Document 1

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Department of Infrastructure and Regional Development

Inland Rail - Economic Analysis of the Shepparton Option

24 June 2015

Final

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Malcolm Southwell
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24 June 2015

Dear Malcolm

Re: Final Report - Inland Rail Analysis of the Shepparton Option

Please see attached the Final version of our report on the Analysis of the Shepparton Option for Inland Rail.

Yours sincerely

47F (personal)

Partner
Deloitte Touche Tohmatsu

Contents

Glossary of Terms

Term	Definition
ARTC	Australian Rail Track Corporation
BCR	Benefit Cost Ratio
DTT	Deloitte Touche Tohmatsu
FBIRA	Food Bowl Inland Rail Alliance
FEU	Forty foot equivalent unit
IRAS	Inland Rail Alignment Study 2010
Ktonnes	Thousands of tonnes
Mtpa	Million tonnes per annum
NSW	New South Wales
NPV	Net Present Value
t	tonne
TEU	Twenty foot equivalent unit
Tpa	Tonnes per annum

1 Executive Summary

Purpose

The Food Bowl Inland Rail Alliance has submitted (to the Inland Rail Implementation Group) a proposal for an alternative Inland Rail alignment through Narrandera and Shepparton – the Shepparton Option.

The Shepparton Option was considered as a possible alignment during the 2010 Melbourne-Brisbane Inland Rail Alignment Study conducted by the Australian Rail Track Corporation (ARTC), but was found to be less attractive when compared to the preferred option via Albury.

The purpose of this study is to undertake an assessment of the costs and benefits of the Shepparton Option compared to the Albury Option and provide the Department of Infrastructure and Regional Development with independent advice on the validity of the 2010 conclusion to select the Albury Option as the preferred option for Inland Rail. The results of this study will assist the Inland Rail Implementation Group in forming their recommendations on the delivery of Inland Rail to the Australian Government.

Background

The 2010 Alignment study found that for the southern section of the route (between Melbourne and Parkes), the Albury option provided the superior outcomes for both capital and transit time criteria. It found that even though the Shepparton Option provided higher regional freight demand outcomes and a slightly faster transit time, these advantages did not offset the higher capital cost of the Shepparton Option.

The Food Bowl Inland Rail Alliance (a grouping of nine local governments in northern Victoria and southern NSW) has undertaken an independent assessment of the likely volume of freight and potential economic development that would occur should the Shepparton Option alignment be selected for Inland Rail. This analysis sought to develop a robust evidence base of freight users in the region and the current and likely volumes that would be attracted to Inland Rail, should the Shepparton Option alignment be used.

Approach

An economic evaluation framework (benefit cost analysis) has been used to assess the relative costs and benefits of the Shepparton and Albury Options. Earlier work undertaken by ARTC[1] found that the Shepparton Option would result in a transit time saving of 30 minutes between Melbourne and Brisbane. However, this saving did not translate into significant benefits for Inland Rail users, and would not improve the market share of Inland Rail for intercapital freight. Therefore this analysis focusses on the costs and benefits to regional freight users of the Shepparton Option.

Two scenarios have been developed to compare the options, these are:

- **The Base Case:** Inland Rail via Albury – including capital and operating cost of new track and track enhancements to existing track (e.g. providing sufficient clearance for double stacking) and the demand dependent on the Albury Option. Under the Base Case freight movements from the Shepparton region are assumed to continue to move over existing origin/destination pairings and utilise existing modes.

[1] ARTC Melbourne – Brisbane Inland Rail Alignment Study, Final Report July 2010, Appendix E Route Development

- **The Shepparton Option (A):** Inland Rail via Shepparton – including capital and operating cost of new and upgraded track with Shepparton demand transferred to Inland Rail assuming current origin/destination – **less** any demand dependent on Inland Rail passing through Albury.

The information used to support this analysis has been primarily drawn from the 2010 Inland Rail Alignment Study, on-going modelling supporting the development of the Inland Rail business case (including supporting information) and the Food Bowl Inland Rail Alliance study.

Modelling Assumptions

Key inputs to the modelling include:

- Freight demand
- Capital costs (for both new and upgraded track)
- Track section distances

Assumptions regarding these parameters for each Option are summarised in Table 1

Table 1: Key modelling assumptions

Parameter	Albury Option	Shepparton Option
Route km	**487km**	**449km**
New Track km	37km	190km
Upgraded Track km[1]	450km	259km
Capital Cost New Track	$144m	$856m
Capital Cost Upgraded Track	$64m	$648m
Capital Cost Total	**$208m**	**$1,503m**
Demand in 2025[2]	**220,000 t**	**1,757,000 t**

Notes:

1. Upgrade works under the Albury Option relate to track enhancements such as providing sufficient clearance for double stacking. For the Shepparton Option, major upgrade works would be required to support heavier and longer trains.
2. This represents local demand that is dependent on each Option.

Findings

The economic analysis indicates that the Shepparton Option delivers a BCR of 0.33, with an NPV of -$629.3M, when compared to the Albury Option. A breakdown of the benefits and costs for the Shepparton Option and the proportional share of each are shown in Table 2.

Table 2: Breakdown of costs and benefits

Key Stream	Undiscounted	Discounted*
Costs		
Capital costs	$1,312.9m	$943.8m
Maintenance Costs	-$38.0m	-$11.0m
Total costs	**$1,274.9m**	**$932.8m**
Benefits		
Time savings	$107.6m	$27.9m
Transport cost savings	$790.0m	$203.3m
Avoided externalities	$117.4m	$30.2m
Avoided crash costs	$65.0m	$16.7m
Avoided road damage	$55.7m	$14.3m
Residual value	$116.2m	$11.0m
Total benefits	**$1,251.9m**	**$303.5m**
NPV		**-$629.3m**
BCR		**0.33**

Notes:

* 4% discount rate used

The key benefit stream arising from the shift of freight from road to rail is the value of operating cost savings, attributable to the lower unit cost of rail relative to road. Operating cost savings account for approximately $203.3m or 67% of the projected benefits over the evaluation period.

