Greater Shepparton City Council

Shepparton Passenger Services Project

Shepparton Passenger Improvements

2017 Updated Report

March 2017

Executive Summary

Shepparton rail services currently provide a limited service compared to other areas of the state where upgrades have occurred. Passenger demand is depressed due to the limited relevance of the timetables to customer needs, uncompetitive journey times and aging rolling stock. As an overview:

- Shepparton is Victoria's fourth largest regional centre. However, its present rail service to Melbourne is infrequent, relatively slow and its timetable does not cater well for the area's increasing population – currently approximately 67,000 with over 90,000 in its catchment area extending to the NSW and beyond.
- Seymour/Shepparton is the only regional rail corridor from Melbourne that was not part of the former Regional Fast Rail (RFR) project (2002-2006) and little has changed since. The recent $4 billion Regional Rail Link (RRL) project provided further significant enhancement to Geelong, Ballarat and Bendigo line services but had no bearing on North-Eastern or Goulburn Valley services. The Ballarat line received a further $518 million allocation in the 2016/17 State Budget for major upgrading.
- The region is significantly disadvantaged relative to the other major regional centres within a comparable distance from Melbourne. For example, Bendigo with a catchment area of similar size and distance from Melbourne, but with almost 50% greater population, currently has 20 weekday services each way to and from Melbourne. From January 2017, Shepparton has four.
- Shepparton trains are much slower than those on the Bendigo line. The fastest Bendigo service takes 92 minutes at an average speed of 106 km/h. The fastest Shepparton service takes 145 minutes - an average speed of 75 km/h. Investment since 2002, both in new rolling stock and the Bendigo line infrastructure explains almost all of the difference. Shepparton trains are actually slower now than 20 years ago. They have used the same locomotives and carriages for more than the past 30 years.

Options for progressive improvement are available, but these are significantly constrained by developments that will increasingly affect transit of Seymour/Shepparton trains through the metropolitan area. In the absence of other actions, the coming operation of additional metropolitan services and later, electrification to service the burgeoning Wallan, Beveridge and Donnybrook areas, will further impede Shepparton services. These issues are explained in some detail. The general position regarding V/Line rolling stock is also discussed.

Nonetheless, short and medium term opportunities exist for substantial improvement on the present arrangements. The most important of these, which involves VLocity railcars operating to Shepparton to provide minimum trip times of 2 hours 15 minutes and up to 8 return services on weekdays, has a lead time of up to 5 years and requires additional rolling stock at an estimated cost of $85 million and infrastructure improvements in the cost range of $70 to $100 million.

Within six to eight years, with the expected opening of an alternative route into Melbourne (via Upfield instead of Broadmeadows), trip times could be reduced to 2 hours 10 minutes and up to 9 return services per day could operate at two hourly intervals.

Longer term, Shepparton's aspiration for trip times of less than two hours would be achieved by diverting all regional services at Wallan to travel on a new link via Melbourne Airport.

The table below gives a summary of potential service improvements together with rolling stock types and potential timeframes.

Table 1 – Potential service improvements, rolling stock types & timeframes

Scenario	Operation	Assumed rolling stock type	No. of cars to operate service	Possible timeframe
Current	January 2017 timetable	Loco-hauled N sets (N/Z cars)	1 x 4-cars 1 x 5-cars	2017
1	Five return services	Loco-hauled N sets (N/Z cars)	2 x 4-cars 1 x 5-cars	1 to 2 years
2A	Eight return services	VLocity sets	4 x 3-cars	2021 - 2022
2B/3	Eight/nine return services	VLocity sets	4 x 3-cars	2B 2023 – 2025 3 2027 - 2030
4	10+ return services via Melbourne Airport	Bi-modal sets	5 x 3-cars	Long term 2030+

A more radical solution will be required to meet all of Shepparton's aspirations for a sustainable high standard rail service. This must involve complete operational segregation from the metropolitan network. It aligns with the Rail Futures Institute's proposal for all Seymour/Shepparton trains to divert at Wallan and run on a new fast - standard gauge - line via Melbourne Airport to Southern Cross.

These scenarios are considered in sequence with anticipated achievable timelines and their associated pre-conditions. The necessary supporting infrastructure is then detailed for each option, initially in the context of the existing broad gauge line and then with gauge standardisation. Capital and operating costs for the various options are then shown.

The report also discusses issues for rail freight in Shepparton and the wider region.

Table of contents

Table index

Figure index

1. Introduction

Greater Shepparton Council has commissioned GHD to update its earlier November 2013 report in relation to passenger rail improvements on the Shepparton corridor. The update is particularly timely as there is an increased statewide focus on regional rail issues, partly in response the Government's May 2016 release of its Regional Rail Network Development Plan.

Our November 2013 report identified a number of viable improvement options together with indicative costs and also canvassed various high level issues associated with each option. Of the options proposed at that time, the cheapest and easiest to implement involved the extension of one morning and one afternoon Seymour commuter service from and to Shepparton. In line with our proposals, the morning service extension was implemented in October 2014 and the afternoon extension was implemented at the end of January 2017.

Further improvement options considered at that time involved the procurement of additional rolling stock and some related infrastructure investment.

In discussion with Councillors and Council officers together with a wider spectrum of the Shepparton community including the Member for Shepparton in the Victorian Parliament, it has become clear that a more ambitious improvement program is being strongly advocated, especially having regard to comparative service levels being provided to other major regional centres and Shepparton's own potential for growth and development.

Notwithstanding many impediments caused by the increasing difficulty of threading regional trains through some of Melbourne's fastest growth areas, this updated report seeks to chart a clear pathway to a much better rail future for Shepparton and its large catchment area. The proposed direction and suggested solutions for the short to medium term do not differ greatly from those proposed in 2013. They suggest that significant change for the better should be achievable in the relatively short term, with services capable of operating at two-hourly intervals in the medium term. However, more significant and radical change will be needed if Shepparton's aspirations for even more frequent and substantially faster services (trip times of two hours or less) are to be both achievable and sustainable.

Although related specifically to the passenger services, the report also takes account of the potential for improved rail freight services and consequently higher traffic levels on the Shepparton corridor. The report also discusses updated issues related to gauge standardisation as they may affect the Shepparton rail corridor.

2. Background

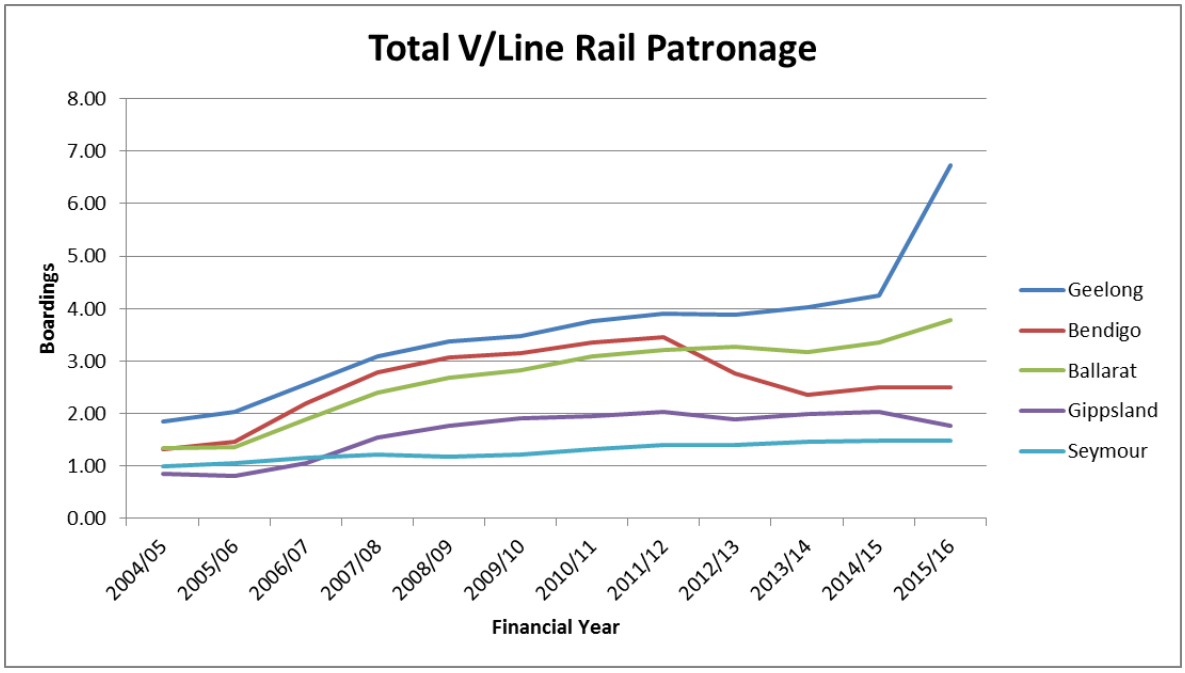
As noted in the previous report, Shepparton rail services currently provide a limited service compared to other areas of the state where upgrades have occurred. Passenger demand is depressed due to the limited relevance of the timetables to customer needs, uncompetitive journey times and aging rolling stock. As an overview:

- Shepparton is Victoria's fifth largest regional centre however its present rail service to Melbourne is infrequent, relatively slow and its timetable does not cater well for the area's increasing population – currently approximately 67,000 with over 90,000 in its catchment area extending to the NSW and beyond.
- The Seymour/Shepparton corridor is the only regional rail corridor from Melbourne that was not part of the former Regional Fast Rail (RFR) project (2002-2006) and little has changed since. The more recent $4 billion Regional Rail Link (RRL) project provided further significant enhancement to Geelong, Ballarat and Bendigo line services but had no bearing on North-Eastern or Goulburn Valley services. The Ballarat corridor was the recipient of a further $518 million upgrade in the 2016/17 State Budget.
- The region is therefore significantly disadvantaged relative to the other major regional centres within a comparable distance from Melbourne. For example, Bendigo with a catchment area of similar size and distance from Melbourne, but with almost 50% greater population, is currently served by 20 weekday services in each direction to and from Melbourne. From January 2017, Shepparton has four.
- Shepparton trains are much slower than those on the Bendigo line. The fastest Bendigo service takes 92 minutes at an average speed of 106 km/h. The fastest Shepparton service takes 145 minutes - an average speed of 75 km/h. Investment since 2002, both in new rolling stock and the Bendigo corridor infrastructure explains almost all of the difference. Shepparton trains are actually slower now than 20 years ago. They have used the same locomotives and carriages for more than the past 30 years.
- The most recent additions to the Shepparton timetable provide a fourth daily service in each direction. However, this has been achieved by the extension beyond Seymour of existing peak period commuter services which stop at all seven intermediate stations south of Seymour and take up to 2 hours 50 minutes for the journey – an average speed of 64 km/h. These trains are heavily used by daily commuters, including those from Melbourne's northern growth regions and overcrowding is already becoming evident. As such these services are unattractive for Shepparton passengers and their practical usefulness is likely to have a fairly short life.
- Without significant investment, Shepparton services are likely to further decline in coming years, not only because of aging rolling stock, but because Seymour/Shepparton trains are being progressively squeezed between additional "stopping all stations" metropolitan trains to service rapidly growing patronage from Craigieburn and intermediate stations to North Melbourne. This adds around 15 minutes to otherwise achievable journey times. The proposed diversion of these services to operate via Upfield instead of Broadmeadows will only provide a relatively short breathing space in terms of capacity and journey time.
- In the absence of other actions, the coming operation of further additional services and later, electrification to service the burgeoning Wallan, Beveridge and Kalkallo/Donnybrook areas, will greatly impede Shepparton services.

The impact of improved services can be seen by the direct changes which occurred after the introduction of RFR services across most of Victoria in 2003-04 and the RRL project which was

completed in 2015. The opportunities evident in Figure 1 below are a key to future options for the Shepparton Line.

Figure 1 - RFR and RRL impacts on patronage across Victoria



Note: The reduction in Bendigo corridor patronage in 2012 resulted from extension of electrification from Watergardens to Sunbury and consequent transfer of Sunbury line patronage from V/Line to metropolitan services.

Seymour corridor patronage shown in Figure 1 above includes services to both Albury and Shepparton as well as Seymour commuter service patronage. Unfortunately, separate data for each of these services was unavailable from V/Line at the time of preparing this report.

Overall Seymour corridor patronage has increased by 51% since 2004/05. This compares with the Geelong corridor 266%, Bendigo corridor 89% (excluding Sunbury metropolitan patronage explained above), Ballarat corridor 181% and Gippsland corridor 107%.

In 2009/10, the most recent data currently available, Shepparton line patronage represented only7% of overall Seymour corridor patronage which is dominated by daily commuter travel to Melbourne. Optimistically, if Shepparton rail patronage had increased since 2009/10 proportionally with overall Seymour corridor patronage, by 2015/16 it would currently involve approximately 97,000 train boardings per annum. This is equivalent to an average of only 266 passengers per day, principally spread over six single direction trips, or an average of 44 passengers per train service, including passengers boarding at intermediate stations.

3. Current services

As from late January 2017, Shepparton was finally provided with a fourth return rail service to Melbourne on weekdays with the extension of the 4.31 pm Melbourne to Seymour commuter service to Shepparton. This will complete the partial change introduced in October 2014 which altered the former 6.20 am Seymour to Melbourne commuter train to instead originate from Shepparton at 5.15 am. A consequential change is that the 6.22 pm Melbourne to Shepparton train has been altered to depart at 7.08 pm and will make three additional stops between Broadmeadows and Seymour. The full service is shown in Table 1, below.

Table 2 - Current Shepparton services (commenced 29 January 2017)

To Melbourne (Up)		From Melbourne (Down)	
Shepparton Dep.	**Melbourne Arr.**	**Melbourne Dep.**	**Shepparton Arr.**
Weekdays			
5.15 am*	7.59 am	9.32 am	12.07 pm
6.31 am	9.10 am	12.52 pm	3.23 pm
12.50 pm	3.15 pm	4.31 pm*	7.21 pm
4.06 pm	6.35 pm	7.08 pm	9.45 pm
Saturdays			
7.04 am	9.28 am	9.12 am	11.41 am
4.05 pm	6.29pm	6.32 pm	9.05 pm
Sundays			
7.15 am	9.39 am	9.30 am*	12.06 pm
5.05 pm	7.29pm	6.32 pm	9.05m

Note: services marked *stop at all stations Donnybrook to Tallarook, inclusive

With some re-arrangement of carriage deployment, these changes have been achieved without the need to provide additional rolling stock, the exception being that one afternoon Geelong service previously formed by a train from Shepparton is now being provided by a new addition to the VLocity fleet. However, being an extension of already well patronised commuter services which serve all stations on the Seymour line (Donnybrook to Seymour, inclusive), the additional services are already operating at close to their 370 seat capacity and provide slow journeys of up to 2 hours 50 minutes.

As an aside, although the two afternoon trains would normally be expected to stable overnight at Shepparton, only one currently does so. The 4.31 pm service from Melbourne returns empty from Shepparton to Seymour at 8.30 pm while the 6.31 am service to Melbourne originates from Seymour at 3.57am and arrives Shepparton at 5.00 am to cross the 5.15 am service to Melbourne. As a consequence, Murchison East has recently been restored as a regularly used and staffed crossing loop for the 8.30 pm empty train to cross the 7.08 pm train from Melbourne. While inefficient, these are likely to be semi-permanent arrangements pending changes in train crewing and train stabling at Shepparton.

Stations served by Seymour commuter services, especially Wallan and Donnybrook, are experiencing rapid patronage growth and residential development in this part of the outer metropolitan area is expected to continue to grow at a burgeoning rate. Two additional stations are planned for construction between Craigieburn and Wallan within the next few years. As such, the practical usefulness of the recently added services for Shepparton is likely to have a fairly short life.

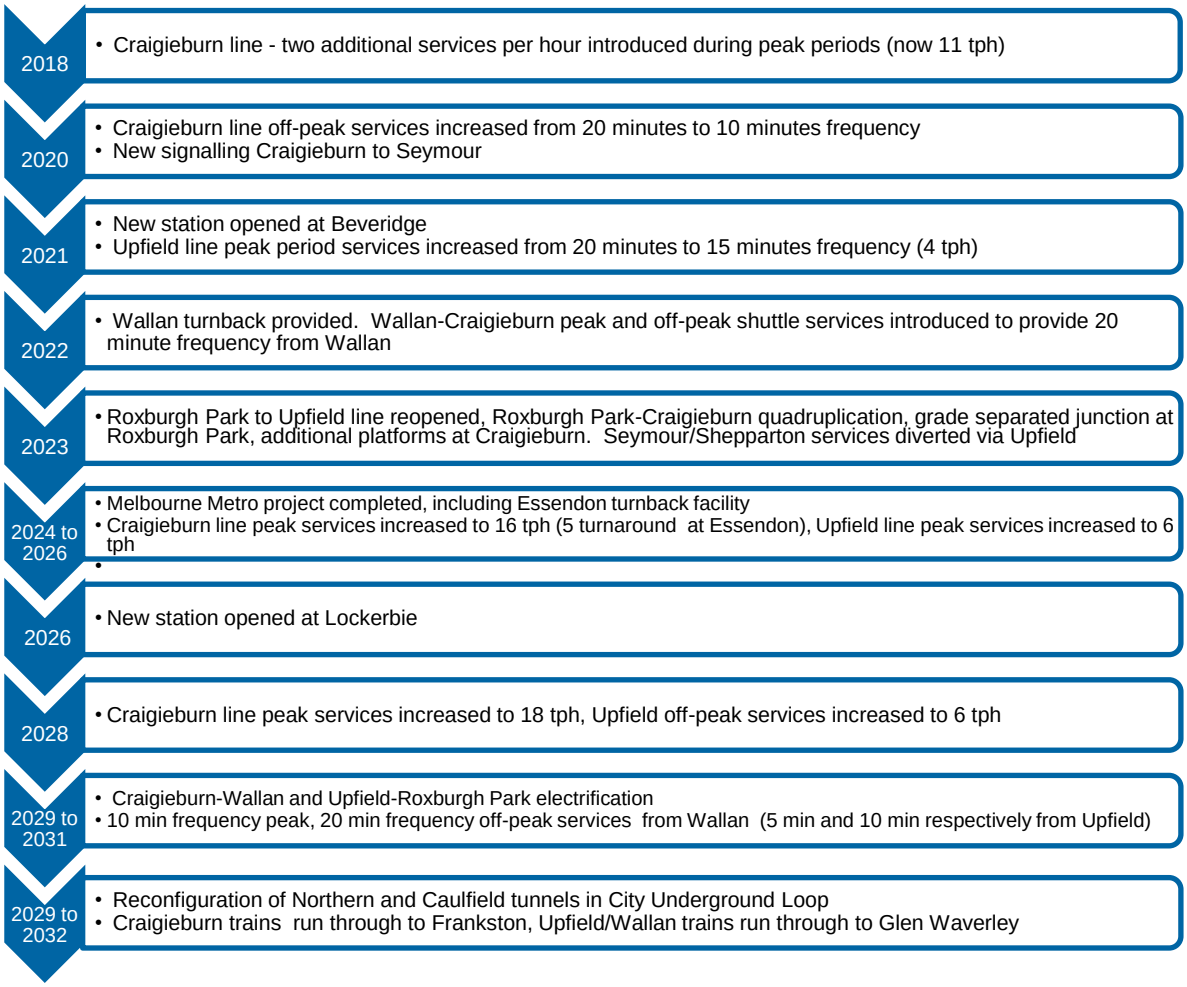
4. The metropolitan area challenge

4.1 Overview and anticipated change timelines

The overall context for V/Line's regional passenger services since the RFR project has been one of demand continuously outstripping supply, both in relation to the supply of rolling stock and also in relation to track capacity - the latter mainly limited to the Melbourne metropolitan area due to concurrent significant growth in patronage of regional and metropolitan services and the need to accommodate both types of services on a common infrastructure. This has led to ongoing overcrowding on some metro and regional services, particularly during peak hours, significantly with an impact of slowing most regional trains through the metropolitan area as they have to compete for increasingly restricted paths between successive metropolitan trains.

