Mathinna / Evercreech Bridge Replacements

Submission to the Parliamentary

Standing Committee on Public Works

February 2012

Department of Infrastructure, Energy and Resources

Tasmania
Explore the possibilities

Contents –

Abbreviations

AHT	Aboriginal Heritage Tasmania
AADT	Annual Average Daily Traffic
AS5100	Australian Standard Bridge Design
BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
DIER	Department of Infrastructure, Energy and Resources
DITRDLG	Department Infrastructure Transport Regional Development and Local Government
DIT	Department of Infrastructure and Transport
EPBCA	Environmental Protection and Biodiversity Conservation Act
FTC	Forest Transport Catchment (For plantation forest areas only)
FFM	Forestry Freight Model (For plantation forest areas only)
GML	General Mass Limit
HPV	High Productivity Vehicle
HML	Higher Mass Limits
LGA	Local Government Area
NPV	Net Present Value
MOU	Memorandum of Understanding
PPR	Project Proposal Report
RTA	Roads and Traffic Authority
VOT	Value Of Time
VOC	Vehicle Operating Cost

A. PROPONENT AND PROJECT DETAILS

Proponent Details

A 1. ABN / ACN and Registered Entity Name

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Project Details

A 3. Project ID

A130013.005

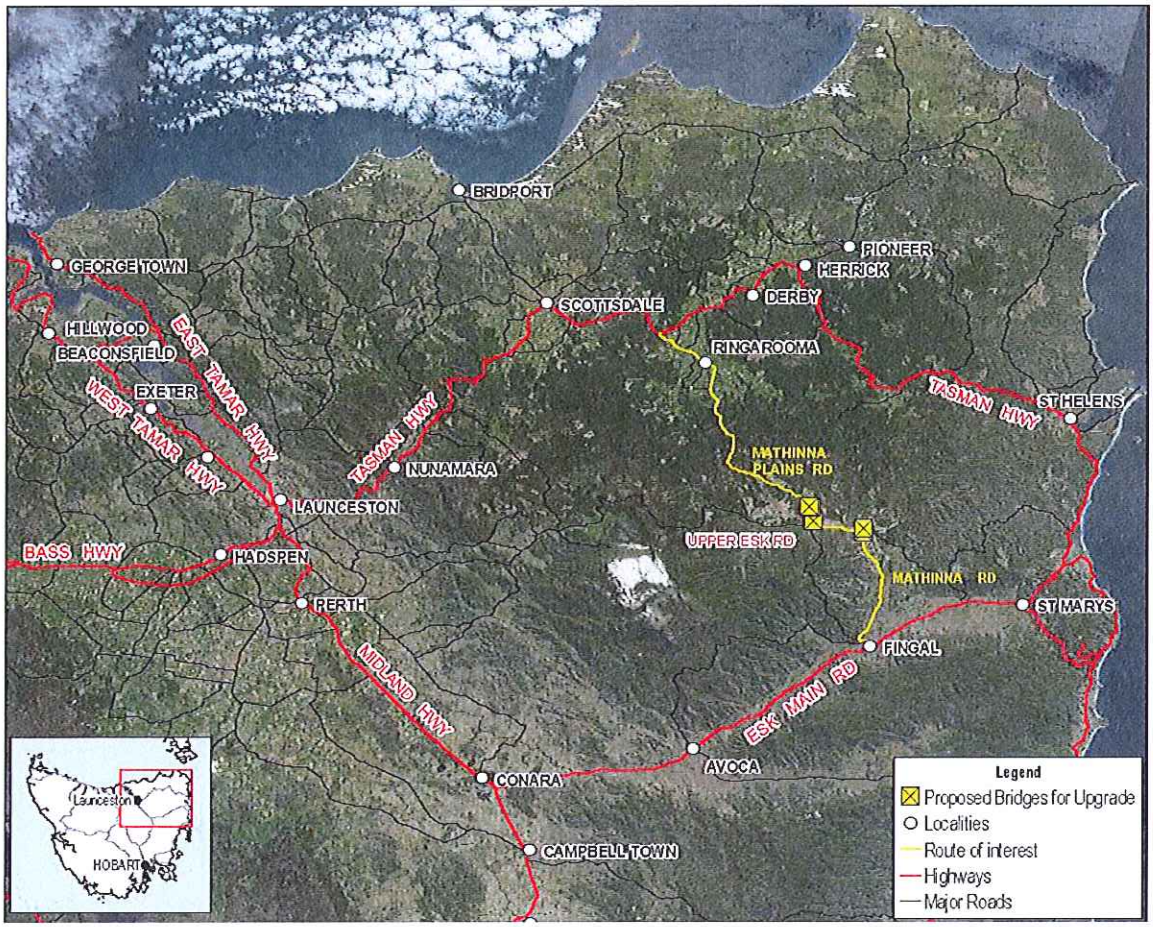
A 4. Project Name and Description

Mathinna / Evercreech Bridge Replacements

This proposal presents a case to replace five (5) wooden bridges on Mathinna Plains Road and Evercreech Road in the northeast of Tasmania to assist in freight efficiency from the Mathinna region to the port of Bell Bay located at George Town.

It is proposed the existing bridges are to be replaced with High Productivity Vehicle / Higher Mass Limit standard (herein referred to as HPV/HML - i.e. 68t, 26m vehicle capacity) compliant concrete structures (for future reference called bridges) to allow the capacity of Mathinna Plains and Evercreech Roads to be realised.

All bridges are within 6 km of each other in the South Esk River valley that runs through the area as shown in the general overview map A4.1.



Map A4.1 Bridge Location Overview

The specific locations and photos of the existing 5 bridges are shown on Map A4.2 and are also summarised below:

Three on Mathinna Plains Road:

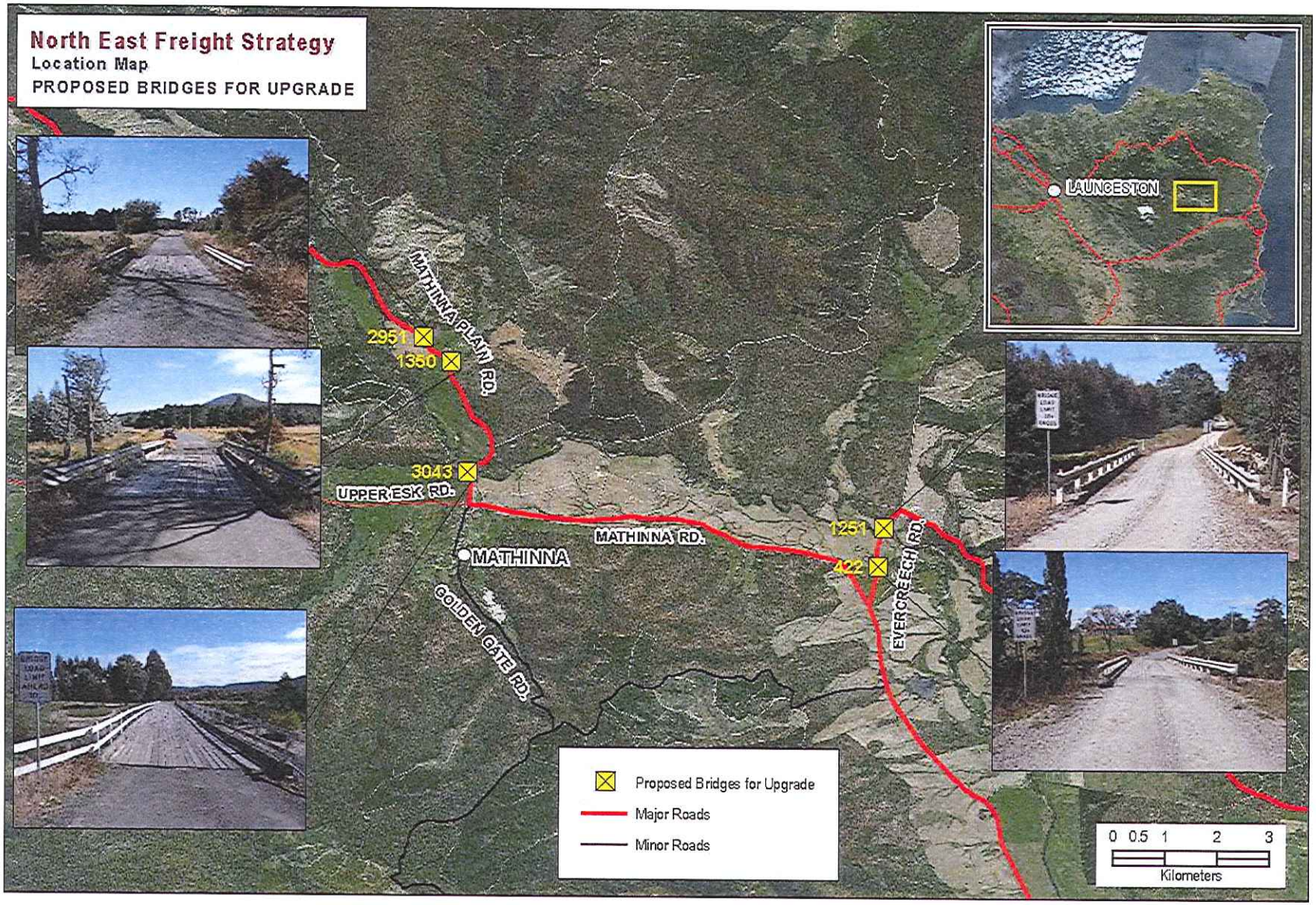
- Bridge No. 3043 over the Southern Esk River
- Bridge No. 1350 over Delvin Creek
- Bridge No. 2951 over Delvin Creek

Two on Evercreech Road:

- Bridge No. 1251 over the South Esk River
  Bridge No. 0422 over an unnamed creek

These 5 bridges are:

- In various states of disrepair, with some components being beyond their service life and are at risk of collapse;
- Load restricted to 10 tonnes; and
- Located on existing HPV/HML gazetted routes, restricting the operational capacity of roads in the area and complicating industry vehicle movements.



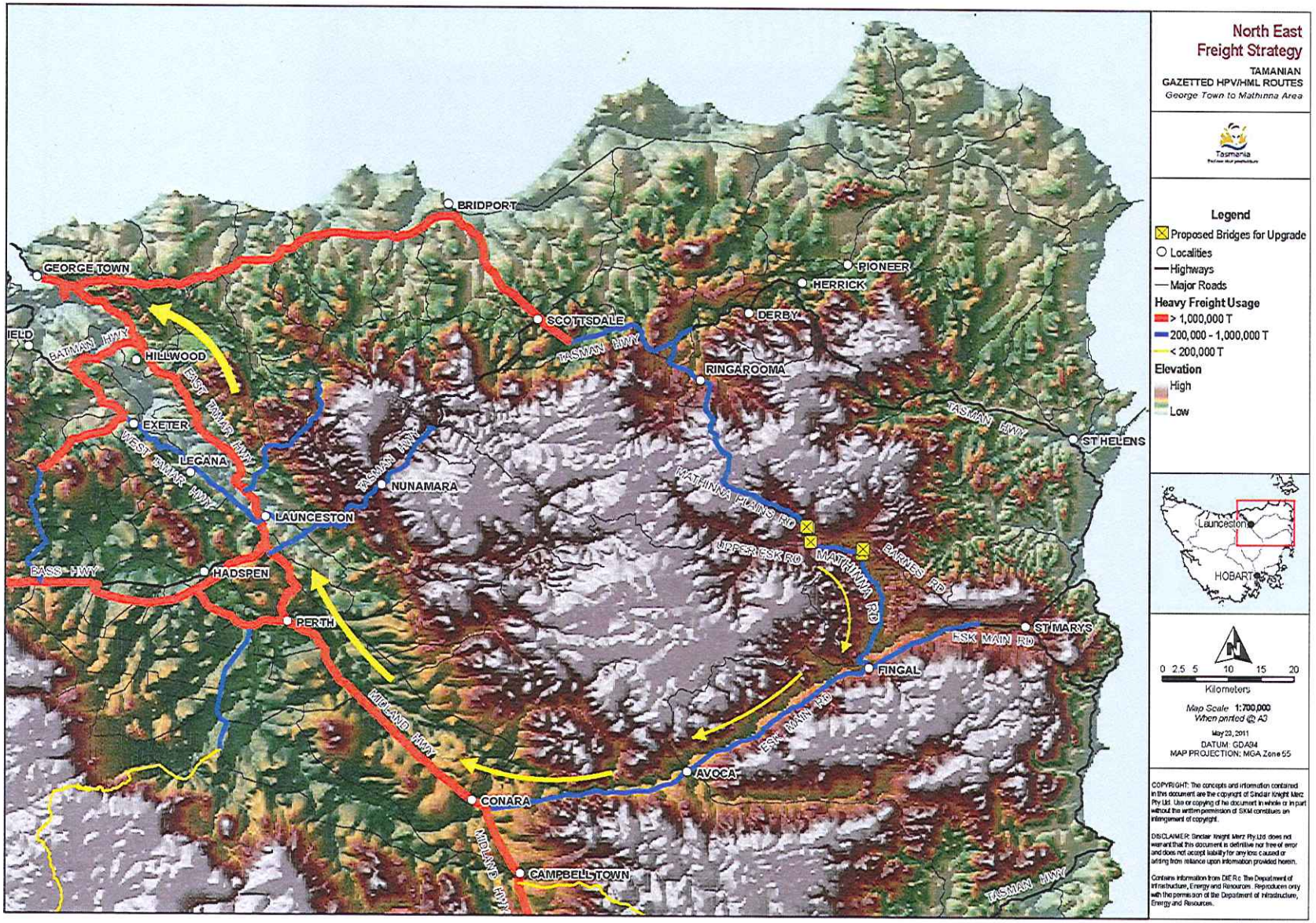
Map A4.2 Bridge Photos and locations

The Break O'Day Council owns all the bridges and the roads they are on. The bridge numbers quoted in this proposal refer to Break O'Day Council's bridge numbering system. The details of the current bridge structures (as noted in Break O'Day Council's asset database) is summarised in Table 1: Existing Bridge Asset Information below:

Table 1: Existing Bridge Asset Information

Bridge No.	Length (m)	Width (m)	Height (m)	No. Spans	Year Built	Construction Materials	Barriers
3043	73.2	5.0	4.0	8.0	1978	Timber	Timber
1350	14.8	4.9	4.5	2.0	1960 - substructure 1997 - new deck	Timber 1 abutment (concrete)	Armour rails on timber posts
2951	7.6	4.9	2.0	1.0	1997	Timber	Armour rails on timber posts
1251	16.7	4.7	6.2	1.0	1985	Timber	Armour rails on timber posts
0422	27.1	5.0	5.5	4.0	1985	timber	Armour rails on timber posts

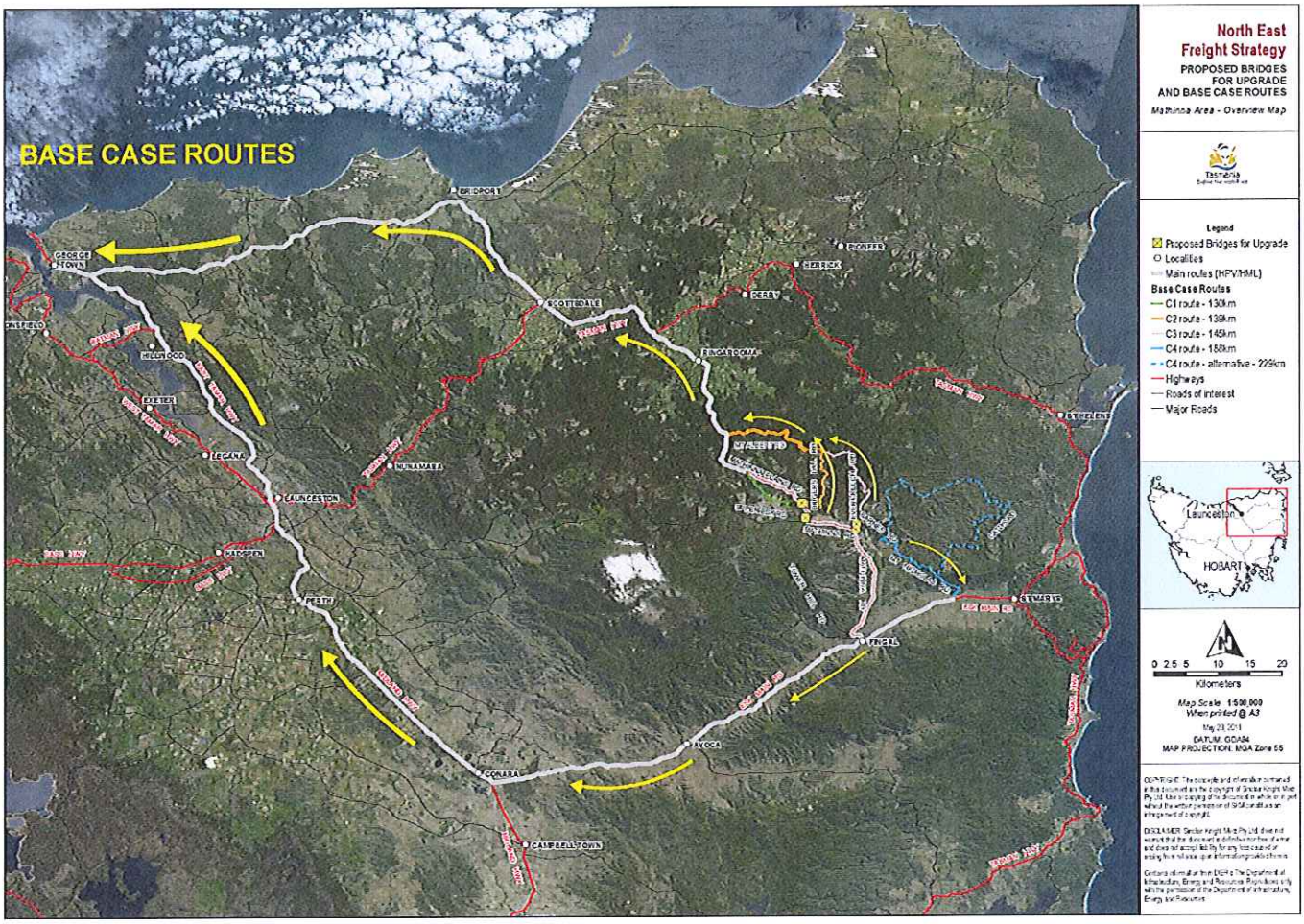
Mathinna Plains Road and Mathinna Road are Gazetted general access HPV/HML (see Map A4.3), however, productivity as sought through the gazettal process has been constricted by the deterioration of the 5 bridges listed above, caused by the additional loading. Load restrictions have been applied to the bridges, preventing efficient industry access from the region to the Fingal Valley. By way of yellow arrows, map A4.3 illustrates the intended direction of plantation freight travel from the Mathinna Plains basin to the Port of Bell Bay using the gazetted network (assuming the bridges in question are replaced with HPV/HML compliant structures).



Map A4.3 HPV/HML Route

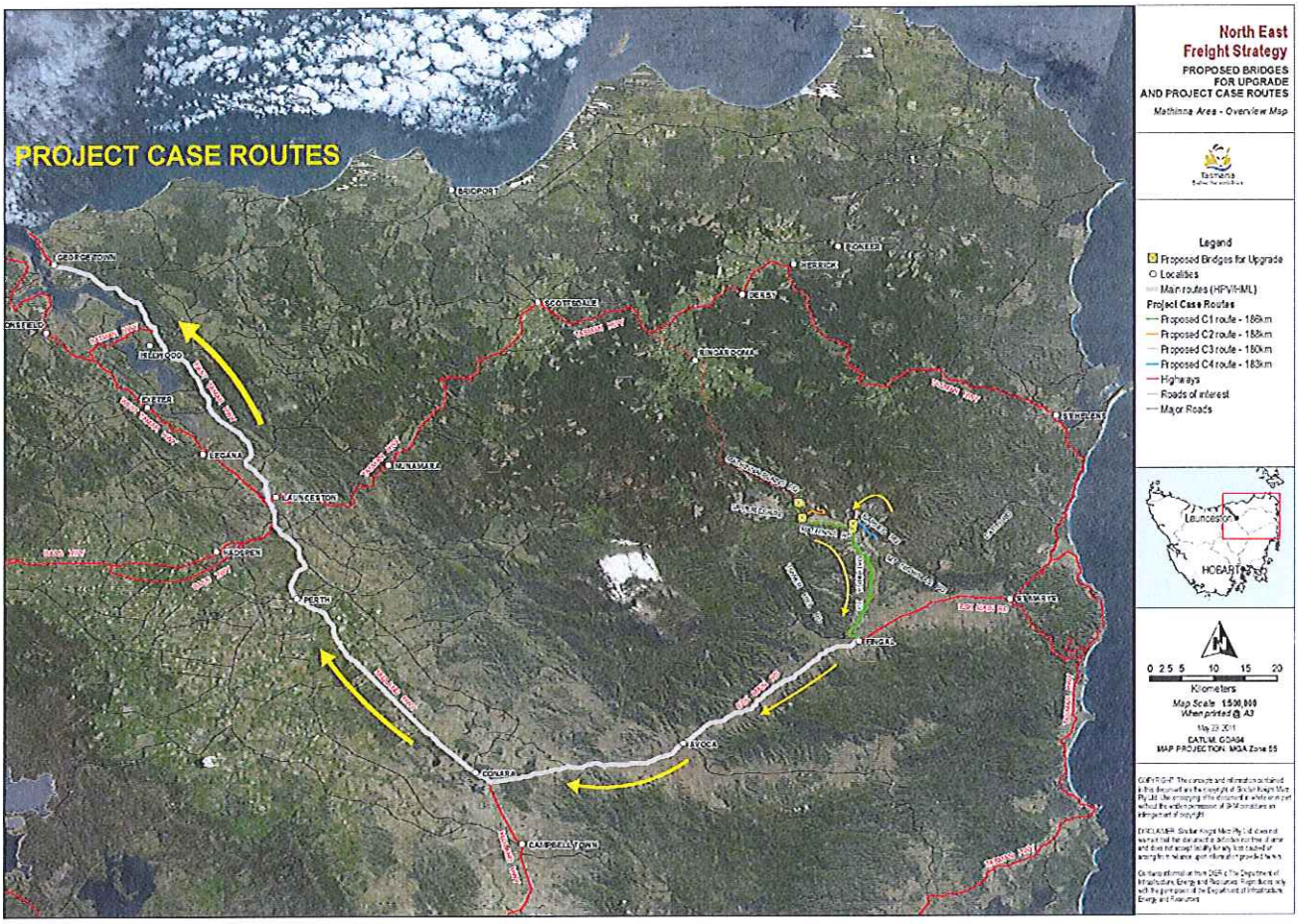
At present industry vehicles operating in the area are required to divert their movements to avoid the 10 tonne load restricted bridges, causing them additional travel time over unfavourable terrain and using both council owned roads and forestry networks. This creates a strain on the local network through increased costs associated with vehicle operation, vehicle maintenance and road maintenance. Driver safety is also affected by diverting around the existing bridges due to increased travel time and the use of steep gravel roads.

The travel routes currently taken by industry vehicles within the Mathinna area are shown in Map A4.4 (i.e the "Base Case" routes and are labelled C1 – C4). These routes were determined using information sourced from the Break O'Day Council and local industry contacts, as well as the likely travel direction zones defined in the North East Freight Roads Projects (Ref Map A7.1). For the purposes of this report, freight vehicles originating from the Mathinna area are assumed to be travelling to Bell Bay. Descriptions for each of the Base Case routes are listed over the next few pages.



Map A4.4: Base Case Routes

The replacement of the 5 bridges to enable HPV / HML use will assist in the capacity of the network and provide efficiencies to industries operating in the area by allowing plantation vehicles to travel along sealed road through more favourable terrain. Map A4.5 shows the likely travel routes that will be taken by plantation vehicles once the 5 replacement bridges are in place (these are referred to as the "Project Case" routes and are labelled "Proposed" C1 – C4). The starting points of each route are identical to those seen in the Base Case and it is again assumed that plantation freight vehicles are travelling to Bell Bay. Descriptions for each of the Project Case routes can be found in the Appendices.



Map A4.5: Project Case Routes

A 5. Project Scope

The scope of work required to achieve the replacement of the 5 bridges listed in Section A4.1 includes the following:

- Full geotechnical investigations at all 5 bridge sites;
- Engineering field surveys at all five bridge sites including the establishment of survey control;
- Stakeholder engagement;
- Preliminary design of all 5 replacement bridges;
- Detailed design of all 5 replacement bridges;
- Construction of all 5 replacement bridges; and
- Ongoing project management including monthly reporting, project team meetings and project risk assessment.