A range of other economic benefits are anticipated to accrue due to the projected mode shift from road to rail. These benefits include avoided environmental externalities, avoided crash costs and avoided road damage. Collectively, these benefits contribute an additional $61.3m in benefits and account for 20% of all projected economic benefits.

The analysis shows that the economic benefits associated with avoided road usage through using a mode with reduced transport costs and avoided externalities are significant. However, they are not large enough to compensate for the relatively high capital cost of the Shepparton Option.

A range of high level tests have been undertaken to assess the sensitivity of the projected economic outcomes to changes in assumptions and inputs. The results of these tests are summarised in Table 3.

Table 3: Sensitivity analysis results

Test	Variable	BCR	NPV ($m)
Discount Rate	7% discount rate	0.18	-$606.0
	10% discount rate	0.11	-$520.7
Capital Cost	-20% capital costs	0.42	-$423.7
	-50% capital costs	0.72	-$115.2
	4.5% cost escalation	0.31	-$678.9
Road and Rail Operating Cost	Coastal route rates	0.30	-$655.2
Lower Average Tonne/TEU	8.78 Average tonne/teu	0.17	-$776.7

Sensitivity analysis suggests that the economic merit of the Shepparton Option does not exist under any sensitivity.

Further analysis has been undertaken to estimate the theoretical volume of freight that would be required to deliver an NPV of $0m (the point of indifference between the Shepparton Option compared to the Albury Option). That is, what escalation of the level of regional freight would be required to make the Shepparton Option an attractive alternative to the Albury Option? This is estimated to be 3.7mtpa of additional freight to that identified by the Food Bowl Inland Rail Alliance.

Conclusion

This analysis indicates that Albury Option provides a better outcome for the Inland Rail project. The volume of additional freight and the reduction in operating costs, generated by the Shepparton Option does not justify the extra capital cost.

However, this analysis has not examined the economic impact of the proximity of Inland Rail on the regions represented by the Food Bowl Inland Rail Alliance. Unlocking lower cost transport options between production sites and markets in these regions could generate economic benefits that may not be realised in the absence of improved freight linkages in the region. Additional analysis of regional economic drivers would be required to model and quantify these potential benefits, and it is noted that these benefits are also not quantified in the development of the Inland Rail business case.

2 Purpose

Inland Rail is a proposed interstate rail alignment to connect two of Australia's largest cities, Melbourne and Brisbane, via an inland rail line with the primary purpose of transporting freight and facilitating improved connections along the east coast corridor as well as between south-east Queensland, Perth and Adelaide.

On 28 November 2013, the Deputy Prime Minister, the Hon Warren Truss MP, committed to accelerating construction of the Inland Railway, and announced the appointment of former Deputy Prime Minister, the Hon John Anderson AO, to Chair a high-level Implementation Group to determine construction priorities for the project. The Inland Rail Implementation Group also includes senior representatives of the Queensland, NSW and Victorian governments, the ARTC and the Department of Infrastructure and Regional Development (the Department)

The current alignment for Inland Rail is based on the ARTC 2010 *Melbourne-Brisbane Inland Rail Alignment Study,* which recommended an alignment in central-west New South Wales through Albury and Wagga Wagga.

The Food Bowl Inland Rail Alliance (FBIRA), which represents the local governments of Mitchell, Greater Shepparton and Moira in Victoria, and Berrigan, Jerilderie, Urana, Griffith, Leeton and Narrandera in New South Wales (NSW), has submitted to the Inland Rail Implementation Group a proposal for an alternative Inland Rail alignment through Narrandera and Shepparton – the Shepparton Option.

The Shepparton Option was considered as a possible alignment during the 2010 Alignment Study, but was found to be less attractive when compared to the Albury Option (which assumed utilising the existing interstate track between Melbourne and Illabo).

The Department is seeking independent advice on the validity of the 2010 conclusions. This advice will assist the Implementation Group in forming its final advice to the Australian Government on the alignment of the proposed railway.

The purpose of this study is to undertake an assessment of the costs and benefits of the Shepparton Option compared to the Albury Option. In order to undertake this analysis a comparison of the capital costs, operating costs and demand for each option has been undertaken. This study relies on demand and cost information generated in the development of the Inland Rail business case and by FBIRA.

This report provides a summary of the findings of the study.

3 Background

The decision on the proposed route for Inland Rail has been informed by the costs and benefits of the alternative options. The costs are driven by the engineering and operating requirements (whether that is upgrading existing rail routes or building new green field route sections). The benefits are measured in both commercial and economic terms. These include the economic benefits of Inland Rail compared to the alternative which are driven by the amount of freight that will utilise the Inland Rail route.

These principles have been applied in making the decision for the preferred alignment (route) for Inland Rail. In 2010, ARTC undertook the Melbourne – Brisbane Inland Rail Alignment Study, which was an extensive process of assessment and comparison of the costs and benefits of alternative alignments. The overall route was divided into three areas: Melbourne to Parkes, Parkes to Moree and Moree to Brisbane. Within each area a number of alternative route options were identified and assessed. Due to the large number of possible routes (over 50,000), the 2010 Study implemented a shortlisting process which compared the capital cost and journey time of each option. Once a shortlist of options was established, each option was subjected to a more detailed technical, financial and economic assessment.

For the Melbourne to Parkes section, the study identified the Albury Option as the preferred alignment and remains the preferred alignment in the current development of the Inland Rail business case being led by the Inland Rail Implementation Group.

In response to this decision a number of councils located on the Shepparton route have formed an alliance (FBIRA) and are seeking to have the decision reviewed. FBIRA argues that since 2010 substantial new economic investment has occurred in the region, and Inland Rail will enhance the economic activity and investment generated in the region from agriculture, food processing and related industries. Furthermore, this activity will generate additional freight volumes for Inland Rail.

This section of the report provides a summary of key outcomes of each study with relevance to the southern alignment options. These outcomes have been used to inform the analysis outlined in Sections 4 and 5 of this report.