The $4 billion Regional Rail Link project, opened in mid-2015, overcame the train path problem, at least for the short term, for Geelong and Ballarat line trains and partially so for Bendigo line trains – the latter still interacting with Metro trains between Sunshine and Sunbury. However, it had no effect on the Seymour/Shepparton corridor where train path availability through the metropolitan network is already an intractable problem and is likely to remain so for a considerable time.

Below are the main metropolitan area changes that will be relevant to the Seymour/Shepparton corridor and their approximate anticipated timelines over the next 10-15 years. Nearly all of these changes will strongly influence achievable service frequencies and trip times that can be provided for Shepparton, as discussed in the following sections.



4.2 The short term (next 5 years)

Currently, nine metropolitan trains per hour operate between the CBD and Broadmeadows and/or Craigieburn during peak periods in the peak flow direction or an average of every 6.5 minutes. During the next 12-18 months, two additional trains per hour are planned to be added, thus increasing the peak period service to 11 trains per hour or on average every 5.5 minutes.

Seymour and Shepparton trains are scheduled in these gaps with the practical outcome that during peak periods, the regional trains can only operate at the same speed as a preceding stopping all stations metropolitan train, typically taking up to 41 minutes to travel 26 kilometres from Southern Cross to Craigieburn – an average speed of 38 km/h.

By contrast, at off-peak times when services are less frequent, regional trains typically take 26 minutes to reach Craigieburn from Southern Cross – an average speed of 60 km/h. Unfortunately, regional off-peak trains will also be forced to become slower by up to 9 minutes in the relatively near future when Craigieburn inter-peak services are improved to operate at 10 minute intervals instead of the current 20 minute frequency.

In addition, Craigieburn, Seymour and Shepparton trains presently have to merge with Upfield line trains at North Melbourne which further restricts the free flow of trains on the Craigieburn corridor. This situation makes it more urgent that faster trip times be achieved outside of the metropolitan electrified area, i.e. north of Craigieburn.

The emerging problem of overcrowding on Seymour line regional trains has to be addressed by either operating longer trains of greater passenger capacity or by providing additional services, particularly to serve the rapidly growing outer northern suburbs at Wallan, Beveridge (where a new station will be built during this period) and around Donnybrook. It is likely that this issue will be addressed by providing a turnback facility at Wallan and operating additional services, most likely by running an interim local shuttle service from Wallan, possibly connecting with metropolitan trains at Craigieburn during peak periods and running through to Southern Cross at other times.

Shepparton services, where feasible, should ideally run express south of Seymour with stops at Broadmeadows and North Melbourne[1] only and do so separately to regular Seymour commuter services. However, both for reasons of available train paths and rolling stock availability, this will only be possible to a very limited extent in the short term.

Three peak period train paths via Broadmeadows (as presently applies) is the maximum likely to be available for Seymour and Shepparton services (excluding potential Wallan-Craigieburn diesel shuttle services) during each two hour peak period. This situation is expected to apply until the Upfield line diversion is in place, currently assumed for 2023 – see Section 4.3, below.

4.3 Medium term issues (6-10 years)

In the 6-10 year period, further substantial changes will have occurred within the metropolitan area that will significantly affect Seymour and Shepparton services. Completion of the major Melbourne Metro project between 2024 and 2026 will remove Sunbury trains from the Northern Underground Loop and thus release capacity for additional peak period services on the Craigieburn line, some of which will turnaround at Essendon. Initially, the Craigieburn line is planned to have 16 trains per hour, rising to 18 trains per hour or at an average of 3.3 minute intervals. This will effectively eliminate the practical availability of train paths for Seymour/Shepparton trains via Broadmeadows and Essendon.

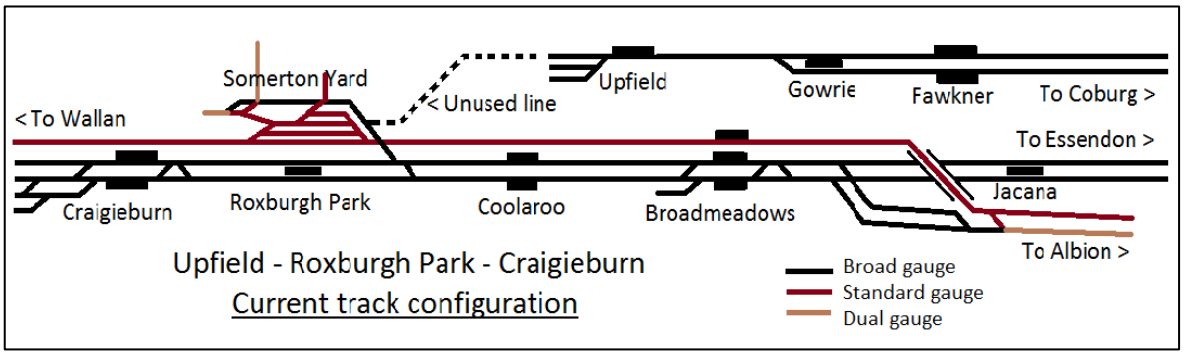
1 North Melbourne stops are provided for interchange to/from City Loop stations and also for connection with the Route 401 bus to Melbourne University and the Parkville hospital precinct. Current practice is that Melbourne-bound trains stop at North Melbourne in the AM period and outbound trains stop in the PM period on weekdays only.

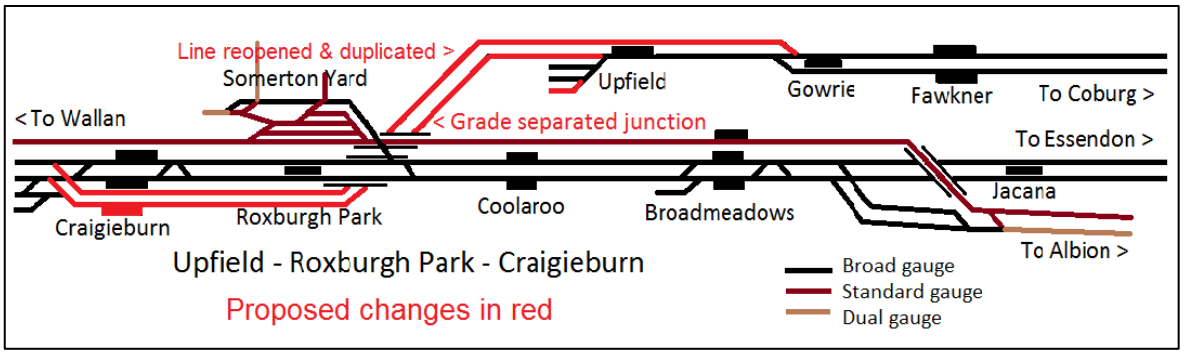
Meanwhile, patronage on Wallan and Seymour trains will have grown rapidly, especially from the new station at Beveridge and a further new station at Lockerbie (between Donnybrook and Beveridge) which is expected to open during this period.

To offset the non-availability of train paths inbound from Craigieburn when Melbourne Metro opens, Seymour/Shepparton trains will earlier have been diverted at Roxburgh Park to run via Upfield and Coburg instead of via Broadmeadows and Essendon. When this occurs, interchange between regional and metropolitan services will be at Craigieburn instead of Broadmeadows.

This is a major project involving reopening and upgrading of a former freight line between Roxburgh Park (otherwise known as Somerton) and Upfield. It will also involve duplication of the single line between Roxburgh Park, Upfield and Gowrie, an additional platform and new stabling sidings at Upfield, a rail/rail grade separated junction at Roxburgh Park to pass under or over the ARTC interstate and Metro tracks, quadruplication of the line between Craigieburn and Roxburgh Park (converted from 2 to 4 tracks) and two additional platforms at Craigieburn.

Diagrams of the current arrangements in the area between Craigieburn, Broadmeadows and Upfield and the proposed reconfiguration are shown below.





The Upfield diversion will initially provide the advantage of an entry and exit from Melbourne on a corridor with only 6 metropolitan trains per hour in peak periods and only 3 trains per hour at other times, thus enabling more reliable transits through the metropolitan area. When Melbourne Metro opens, it will also avoid the current merging moves at North Melbourne between Craigieburn and Upfield line trains as each will then be able to run on a separate pair of tracks between North Melbourne and Southern Cross.

When the Upfield diversion commences and the full project including grade separation of the junction at Roxburgh Park has been completed, up to six peak period train paths via Upfield are likely to initially be available for Seymour and Shepparton services (excluding proposed Wallan-Craigieburn diesel shuttle services) during each two hour peak period.

4.4 Longer term developments (10-15 years)

Further significant changes to the metropolitan network are expected to occur within a 10 to 15 year timeframe. The most important of these for Seymour/Shepparton services will be extension of electrification from Upfield to Roxburgh Park and from Craigieburn to Wallan to provide frequent metropolitan services to Wallan and to also serve at least three intermediate stations beyond Craigieburn (Donnybrook, Lockerbie and Beveridge) within this rapidly growing part of Melbourne.

Wallan trains will also use the diversion via Upfield, while Craigieburn trains will continue to run via Broadmeadows and Essendon.

In turn, this will require Seymour/Shepparton trains to share track capacity with metropolitan trains making three intermediate stops between Wallan and Craigieburn. It will also impose greater demands on the Upfield line which is now expected to have 12 metropolitan trains per hour during peak periods and 6 trains per hour at other times. Seymour/Shepparton trains will then once again be significantly impeded in respect of available paths and further slowed by up to 10 minutes, particularly between Upfield and the CBD. Any late running of metropolitan services will add to these delays.

Towards the end of this period, there are proposals for the City Underground Loop to be reconfigured with two of the separate loop tunnels to be connected in such a way to enable Craigieburn suburban trains to run directly to and from the Frankston line. This will increase the capacity of this corridor to more than 20 trains per hour. These trains will run via Flagstaff, Melbourne Central and Parliament but will not pass through Southern Cross or Flinders Street with passengers for these stations interchanging at North Melbourne.

Under these proposals, at that time, Wallan suburban trains via Upfield and North Melbourne would no longer use the Underground Loop but continue directly through Southern Cross and Flinders Street to Glen Waverley making use of two viaduct tracks between Southern Cross and Flinders Street that are released from the Craigieburn and Frankston lines.

Also within the 11 to 15 year timeframe is the proposed upgrading of the existing tracks between Wallan and Seymour to enable 160 km/h operation of VLocity DMUs and duplication of the Goulburn River Bridge near Seymour. This would reduce trip times for VLocity trains running express between Seymour and Wallan by 4 minutes, thus partly offsetting the slower transit through the extended metropolitan area.

These developments will continue to allow up to six peak period paths during each two hour peak period to be available via Upfield for Seymour and Shepparton trains. However because of slower running between the CBD and Wallan, VLocity trains running express south of Seymour will be unable to achieve Shepparton-Melbourne trip times of less than 2¼ hours during peak periods and 2hr 10 mins at other times (see details in Section 6).

4.5 The long term solution – routing via Melbourne Airport

Over the coming years, due to its proximity to Melbourne, its current size, growth projections and associated population catchment area, it would be reasonable for Shepparton to expect provision of a rail service with a reliable 2 hour transit time (or better) and trains running at two hourly or lesser intervals. Using an upgraded version of the present VLocity DMUs, this would be highly competitive against travel by road. Such an increased level of service would be more akin to services currently operating to Ballarat and Bendigo which offer more frequent, regular interval services.

Although a two hour Shepparton-Melbourne transit time equates to an average speed of 91km/h which should be readily achievable on lines with 130 to 160km/h speed capability, because of the constraints described earlier, it is inevitable that a relatively few regional trains attempting to penetrate a densely operated metropolitan corridor will be impeded. As such, two hour transit times are likely to remain unachievable in the absence of more radical network solutions.

The long term solution, certainly achievable within the 15-20 year timeframe or sooner, will be for all Seymour/Shepparton trains, together with Albury trains, to travel from Wallan to the CBD on a new higher speed corridor via Melbourne Airport, with regional trains stopping at Wallan for interchange with metropolitan services.

This concept is linked to the Rail Futures Institute proposal[2] for a new independent line from Southern Cross to Melbourne Airport, initially for Airport shuttle trains taking 15 minutes and running at continuous 10 minute intervals. From the Airport, the new line would continue north-west to link with the Bendigo line at Clarkefield and north-east to the Seymour/Shepparton/Albury lines near Beveridge, in the latter case using the already reserved easement for the Outer Metropolitan Ring (OMR) corridor. This would permanently achieve the segregation of all regional trains from metropolitan services on the Bendigo and Seymour/Shepparton/Albury lines. (Refer diagrams below).

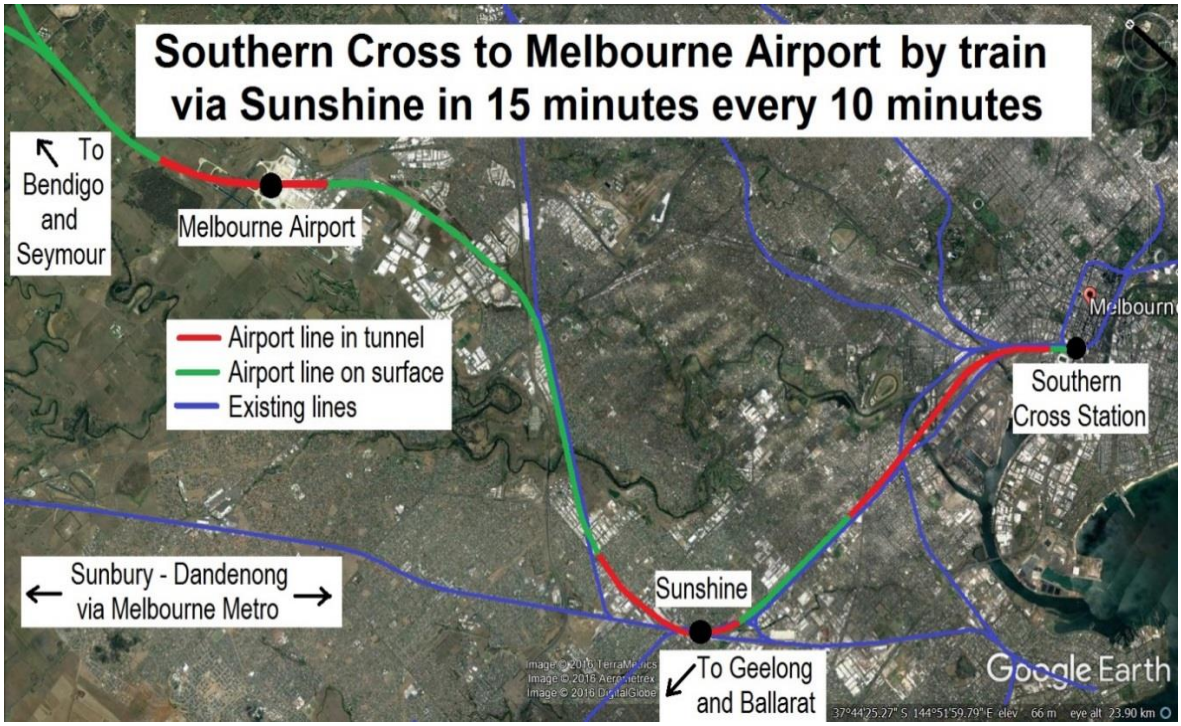


Figure 1 – Rail Futures Institute concept for new independent Southern Cross to Melbourne Airport train lines

2 "*InterCity*: How Regional Rail can Re-balance Population Growth and create a "State of Cities" in Victoria", Rail Futures Institute, August 2016 – see http://www.railfutures.org.au .

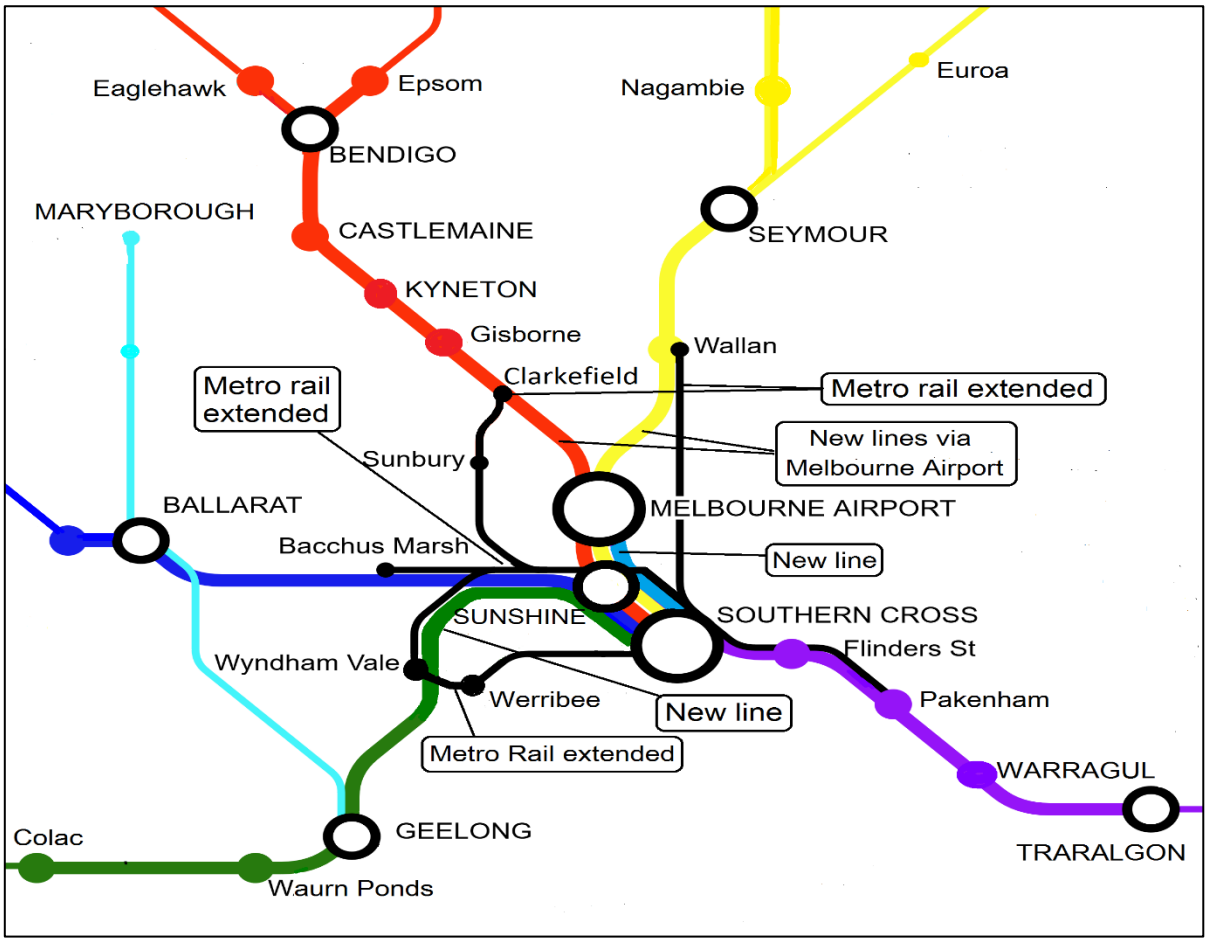


Figure 2 - Rail Futures Institute concept for Bendigo, Seymour, Shepparton and Albury trains to operate via Melbourne Airport

The new Wallan link via Melbourne Airport would be configured to allow regional trains to operate at between 160 and 200 km/h, enabling trip times from Southern Cross to Wallan of 29 minutes, inclusive of stops at Sunshine (for connections to/from Geelong, Ballarat and Melbourne Metro stations) and Melbourne Airport. This compares with between 39 and 59 minutes at present, depending upon the time of day and stopping conditions.