Each bridge will be replaced based on the following specifications:

- HPV / HML bridge standards with minimum 68 tonne load limit (AS5100);
- At a minimum deck width of 4.7 metres (single lane);
- Consideration of predicted climate change rainfall intensity quantities (verification of climate change quantum required following results of further analysis of the region); and
- Concrete structures complying with AS5100 - Bridge Code.

A 6. Geographical References

Refer mapping in section A4.1 and A4.2 which indicate the location of the proposed project. The individual bridge locations are summarised in Table 2 below:

Table 2: Existing Bridge Asset Information

Bridge No.	Name	Easting	Northing	Elevation (m)
3043	Mathinna Plains Road South Esk River Bridge	574364	5407320	280
1350	Mathinna Plains Road Delvin Creek Bridge	574151	5411430	295
2951	Mathinna Plains Road Delvin Creek Bridge	573942	5411620	295
1251	Evercreech Road South Esk River Bridge	580327	5408240	260
0422	Evercreech Road Bridge	580249	5407490	260

A 7. Project Summary

A 7.1 Background

In October 2007 the Australian Labor Party made an election commitment to provide funding towards a North East Freight Strategy. The Strategy identifies a package of works focusing on improving the freight road network in North East Tasmania. Together, the projects in the package are referred to as the North East Freight Roads Projects. The package of projects was developed to improve the safety, efficiency and level of service along key routes to meet the then forecast 40% increase in freight generated from the area, most of which will be plantation related freight (DIER 2010, *Project Proposal Report – North East Freight Strategy and DIER 2011, Amendment Project Proposal Report (Scoping) May 2011).*

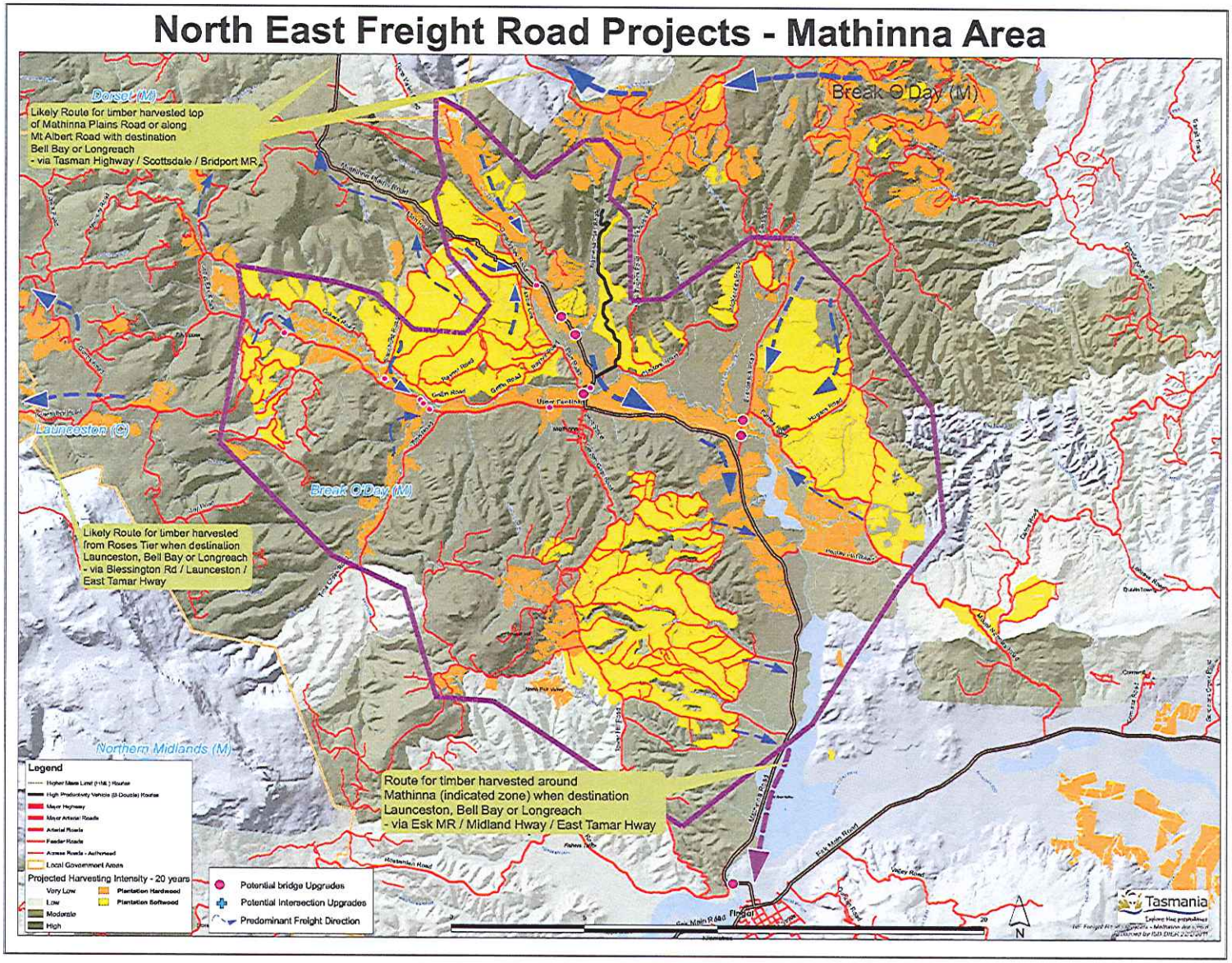
In 2008, a DIER Forestry Freight Model V2 (FFM) was developed. This model forecast 20 year (2008 to 2027) wood harvesting estimates in 4 separate 5 year periods. The model determined harvesting per 5 year periods within each plantation Forest Transport Catchment (FTC).

The model predicted (with bridges in place capable of 68t, 26m HPV/HML capacity and based on 240 operating days per year and 32 ton payload per vehicle) that there would be the following range of daily truck movements in the long term due to harvesting occurring in the North East of Tasmania:

- 23 to 60 trucks per day generated along Esk Main Road;
- 112 to 165 trucks per day along the Midlands Highway (near Launceston);
- 42 to 108 trucks per day generated along Mathinna Road and Mathinna Plains Road in both directions (i.e. South to Fingal and north to Scottsdale);
- 275 to 364 trucks per day along the East Tamar Hwy between Launceston and Bell Bay; and
- 132 to 185 trucks per day along Bridport Main Road between Scottsdale and Bell Bay.

Further forecasting information was recently released by the forestry industry and was used to complement previously calculated information from the FFM. Appendix C offers an explanation on the methods used to arrive at the forecast timber harvest volumes that were used in the Cost Benefit Analysis (CBA). Note; for the 30 year economic model, productivity was extrapolated for the years beyond the FFM predictions.

Map A7.1, which was previously developed for the North East Freight Roads projects, indicates the plantation areas destined for future harvesting in the Mathinna / Evercreech basins and subsequent transport along Mathinna Plains and Evercreech Road. The plantation areas were a direct input into the forecasted freight used in the CBA. The Map also depicts the likely travel direction for industry vehicles operating in the Mathinna / Evercreech region, which was used to quantify the harvest areas associated with both the Base and Project Case routes.



Map A7.1: Hardwood and Softwood Plantation Areas and Likely Travel Directions

A 7.2 Outputs and Benefits

Investment in the components of the strategy described in A5 – Project Scope, above, will provide the following benefits:

- Strategic bridge upgrades that support improved freight efficiency through reduced travel times, operating costs over the longer term;
- Better access to high quality road networks to cater for the harvesting of plantation timber from the Mathinna Plains and Evercreech plantation catchments;
- Reduced maintenance costs on surrounding roads in the network currently used by plantation freight vehicles detouring to avoid the load restricted bridges;
- Greater sustainability with the use of less fuel and lower generation of greenhouse gas emissions; and
- Improved safety for both industry and private vehicles in North East Tasmania as the existing bridges are reaching the end of their service life and in risk of collapse.

The results of the CBA support the above benefits from an economic perspective with a Benefit Cost Ratio (BCR) of 2.6.

The beneficial BCR results for the project case are due mainly through greater travel efficiency for industry. Whilst distances to the port of Bell Bay have in general marginally increased with the Project Case, the travel times and operating costs of the vehicles have reduced significantly. A study of the terrain in the region reveals an explanation as the improved Project Case offers industry vehicles the opportunity to traverse gently downhill and then follow the floor of the Fingal Valley along a route with only a small number of tight corners. The Base Case forces industry through mountainous terrain in smaller vehicles. Map A4.3 illustrates the different types of terrain encountered by the Base and Project Cases. The Base and Project Case routes are described in A4.1 and route profiles can be found in Appendix D.

A 7.3 Milestones

The Anticipated milestones for the development and delivery aspects for the 5 bridges are:

- Development phase incl. Geotechnical investigations, engineering site survey, and environmental assessments;
- Preparation of Contract documentation;
- Contract award;
- Construction of three (3) Mathinna Plains Road bridges, and
- Construction of two (2) Evercreech Road bridges.

A7.4 Funding Split

Project funding is to be sourced from the Australian Government North East Freight Roads allocation approved by the Minister for Infrastructure and Transport on the 5 July 2011.

The P50 Project Cost estimate is $7.52 million and the P90 Project Cost estimate is $7.97 with cashflow as indicated in section E1.

A 8. National Network Location

The Mathinna / Evercreech Bridge Replacements Project constitute an off-network project, and the Strategy has been approved as an off National Network Project (see below - section A9).

A 9. Project Eligibility for Approval

The project is eligible for approval as a Nation Building Program Off-Network Project under the *Nation Building Program (National Land Transport) Act 2009*. The relevant category is Part 6, Division 1, Section 54(a):

> *"the construction of an existing or proposed road, in a State or Indian Ocean Territory, that is not included in the National Land Transport Network"*

A 10. Project Phase for Approval

This Submission is seeking State Government Approval for the Delivery Phase of the Mathinna / Evercreech Bridge Replacements project.

B. STRATEGIC FIT

B 1. Previous Approvals

The Development and Delivery Phases for these bridges as part of the North East Freight Roads Strategy was approved in July 2011 by the Minister for Infrastructure and Transport.

B 2. Project Identification in MOU

The North East Freight Roads Strategy is identified in the MOU between the Australian and Tasmanian Governments.

B 3. Strategic Merit Test

The Project meets the Strategic Merits Test for the North East Freight Roads Strategy and was forwarded to the then DITRDLG in June 2008 as the business case document for this Nation Building Program Schedule A project.

C. PLANNED OUTCOMES AND OUTPUTS

C 1. Project Performance Objectives and Intended Outcomes

The 5 existing bridges located along Mathinna Road and Evercreech Road in the North East of Tasmania are beyond their service life, have a load limit applied and in risk of collapse. These bridges will be replaced with HPV / HML compliant bridges to remove current load and route restrictions.

The Mathinna/ Evercreech Bridge Replacements project will support the following strategic objectives:

- Improve safety and consistency of travel environment along Mathinna Road and Evercreech road for all road users (specifically HPV road users).
- Increase transport productivity and improve efficiencies for industry operating in North East Tasmania.

The key outcomes of this project are:

- To replace 5 existing bridges located along Mathinna Plains Road and Evercreech Road to a structural standard that will accommodate HPV / HML vehicle loads (to meet AS5100), which will:
    - Improve safety for both passenger and freight vehicles travelling in the area;
    - Improve transport efficiencies for industry vehicles operating in the area; and
    - Reduce maintenance costs for roads currently used by industry vehicles;

The key risks associated with this project are listed below, and the Risk Management Plan shown in Appendix B has been implemented:

- The P50 / P90 Cost Estimate is high with high Contingent Risk and Inherent Risk values due to the limited time available to obtain full relevant site information;
- Unforseen geotechnical issues for foundations have been assessed with a high Inherent Risk Value;
- Adverse weather and flooding events during construction (damage, programme drift);
- Aboriginal cultural heritage sites identified during construction;
- Contractor delivery issues; and
- Triggering EPBCA due to identification of species during construction.

C 2. Measurement of Outcomes

Overall project outcomes will be measured using a combination of efficiency, safety and metrics, as per the following:

- Replacement of bridges to cost and programme;
- Travel time, distance and route elevation profile – freight vehicles (laden / unladen);

- Reduced vehicle operating costs;
- Reduced bridge and road maintenance costs;
- Reduced road traffic on base case roads; and
- Increased industry productivity.

C 3. Baseline Data

For the purposes of this Submission, the Base Case is an assessment of the current existing situation. It represents the case where the load restrictions on the bridges are maintained and industry is forced to use alternative routes. See Map A4.4 and associated descriptions.

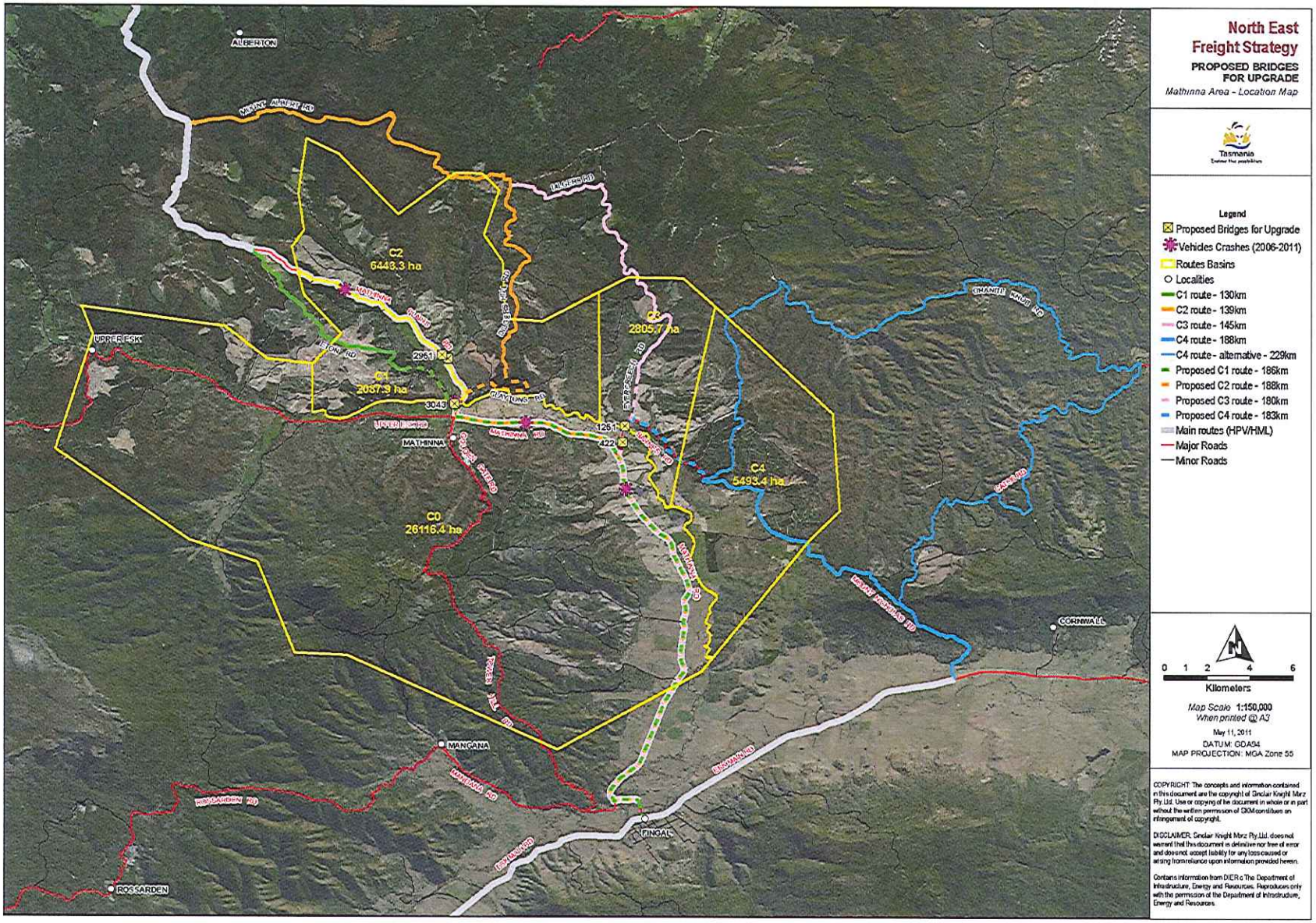
The Project Case on the other hand assumes that new bridges with HPV / HML capacities are constructed, and that Evercreech and Mathinna Plains Roads are reinstated as high productivity routes. See Map A4.5 and associated descriptions.

The Base Case was established by identifying the alternative routes from the logging coupes to the port of Bell Bay that industry has been using due to the load restrictions on the current bridges. To effectively measure this, the subject area was split into 4 harvest catchment areas, or "basins", which were independently assessed for harvesting volumes and the route required from the basin to the port.

The areas of timber harvesting associated with each route (i.e. route basins) were calculated using a number of sources including the likely travel direction zone previously defined for the Mathinna Area for the North East Freight Roads Projects, the starting points for each route C1 to C4, the distance to another route option, and the location of the major roads and rivers. These areas have been used to calculate the projected volumes of timber that are directly related to the upgrade of the 5 bridges along Mathinna Plains Road and Evercreech Road. Harvest areas and travel options outside the route basins were not considered as the bridge replacements would have no effect (i.e. freight vehicles can either bypass the bridges or are more likely to use another route).

A map of the basins in which the Base and Project Cases were assessed is shown in Map C3 and the following information has been used to assess the data metrics as identified in C2 above:

- Travel distance and route elevation profiles for existing and proposed routes (Appendix D);
- Measured average travel times for freight vehicles (laden / unladen); Forecast average travel times for freight vehicles have been modelled for existing and proposed new routes utilising DIER Forestry Freight Model (ref. Section E)
- Forestry Freight Model Version 2 (FFM);
- Traffic volumes - historical Average Annual Daily Traffic (AADT) (DIER and LGAs); and
- Safety – crash statistics (DIER 2001-2011) (ref. Section E)



Map C3: Outline of Basin Areas Attributing Freight Volumes to Routes

D. PROJECT APPROACH AND TIMING

D 1. Private Financing

This project will be 100% publicly funded.

D 2. Key Milestones and Critical Path

The milestone identified in A7.3 have the timing detailed in table 3:

Table 3: Mathinna Evercreech Bridges –Development and Delivery Phase Milestones

Key Milestones	Completion Date / Timing	Critical Path (Yes/No)
Development and Delivery PPR submission to DIT	Completed 2011	Yes
Approval of PPR– Instrument of Agreement finalised	Completed 2011	Yes
Completion of Scoping Phase activities • Geotechnical investigations and reporting • Engineering ground survey completion • Scoping report completion • Procurement Methodology Agreement	Completed 2011	Yes
Development phase commenced • Preparation of tender documentation for design and construction contracts completed • Contracts advertised	October 2011 Due March 2012 Due March/April 2012	Yes
Delivery milestones – 3 Mathinna Road Bridges: • Contract awarded • Detailed design plans reviewed and approved for construction • On site construction starts • Construction completed	 July 2012 October 2012 October 2012 December 2013	Yes
Delivery milestones - 2 Evercreech Road Bridges • Contract awarded • Detailed design plans reviewed and approved for construction • On site construction starts • Construction completed	 July 2012 October 2012 Determined by Contract progress March 2014.	Yes

(NOTE: These timeframes are subject to the actual delivery details to be provided by the successful Contractor for this Design and Construct Contract.)

The critical path for the delivery of the project is mapped through both bridges 3034 and 0422, which are multi span structures demanding additional time and resources.

The critical constraint for delivery is the Break O'Day Council requirement that both Mathinna Plains Road and Evercreech Road are not closed at the same time, with Mathinna Plains Road work scheduled first, followed by Evercreech Road.

One design and construct (D & C) contract will be tendered to ensure a smooth transition of work from Mathinna Plains Road to Evercreech Road to satisfy the Council requirements.

D 3. Assumptions Made in Deriving Key Milestones

Key assumptions in developing this program include:

- The construction zone will be within 20 metres upstream and 20 metres downstream of the existing bridges.
- DIER is not required to submit a Development Application to Break O'Day Council seeking planning approval permits for the bridge replacements. Break O'Day Council has advised DIER that a Development Application is not required for the "repair to make good" of these bridges.
- Aboriginal Heritage Tasmania (AHT) has advised that Aboriginal cultural heritage field investigations are not required on the basis of the high level of site disturbance and that bridges are to be demolished and replaced at the same location. No Aboriginal sites have been reported in the vicinity.
- Department of Primary Industries Water, Conservation Branch has advised that flora and fauna field investigations are not required on the basis that the site is highly disturbed, bridges are to be demolished and replaced at the same location and the risk based approach to the desk top assessment for ecological values indicates low likelihood of species or communities of conservation significance.
- No eagle nests occur within a 1km radius of any of the five bridges as evidenced by recent field investigations.
- All bridges will be constructed using a majority of precast components;
- There will be no high rainfall and flood events during the delivery phase;
- The project proceeds as one Design and Construct Contract
- All works under the Nation Building Program will be complete by 30 June 2014

.D 4. Proponent Approval of Milestones and Critical Path

This project is being overseen within DIER by a specifically established North East Freight Strategy governance group, called the Project Executive Group.

The Project Executive Group has approved this Submission, including the milestones and critical path.

E. FINANCIAL ANALYSIS

The financial capital expenditure analysis inclusive of P50 and P90 Cost Estimate for capital expenditure levels is detailed in Figure E1 below.

E 1. Anticipated Project Total Outturn Cost

The total project outturn cost for the replacement of the 5 bridges is $7.520 million for the P50 case using the Evans and Peck "Best Practice Cost Estimation for Publicly Funded Projects".

The cash flow shown in Table 4 below is for the P50 and P90 capital expenditure value.

Table 4: Cash Flow

Year	2011/2012	2012/2013	2013/2014	2014/2015	Total
P50 Cash Flow	$ 210,000	$ 3,300,000	$ 3,000,000	$ 1,000,000	$ 7,510,000
P90 Cash Flow	$ 220,000	$ 3,530,000	$ 3,200,000	$ 1,000,000	$ 7,950,000

P50 and P90 Capital Expenditure Cost Estimates

ID	Description	Base Estimate				Contingency		Base Estimate + Contingency	% of Base Estimate
		Unit	Billed Qty	Net Rate	Net amount	%	Amount	%	
1.0	**Concept Development**								
1.1	Concept development project management	item	1.00	$ 6,850.00	$ 6,850.00	0%	$ -	$ 6,850.00	
1.2	Engineering Survey	item	1.00	$ 11,397.00	$ 11,397.00	0%	$ -	$ 11,397.00	
1.3	Site Geotechnical Investigations	item	1.00	$ 81,126.00	$ 81,126.00	0%	$ -	$ 81,126.00	
1.4	Functional Design Statement	item	1.00	$ 10,675.00	$ 10,675.00	0%	$ -	$ 10,675.00	
1.5	Stakeholder consultation	item	1.00	$ 2,800.00	$ 2,800.00	0%	$ -	$ 2,800.00	
1.6	PPR and CBA	item	1.00	$ 48,489.00	$ 48,489.00	0%	$ -	$ 48,489.00	
1.7	DIER Concept development costs	item	1.00	$ 55,000.00	$ 55,000.00	0%	$ -	$ 55,000.00	
1.8	Concept Design	item	1.00	$ 14,000.00	$ 14,000.00	0%	$ -	$ 14,000.00	
	Subtotal Concept Development				**$ 230,337.00**		**$ -**	**$ 230,337.00**	4%
2.0	**Detail Design and Documentation**								
2.1	Detailed Design	item	1.00	$ 125,000.00	$ 125,000.00	6%	$ 7,291.67	$ 132,291.67	
2.2	Design Review	item	1.00	$ 20,000.00	$ 20,000.00	6%	$ 1,166.67	$ 21,166.67	
2.3	Tender and Contract Documentation	item	1.00	$ 30,000.00	$ 30,000.00	2%	$ 500.00	$ 30,500.00	
2.4	Owner project management services	item	1.00	$ 25,000.00	$ 25,000.00	6%	$ 1,458.33	$ 26,458.33	
	Subtotal Detail Design and Documentation				**$ 175,000.00**		**$ 8,958.33**	**$ 183,958.33**	3%
3.0	**Contract Administration**								
3.1	Contract Administration	years	2.00	$ 95,000.00	$ 190,000.00	6%	$ 11,083.33	$ 201,083.33	
3.2	Owners contract administration	item	2.00	$ 60,000.00	$ 120,000.00	6%	$ 7,000.00	$ 127,000.00	
3.3	Owners Engineer	item	1.00	$ 30,000.00	$ 30,000.00	6%	$ 1,750.00	$ 31,750.00	
3.4	Insurances	item	4,726,620.00	3.9%	$ 184,338.18	0%	$ -	$ 184,338.18	
3.5	Professional Services (Legal)	item	1.00	$ 12,000.00	$ 12,000.00	-47%	-$ 5,650.00	$ 6,350.00	
	Subtotal Contract Administration				**$ 536,338.18**		**$ 14,183.33**	**$ 550,521.51**	10%
	Total Owners Costs				**$ 941,675.18**		**$ 23,141.67**	**$ 964,816.85**	17%
4.0	**Construction**								
4.1	Bridge No. 3043	Item	1.00	$ 1,527,552.00	$ 1,527,552.00	8%	$ 127,296.00	$ 1,654,848.00	
4.2	Bridge No. 1350	Item	1.00	$ 414,336.00	$ 414,336.00	7%	$ 27,622.40	$ 441,958.40	
4.3	Bridge No. 2951	Item	1.00	$ 235,872.00	$ 235,872.00	12%	$ 27,518.40	$ 263,390.40	
4.4	Bridge No. 422	Item	1.00	$ 721,968.00	$ 721,968.00	7%	$ 48,131.20	$ 770,099.20	
4.5	Bridge No. 1251	Item	1.00	$ 581,568.00	$ 581,568.00	5%	$ 29,078.40	$ 610,646.40	
4.6	temporary works	Item	1.00	$ 250,000.00	$ 250,000.00	9%	$ 23,402.78	$ 273,402.78	
4.7	Traffic Management	item	1.00	$ 25,000.00	$ 25,000.00	15%	$ 3,645.83	$ 28,645.83	
4.8	Service relocations	item	1.00	$ 25,000.00	$ 25,000.00	0%	$ 6,970.49	$ 31,970.49	
4.9	Contractors project management	%	3,781,296.00	25%	$ 945,324.00	0%	-$ 34,464.94	$ 910,859.06	
	Total Construction Costs (TCC)				**$ 4,726,620.00**		**$ 259,200.56**	**$ 4,985,820.56**	88%
	Base Estimate (Owners Cost + Construction Cost)				**$ 5,668,295.18**		**$ 282,342.23**	**$ 5,950,637.41**	105%
	Contingency - Inherent Risk (incl. Above)	% of TCC		$ -				$ -	
	Contingency - Contingent risk	% of TCC	1.00	$ 624,354.17				$ 624,354.17	
	Base Estimate + Contingency (Inherent + Contingent)							$ 6,574,991.57	116%
	Cash Flow: Start Construction October 2011 Finish Construction May 2013					2011/2012	2012/2013		
	Escalation (applied to base case + contingency)	Compound				7%	7%	$ 952,716.28	
	Total Outturn Cost							$ 7,527,707.85	133%

P50	$ 7,519,151.65
P90	$ 7,974,702.45

E 2. Cost Escalation

All dollars are real as of 1 July 2011. Where Net Present Values (NPVs) are presented, a real discount rate of 7% as prescribed by Infrastructure Australia has been adopted.

