used in the Options report to estimate its lifecycle costs appears not to include end-of-life demolition and replacement of the bridge. For the purposes of this CBA, these costs have not been included. It is recommended they be included in a full CBA.

Accident Costs

A bridge across the Daintree will increase the likelihood of vehicle accidents occurring due to weather, conditions, unexpected damage to the bridge surface or human error (notwithstanding speed limits that may apply). Without a strong evidence base to estimate the increased probability of accidents and deaths, for the purposes of this analysis, no estimates of accident costs have been included.

Environmental Costs

The current and proposed ferry options utilize diesel motors which release carbon dioxide and other chemicals into the environment.

The bridge option increases emissions arising from the concrete production process. Further emissions increases are expected to arise from ongoing maintenance and repair work. And, to the extent that there is increased vehicle traffic due to the bridge, increased emissions from use of the bridge.

It is beyond the scope of this analysis to determine whether the one-off construction, ongoing maintenance and repair emissions, and higher emissions from increased vehicle traffic outweigh the diesel engine-related emissions. Suggestions of a solar-powered ferry, which avoid emissions, are not considered for the purpose of this analysis.

Therefore, emissions of the options are noted but not explicitly included in this CBA. It is recommended this issue be given more consideration when a full CBA is undertaken.

The two-ferry and bridge options will also involve destruction of vegetation associated with access road infrastructure. Again, a comparison of the extent of vegetation loss is beyond the scope of this analysis.

Finally, bridge and ferry options cause environmental damage to the river itself. The ferry requires regular dredging while the bridge will result in (currently unknown) siltage and scouring effects. Siltage and scouring effects (exacerbated by floods and heavy rains) are a potentially significant environmental impact and should be carefully examined, with these impacts reflected in a future full CBA. For the purposes of this analysis, these effects and costs are noted but not explicitly included.

Note on diesel use across the Daintree

Anecdotal reports (eg. social media sites) suggest that building a bridge will result in reduced diesel use north of the Daintree river because it is assumed a bridge will provide a path for electricity transmission. However, it is understood that power lines already cross the river at two points. Therefore, even if the bridge is used for purposes of power transmission, any reduction in diesel use will be incremental (ie. small).

For the purposes of this analysis, it is assumed that the current situation with respect to electricity transmission and diesel generator use is unchanged under any of the options. To this extent, no bias for or against any option is introduced.

Travel Time Savings

Current queueing times during peak periods of the year are the main reason for considering a bridge or two-ferry service. That is, the objective of considering options beyond the current single ferry service is to reduce the length of time taken to cross the river.

Savings in time spent crossing the river are the single largest benefit of both the bridge and two-ferry options. Unfortunately, neither the Options report nor the ferry traffic modelling report prepared for Council in 2019 provide enough data to calculate travel time savings without the need for significant assumptions. Simplifications associated with making assumptions may favour one or the other option and, where this occurs, it should be highlighted in the analysis.

The Council's Options report notes that four different bridge sites were considered and costed. The Options report acknowledges that the cost of bridge access roads is not included in the analysis, which biases this CBA in favour of the bridge option (by making it cheaper than in reality).

The Options report also excludes consideration of the travel time associated with different bridge options. Depending on the location of the bridge, drivers may be required to drive several additional minutes to reach the bridge, reducing the time savings associated with the bridge option.

It is beyond the scope of this analysis to estimate total travel times associated with the four different bridge options. However, it is recommended this is incorporated into a full CBA. Not including any additional travel times acts to bias the CBA analysis in favour of the bridge option.

Estimating travel time savings

Given the lack of necessary data, it is necessary to make certain assumptions to estimate travel time savings. Simplified modelling of the value of travel time savings for the bridge and two-ferry options finds:

- Savings of $1.7 million per year ongoing - for the bridge
- Savings of $1.7 million per year for 20 years (dropping to $0 after that) - for the two-ferry option (a straight-line decline is assumed)

Details on the calculation of these values is provided in Appendix A, Table A1. However, the results of the time savings analysis finds the bridge will result in zero queueing compared to the current single ferry situation. And the two-ferry option will result in zero queueing for approximately 20 years, after which queues will gradually form, eventually reaching levels similar to current levels some years after the 20-year break-even point.