Combined with the earlier infrastructure improvements proposed within the 5 and 10 year horizons (see Section 7 of this report), the reconfigured rail network would provide routine trip times between Shepparton and Southern Cross of 1 hour 50 minutes and from Shepparton to Melbourne Airport of 1 hour 35 minutes with services operating at minimum two-hourly intervals and more often at busier times.

Experience elsewhere in Victoria provides confidence that, longer term, fast rail services to the Airport and Melbourne's CBD would almost certainly induce significant population growth and further strengthen Shepparton's role as an important service centre for the wider region, extending into the NSW southern Riverina.

The connection via Melbourne Airport would need to be part of a policy driven initiative directed at enhancing the attractiveness and viability of the Goulburn Valley and north-eastern Victoria and would require both State and Commonwealth political support. Irrespective, the practical impossibility of regional trains from the north-east achieving a satisfactory passage over the 47 km of existing railway between the CBD and Wallan while they continue to share tracks with metropolitan services will increasingly become an issue that demands resolution.

5. Rolling stock overview

The availability of V/Line rolling stock is also an important factor in considering options for service improvement. The V/Line rolling stock situation can be summed up as follows:

- Prior to the 2002-2005 Regional Fast Rail project (RFR), the V/Line fleet comprised 139 locomotive-hauled carriages and 21 Sprinter diesel multiple unit (DMU) railcars;
- The original RFR project added 76 VLocity DMU railcars. However, this fleet has now been progressively expanded to 192 railcars (as at February 2017) with a further 33 on order for delivery through to mid-2018;
- The remainder of the V/Line broad gauge passenger fleet now comprises 133 locomotive hauled carriages (5 were withdrawn due to age and poor condition and one was scrapped following the 2007 Kerang accident) plus the 21 Sprinter cars;
- Although some of the locomotive-hauled carriages are now up to 60 years old, as yet, there are no firm plans to withdraw any in the short term. This is because the additional VLocity railcars are being absorbed by very rapid patronage growth and this is expected to continue, further boosted by a new station at Caroline Springs on the Melton/Ballarat line which opened in late January 2017.

Figure 3 - V/Line Sprinter regional passenger train in old V/Line livery

There is no realistic ability for V/Line to provide additional rolling stock for the Shepparton service from the rolling stock fleet to be operational by mid-2018 as the additional 33 vehicles still to be delivered have already been committed to augment capacity on other corridors. Therefore, the government will need to purchase additional fleet capacity in order to directly or indirectly provide additional services using VLocity DMUs on the Shepparton corridor.

In practice, provision of additional VLocity DMU's for Shepparton services would come about when the government decides to provide additional capacity to meet continuing burgeoning demand on other lines. This may take the form of procurement of additional VLocity carriages, or a different

DMU version resulting in the release of some existing VLocity sets, or a decision to extend electrification to metropolitan growth areas on other lines presently served by V/Line.

Under any of these scenarios, the expectation is that sufficient numbers of VLocity cars would be progressively made available at that time to accommodate expected significant growth on other corridors, including Seymour/Shepparton. However, the capital and operating costs of providing the required number of VLocity cars would still be attributable to the additional services that are to be provided on each corridor.

A related issue will be the need to replace the existing locomotive-hauled rolling stock used on longer distance InterCity services (including to Shepparton) within the foreseeable future. The N and Z type carriages used on Shepparton services, form part of a sub-fleet of 78 vehicles that also operate to Albury (on standard gauge), Warrnambool, Swan Hill and Bairnsdale. The Z type carriages entered service between 1956 and 1962 and the generally similar but newer N type carriages were built between 1981 and 1984. As such, the combined N/Z car fleet has been in service for between 33 and 61 years.

The present expectation is that these vehicles will need to remain in service for at least a further 5 years and quite likely longer pending their replacement with a new long distance regional train. Some life extension works including refurbishment and/or upgrading may take place during this time. However, they represent outdated technology and new trains to service the longer distance corridors will certainly be badly needed by the time all of these vehicles have been in operation for around 40 years, assuming of course that government of the day intends to retain or (hopefully) expand rail service to these and other locations.

At that time, the opportunity will exist to incorporate a range of features and amenities in a new long distance fleet that are comparable with overseas best practice[3]. Such features could include special areas for business or premium fare passengers with a range of facilities that could provide an attractive alternative to travel by car or even by air, in some circumstances.

The issue for Shepparton is whether the preference would be for faster and more frequent services in VLocity type equipment that, while comfortable and quite suitable for journeys of 2 to 3 hours duration, does not have provision for first class seating, an on-board catering service or a range of ancillary facilities that might appeal to business travellers or those seeking more of a travel experience than a simple point to point journey.

The pragmatic view will undoubtedly be influenced by the relative timing of such opportunities. It seems possible that VLocity DMUs could be made available for use on the Shepparton corridor by around 2020 or once the required infrastructure works are completed, and that is the recommended approach in this report. The alternative is for Shepparton to continue to be regarded as part of the longer distance InterCity operation and therefore be unlikely to see replacement rolling stock before 2025 or later.

Longer term, in the context of the proposed fast line via Melbourne Airport, it is likely that other new trains would be acquired. These would utilise different technology to the current VLocity trains due to the need to prevent diesel emissions while travelling through underground tunnels. In accordance with latest international practice, these are likely to be so-called bi-modal trains, seamlessly switching between diesel power in open country areas and electric traction in tunnels and within dense urban environments and capable of running at 200 km/h.

3 There are numerous articles and papers in rail industry literature that provide a wealth of information regarding modern passenger rolling stock used on overseas rail networks, especially in Europe and some Asian countries. GHD can provide links to some of this information if desired).

Figure 3 – VLocity regional passenger train

Figure 4 - Locomotive-hauled V/Line regional passenger train in old V/Line livery

6. Options for service improvement

6.1 Scenario 1 – Five return services using loco-hauled rolling stock (achievable within less than two years)

With some further modest re-arrangement of rolling stock deployment, achievable with the current deliveries of additional VLocity trains, it should be feasible to introduce a fifth return service to Shepparton on weekdays and four return services on weekends. This would use the existing locomotive-hauled equipment more intensively without the need for prior infrastructure investment. This could be done within less than two years as an interim step before introducing a permanently upgraded service using VLocity railcars.

However, the interim service would require compromises to some existing weekday timetables and consequential changes to Melbourne-Seymour services, including the potential operation of up to three additional Melbourne-Seymour and return services, each using a pair of Sprinter railcars. This would provide Seymour with an all-day minimum hourly service frequency, also largely achieved by more intensive use of existing rolling stock. Under this scenario, the costs and benefits would accrue separately both to Shepparton and to regular Seymour commuter services, as discussed in Section 8.

Importantly, this option does not require provision of any additional peak period train paths between Southern Cross and Craigieburn than presently applies.

An indicative timetable (subject to detail of train pathing between Southern Cross and Craigieburn) for a five train service using loco-hauled rolling stock is shown below.

Table 3 – Potential 5 train timetable using loco-hauled rolling stock

To Melbourne (Up)		From Melbourne (Down)	
Shepparton Dep.	**Melbourne Arr.**	**Melbourne Dep.**	**Shepparton Arr.**
Weekdays			
5.15 am*	7.59 am	8.25 am**	11.00 am
6.31 am**	9.10 am	11.05 am***	1.30 pm
11.20 am***	1.45 pm	2.05 pm***	4.30 pm
1.50 pm**	4.20 pm	4.31 pm*	7.21 pm
4.50 pm**	7.20 pm	7.08 pm**	9.45 pm
Saturdays and Sundays			
6.30 am**	8.55 am	9.32 am**	11.57 am
9.00 am**	11.25 am	12.50 pm***	3.15 pm
12.50 pm***	3.15 pm	5.10 pm**	7.40 pm
4.25 pm**	6.49 pm	7.12 pm**	9.45 pm

Note: *these services would stop at all stations between Donnybrook and Seymour

**these services would make limited stops between Broadmeadows and Seymour

***these services would operate express between Broadmeadows and Seymour

As shown above, it would be possible to provide up to four return services at weekends using two train sets. Maintenance requirements set this as the practical limit of weekend services using loco-hauled rolling stock.

6.2 Scenario 2A – Eight return services using VLocity railcars via Broadmeadows (achievable within five years)

The more sustainable short term option is to provide faster and more frequent services by deploying VLocity railcars to the Shepparton corridor once sufficient fleet capacity exists to do so and the various infrastructure pre-requisites have been achieved (see below).

If the Government agrees to the preparation of a business case during 2017 and funding approval is forthcoming no later than the May 2018 State Budget, it is possible that the necessary additional rolling stock could be in place during 2021. Further rolling stock procurement for regional services is unlikely to be for any one corridor, however there is a strong possibility that a further order or orders could be placed during 2017 or 2018, with the potential for Shepparton's initial needs of 4 x 3-car sets to be included. This could either be achieved directly by a further order for new vehicles and/or by partial redeployment of the existing VLocity fleet. This would include the short term re-use elsewhere of the locomotive-hauled rolling stock currently used on Shepparton services.

However, before VLocity services can operate, the rail corridor between Seymour and Shepparton must be upgraded to meet VLocity operating and safety requirements. These infrastructure investments would have to form part of the same business case as for the rolling stock investment and, subject to effective project management, would have a realistic lead time to completion of three years from funding approval. In summary, this will involve:

- Track and signalling alterations at Seymour to enable simultaneous train arrivals in each direction and to side-track terminating trains
- Upgrading of 32 level crossings that do not meet current standards for full active protection
- Modest track upgrading from the present Class 3 to Class 2 standard, thus enabling VLocity operation at 130 km/h, subject to localised curve speed constraints
- Construction of a new remotely controlled 1500 m long crossing loop at Tabilk
- Provision of a remotely controlled signalling system between Seymour and Shepparton to replace the existing Train Orders system of train safeworking and incorporating signalling changes at Murchison East, Toolamba and Mooroopna
- Provision of a secure facility at Shepparton for VLocity overnight stabling and servicing
- Expanded train crew facilities at Shepparton
- Any other infrastructure changes deemed necessary following normal risk assessment.

A further essential pre-requisite, but which will be required in the relatively near future in any event and therefore should not be attributable to Shepparton service improvements, will be a new signalling system between Craigieburn and Seymour to replace the very old, inflexible and labour intensive Double Line Block safeworking system.

The required infrastructure improvements, including estimated costs, are discussed in greater detail in Section 7.

Until the Upfield diversion can be introduced (see Section 4.3), currently assumed for 2023, Seymour commuter services and Shepparton trains would continue to have only three peak period train paths available between Craigieburn and Southern Cross via Broadmeadows. At off-peak times, by around 2020, they will be required to slot between Craigieburn metropolitan services which are expected to double in frequency and run at 10 minute intervals.

The implication is that while Seymour/Shepparton services continue to operate via Broadmeadows, almost all will be faced with slow running for 26 km through the metropolitan area. Standard running time for metropolitan trains between Southern Cross and Craigieburn is 40 minutes or an average speed of 39 km/h. During peak times when metropolitan services are closely spaced, regional trains are also allowed 40 minutes. Currently during off-peak times when metropolitan trains operate at 20 minute intervals, this reduces to 28 minutes. Once off-peak services are increased to 10 minutes frequency by 2020, this will increase to 36 minutes.

As such, while the introduction of VLocity railcars will provide average journey time reductions of 10-15 minutes compared to present services, most overall trip times will still be relatively slow at around 2 hours 20 minutes.

The maximum train frequency that can be operated via Broadmeadows, assuming availability of the additional infrastructure listed above, is a service approximately every 2 hours 10 minutes. This is a function of the total cycle time taken for a train to run from Southern Cross to Shepparton and return.

In practical terms, that would mean a timetable resembling that in Table 3 below which provides up to eight return services on weekdays and seven return services on weekends.

Table 4 – Potential 8 train VLocity timetable via Broadmeadows

To Melbourne (Up)		From Melbourne (Down)	
Shepparton Dep.	**Melbourne Arr.**	**Melbourne Dep.**	**Shepparton Arr.**
Weekdays			
5.20 am*§	7.55 am	6.10 am**	8.35 am
6.40 am**	9.10 am	8.20 am	10.40 am
8.50 am	11.10 am	10.30 am	12.50 pm
10.55 am	1.15 pm	12.40 pm	3.00 pm
1.05 pm	3.25 pm	2.50 pm	5.10 pm
3.15 pm	5.35 pm	4.40 pm*§	7.10 pm
5.25 pm**	7.50 pm	6.55 pm**	9.15 pm
7.25 pm**	9.45 pm	10.00 pm**	12.20 am
Weekends			
6.20 am**	8.40 am	7.15 am**	9.35 am
7.45 am**	10.05 am	9.20 am**	11.40 am
9.50 am**	12.10 pm	11.25 am**	1.45 pm
11.55 am **	2.15 pm	1.30 pm**	3.50 pm
2.00 pm**	4.20 pm	5.30 pm	7.45 pm
4.05 pm**	6.25 pm	7.30 pm**	9.50 pm
8.00 pm**	10.20 pm	11.00 pm**	1.20 am

Note:*these services would stop at all stations between Donnybrook and Seymour

**these services would make limited stops between Broadmeadows and Seymour

Other services would operate express between Broadmeadows and Seymour

§ - these services would operate as 6-car consists (444 seats). All other services would be 3-car consists (222 seats).

Options for variations to the above timetables could be investigated closer to implementation as more detailed metropolitan services planning information which should be available at that time.

6.3 Scenario 2B – Eight or nine return services using VLocity railcars via Upfield (achievable within six to eight years)

As explained in Section 4.3, completion of the major Melbourne Metro project between 2024 and 2026 will remove Sunbury trains from the Northern Underground Loop and thus release capacity for additional peak period services on the Craigieburn line. This will effectively eliminate the practical availability of train paths for Seymour/Shepparton trains via Broadmeadows and Essendon.

To offset the non-availability of train paths inbound from Craigieburn, by around 2023 Seymour/Shepparton trains will have been diverted at Roxburgh Park to run via Upfield and Coburg instead of via Broadmeadows and Essendon. When this occurs, interchange between regional and metropolitan services will be at Craigieburn instead of Broadmeadows.

At that stage, track quadruplication between Craigieburn and Roxburgh Park will mean that regional trains will only need to interface with metropolitan trains between Upfield and Southern Cross running every 10 minutes at peak times and every 20 minutes at other times. Compared to operating via Broadmeadows, this will allow regional train trip times between Craigieburn and Southern Cross to be reduced from 40 minutes to 33 minutes during peak periods and from 36 minutes to 26 minutes at other times.

The multiple effects of these changes will be to allow more regional services to operate through the metropolitan area and to do so with less delay. Meanwhile, patronage on Wallan and Seymour trains will have grown rapidly, especially from the new station at Beveridge and a further new station at Lockerbie (between Donnybrook and Beveridge) which is expected to open during this period. Seymour commuter services will then by necessity be operating a more intensive service of 20 minutes peak and 40 minutes off-peak frequency, most likely supplemented by some additional services originating at Wallan. This will provide the opportunity to fully separate Shepparton services from Seymour commuter trains and allow the majority of Shepparton trains to run express between Seymour and Craigieburn.

In turn, this will allow overall Shepparton-Melbourne trip times for express services to be reduced to approximately 2 hours 10 minutes and, for the first time, the reduced total cycle times will permit the introduction of services operating at two-hourly frequencies on a regular clockface timetable. This service would be more equitable by comparison with other regions within a similar distance cordon from Melbourne and with generally comparable population projections.

The previously enhanced services should also have lifted Shepparton line patronage to a stage where additional services would be warranted. Based on experience elsewhere, several market segments could be expected to emerge that would further drive up travel demand from the Shepparton region once a much more attractive rail service became a reality. These include longer distance commuting to the Melbourne metropolitan area, increased discretionary travel for business, visiting friends and relatives, shopping, attending sporting events and the like, and increased use of rail for those required to travel long distances to attend medical appointments or for other non-discretionary reasons.

There would also be the opportunity to develop demand for inward or contra-flow travel to Shepparton from Seymour and other stations on the corridor, particularly for students, those working normal business hours and for shopping trips. This would necessitate at least one service arriving into Shepparton by around 8.30 am and departing after 4.30 pm.

In practical terms, that would mean a timetable resembling that in Table 4 below which provides up to nine return services on weekdays and eight return services on weekends.

Table 5 – Potential 9 train VLocity timetable via Upfield

To Melbourne (Up)		From Melbourne (Down)	
Shepparton Dep.	**Melbourne Arr.**	**Melbourne Dep.**	**Shepparton Arr.**
Weekdays			
5.30 am*§	7.55 am	6.10 am*	8.30 am
6.45 am	9.00 am	8.15 am	10.30 am
8.45 am	10.55 am	10.20 am	12.30 pm
10.45 am	12.55 pm	12.20 pm	2.30 pm
12.45 pm	2.55 pm	2.20 pm	4.30 pm
2.45 pm	5.00 pm	4.15 pm §	6.30 pm
4.45 pm**	7.00 pm	6.20 pm	8.30 pm
6.45 pm*	9.05 pm	8.20 pm**	10.35 pm
8.45 pm*	11.05 pm	10.10 pm*	12.30am
Weekends			
6.20 am**	8.35 am	7.15 am**	9.30 am
7.45 am**	10.00 am	9.15 am**	11.30 am
9.45 am **	12.00 pm	11.15 am**	1.30 pm
11.45 am**	2.00 pm	1.15 pm**	3.30 pm
1.45 pm**	4.00 pm	3.15 pm**	5.30 pm
3.45 pm**	6.00 pm	5.15 pm**	7.30 pm
5.45 pm**	8.00 pm	7.15 pm**	9.30 pm
7.45 pm*	10.05 pm	11.00 pm*	1.15 am

Note: * these services would stop at all stations between Donnybrook and Seymour

** these services would make limited stops between Broadmeadows and Seymour

Other services would operate express between Broadmeadows and Seymour

§ - these services would operate as 6-car consists (444 seats). All other services would be 3-car consists (222 seats).

More detailed timetables for the above services (Including dovetailing with Seymour commuter services) and proposed rolling stock utilisation are contained in the Appendices. Options for variations to the above timetables could be investigated closer to the time of implementation.

6.4 Scenario 3 - Eight or nine return services using VLocity railcars in the context of electrification to Wallan (beyond 10 years)

Shepparton in around 15 years could have a potential population in excess of 80,000 and some 115,000 in its wider catchment region, with the previously upgraded rail service likely to be an important factor in this growth.

During the next 10-15 years, it is also anticipated that extension of electrification from Craigieburn to Wallan and operation of frequent metropolitan services to Wallan will occur. As detailed in Section 4.4, Wallan trains will also use the diversion via Upfield, while Craigieburn trains will continue to run via Broadmeadows and Essendon. In turn, this will require Seymour/Shepparton trains to share track capacity with metropolitan trains making three intermediate stops between Wallan and Craigieburn and up to 13 station stops between Upfield and the CBD.