E 3. Escalation Rates Used

A real increase of 1% pa has been applied to maintenance, travel time cost, vehicle operating cost, environmental cost and crash cost. Refer E5 Cost Benefit Analysis, and Appendix C.

E 4. Total Outturn Cost and Ineligible Costs

No illegible costs form part of this Submission. All costs are associated with the replacement of the bridges.

E 5. Summary Cost Benefit Analysis

Appendix C provides full details of the comprehensive Cost Benefit Analysis.

Table 21 presents a summary of Net Present Value (NPV) and BCR results under the baseline scenario and sensitivity tests. The analysis returned a BCR of approximately 2.6 under the baseline scenario. This means that every dollar of investment results in 2.6 dollars of benefit to the community. Despite the low AADT figures, this BCR is not unexpected and may be attributed to factors such as:

- The low capital cost associated with the project;
- The bridges are a part of a critical link between productive areas and the main road leading to the port;
- The bridges link up productive areas with high quality roads which are capable of carrying HPV vehicles; and
- Without the bridges, vehicles will be forced to take highly windy, mountainous and gravel roads.

In all the sensitivity tests, the BCR is no less than 2.1.

Table 21 Summary of results

Scenario/Test	Description	NPV	BCR
(0) Baseline	7.0% Discount rate	$ 20.25 m	2.6
1	4.0% Discount rate	$ 33.85 m	3.2
2	4.4% Discount rate	$ 31.55 m	3.1
3	10.0% Discount rate	$ 12.33 m	2.1
4	Increase capex by 10%	$ 19.53 m	2.5
5	Decrease capex by 10%	$ 20.97 m	2.7
6	Decrease the payload capacity of B-doubles from 47t to 34t	$ 14.07 m	2.1
7	Increase the payload capacity of Mini B-doubles from 29t to 32t	$ 17.65 m	2.4
8	Remove all real growth	$ 16.98 m	2.4
9	Remove road maintenance cost	$ 13.00 m	2.8

E 6. Economic Assumptions Used in Financial Analysis

A number of assumptions were used in this financial analysis, which are listed below.

- The only road users are Forestry Industry. This is a conservative approach considering there would be benefits for the agricultural business, however, there are a limited number of farms in the area and it is understood that agriculture business in the area has turned largely to forest plantation for income.
- Volumes of timber harvested have been based on the FFM and recent industry data supplied by Timberlands. Information has been supplied through:
    1. forecasted volumes, and
    2. production volumes per hectare for both soft woods and hardwoods.
- The implementation of the 12 Point Forest Action Plan would have minimal effect on freight in the Mathinna / Evercreech area due to the extensive plantation areas in the region.
- The lifespan expectancy of the existing bridges is only one year (under full load limits).
- Many of the road conditions have been measured as "poor" in referencing vehicle operating costs. This assumption has been made to account for the often poor road / weather conditions as well as the additional expense associated with vehicle operation in Tasmania when compared those experienced in other states (due to adverse terrain, rain intensity and road geometry).

F. RISK AND GOVERNANCE

F 1. Major Risks and Proposed Mitigation Strategies

DIER has established a Governance Structure and Risk Assessment process, both of which have been set up to support delivery of the North East Freight Strategy.

F1.1 Governance Structure

Details of the project Governance are contained within Appendix A. Governance for this project fits in with the overall NEFR governance structure set out in the June 2011 Project Proposal Report – North East Freight Roads.

F1.2 Risk Assessment

The project risk assessment can be found in Appendix B – Risk Assessment.

F 2. Tender Exemption

A tender exemption is not being sought. The Bridge replacement projects will be fully tendered through DIER's approved tendering process.

F 3. Environmental and Cultural Issues

Aboriginal Heritage Tasmania has indicated that the bridges can be reconstructed at their current locations without cultural heritage site investigations, on the basis of the land being previously disturbed. Under the 1974 Relics Act, should cultural heritage artefacts be encountered during the delivery phase, the works must cease at that particular site until the relevant permits have been processed. This is considered to be a very low risk considering the level of disturbance at each bridge site, particularly at abutments.

There are no known environmental issues associated with any of the bridge locations. Contractors will be required to submit legislative conforming environmental management plans as part of the delivery phase of works. Conformance of delivery to the agreed environmental management plans will be monitored during the delivery phase of the works.

There are no observed eagles nests occurring within a 1km radius of any of the bridges.

F 4. Public and Stakeholders

This project is supported by all stakeholders. There is no known opposition to the replacement of these bridges at any political or private level. Full local government, community and industry support exists for this project.

Key stakeholders to the bridge replacements are:

Forestry industry, including:

- Timberland Pacific;
- Gunns Ltd;
- Forestry Tasmania, and
- Truck Operator representatives.

Local Government stakeholders are:

- Break O'Day Council;
- Dorset Council;

Local landowners and "commuters" between Fingal/Mathinna and Ledgerwood/Ringarooma/Scottsdale.

- The most affected local and adjacent residents have been interviewed;
- One private property owner immediately adjacent to two of the bridges has been interviewed and concerns addressed;
- Up road property owners have been contacted; and
- Commuters will have access to alternative routes during bridge construction, via future advice.

Stakeholder engagement will occur in the following ways:

- Ongoing briefing and liaison with abovementioned stakeholders in relation to any road closures;
- Public notices for any road closures;
- Advance warning signage advising of road closures;
- Advice to local "Visitor Information Centres";
- Public display plans at various locations.
- Periodic media articles describing any road closures and construction timetables; and
- Letters of notification to all stakeholders.

APPENDICES

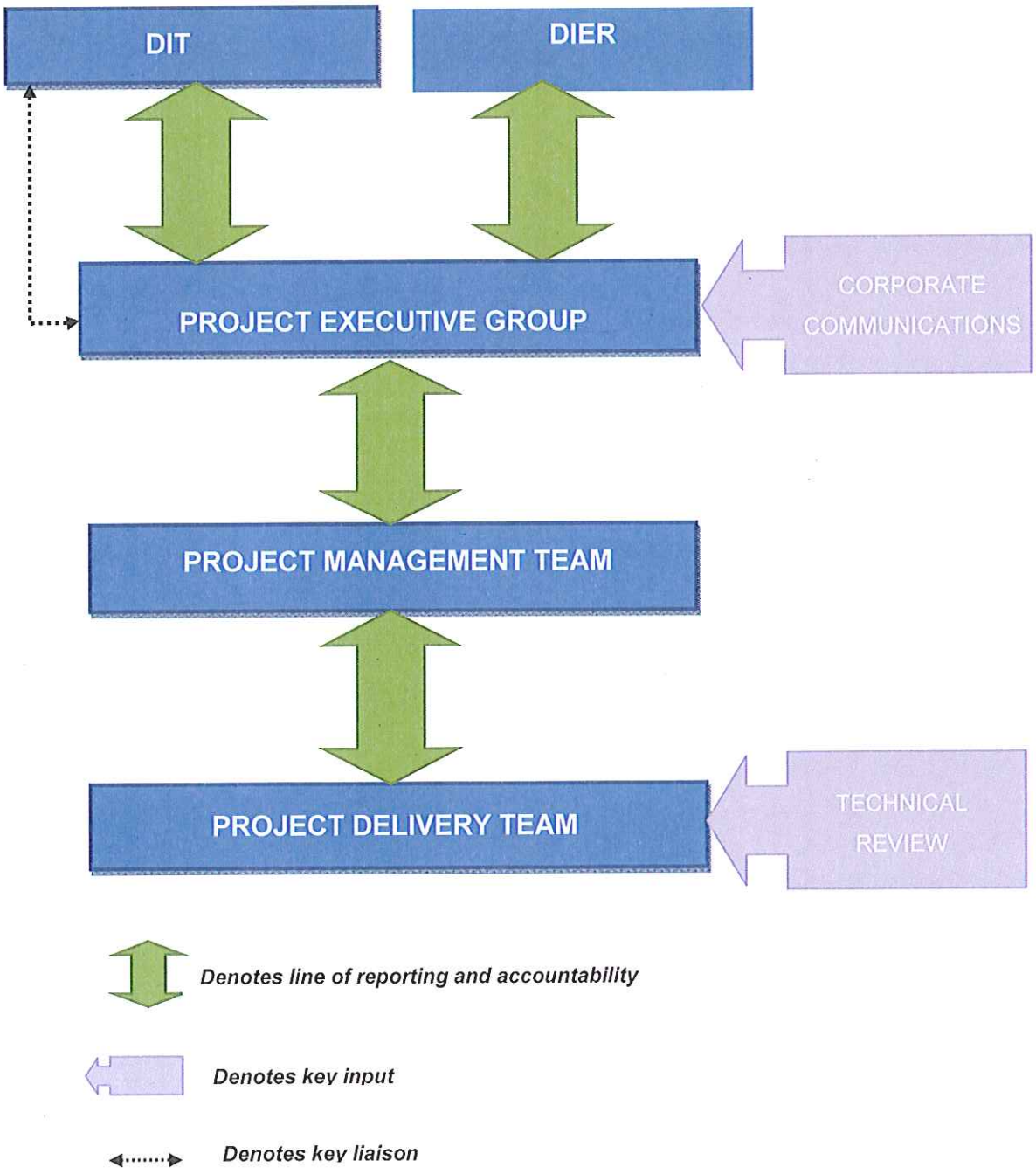
Appendix A – Governance

Governance Structure

The project will be run with an alliance philosophy under a Governance Structure, clearly defining lines of reporting and accountability. The structure is shown in the following chart, on the following page.

- Blue boxes indicate key levels within the structure for accountability and reporting.
- Green arrows define the lines of reporting, accountability and direction within the structure.
- Purple boxes indicate where key inputs are derived from resources or groups external to the lines of reporting.

Project Governance Structure



Governance for this project fits in with the overall NEFR governance structure set out in the May 2010 PPR (Scoping) – North East Freight Roads and reiterated in the My 2011 Amendment.

PROJECT EXECUTIVE GROUP

The Project Executive Group provides the link between Government Policy and the Project Management and Project Delivery teams.

The role of the Project Executive Group is to oversee the delivery of the project, ensuring that:

- Outcomes meet strategic intent and are consistent with long-term planning for infrastructure in Tasmania.
- Public funds are being expended in an appropriate manner;
- Progress is being made in the delivery of the project in accordance with the Project Plan;
- Public consultation messages and communication are consistent with the broader intent of the Agency and State Government;
- The Agency Executive, Minister and Government are kept informed of progress on, and issues arising from, the project;
- Strategic risks have been recognized and appropriate mitigation strategies implemented and
- Keep DITRDLG informed on progress, critical issues, timeframes and future opportunities.

The Project Executive Group shall specifically:

- Approve the project objectives and outputs of the proposed planning activities;
- Provide direction on strategic issues that arise during the course of the project;
- Liaise with Corporate Affairs on critical stakeholder issues and critical communication; and
- Provide strategic advice to the Minister, Secretary and Deputy Secretary.

The Project Executive group has the sole authority to amend the project objectives, amend the project scope, extend project timeframes or increase project budget.

The Project Executive Group shall comprise:

- General Manager Roads & Traffic Division, DIER (Chair)
- General Manager Infrastructure Strategy Division, DIER
- Director Traffic and Infrastructure Branch, DIER
- Manager Corporate Affairs

The Project Executive group shall meet with the Project Management Team at regular intervals to review progress of the project. Project Governance meetings will be held on an as needs basis as determined by the Chair.

In the event that a Project Executive Group member cannot attend a scheduled meeting, they may nominate a proxy who shall assume their full rights and responsibilities.

The Project Executive Group is active for the North East Freight Roads Strategy, has endorsed the PPR and has set direction for project prioritisation for delivery within the allocated funding.

PROJECT MANAGEMENT TEAM

The role of the Project Management Team is to manage the delivery of the project in accordance with the agreed objectives and directions from the Project Executive Group. The Project Management Team is specifically responsible for the management of the project risks, budget, programme and outputs.

The Project Management Team has the authority to reallocate funds within the approved budget and reorganise activity timeframes within the approved programme, without prior approval of the Project Executive group. Any changes of this nature are to be reported to the Project Executive Group in normal monthly reporting.

The Project Management Team shall organise Project Governance meetings as requested by the Chair.

The Project Management Team shall comprise:

1. Project Manager, DIER
2. Director

The DIER representative on the Project Management Team shall be responsible for officer level liaison with the DITRDLG.

PROJECT DELIVERY TEAM

The role of the Project Delivery Team is to deliver the technical and statutory requirements of the Project Brief through the application of relevant Legislation, Technical & Design Guidelines, Australian Standards, standard specifications and sound engineering and planning judgement.

The Project Delivery Team reports directly to, and takes direction from, the Project Management Team. While the Project Delivery Team will seek technical input and guidance from other areas of the Agency it has no reporting line or accountability other than to the Project Management Team.

The Project Delivery Team shall comprise:

1. Project Manager, Delivery
2. Technical Manager, relevant consultant
3. Technical Resources
4. Sub-consultants

Appendix B – Risk Assessment

DIER has adopted a formal risk assessment model to be applied in the planning phase of all projects.

The model requires the following steps:

- identification of possible risk events,;
- scoring "consequence" (scale of 1 (low) – 6 (catastrophic)) and "likelihood" (scale 1(rare) – 5 (almost certain)) of that event occurring;
- determine the risk ranking (via risk assessment matrix);
- proposing risk mitigation strategies;
- revise the consequence and likelihood ratings for each risk with mitigation strategy implemented; and
- revise the risk ranking for each risk event with mitigation strategies in place.

Note that the "consequence" scoring is based on agreed project planning related definitions, and includes consideration of Community, Environment and Heritage, Legal and Compliance, Reputation, Management Impact, Financial Impact and Program Impact.

The Risk Assessment matrix framework and definitions can be found on the following pages. Financial risks are included as part of the cost estimation model.

The following page shows a summary of the identified risk events for the North East Freight Strategy, their impact, risk rating, mitigation strategies and revised risk rating, throughout the Development and Delivery Phases of the project.

NEFR - Mathinna/Evercreech Bridge Replacements	
RISK PLAN AT PPR STAGE	Date of Review: 18 October 2011.
TRIM 2011/185892	

Risk	Potential Consequence	Likelihood	Consequence	Risk Level	Risk treatment initiative	Responsible party	Residual Risk			Action
							Likelihood	Consequence	Risk level	
Poor communication - re alternative traffic routes and timing for road closures	*Road closures adversely impacting resident and industry access resulting in negative media exposure for DIER/Minister .*	3	2	C	*Develop stakeholder management plan in conjunction with industry and council to identify and agree on alternative routes and access between bridges,to identify times of closure.*	PM	2	1	D	S Kacz and G Nibbs to develop a stakeholder plan to ensure communications continue with identified stakeholders. Due Mid Nov 2011. COMPLETED
Additional construction access tracks required to be constructed down to and across the river at each bridge - environmental approval may be required for the construction of these additional (temporary) construction tracks	*Restricting access to and across the river will likely add $200,000 - $400,000 to overall project cost due to additional transport costs of construction materials to site.*	2	2	D	*Ensure well defined environmental constraints.SK and FG site assessment , scope the construction access to and across the river at each of the sites and meet with DPIPWE -PACB (Rebecca Pinto) to seek extension of scope of exemption.*	PM	2	1	D	S Kacz to meet with D Shaw and S Dixon to review planning issues. SK & F Giana to review on site by Mid Nov 2011. COMPLETED
Budget impacts - cost of project delivery be higher, if river access at each of the construction sites is restricted, particularly for bridge 3043.	*Additional $200, 000 - $400, 000 to overall project costs if unable to gain enviornmental approval to construct additional access tracks down to the river.*	2	3	C	*Gain approval from PACB (DPIPWE) for construction of additional access tracks down to the river.*	PM	2	1	D	S Kacz to meet with D Shaw and S Dixon to review planning issues. SK & F Giana to review on site by Mid Nov 2011. COMPLETED
Exemptions for Aboriginal investigations do not include construction of additional access tracks to the river, for construction purposes.	*That the exemption to undertake Aboriginal Heritage investigations does not include the construction of additional temporary access tracks to the river's edge.*	2	2	D	*One stop shop - our cultural heritage officer Selena..SK to check with Selena , RFA documents and AHT if nec. Confirm Aborigial Assesment for each of the bridges as per enviro accesses to and across River*	PM	1	1	D	S Kacz to meet with D Shaw and S Dixon to review planning issues. SK & F Giana to review on site by Mid Nov 2011. COMPLETED
Tender prices are higher than delivery phase P50 and P90 cost estimates.	*Additional funding required to be drawn from the NEFR program. Project Sponosr will provide re-scoping.*	3	3	C	*Cost efficiencies sought in construction delivery eg single contract tendered, temporary river access tracks for construction, both sides of the river.*	PM	3	3	C	Tender work asap as bridge contractors are relatively light at this time. PROGRAMMED FOR END MAR 12.

Risk	Potential Consequence	Likelihood	Consequence	Risk Level	Risk treatment initiative	Responsible party	Residual Risk			Action
							Likelihood	Consequence	Risk level	
Principles Project Requirements not clearly defined in the technical specifications. As D & C contract need to ensure that principles project requirements are clearly defined in the tech spec. Note recent flood history and	*Bridges not designed appropriately for projected increase frquency in flood events subsequent increase in inundation events including debris mats, log impacts and potential scouring of abutments.*	3	2	C	*Review technical specs to ensure that prinicples project requirements are properly defined including debris mat and log impact , inundation, loading condition, protection of abutments from scour. The recent experienced flood*	PM / FG / GM	2	2	D	S Kacz to obtain Principals Acceptance of Principals Project Requirements. By Mid Novemebr 2011. ..... to provide recent flood history by Mid Novemebr 2011. PPR APPROVED
Environmental issues in relation to the southern river access to and river crossing affecting efficient and cost effective construction methodologies.	*Appropriate access to river at each of the different locations will improve the efficiency and cost effectiveness of constructability.*	3	2	C	*Getting southern river access approved from environmental perspective.*	PM	2	1	D	S Kacz to meet with D Shaw and S Dixon to review planning issues. SK & F Giana to review on site by Mid Nov 2011. OUTSTANDING
Single D&C project	*Can have project savings but increased or reduced risks*	*1*	2	D	*Review procurement early in project lifecycle*	*PM*	1	1	D	S Kacz to review procurement contract, by Mid Nov 2011. COMPLETED
Environmental approvals not provided for the construction of additional temporary access to and across the river at each of the locations.	*Any additional approvals and or investigations required to construct additional temporary construction access tracks to the rivers edge may delay the project and add additional project costs equivalent to the cost of additional trasnport and cartage should river access be restricted to exiting agreed locations.*	2	3	C	*Undertake field constructability assessments, formulate scope of additional river access tracks for construction purposes only, discuss with Dick Shaw and meet with DPIPWE.*	PM	2	2	C	S Kacz and G Nibbs to develop a stakeholder plan to ensure communications continue with identified stakeholders. Due Mid Nov 2011. COMPLETED
PSCPW approvals process delays tendering process, affecting cash flow from Australian Government.	*Tendering can not commence until PSCPW has met and endorsed the project*	3	2	C	*Meet with Governer - 7th Nov. Dates for PSCPW set at that meeting. Hoping that PSCPW meets prior to Christmas, with delivery of the PSCPW report after Christmas. Tenders as soon as possible after Christmas.*	PM	2	2	C	Narelle to prepare Ministerial Minute for Referral of Mathinna / Evercreech Bridge Replacements to the PSCPW meeting in Feb 12. COMPLETED
The advised project timing and cash flow with current projected expenditure of $5.5M for 2011/12.	*PPR received mid October 2011, work specification is at a detailed level requiring contract documentation. Normal DIER procedures require in excess of 5 - 6 month lead time to start construction.*	3	2	C	*Review Development Program to reduce timeframes. Seek approval to undertake development activities in parallel.*	PM	2	2	C	COMPLETED
P50 & P90 Strategic Estimate high due to limited site information avaialble at the time of the estimate.	*Actual project costs could be less leaving funding available for other NEFR Projects.*	3	2	C	*Review estimated project cost at tendering time*	PM	3	1	D	Progressively review Project Estimate as additional information becomes available and adjust at tender time.

Risk Matrix

Consequences (Refer to Definitions Overleaf)	LIKELIHOOD (Refer to Definitions right)				
	1. Rare	2. Unlikely	3. Possible	4. Likely	5. Almost Certain
6 - Catastrophic	B	B	A	A	A
5 - Extreme	C	B	B	A	A
4 - Severe	C	C	B	B	A
3 - High	D	C	C	B	B
2 - Medium	D	D	C	C	B
1 - Low	D	D	D	C	C

Likelihood Definitions:

What is the likelihood of the selected consequences occurring?

Rating	*Criteria*
5. Almost Certain	▪ Over 90% probability; or ▪ "Happens Often"; or ▪ "Unlikely that it won't happen"
4. Likely	▪ Greater than 50% probability; or ▪ "Could easily happen"
3. Possible	▪ Greater than 10% probability; or ▪ "Could happen, has occurred before".
2. Unlikely	▪ Greater than 1% probability; or ▪ "Hasn't happened yet but could".
1. Rare	▪ Less than 1% probability; or ▪ Conceivable, but only in extreme circumstances.

Risk Action Levels	
A - Extreme	▪Immediately stop the process; ▪Minister/Secretary decision/direction required.
B - High	▪Take immediate action to further control the risk; ▪General Manager/Governance Group action required.
C - Medium	▪Specific risk management plan to be implemented. ▪Review for improvement opportunities.
D - Low	▪Implement normal procedures and processes. ▪Monitor risk, reduce if practicable.