3.1 Melbourne – Brisbane Inland Rail Alignment Study 2010

The key objective of the 2010 Alignment Study was to determine the optimal alignment of the inland railway, taking into consideration user requirements and the economic, engineering, statutory planning and environmental constraints.[2]

Key decisions on the optimal route were required at the southern, central and northern sections of the alignment. This study is concerned with the decision regarding the southern end of the alignment, namely; the route through northern Victoria and southern NSW via Shepparton or Albury.

Each of the Shepparton and Albury route options incorporated a number of variations. These are described in Table 4 and Table 5 below:

[2] ARTC, Melbourne – Brisbane Inland Rail Alignment Study, Stage 1 Working Paper No. 5 Pg A-24

Table 4: Summary of Albury Option

Albury Option: Utilises existing track with 2 variations	
Variation 1	Use all existing track from Melbourne to Parkes (including the deviation at Wodonga)
Variation 2*	As with Variation 1, uses the existing line between Melbourne and Parkes but incorporates a new direct connection from Junee (Illabo) to Stockinbingal (by-passing Cootamundra)

Notes:

*This is the current proposed Inland Rail Alignment

Table 5: Summary of Shepparton Option

Shepparton Option: Follows the existing broad gauge Mangalore – Tocumwal line (that would require upgrade and conversion to standard gauge). It then requires a new track from Finley to Jerilderie, from where it follows the disused standard gauge alignment from Jerilderie to Narrandera. From Narrandera to Parkes there are two possible variations.	
Variation 1	Construction of a new direct connection between Narrandera and Caragabal
Variation 2	Use existing track from Narrandera to Junee and use a new direct connection from Junee to Stockinbingal (by-passing Cootamundra) similar to the Albury Option, Variation 2

Figure 1 provides a high level summary of the options assessed for the Melbourne to Parkes section of the route.

Figure 1: Albury and Shepparton Route Options[3]

[3] ARTC Melbourne – Brisbane Inland Rail Alignment Study, Final Report July 2010, Appendix E Route Development p5

The 2010 study made a comparison of the capital costs, transit times and likely demand associated with the shortlisted options. The result of this analysis has been reproduced in Table 6.

Table 6: 2010 Alignment Study - Melbourne to Parkes Route Options Comparative Table*

Parameter	Via Shepparton to Caragabal	Via Shepparton through Junee	Via Albury (do nothing)	Via Albury (with Cootamundra by-pass)
Transit time Melbourne to Parkes (minutes)#	516	600	590	562
Preliminary capital cost estimate Mangalore – Parkes ($million)^	1,069	803	0	139
Regional demand (million net tonnes in 2030)**	0.470	0.470	0	0
Route distance Melbourne – Parkes (km)	657	776	732	696
Track maintenance cost pa ($million)	19	22	21	20
Incremental access fees pa ($million) – Shepparton – Mangalore (in 2030)	0.7	0.8	0	0

Notes:

* ARTC Melbourne – Brisbane Inland Rail Alignment Study, Final Report July 2010, Appendix E Route Development Table 2.2 p6
#At assumed **average speed** of 88 km/hr for flat and straight, and 63 km/hr for high gradient and curvy
^2010 Alignment study assumed no capital costs would be required on the existing interstate alignment due to the upgrade programme planned for the route at that time.
** Regional demand as identified in the 2010 Alignment Study

The 2010 Alignment Study's assessment of the options concluded that the Albury routes offer superior outcomes based on the capital and transit time trade-off criteria used in the 2010 Alignment Study. Even though the shortest Shepparton route (linking Narrandera and Caragabal) offered a faster transit time (by 30 minutes) it required considerably more capital expenditure than all the other options. The two key advantages of the Shepparton Option were identified as more regional freight and better suitability for double stacking. The analysis identified 470,000 tonnes of regional demand that would eventuate with the Shepparton Option; no regional demand was identified for the Albury Option. However, the 2010 Alignment Study concluded that these advantages did not offset the higher capital cost of the Shepparton Option.

It should be noted that the assessment concluded that due to the upgrade programme being undertaken on the corridor at that time, no capital cost would be required between Melbourne and Junee for the Albury Option.

3.2 Melbourne – Brisbane Inland Rail Business Case 2015

The current Melbourne – Brisbane Inland Rail business case (the Business Case), being developed by ARTC on behalf of the Inland Rail Implementation Group has adopted the Albury Option for the Melbourne to Parkes section of the Inland Rail. The Business Case assumes the Albury Option with the following elements[4]:

- Tottenham – Albury, 304 km of existing track. Enhancement works to increase height clearance and allow double stacking
- Albury – Illabo, 186km of existing track. Enhancement works to increase height clearance and allow double stacking
- Illabo – Stockinbingal, 37 km of new track.
- Stockinbingal – Parkes 173km of existing track. Enhancement works to increase height clearance and allow double stacking

The Business Case provides a high level summary of the key assumptions regarding:

- Capital costs
- Track operating costs
- Maintenance costs
- Road and above rail operating costs
- Demand assessment.

For this study more detailed assumptions regarding the costs associated with the Melbourne – Parkes section of the route are required. These assumptions have been provided by the Department and are summarised in detail in Section 5.

The demand assessment provided in the Business Case, does not provide the required level of detail for this study. More detailed information regarding demand specifically relating to the Albury and southern NSW section of the route has been provided by the Department and is summarised in more detail in Section 5.

[4] Modelling relating to the development of the 2015 Inland Rail business case has been drawn from that available as at February 2015. It is noted that ARTC continues to refine the underlying modelling as it prepares the Inland Rail Programme Business Case that will be provided to the Australian Government mid-2015.

3.3 Food Bowl Route 2014

The Food Bowl Inland Rail Alliance (FBIRA) is an alliance of a number of councils located on the Shepparton Option route for Inland Rail. FBIRA is seeking a review of the decision to route Inland Rail via Albury rather than Shepparton.