Even under zero-queuing conditions, the bridge option is assumed to provide a timesaving of approximately 5 minutes per trip – the difference between driving across the river at the recommended 40km/hr speed limit versus taking the 7-minute ferry trip.

It is noted that the current bridge option does not include sufficiently elevated access roads to allow the bridge to be used during periods the river is in flood. A detailed analysis of flood levels and their impacts on ferry and bridge options is beyond the scope of this analysis. Therefore, to avoid introducing an unknown bias, it is assumed that the bridge does not offer additional river crossing advantages, compared to the ferry options, during periods the river level is elevated.

It is again highlighted that the information required to accurately estimate travel cost savings is not currently available and it is recommended appropriate dynamic traffic modelling (taking into account flood levels and the cost of raising bridge access roads) is undertaken to provide a more accurate estimate.

Improved Access to Emergency Services

Anecdotal reports (ie. social media reports) suggest that because the bridge is available 24 hours a day, while the ferry ceases regular services between midnight and 5AM, there is the possibility of improved health outcomes should visitors/residents north of the Daintree require emergency medical services or transport to a hospital.

However, it is noted that the ferry operator provides a 24 hour on-call service for emergency transport purposes, which reduces the relative benefit of a bridge as compared to the ferry.

A similar case can be made for both bridge and two-ferry options with respect to emergencies arising during periods of peak queuing.

It is beyond the scope of this analysis to review historical health data to determine numbers of medical emergencies and health outcomes that would have been improved if a bridge were in place. Therefore, these benefits are not included explicitly in this analysis.

By not explicitly including these benefits, and not explicitly including the costs of additional bridge-related motor vehicle accidents, this analysis is implicitly assuming that the human health benefits and costs balance each other out. That is, given the lack of evidence to support one or the other, bias is removed from the analysis.

It is recommended appropriate analysis of human health outcomes be undertaken and incorporated in a full CBA.

Economic Costs and Benefits (jobs, business income, tourism)

The inclusion of economic costs and benefits associated with increases/decreases in jobs, business income and tourism require complex analyses that are well beyond the scope of this analysis.

For example, with respect to jobs, only the incremental change in wages associated with a job can be included in a CBA. If a job is lost as a result of an option (eg. ferry jobs lost as a result of the bridge), then the loss of income to be included in the CBA is the difference between the ferry wage and the unemployment benefit. But, an assessment needs to be made as to whether the person losing their ferry job will be re-employed in another job, in which case what is included in the CBA is the difference between the ferry wage and the new job wage.

Similarly, the impact on business income is a complex web of assumptions around the extent to which a bridge will generate additional tourism and the additional tourist spend on goods and services within the Douglas Shire.

For the purposes of this analysis, job and business income effects are not explicitly included in this analysis. However, the issues are explored in more detail in Appendix B: *Other Considerations*, of this report.

5. Cost Benefit Analysis (CBA) Results

It is important to understand that the Options report is not a cost benefit analysis. That is, it is not an economic analysis that the government would use to determine if an option is worth funding (because it generates a net public benefit).

The Options report is a financial analysis onl, which looks at the options from the perspective of the Council. Therefore, it excludes economic benefits of jobs or the time saving associated with the bridge

or two-ferry options[1], which are of interest when looking at the options from the perspective of the community as a whole.

Because it is a financial analysis, the Options report does not provide a lot of the information needed to undertake a CBA. However, the financial analysis is useful in understanding the financial impact on Council's budget (and the impact on rates) of the different options.

As noted previously, a CBA will determine which of the bridge or two-ferry options provides the greatest net public benefit (ie. which one is the better option from a whole-of-community perspective). Even if the bridge and two-ferry options are not financially viable (from the perspective of the Council's budget), if they provide a net public benefit then that is a strong rationale for the Queensland Government to provide funding for them.

From a Queensland Government perspective, the most attractive option will be one that has a net public benefit and is financially viable at the local level (ie. does not require State government funding).