Consequence Definitions – *What are the likely consequences in the event of a failure?*							
Rating	**Community**	**Environment & Heritage**	**Legal & Compliance**	**Reputation**	**Management Impact**	**Financial Impact**	**Program Impact**
Catastrophic	▪ Complete loss of trust by affected community leading to social unrest & outrage.	▪ Very serious long term impairment of ecosystem or damage to a species; ▪ Total destruction of significant heritage items and complete loss of heritage values	▪ Major litigation with significant damages costs; ▪ Jailing of Minister or Secretary; ▪ Court or NGO imposed fine	▪ Minister or Government forced to resign;	▪ Requires management at Ministerial level. ▪ Requires new or amended Legislation.	▪ Project unable to proceed; ▪ Loss of Federal funding; ▪ Election commitment projects cancelled or deferred to balance budget	▪ Project is never able to proceed
Extreme	▪ Prolonged community outrage;	▪ Serious medium term environmental effects; ▪ Partial loss of significant heritage items and values	▪ Major litigation ; ▪ Class action; ▪ Possibility of custodial sentence for Senior Management.	▪ Secretary leaves; ▪ National press reporting. ▪ Vote of no confidence in Minister	▪ Critical event that requires considerable Secretarial time to handle over many months.	▪ Additional funding required from Federal Government at project level ▪ Additional funding required from State to balance program budge	▪ Project is delayed indefinitely
Severe	▪ Long-term community irritant leading to disruptive actions & requiring continual management attention	▪ Moderate short-term effects but not affecting ecosystem function; ▪ Disturbance of heritage items and moderate impact on heritage values	▪ Major breach of regulation with punitive fine; ▪ Significant litigation involving many weeks of Divisional Management time.	▪ Divisional Manager leaves; ▪ State-based media reporting.	▪ Will require the involvement of the Secretary and will take the time of R & T General Manager over an extended period	▪ Other projects cancelled or deferred (Internal budget reallocation.)	▪ Critical timeframe for delivery cannot be met
High	▪ Short term community outrage or longer term unrest & dissention	▪ Minor effects on biological or physiological environment; ▪ Minor effects on heritage values	▪ Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.	▪ Manager disciplined; ▪ Significant level of discussion in Parliament; ▪ Local media reporting.	▪ Significant event that can be managed with the careful management attention; ▪ Will take some Branch-level Management time over several weeks.	▪ Scope reduced on other projects in the program. ▪ Internal budget reallocation.	▪ Significant delay against non-critical timeframe for delivery
Medium	▪ One-off community protest requiring intervention and management attention	▪ Limited damage to minimal area or low significance;	▪ Minor legal issues, non-compliances and breaches of regulation.	▪ Employee disciplined; ▪ Public awareness.	▪ Will require Section Manager attention over several days.	▪ Scope reduced on this project	▪ Moderate delay against non-critical timeframe for delivery
Low	▪ One complaint	▪ Small impact;	▪ Minor breach of regulation.	▪ No visible impact on the portfolio	▪ Impact of event absorbed in normal management activity.	▪ Use of contingency funds is required.	▪ Minor delay to program

Appendix C – Cost Benefit Analysis

Additional Detail - Cost Benefit Analysis

This Appendix provides the supporting detail to Section E5 – Summary Cost Benefit Analysis in the body of the report and the following information is referenced as Section E5 for continuity.

This section assesses the economic viability associated with the replacement of the Mathinna/Evercreech bridges using a Cost Benefit Analysis (CBA) framework. The analysis demonstrates that the project is economically viable, resulting in a net benefit to the community. With a Benefit Cost Ratio (BCR) of 2.6, every dollar of investment results in 2.6 dollars of benefit to the community. The following sections detail the CBA methodology, assumptions and results.

This chapter has been divided into nine sections. These include:

- Section E5.1: Methodology
- Sections E5.2-E5.8: Discussion on costs, benefits and other issues
- Section E5.9: Results

All assumptions and cost and benefit streams are real and have been indexed to 1 July 2011 dollars.

E5.1 Methodology

A CBA model was used to assess the economic viability of the project. The methodology for transport CBA is well established in Australia. There are many guidelines such as *Austroads' Guide to Project Evaluation* and subsequent State road agency guidelines (e.g. the NSW Roads and Traffic Authority or RTA's Economic Analysis Guidelines). The overall approach is generally the same across all jurisdictional guidelines, differing only in the calculation methodology of some of the economic parameters. The RTA's Economic Analysis Guidelines have been chosen to be applied to this analysis on the basis that it makes a clearer distinction between the parameters to adopt for urban and rural roads[1].

[1] With the exception of crash cost where the Austroads' Guide to Project Evaluation was adopted

The general economic parameters have been tabulated in Table 5 below.

Table 5 General economic parameters

Parameter	Description	Value Adopted
Discount Rate	Discount rate by Infrastructure Australia	7%
Price Year	Base year for all costs and benefits	1 July 2011
Inflation	All costs are in real dollars, inflation has been excluded from the analysis	Excluded
Appraisal Period	30 years of operation, post construction	30 years
Escalation Factor	Real escalation over and above CPI	A real increase of 1% pa has been applied to maintenance, travel time cost, vehicle operating cost, environmental cost and crash cost
Annualisation Factor	Conversion factor for transforming Annual Average Daily Traffic (AADT) volumes to annual traffic volumes	240

E 5.1.2 Costs, benefits and forecast

The basic concept of a CBA is to determine the incremental net benefits a project will deliver relative to the base case.

Costs quantified in this CBA include:

- Capital expenditure
- Bridge maintenance cost (Routine and periodic)
- Road maintenance cost (Routine only)

Benefits quantified in this CBA include:

- Road and bridge maintenance cost savings
- Travel time savings
- Vehicle operating cost (VOC) savings
- Avoided environmental cost
- Avoided crash cost

The cost and benefit streams were forecast over a 30 year appraisal period using revised freight volume forecasts based on industry data. Given that the freight volume forecast is a step function (i.e. freight volume is constant from 2008-12, 2013-17, 2018-22 and 2023-27 calendar years - see E5.1.4.1), an assumption has been made about when this actually occurs to enable discrete points to be constructed. For example, it is assumed that the 2013-17 volume of 17,563.5 tonnes per year for basin 1 occurs in 2014-15 financial year. With freight volumes at four discrete years (i.e. 2009-10, 2014-15, 2019-20 and 2024-25 financial years), a linear growth in volumes was assumed between each of these points. For the years beyond 2024-25, a volume based on the previous 15 year was adopted.

The analysis was based on the costs and benefits of two way travel, i.e. the costs and benefits associated with travelling from the plantation area to the port and from the port to the plantation.

It is understood that the existing bridges are in a poor state with a serviceable life of less than 12 months. Under these uncertain conditions and in order to avoid distortions, the maintenance cost and potential benefits from 2011-12 to 2014-15 have been excluded from the analysis.

E 5.1.3 Sensitivity testing

The assumptions and calculations in the rest of this chapter refer to the most likely scenario, also known as the baseline scenario.

In addition, a sensitivity analysis was undertaken to test the outcome of the results to key input assumptions. The nine sensitivity tests include:

- Decrease discount rate from 7.0% to 4.0%;
- Decrease discount rate from 7.0% to 4.4%;
- Increase discount rate from 7.0% to 10.0%;
- Increase capital expenditure by 10%;
- Decrease capital expenditure by 10%;
- Decrease the payload capacity of B-doubles from 47 tonnes to 34 tonnes;
- Increase the payload capacity of mini B-doubles from 29 tonnes to 32 tonnes;
- Removal of all real growth which has been previously applied to maintenance, travel time cost, vehicle operating cost, environmental cost and crash cost ; and
- Remove road maintenance cost.

E 5.1.4 Traffic input

One of the primary inputs into the economic model is the Annual Average Daily Traffic (AADT) volumes originating from the four basins to the Port of Bell Bay located north of Launceston on the heads to the Tamar River. The AADT estimates were based on the assumption that all vehicles operate at capacity, hauling plantation freight volumes (as outlined in section E5.1.4.1) for 240 days in a year. Vehicle usage is primarily plantation industry based with small numbers of passenger vehicles. Mathinna Plains Road has three farms up-road from the bridges. Although Mathinna Plains Road links the Mathinna region to Scottsdale Region, little general traffic utilises this route. On this basis, Mathinna Plains Road is considered an industry use only road.

The roads under the base case are primarily narrow and windy, through heavily forested mountainous terrain. Therefore it has been assumed that the maximum sized vehicle that may be safety used to navigate the area are mini B-doubles with a General Mass Limit (GML) and tare weight of 50 tonnes and 21 tonnes respectively. This results in a payload capacity of 29 tonnes.

On the other hand, the roads under the project case, such as the Midlands Highway and East Tamar Highway (recently upgraded) are can accommodate 68t, 26m HPV/HML vehicles. Therefore it has

been assumed that B-doubles with a HML of 68 tonnes and a tare weight of 21 tonnes will be utilised. This results in a payload capacity of 47 tonnes.

See Table 6 for a summary of AADT volumes.

Table 6 Annual average daily truck traffic volumes

Route	Base case using mini B-doubles only				Project case using HPV / HML B-doubles only			
	2009-10	2014-15	2019-20	2024-25	2009-10	2014-15	2019-20	2024-25
C1	2.2	2.5	4.4	5.1	1.3	1.6	2.7	3.2
C2	2.7	3.2	5.6	6.1	1.7	2.0	3.5	3.8
C3	2.9	2.1	6.6	3.6	1.8	1.3	4.1	2.2
C4	4.7	5.2	10.3	4.9	2.9	3.2	6.4	3.0

The Base and Project case routes utilised can be seen in Maps A4.4 and A4.5 respectively and summaries of the routes can be found in Tables 7 and 8.

Table 7 Base Case route summaries

Base Case			
Route	Road	Start Km	End Km
C1	Eton Road	0	6.5
	Mathinna Plains Road	6.5	26.9
	New River Road	26.9	28.8
	Ringarooma Road	28.8	36.4
	Tasman Highway	36.4	57
	Bridport Main Road	57	125.7
	East Tamar Highway	125.7	128.7
C2	Dilgers Hill Road	0	12.9
	Mount Albert Road	12.9	24.9
	Mathinna Plains Road	24.9	37.2
	New River Road	37.2	39.1
	Ringarooma Road	39.1	46.7
	Tasman Highway	46.7	67.3
	Bridport Main Road	67.3	136
	East Tamar Highway	136	139
C3	Evercreech Road	0	12.5
	Unnamed Road	12.5	16.4
	Dilgers Hill Road	16.4	18.8
	Mount Albert Road	18.8	30.8
	Mathinna Plains Road	30.8	43.1
	New River Road	43.1	45
	Ringarooma Road	45	52.6
	Tasman Highway	52.6	73.2
	Bridport Main Road	73.2	141.9
	East Tamar Highway	141.9	145
C4	Barnes Road	0	6.6
	Mount Nicholas Road	6.6	16.3
	Esk Main Road	16.3	81.4
	Midlands Highway	81.4	137.3
	East Tamar Highway	137.3	188

Table 8 Project Case route summaries

Project Case			
Route	Road	Start (Km)	End (Km)
C1	Eton Road	0	5.6
	Mathinna Plains Road	5.6	6.3
	Mathinna Road	6.3	32
	Esk Main Road	32	83.9
	Midlands Highway	83.9	139.8
	East Tamar Highway	139.8	186
C2	Dilgers Hill Road	0	1.3
	Clytons Road	1.3	3.8
	Mathinna Plains Road	3.8	5.1
	Mathinna Road	5.1	30.8
	Esk Main Road	30.8	82.7
	Midlands Highway	82.7	139.6
	East Tamar Highway	139.6	188
C3	Evercreech Road	0	3.6
	Mathinna Road	3.6	23
	Esk Main Road	23	74.9
	Midlands Highway	74.9	130.8
	East Tamar Highway	130.8	180
C4	Barnes Road	0	4.2
	Evercreech Road	4.2	6.1
	Mathinna Road	6.1	25.5
	Esk Main Road	25.5	77.4
	Midlands Highway	77.4	133.3
	East Tamar Highway	133.3	183

E 5.1.4.1 Projected Harvest Intensity Calculation Method to determine truck volumes

Projected harvest intensity for Mathinna/Evercreech area was generated from the following GIS spatial analysis of data previously determined for the North East Freight Roads Projects.
The GIS analysis was generated using the 3 following datasets:

1) Plantation Catchments– representing projected harvest volume of plantation catchments in five year periods for 25 years. The GIS layer and volumes used in this analysis are sourced directly from the Forestry Freight Model V2 (FFM).
2) Forest Groups– representing forest types such as hardwood plantation and softwood plantation in the Mathinna / Evercreech region.
3) Route Basins– representing the study area where each route basin serves as a reporting area (as illustrated in Map C3).

Methodology used in GIS analysis (including assumptions made):

- Hardwood and softwood plantations are assumed to be the only forest type responsible for the production of plantation harvest volume;
- Plantation catchment numbers and associated harvest volumes values were initially transferred to plantations polygons by a simple spatial overlay;
- Adjustment to harvest volumes was then necessary when plantation catchments were not totally inside in the study area (i.e. the bounded zone shown Map A7.1). Adjustment method used was based on the logic of ratio of plantation areas inside versus plantation areas outside the study area. Where plantation areas within a certain catchment fell totally inside the study area, no adjustment to harvest volumes were made;
- Plantations and associated adjusted harvest volumes were then combined with the route basin GIS layer. The route basins are shown in Map C3;
- An adjustment of harvest volumes was again necessary when plantations issued from a particular plantation catchment occurred between two route basins. The adjustment method was again based on the logic of ratio of plantations area inside versus plantation area outside a given route basin;
- Finally the sum of all plantation harvest volumes was calculated for each individual route basin; and
- These harvest volumes were then split into hardwood / softwood harvest volume based on the ratio of hardwood / softwood areas for each route basins.

Updates to GIS analysis based on industry data:

Following the provision of current industry data in relation to approximate harvest volumes for the Mathinna and Evercreech areas, further GIS analysis was undertaken in order to verify the results of the initial analyses. The steps undertaken and key data used are listed below:

- The harvest volume for softwood plantations in the Mathinna / Evercreech area is approximately 350 tons / ha for a 25 year rotation;
- The harvest volume for hardwood plantations in the Mathinna / Evercreech area is approximately 400 tons / ha for a 15 year rotation;
- Plantations areas were simply extracted from the GIS layer then multiplied by the approximate harvest volume value listed above and then divided by the associated rotation period to give annual harvest volumes;
- Averaged annual hardwood and softwood volumes were calculated from the original GIS analysis (see methodology above) to compare with volumes derived from industry predictions; and

- A comparison ratio was then calculated between the two sets of results. Comparison ratio values ranged from 0.35 to 3.8 with the value of 1 representing when results of the two analyses were identical.

Review of results

In a general manner the GIS analysis did underestimate the harvest volume for each route basin. To accommodate this situation an adjustment factor was applied to the GIS analysis harvest volumes. An adjustment factor was assigned to each route basin from the calculation of the softwood / hardwood comparison ratio mean. New values of harvest volumes were then calculated for each route basin and these values were used in the cost /benefit analysis.

An insight into the methodology engaged to arrive at the total harvested volumes is demonstrated through the following calculation tables:

Route Basin	2003-2007 Harvest (t)	2008-2012 Harvest (t)	2013-2017 Harvest (t)	2018-2022 Harvest (t)	2023-2027 Harvest (t)	25 Year Harvest Sum (t)
C1	109963.6	49352.3	57774.5	101471.1	117527.7	436089.2
C2	384449.2	184850.8	219692.2	382275.4	418976.0	1590243.6
C3	122706.1	140915.3	102061.4	325573.3	177879.9	869135.9
C4	41894.2	55669.6	62411.9	122917.2	57805.3	340698.2

Route Basin	Hardwood Ratio	2003-2007 Hardwood (t)	2008-2012 Hardwood (t)	2013-2017 Hardwood (t)	2018-2022 Hardwood (t)	2023-2027 Hardwood (t)
C1	0.1	10996.4	4935.2	5777.5	10147.1	11752.8
C2	0.5	203758.1	97970.9	116436.9	202606.0	222057.3
C3	0.2	28222.4	32410.5	23474.1	74881.9	40912.4
C4	0.2	8378.8	11133.9	12482.4	24583.4	11561.1

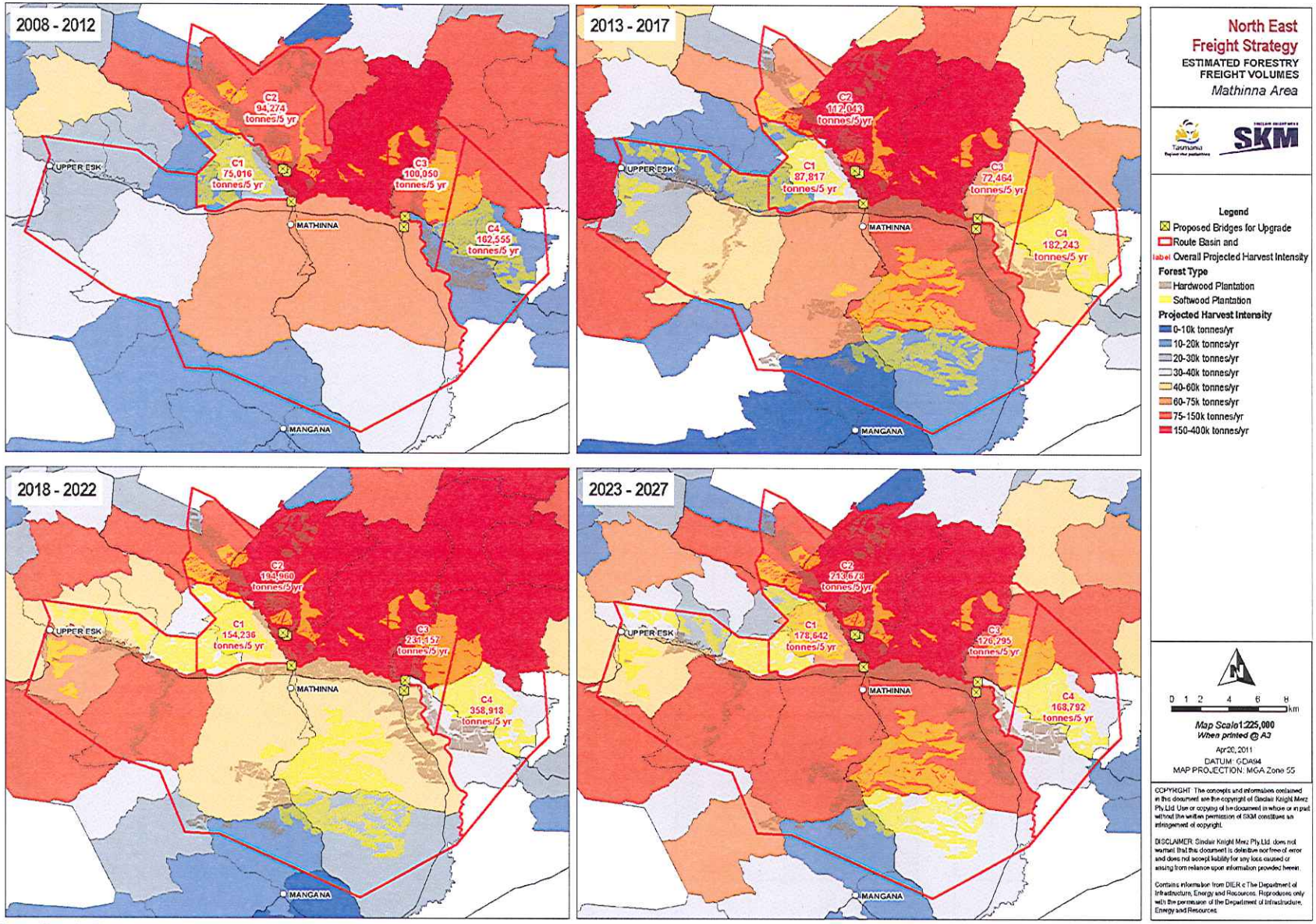
Route Basin	Softwood Ratio	2003-2007 Softwood (t)	2008-2012 Softwood (t)	2013-2017 Softwood (t)	2018-2022 Softwood (t)	2023-2027 Softwood (t)
C1	0.9	98967.2	44417.1	51997.1	91324.0	105775.0
C2	0.5	180691.1	86879.9	103255.3	179669.4	196918.7
C3	0.8	94483.7	108504.8	78587.3	250691.4	136967.5
C4	0.8	33515.4	44535.7	49929.5	98333.8	46244.3

Route Basin	25 Year Hardwood Harvest (t)	25 Year Softwood Harvest (t)	Annual Hardwood Harvest (t)	Annual Softwood Harvest (t)
C1	43608.9	392480.3	1744.4	15699.2
C2	842829.1	747414.5	33713.2	29896.6
C3	199901.3	669234.7	7996.1	26769.4
C4	68139.6	272558.6	2725.6	10902.3

Route Basin	Industry Annual Hardwood Harvest (t)	Industry Annual Softwood Harvest (t)	Hardwood Comparison Ratio	Softwood Comparison Ratio	Averaged Adjustment Factor
C1	3467.3	16714.9	2.0	1.1	1.5
C2	22389.6	10407.8	0.7	0.3	0.5
C3	7406.3	12972.8	0.9	0.5	0.7
C4	10362.2	22186.7	3.8	2.0	2.9

Route Basin	Adjusted 2003-2007 Harvest (t)	Adjusted 2008-2012 Harvest (t)	Adjusted 2013-2017 Harvest (t)	Adjusted 2018-2022 Harvest (t)	Adjusted2023-2027 Harvest (t)
C1	167144.6	75015.5	87817.3	154236.1	178642
C2	196069.1	94273.9	112043.0	194960.5	213678
C3	87121.3	100049.9	72463.6	231157.0	126295
C4	122331.0	162555.3	182242.7	358918.3	168792

The results of the forecasted harvested calculations are shown on the map on the following page. The anticipated harvested volumes are shown diagrammatically on each of the four Basins through a colour key in the map E5.1 overleaf.



Map E5.1: Forecasted Freight Volume

E 5.2 Capital costs

A detailed breakdown of the capital costs including the assumptions and unit rates has been provided in chapter E1 and Appendix C. See Table 9 for a brief summary (please note that the capital costs for 2010 have been absorbed into 2011 – 2013).

Table 9 Capital costs

Bridge No.	Location	Total
3043	Over the Southern Esk River	2,991,444
1350	Over Delvin Creek	1,030,798
2951	Over Delvin Creek	804,533
1251	Over the South Esk River	1,191,395
422	Over an un-named creek	1,509,535
Total	P50 Estimate	7,527,705

E 5.3 Maintenance cost

E 5.3.1Bridge maintenance

Table 10 presents the routine and periodic maintenance cost under the base case and project case. Under the base case, routine maintenance has only been applied to the 2011-12 financial year. It is assumed that under the base case, the existing bridges will reach the end of their useful life by the start of 2012-13, and therefore shut down after 2011-12.

Table 10 Bridge maintenance cost

Bridge No.	Base case	Project case	
	Routine	Routine	Periodic
	$/pa	$/pa	$/per 30 years
3043	10,000.0	1,000.0	18,000.0
1350	3,000.0	1,000.0	5,000.0
2951	3,000.0	1,000.0	5,000.0
1251	3,000.0	1,000.0	5,000.0
422	5,000.0	1,000.0	7,500.0
Total	24,000.0	5,000.0	40,500.0

E 5.3.2 Road maintenance

The cost of road maintenance is a function of the length of road that is being used and the relevant maintenance cost rates. Tables 11 and 12 presents the road lengths and rates adopted. Therefore the road maintenance cost is

- Base case: $1,030,750 per year
- Project case: $441,750 per year[2]

Table 11 Road lengths adopted for maintenance

Type	Base case	Project case
Road without trucks (km)	16.5	78.5
Road with trucks (km)	78.5	16.5

Table 12 Road maintenance rates

Type	$/km per pa
Road without trucks	3,000.0
Road with trucks	12,500.0

E 5.4 Travel time cost

Travel time cost is a function of total hours travelled (Distance divided by speed) and the Value of Time (VOT). The VOT adopted was based on the RTA's economic analysis guidelines (see table 13 below) and included:

From plantation to port:

- **HPV / HML B-doubles:** $67.4 per vehicle-hour
- **Mini B-doubles:** $52.2.0 per vehicle-hour. This is an adjustment to the VOT for HPV / HML B-doubles, adopted to reflect reduced freight carried.

From port to plantation:

- **HPV / HML B-doubles:** $27.7 per vehicle-hour. This reflects the fact that the vehicles will be unladen on the port to plantation leg of the return trip.
- **Mini B-doubles:** $27.7 per vehicle-hour. This reflects the fact that the vehicles will be unladen on the port to plantation leg of the return trip.

[2] This is the real cost in 2011-12 if the project case is in operation. As discussed in earlier chapters, a real increase of 1% has been applied to maintenance.