In making its case for the review, FBIRA has commissioned a study to identify the current and likely volumes of freight that could be carried on Inland Rail should the Shepparton Option be the selected route between Melbourne and Parkes. The Food Bowl Route, Rail User Economics and Freight Commerce (dated 29 January 2014[5]) – the FBIRA report, provides a summary of the key findings of the study.

The study sought to develop a robust evidence base for potential demand for the Shepparton Option. It identifies the types of freight users in the region and the current and likely volumes that would be available for Inland Rail. It also quantifies the value of domestic and export markets, employee numbers and industry investment in the Food Bowl Region. Figure 2 provides a summary of the location of the council members of the Alliance and the possible route via Shepparton.

[5] The date on the report may be incorrect and should probably be 2015 not 2014.

Figure 2: Inland Rail Food Bowl – Shepparton Option

The demand assessment summarised in the FBIRA report has been used by this study to identify freight that would be carried on Inland Rail if the Shepparton Option were adopted by Inland Rail.

Table 7 and Table 8 below have been reproduced from the FBIRA report.

It is not within the scope of this study to review the validity of the demand assessment made in the FBIRA report, as such the demand numbers have been taken at face value.

Table 7: Projected containerised rail freight demand generated in the Food Bowl Region

Origin	2015 (TEU pa)	2020 (TEU pa)	2025 (TEU pa)	2030 (TEU pa)	2035 (TEU pa)
Griffith	40,000	57,361	58,340	59,383	60,493
Tocumwal	11,000	23,652	28,319	33,920	40,646
Shepparton	3,000	17,052	22,591	30,042	40,084
Western Riverina	0	18,361	21,286	24,676	28,606
Total	**54,000**	**116,427**	**130,536**	**148,020**	**169,829**

Source: FBIRA – Food Bowl Route – Rail User Economics and Freight Commerce report (Jan 2015) Table 6

Table 8: Total projected bulk freight demand generated in the Food Bowl Region

Volume/number	2015	2020	2025	2030	2035
Total volume (tonnes)	1,583,000	1,835,000	2,127,000	2,466,000	2,859,000
Potential rail volumes (tonnes)	1,250,000	1,449,000	1,680,000	1,947,000	2,258,000

Source: FBIRA – Food Bowl Route – Rail User Economics and Freight Commerce report (Jan 2015) Table 68

4 Approach

The objective of this study is to develop independent advice on the validity of the 2010 Inland Rail Alignment Study's conclusion that the Shepparton Option is less attractive than the Albury Option.

In order to provide this advice an analytical framework has been developed to compare the costs and benefits of the Shepparton Option with the costs and benefits of the Albury Option. An economic evaluation framework (benefit cost ratio (BCR) and net present value (NPV)) has been used to determine the comparative benefits of each option.

Two scenarios have been used to compare the options:

The Base Case:

Inland Rail via Albury – including capital and operating cost of new and upgraded track and the demand dependent on the Albury Option. Under the Base Case freight movements from the Shepparton region are assumed to continue to move over existing origin/destination pairings and utilise existing modes.

The Shepparton Option (A):

Inland Rail via Shepparton – including capital and operating cost of new and upgraded track with Shepparton demand transferred to Inland Rail assuming current origin/destination – less any demand dependent on Inland Rail passing through Albury.

Information and data to support the analysis has been drawn from a number of sources, including:

- Modelling supporting the development of the current Inland Rail business case (as at February 2015)
- FBIRA Food Bowl Route, Rail User Economics and Freight Commerce
- Melbourne – Brisbane Inland Rail Alignment Study 2010
- Information from the Department of Infrastructure and Regional Development (the Department)
- Publically available information regarding the existing rail and road networks.

Based on information from these sources, the following has been estimated:

- Demand (for Inland Rail) which is contingent on each option. For the Albury Option this has been sourced from the Business Case demand assessment. For the Shepparton Option demand data has been extracted from the FBIRA review.
- The track capital and operating costs for the Albury option have been generated from the Inland Rail Business Case. The Department has provided additional detail on allocation of capital costs across the track sections on the Albury Option. Estimates of track upgrade and new track sections on the Shepparton Option have been provided by the Department. Track operating costs have been sourced from the Inland Rail Business Case.
- Above rail and road costs have been extracted from the Inland Rail Business Case.

A detailed summary of key assumption and source data is provided in Section 5.

5 Modelling input assumptions

This section of the report provides a detailed summary of key assumptions used in the modelling.

5.1 Demand

As the demand assumptions for each option have been obtained from different sources it has not been possible to undertake a detailed reconciliation between the two, nor has it been within the scope of this project to validate the demand forecasts.

5.1.1 Albury Option

For the purposed of this analysis, the demand estimates dependent on the Albury Option were extracted from the demand database used in the Inland Rail Concept Business Case[6]. Volumes from three regions in northern Victoria and southern NSW; namely Albury, Benalla and Riverina Regions, were identified as being relevant to the Albury Option. Table 9 provides a summary of the volumes identified.

Table 9: Albury Options – freight volumes (thousand tonnes per annum).

Region	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Albury Region	25	26	28
Benalla Region	195	206	218
Riverina Region	2,663	2,813	2,971
Ettamogah Intermodal	800	832	896

Source document: excel work book *IR Business Case Rail Demand*, provided by the Department on 31/03/15

Of the 2.7mtpa of volume moving to and from the Riverina Region in 2025, 1.8 mtpa was identified as moving between Port Kembla and the Riverina Region – it is assumed that this volume is grain, which is highly variable as it is dependent on seasonal climatic conditions.

A further 800,000 tonnes per annum is also moving from Ettamogah (near Albury) to Brisbane. This volume is currently being transported via the intercapital Coastal Rail Route and has been included in the Melbourne – Brisbane Intercapital demand classification in the Inland Rail Business Case.

For the purposes of this study it is assumed Riverina Region and Ettamogah Intermodal volume would be retained on Inland Rail regardless of which Option was selected.