Wallan electrification will impose greater demands on the Upfield line which will then be likely to have 12 metropolitan trains per hour during peak periods and 6 trains per hour at other times. While Seymour/Shepparton trains would presumably be able to at least retain the number of train paths shown in Scenario 3, they again will be slowed by up to 10 minutes, particularly between Upfield and the CBD. This will reduce the available time for trains to turnaround at the respective terminals which in turn is likely to affect service reliability. Any late running of metropolitan services will add to such delays.

As also noted in Section 4.4, within the 11 to 15 year timeframe, the proposed upgrading of the existing tracks between Wallan and Seymour would enable 160 km/h operation of VLocity DMUs. Duplication of the Goulburn River Bridge near Seymour would also provide greater timetabling flexibility and improve service reliability on the corridor. This would reduce trip times for VLocity trains running express between Seymour and Wallan by 4 minutes, thus partly offsetting the slower transit through the extended metropolitan area.

Overall, whilst electrification to Wallan will be an inevitable requirement given the burgeoning residential development which is already well underway on Melbourne's northern outskirts, particularly between Donnybrook and Wallan, it will not be helpful to those using services from and to stations north of Wallan.

More significantly, in the absence of more radical solutions, it will effectively negate any serious possibility of achieving Shepparton's aspiration for two hour rail transits (or better) to and from Melbourne. This should not be acceptable to the community of Victoria's fifth largest regional city.

6.5 Scenario 4 - Higher frequency services via Melbourne Airport

The reduced trip time on a high quality railway via Melbourne Airport as described in Section 4.5 combined with complete segregation from metropolitan services would provide considerably greater timetabling flexibility and hence provide more service options than would be possible under any of the network scenarios described in previous sections of this report.

The majority of trains operating under this scenario would run express south of Seymour, stopping only at Wallan (only for metropolitan service interchange), Melbourne Airport and Sunshine. When combined with the infrastructure enhancements required to enable the previously described Scenario 2 together with subsequent major track upgrading between Wallan and Seymour, trip times of between 1 hour 50 minutes and 1 hour 55 minutes between Shepparton and the Melbourne CBD at Southern Cross should be routinely achieved and sustainable. Trips to and from Melbourne Airport would be 15 minutes quicker than to Melbourne CBD.

An example of a feasible timetable under these conditions is shown in Table 6 below.

Table 6 – Potential timetable for 10 or more trains via Melbourne Airport

To Melbourne (Up)			From Melbourne (Down)		
Shepparton Depart	Melbourne Airport Arr.	Melbourne Arrive.	Melbourne Depart	Melbourne Airport Dep.	Shepparton Arrive.
Weekdays					
5.00 am	6.35 am	6.50 am	6.20 am	6.35 am	8.15 am
6.45 am	8.20 am	8.35 am	8.00 am	8.15 am	9.55 am
8.30 am	10.05 am	10.20 am	9.45 am	10.00 am	11.40 am
10.15 am	11.50 am	12.05 pm	11.30 am	11.45 am	1.25 pm
12.00 pm	1.35 pm	1.50 pm	1.15 pm	1.30 pm	3.05 pm
1.45 pm	3.25 pm	3.40 pm	3.00 pm	3.15 pm	4.50 pm
3.30 pm	5.10 pm	5.25 pm	4.45 pm	5.00 pm	6.35 pm
5.15 pm	6.55 pm	7.10 pm	6.30 pm	6.45 pm	8.20 pm
7.00 pm	8.40 pm	8.55 pm	8.15 pm	8.30 pm	10.05 pm
8.45 pm	10.25 pm	10.40 pm	10.00 pm	10.15 pm	11.50 pm
Weekends					
6.45 am	8.20 am	8.35 am	8.00 am	8.15 am	9.55 am
8.30 am	10.05 am	10.20 am	10.00 am	10.15 am	11.55 am
10.30 am	12.05 pm	12.20 pm	12.00 pm	12.15 pm	1.55 pm
12.30 pm	2.05 pm	2.20 pm	2.00 pm	2.15 pm	3.55 pm
2.30 pm	4.05 pm	4.20 pm	4.00 pm	4.15 pm	5.55 pm
4.30 pm	6.05 pm	6.20 pm	6.30 pm	6.45 pm	8.25 pm
7.00 pm	8.35 pm	8.50 pm	9.15 pm	9.30 pm	11.05 pm

These timetables would comprise sectional running times as under:

- Southern Cross – Sunshine 7 minutes
- Sunshine - Melbourne Airport 8 minutes
- Melbourne Airport – Wallan 14 minutes
- Wallan – Seymour 24 minutes (assumes Class 1 track –see Section 7.3)
- Seymour – Shepparton 52 minutes (assumes Class 2 track – see Section 7.1)

- Recovery allowances 5 to 10 minutes (depending on circumstances)
- **Total trip times** **110 to 115 minutes**

This would still only be half the service frequency provided to both Bendigo and the Latrobe Valley. However, this is considered to be a reasonable expectation given the long established acceptance of daily long distance commuting from the Bendigo and Latrobe Valley rail corridors and the greater population distribution along those corridors which also generates substantial travel demand from intermediate stations. This is not expected to be the case between Seymour and Shepparton, at least for some years, although a substantially enhanced service will, over time, increase the attractiveness of towns like Nagambie and Murchison as places from which daily travel to Melbourne might increasingly become a practical option.

Once converted to standard gauge and upgraded, the new infrastructure would also enable Albury line trains to once again utilise the present broad gauge lines south of Seymour instead of the ARTC interstate line as at present. Gauge conversion is inherent in the overall network reconfiguration that would come with the Airport connection. Related issues are discussed in Section 9 of this report.

The proposed network configuration via Melbourne Airport as illustrated in Section 4.5 will also provide excellent connectivity to locations other than the Melbourne CBD, generally with no more than one change at a connecting station, as shown in the table 7 below.

Table 7 – Statewide connectivity with proposed Melbourne Airport rail link

Other regional lines		Melbourne metropolitan lines	
Destination or line	**Connecting station**	**Destination or line**	**Connecting station**
Albury line	Seymour	Craigieburn line	Wallan
Wallan-Seymour line	Seymour	Upfield line	Wallan
Bendigo line	Melbourne Airport	Sunbury line	Sunshine
Ballarat line	Sunshine	Dandenong line	Sunshine
Geelong/Warrnambool	Sunshine	Wyndham Vale/Werribee	Sunshine
Traralgon/Bairnsdale	Southern Cross	All other lines	Southern Cross

7. Supporting infrastructure requirements

7.1 Infrastructure for VLocity operation (Scenario 2)

7.1.1 Infrastructure requirements overview

Inclusive of 30% contingency, the recommended allowance for infrastructure capital expenditure prior to implementation of Scenario 2 is $101 million.

As discussed in section 6.2, before VLocity services can operate, the rail corridor between Seymour and Shepparton must be upgraded to meet VLocity operating and safety requirements. In summary, this will involve estimated infrastructure capital investment as shown in the following table.

Table 8 – Estimated infrastructure capital investment requirements

Project description	Purpose	Estimated cost
Seymour - track and signalling alterations	To enable simultaneous train arrivals in each direction and to side-track terminating trains	$3.0 million
Seymour to Shepparton – upgrading of 32 level crossings	To meet current standards for full active protection and to allow VLocity operation.	$19.5 million
Seymour to Shepparton – track upgrading from Class 3 to Class 2 standard	To enable VLocity operation at 130km/h, subject to localised curve speed constraints	$22.0 million
Seymour to Shepparton – provision of remotely controlled Automatic Block signalling system	To replace the existing Train Orders system of safeworking to efficiently accommodate additional train services. To include signalling changes at Murchison East, Toolamba and Mooroopna.	$10.0 million
Tabilk – new 1500m long crossing loop between MP 117.5 and MP 119.0	To provide a recovery buffer to ensure any late running of passenger trains does not cause chain reaction delays and to allow for freight trains to also operate efficiently in conjunction with a much more intensive passenger service.	$14.0 million
Shepparton – facility for VLocity overnight stabling and servicing	To provide a facility to enable VLocity trains to be stabled overnight under appropriate security and for routine cleaning and servicing to be undertaken. Includes road vehicle access and changes to signalling.	$9.0 million
Shepparton – expanded train crew facilities	To accommodate additional train crew required to operate additional passenger services	$0.5 million
Contingency allowance	Added 30% contingency allowance to the above items pending detailed investigation and design	$23.0 million
Total recommended allowance for infrastructure capital investment		**$101.0 million**

More detail regarding these projects is contained in the following sections of this report.

7.1.2 Seymour track and signalling alterations

Seymour station and yard, as presently configured, cannot accept simultaneous arrivals from both the Melbourne and Shepparton directions as there is no overrun protection at the Down (northern) end of the station. To overcome this situation, it is proposed to install a new turnout beyond the Down end of No.3 platform and connect it to the Shed Road track, together with an extension of the Stabling Road to a minimum of 160 metres in length in order to accommodate a 6-car VLocity consist or equivalent (see diagrams below).

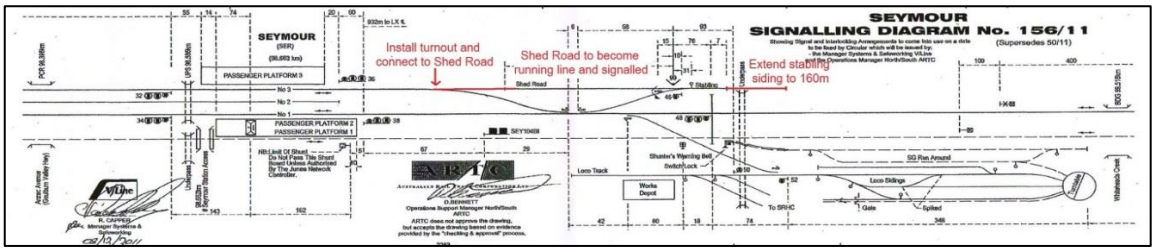


Figure 4 - Seymour station and yard (Down end) showing proposed alterations to permit simultaneous arrivals in each direction

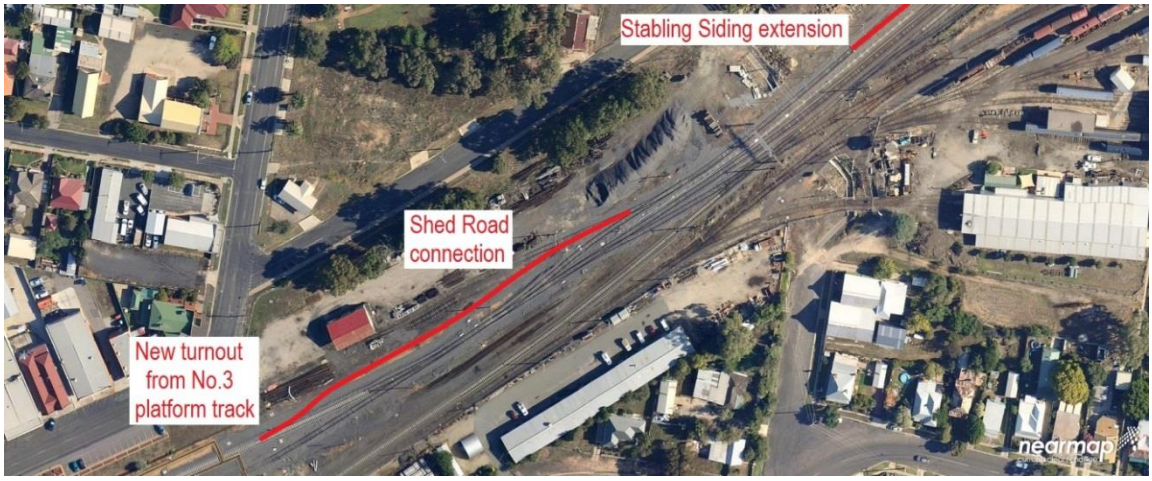


Figure 5 - Aerial photograph of Seymour station and yard (Down end) showing proposed alterations

This will have the dual functionality of permitting simultaneous arrivals of Down trains into No.3 platform and Up trains into No.2 platform and also providing short term stabling for terminating trains when it is necessary to clear both platforms for other services. This will be a useful alternative to the current regular crossing of the ARTC mainline to access the loco depot tracks for terminating trains to be side-tracked. The estimated cost of the proposed alterations at Seymour is $3 million.

7.1.3 Level crossings

The current level crossing situation between Seymour and Shepparton is summarised below in Table 8.

Table 9 – Level crossings Seymour to Shepparton – current protection

Line section	RFR standard (flashing lights and booms)	Flashing lights only	Passive only (Stop or Give Way signs)	Occupation crossings (no protection)	Total number
Seymour-Mangalore	1		1		2
Mangalore-Nagambie	2	4	5	1	12
Nagambie-Murchison East	4		9	1	14
Murchison East-Toolamba	1	1	6	4	12
Toolamba-Mooroopna	1	1	5	2	9
Mooroopna-Shepparton	4				4
Totals	**13**	**6**	**26**	**8**	**53**

All 32 level crossings currently equipped with flashing lights only and passive protection only will require upgrading to full RFR standards before VLocity trains can operate on the corridor at an

estimated average cost of $600,000 per crossing. Allowance has also been made for minor adjustments to the 12 existing RFR standard crossings beyond Mangalore to handle the increased speed of VLocity DMUs.

The eight occupation crossings will require individual assessment and may also require additional minor treatment such a new gates with special locks or frangible gates that are permanently locked but can be forced open if necessary, e.g. by emergency services vehicles.

7.1.4 Track upgrading

The Shepparton line is already at Class 2 standard between Seymour and Mangalore (11 km). The remaining 72 km beyond Mangalore is likely to require some attention for it to be upgraded from Class 3 to Class 2 standard, thus permitting VLocity DMUs to operate at up to 130 km/h on suitably aligned track.

Based on general observation, the Mangalore to Shepparton section of track is in reasonable condition with rail joints continuously welded and sleepers, ballast and drainage also in average to good condition. Major bridge renewals and decking upgrading have recently been undertaken in the vicinity of Toolamba and Mooroopna. A number of level crossings have also been reconditioned in recent times, having been re-laid with concrete sleepers and a third rail making provision for future gauge standardisation.

However, the rail between Mangalore and Murchison East (38 km) is very old 45 kg/m section that was cascaded from the main north-eastern line many years ago. An allowance has been made for this to be replaced with new 50 kg/m rail at an estimated cost of $15 million, including installation. Allowance has also been made for a minor tie cycle between Mangalore and Shepparton (sleeper renewal at 200/km) and track re-surfacing at an estimated cost of $6 million. A further allowance of $1 million has been included for miscellaneous associated works such as drainage improvement, replacement of turnout bearers, vegetation control, localised rail grinding, etc.

To the extent that future sleeper installation between Seymour and Shepparton uses concrete instead of timber sleepers, these must be of the gauge convertible type in anticipation that the Shepparton/Tocumwal and connecting lines will be converted to standard gauge in the foreseeable future. This aspect is further discussed in Section 9 of this report.

7.1.5 Seymour-Shepparton signalling, safeworking and Tabilk crossing loop

A maximum of six return services per day can be operated with opposing direction trains all passing each other on the double lines south of Seymour. For the operation of additional services, opposing direction trains will need to either pass each other at Seymour and at a crossing loop suitably located north of Seymour. In addition, the exiting manual Train Order system of safeworking will need to be replaced with remotely controlled signalling so that trains can pass each other with minimum delay.

An efficient method of passing or crossing trains is also required to the north of Seymour. It will have a dual purpose – to provide a recovery buffer in the event that the late running of one train does not result in serious chain reaction delays to a succession of other trains and secondly, to provide a facility for freight trains to also operate on the line in a situation where (under Scenario 2 and subsequently) a passenger train would be occupying some part of the line between Seymour and Shepparton almost continuously from 5am to midnight on most days.

While it was previously proposed that the existing crossing loop at Murchison East be upgraded for this purpose, simulation of a two hour interval timetable suggests that this would result in excessive turnaround times at Shepparton. Instead, it is proposed that a new 1500m long crossing loop be constructed between MP 117.5 and 119.0 near the former Tabilk station site between Avenel Road (at MP 116.837) and Tabilk-Monea Road (at MP 119.340) level crossings in the section between

Mangalore and Nagambie. The site is on straight and near level track and would require minimal earthworks. The crossing loop would also have freight benefits in facilitating operation of freight trains up to 1200m in length. Based on similar recent projects, the estimated cost of this facility with clear standing room of 1200 metres (plus 300 metres for signal overlap) is $14 million.

The new remotely controlled signalling system between Seymour and Shepparton would effectively divide the line into four block sections, i.e. Seymour to Tabilk Loop, Tabilk Loop to Murchison East, Murchison-East to Toolamba and Toolamba to Shepparton, thus enabling limited follow-on movements in each direction. Apart from the proposed new Tabilk crossing loop, the system would also remotely control entry to intermediate sidings at Murchison East and Mooroopna and control the junction to the Echuca line at Toolamba. If necessary, the system would also allow a freight train to be locked away at Murchison East or Mooroopna while passenger trains go past. (Also see Section 10 of this report regarding freight services). It will also interface with existing signal installations at Seymour and Shepparton. The estimated cost of providing this facility is $10 million.

Within the same timescale (or earlier) that new signalling will be required between Seymour and Shepparton, a separate new signalling system will also be required between Craigieburn and Seymour to replace the very old Double Line Block system of safeworking – the only installation of this type still in use in Australia. This will be required irrespective of proposed improvements to Shepparton services, hence its cost is not attributable to the Shepparton line proposals. However, its designed functionality will be of critical importance for the effective operation of Shepparton services and should be configured in anticipation of a mix of stopping and express services on the corridor with approximate headways not exceeding 5 minutes for passenger services operating at 130km/h.

7.1.6 VLocity stabling and servicing facility

A security compound for stabling VLocity railcars and additional train crew facilities will also be needed at Shepparton at an estimated cost of $9 million. The existing Shepparton station yard is considered unsuitable for this purpose, partly because its use involves avoidable shunt manoeuvres, partly because the existing yard sidings are within 100 metres of the nearest residences where noise will likely be an issue and particularly because the property involved has potential for significant complementary commercial redevelopment. Therefore it should not be held for overnight train stabling if other acceptable alternatives exist.

Accordingly, it is proposed that negotiations take place with the existing siding owner to adapt the southern part of the former Shell oil sidings complex, some 2.5km north of Shepparton station, to provide stabling accommodation for up to 12 VLocity cars, together with the normal toilet servicing and water supply facilities required for overnight servicing of these vehicles (see diagram below). The facility would have two parallel sidings, each 180 metres in length. The estimated cost includes alterations to signalling between Shepparton station and the oil sidings, including provision for a remote controlled security gate, signalled entry and exit from the sidings and road vehicle access from New Dookie Road.