Table 13 Value of time

Type	Occupancy	VoT (Excl freight)		Freight	VOT (Incl freight)
		$/person.h	$/veh-h	$/veh-h	$/veh-h
Private car	1.8	12.8	23.1	-	**23.1**
Business car	1.4	41.1	56.7	-	**56.7**
Light commercial	1.3	25.2	32.7	0.6	**33.4**
Heavy commercial	1.0	26.6	26.6	16.9	**43.5**
B-Double/ Road train	1.0	27.7	27.7	39.8	**67.4**

Source: Table 17, RTA Economic Analysis Manual (Updated to 1 July 2011 dollars)

E 5.5 Vehicle Operating Cost

The RTA's economic analysis guidelines provided VOC rates for variations in vertical alignment, speed, pavement conditions; volume capacity ratio and road curvature. Therefore the vertical alignment, speed and pavement conditions along each of the routes have been estimated and assessed for the base case and project case in order to determine the most appropriate base VOC to adopt[3].

The terrain in north-east of Tasmania is mountainous, and the roads traverse windy, steep terrain. Therefore, an incremental VOC was added onto the base VOC to reflect the additional wear and tear on tires etc. The incremental value was based on the estimated road curvature and the relevant rates provided by the RTA's economic analysis guidelines.

Table 14 provides a summary of the route lengths, weighted operating speed and weighted VOC in cents per km travelled.

Table 14 Summary of vehicle operating cost

Basin	Base case			Project case		
	Length (km)	Weighted speed (km/h)	Weighted VOC (c/km)	Length (km)	Weighted speed (km/h)	Weighted VOC (c/km)
C1	130.0	56.4	143.9	185.9	78.4	128.6
C2	139.0	53.4	149.0	188.0	78.9	125.9
C3	144.5	51.5	155.3	180.0	78.9	124.9
C4	188.0	74.6	132.8	183.0	78.4	125.3

Notes on calculation of VOC's for each of the 4 basins:

The average grade was found for sections of roads with similar grade values. The profiles of each route have been provided complete with a full list of grades.

[3] Volume capacity ratio assumed to be zero due to no congestion.

The vehicle operating speeds were determined using the vehicle speed matrix used in the Forestry Freight Model V2 (this assumes a fully laden B-Double as the operating vehicle). The operating speed chosen for each section of road was based on what class of road, whether the road was sealed or unsealed and also the road gradient. The road classes and conditions that were used to find the operating speed can be seen in below in Table 15. It should be noted that Bridport Main Road, Esk Main Road and Ringarooma Road have been assumed to be state highways.

In order to incorporate the costs associated with corners, roads have been assigned with Roads and Traffic Authority of New South Wales (RTA) curvature class design speeds. Feeder and arterial roads have been assigned a curvature class design speed of 50 km/h, whilst highways have been assigned 80 km/h (the maximum curvature class defined in the RTA Economic Analysis Guidelines). These values are shown below in Table 15.

Table 15: Summary of Road Classes, Conditions and Curvatures.

Road Name	Class	Sealed / Unsealed	Condition	Curvature Class Design Speed
East Tamar Highway	State Highway	Sealed	Excellent	80 km/h
Midlands Highway	State Highway	Sealed	Excellent	80 km/h
Bridport Main Road	State Highway	Sealed	Moderate	80 km/h
Esk Main Road	State Highway	Sealed	Moderate	80 km/h
Barnes Road	Arterial Road	Unsealed	Poor	50 km/h
Mathinna Road	Arterial Road	Sealed	Moderate	50 km/h
Mathinna Plains Road	Arterial Road	Sealed / Unsealed	Poor	50 km/h
Mount Nicholas Road	Arterial Road	Unsealed	Poor	50 km/h
New River Road	Arterial Road	Sealed	Poor	50 km/h
Ringarooma Road	State Highway	Sealed	Poor	80 km/h
Tasman Highway	State Highway	Sealed	Excellent	80 km/h
Claytons Road	Feeder Road	Unsealed	Poor	50 km/h
Dilgers Hill Road	Feeder Road	Unsealed	Poor	50 km/h
Eton Road	Feeder Road	Unsealed	Poor	50 km/h
Evercreech Road	Feeder Road	Sealed / Unsealed	Poor	50 km/h
Mount Albert Road	Arterial Road	Unsealed	Poor	50 km/h
Unnamed Road	Access Road	Unsealed	Poor	50 km/h

Table 16 - Matrix Used to Determine Vehicle Speeds

B-double fully laden												
LIST road class DIER speed index	*0.7*				*0.66*		*0.4*		*0.3*		*0.22*	
Locality (slope class)	Urban (contrained)		Rural (0-2%)		Rural (2-4%)		Rural (4-6%)		Rural (6-8%)		Rural (8%>)	
Road class \ seal	Unsealed	Sealed	Unsealed	Sealed	Unsealed	Sealed	Unsealed	Sealed	Unsealed	Sealed	Unsealed	Sealed
National/State Highway		63		90		59		36		27		20
Major Arterial Road		60	60	85	39	56	24	34	18	26	13	19
Arterial Road		42	42	60	28	40	17	24	13	18	9	13
Feeder	25	35	35	50	23	33	14	20	11	15	8	11
Access Road	12	18	18	25	12	17	7	10	5	8	4	6
Vehicular Track			15		8		5		4	5	4	
Forestry Roads (Class 1)			40		26		16		12		9	
Forestry Roads (Class 2)			30		20		12		9		7	
Forestry Roads (Class 3)			20		13		8		6		4	
Forestry Roads (Class 4)			15		10		6		5		3	

E5.6 Environmental Cost

The cost of rural freight vehicles on the environment is a function of tonnes-kilometre travelled and the relevant unit rates. The unit rates applied were adopted from the RTA's economic analysis guideline (see table 17 below).

The rates take into consideration externalities such as noise and air pollution, and suggest that the environmental cost is $32.7 dollars per 1000 tonnes-km travelled (or $0.03 per tonne-km travelled). Therefore a mini B-double with a GML of 50 tonnes will exert an environmental cost of $1.6 per kilometre travelled. The following is a summary of the environmental unit rates:

From plantation to port

- **HPV / HML B-doubles:** $1.6 per vehicle-km.
- **Mini B-doubles:** $2.2 per vehicle-km.

From port to plantation

- **HPV / HML B-doubles:** $0.7 per vehicle-km.
- **Mini B-doubles:** $0.7 per vehicle-km.

The environmental unit rate from the port to plantation is less than the unit rate from the plantation to the port because vehicles will be un-laden on this leg of the return trip.

Table 17 Environmental cost

Type	Freight ($/1000 tonne-km)
Noise	0.4
Air Pollution	0.2
Water Pollution	1.4
Greenhouse	5.3
Nature and Landscape	4.0
Urban Separation	0.0
Upstream & Downstream costs	21.3
Total	**32.7**

Source: Table 18, Economic Analysis Manual (Updated to 1 July 2011 dollars)

E5.7 Crash Cost

Crash cost is a function of the estimated number of crashes and the assumed cost per crash, both adopted from Austroads' guide to project evaluation.

As the crash categories in table 18 do not match up with the cost categories in table 19, the fatal and injury class crash rates were summed together and then multiplied by the average casualty cost rate. This resulted in the following:

- Gravel road crash cost rate of $7.3m per 100 million kilometre travelled
- Sealed road crash cost rate of $6.3m per 100 million kilometre travelled

Table 18 Estimated number of crashes per 100 million km of travel

Road Description	Accident Category			
	Fatal	Injury	Property	Total
Undivided gravel road with a carriageway equal to or less than 4.5m	1.75	33.3	91.0	126.0
Undivided sealed road with a carriageway equal to or less than 4.5m	1.50	28.5	74.0	104.0

Source: Table 4.1 of Project Evaluation Data, Austroads' Guide to Project Evaluation

Table 19 Estimated average crash cost by severity category

Jurisdiction	Accident Category				
	Fatal	Serious injury	Minor injury	Average casualty	PDO
Tasmania	2,434,767.7	514,069.3	24,517.2	188,680.4	8,473.7

Source: Table 4.3 of Project Evaluation Data, Austroads' Guide to Project Evaluation (Updated to 1 July 2011 dollars)

E5.9 Results

E5.9.1 Annual average daily traffic

Figure E5.9.1.1 and Figure E5.9.1.2 shows the estimated AADT volumes under the base case and project case respectively.

Figure E5.9.1.1 AADT under the base case

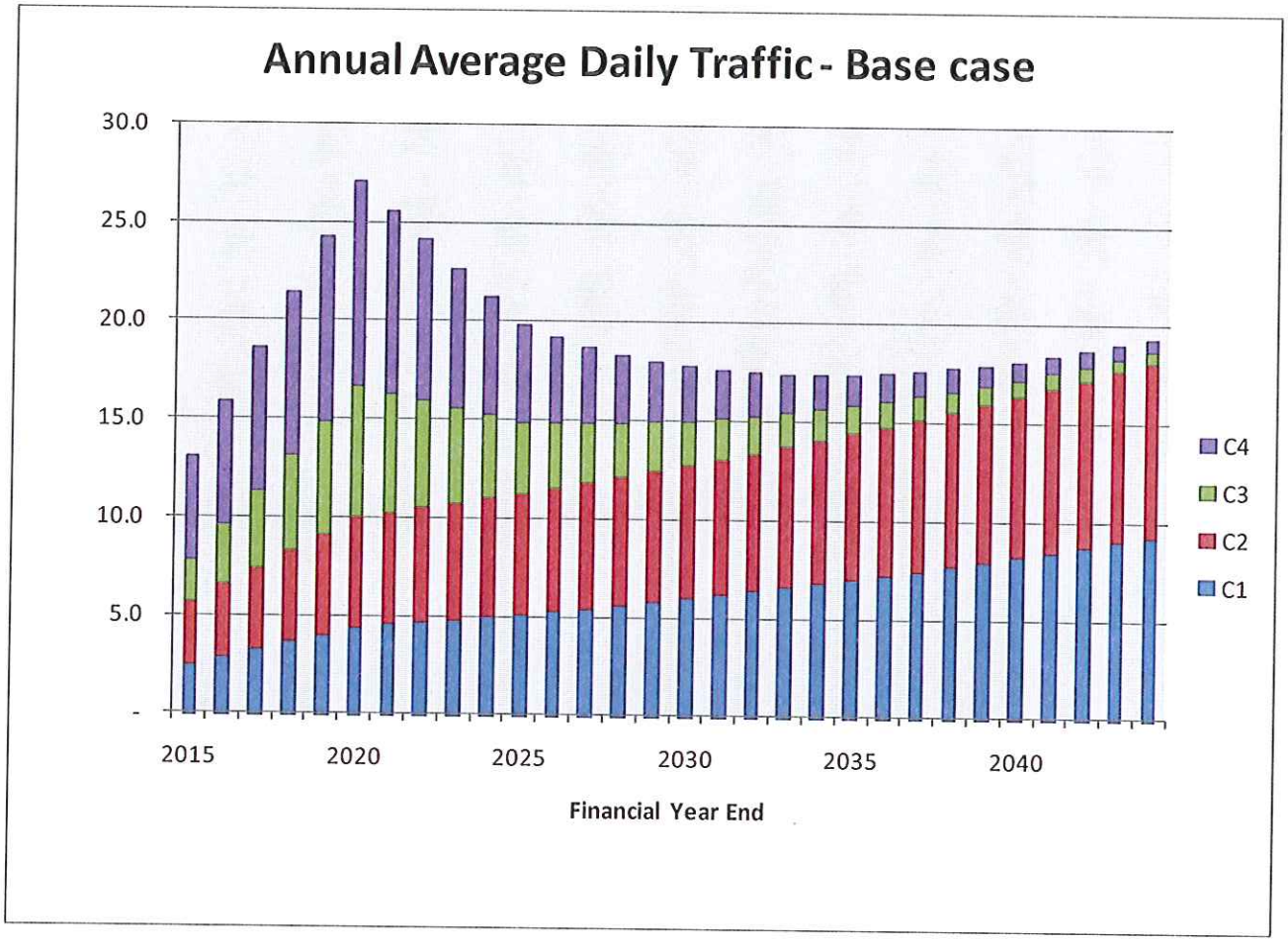
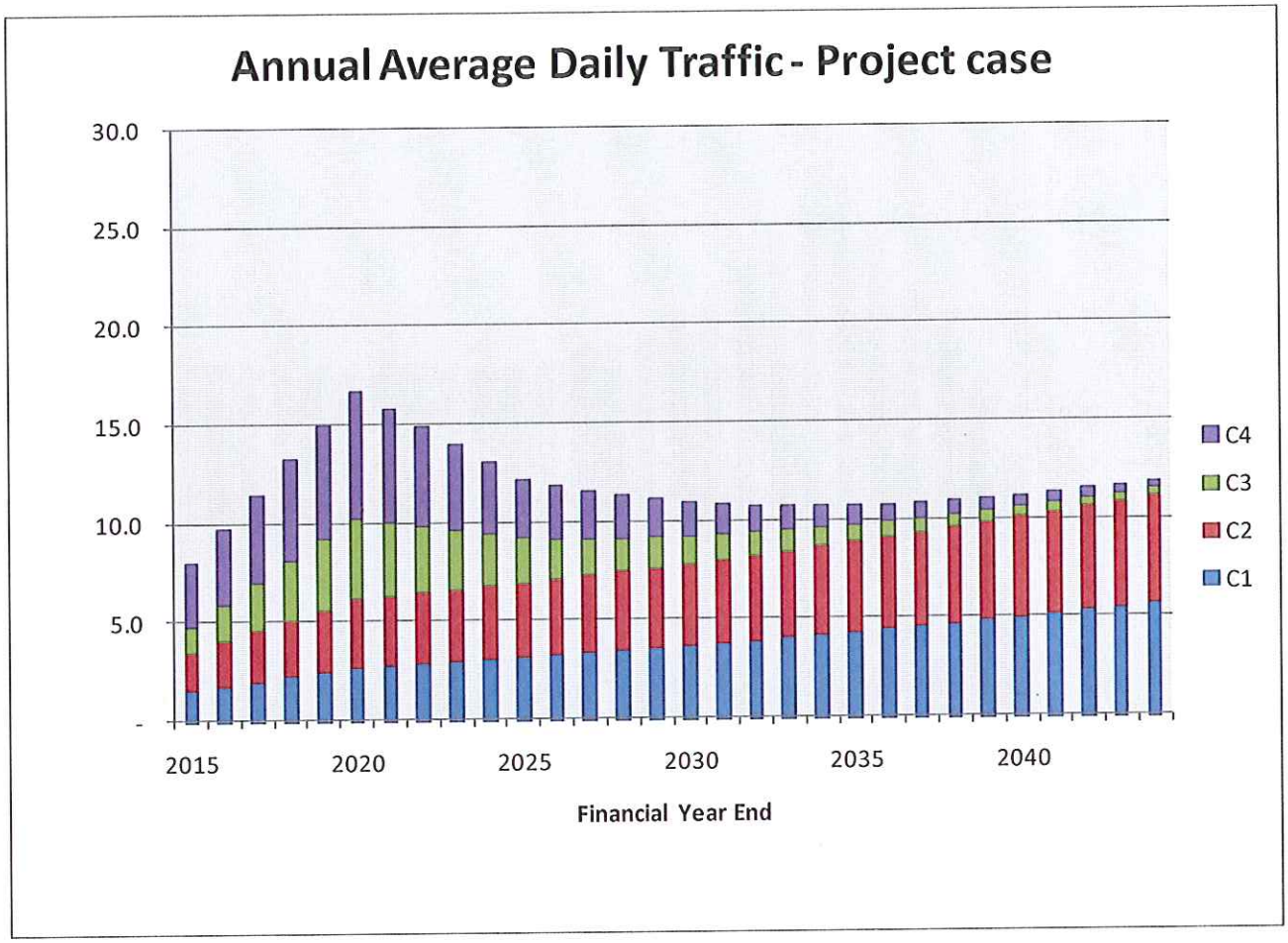


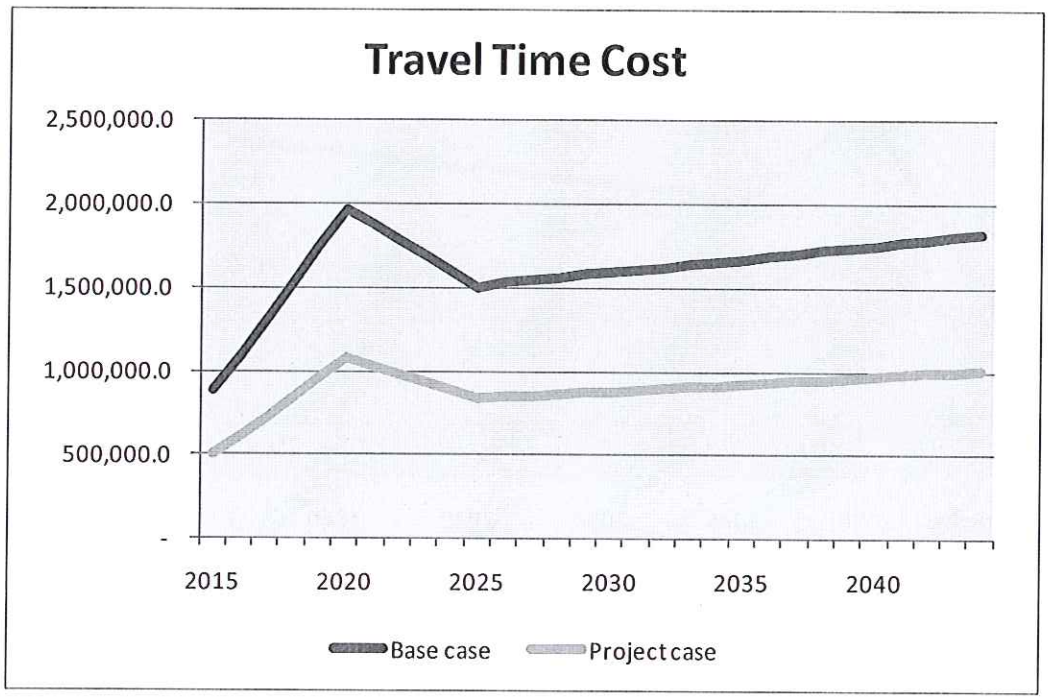
Figure E5.9.1.2 AADT under the project case



E5.9.2 Travel time costs

As discussed in chapter E5.4, travel time cost is a function of total hours travelled and the VOT. Figure E5.9.2.1 shows that the travel time cost under the base case is higher than under the project case over the entire appraisal period. This illustrates the fact that any gains from the shorter travel distance at 601.5km compared to 736.8km (See table 12 for distance under the base case and project case) and a lower VOT[4] is offset by the project case's higher weighted travel speed and lower AADT volumes.

Figure E5.9.2.1 Travel time cost

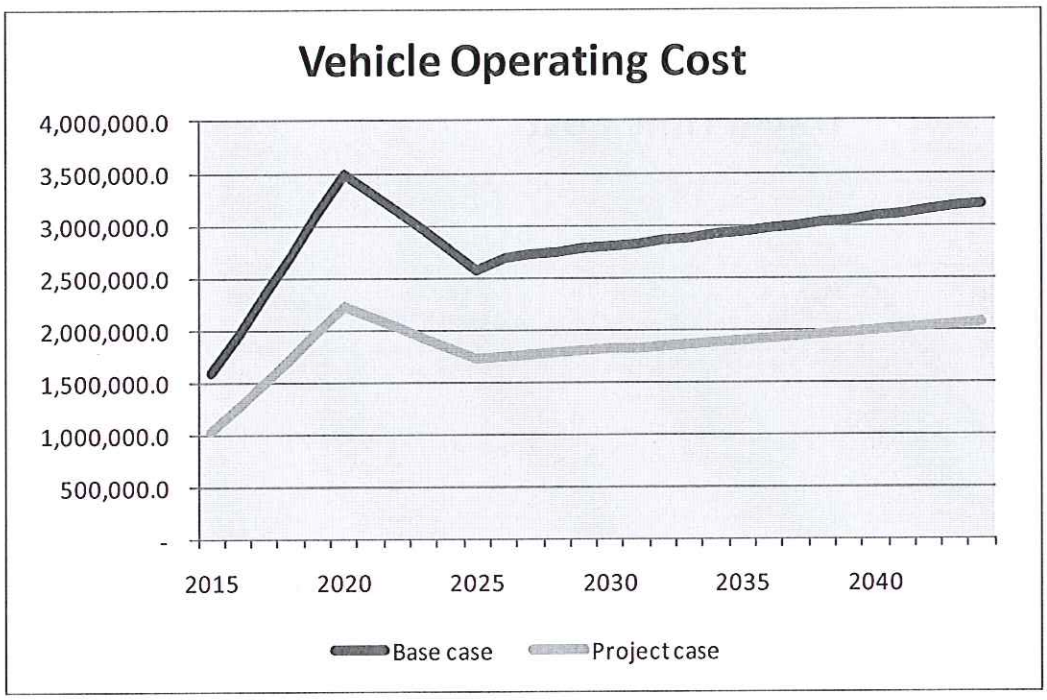


[4] With the exception of the port to forest leg of the return trip where the VOT under the base case and project case are equal.

E5.9.3 Vehicle operating cost savings

As discussed in chapter E5.5, vehicle operating cost is a function of distance travelled and VOC rates as prescribed by the RTA's economic analysis guidelines. Figure E5.9.3.1 shows the results of the analysis and it is clear that the vehicle operating cost is higher under the base case than project case. This means that any gains from shorter travel distance (See table 12 for distance under the base case and project case) under the base case is offset by the project case's lower weighted VOC rates and lower AADT volumes.

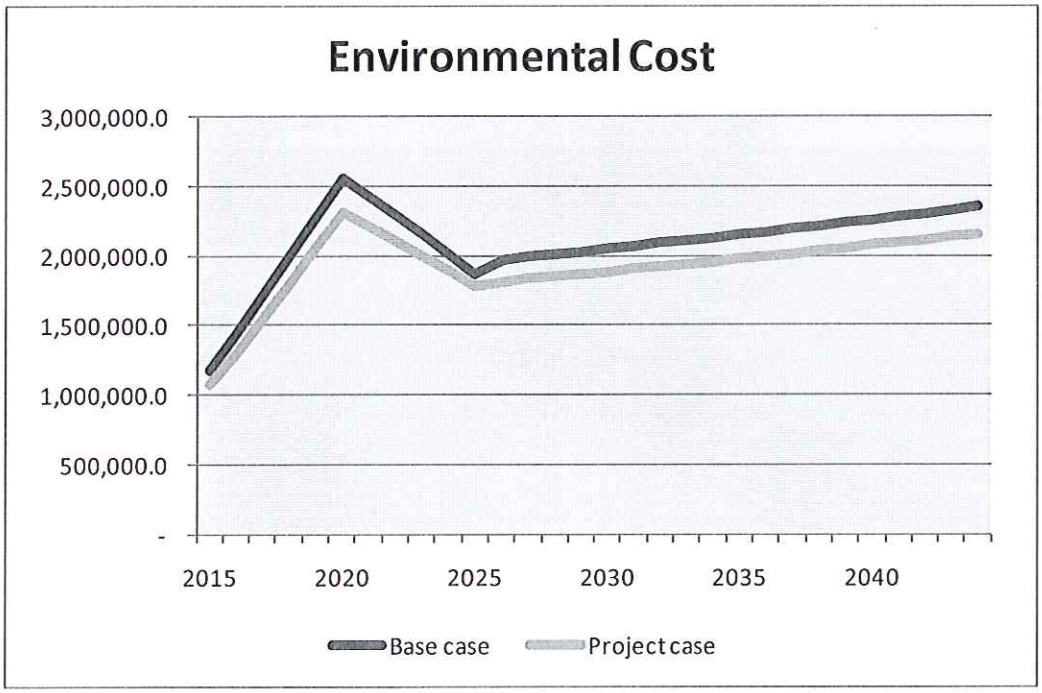
Figure E5.9.3.1 Vehicle operating cost results



E5.9.4 Avoided environmental cost

The environmental cost under the base case is marginally higher than under the project case (See figure E5.9.4.1). This means that the combination of the base case's higher AADT volumes, shorter distance and lower environmental externality rate[5] roughly balances the effect of the project case's lower AADT volumes, greater distance and higher externality rate.