[6] IR Business Case Rail Demand.xlsx provided by by the Department 31/03/15

5.1.2 Shepparton Option

The demand dependent on the Shepparton Option has been extracted from the FBIRA demand analysis (see Section 3.3). The FBIRA demand analysis has been converted to tonnes per annum and allocated to the Shepparton Region and Riverina Regions to allow comparison with the regions assessed in the Inland Rail demand assessment.

Table 10 Shepparton Option - freight volumes

Region	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Shepparton Region			
Container Freight*	916	1,151	1,453
Bulk Freight^	840	974	1,129
Total Shepparton	**1,756**	**2,124**	**2,582**
Riverina Region			
Container Freight*	1,433	1,513	1,604
Bulk Freight^	840	974	1,129
Total Riverina	**2,273**	**2,487**	**2,733**

Source: FBIRA – Food Bowl Route – Rail User Economics and Freight Commerce report (Jan 2015)

Notes:

* For container traffic the Shepparton region is defined as Tocumwal and Shepparton, the Riverina Region is defined as Griffin and Western Riverina (see Section 3.3). TEU estimates provided in the FBIRA report have been converted to tonnes assuming 18t payload per container.

^ It is assumed 50% of bulk freight is sourced from the Riverina Region (Narrandera) and 50% from Shepparton Region (Tocumwal).

This analysis of the FBIRA data suggests that approximately 2.273 mtpa would come from the Riverina Region in 2025. This compares with 2.7mtpa from a comparable region in the Inland Rail Business Case demand analysis. As noted, no attempt has been made to reconcile these alternative estimates.

For this study it has been assumed all volume from the Shepparton Region as defined in Table 5 would be attracted to Inland Rail under the Shepparton Option.

As noted in Section 5.1.1 freight from the Riverina Region is assumed to use Inland Rail regardless of which Option is chosen.

Figure 3 provides a graphical representation of the volumes of freight identified to be dependent on each option. As illustrated in Figure 3 freight from the Riverina Region and Ettamogah Intermodal Terminal has been excluded from this comparative analysis, as it assumed that this freight would use Inland Rail regardless of which option / alignment is used.

Figure 3: Estimated demand for each option (base year 2025)

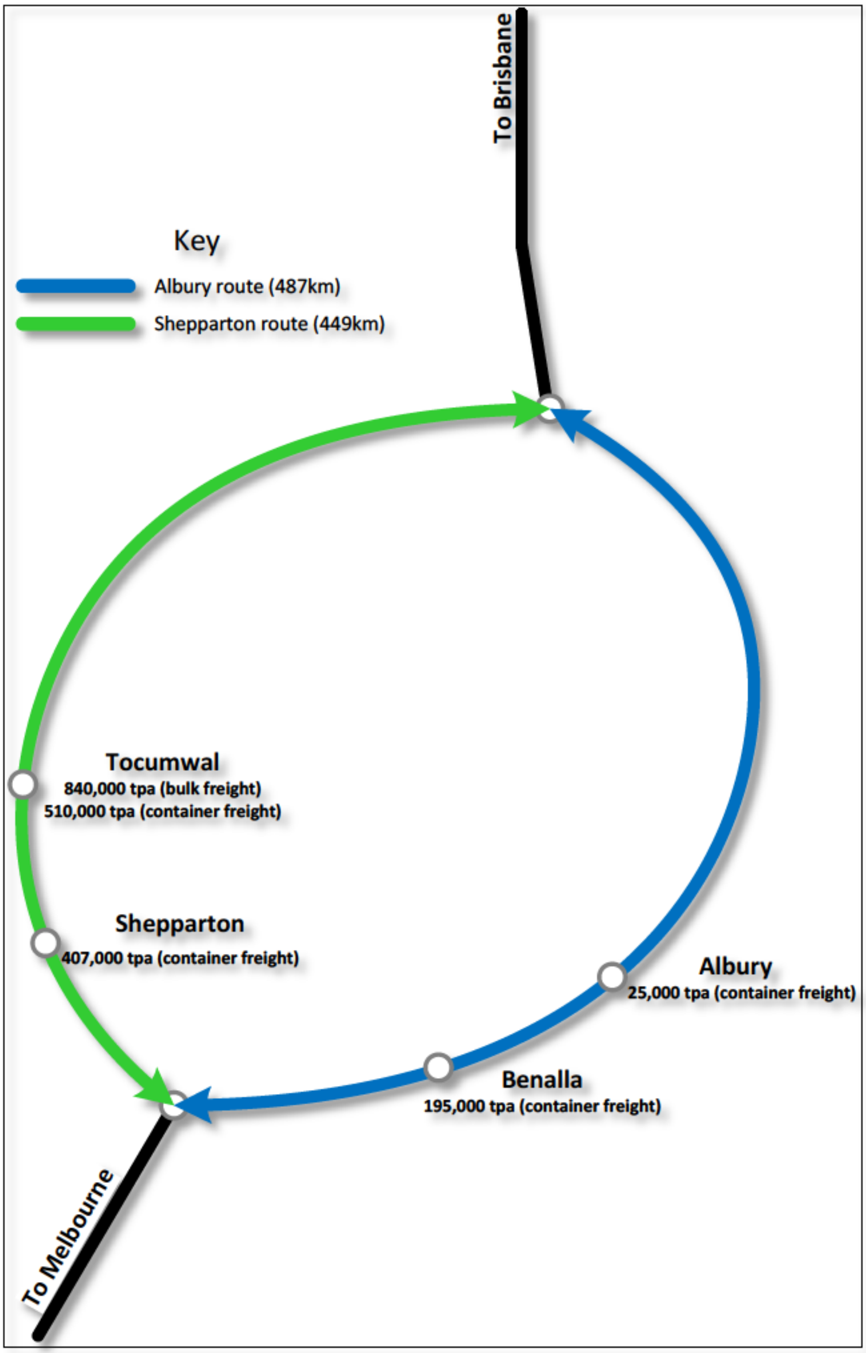


Table 11 Base Case Rail Freight Volumes– Assumes Inland Rail via Albury Option

Region (origin)*	Type of freight	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Inland Rail Demand – Via Albury Option				
Albury Region ^	container	25	26	28
Benalla Region^	container	195	206	218
Total		**1,020**	**1,064**	**1,142**
Existing rail – Via Shepparton region				
Shepparton #	container	89	116	152
Tocumwal #	container	283	339	406
Tocumwal bulk	bulk	840	974	1,129
Total		**1,212**	**1,429**	**1,687**

Notes

* All volume is assumed to move from the stated origins to the Port of Melbourne.