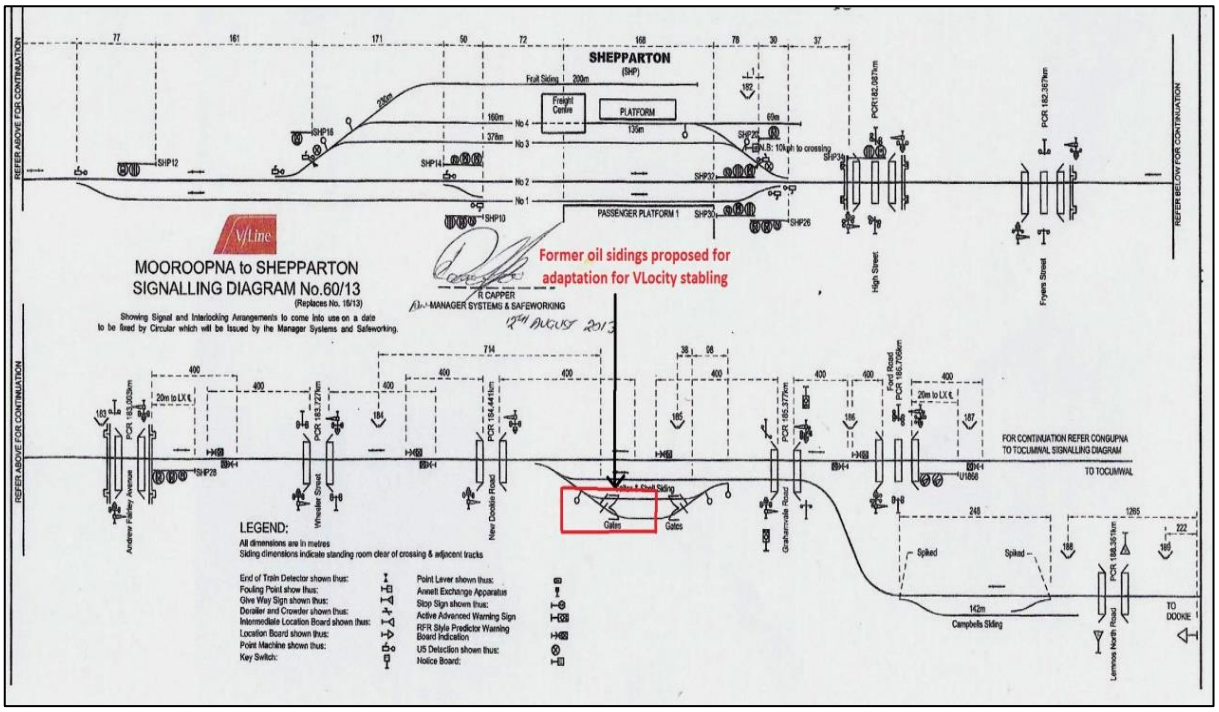


Figure 6 - Diagram showing location of proposed VLocity stabling sidings 2.5km north of Shepparton station

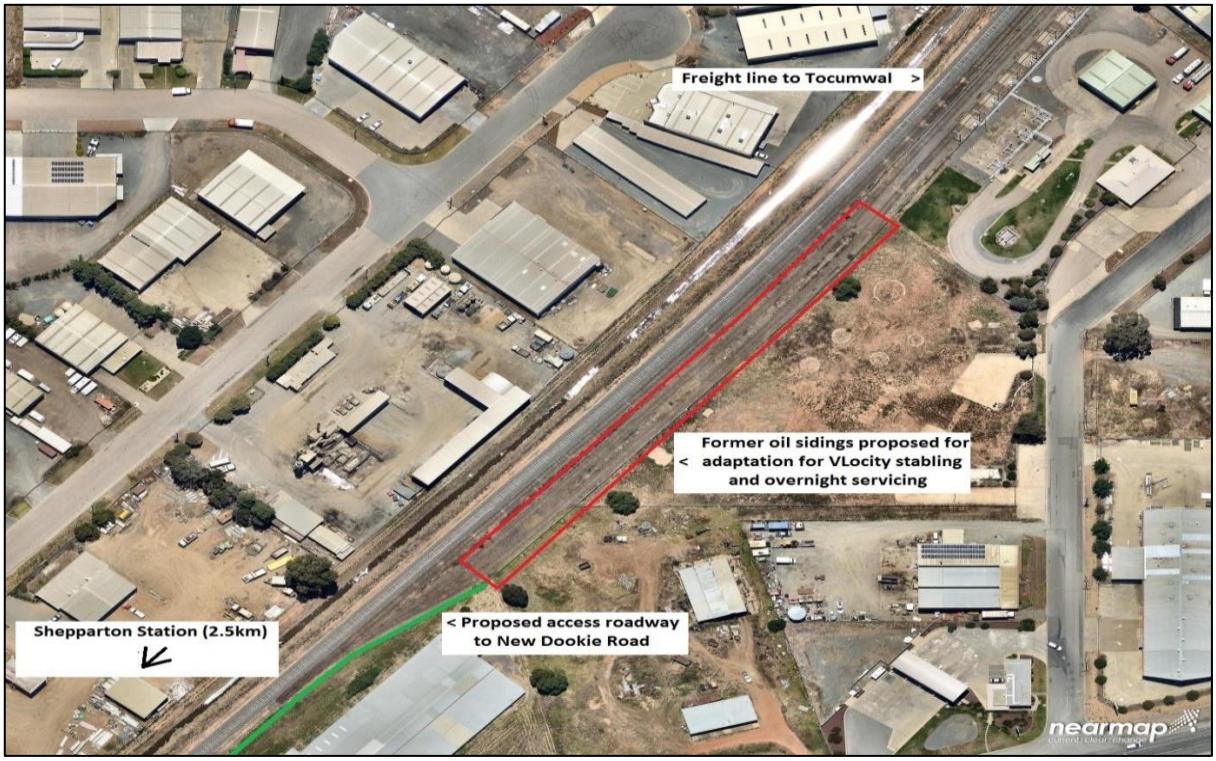


Figure 7 - Location of proposed VLocity stabling sidings north of Shepparton Station

7.1.7 Train crew facilities

A nominal $0.5 million has been allowed for expanded train crew facilities which will be needed at Shepparton to cover the additional services proposed in Scenario 2 and subsequently. These may be provided at either the existing station or at the proposed stabling and servicing facility, depending upon local requirements.

7.1.8 Other prospective works

A further project under consideration is the duplication of the Goulburn River Bridge just south of Seymour. This presently comprises two adjacent single track structures however the newer eastern side structure (former Up track) was converted to standard gauge when that line was constructed in 1962 and it therefore forms part of the ARTC interstate main line. The original 19th Century bridge remains in use for the broad gauge track. As a consequence, a short section of colour light signalling was installed between Seymour and Dysart, the latter being where the double to single track junction is located approximately 3 km south of Seymour.

The bridge is a substantial structure over both the Goulburn River and adjoining flood plain and would be expensive to construct. While the short section of single line between Dysart and Seymour can cause minor delays at times, its duplication is not a pre-requisite for the enhanced services proposed under Scenarios 2, 3 and 4 in this report. It would nonetheless be valuable in assisting maintenance of good service reliability.

Figure 8 - Dysart Junction looking towards Seymour and the Goulburn River bridges – broad gauge tracks are on the left

(Photo courtesy the Late Weston Langford Collection reference 120355 – taken 20 July 1995)

7.2 Additional infrastructure for operations via Melbourne Airport (Scenario 4)

The proposed higher speed rail connection between Wallan and Melbourne Airport, as described in Section 4.5 above, will provide the essential missing link that would finally allow all of Shepparton's aspirations for high quality rail passenger services to be permanently realised. The proposed new rail line, 29 km in length, which would utilise the previously reserved Outer Metropolitan Ring (OMR) corridor would be aligned to accommodate the future operation of High Speed Trains between Melbourne and Sydney at speeds of up to 350 km/h.

In the shorter term, it would be used by new bi-modal regional trains operating at between 160 and 200 km/h. Longer term, should High Speed Rail eventuate, the OMR rail link could be readily expanded to include passing loops that would allow both High Speed Trains and medium speed regional trains to seamlessly operate on the corridor. This commonly occurs on rail networks in Europe and Asia.

Prior to opening of the proposed Airport link, major upgrading of the present broad gauge track infrastructure between Wallan and Seymour would be required. This would be along the lines of the Regional Fast Rail project that significantly upgraded the Geelong, Ballarat, Bendigo and Traralgon lines between 2002 and 2006 to partly bring them to 160 km/h standard and provide modern signalling. The capital costs would be significant at around $200 million. Any such upgrading must include the use of gauge convertible concrete sleepers as the Airport link will necessitate final conversion of all lines north of Wallan to standard gauge, as discussed in Section 9 of this report.

8. Capital and operating costs

8.1 Capital and train operating costs for specific service options

The estimated additional rolling stock and related capital and annual train operating costs (including train crew costs) over and above that of the current operation (as from 29 January 2017) involved in each of the scenarios described in this paper are as shown in Table 9 below.

Table 10 – Rolling stock estimated capital and train operating costs

Scenario	Operation	Assumed rolling stock type	No. of cars to operate service	Maintenance allowance	Rolling stock incremental Capital cost ($)	Annual incremental OPEX ($)	Notes
Current	January 2017 timetable	Loco-hauled N sets (N/Z cars)	1 x 4-cars 1 x 5-cars	20%	nil	Base case	
1	Five return services	Loco-hauled N sets (N/Z cars)	2 x 4-cars 1 x 5-cars	20%	nil	$2.6m	(1)
2A	Eight return services	VLocity sets	4 x 3-cars	10%	$84.5m	$5.7m	(2)
2B/3	Eight/nine return services	VLocity sets	4 x 3-cars	10%	nil	$7.1m	(3)
4	10+ return services via Melbourne Airport	Bi-modal sets	5 x 3-cars	10%	Not assessed	Not assessed	(4)

Notes to the above table:

1. In **Scenario 1**, the additional costs are primarily associated with maintenance, fuel and train crews as no additional rolling stock is required following re-arrangement of existing carriage working. However, this option would also involve a partial re-arrangement of regular Seymour commuter services, including the potential operation of up to three additional Melbourne-Seymour return services, each using a pair of Sprinter railcars.

   – In aggregate, the additional annual operating cost involved is estimated at $4.1 m per annum. However, this would also provide Seymour with an enhanced service including an all-day minimum hourly frequency. As such, the proportion of additional cost directly attributable to the additional Shepparton service, net of prospective additional revenue, is approximately $2.6 m per annum, as shown above.

2. Under **Scenario 2A**, after allowing for the cascade effect of the existing two sets of locomotive-hauled carriages to add to capacity on other services, this would require the purchase of an additional twelve VLocity cars (or equivalent) at an estimated cost of approximately $84.5 million. This includes a notional 10% proportion of an additional 3-car set to cover routine maintenance and servicing requirements.

   – A fifth 3-car set would be required to provide additional capacity on the 5.20 am to Melbourne and the 4.40 pm from Melbourne. These services would use 6-car sets (444 seats) between Melbourne and Seymour to handle commuter traffic, however the capital

cost of $21.1 million (including maintenance proportion) and $1.6 million annual operating cost for the fifth set is related to peak Seymour commuter requirements and not considered attributable to the additional Shepparton services.

- If Scenario 1 had been initially introduced, the additional annual operating cost (over and above that of Scenario 1) of an eight train per day VLocity service, net of prospective additional revenue is approximately $3.1 million per annum, largely due to much improved utilisation of rolling stock and train crew.
- If Scenario 1 had not been previously introduced, the additional annual operating cost (over and above that of the January 2017 services) of an eight train per day VLocity service, net of prospective additional revenue is approximately $5.7 million per annum, as shown above.
- In summary, a VLocity operation of eight return Shepparton services per day, plus additional peak and off-peak services to Seymour, would involve a total capital outlay of approximately $106.5 million plus an additional net annual operating cost of approximately $6.3 million per annum. Of this, the rolling stock capital outlay and estimated annual operating cost attributable to Shepparton services is $84.5 million and $5.7 million, respectively.

3. Under **Scenarios 2B and 3**, eight or nine train service concept, assuming prior introduction of the eight train service described under Scenario 2A, no additional rolling stock would be required for Shepparton services however as the service would now be operated independently from Seymour commuter services, i.e. Shepparton trains operate express between Craigieburn and Seymour, this would require Seymour commuter services to be re-vamped. A direct consequence would be a requirement for five additional Seymour return services to operate on weekdays. The additional costs involved are considered partly attributable to Shepparton services, hence 50% of that cost has been allocated against Scenario 2B.

   - If Scenario 2A had been initially introduced, on the above basis, the additional annual operating cost (over and above that of Scenario 2) of an 8/9 train per day VLocity service under Scenario 2B, net of prospective additional revenue is approximately $1.4 million per annum.
   - If Scenario 2A had not been previously introduced but Scenario 1 had been introduced, the additional annual operating cost of Scenario 2B (over and above that of Scenario 1) of an 8/9 train per day VLocity service, net of prospective additional revenue is approximately $4.5 million per annum.
   - If Scenarios 1 and 2A had not been previously introduced, the additional annual operating cost (over and above that of the January 2017 services) of an 8/9 train per day VLocity service under Scenario 2B, net of prospective additional revenue is approximately $7.1 million per annum, as shown above.

4. **Scenario 4** could also be theoretically operated with 4 x 3-car sets by virtue of still shorter trip times and faster turnarounds, particularly in Melbourne. However, the intensity of this service and likely demand by that time would probably justify a total of five sets to ensure a high level of reliability and to provide augmented capacity on high demand trips. No specific additional capital outlays or operating costs have been assessed for this Scenario as the rolling stock required would utilise different technology to the VLocity sets and the project is sufficiently in the future to make such estimates rather meaningless.

8.2 Infrastructure capital expenditure

Details of capital expenditure and timelines for required infrastructure investments were covered in Section 7, above.

9. Gauge standardisation issues and implications

9.1 Background

Proposals and limited action for conversion of all or parts of the Victorian broad gauge (1600 mm or 5'3") network to standard gauge (1435 mm or 4'8½") have been an issue for the Victorian rail network for over 100 years with various plans for standardisation of all Australian rail gauges being discussed even in the lead up to Federation in 1901.

In 1923, the Victorian Railways Commissioners decided that all future locomotives and rolling stock would be designed so as to facilitate their conversion from broad to standard gauge. The massive difficulties encountered during the Second World War in transporting large numbers of troops and military supplies to northern Australia across state borders through multiple rail breaks of gauge led to several major inquiries and recommendations as to how the gauge problem could be overcome.

In 1946, the Victorian Government accepted the recommendations of former Railways Commissioner Sir Harold Clapp that the entire Victorian rail network be converted to standard gauge over a comparatively short period at a cost of some £10 million using the services of thousands of recently demobilised soldiers. However, in what remains a familiar scenario, the work was to be conditional on a significant financial contribution from the Commonwealth Government.

In 1949, legislation in the Commonwealth Parliament to fund a national program of rail gauge standardisation was narrowly defeated in favour of allocating the money to the Snowy Mountains scheme. It was another ten years before the Commonwealth agreed to partially fund three specific gauge conversion projects, of which the first was construction of a new standard gauge line between Albury and Melbourne, parallel to the existing broad gauge line, in order to eliminate the then 70 year old break of gauge at Albury and finally have a uniform gauge railway between Melbourne and Sydney. The new line opened in 1962.

Finally, in 2008 the original broad gauge line between Seymour and Albury closed for conversion to standard gauge, so that when it finally reopened in 2011, there was now a double track standard gauge railway between Seymour and Albury. Concurrently, the branch line from Benalla to Oaklands via Yarrawonga was also converted to standard gauge so that it could continue to operate.

9.2 The next gauge standardisation project

The next gauge standardisation project will be the $440 million Murray Basin Rail Project which has been jointly funded by the State and Commonwealth Governments and is planned for implementation between 2017 and 2019. This is a significant project entailing conversion of over 1,000 kilometres of line from broad to standard gauge and re-opening and rehabilitation of the 88 km Maryborough to Ararat line which has not operated since 2004. The lines to be converted from broad to standard gauge are:

- Maryborough to Mildura and Yelta
- Ouyen to Murrayville
- Dunolly to Korong Vale and Sea Lake
- Korong Vale to Manangatang
- Warrenheip to Maryborough (dual gauge)
- Gheringhap to Warrenheip

These rail corridors are shown on the map below.

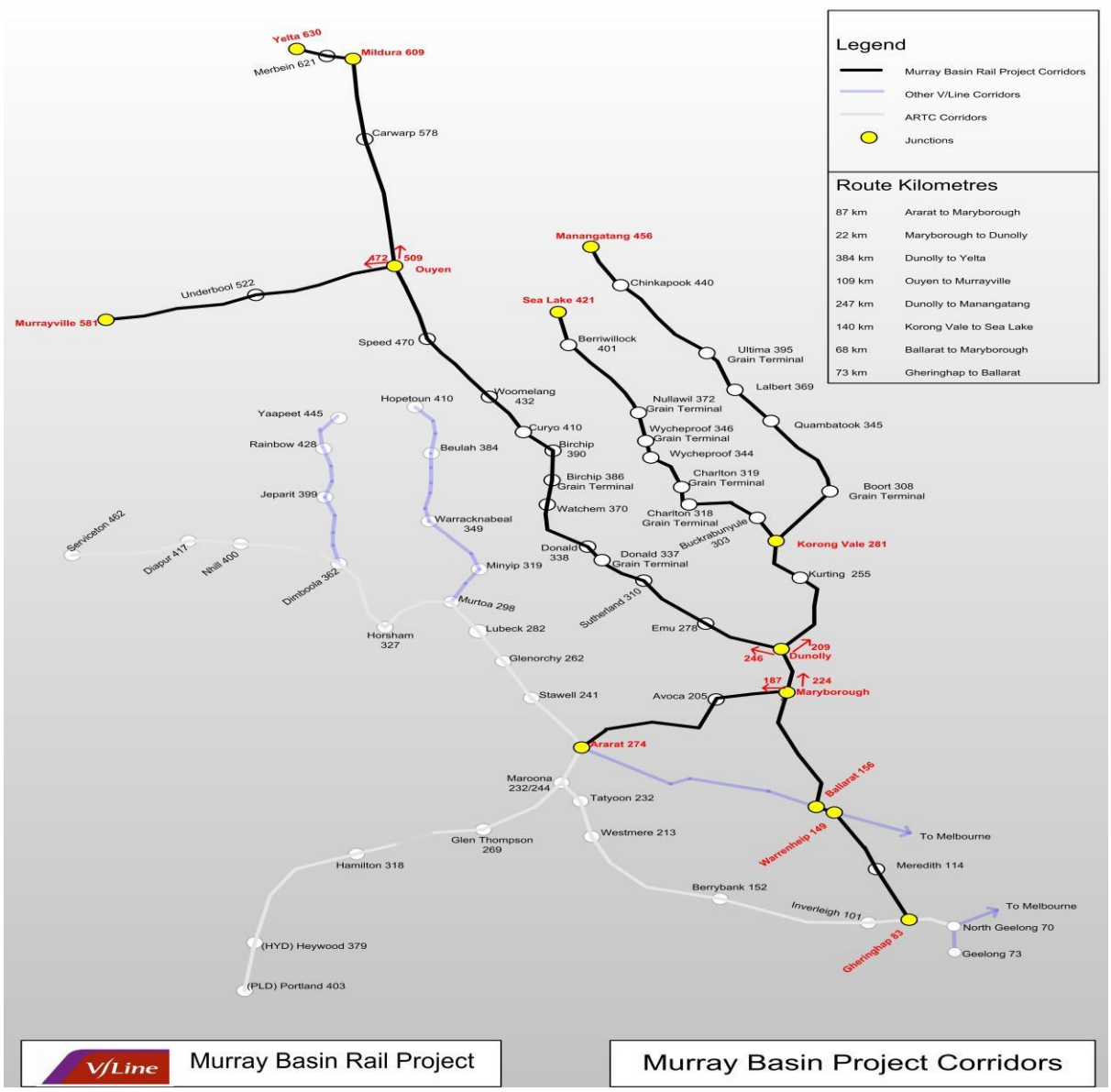


Figure 9 – Murray Basin Rail Corridor Map

In terms of logical sequencing, there is a possible case for the next gauge standardisation project to be from Seymour (Mangalore) to Shepparton and Tocumwal and, following its recent rehabilitation, also from Toolamba to Echuca and Deniliquin. It is understood that the Department of Transport undertook a preliminary study of this option during 2012.