Table 3 shows relevant economic cost and benefit data (taken from the Options report and estimated in this analysis).

Table 3: Economic costs and benefits

PARAMETER	Two-Ferry	Bridge	Source
COSTS			
Net present value of Capital costs over 100 years	$3.775 million	$60 million	Daintree River Crossing - Options Assessment Report
Net present value of maintenance costs over 100 years	$186,685	$4.281 million	Calculated from Daintree River Crossing - Options Assessment Report (states 0.5% of capital costs)
Net present value of total cost over 100 years	$3.974 million	$64.281 million	Calculated
BENEFITS			
Net present value of travel time savings over 100 years	$10.791 million	$23.637 million	Calculated (also see Appendix A)
COST BENEFIT ANALYSIS (CBA) DECISION CRITERIA			
Net Present Value (NPV) (are benefits greater than costs?)	$6.817 million There is a net benefit	-$40.644 million There is a net cost	
Benefit Cost Ratio (BCR) (dollar return for every dollar spent)	2.72 ($2.72 return for every dollar spent)	0.37 ($0.37 return for every dollar spent)	

[1] A financial analysis also ignores that ferry and bridge tolls (ie. revenue) comes out of the pockets of local residents. A CBA takes into account that tolls are a transfer of money between different entities (eg. residents to Council).

Notes on key costs and benefits

Capital costs

To match the 100-year lifespan of the bridge option, it is assumed that the ferry is replaced every 20 years. That is, over a 100-year period, the ferry is replaced five times after its initial purchase in 2020. Future year costs are discounted back to the present day – see discounting note in Appendix A. This ensures no bias in favour of the two-ferry option.

Maintenance costs

- Maintenance costs (of 0.5% of capital cost as per the Options report) for the two-ferry option appear to be limited to land-based infrastructure. Maintenance costs for the ferry itself appear to be 'contained' within the contractor payments to operate and maintain the ferry. These maintenance costs should be explicitly included in a full CBA.
- Maintenance costs for the bridge are limited to the bridge itself and do not include land-based infrastructure costs (eg. access roads). Maintenance costs for the additional land-based infrastructure are larger than ferry maintenance costs and should be explicitly included in a full CBA.
- Excluding the above maintenance costs creates a bias in favour of the bridge option.

6. Interpreting the CBA Results

Summary

This 'back-of-the-envelop' CBA has found that implementing a two-ferry solution is a far better option than building a bridge. The two-ferry option ends up delivering $6.817 million worth of benefits to the broader community. On the other hand, the bridge option ends up costing the community $40.644 million more than it delivers.

Another way of looking at the results is that for each dollar spent on a two-ferry option, the community gets a return of $2.72. But only gets $0.37 for every dollar spent building the bridge.

The wider economic benefits of increased tourism (briefly explored in Appendix B) strongly suggest that a bridge will not entice tourists to spend an additional $475,000 per year in the Douglas Shire – enough to offset the net costs of the bridge option.

Possible misinterpretations

CBAs results can sometimes be misinterpreted. One of the most frequent misinterpretations arises when there is a possibility of an external group (eg. government or tourists or a private donor) paying for the capital costs of a project.

For example, the Options report has indicated that the bridge is beyond Council's budget and would require either a loan or a government grant. The argument goes that if the government pays for the bridge, then the CBA will show that the bridge is a better option.

This thinking assumes that 'money is free', whereas government grants are paid by Queensland and/or Australian taxpayers (depending on which level of government provides the grant). A grant does not change the net present value (NPV) or the benefit cost ratio (BCR), it only changes who bears the costs.

Similarly, arguments may be raised that it is possible to include a bridge toll, which will reduce the cost of the bridge option. Here also the toll does not change how much the bridge costs to build, it simply changes who pays for the bridge (ie. it shifts bridge costs onto bridge users and away from ratepayers).

However, a bridge toll can change the benefits provided by the bridge. For example, if a manual payment toll booth is installed the free flow of traffic is broken, queues develop and the benefits of free-flowing traffic (ie. time savings) is lost.