^Volumes extracted from Inland Rail Business Case demand data.

FIBRA - Based on 2015 market share, growth forecasts as per the FBIRA report Tables 6 & 7

Table 12: Option Case Rail Freight Volumes – Assumes Inland Rail via Shepparton Option

Region (origin)*	Type of freight	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Existing Rail Demand – Via Albury region				
Albury Region^	container	25	26	28
Benalla Region^	container	195	206	218
Total		**1,020**	**1,064**	**1,142**
Inland Rail Demand - Via Shepparton Option				
Shepparton#	container	407	541	722
Tocumwal#	container	510	611	732
Tocumwal	bulk	840	974	1,129
Total		**1,757**	**2,126**	**2,583**

Notes:

*All volume is assumed to move from the stated origins to the Port of Melbourne.
^Volumes extracted from Inland Rail Business Case demand data.
#Assumes container freight from Shepparton and Tocumwal provided by FBIRA (as per Table 7 and Table 8. Note that due to Inland Rail the rail share of the container market from the Shepparton region increases.

5.2 Distance assumptions

Track section distances have been generated from a number of sources including:

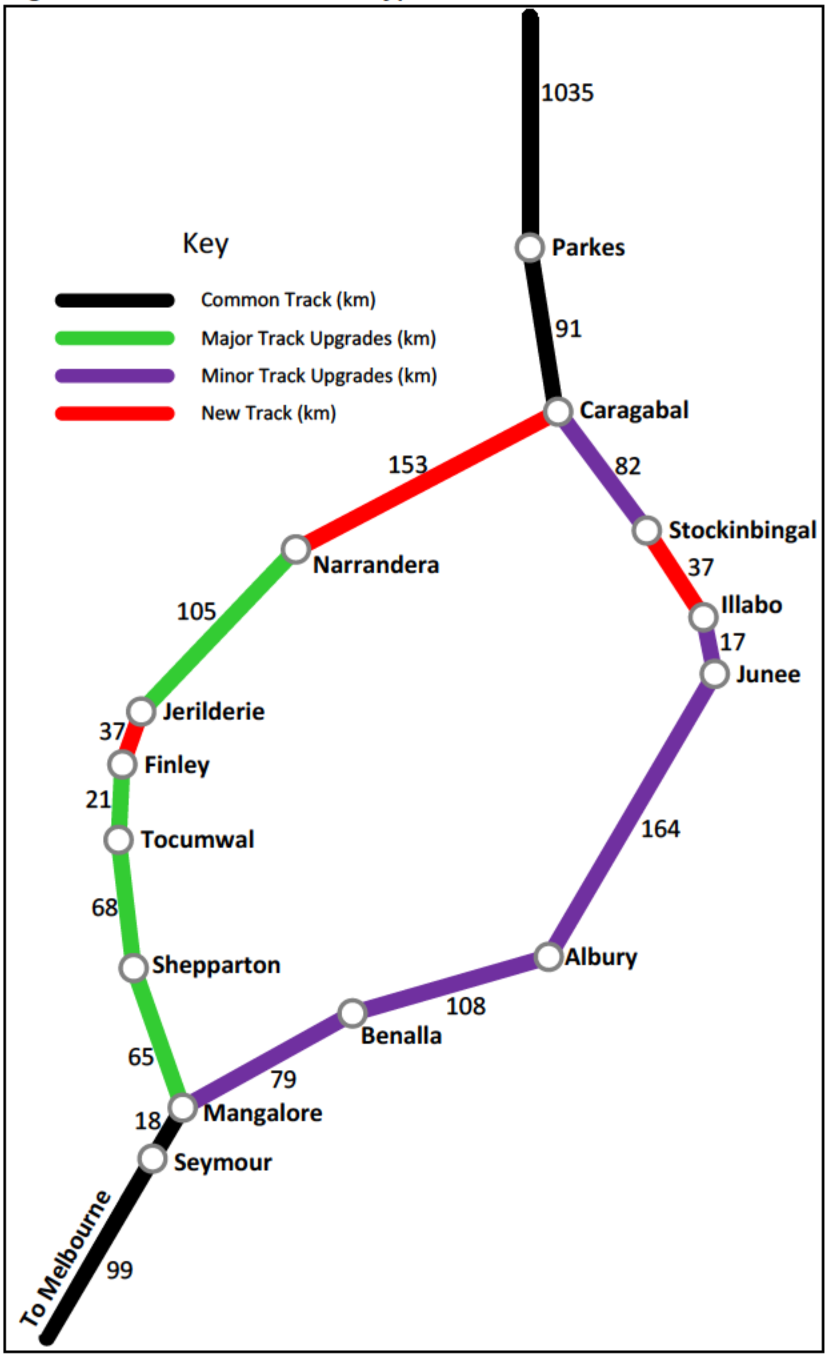
- Inland Rail Concept Business Case
- Melbourne – Brisbane Inland Rail Alignment Study 2010
- Information from the Department of Infrastructure and Regional Development (the Department)
- Publically available information regarding the existing rail and road networks.

From this information a summary of route kilometre for each option by track section has been generated, this is summarised in Figure 4.

The total route distance between Mangalore and Caragabal for the Albury Option is 487 km and for the Shepparton Option the comparable distance is 449 km a distance saving of 38 km. It is estimated that this would provide a transit time saving of approximately 30 minutes for the journey between Melbourne and Brisbane[7].