While the overall cost of a basic gauge conversion scheme for the Goulburn Valley and connecting lines is likely to be relatively modest at around $100 million (including conversion of passenger rolling stock), the main benefits of such a project would accrue to freight, rather than to passenger traffic. In part, this is because standardisation would encourage multiple rail operators to enter the Victorian market, thus providing more aggressive competition with long distance road transport. The likely result is that increased volumes of rice, grain and other commodities would be transported by rail and other new opportunities would also emerge for rail freight.

A basic conversion scheme would not, of itself, involve any upgrading of the existing railway, but would simply reduce the distance between the rails by 165 mm, generally by using mechanised equipment to relocate one rail on the existing timber or gauge convertible concrete sleepers and track modifications on bridges and through level crossings. It would also require conversion to dual gauge of several tracks in Seymour and Echuca yards and associated signalling alterations.

Standardisation of the Goulburn Valley lines would also result in significantly more traffic being diverted from the broad gauge double line south of Seymour onto the single standard gauge line controlled by ARTC. This has important implications for efficient operation of Shepparton passenger services in particular, as discussed in the following section.

A different situation would however apply in the event that the proposed Melbourne to Brisbane Inland Railway was to be routed via Shepparton, Tocumwal and Narrandera, rather than the current ARTC proposal which would continue to use the existing line via Albury and Junee. This scenario is discussed later in this report.

9.3 Gauge standardisation – short term issues for passenger services

A basic gauge conversion scheme does have a number of specific issues and implications, especially for passenger services. These can be summarised as under:

- Since the V/line Melbourne-Albury services were converted to standard gauge and re-commenced operation in 2011 following a 3-year hiatus while the various conversion works were undertaken, the service has been plagued by almost continual disruption and very poor reliability which has seriously damaged its reputation. This is continuing. These problems are understood to have emanated from a combination of unsatisfactory track condition and ongoing issues with rolling stock, some of which have been apparently contributed by the track issues.
- The poor performance of V/Line Albury services since conversion to standard gauge may also be partly attributable to the split responsibility between ARTC for infrastructure and V/Line for rolling stock and operations. There is ample anecdotal evidence to suggest that this has blurred accountability and led to ongoing blame shifting. There are important lessons to be learned from this experience.
- Within the Melbourne area, the standard gauge line runs via Albion and Sunshine whereas the present broad gauge line runs via Essendon. The distance via Albion is 10 km longer than via Essendon and subject to other factors, can involve a journey time about 10 minutes longer than on the broad gauge line via Essendon.
- The current standard gauge line south of Seymour is predominantly a single track with several long crossing loops, whereas the broad gauge line is double track throughout except for a 3 km section between Dysart and Seymour. As a result, delays occur on the standard gauge line when opposing trains have to be passed or slower trains overtaken.
- The standard gauge line between Melbourne and Mangalore forms part of the main Melbourne-Sydney-Brisbane corridor and carries much more freight traffic than the broad gauge line which has a normal maximum of 8 freight train movements per day from and to Kilmore East (Hanson Quarry), Tocumwal and Deniliquin, the latter when it operates via Toolamba and Echuca.
- Nearer to Melbourne, at Tottenham, the standard gauge line is joined by the main Melbourne-Adelaide-Perth corridor which further increases usage of the line by freight trains thus adding to the risk of delays caused by the movement of long and heavy freight trains. In practice, the availability of suitable paths and priority for Shepparton standard gauge passenger trains over freight trains would be dependent upon the outcome of negotiations with the Australian Rail Track Corporation (ARTC).
- The offsetting benefit is that, once on standard gauge, Shepparton trains would no longer have to compete with suburban electric trains for increasingly scarce capacity and slow running on the line between the CBD and Craigieburn.

- Standard gauge passenger trains arriving or departing Southern Cross station can only use platforms 1 and 2 (as these are presently the only platforms with standard gauge track) whereas broad gauge trains have access to all platforms 1 through 8, together with new platforms 15 and 16, built as part of the Regional Rail Link (RRL) project. Additional standard gauge platform capacity (most likely by converting platform 3 to dual gauge) may be required to accommodate Shepparton services.
- The present small locomotive-hauled rolling stock fleet used for V/Line standard gauge services to Albury is effectively segregated from the much larger broad gauge fleet and is therefore self-contained in terms of maintenance back-up and cover for unplanned events. This appears to be a contributing factor to the poor performance of the V/Line Albury service since it has operated on standard gauge. There would be some scope for future integration of the Albury and Shepparton rolling stock on standard gauge with potential benefits in terms of a slightly larger overall standard gauge fleet which would enable more efficient fleet utilisation.
- In turn, this would necessitate some modifications and improvements to additional rolling stock proposed for conversion to standard gauge to make them fully interchangeable with the trains being used on the present V/Line Albury services. In order to do so, a number of additional vehicles would be dedicated to Albury/Shepparton services which may well trigger a requirement for replacement broad gauge rolling stock.
- Additional standard gauge capacity at the Melbourne end, both for maintenance and overnight stabling, would also be required.
- There are presently no standard gauge facilities for maintenance and servicing of VLocity railcars and it would be difficult to provide these in the metropolitan area. In addition, it is likely that the Rail Safety Regulator would require a number of significant safety related issues to be addressed before VLocity sets could operate on the ARTC network between Melbourne and Seymour. Early gauge conversion would likely impede the planned introduction of VLocity operations on the Shepparton corridor.
- There are no passenger platforms on the standard gauge line between Broadmeadows and Seymour so those Shepparton services that presently stop at Wallan, Wandong, Kilmore East and Broadford would no longer be able to do so. This has an offsetting benefit in that the time gained in not stopping at these stations would largely balance the additional journey time involved for standard gauge trains operating via Albion and Sunshine instead of via Essendon.
- In order to replace services to Wallan, Wandong, Kilmore East and Broadford, it is likely that additional broad gauge services would need to be added between Melbourne and Seymour thus increasing overall corridor operating costs by up to $2 million per annum.
- An alternative would be to construct additional 160 metre long platforms at these locations at a cost of around $16 million although this would likely face strong opposition from ARTC on the grounds of imposing additional capacity constraints on this single line section.
- Apart from the estimated $100 million cost of converting infrastructure and existing passenger rolling stock for a basic gauge standardisation project between Seymour, Shepparton and Tocumwal and from Toolamba to Echuca and Deniliquin, to cover the existing four daily Shepparton services on standard gauge, there may be a consequential claim for limited replacement rolling stock for existing broad gauge services. This could involve procurement of two additional 3-car VLocity sets at an estimated cost of $40 million.

Overall, the sequence and timing of standard gauge conversion, especially where passenger services are involved, is of critical importance and if mistimed, could be counter-productive. This is likely to be the case for Seymour/Shepparton services. As such, for this region, this is best considered as a medium term, rather than a short term initiative, as discussed in the following section.

9.4 Medium to longer term issues for passenger services on standard gauge

Many of the issues involved in providing more frequent and/or faster Shepparton passenger services on standard gauge are similar to those described earlier in this paper for broad gauge operations. However, there are some differences, as described below.

- Although the rolling stock requirements for broad and standard gauge services would be generally similar, it would still be the case that a small self-contained rolling stock fleet on standard gauge requires a relatively larger back-up fleet to cover maintenance and unplanned events than is the case for a much larger broad gauge fleet. Obviously this situation would improve as more lines are standardised.
- VLocity and similar types of DMU (diesel multiple unit) rolling stock require specialised maintenance facilities because of their underfloor engines and other traction equipment. No such facilities are presently accessible on standard gauge in the Melbourne area or elsewhere and would need to be developed should a Shepparton service be operated with DMUs on standard gauge. A facility of this type was constructed at Ballarat in 2012 at a cost of $33 million.
- While it is likely that the present standard gauge single line infrastructure between Tottenham and Seymour could accommodate up to an additional six one-way trips between Melbourne and Shepparton, a more intensive service is almost certain to require additional track capacity over this sector. This would most likely take the form of complete or partial infill sections of track duplication between the existing crossing loops (“passing lanes” in ARTC parlance), and ultimately full duplication over its entire length. This would be a matter for negotiation with ARTC as other traffics would also benefit from this work.
- Implementation of the Melbourne to Brisbane Inland Railway, as discussed in Section 10, would absorb much of the existing spare track capacity on the ARTC corridor, including the complete or partial infill sections as track duplication between Tottenham and Seymour, as discussed above. Increased freight traffic on the corridor will not prove a good mix with any form of relatively intensive passenger service, as will certainly be required on the Seymour/Shepparton corridor.
- A more strategic and vastly more sustainable approach would be for gauge conversion of all broad gauge infrastructure north of Wallan to coincide with the proposed Melbourne Airport to Wallan link as earlier discussed in this report. This would not only encompass the Seymour to Shepparton and Tocumwal corridor but also the connecting lines from Toolamba to Echuca and Deniliquin and (if reopened) from Shepparton to Dookie. It would also include conversion of the broad gauge lines between Wallan and Seymour and, once upgraded, enable Albury line passenger trains to again use the double track former broad gauge lines south of Seymour. Under this scenario, all north-eastern passenger trains would be diverted via the Melbourne Airport link, interchanging with metropolitan services at Wallan. Standard gauge freight trains would continue to use the ARTC corridor. This would produce an optimal outcome for both passenger and freight traffic.

- Extension of electrification from Craigieburn to Wallan is planned to occur within the 10-15 year timeframe. This will utilise the existing two broad gauge tracks. Irrespective of other possible options, it is certain that the existing broad gauge infrastructure in this section will remain in situ for the foreseeable future.

10. Issues for rail freight

Currently daily freight services operate between Melbourne and the independent freight intermodal terminal at Tocumwal, primarily carrying export containers with a range of commodities, mainly from the southern Riverina region of New South Wales. Some trains also serve the freight terminal at Mooroopna which handles containers with Goulburn Valley produce for export. Dedicated bulk grain trains also operate from the major grain receival facilities at Tocumwal. Other major bulk grain facilities are located at Murchison East and Dookie although these are not presently being serviced by rail.

Other freight trains conveying export containers operate to and from Echuca and Deniliquin on a daily basis and use the cross-country line between Toolamba and Echuca on an “as required” basis, having the alternative of also operating to Melbourne via the passenger line between Echuca and Bendigo.

The much more frequent passenger service being proposed in this report (Scenario 2) will have a train occupying the line between Seymour and Shepparton on an almost continuous basis between 5am and midnight on most days. Because of this, it will be of critical importance to have a suitably located crossing loop that will allow freight trains to co-exist with the enhanced passenger service and to do so in ways that largely eliminate mutual interference between each service.

The combination of the proposed new crossing loop at Tabilk, coupled with provision of a new remotely controlled signalling system between Seymour and Shepparton to replace the existing Train Orders system of train safeworking and incorporating signalling changes at Murchison East, Toolamba and Mooroopna, as detailed in Section 7.1.5, will be necessary to achieve this outcome. This arrangement will allow for very efficient train crosses to occur at Tabilk, and will also allow for a freight train to be locked away at Murchison East or Mooroopna while passenger trains run past.

Medium term, it seems increasingly possible that the long proposed Inland Railway between Melbourne and Brisbane will become a reality within a decade or so as its construction appears to be bi-partisan policy at Commonwealth Government level, notwithstanding the lack of any financial commitment as yet beyond the project’s planning phase.

An Inland Rail Alignment Study undertaken by ARTC during 2010 favoured using much of the existing railway via Albury, Junee, Stockinbingal and Parkes as the preferred route for the southern section of the railway. However the alternative of using a route from Mangalore to Parkes via Shepparton, Tocumwal and Narrandera is favoured in many quarters. This is because of its more favourable terrain, better connectivity to highly productive areas such as the Goulburn Valley and Murrumbidgee Irrigation Area (MIA) and its shorter overall distance. The National Trunk Railway Company has been actively promoting its proposal for use of the Shepparton route (see comparison map on page 40). The present Commonwealth Government has taken the ARTC proposed route via Albury as its default position however the project is presently the subject of Market Testing and a final decision on the preferred route will largely depend upon the outcome of that process.

This is a particularly important issue for prospective rail gauge standardisation as, in the absence of the Goulburn Valley route forming the basis of the southern end of the overall Inland Railway, it would be more difficult to make a sustainable business case for investing scarce capital to standardise the existing line with its current freight task limited to one or two trains per day moving export containers to the Port of Melbourne and the occasional bulk grain train heading to Melbourne or Geelong.

By the same token, substantial investment in the development of rail facilities at the proposed Goulburn Valley Logistics Hub will be problematic at best should the existing railway only retain its

present freight functions, all of which represent but a small share of the region's current overall freight transport task and is highly contestable with road transport.

In the event that the Inland Railway is routed via Shepparton, the entire nature and functions of the existing railway would dramatically change in several ways. Firstly, its entire infrastructure would necessarily undergo a major upgrade with the installation of heavier rail and concrete sleepers, new bridge structures, long crossing loops and signalling, and major deviations to eliminate sharp curvature.

Secondly, within the immediate Shepparton area, it would not be feasible to have a large number of long interstate freight trains running through the city centre and over level crossings at all hours of the day and night. Consequently, a proposal has been developed in conjunction with VicRoads for a rail bypass that would generally be located within the median of the proposed Goulburn Valley Freeway bypass that will pass to the west of the city. The existing line through Shepparton CBD would however be retained to provide access for freight trains serving the proposed GV Logistics Hub and for passenger trains running into the existing Shepparton station.

Finally, the railway's traffic task would massively increase almost overnight once the complete inland route between Melbourne and Brisbane became available for use. Rail's current market share of freight between Melbourne and Brisbane is variously estimated at between 15% and 25% and, under an Inland Railway scenario, this is expected to grow to at least 70% during its first few years of operation on the base of ongoing total freight movement demand also growing at in excess of 3% per annum.

This would translate into the present four trains each way between Melbourne and Brisbane via Albury rising to at least ten trains daily in each direction by the mid-2020's, to which would be added at least one or two trains each way between the Griffith area and Melbourne which also presently run via Albury and Junee, given that the rail distance from Griffith to Melbourne is 129km shorter via Shepparton. Added to this would be the existing intermodal train to Tocumwal and return and any other services developed through induced demand arising from much better rail connectivity from the Goulburn Valley region to interstate destinations.

Infrastructure of this quality and capacity will only materialise between Mangalore and Shepparton (and beyond) in the event that the Inland Railway project adopts the Goulburn Valley as its preferred route.

Figure 10 - Map showing comparison between National Trunk Rail and ARTC proposed Inland Rail routes

11. Conclusions

These can be summarised as under:

1. Shepparton rail services currently provide a limited service compared to other areas of the state where upgrades have occurred. Passenger demand is depressed due to the limited relevance of the timetables to customer needs, uncompetitive journey times and aging rolling stock.
2. The Shepparton region is significantly disadvantaged relative to rail services at other major regional centres within a comparable distance from Melbourne. Shepparton trains are actually slower now than 20 years ago. They have used the same locomotives and carriages for more than the past 30 years.
3. Options for progressive improvement are available, but are constrained by developments that will increasingly affect transit of Seymour/Shepparton trains through the metropolitan area.
4. Opportunities exist for short and medium term improvement on the present arrangements, notwithstanding the foregoing constraints. The most important of these, involving VLocity railcars operating to Shepparton to provide faster and more frequent services, has a lead time of up to 5 years and requires infrastructure improvement in the range of $70 to $100 million and additional rolling stock procurement.
5. If the Government agrees to the preparation of a business case during 2017 and funding approval is forthcoming no later than the May 2018 State Budget, it is possible that the necessary additional rolling stock and the infrastructure improvements could be in place during 2021.
6. The recent addition of one return service daily by means of extending a Seymour peak period commuter service to and from Shepparton is likely to have a fairly short useful life. These trains are already well loaded and stations served by Seymour commuter services, especially Wallan and Donnybrook, are experiencing rapid patronage growth and residential development. This part of the outer metropolitan area is expected to continue to grow at a burgeoning rate.
7. Three peak period train paths via Broadmeadows (as presently applies) is likely to be the maximum available for Seymour and Shepparton services during each two hour peak period until the Upfield line diversion is in place, currently assumed for 2023. Until then, our assessment is that this factor, together with extended train cycle times due to slow running through the metropolitan area, will impose a practical limit of eight return Shepparton services on weekdays, including one return peak period service, once VLocity operations commence.
8. When the Upfield diversion commences and the full project including grade separation of the junction at Roxburgh Park has been completed, up to six peak period train paths via Upfield are likely to be available for Seymour and Shepparton services during each two hour peak period. This factor, together with improved train cycle times brought about by faster running through the metropolitan area, will allow a total of up to 9 return Shepparton services to operate on weekdays with trip times some 5 to 10 minutes faster than applied via Broadmeadows.

9. While an option would be for Shepparton services to remain integrated with Seymour services (particularly during off-peak periods), rapid patronage growth on Seymour services and faster trip times for Shepparton services by having the majority run express south of Seymour, strongly suggests their full separation from Seymour services should occur as soon as the Upfield diversion becomes available.

10. Extension of electrification from Craigieburn to Wallan is expected to occur within the 10 to 15 year timeframe. This will provide frequent metropolitan services to Wallan which will also use the diversion via Upfield, while Craigieburn trains will continue to run via Broadmeadows and Essendon. Seymour/Shepparton trains will then share track capacity with metropolitan trains making additional stops between Wallan and Craigieburn and impose greater demands on the Upfield line.

11. Seymour/Shepparton trains will then once again be significantly impeded in respect of additional available paths and further slowed by up to 10 minutes, particularly between Upfield and the CBD, with typical Shepparton-Melbourne trip times for VLocity trains running express south of Seymour being 2 hours 15 minutes during peak periods and 2hr 10 mins at other times

12. The longer term solution, certainly achievable within the 15-20 year timeframe or sooner, will be for all Seymour/Shepparton trains, together with Albury trains, to travel from Wallan to the CBD on a new higher speed corridor via Melbourne Airport, with regional trains stopping at Wallan for interchange with metropolitan services.

13. This would provide routine trip times between Shepparton and Southern Cross of 1 hour 50 minutes and from Shepparton to Melbourne Airport of 1 hour 35 minutes with services operating at minimum two-hourly intervals and more often at busier times.

14. The sequence and timing of standard gauge conversion, especially where passenger services are involved, is of critical importance, especially for Seymour/Shepparton services. The recommended approach would be for gauge conversion of all broad gauge infrastructure north of Wallan to coincide with the proposed Melbourne Airport to Wallan link. This would encompass the Seymour to Shepparton and Tocumwal corridor and also the connecting lines from Toolamba to Echuca and Deniliquin and (if reopened) from Shepparton to Dookie. It would also include conversion of the broad gauge lines between Wallan and Seymour and enable Albury line passenger trains to again use the double track former broad gauge lines south of Seymour. Standard gauge freight trains would continue to use the ARTC corridor. This would produce an optimal outcome for both passenger and freight traffic.