To maintain free-flowing traffic on the bridge it will be necessary to install electronic tolling. However, installing electronic toll infrastructure is costly, and it further requires extra administrative support within Council to chase toll payments from vehicles (often tourist vehicles) without an electronic tag, and generally manage the toll system. A separate CBA can be undertaken to work out if the revenue from tolls will be enough to justify the extra costs of installing electronic tolls.

7. Appendices

Appendix A: Estimating Travel Time Savings

Table A1: Key variables for calculating travel time savings

Note:
The estimation method used is crude and should be improved upon when undertaking a full CBA. Nevertheless, it still allows a valid comparison of the time savings differences between the two-ferry and bridge options.

DATA FOR INPUT TO CBA	SOURCE
Current single ferry has 27 car capacity Round trip takes 14 minutes	Daintree River Crossing Options Assessment Report Daintree River Ferry Traffic Assessment – Traffic Modelling Report
Maximum carrying capacity is 115 cars per hour (in one direction) or a total of 230 cars per hour (northbound and southbound) [According to Ferry Traffic report, this capacity was readily achieved in July 2015, indicating high operational efficiency]	Daintree River Crossing Options Assessment Report Daintree River Ferry Traffic Assessment – Traffic Modelling Report
GHD calculates[2]: • a 590 metre long queue of vehicles are waiting to cross between 11am and 1pm (northbound) • a 223 metre long queue waiting to cross between 4pm and 6pm (southbound) 590m is equivalent to 91 cars (assume cars are on average 4.5 metres long and there is an average 2-metre gap between cars). 223 metres is equivalent to 34 cars. Making a worst-case assumption, each of the 125 cars has to wait 60 min to get onto ferry [the ferry's maximum hourly capacity of 230 cars (both directions) means queue lengths less than 230 cars can only wait a maximum of 1 hour]. Assuming queueing of the above lengths occurs for 5 hours each day, there are 625 cars queueing for 60 minutes per day. Further assuming this queueing occurs every day for the months of June, July and August (92 days), the total number of cars queueing for 60 minutes per year is 57,500. The worst-case assumption of a 60-minute wait for every car in the queue overestimates how much time is spent waiting to cross the river. This means that both the bridge and two-ferry options appear better than they are in reality. The worst-case assumption does not favour either the bridge or the two-ferry options.	Daintree River Ferry Traffic Assessment – Traffic Modelling Report

[2] The Ferry Traffic report by GHD assumes growth in traffic of 1.027% per year. They calculate that queue lengths will increase to 938 metres (northbound) and 706 metres (southbound) by the year 2036.

The total value of time ($ per vehicle hour) is $28.81. This is a weighted average value based on the Ferry Traffic report which indicates 89% of vehicles using the ferry are light vehicles, 8% commercial vehicles and 3% buses. For a full CBA, ferry traffic should be disaggregated further to reflect the type of vehicle (eg. motorbike, car, bus, truck) and to account for whether the vehicles are being used for commercial or recreational purposes. This level of analysis is not possible given available data. A weighted average value of time of $28.81 is higher than if it is assumed that 100% of vehicles are private cars (in which case it would be $23.00). This does not bias the analysis in favour of either a bridge or a two-ferry option.	Department of Transport and Main Roads Cost Benefit Analysis Guidelines (indexed to 2020 dollars) Daintree River Ferry Traffic Assessment – Traffic Modelling Report
The total value of time spent queuing (for 57,500 cars) is $1,656,462 per year. **<u>Bridge Option Time Saving</u>** **The total value of time spent queuing is equivalent to the value of the time savings associated with the bridge option, which is assumed to have zero queueing. That is, an annual saving of $1.657 million.** **The net present value of annual time savings (discounted by 7% as per Dept of Transport and Main Roads CBA guidelines) is $16.845 million.**	
The second ferry has a 36-car capacity, which increases the hourly capacity by 154 cars. This capacity is greater than the number of cars queueing (91 cars) – and so queuing reduces to zero. Therefore, the value of time savings associated with the second ferry option is equivalent to the bridge. Over time, as traffic volumes increase, the second ferry will also develop queues, while the bridge will continue to have no queues. For purposes of this analysis, drawing on the GHD report, it is assumed that zero queuing will be experienced for 10 years (ie. to 2030), with subsequent gradual increases in queuing time until current queueing times are experienced again in 20 years' time (2040). **<u>Two-Ferry Option Time Saving</u>** **The total value of time spent queuing ($1.657 million) is equivalent to the value of the time savings associated with the two-ferry option in the first year and diminishes thereafter.** **The net present value of annual time savings (discounted by 7% as per Dept of Transport and Main Roads CBA guidelines) is $9.118 million.** The assumptions used are highly sensitive to GHD estimates of annual traffic growth rates. The GHD report uses two years of data from 2015 to	