[7] ARTC Melbourne – Brisbane Inland Rail Alignment Study, Final Report July 2010, Appendix E Route Development p8

Figure 4 Track distance and type



5.3 Track Costs

5.3.1 Capital cost assumptions

Capital cost by track section has been provided by the Department and is summarised in Table 13 and Table 14 below. The total track capital cost for the Albury Option is $208m compared to $1,503m of the Shepparton Option.

Despite the shorter length of the Shepparton Option, the Albury Option track capital cost is lower due to the requirement for less new track (37 km compared to 190km) and lower cost per kilometre for new track. Furthermore, there is a lower level of work required for upgrading existing track on the Albury Option (the average upgrade cost per kilometre on the Albury Option is $142,000 compared to $2.5 m per kilometre for the Shepparton Option).

Table 13: Capital cost assumption Albury Option

Track Section		Type	Distance Km^	Cost $000/km*	Total $m
Mangalore	Illabo	Minor Upgrade	368	108	40
Illabo	Stockinbingal	New	37	3,900	144
Stockinbingal	Caragabal	Minor Upgrade	82	296	24
Total capital cost- Albury Option					**208**

Notes:

*Capital costs estimates provided by the Department of Infrastructure and Regional Development are based on ARTC's business case cost estimates as at February 2015. Upgrade costs to the Stockinbingal-Caragabal section are not separately identified in the business case and are contained within the Stockinbingal-Parkes estimate. The latter was applied pro-rata on a per kilometre basis to the Stockinbingal-Caragabal section. The margin of error of this estimate is likely to be less than the sensitivity testing of construction costs.

^ Track distances – see Section 5.2

Table 14: Capital cost assumptions Shepparton Option

Track Section		Type	Distance Km	Cost per km $000/km*	Total $m
Mangalore	Finley	Major Upgrade	154	2,500	385
Finley	Jerilderie	New	37	4,500	167
Jerilderie	Narrandera	Major Upgrade	105	2,500	263
Narrandera	Caragabal	New	153	4,500	689
Total capital cost – Shepparton Option					**1,503**

Notes:

**Capital costs estimates provided by the Department of Infrastructure and Regional Development, derived from a range of cost estimates in the business case (as at February 2015) for sections of line that are reasonably aligned with the topographical and technical requirements of the proposed line from Seymour to Parkes via Shepparton and Narrandera. The capital costs assumed in the base case modelling represent the mid points of the range of ARTC estimates for such track sections.

^ Track distances – see Section 5.2

5.3.2 Track operating cost assumptions

Track maintenance and operating costs have been extracted from the Inland Rail business case modelling (as at February 2015) and are as follows:

- Maintenance costs are assumed to be $15,709 per km per annum
- Below rail operating costs assumed to be $4,300 per km per annum.

5.4 Above rail and road assumptions

Above rail and road operating unit costs have been extracted from the Inland Rail Business Case modelling (as at February 2015) and are summarised in Table 15.

Table 15: Inland Rail Train and Truck Operating Cost Estimates (2024-25, $2014 per ntk)

	Albury Option $ per ntk	Shepparton Option $ per ntk
Shepparton Option		
Tocumwal (containerised freight)	0.0242	0.0183
Shepparton (containerised freight)	0.0242	0.0183
Tocumwal (bulk freight)	0.0329	0.0322
Ettamogah (containerised freight)	0.0183	0.0183
Albury Option		
Albury (containerised freight)	0.0183	0.0242
Benalla (containerised freight)	0.0183	0.0242
Ettamogah (containerised freight)	0.0183	0.0183

Source: Inland Rail business case modelling as at February 2015

The assumed road costs are as follows:

- Road container freight - 0.084 $/NTK
- Road agricultural freight – 0.084 $/NTK

5.5 General modelling parameters

The general modelling assumptions are summarised in Table 16. The evaluation period is 50 years, commencing from 2025. A discount rate of 4.0% has been used.

Table 16: General Modelling Assumptions

Key Parameter	Value
Base year	2014
Discount rate	4.0% per annum
Commencement of operations	2025
Evaluation period	55 years
Construction Period	5 years
Benefits Period	50 years
Valuation	In real terms. Valuations are in resource cost terms and exclude taxes.
Indexation	Nil.
Capital escalation	3.5% per annum

5.6 Economic modelling approach

The valuation of costs and benefits is based on a discounted cash flow technique with benefits and costs valued in line with Australian Transport Council (ATC), Austroads and Transport for NSW (TfNSW) appraisal guidelines.

The project option was compared with the Base Case using a discounted cash flow technique on the basis of a real discount rate of 4.0%. All values are expressed in 2014 dollars. The benefits of the project were assessed over a 50 year evaluation period commencing from the first year of operation in 2025.

As each project option assumes there will be ongoing routine rail maintenance and major periodic maintenance to maintain the track to standard, these costs are also included in the economic analysis.

6 Findings

6.1 Benefit Cost

An economic evaluation indicates that the Shepparton Option delivers a BCR of 0.33, with an NPV of -$629.3M.

A breakdown of the benefits and costs for the Shepparton Option and the proportional share of each are shown in Table 17.

Table 17 Breakdown of Costs and Benefits

Key Stream	Undiscounted	Discounted *
Costs		
Capital costs	$1,312.9m	$943.8m
Maintenance Costs	-$38.0m	-$11.0m
Total costs	**$1,274.9m**	**$932.8m**
Benefits		
Time savings	$107.6m	$27.9m
Transport cost savings	$790.0m	$203.3m
Avoided externalities	$117.4m	$30.2m
Avoided crash costs	$65.0m	$16.7m
Avoided road damage	$55.7m	$14.3m
Residual value	$116.2m	$11.0m
Total benefits	**$1,251.9m**	**$303.5m**
NPV		**-$629.3m**
BCR		**0.33**

Notes:

* 4% discount rate used

The key benefit stream arising from the shift of freight from road to rail is the value of operating cost savings, attributable to the lower unit cost of rail relative to road. Operating cost savings account for approximately $203.3m or 67% of the projected benefits over the evaluation period.