15. Should the proposed Melbourne to Brisbane Inland Railway be routed via Shepparton, the entire nature and functions of the existing railway would dramatically change with its entire infrastructure necessarily undergoing a major upgrade and located within the median of the proposed Goulburn Valley Freeway bypass that will pass to the west of the city. The railway's traffic task would also massively increase almost overnight once the complete inland route became available for use, (However, it should be noted that the Commonwealth Government's stated intention is that the Inland Railway will be routed via Albury rather than Shepparton.)

Appendices

The following pages contain detailed timetables and rolling stock utilisation data that relates to Scenario 2B in the main body of this report.

In sequence the pages cover the following:

- Weekday service timetables – Down (Melbourne to Shepparton) direction
- Weekday service timetables – Up (Shepparton to Melbourne) direction
- Weekday Shepparton services rolling stock utilisation
- Weekend service timetables – Down (Melbourne to Shepparton) direction
- Weekend service timetables – Up (Shepparton to Melbourne) direction
- Weekend Shepparton services rolling stock utilisation

SHEPPARTON / SEYMOUR . V/LOCITY OPTION .				**Seymour 40 min Off Peak**			**Off Peak Cycle / Shepparton 120 Minute Off Peak cycle**					**SCENARIO 2B**		*Version 070317*		
Seymour trains - SAS both ways.			***Ltd Stops***	Wallan, Wandong, Kilmore East, Broadford .				***Express - Express Craigieburn to Seymour .***								
Down :	***WEEKDAYS***						***NB: 2200 Dn Seymour (Mon to Thurs), FRIDAY ONLY to Shepparton .***									
Shepparton	***Downs to Shepparton @ 0610 0820 1020 1220 1420 1615 1820 & 2020 - Friday ONLY 2200.***								***Down Seymour locals 22 .***			***Total Down trips @ Seymour = 30***				
Formed by >>>>>>	*ON*	*0630arr*	*0720 arr*	*0755 arr*	*ON*	*ON*	*ON*	*0905 arr*	*0950 arr*	*1030 arr*	*1110 arr*	*1055arr*	*1150 arr*	*1230 arr*	*1310 arr*	*1255arr*
	V/Locity	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*
Southern Cross	610	700	740	820	835	915	955	1020	1035	1115	1155	1220	1235	1315	1355	1420
	SAS	SAS	SAS	Express	SAS	SAS	SAS	Express	SAS	SAS	SAS	Express	SAS	SAS	SAS	Express
SEYMOUR arr	0735 (3)	835	0915(3)	0935(3)	1000	1040	1120 (3)	1135(3)	1200	1240	1320 (3)	1335(3)	1400	1440	1520 (3)	1535(3)
SEYMOUR dep	0740 (3)	*Forms*	0920 (3)	0937 (3)	*Forms*	*Forms*	1125 (3)	1137 (3)	*Forms*	*Forms*	1325 (3)	1337 (3)	*Forms*	*Forms*	1525 (3)	1537 (3)
Shed Road arr		0905 Up	*922*		*1025 Up*	*1105 Up*	*1127*		*1225 Up*	*1305 Up*	*1327*		*1425 Up*	*1505 Up*	*1527*	
	1			2				2				2				2
SHEPPARTON arr	832		*Form*	1030			*Form*	1230			*Form*	1430			*Form*	1630
			0945 Up				*1145 Up*				*1345 Up*				*1545 Up*	
Forms >>>>>>>>>>	*0842 Up*			*1042 Up*				*1242 Up*				*1442 Up*				*1642 up*
Down :																
Formed by >>>>>>	*1350arr*	*1430arr*	*1510arr*	*1455arr*	*0835arr*	*0900arr*	*1550arr &1630arr*	*1655arr*	*1710arr &1750arr*	*1830arr*	*1950arr*	*1900arr*	*2030arr*	*2200arr*	*2105 arr*	***FRIDAY***
														Mon to Thur	***Friday ONLY***	***Only***
	Sprinter	*Sprinter*	*Sprinter*	*V/Locity* ***DC***	H Set	H Set	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*
Southern Cross	1435	1515	1555	1615	1635	1715	1755	1820	1835	1915	1955	2020	2100	2210	2210	2300
	SAS	SAS	SAS	Express	SAS	SAS	SAS	Express	SAS	SAS	SAS	Ltd Stops	SAS	SAS	SAS	*SAS*
SEYMOUR arr	1600	1640	1720 (3)	1735 (3)	1810	1850	1920 (3)	1935 (3)	2000	2040	2120	2140 (3)	2225	2335	2335	0025Sat
SEYMOUR dep	*Forms*	*Forms*	1725 (3)	1737 (3)	*Forms*	*Forms*	1925 (3)	1937 (3)	*Forms*	*OFF*	*OFF*	2142(3)	*Forms*	*OFF*	2337 (3)	*OFF*
Shed Road arr	*1625 up*	*1705 Up*	*1727*		*0650UpND*	*0715UpND*	*1927*		*2137 Up*				*2237 Up*		2	
				2				2	*Mo-Thur*			2			Sat	
SHEPPARTON arr			*Form*	1830			*Form*	2030				2235			OO30	
			1745 Up				*1945 Up*									
Forms >>>>>>>>>>				*1842 Up & OFF*				*2042 Up* Friday ONLY *OFF-Mon-Thur*				*OFF*			*OFF*	

NOTES :

Modify signalling at Seymour to allow through Shepparton trains to cross .

Extend # 3 Road in a Down direction to link up with Shed Road to provide overun protection for a Down train standing in 3 road platform .
Install a 40kmh RH turnout in # 3 Road at Down end platform linking with existing track to # 2 Road and towards Mangalore .

3 V/Locity sets overnight at Shepparton — Turnaround time at Shepparton is 12 minutes .

Total VL sets to run Shepparton 2 hourly frequency is — is 3 OP — Total Sprinter sets to run Seymour is 6 — OP

Method stabling Seymour Local away from platforms during passage Up & Down Sheppartons crossing at Seymour :

Local Dn Seymour	Arr Pl-3	1120	>>>>>>>>>	Dep Pl-3	1125	>>>>>>>>>	Shed Road	Arr	1127
Dn Shepparton	Arr Pl-3	1135	>>>>>>>>>	Dep Pl-3	1137	to Shepparton			
Up Shepparton	*Arr Pl-2*	*1134*	*<<<<<<<<*	*Dep Pl-2*	*1137*	*from Shepparton*			
Local Up Seymour	*Dep Pl-2*	*1145*	*<<<<<<<<*	*Arr Pl-2*	*1142*	*<<<<<<<<*	Shed Road	*Dep*	*1140*

SHEPPARTON / SEYMOUR . V/LOCITY OPTION .				**Seymour 40 min Off Peak**			**Off Peak Cycle / Shepparton 120 Minute Off Peak cycle**						***Scenario 2B***		*Version 070317*	
Seymour trains - SAS both ways.			#	Off Peak Shepparton trains - stop Wallan, Wandong, Kilmore East, Broadford, Seymour then SAS to Shepparton both ways .												
UP :	***WEEKDAYS***		***NB:***	***2137 Up Seymour - Fridays ONLY originates SHEPPARTON 2042.***												
Shepparton	***Ups at 0530 0645 0842 1042 1242 1442 1642 1842 Friday ONLY 2042 . 23 Up local Seymour . 31 Up trips ex Seymour .***															
			1830arrPD													
Formed by >>>>>>	*ON*	*ON*	*2235arrPD*	*1810arr PD*	*1850arrPD*	*2030arr PD*	*ON*	*0835arr*	*0832arr*	*0915arr*	*1000arr*	*1040arr*	*1030 arr*	*1120arr*	*1200arr*	*1240arr*
			V/Locity													
	Sprinter	*Sprinter*	***DC***	H set	H set	*V/Locity*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*
SHEPPARTON dep			530			645			842				1042			
Shed Road dep										*940*				*1140*		
SEYMOUR arr			0623 (2)			0737 (2)			0934 (2)	0942 (2)			1134 (2)	1142 (2)		
SEYMOUR dep	500	550	625	650	715	740	825	905	0937 (2)	0945 (2)	1025	1105	1137 (2)	1145 (2)	1225	1305
	SAS	SAS	SAS	SAS	SAS	Express	SAS	SAS	Express	SAS	SAS	SAS	Express	SAS	SAS	SAS
Southern Cross arr	630	720	755	835	900	900	950	1030	1055	1110	1150	1230	1255	1310	1350	1430
Forms >>>>>>>>	*0700Dn*	*0740Dn*	*0820 Dn*	*1635Dn*	*1715Dn*	*1020 Dn*	*1035Dn*	*1115Dn*	*1220 Dn*	*1155 Dn*	*1235 Dn*	*1315 Dn*	*1420 Dn*	*1355 Dn*	*1435 Dn*	*1515 Dn*
UP: :																
Formed by >>>>>>	*1230 arr*	*1320arr*	*1400arr*	*1440arr*	*1430 arr*	*1520arr*	*1600arr*	*1640arr*	*1630 arr*	*1720arr*	*ON*	*1830 arr*	*1920arr*	***MontoThur***	***Friday ONLY***	***Mon to Frid***
														2120 arr	***2030 arr FO***	***2225arr***
	V/Locity	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*	*Sprinter*	*V/Locity*	*Sprinter*
SHEPPARTON dep	1242				1442				1642			1842			2042	
Shed Road dep		*1340*				*1540*				*1740*			*1940*			
SEYMOUR arr	1334 (2)	1342 (2)			1534 (2)	1542 (2)			1734 (2)	1742 (2)		1934 (2)	1942 (2)		2134 (2)	
SEYMOUR dep	1337 (2)	1345 (2)	1425	1505	1537 (2)	1545 (2)	1625	1705	1737 (2)	1745 (2)	1905	1937 (2)	1945 (2)	2137	2137 (2)	2237
	Express	SAS	SAS	SAS	Express	SAS	SAS	SAS	Ltd Stops	SAS	SAS	SAS	SAS	SAS	SAS	SAS
Southern Cross arr	1455	1510	1550	1630	1655	1710	1750	1830	1900	1950	2030	2105	2200	2305	2305	OOOO
Forms >>>>>>>>	*1615 Dn*	*1555Dn*	*1755Dn*	*1755Dn*	*1820 Dn*	*1835 Dn*	*1835Dn*	*1915 Dn*	*2020 Dn*	*1955Dn*	*2100 Dn*	*2200 Dn FO*	*2210 Dn*	*2315 Dn*	*OFF*	*OFF*

NOTES :

Modify signalling at Seymour to allow through Shepparton trains to cross .

Extend # 3 Road in a Down direction to link up with Shed Road to provide overun protection for a Down train standing in 3 road platform .
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Local Dn Seymour	Arr Pl-3	1120	>>>>>>>>	Dep Pl-3	1125	>>>>>>>>	Shed Road	Arr	1127
Dn Shepparton	Arr Pl-3	1135	>>>>>>>>	Dep Pl-3	1137	to Shepparton			
Up Shepparton	*Arr Pl-2*	*1134*	<<<<<<<<	*Dep Pl-2*	*1137*	*from Shepparton*			
Local Up Seymour	*Dep Pl-2*	*1145*	<<<<<<<<	*Arr Pl-2*	*1142*	<<<<<<<<	Shed Road	*Dep*	*1140*

SHEPPARTON - 2 HOURLY SERVICE .			***V/LOCITY UTILIZATION .***		***WEEKDAYS***	***SCENARIO 2B***	*Version 073217*			
Formed by SH -04 Mon to Thurs			*Formed by SH-01 Mon to Thurs*			*Formed by Run SH-02 Mon - Thurs*		*Formed by Run SH-03 Mon - Thurs*		
Run SH-01			***Run SH-02***			***Run SH-03***		***Run SH-04***		
Sxs		*Shn*	*Sxs*		*Shn*	*Sxs*	*Shn*	*Sxs*		*Shn*
610					645		0530 **			0530 **
	>>>>>>>>			<<<<<<<<			<<<<<<<<		<<<<<<<<	
		832	900			755		755		
		842	1020			820				
	<<<<<<<<			>>>>>>>>			>>>>>>>>			
1055					1230		1030		PPM	
1220					1242		1042			
	>>>>>>>>			<<<<<<<<			<<<<<<<<			
		1430	1455			1255				
		1442	1615 ##			1420				
	<<<<<<<<			>>>>>>>>			>>>>>>>>	1615 ##		
1655					1830		1630		>>>>>>>>	
1820					1842		1642			1830
	>>>>>>>>			<<<<<<<<			<<<<<<<<			
		2030	2110			1900				
						2020				
	FRIDAY ONLY		**FRIDAY ONLY**				>>>>>>>>			
							2235			
		2042	2210					*** 0530 Up Shepparton DC*		
	<<<<<<<<			>>>>>>>>				*throughout to Southern Cross*		
2305					0030 Sat			*with Run - SH03*		
Forms Run SH-02 Tues - Frid			*Forms Run SH-01 Tues to Friday*			*Forms Run SH-04 Tues to Frid*		*Forms Run SH-03 Tues to Friday*		
Forms Run SH-01 Saturday			*Forms Run SH-03 Saturday*			*Forms Run SH-02 Saturday*		*Forms Run SH- 04 Saturday*		
BLUE	Down trains		*## 1615 Dn Shepparton DC*			*** 0520 Up Shepparton DC*		*## 1615 Dn Shepparton DC*		
RED	Up trains		*throughout to Shepparton*			*throughout to Southern Cross*		*throughout to Shepparton*		
			with Run SH-04			*with Run SH- 04*		*with Run SH-02*		

SHEPPARTON / SEYMOUR . V/LOCITY OPTION . **SHEPPARTON 2 hourly SEYMOUR - Hourly .** *(Version 070317)*

Seymour trains - SAS both ways. Off Peak Shepparton trains - stop Wallan, Wandong, Kilmore East, Broadford, Seymour then SAS to Shepparton both ways .

Down : ***W E E K E N D S*** ***8 services to Shepparton a 0715 0915 1115 1315 1515 1715 1915 & 2115 plus 11 local Services to Seymour = 19 Down Down trips Melbourne to Seymour .***

			V/Locity		*V/Locity*		*V/Locity*		*V/Locity*		*V/Locity*
Southern Cross		615	715	815	915	1015	1115	1215	1315	1415	1515
		SAS	Ltd #	SAS	Ltd #	SAS	Ltd #	SAS	Ltd #	SAS	Ltd #
SEYMOUR	arr	740	835	940	1035	1140	1235	1340	1435	1540	1635
SEYMOUR	dep		837		1037		1237		1437		1637
SHEPPARTON	arr		930		1130		1330		1530		1730

Down : ***W E E K E N D S***

			V/Locity			*V/Locity*		*V/Locity*			
Southern Cross		1615	1715	1755	1835	1915	2015	2115	2215	2315	
		SAS	Ltd #	SAS	SAS	Ltd #	SAS	SAS	SAS	SAS	
SEYMOUR	arr	1740	1835	1920	2000	2035	2140	2240	2340	OO40	
SEYMOUR	dep		1837			2037		2242			
SHEPPARTON	arr		1930			2130		2335			

NOTES :

Modify signalling at Seymour to allow through Shepparton trains to cross .

Much cheaper to provide overrun protection on # 3 road for down trains than build a Crossing Loop .

Extend # 3 Road in a Down direction to link up with Shed Road to provide overun protection for a Down train standing in 3 road platform .

Install a 40kmh RH turnout in # 3 Road at Down end platform linking with existing track to # 2 Road and towards Mangalore .

Sequence proposed Up & Down Shepparton trains crossing at Seymour .

Down train ex Southern Cross arrives platform 3	*35 mins past the hour*
Up train ex Shepparton arrives platform 2	*34 mins past the hour*
Down train departs for Shepparton ex platform 3	*37 mins past the hour*
Up train departs for Southern Cross ex paltform 2	*37 mins past the hour*

Turnaround time at Shepparton is 12 mins

SHEPPARTON / SEYMOUR . V/LOCITY OPTION .			**Seymour 40 min Off Peak**				**Off Peak Cycle / Shepparton 120 Minute Off Peak cycle**				*(Version 070317)*	
Seymour trains - SAS both ways.			Off Peak Shepparton trains - stop Wallan, Wandong, Kilmore East, Broadford, Seymour then SAS to Shepparton both ways .									
UP :	***WEEKENDS***	***8 Services from Shepparton at 0622 0742 0942 1142 1342 1542 1742 & 1942 + 11 local services from Seymour = 19 Up services from Seymour to Melbourne.***										
				V/Locity		*V/Locity*			*V/Locity*		*V/Locity*	
SHEPPARTON	dep			622		742			942		1142	
SEYMOUR	arr			714		834			1034		1234	
SEYMOUR	dep	537	637	717	757	837	917	957	1037	1132	1237	
		SAS	SAS	Ltd #	SAS	Ltd#	SAS	SAS	Ltd #	SAS	Ltd #	
Southern Cross	arr	702	802	837	922	957	1042	1122	1157	1257	1357	
UP: :	***WEEKENDS***											
			V/Locity		*V/Locity*		*V/Locity*		*V/Locity*			
SHEPPARTON	dep		1342		1542		1742		1942			
SEYMOUR	arr		1434		1634		1834		2034			
SEYMOUR	dep	1332	1437	1532	1637	1732	1837	1932	2037	2132		
		SAS	Ltd #	SAS	Ltd #	SAS	Ltd #	SAS	SAS	SAS		
Southern Cross	arr	1457	1557	1657	1757	1857	1957	2057	2202	2257		
NOTES :												
Modify signalling at Seymour to allow through Shepparton trains to cross .							Much cheaper to provide overrun protection on # 3 road for down trains than build a Crossing Loop .					
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Down train ex Southern Cross arrives platform 3			*35 mins past the hour*									
Up train ex Shepparton arrives platform 2			*34 mins past the hour*									
Down train departs for Shepparton ex platform 3			*37 mins past the hour*									
Up train departs for Southern Cross ex paltform 2			*37 mins past the hour*				Turnaround time at Shepparton is				12 mins	

SHEPPARTON - 2 HOURLY SERVICE .	***V/LOCITY UTILIZATION .***	***W E E K E N D S***	*(Version 070317)*
SH-01	***SH-2***	***SH-3***	***SH-4***
Formed by SH-04 Friday	*Formed by SH-01 Friday*	*formed by SH-02 Friday*	*Formed by SH-03 Frid 01 Friday*
Formed by Run - SH03 Saturday	*Formed by Run SH- 01 Sat*	*Formed by Run SH - 02 Saturday*	*Formed by run SH-04 Saturday*
Sxs *Shn*	*Sxs* *Shn*	*Sxs* *Shn*	*Sxs* *Shn*
715	622	742	*SATURDAY*
>>>>>>>>>>>>>>>>	<<<<<<<<<<<<<<<<	<<<<< DC <<<<<<<<<	
930	837	957	742
942	915		<<<<< DC <<<<<<<<<
<<<<<<<<<<<<<<<<	>>>>>>>>>>>>>>>>		957
1157	1130		PPM
	1142	1342	1915
	<<<<<<<<<<<<<<<<	<<<<<<<<<<<<<<<<	>>>>> DC >>>>>>>>
	1357	1557	2130
1542	1515	1715	
<<<<<<<<<<<<<<<<	>>>>>>>>>>>>>>>>	>>>>>>>>>>>>>>>>	*SUNDAY*
1757	1730	1930	
1915	1742	1942	**Normally at Shepparton NOT USED.**
>>>DC >>>>>>>>>>>	<<<<<<<<<<<<<<<<	<<<<<<<<<<<<<<<<	*Can run attached as DC if required*
2130	1957	2202	742
	2115		<<<<< DC <<<<<<<<<
	>>>>>>>>>>>>>>>>		957
	2335		1915
			>>>>>> DC >>>>>>>>
			2130
Forms Run SH 02 *Sunday*	*Forms Run SH 03* *Sunday*	*Forms Run - SH01* *Sunday*	*Forms Run - SH 04* *Sunday*
Forms Run SH-02 Monday	*Forms Run SH-04 Monday*	*Forms Run SH-01 Monday*	*Forms Run SH-03 Monday*

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Document Status

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		Name	Signature	Name	Signature	Date
2	John Hearsch	Bernard Shepherd/Peter Templer		Bernard Shepherd		31 March 2017

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Shepparton Passenger Rail Improvements Economic Impact Study

Prepared for Greater Shepparton City Council

Final Report – April 2017

Independent insight.