2017 and extrapolates 20 years into the future. This assumption is considered highly dubious and it is recommended a more robust estimate is developed. Underlying the GHD traffic growth rate estimate is an assumption that tourism across the Daintree river will continue growing at 2015-2017 levels – which has not eventuated. It also implicitly assumes population growth north of the Daintree river will match that of the rest of the Douglas Shire. This assumption will be determined by Council zoning and development approval trends and should be assessed more rigorously and used in a full CBA. The current reduction in traffic arising from Covid-19 could act to extend the zero-queuing threshold by an additional 10 years (ie. queuing will not commence again until 2040). This assumes that pre-Covid international travel and domestic (Douglas Shire) population growth rates will be resumed within 5 years (by 2025).	

Further notes on time savings estimates

- The analysis assumes bridge construction is completed and commences use within 5 years (by 2025).
- A two-ferry option is assumed to be in operation within 2 years (2022).
- Queensland CBA guidelines state that future costs and benefits must be discounted at a 7% rate to bring them back to today's dollars. Discounting has the following effect:
    - $1 million in 2070 (50 years from today) is worth $33,947.76 today
    - $1 million in 2120 (100 years from today) is worth $1,152.45 today

Appendix B: Other Considerations

Wider economic impact assessment of tourism on business income and jobs

Anecdotal claims have been raised that a bridge will generate additional income to the Douglas Shire, especially to businesses across the Daintree river. This is an important point to consider given the findings of the analysis – that the bridge option results in over $40 million of costs to the community.

Simplistically, this implies that the bridge is costing the community in the vicinity of $406,000 per year (for 100 years). This cost may be overcome if there is enough additional tourist revenue generated due to the construction of the bridge.

It is beyond the scope of this analysis to undertake this assessment in detail. However, it is possible to use rules-of-thumb to make a rough estimate of how much additional tourist revenue would be required to generate sufficient producer surplus to offset the $400,00 annual cost of the bridge option.

Producer surplus

In a cost benefit analysis, producer surplus is used to measure business benefits. In very simplified form, producer surplus is the difference between how much it costs a producer to provide a good or service and the sales price of that good or service. For the purposes of simplification, this can be roughly translated as the 'profit margin' (though it is recognized this is not strictly correct).

Every good and service (and every business) will have different profit margins but for the purposes of this analysis, a rule-of-thumb of 30% can be applied to all goods and services sold to tourists.

How much tourist revenue is needed to offset the bridge cost?

To generate an annual $406,000 producer surplus (assuming a 30% margin), it will be necessary for tourists to spend an additional $1.355 million per year (every year for 100 years)[3] over and above how much they spend today.

It appears unlikely that, by itself, the bridge will generate nearly $1.4 million of additional tourist spend on an ongoing basis for 100 years. However, this issue is deserving of a separate, more in-depth analysis[4].

[3] It is likely that a bridge will generate additional tourist traffic. However, there is a difference between additional tourist traffic and additional tourist spend in the Douglas Shire. It is beyond the scope of this analysis to determine how much of the additional tourist traffic will result in additional tourist revenue (or spend) in the Douglas Shire, but such an analysis should be undertaken in a full CBA.

[4] Additional producer surplus can be used to generate additional employment. However, assessing employment effects is a complex task (as described in the body of this report) and should be undertaken by relevant experts and the collection of additional data necessary to undertake such an assessment.