A range of other economic benefits are anticipated to accrue due to the projected mode shift from road to rail. These benefits include avoided environmental externalities, avoided crash costs and avoided road damage. Collectively, these benefits contribute an additional $61.3m in benefits and account for 20% of all projected economic benefits.

The analysis shows that the economic benefits associated with avoided road usage through using a mode with reduced transport costs and avoided externalities are significant.

6.2 Sensitivity Testing

A range of high level tests have been undertaken to assess the sensitivity of the projected economic outcomes to changes in assumptions and inputs. The following table summarises the sensitivity tests that have been conducted.

Table 18: Description of Sensitivity Tests

Test	Description
Discount rates	The core economic assessment results are based on a discount rate of 4%, recommended by the Department. The discount rate for all the options has been varied using discount rates recommended by Infrastructure Australia of 7% and 10%.
Variation in Construction Costs	-20% variation in the upfront cost of capital. -50% variation in the upfront cost of capital.
Variation in Construction Costs Escalation	The core economic assessment results are based on a 3.5% capital escalation. A 4.5% capital escalation was tested as a sensitivity.
Road and Rail Operating Cost	The core economic assessment results are based on the road and rail operating costs for Inland Rail adapted from the Inland Rail Concept Business Case, Table 23. Sensitivity was done using the coastal route rates.
Average Tonne/TEU	The demand is based on a factor of 18 tonnes per TEU. As a sensitivity 8.78 tonnes per TEU has been tested.

The sensitivity test results are shown in Table 19 below.

Table 19: Sensitivity analysis results

Test	Variable	BCR	NPV ($m)
Discount Rate	7% discount rate	0.18	-$606.0
	10% discount rate	0.11	-$520.7
Capital Cost	-20% capital costs	0.42	-$423.7
	-50% capital costs	0.72	-$115.2
	4.5% cost escalation	0.31	-$678.9
Road and Rail Operating Cost	Costal route rates	0.30	-$655.2
Lower Average Tonne/TEU	8.78 Average tonne/teu	0.17	-$776.7

Sensitivity analysis suggests that there is no economic merit in developing the Shepparton Option compared to the Albury Option. For example, holding all other variables constant, even if a decrease of 50% in capital costs was achieved, the projected benefits of developing the Inland Rail via the Shepparton Option would still be lower than the costs of this Albury Option in present value terms.

6.3 Volume Sensitivity

An assessment has been undertaken to identify the volume of freight that would be required to deliver a positive benefit for the Shepparton Option compared to the Albury Option.

Table 20 identifies the rail freight volumes required to achieve a NPV of zero. The total volume required in 2025 would be 5.5 mtpa of freight, which is an additional 3.7 mtpa of freight to the 1.8 mtpa of freight identified by the Food Bowl Inland Rail Alliance. Table 21 and Table 22 identify the volume required in the event capital costs were reduced by 20% and 50%.

Table 20: Rail Freight Volumes

Region (origin)	Type of freight	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Existing rail – Via Shepparton region				
Shepparton	container	1,268	1,686	2,249
Tocumwal	container	1,589	1,903	2,281
Tocumwal bulk	bulk	2,618	3,034	3,519
Total		**5,475**	**6,623**	**8,049**
Gap		**3,718**	**4,497**	**5,466**

Table 21 Rail Freight Volumes – Assumes 20% reduction in Capital Costs

Region (origin)	Type of freight	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Existing rail – Via Shepparton region				
Shepparton	container	986	1,312	1,750
Tocumwal	container	1,236	1,481	1,774
Tocumwal bulk	bulk	2,037	2,361	2,738
Total		**4,260**	**5,153**	**6,262**
Gap		**2,503**	**3,027**	**3,679**

Table 22: Rail Freight Volumes – Assumes 50% reduction in Capital Costs

Region (origin)	Type of freight	2025 (000 tpa)	2030 (000 tpa)	2035 (000 tpa)
Existing rail – Via Shepparton region				
Shepparton	container	564	750	1,001
Tocumwal	container	707	847	1,015
Tocumwal bulk	bulk	1,166	1,351	1,567
Total		**2,437**	**2,949**	**3,583**
Gap		**680**	**823**	**1,000**

7 Conclusion

This analysis indicates that the Albury Option provides a better economic outcome for the Inland Rail project. The volume of additional freight and the reduction in operating costs, generated by the Shepparton Option does not justify the extra capital cost.

However, this analysis has not examined the economic impact on the regions of Shepparton, Albury and the Riverina of the proximity of Inland Rail. (It should be noted that this approach is consistent with that taken in the Inland Rail Business Case). For example, as argued in the FBIRA analysis, Inland Rail via Shepparton may improve productivity of local industry (such as value added food producers, agriculture and horticulture) by unlocking lower cost transport options between production sites and markets. Additional analysis of regional economic drivers is required to model and quantify these potential benefits.

It is recognised that the region represented by FBIRA is a significant contributor to Australia's economic wealth and ensuring the region is adequately supported by the right transport infrastructure is a strategic imperative. However, it is not clear that Inland Rail is the right piece of infrastructure to fully address the region's needs.

This analysis confirms the 2010 findings that while an Inland Rail alignment through Shepparton and Narrandera would provide a significant economic benefit to the region, the capital costs of providing the infrastructure substantially outweigh the expected benefits.

The estimated 3.7 mtpa gap between existing freight demand and that which would be required to 'break even' on the investment indicates that a substantial new supply chain (for example a significant bulk product such as minerals or construction material extraction) would need to be found to make the Shepparton Option viable. Organic growth in existing supply chain volumes is unlikely to bridge the benefit-cost gap.

8 Limitation of our work

General use restriction

This report is prepared solely for the internal use of Department of Infrastructure and Regional Development. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose set out in our Work Order dated 6 March 2015. You should not refer to or use our name or the advice for any other purpose.