Figure E5.9.4.1 Environmental cost results

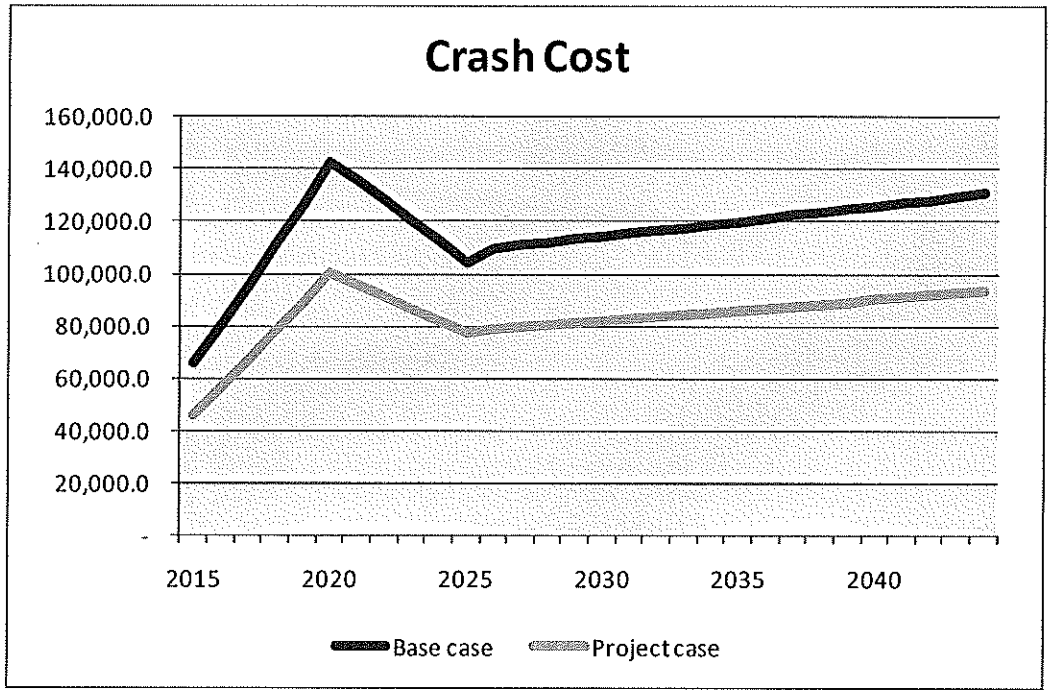


[5] With the exception of the port to forest leg of the return trip where the environmental externality rate under the base case and project case are equal.

E5.9.5 Avoided crash cost

Crash cost is a function of the estimated number of crashes. From figure E5.9.5.1, it can be seen that the crash cost under the base case is higher than under the project case. This means that the any gains from the base case's shorter travel distance is eliminated by the project case's lower AADT volumes and lower crash estimates. Due to the relatively low total vehicle-km travelled under the base case and project case, the avoided crash cost makes up a very small component of the benefit streams in the overall analysis.

Figure E5.9.5.1 Crash cost results



E5.9.6 Benefit Cost Ratio (BCR) results

Table 21 presents a summary of Net Present Value (NPV) and BCR results under the baseline scenario and sensitivity tests. The analysis returned a BCR of approximately 2.6 under the baseline scenario. This means that every dollar of investment results in 2.6 dollars of benefit to the community. Despite the low AADT figures, this BCR is not unexpected and may be attributed to factors such as:

- The low capital cost associated with the project
- The bridges are a part of a critical link between productive areas and the main road leading to the port
- The bridges link up productive areas with high quality roads which are capable of carrying B-doubles
- Without the bridges, vehicles will be forced to take highly windy, mountainous and gravel roads

In all the sensitivity tests, the BCR is greater than one. This means that under varying circumstances and different states of the world, the project is expected to deliver more than 1 dollar of benefits for each dollar of investment spent.

Table 21 Summary of results

Scenario/Test	Description	NPV	BCR
(0) Baseline	7.0% Discount rate	$ 20.25 m	2.6
1	4.0% Discount rate	$ 33.85 m	3.2
2	4.4% Discount rate	$ 31.55 m	3.1
3	10.0% Discount rate	$ 12.33 m	2.1
4	Increase capex by 10%	$ 19.53 m	2.5
5	Decrease capex by 10%	$ 20.97 m	2.7
6	Decrease the payload capacity of B-doubles from 47t to 34t	$ 14.07 m	2.1
7	Increase the payload capacity of Mini B-doubles from 29t to 32t	$ 17.65 m	2.4
8	Remove all real growth	$ 16.98 m	2.4
9	Remove road maintenance cost	$ 13.00 m	2.8

E 6. Economic Assumptions Used in Financial Analysis

A number of assumptions were used in this financial analysis, which are listed below.

- The only road users are Forestry Industry. This is a conservative approach considering there would be benefits for the agricultural business, however, there are a limited number of farms in the area and it is understood that agriculture business in the area has turned largely to forestry plantation for income.
- Volumes of timber harvested have been based on the FFM and recent industry data supplied by Timberlands. Information has been supplied through:
    3. forecasted volumes, and
    4. production volumes per hectare for both soft woods and hardwoods.
- The implementation of the 12 Point Forest Action Plan would have minimal effect on plantation freight in the Mathinna / Evercreech area due to the extensive plantation areas in the region.
- The lifespan expectancy of the existing bridges is only one year (under full load limits).
- Many of the road conditions have been measured as "poor" in referencing vehicle operating costs. This assumption has been made to account for the often poor road / weather conditions as well as the additional expense associated with vehicle operation in Tasmania when compared those experienced in other states (due to adverse terrain, rain intensity and road geometry).

Appendix D – Route Profiles

Route profiles depicting the routes available with and without the construction of the upgraded bridges are shown in Map A4.4 and A4.5 respectively (see section A4).

The Base Case routes C1 – C4 show the likely direction of freight vehicles due to the load restrictions on the bridges, while the Project Case routes show the preferred travel option that vehicles are able to access due to the replacement of the 5 bridges to HPV/HML capacity.

The starting locations for each route (C1 – C4) were determined using local government and industry contacts information, as well as Map A7.1, which depicts the likely direction of travel for freight vehicles transporting timber to Bell Bay, within the Mathinna area. It can be seen that within the bounded zone, the most likely route for freight vehicles includes the use of Mathinna Plains Road and Evercreech Road.

The area of timber harvesting associated with each route (i.e. route basins) was calculated using the likely travel direction zone and the starting points for each route, as well as incorporating a number of other factors including the including the distance to another route option, and the location of the major roads and rivers. The route basins are shown in Map C3. These areas have been used to calculate the projected volumes of timber that are directly related to the upgrade of the 5 bridges along Mathinna Plains Road and Evercreech Road. Harvest areas and travel options outside the route basins were not considered; as the bridge replacements would have no effect (i.e. freight vehicles can either bypass the bridges or are more likely to use another route).

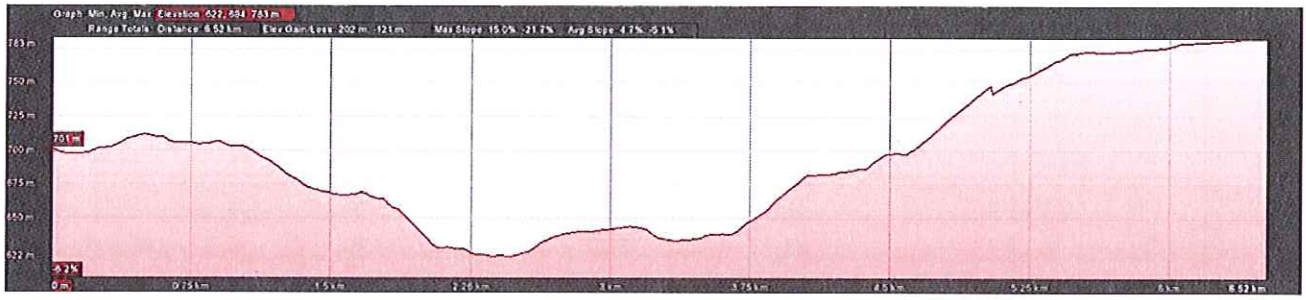
C1. Trip Profile: Mathinna area to Bell Bay via Scottsdale Option A – Via Eton Road

Route Summary:

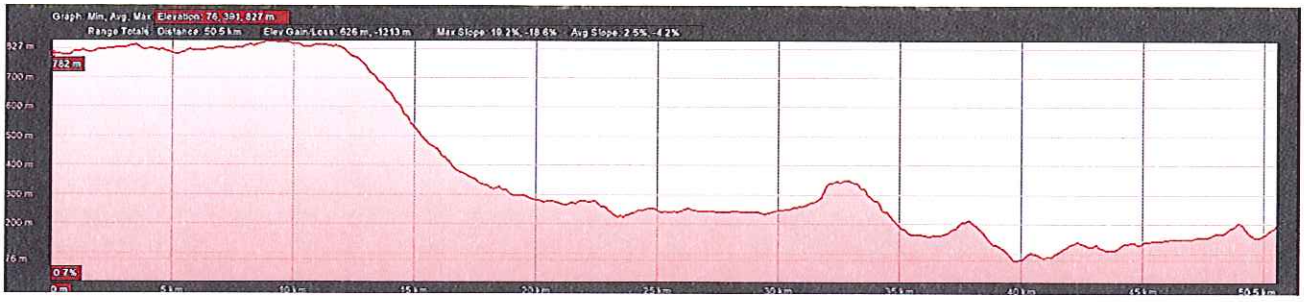
- **Eton Road (0 to 6.5 km)**
- **Mathinna Plains Road (6.5 km to 26.9 km)**
- **New River Road (26.9 km to 28.8 km)**
- **Ringarooma Road (28.8 km to 36.4 km)**
- **Tasman Highway (36.4 km to 57 km)**
- **Bridport Main Road (57 km to 125.7 km)**
- **East Tamar Highway (125.7 km to 128.7 km)**

    - Total Distance: 128.7 km
    - Elevations - Start: 701 m. End: 36 m. Min: 17 m Max: 782 m
    - Maximum slope: 19%

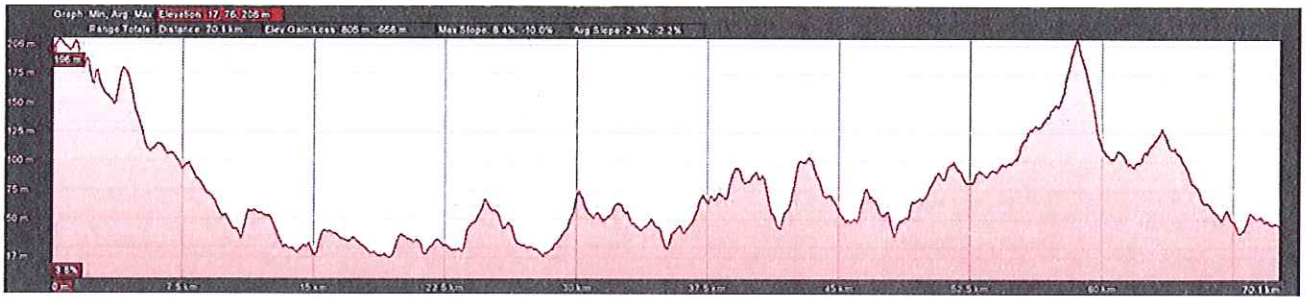
Elevation Profiles:



Eton Rd Profile



Eton Road to Scottsdale Profile



Scottsdale to Bell Bay Profile

Route C1

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition	
								Surface	Condition
1	Eton Rd	0.0	0.1	50.0	0.1	5.0	14	Gravel	Poor
2	Eton Rd	0.1	0.2	50.0	0.1	2.0	35	Gravel	Poor
3	Eton Rd	0.2	0.5	50.0	0.3	5.0	14	Gravel	Poor
4	Eton Rd	0.5	0.7	50.0	0.2	5.0	14	Gravel	Poor
5	Eton Rd	0.7	0.9	50.0	0.2	2.0	35	Gravel	Poor
6	Eton Rd	0.9	1.6	50.0	0.7	7.0	11	Gravel	Poor
7	Eton Rd	1.6	1.7	50.0	0.1	2.0	35	Gravel	Poor
8	Eton Rd	1.7	1.9	50.0	0.2	7.0	11	Gravel	Poor
9	Eton Rd	1.9	2.1	50.0	0.2	13.0	8	Gravel	Poor
10	Eton Rd	2.1	2.2	50.0	0.1	2.0	35	Gravel	Poor
11	Eton Rd	2.2	2.3	50.0	0.1	7.0	11	Gravel	Poor
12	Eton Rd	2.3	2.5	50.0	0.2	2.0	35	Gravel	Poor
13	Eton Rd	2.5	2.7	50.0	0.2	6.0	14	Gravel	Poor
14	Eton Rd	2.7	3.2	50.0	0.5	3.0	23	Gravel	Poor
15	Eton Rd	3.2	3.3	50.0	0.1	7.0	11	Gravel	Poor
16	Eton Rd	3.3	3.5	50.0	0.2	2.0	35	Gravel	Poor
17	Eton Rd	3.5	3.5	50.0	0.0	5.0	14	Gravel	Poor
18	Eton Rd	3.5	3.7	50.0	0.1	3.0	23	Gravel	Poor
19	Eton Rd	3.7	4.1	50.0	0.4	10.0	8	Gravel	Poor
20	Eton Rd	4.1	4.4	50.0	0.3	2.0	35	Gravel	Poor
21	Eton Rd	4.4	4.5	50.0	0.1	8.0	11	Gravel	Poor
22	Eton Rd	4.5	4.6	50.0	0.1	2.0	35	Gravel	Poor
23	Eton Rd	4.6	5.5	50.0	0.9	9.0	8	Gravel	Poor
24	Eton Rd	5.5	6.5	50.0	1.1	2.0	35	Gravel	Poor
25	Mathinna Plains Rd	6.5	7.5	50.0	1.0	5.0	17	Gravel	Poor
26	Mathinna Plains Rd	7.5	18.1	50.0	10.6	2.0	42	Gravel	Poor
27	Mathinna Plains Rd	18.1	20.9	50.0	2.8	8.0	13	Gravel	Poor
28	Mathinna Plains Rd	20.9	24.7	50.0	3.8	8.0	18	Sealed	Poor
29	Mathinna Plains Rd / New River Rd	24.7	28.8	50.0	4.1	3.0	40	Sealed	Poor
30	Ringarooma Rd	28.8	29.9	80.0	1.1	5.0	36	Sealed	Poor
31	Ringarooma Rd / Tasman Highway	29.9	38.0	80.0	8.1	2.0	90	Sealed	Poor
32	Tasman Highway	38.0	38.5	80.0	0.5	11.0	20	Sealed	Excellent
33	Tasman Highway	38.5	39.6	80.0	1.1	2.0	90	Sealed	Excellent
34	Tasman Highway	39.6	41.8	80.0	2.2	8.0	27	Sealed	Excellent
35	Tasman Highway	41.8	43.3	80.0	1.5	2.0	90	Sealed	Excellent
36	Tasman Highway	43.3	44.4	80.0	1.1	5.0	36	Sealed	Excellent
37	Tasman Highway	44.4	46.2	80.0	1.8	7.0	27	Sealed	Excellent
38	Tasman Highway	46.2	46.8	80.0	0.6	5.0	36	Sealed	Excellent
39	Tasman Highway	46.8	47.6	80.0	0.8	2.0	90	Sealed	Excellent
40	Tasman Highway	47.6	48.5	80.0	0.9	5.0	36	Sealed	Excellent

41	Tasman Highway	48.5	50.2	80.0	1.7	2.0	90	Sealed	Excellent
42	Tasman Highway	50.2	50.5	80.0	0.3	5.0	36	Sealed	Excellent
43	Tasman Highway	50.5	54.7	80.0	4.2	2.0	90	Sealed	Excellent
44	Tasman Highway	54.7	55.4	80.0	0.7	5.0	36	Sealed	Excellent
45	Tasman Highway	55.4	56.2	80.0	0.8	6.0	36	Sealed	Excellent
46	Tasman Highway	56.2	56.9	80.0	0.7	5.0	36	Sealed	Excellent
47	Bridport Main Rd	56.9	58.2	80.0	1.3	3.0	59	Sealed	Moderate
48	Bridport Main Rd	58.2	59.3	80.0	1.1	5.0	36	Sealed	Moderate
49	Bridport Main Rd	59.3	60.4	80.0	1.1	3.0	59	Sealed	Moderate
50	Bridport Main Rd	60.4	60.9	80.0	0.5	6.0	36	Sealed	Moderate
51	Bridport Main Rd	60.9	62.4	80.0	1.5	5.0	36	Sealed	Moderate
52	Bridport Main Rd	62.4	67.7	80.0	5.3	3.0	59	Sealed	Moderate
53	Bridport Main Rd	67.7	68.1	80.0	0.4	5.0	36	Sealed	Moderate
54	Bridport Main Rd	68.1	72.0	80.0	3.9	2.0	90	Sealed	Moderate
55	Bridport Main Rd	72.0	72.4	80.0	0.4	5.0	36	Sealed	Moderate
56	Bridport Main Rd	72.4	80.4	80.0	8.0	3.0	59	Sealed	Moderate
57	Bridport Main Rd	80.4	80.7	80.0	0.3	5.0	36	Sealed	Moderate
58	Bridport Main Rd	80.7	86.7	80.0	6.0	3.0	59	Sealed	Moderate
59	Bridport Main Rd	86.7	87.0	80.0	0.3	5.0	36	Sealed	Moderate
60	Bridport Main Rd	87.0	95.4	80.0	8.4	3.0	59	Sealed	Moderate
61	Bridport Main Rd	95.4	95.9	80.0	0.5	5.0	36	Sealed	Moderate
62	Bridport Main Rd	95.9	97.6	80.0	1.7	3.0	59	Sealed	Moderate
63	Bridport Main Rd	97.6	98.1	80.0	0.5	5.0	36	Sealed	Moderate
64	Bridport Main Rd	98.1	98.5	80.0	0.4	3.0	59	Sealed	Moderate
65	Bridport Main Rd	98.5	99.7	80.0	1.2	5.0	36	Sealed	Moderate
66	Bridport Main Rd	99.7	100.3	80.0	0.6	3.0	59	Sealed	Moderate
67	Bridport Main Rd	100.3	101.0	80.0	0.7	3.0	59	Sealed	Moderate
68	Bridport Main Rd	101.0	103.0	80.0	2.0	3.0	59	Sealed	Moderate
69	Bridport Main Rd	103.0	103.4	80.0	0.4	5.0	36	Sealed	Moderate
70	Bridport Main Rd	103.4	104.7	80.0	1.3	5.0	36	Sealed	Moderate
71	Bridport Main Rd	104.7	105.0	80.0	0.3	5.0	36	Sealed	Moderate
72	Bridport Main Rd	105.0	105.9	80.0	0.9	3.0	59	Sealed	Moderate
73	Bridport Main Rd	105.9	106.1	80.0	0.2	3.0	59	Sealed	Moderate
74	Bridport Main Rd	106.1	114.4	80.0	8.3	3.0	59	Sealed	Moderate
75	Bridport Main Rd	114.4	115.4	80.0	1.0	5.0	36	Sealed	Moderate
76	Bridport Main Rd	115.4	117.4	80.0	2.0	5.0	36	Sealed	Moderate
77	Bridport Main Rd / East Tamar Highway	117.4	130.0	80.0	12.6	2.0	90	Sealed	Moderate

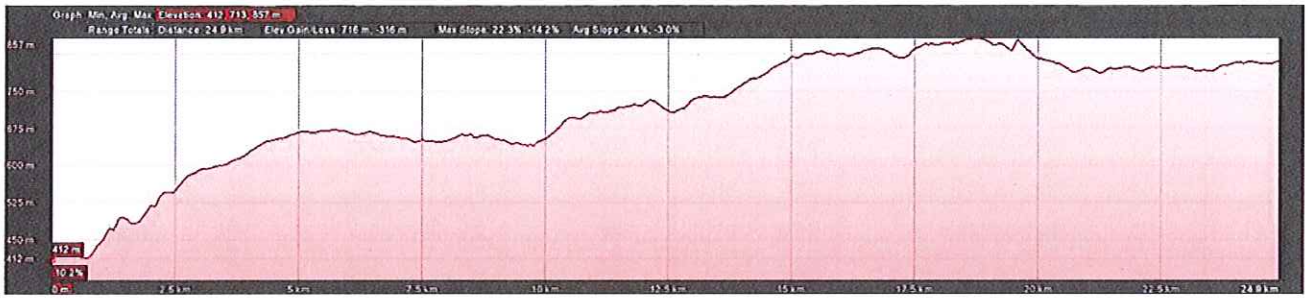
C2. Trip Profile: Mathinna area to Bell Bay via Scottsdale Option B – Along Dilgers Hill Road and Mount Albert Road

Route Summary:

- **Dilgers Hill Road (0 to 12.9 km)**
- **Mount Albert Road (12.9 km to 24.9 km)**
- **Mathinna Plains Road (24.9 to 37.2 km)**
- **New River Road (37.2 km to 39.1 km)**
- **Ringarooma Road (39.1 km to 46.7 km)**
- **Tasman Highway (46.7 km to 67.3 km)**
- **Bridport Road (67.3 km to 136 km)**
- **East Tamar Highway (136 km to 139km)**

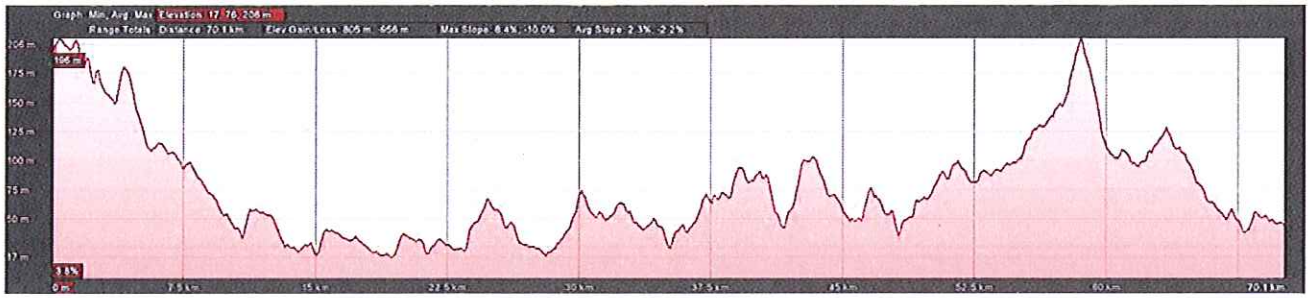
- Total Distance: 139 km.
- Elevations - Start: 412 m. End: 36 m. Min: 17 m Max: 856 m
- Maximum Slope: 22%

Elevation Profiles:



Dilgers Hill Road and Mount Albert Road Profile

Mount Albert Road to Scottsdale Profile



Scottsdale to Bell Bay Profile

Route C2

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition Surface	Pavement Condition Condition
1	Dilgers Hill Rd	0.0	0.3	50.0	0.3	9	8	Gravel	Poor
2	Dilgers Hill Rd	0.3	0.7	50.0	0.4	6	14	Gravel	Poor
3	Dilgers Hill Rd	0.7	1.4	50.0	0.8	12	8	Gravel	Poor
4	Dilgers Hill Rd	1.4	1.7	50.0	0.3	4	23	Gravel	Poor
5	Dilgers Hill Rd	1.7	2.0	50.0	0.4	10	8	Gravel	Poor
6	Dilgers Hill Rd	2.0	2.3	50.0	0.2	14	8	Gravel	Poor
7	Dilgers Hill Rd	2.3	2.5	50.0	0.2	3	23	Gravel	Poor
8	Dilgers Hill Rd	2.5	2.8	50.0	0.3	10	8	Gravel	Poor
9	Dilgers Hill Rd	2.8	3.5	50.0	0.7	3	23	Gravel	Poor
10	Dilgers Hill Rd	3.5	5.0	50.0	1.5	4	23	Gravel	Poor
11	Dilgers Hill Rd	5.0	9.7	50.0	4.7	2	35	Gravel	Poor
12	Dilgers Hill Rd	9.7	10.5	50.0	0.8	7	11	Gravel	Poor
13	Dilgers Hill Rd	10.5	10.7	50.0	0.2	3	23	Gravel	Poor
14	Dilgers Hill Rd	10.7	10.9	50.0	0.2	7	11	Gravel	Poor
15	Dilgers Hill Rd	10.9	11.9	50.0	1.0	2	35	Gravel	Poor
16	Dilgers Hill Rd	11.9	12.1	50.0	0.2	5	14	Gravel	Poor
17	Dilgers Hill Rd	12.1	12.6	50.0	0.5	5	14	Gravel	Poor
18	Mount Albert Road	12.6	13.0	50.0	0.4	6	17	Gravel	Poor
19	Mount Albert Road	13.0	13.6	50.0	0.6	2	42	Gravel	Poor
20	Mount Albert Road	13.6	15.5	50.0	1.9	5	17	Gravel	Poor
21	Mount Albert Road	15.5	16.8	50.0	1.3	2	42	Gravel	Poor
22	Mount Albert Road	16.8	17.2	50.0	0.4	5	17	Gravel	Poor
23	Mount Albert Road	17.2	17.7	50.0	0.5	6	17	Gravel	Poor
24	Mount Albert Road	17.7	19.2	50.0	1.5	3	28	Gravel	Poor
25	Mount Albert Road	19.2	19.4	50.0	0.2	7	13	Gravel	Poor
26	Mount Albert Road	19.4	20.0	50.0	0.6	9	9	Gravel	Poor
27	Mount Albert Road	20.0	21.3	50.0	1.3	4	28	Gravel	Poor
28	Mount Albert Road	21.3	21.4	50.0	0.1	5	17	Gravel	Poor
29	Mount Albert Road	21.4	23.5	50.0	2.1	2	42	Gravel	Poor
30	Mount Albert Road	23.5	23.7	50.0	0.2	5	17	Gravel	Poor
31	Mount Albert Road	23.7	24.9	50.0	1.2	2	42	Gravel	Poor
32	Mathinna Plains Rd	24.9	28.5	50.0	3.6	2	42	Gravel	Poor
33	Mathinna Plains Rd	28.5	31.3	50.0	2.8	8	13	Gravel	Poor
34	Mathinna Plains Rd	31.3	35.1	50.0	3.8	8	18	Sealed	Poor
35	Mathinna Plains Rd / New River Rd	35.1	39.2	50.0	4.1	3	40	Sealed	Poor
36	Ringarooma Rd	39.2	40.3	80.0	1.1	5	36	Sealed	Poor
37	Ringarooma Rd /Tasman Highway	40.3	48.4	80.0	8.1	2	90	Sealed	Poor
38	Tasman Highway	48.4	48.9	80.0	0.5	11	20	Sealed	Excellent

39	Tasman Highway	48.9	50.0	80.0	1.1	2	90	Sealed	Excellent
40	Tasman Highway	50.0	52.2	80.0	2.2	8	27	Sealed	Excellent
41	Tasman Highway	52.2	53.7	80.0	1.5	2	90	Sealed	Excellent
42	Tasman Highway	53.7	54.8	80.0	1.1	5	36	Sealed	Excellent
43	Tasman Highway	54.8	56.6	80.0	1.8	7	27	Sealed	Excellent
44	Tasman Highway	56.6	57.2	80.0	0.6	5	36	Sealed	Excellent
45	Tasman Highway	57.2	58.0	80.0	0.8	2	90	Sealed	Excellent
46	Tasman Highway	58.0	58.9	80.0	0.9	5	36	Sealed	Excellent
47	Tasman Highway	58.9	60.6	80.0	1.7	2	90	Sealed	Excellent
48	Tasman Highway	60.6	60.9	80.0	0.3	5	36	Sealed	Excellent
49	Tasman Highway	60.9	65.1	80.0	4.2	2	90	Sealed	Excellent
50	Tasman Highway	65.1	65.8	80.0	0.7	5	36	Sealed	Excellent
51	Tasman Highway	65.8	66.6	80.0	0.8	6	36	Sealed	Excellent
52	Tasman Highway	66.6	67.3	80.0	0.7	5	36	Sealed	Excellent
53	Bridport Main Rd	67.3	68.6	80.0	1.3	3	59	Sealed	Moderate
54	Bridport Main Rd	68.6	69.7	80.0	1.1	5	36	Sealed	Moderate
55	Bridport Main Rd	69.7	70.8	80.0	1.1	3	59	Sealed	Moderate
56	Bridport Main Rd	70.8	71.3	80.0	0.5	6	36	Sealed	Moderate
57	Bridport Main Rd	71.3	72.8	80.0	1.5	5	36	Sealed	Moderate
58	Bridport Main Rd	72.8	78.1	80.0	5.3	3	59	Sealed	Moderate
59	Bridport Main Rd	78.1	78.5	80.0	0.4	5	36	Sealed	Moderate
60	Bridport Main Rd	78.5	82.4	80.0	3.9	2	90	Sealed	Moderate
61	Bridport Main Rd	82.4	82.8	80.0	0.4	5	36	Sealed	Moderate
62	Bridport Main Rd	82.8	90.8	80.0	8.0	3	59	Sealed	Moderate
63	Bridport Main Rd	90.8	91.1	80.0	0.3	5	36	Sealed	Moderate
64	Bridport Main Rd	91.1	97.1	80.0	6.0	3	59	Sealed	Moderate
65	Bridport Main Rd	97.1	97.4	80.0	0.3	5	36	Sealed	Moderate
66	Bridport Main Rd	97.4	105.8	80.0	8.4	3	59	Sealed	Moderate
67	Bridport Main Rd	105.8	106.3	80.0	0.5	5	36	Sealed	Moderate
68	Bridport Main Rd	106.3	108.0	80.0	1.7	3	59	Sealed	Moderate
69	Bridport Main Rd	108.0	108.5	80.0	0.5	5	36	Sealed	Moderate
70	Bridport Main Rd	108.5	108.9	80.0	0.4	3	59	Sealed	Moderate
71	Bridport Main Rd	108.9	110.1	80.0	1.2	5	36	Sealed	Moderate
72	Bridport Main Rd	110.1	110.7	80.0	0.6	3	59	Sealed	Moderate
73	Bridport Main Rd	110.7	111.4	80.0	0.7	3	59	Sealed	Moderate
74	Bridport Main Rd	111.4	113.4	80.0	2.0	3	59	Sealed	Moderate
75	Bridport Main Rd	113.4	113.8	80.0	0.4	5	36	Sealed	Moderate
76	Bridport Main Rd	113.8	115.1	80.0	1.3	5	36	Sealed	Moderate
77	Bridport Main Rd	115.1	115.4	80.0	0.3	5	36	Sealed	Moderate
78	Bridport Main Rd	115.4	116.3	80.0	0.9	3	59	Sealed	Moderate
79	Bridport Main Rd	116.3	116.5	80.0	0.2	3	59	Sealed	Moderate
80	Bridport Main Rd	116.5	124.8	80.0	8.3	3	59	Sealed	Moderate
81	Bridport Main Rd	124.8	125.8	80.0	1.0	5	36	Sealed	Moderate
82	Bridport Main Rd	125.8	127.8	80.0	2.0	5	36	Sealed	Moderate
83	Bridport Main Rd / East Tamar Highway	127.8	139.0	80.0	11.2	2	90	Sealed	Moderate

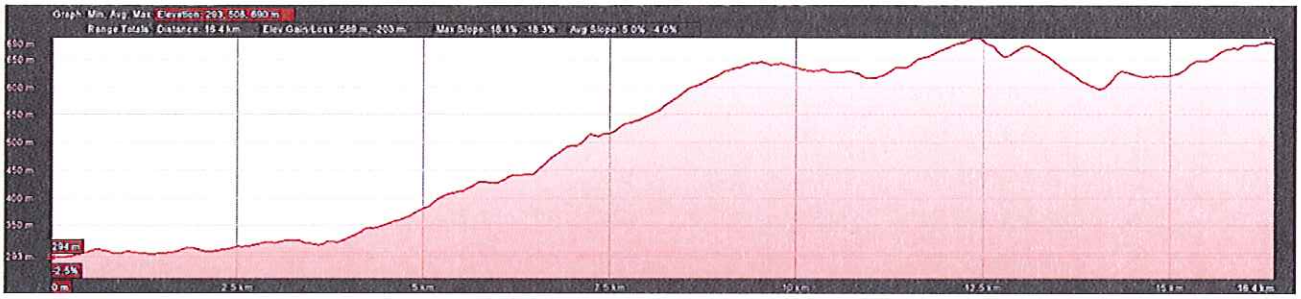
C3. Trip Profile: Mathinna area to Bell Bay via Scottsdale Option C – Along Evercreech Road Road and Mount Albert Road

Route Summary:

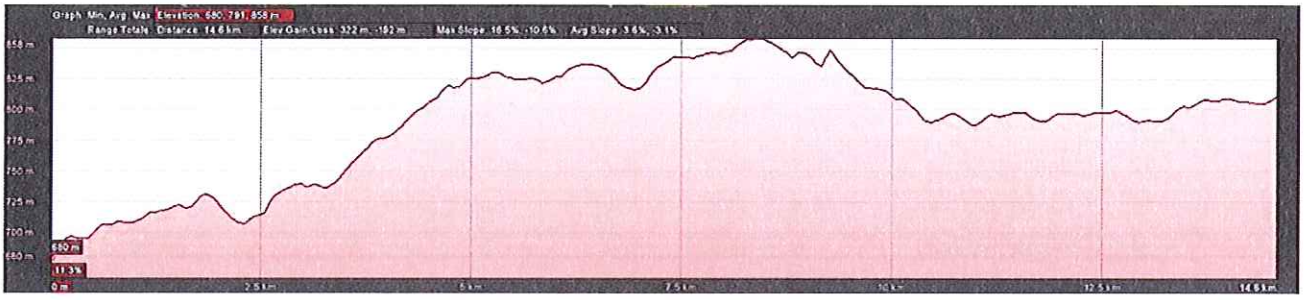
- **Evercreech Road (0 km to 12.5 km)**
- **Unnamed Road (12.5 km to 16.4 km)**
- **Dilgers Hill Road (16.4 km to 18.8 km)**
- **Mount Albert Road (18.8 km to 30.8 km)**
- **Mathinna Road (30.8 to 43.1 km)**
- **New River Road (43.1 km to 45 km)**
- **Ringarooma Road (45 km to 52.6 km)**
- **Tasman Highway (52.6 km to 73.2 km)**
- **Bridport Road (73.2 km to 141.9 km)**
- **East Tamar Highway (141.9 km to 145 km)**

    - Total Distance: 145 km.
    - Elevations - Start: 294 m. End: 36 m. Min: 17 m Max: 856 m
    - Maximum Slope: 15%

Elevation Profiles:

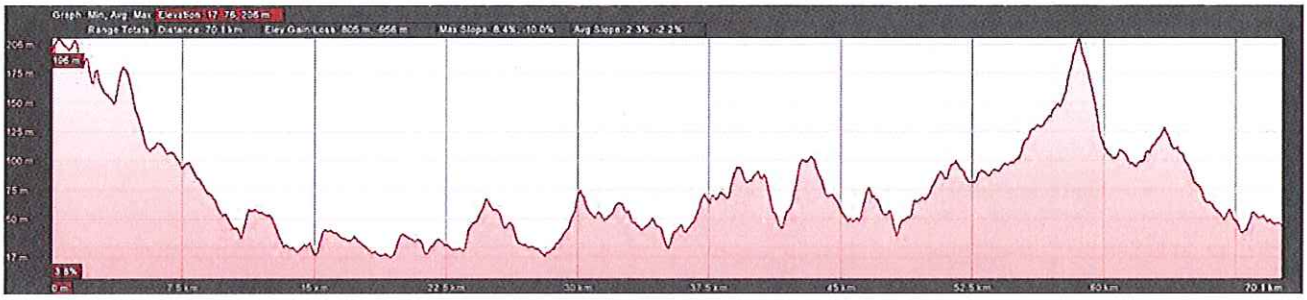


Evercreech Road and Unnamed Road Profile



Dilgers Hill Road and Mount Albert Road Profile

Mount Albert Road to Scottsdale Profile



Scottsdale to Bell Bay Profile

Route C3

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition Surface	Pavement Condition Condition
1	Evercreech Rd	0.0	3.5	50.0	3.5	2	35	Gravel	Poor
2	Evercreech Rd	3.5	5.8	50.0	2.2	6	14	Gravel	Poor
3	Evercreech Rd	5.8	6.0	50.0	0.3	2	35	Gravel	Poor
4	Evercreech Rd	6.0	6.1	50.0	0.1	7	11	Gravel	Poor
5	Evercreech Rd	6.1	6.4	50.0	0.2	3	23	Gravel	Poor
6	Evercreech Rd	6.4	7.2	50.0	0.9	9	8	Gravel	Poor
7	Evercreech Rd	7.2	9.4	50.0	2.2	6	14	Gravel	Poor
8	Evercreech Rd	9.4	9.8	50.0	0.4	3	23	Gravel	Poor
9	Evercreech Rd	9.8	10.3	50.0	0.5	3	23	Gravel	Poor
10	Evercreech Rd	10.3	10.7	50.0	0.4	3	23	Gravel	Poor
11	Evercreech Rd	10.7	10.9	50.0	0.2	5	14	Gravel	Poor
12	Evercreech Rd	10.9	12.4	50.0	1.5	6	14	Gravel	Poor
13	Unnamed Road	12.4	12.8	50.0	0.4	8	11	Gravel	Poor
14	Unnamed Road	12.8	13.0	50.0	0.2	6	7	Gravel	Poor
15	Unnamed Road	13.0	14.0	50.0	1.0	8	5	Gravel	Poor
16	Unnamed Road	14.0	14.3	50.0	0.3	11	4	Gravel	Poor
17	Unnamed Road	14.3	15.0	50.0	0.7	2	18	Gravel	Poor
18	Unnamed Road	15.0	15.3	50.0	0.3	8	13	Gravel	Poor
19	Unnamed Road	15.3	15.5	50.0	0.2	2	18	Gravel	Poor
20	Unnamed Road	15.5	15.7	50.0	0.2	7	5	Gravel	Poor
21	Unnamed Road	15.7	15.9	50.0	0.2	3	12	Gravel	Poor

22	Unnamed Road	15.9	16.0	50.0	0.1	5	7	Gravel	Poor
23	Unnamed Road	16.0	16.4	50.0	0.4	3	12	Gravel	Poor
24	Dilgers Hill Rd	16.4	16.7	50.0	0.3	7	11	Gravel	Poor
25	Dilgers Hill Rd	16.7	16.9	50.0	0.2	3	23	Gravel	Poor
26	Dilgers Hill Rd	16.9	17.1	50.0	0.2	7	11	Gravel	Poor
27	Dilgers Hill Rd	17.1	18.1	50.0	1.0	2	35	Gravel	Poor
28	Dilgers Hill Rd	18.1	18.3	50.0	0.2	5	14	Gravel	Poor
29	Dilgers Hill Rd	18.3	18.8	50.0	0.5	5	14	Gravel	Poor
30	Mount Albert Road	18.8	19.2	50.0	0.4	6	17	Gravel	Poor
31	Mount Albert Road	19.2	19.8	50.0	0.6	2	42	Gravel	Poor
32	Mount Albert Road	19.8	21.7	50.0	1.9	5	17	Gravel	Poor
33	Mount Albert Road	21.7	23.0	50.0	1.3	2	42	Gravel	Poor
34	Mount Albert Road	23.0	23.4	50.0	0.4	5	17	Gravel	Poor
35	Mount Albert Road	23.4	23.9	50.0	0.5	6	17	Gravel	Poor
36	Mount Albert Road	23.9	25.4	50.0	1.5	3	42	Gravel	Poor
37	Mount Albert Road	25.4	25.6	50.0	0.2	7	13	Gravel	Poor
38	Mount Albert Road	25.6	26.2	50.0	0.6	9	9	Gravel	Poor
39	Mount Albert Road	26.2	27.5	50.0	1.3	4	28	Gravel	Poor
40	Mount Albert Road	27.5	27.6	50.0	0.1	5	17	Gravel	Poor
41	Mount Albert Road	27.6	29.7	50.0	2.1	2	42	Gravel	Poor
42	Mount Albert Road	29.7	29.9	50.0	0.2	5	17	Gravel	Poor
43	Mount Albert Road	29.9	31.1	50.0	1.2	2	42	Gravel	Poor
44	Mathinna Plains Rd	31.2	34.8	50.0	3.6	2	42	Gravel	Poor
45	Mathinna Plains Rd	34.8	37.6	50.0	2.8	8	13	Gravel	Poor
46	Mathinna Plains Rd	37.6	41.4	50.0	3.8	8	18	Sealed	Poor
47	Mathinna Plains Rd / New River Rd	41.4	45.5	50.0	4.1	3	40	Sealed	Poor
48	Ringarooma Rd	45.5	46.6	80.0	1.1	5	36	Sealed	Poor
49	Ringarooma Rd / Tasman Highway	46.6	54.7	80.0	8.1	2	90	Sealed	Poor
50	Tasman Highway	54.7	55.2	80.0	0.5	11	20	Sealed	Excellent
51	Tasman Highway	55.2	56.3	80.0	1.1	2	90	Sealed	Excellent
52	Tasman Highway	56.3	58.5	80.0	2.2	8	27	Sealed	Excellent
53	Tasman Highway	58.5	60.0	80.0	1.5	2	90	Sealed	Excellent
54	Tasman Highway	60.0	61.1	80.0	1.1	5	36	Sealed	Excellent
55	Tasman Highway	61.1	62.9	80.0	1.8	7	27	Sealed	Excellent
56	Tasman Highway	62.9	63.5	80.0	0.6	5	36	Sealed	Excellent
57	Tasman Highway	63.5	64.3	80.0	0.8	2	90	Sealed	Excellent
58	Tasman Highway	64.3	65.2	80.0	0.9	5	36	Sealed	Excellent
59	Tasman Highway	65.2	66.9	80.0	1.7	2	90	Sealed	Excellent
60	Tasman Highway	66.9	67.2	80.0	0.3	5	36	Sealed	Excellent
61	Tasman Highway	67.2	71.4	80.0	4.2	2	90	Sealed	Excellent
62	Tasman Highway	71.4	72.1	80.0	0.7	5	36	Sealed	Excellent
63	Tasman Highway	72.1	72.9	80.0	0.8	6	36	Sealed	Excellent
64	Tasman Highway	72.9	73.6	80.0	0.7	5	36	Sealed	Excellent
65	Bridport Main Rd	73.6	74.9	80.0	1.3	3	59	Sealed	Moderate
66	Bridport Main Rd	74.9	76.0	80.0	1.1	5	36	Sealed	Moderate

67	Bridport Main Rd	76.0	77.1	80.0	1.1	3	59	Sealed	Moderate
68	Bridport Main Rd	77.1	77.6	80.0	0.5	6	36	Sealed	Moderate
69	Bridport Main Rd	77.6	79.1	80.0	1.5	5	36	Sealed	Moderate
70	Bridport Main Rd	79.1	84.4	80.0	5.3	3	59	Sealed	Moderate
71	Bridport Main Rd	84.4	84.8	80.0	0.4	5	36	Sealed	Moderate
72	Bridport Main Rd	84.8	88.7	80.0	3.9	2	90	Sealed	Moderate
73	Bridport Main Rd	88.7	89.1	80.0	0.4	5	36	Sealed	Moderate
74	Bridport Main Rd	89.1	97.1	80.0	8.0	3	59	Sealed	Moderate
75	Bridport Main Rd	97.1	97.4	80.0	0.3	5	36	Sealed	Moderate
76	Bridport Main Rd	97.4	103.4	80.0	6.0	3	59	Sealed	Moderate
77	Bridport Main Rd	103.4	103.7	80.0	0.3	5	36	Sealed	Moderate
78	Bridport Main Rd	103.7	112.1	80.0	8.4	3	59	Sealed	Moderate
79	Bridport Main Rd	112.1	112.6	80.0	0.5	5	36	Sealed	Moderate
80	Bridport Main Rd	112.6	114.3	80.0	1.7	3	59	Sealed	Moderate
81	Bridport Main Rd	114.3	114.8	80.0	0.5	5	36	Sealed	Moderate
82	Bridport Main Rd	114.8	115.2	80.0	0.4	3	59	Sealed	Moderate
83	Bridport Main Rd	115.2	116.4	80.0	1.2	5	36	Sealed	Moderate
84	Bridport Main Rd	116.4	117	80	0.6	3	59	Sealed	Moderate
85	Bridport Main Rd	117	117.7	80	0.7	3	59	Sealed	Moderate
86	Bridport Main Rd	117.7	119.7	80	2	3	59	Sealed	Moderate
87	Bridport Main Rd	119.7	120.1	80	0.4	5	36	Sealed	Moderate
88	Bridport Main Rd	120.1	121.4	80	1.3	5	36	Sealed	Moderate
89	Bridport Main Rd	121.4	121.7	80	0.3	5	36	Sealed	Moderate
90	Bridport Main Rd	121.7	122.6	80	0.9	3	59	Sealed	Moderate
91	Bridport Main Rd	122.6	122.8	80	0.2	3	59	Sealed	Moderate
92	Bridport Main Rd	122.8	131.1	80	8.3	3	59	Sealed	Moderate
93	Bridport Main Rd	131.1	132.1	80	1	5	36	Sealed	Moderate
94	Bridport Main Rd	132.1	134.1	80	2	5	36	Sealed	Moderate
95	Bridport Main Rd / East Tamar Highway	134.1	144.6	80	10.5	2	90	Sealed	Moderate

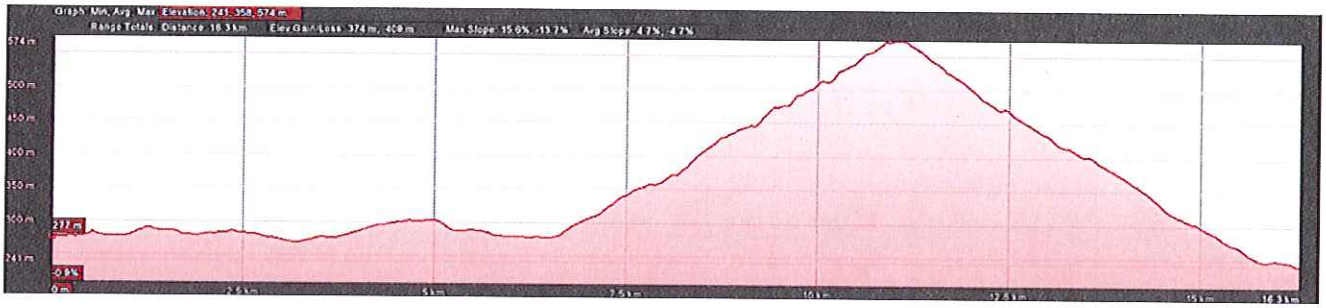
C4. Trip Profile: Mathinna area to Bell Bay via Fingal – Along Barnes Road, Esk Main Road, Midlands Highway and East Tamar Highway

Route Summary:

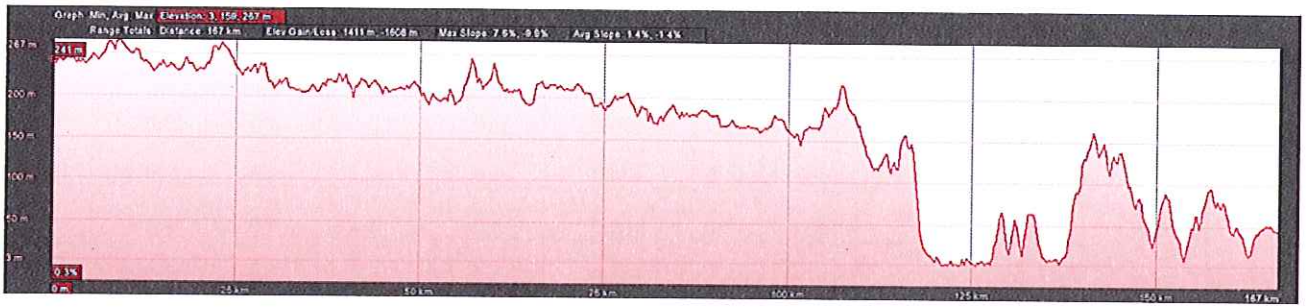
- **Barnes Road (0 km to 6.6 km)**
- **Mount Nicholas Road (6.6 km to 16.3 km)**
- **Esk Main Road (16.3 km to 81.4 km)**
- **Midlands Highway (81.4 km to 137.3 km)**
- **East Tamar Highway (137.3 to 188 km)**

  - Total Distance: 188 km.
  - Elevations - Start: 277 m. End: 36 m. Min: 2m Max: 574 m
  - Maximum Slope:15%

Elevation Profiles:



Barnes Road and Mount Nicholas Road Profile



Mount Nicholas Road to Bell Bay Profile

Route C4

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition	
								Surface	Condition
1	Barnes Rd	0.0	5.1	50.0	5.1	2	42	Gravel	Poor
2	Barnes Rd	5.1	5.2	50.0	0.1	8	13	Gravel	Poor
3	Barnes Rd	5.2	6.6	50.0	1.4	3	28	Gravel	Poor
4	Barnes Rd	6.6	9.2	50.0	2.6	7	13	Gravel	Poor
5	Barnes Rd	9.2	9.4	50.0	0.2	11	9	Gravel	Poor
6	Barnes Rd	9.4	9.6	50.0	0.2	3	28	Gravel	Poor
7	Barnes Rd	9.6	10.0	50.0	0.4	8	13	Gravel	Poor
8	Barnes Rd	10.0	10.1	50.0	0.1	4	28	Gravel	Poor
9	Barnes Rd	10.1	10.9	50.0	0.8	8	13	Gravel	Poor
10	Barnes Rd	10.9	11.1	50.0	0.2	3	28	Gravel	Poor
11	Mount Nicholas Rd	11.1	12.4	50.0	1.3	8	13	Gravel	Poor
12	Mount Nicholas Rd	12.4	12.5	50.0	0.1	2	42	Gravel	Poor
13	Mount Nicholas Rd	12.5	13.4	50.0	0.9	8	13	Gravel	Poor
14	Mount Nicholas Rd	13.4	13.5	50.0	0.1	2	42	Gravel	Poor
15	Mount Nicholas Rd	13.5	15.8	50.0	2.3	7	13	Gravel	Poor
16	Mount Nicholas Rd	15.8	16.4	50.0	0.6	2	42	Gravel	Poor
17	Esk Main Rd	16.4	29.4	80.0	13.0	2	90	Sealed	Moderate
18	Esk Main Rd / Midlands Highway	29.4	131.5	80.0	102.1	2	90	Sealed	Moderate
19	Midlands Highway	131.5	132.5	100.0	1.0	2	90	Sealed	Excellent
20	Midlands Highway	132.5	133.5	100.0	1.0	3	59	Sealed	Excellent
21	Midlands Highway	133.5	135.5	100.0	2.0	6	36	Sealed	Excellent
22	Midlands Highway / East Tamar Highway	135.5	144.5	100.0	9.0	3	59	Sealed	Excellent
23	East Tamar Highway	144.5	145.5	100.0	1.0	5	36	Sealed	Excellent
24	East Tamar Highway	145.5	146.5	100.0	1.0	4	59	Sealed	Excellent
25	East Tamar Highway	146.5	147.5	100.0	1.0	4	59	Sealed	Excellent
26	East Tamar Highway	147.5	148.5	100.0	1.0	5	36	Sealed	Excellent
27	East Tamar Highway	148.5	149.2	100.0	0.7	6	36	Sealed	Excellent
28	East Tamar Highway	149.2	150.5	100.0	1.3	3	59	Sealed	Excellent
29	East Tamar Highway	150.5	151.5	100.0	1.0	2	90	Sealed	Excellent
30	East Tamar Highway	151.5	154.5	100.0	3.0	3	59	Sealed	Excellent
31	East Tamar Highway	154.5	155.5	100.0	1.0	5	36	Sealed	Excellent
32	East Tamar Highway	155.5	155.8	100.0	0.3	2	90	Sealed	Excellent
33	East Tamar Highway	155.8	156.6	100.0	0.8	5	36	Sealed	Excellent
34	East Tamar Highway	156.6	188.0	100.0	31.4	3	59	Sealed	Excellent

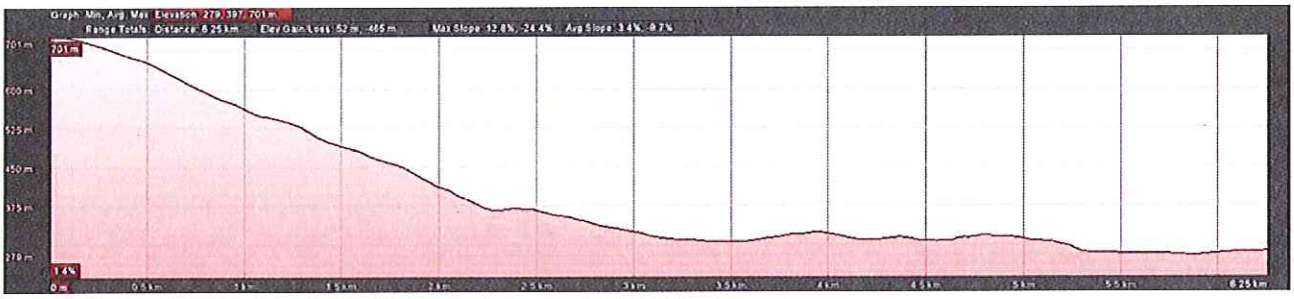
Proposed Route C1. Trip Profile: Mathinna area to Bell Bay via Fingal

Route Summary:

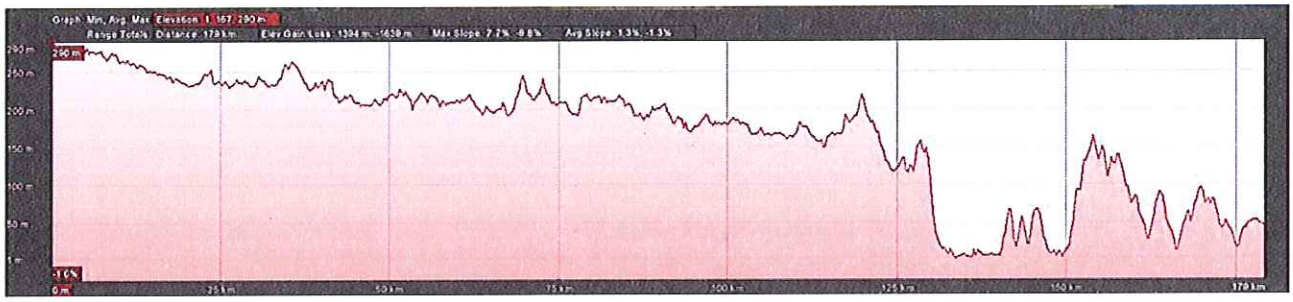
- **Eton Road (0 km to 5.6 km)**
- **Mathinna Plains Road (5.6 km to 6.3 km)**
- **Mathinna Road (6.3 km to 32 km)**
- **Esk Main Road (32 km to 83.9 km)**
- **Midlands Highway (83.9 km to 139.8 km)**
- **East Tamar Highway (139.8 to 186 km)**

    - Total Distance: 186 km.
    - Elevations - Start: 701 m. End: 36 m. Min: 2m Max: 701 m
    - Maximum slope: 28%

Elevation Profiles:



Eton Road to Mathinna Profile



Mathinna to Bell Bay Profile

Proposed Route C1

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition Surface	Pavement Condition Condition
1	Eton Rd	0.0	2.3	50.0	2.3	15	8	Gravel	Poor
2	Eton Rd	2.3	2.4	50.0	0.1	3	23	Gravel	Poor
3	Eton Rd	2.4	3.5	50.0	1.1	6	14	Gravel	Poor
4	Eton Rd	3.5	3.9	50.0	0.4	4	23	Gravel	Poor
5	Eton Rd	3.9	4.1	50.0	0.2	7	11	Gravel	Poor
6	Eton Rd	4.1	4.4	50.0	0.2	3	23	Gravel	Poor
7	Eton Rd	4.4	4.5	50.0	0.1	6	14	Gravel	Poor
8	Eton Rd	4.5	4.6	50.0	0.2	2	35	Gravel	Poor
9	Eton Rd	4.6	4.8	50.0	0.2	6	14	Gravel	Poor
10	Eton Rd	4.8	5.3	50.0	0.5	7	11	Gravel	Poor
11	Eton Rd / Mathinna Plains Rd	5.3	6.3	50.0	1.0	2	35	Gravel	Poor
12	Mathinna Rd / Esk Main Road / Midlands Highway	6.3	133.9	80.0	127.6	2	90	Sealed	Moderate
13	Midlands Highway	133.9	134.9	100.0	1.0	2	90	Sealed	Excellent
14	Midlands Highway	134.9	135.9	100.0	1.0	3	59	Sealed	Excellent
15	Midlands Highway	135.9	137.9	100.0	2.0	6	36	Sealed	Excellent
16	Midlands Highway / East Tamar Highway	137.9	146.9	100.0	9.0	3	59	Sealed	Excellent
17	East Tamar Highway	146.9	147.9	100.0	1.0	5	36	Sealed	Excellent
18	East Tamar Highway	147.9	148.9	100.0	1.0	4	59	Sealed	Excellent
19	East Tamar Highway	148.9	149.9	100.0	1.0	4	59	Sealed	Excellent
20	East Tamar Highway	149.9	150.9	100.0	1.0	5	36	Sealed	Excellent
21	East Tamar Highway	150.9	151.6	100.0	0.7	6	36	Sealed	Excellent
22	East Tamar Highway	151.6	152.9	100.0	1.3	3	59	Sealed	Excellent
23	East Tamar Highway	152.9	153.9	100.0	1.0	2	90	Sealed	Excellent
24	East Tamar Highway	153.9	156.9	100.0	3.0	3	59	Sealed	Excellent
25	East Tamar Highway	156.9	157.9	100.0	1.0	5	36	Sealed	Excellent
26	East Tamar Highway	157.9	158.2	100.0	0.3	2	90	Sealed	Excellent
27	East Tamar Highway	158.2	159.0	100.0	0.8	5	36	Sealed	Excellent
28	East Tamar Highway	159.0	185.9	100.0	26.9	3	59	Sealed	Excellent

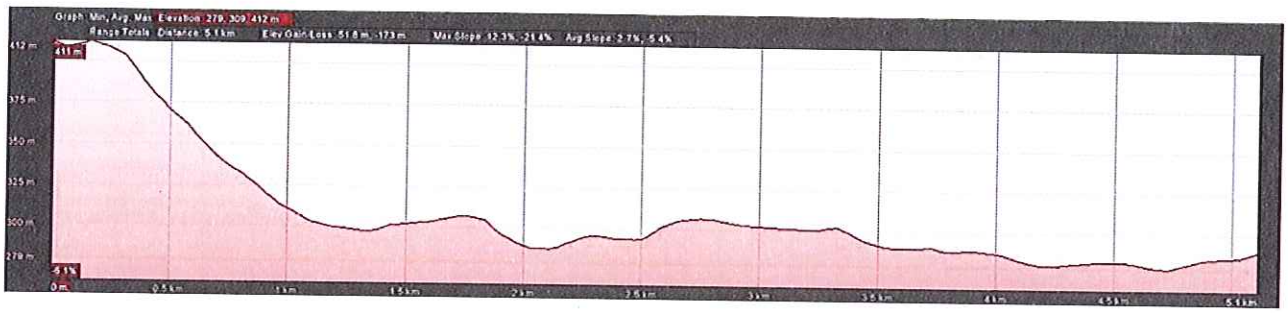
Proposed Route C2. Trip Profile: Mathinna area to Bell Bay via Fingal

Route Summary:

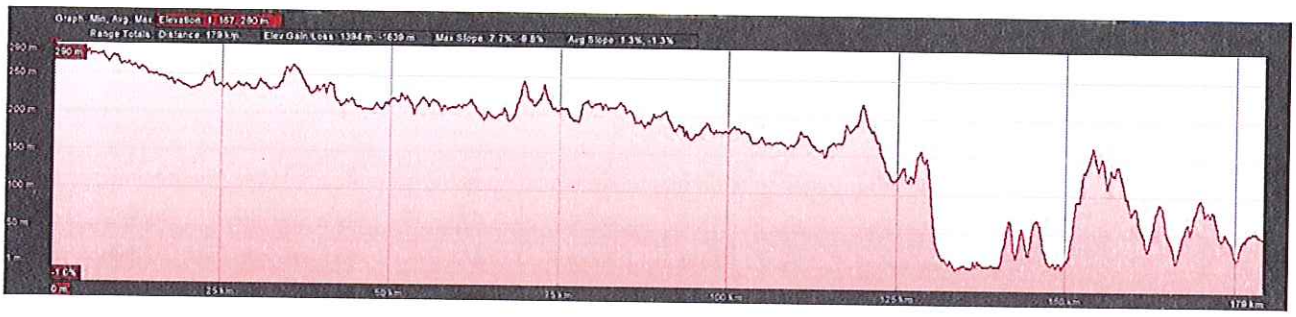
- **Dilgers Hill Road (0 km to 1.3 km)**
- **Claytons Road (1.3 km to 3.1 km)**
- **Mathinna Plains Road (3.8 km to 5.1 km)**
- **Mathinna Road (5.1 km to 30.8 km)**
- **Esk Main Road (30.8 km to 82.7 km)**
- **Midlands Highway (82.7 km to 139.6 km)**
- **East Tamar Highway (139.6 km to 188 km)**

  - Total Distance: 188 km.
  - Elevations - Start: 411 m. End: 36 m. Min: 2m Max: 411 m
  - Maximum slope: 21%

Elevation Profiles:



Dilgers Hill Road to Mathinna Profile



Mathinna to Bell Bay Profile

Proposed Route C2

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length	Gradient	Speed	Pavement Condition	
					km	%	km/h	Surface	Condition
1	Dilgers Hill Rd	0.0	0.1	50.0	0.1	6	14	Gravel	Poor
2	Dilgers Hill Rd	0.1	0.2	50.0	0.2	4	23	Gravel	Poor
3	Dilgers Hill Rd	0.2	1.1	50.0	0.8	12	8	Gravel	Poor
4	Dilgers Hill Rd / Claytons Rd	1.1	1.8	50.0	0.7	3	23	Gravel	Poor
5	Claytons Rd	1.8	2.1	50.0	0.3	7	11	Gravel	Poor
6	Claytons Rd	2.1	2.3	50.0	0.2	5	14	Gravel	Poor
7	Claytons Rd	2.3	2.5	50.0	0.2	2	35	Gravel	Poor
8	Claytons Rd	2.5	2.6	50.0	0.1	5	14	Gravel	Poor
9	Claytons Rd	2.6	3.3	50.0	0.7	2	35	Gravel	Poor
10	Claytons Rd	3.3	3.5	50.0	0.2	6	14	Gravel	Poor
11	Claytons Rd	3.5	3.8	50.0	0.2	2	35	Gravel	Poor
12	Mathinna Plains Rd	3.8	5.1	50.0	1.3	2	60	Sealed	Poor
13	Mathinna Rd / Esk Main Rd/ Midlands Highway	5.1	132.7	80.0	127.6	2	90	Sealed	Moderate
14	Midlands Highway	132.7	133.7	100.0	1.0	2	90	Sealed	Excellent
15	Midlands Highway	133.7	134.7	100.0	1.0	3	59	Sealed	Excellent
16	Midlands Highway	134.7	136.7	100.0	2.0	6	36	Sealed	Excellent
17	Midlands Highway / East Tamar Highway	136.7	145.7	100.0	9.0	3	59	Sealed	Excellent
18	East Tamar Highway	145.7	146.7	100.0	1.0	5	36	Sealed	Excellent
19	East Tamar Highway	146.7	147.7	100.0	1.0	4	59	Sealed	Excellent
20	East Tamar Highway	147.7	148.7	100.0	1.0	4	59	Sealed	Excellent
21	East Tamar Highway	148.7	149.7	100.0	1.0	5	36	Sealed	Excellent
22	East Tamar Highway	149.7	150.4	100.0	0.7	6	36	Sealed	Excellent
23	East Tamar Highway	150.4	151.7	100.0	1.3	3	59	Sealed	Excellent
24	East Tamar Highway	151.7	152.7	100.0	1.0	2	90	Sealed	Excellent
25	East Tamar Highway	152.7	155.7	100.0	3.0	3	59	Sealed	Excellent
26	East Tamar Highway	155.7	156.7	100.0	1.0	5	36	Sealed	Excellent
27	East Tamar Highway	156.7	157.0	100.0	0.3	2	90	Sealed	Excellent
28	East Tamar Highway	157.0	157.8	100.0	0.8	5	36	Sealed	Excellent
29	East Tamar Highway	157.8	188.0	100.0	30.2	3	59	Sealed	Excellent

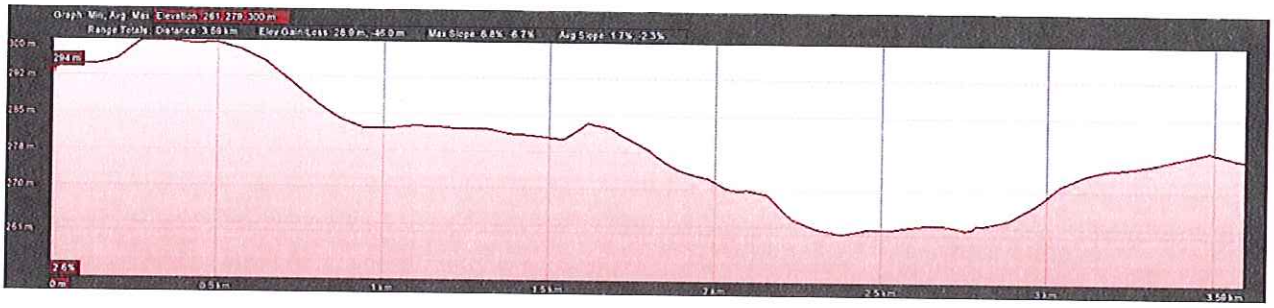
Proposed Route C3. Trip Profile: Mathinna area to Bell Bay via Fingal

Route Summary:

- **Evercreech Road (0 km to 3.6 km)**
- **Mathinna Road (3.6 km to 23 km)**
- **Esk Main Road (23 km to 74.9 km)**
- **Midlands Highway (74.9 km to 130.8 km)**
- **East Tamar Highway (130.8 km to 180 km)**

    - Total Distance: 180 km.
    - Elevations - Start: 294 m. End: 36 m. Min: 2m Max: 300 m
    - Maximum Slope: 10%

Elevation Profiles:



Evercreech Road Profile

Evercreech Road to Bell Bay Profile

Proposed Route C3

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition Surface	Pavement Condition Condition
1	Evercreech Rd	0.0	0.2	50.0	0.2	2	35	Gravel	Poor
2	Evercreech Rd	0.2	0.3	50.0	0.1	5	14	Gravel	Poor
3	Evercreech Rd	0.3	0.7	50.0	0.4	3	23	Gravel	Poor
4	Evercreech Rd	0.7	1.0	50.0	0.3	5	14	Gravel	Poor
5	Evercreech Rd	1.0	1.5	50.0	0.5	3	23	Gravel	Poor
6	Evercreech Rd	1.5	1.6	50.0	0.1	4	23	Gravel	Poor
7	Evercreech Rd	1.6	2.2	50.0	0.5	3	23	Gravel	Poor
8	Evercreech Rd	2.2	2.5	50.0	0.4	4	23	Gravel	Poor
9	Evercreech Rd	2.5	2.9	50.0	0.4	2	42	Gravel	Poor
10	Evercreech Rd	2.9	3.1	50.0	0.2	4	40	Sealed	Poor
11	Evercreech Rd	3.1	3.6	50.0	0.5	2	60	Sealed	Poor
12	Mathinna Rd / Esk Main Rd / Midlands Highway	3.6	124.7	80.0	121.1	2	90	Sealed	Moderate
13	Midlands Highway	124.7	125.7	100.0	1.0	2	90	Sealed	Excellent
14	Midlands Highway	125.7	126.7	100.0	1.0	3	59	Sealed	Excellent
15	Midlands Highway	126.7	128.7	100.0	2.0	6	36	Sealed	Excellent
16	Midlands Highway / East Tamar Highway	128.7	137.7	100.0	9.0	3	59	Sealed	Excellent
17	East Tamar Highway	137.7	138.7	100.0	1.0	5	36	Sealed	Excellent
18	East Tamar Highway	138.7	139.7	100.0	1.0	4	59	Sealed	Excellent
19	East Tamar Highway	139.7	140.7	100.0	1.0	4	59	Sealed	Excellent
20	East Tamar Highway	140.7	141.7	100.0	1.0	5	36	Sealed	Excellent
21	East Tamar Highway	141.7	142.4	100.0	0.7	6	36	Sealed	Excellent
22	East Tamar Highway	142.4	143.7	100.0	1.3	3	59	Sealed	Excellent
23	East Tamar Highway	143.7	144.7	100.0	1.0	2	90	Sealed	Excellent
24	East Tamar Highway	144.7	147.7	100.0	3.0	3	59	Sealed	Excellent
25	East Tamar Highway	147.7	148.7	100.0	1.0	5	36	Sealed	Excellent
26	East Tamar Highway	148.7	149.0	100.0	0.3	2	90	Sealed	Excellent
27	East Tamar Highway	149.0	149.8	100.0	0.8	5	36	Sealed	Excellent
28	East Tamar Highway	149.8	180.0	100.0	30.2	3	59	Sealed	Excellent

Proposed Route C4. Trip Profile: Mathinna area to Bell Bay via Fingal

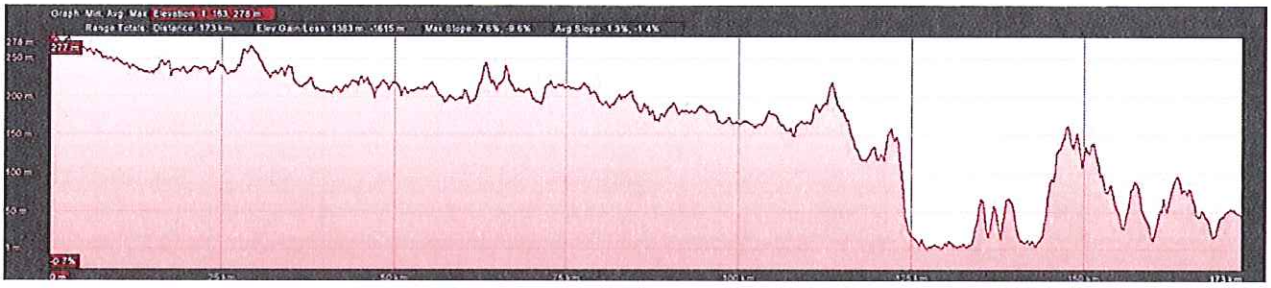
Route Summary:

- **Barnes Road (0 km to 4.2 km)**
- **Evercreech Road (4.2 km to 6.1 km)**
- **Mathinna Road (6.1 km to 25.5 km)**
- **Esk Main Road (25.5 km to 77.4 km)**
- **Midlands Highway (77.4 km to 133.3 km)**
- **East Tamar Highway (133.3 km to 183 km)**

    - Total Distance: 183 km.
    - Elevations - Start: 278 m. End: 36 m. Min: 2m Max: 278 m
    - Maximum Slope: 15%

Elevation Profiles:

Barnes Road and Evercreech Road Profile



Evercreech Road to Bell Bay Profile

Proposed Route C4

Section	Road Name	From	To	Curvature Class Design Speed (km/h)	Length km	Gradient %	Speed km/h	Pavement Condition Surface	Pavement Condition Condition
1	Barnes Rd	0.0	0.9	50.0	0.9	2	42	Gravel	Poor
2	Barnes Rd	0.9	1.0	50.0	0.1	6	17	Gravel	Poor
3	Barnes Rd	1.0	1.6	50.0	0.6	2	42	Gravel	Poor
4	Barnes Rd	1.6	1.9	50.0	0.2	9	9	Gravel	Poor
5	Barnes Rd	1.9	2.0	50.0	0.1	2	42	Gravel	Poor
6	Barnes Rd	2.0	2.2	50.0	0.3	7	13	Gravel	Poor
7	Barnes Rd	2.2	2.7	50.0	0.5	3	28	Gravel	Poor
8	Barnes Rd	2.7	2.9	50.0	0.2	7	13	Gravel	Poor
9	Barnes Rd	2.9	2.9	50.0	0.1	3	28	Gravel	Poor
10	Barnes Rd	2.9	3.0	50.0	0.1	5	17	Gravel	Poor
11	Barnes Rd	3.0	3.1	50.0	0.0	2	42	Gravel	Poor
12	Barnes Rd	3.1	3.2	50.0	0.1	7	13	Gravel	Poor
13	Barnes Rd	3.2	4.2	50.0	0.9	2	42	Gravel	Poor
14	Evercreech Rd	4.2	5.4	50.0	1.2	2	42	Gravel	Poor
15	Evercreech Rd	5.4	5.6	50.0	0.2	4	40	Sealed	Poor
16	Evercreech Rd	5.6	6.1	50.0	0.5	2	60	Sealed	Poor
17	Mathinna Rd / Esk Main Rd / Midlands Highway	6.1	127.2	80.0	121.1	2	90	Sealed	Moderate
18	Midlands Highway	127.2	128.2	100.0	1.0	2	90	Sealed	Excellent
19	Midlands Highway	128.2	129.2	100.0	1.0	3	59	Sealed	Excellent
20	Midlands Highway	129.2	131.2	100.0	2.0	6	36	Sealed	Excellent
21	Midlands Highway / East Tamar Highway	131.2	140.2	100.0	9.0	3	59	Sealed	Excellent
22	East Tamar Highway	140.2	141.2	100.0	1.0	5	36	Sealed	Excellent
23	East Tamar Highway	141.2	142.2	100.0	1.0	4	59	Sealed	Excellent
24	East Tamar Highway	142.2	143.2	100.0	1.0	4	59	Sealed	Excellent
25	East Tamar Highway	143.2	144.2	100.0	1.0	5	36	Sealed	Excellent
26	East Tamar Highway	144.2	144.9	100.0	0.7	6	36	Sealed	Excellent
27	East Tamar Highway	144.9	146.2	100.0	1.3	3	59	Sealed	Excellent
28	East Tamar Highway	146.2	147.2	100.0	1.0	2	90	Sealed	Excellent
29	East Tamar Highway	147.2	150.2	100.0	3.0	3	59	Sealed	Excellent
30	East Tamar Highway	150.2	151.2	100.0	1.0	5	36	Sealed	Excellent
31	East Tamar Highway	151.2	151.5	100.0	0.3	2	90	Sealed	Excellent
32	East Tamar Highway	151.5	152.3	100.0	0.8	5	36	Sealed	Excellent
33	East Tamar Highway	152.3	183.0	100.0	30.7	3	59	Sealed	Excellent