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Table of contents

List of figures

List of tables

Executive Summary

SGS was commissioned by the Greater Shepparton City Council to provide a cost benefit analysis of improved passenger rail services to between Melbourne and Shepparton.

Base Case and Project Case

Since January 2017 Shepparton has been served by four return rail services to Melbourne on weekdays and two on weekends with an average journey times of at least two and a half hours. The continuation of this service was the Base Case for this cost benefit analysis.

The Project Case is based on Scenario 2A as described in the *Shepparton Passenger Service Project* report prepared by GHD (dated March 2017). Under this scenario Shepparton would be served by eight return rail services to Melbourne on weekdays and seven on weekends, with journey times of 2 hours and 20 minutes in peak periods and 2 hours and 10 minutes off-peak. These improvements will also result in signficantly higher levels of service to th Shepparton, Mooroopna, Murchison East and Nagambie stations.

The following assumptions have informed the modelling of the costs and benefits associated with the improved service:

- Design and construction commences in the 2018 financial year (17/18) and takes four years;
- Improved services commence operation in the 2022 financial year (21/22);
- Increased patronage progressively ramps up between 2022 and 2025;
- Patronage settles at a new 'equilibrium' from year 2025 onwards;
- 50% of new rail passengers area result of mode shift from car travel (1.5 persons per vehicle);
- 50% of new rail passengers are induced travel (they would not travel in the Base Case).

Costs

To allow a more frequent and faster rail service additional rolling stock and rail infrastructure upgrades will be required. Rolling stock upgrades will be to the VLocity type with a requirement for 4 x 3-car sets. The rail corridor between Seymour and Shepparton will need to be upgraded to meet operating and safety requirements of the new rolling stock. The total cost of additional rolling stock and other upgrade works has been estimated to be $186 million (GHD, 2017).

Benefits

The potential benefits of improved passenger rail for Shepparton are:

- User benefits (travel time savings; reduced travel costs and productivity benefits)
- Reduced externalities from vehicle usage
- Health benefits derived from increased physical activity;
- Enhanced business productivity
- Human capital improvements
- Improved housing choice (i.e. a greater share of infill vs greenfield development)
- Reduce infrastructure costs (as a result of an increase in the share of infill development)
- More balanced spatial development of Victoria; and
- Option and non-use value.

Patronage assumptions

Improvements in the frequency, speed and reliability of rail services to Shepparton will result in higher patronage. A key question for estimating the benefits of the improved service is the size of this patronage increase.

The current service provides capacity for approximately 550,000 trips per annum. The estimated total number of passengers boarding and alighting at Shepparton, Mooroopna, Murchison East and Nagambiee stations was 155,000 per annum in 2016 (based on data from November and assuming this is a typical patronage month). This equates to an *average* occupancy between Seymour and Shepparton of 28% of the available capacity, although occupancy of individual services varies signficantly from as low as 5% and up to 60%.

Under the Base Case capacity will increase to 1.7 million trips per annum. A doubling of patronage would utilise, on average, 18% of the Project Case capacity; a 2.5 times increase in patronage would utilise 23% of the total capacity; and a tripling of patronage would utilise 27% of total capacity, almost matching the current average occupancy.

To put these figures in context, the introduction of the Regional Fast Rail (RFR) service to Bendigo coincided with significant increases in patronage. Passenger numbers more than doubled in four years, increasing from 1.5 million passengers in 2005/6 to over three million in 2009/10. Passenger numbers for the Traralgon service increased by a similar magnitude. All services that benefited from the RFR service improvements saw increases in passenger numbers of at least one million passengers over the same four year period.

CBA results

The table below present the findings of the CBA based on the three different patronage scenarios:

- A doubling of passenger numbers relative to the Base Case;
- A 2.5 times increase in passenger numbers relative to the Base Case; and
- A tripling of passenger numbers relative to the Base Case.

The first set of results in the table is the base CBA results. The second set includes option and non-use value benefits.

Under the mid-patronage scenario the net present value is a loss of $31 million dollars and the cost benefit ratio 0.85. The high-patronage scenario returns a positive NPV of $24 million and a BCR of 1.12.

When the option and non-use value benefits are included the NPVs and BCRs improve significantly with the mid-patronage scenario returning an NPV of $12 million and a BCR 1.06.

CBA RESULTS ($ MILLIONS)

Patronage scenario relative to Base Case	Results excluding non-use and option value		Results with non-use and option value		Annual passengers by year 8*
	NPV	BCR	NPV	BCR	
2x patronage	$(85)	0.58	$(56)	0.73	300,000
2.5 patronage	$(31)	0.85	$12	1.06	400,000
3x patronage	$24	1.12	$81	1.40	500,000

* Four years after the introduction of the improved passenger rail service.

Additional benefits not included in this CBA

It is likely that improvements to the Shepparton passenger rail service will result in additional direct rail services to Seymour. The benefits to Seymour users were not addressed in this CBA however they are likely to be significant. Service improvements could also have a catalytic effect on the renewal of the Shepparton station precinct. These additional benefits and should be considered in future work assessing the merits of the proposed passenger rail service improvements.

1. Introduction

This chapter provides the context for the study and gives a general overview of cost beneft analysis.

1.1 Context

The current rail service between Melbourne and Shepparton has traditionally been treated as a long-haul service providing journey times of between two hours and 30 minutes and two hours and 50 minutes. Enhancing this service to reduce the travel time to Melbourne and provide more frequent services will benefit Shepparton and its surrounding communities. These benefits would be both financial (e.g. cost savings due to reduce private vehicle usage) and non-financial (e.g. travel time savings and reduced pollution).

When assessing the merits of infrastructure investments, governments are obliged to consider the full range of economic, social, and environmental costs and benefits. This is typically done via cost benefit analysis (CBA).

CBA calculates the net costs and net benefits against a 'do nothing' or Base Case situation in this case maintaining the current rail service as is. The Project Case assumed the introduction of additional rail services between Shepparton and Southern Cross. Replacement of rolling stock and upgrades to the rail line, and works at level crossings will also be required.

This study has been informed by a parallel commission undertaken by GHD to estimate the costs of the rolling stock, infrastructure upgrades and additional operating costs. This CBA was guided by the Department of Treasury and Finance's guidelines for assessing infrastructure investments within the state of Victoria. This type of analysis requires that both financial and non-financial costs and benefits to be monetised and discounted to the present day to establish the expected net community benefit over the life of the investment.

1.2 Purpose of this report

This report presents the results from the CBA and financial analysis. The chapters following this introductory chapter provide:

- Key background data including population, employment and patronage data;
- A description of the Base Case (business as usual) and Project Case (improved passenger rail);
- A description of the anticipated costs and benefits; and
- The findings of the CBA and financial analysis.

1.3 What is cost-benefit analysis?

Cost benefit analysis (CBA) in government policy development

Cost benefit analysis is an approach routinely used to evaluate the merits of a projects and/or to distinguish between a series of project options. As specified in State Government guidelines, CBA must address the full spectrum of environmental, social, and business impacts of the proposal at hand. Positive and negative effects are quantified and monetised (expressed in dollar terms) as far as possible and then compared to arrive at a conclusion as to whether the proposal is likely to make the community better off, or worse off, in net terms compared with persevering with business as usual conditions.

The principal steps in the generic cost benefit analysis method (see Figure 1) include:

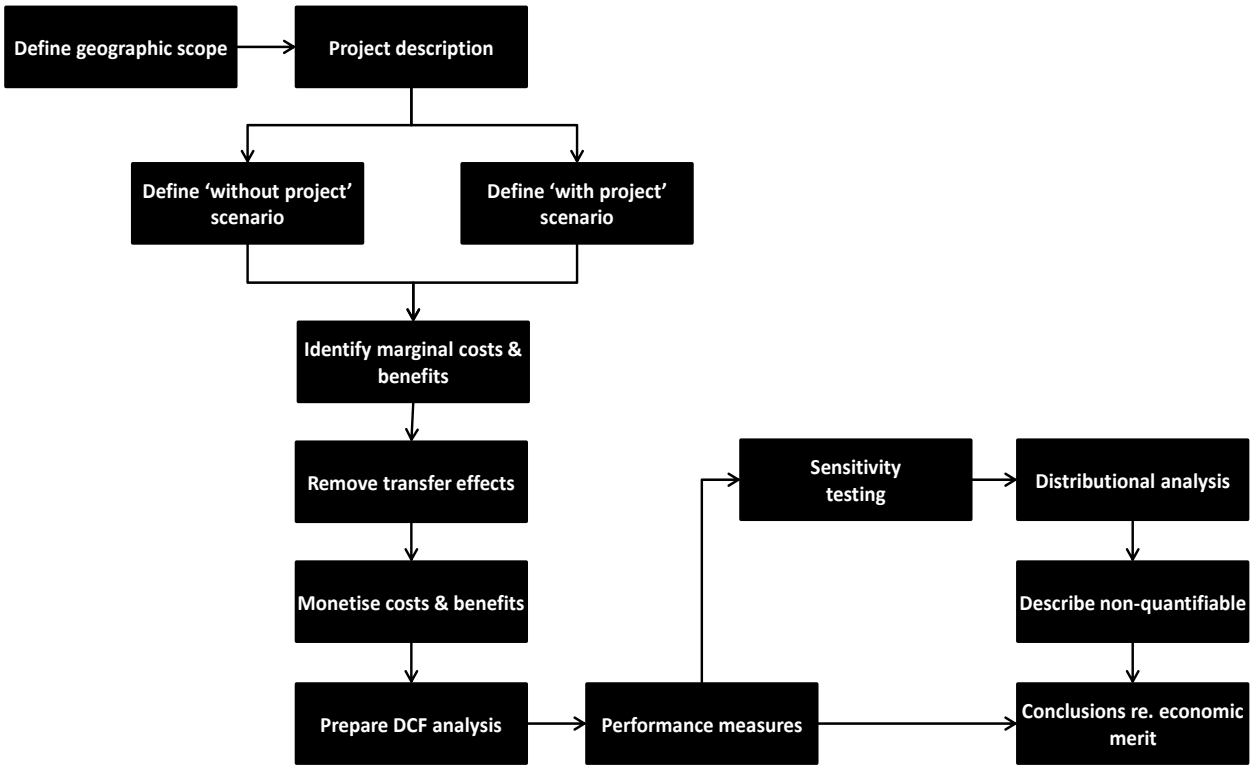
- Differentiating between the outcomes under a 'business as usual' or 'Base Case' scenario (maintain current rail services and timetable), and the Project Case (extension of a number of rail services to Shepparton);
- Identifying the economic, social, and environmental costs and benefits that might arise in moving from the Base Case to the Project Cases;
- Quantifying and monetising these costs and benefits, where possible, over a suitable project evaluation period (in this case 30 years) and with due acknowledgment of on-going benefits and costs;
- Generating measures of net community impact using discounted cash flow techniques over the 30 years in question; this requires expression of future costs and benefits in present value terms using a discount rate that is reflective of the opportunity costs of resources diverted to the implementation of the Project Cases;
- Testing the sensitivity of these measures to changes in the underlying assumptions utilised; and
- Supplementing this quantitative analysis with a description of costs and benefits that cannot be readily quantified and monetised.

It is important to note that all impacts of the proposed project versus the Base Case must be taken into account, whether or not they are 'traded' effects or 'externalities'. Traded costs and benefits are those which have a financial value in the market. Externalities on the other hand are unpriced costs and benefits sustained by third parties in any market transaction. The cost benefit analysis must account for these impacts even though they are not directly mediated (bought and sold) in the market. The monetised value of these external effects needs to be imputed using a variety of techniques as advised by DTF in its Cost Benefit Analysis Tool Kit.

Another vital characteristic of cost benefit analysis is that the community benefit delivered by this regulatory initiative is judged by reference to the 'Kaldor-Hicks' rule. This states that the initiative in question is worth undertaking if the gain in welfare by the beneficiaries is greater than the loss in welfare for those adversely affected. In other words, a particular Project Case would be warranted if the beneficiaries could, if required, compensate those adversely affected and still be better off. This is where the term 'net' community benefit comes from. Whether such compensation is actually paid is not material.

The 'Kaldor Hicks' rule differs from the 'Pareto' test which is sometimes invoked in town planning practice. The Pareto test is that an initiative is only warranted if there are no losers in the process. The Pareto test is not sanctioned in regulatory impact assessment because it places an unworkable onus of proof on the economic merits of a project.

FIGURE 1. COST BENEFIT ANALYSIS METHOD



1.4 Limitations and common problems

There are some common pitfalls in assessment of net community benefit. One is to confuse 'economic impact' with 'economic benefit'. The former deals with the commercial flow on effects of an initiative or program (sales made, people employed, suppliers contracted etc.), while the latter relates to an improvement in community welfare.

By way of illustration, a $10 million construction contract to dig a long trench then fill it up again would generate the same economic *impact* (i.e. multiplier) as a $10 million contract using the same equipment and workers to undertake earthworks for the improvement of a parkland. The economic *benefit* from the latter is clearly superior to the former.

Another pitfall is to construe construction and operational jobs as a 'benefit' of a proposal whereas they are typically factored into cost benefit analyses as a cost. This is because the labour in question has an opportunity cost – it could be deployed elsewhere to produce benefits for the community were it not for the project at hand. Employment is usually only counted as a benefit when the project creates jobs for people who would otherwise be permanently unemployed or underemployed.

For these reasons, amongst others, the DTF advises that the use of economic multipliers should generally be avoided in economic (CBA) evaluations.

A third common misapplication of economic thinking to the net community benefit test is to implicitly or explicitly confine the analysis to the local district or host region of the development in question. Again, in line with usual advice offered by jurisdictional Treasuries, the frame for assessing net community benefit should be set at the State jurisdiction level. To do otherwise runs the risk of patently illogical findings; that is, a net community benefit may be found for the local area, but this might be more than offset by transfers or external costs for neighbouring communities or the host metropolitan area or state.

The upshot, in the case of increased rail services to Shepparton, is that a given Project Case must be demonstrated to generate a net community benefit at the level of the State and not necessarily at the local or district levels.

1.5 Financial analysis

The financial analysis is essentially a subset of the cost-benefit analysis. It takes into account the *financial* costs and benefits relevant to the project, and seeks to determine if the best option, as shown by the CBA, is feasible from the perspective of those who bear the financial impacts.

While the purpose of the CBA is to show which option is best from a whole community perspective, the purpose of the financial assessment is to allow relevant parties to make a decision on whether or not this option is realistic from a financial perspective.

In this particular case, where State Government funding is required, the financial assessment considers the financial investment the Victorian Government will need to make to improved passenger rail services between Southern Cross and Shepparton.

TABLE 1. FINANCIAL ANALYSIS

Item	Notional timing	Data source	Type
Infrastructure/build costs	Years 1 to 3	GHD	Capital
Rolling stock	Year 4	GHD	Capital
Additional operating costs	Year 4 onwards	GHD	Operating

Source: GHD, 2017.

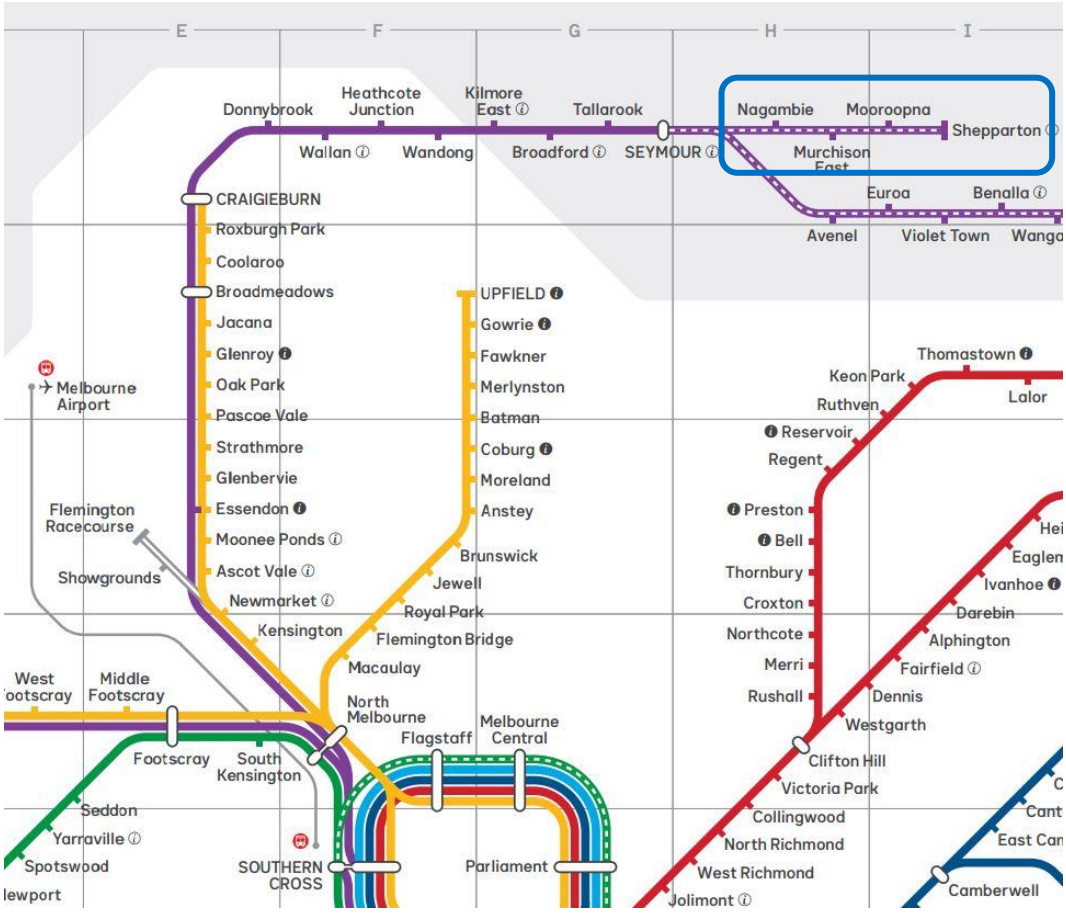
2. Background

This chapter provides background data relevant to the cost benefit analysis.

2.1 Context

Improvements to Shepparton's passenger rail service would require upgrades to the section of the Shepparton line between Seymour and Shepparton that is approximately 85 kilometres in length and includes the stations of Nagambie, Murchison East, Mooroopna and Shepparton (see Figure 2).

FIGURE 2. NORTHERN VICTORIA'S RAIL NETWORK



Source: PTV Train Network Map 2017 (https://static.ptv.vic.gov.au/Maps/1482457134/PTV_Train-Network-Map_2017.pdf)

2.2 Population and employment projections

Catchment

For the purpose of this CBA an indicative catchment for rail passengers served by the Shepparton rail service via stations at Nagambie, Murchison East, Mooroopna and Shepparton was developed.

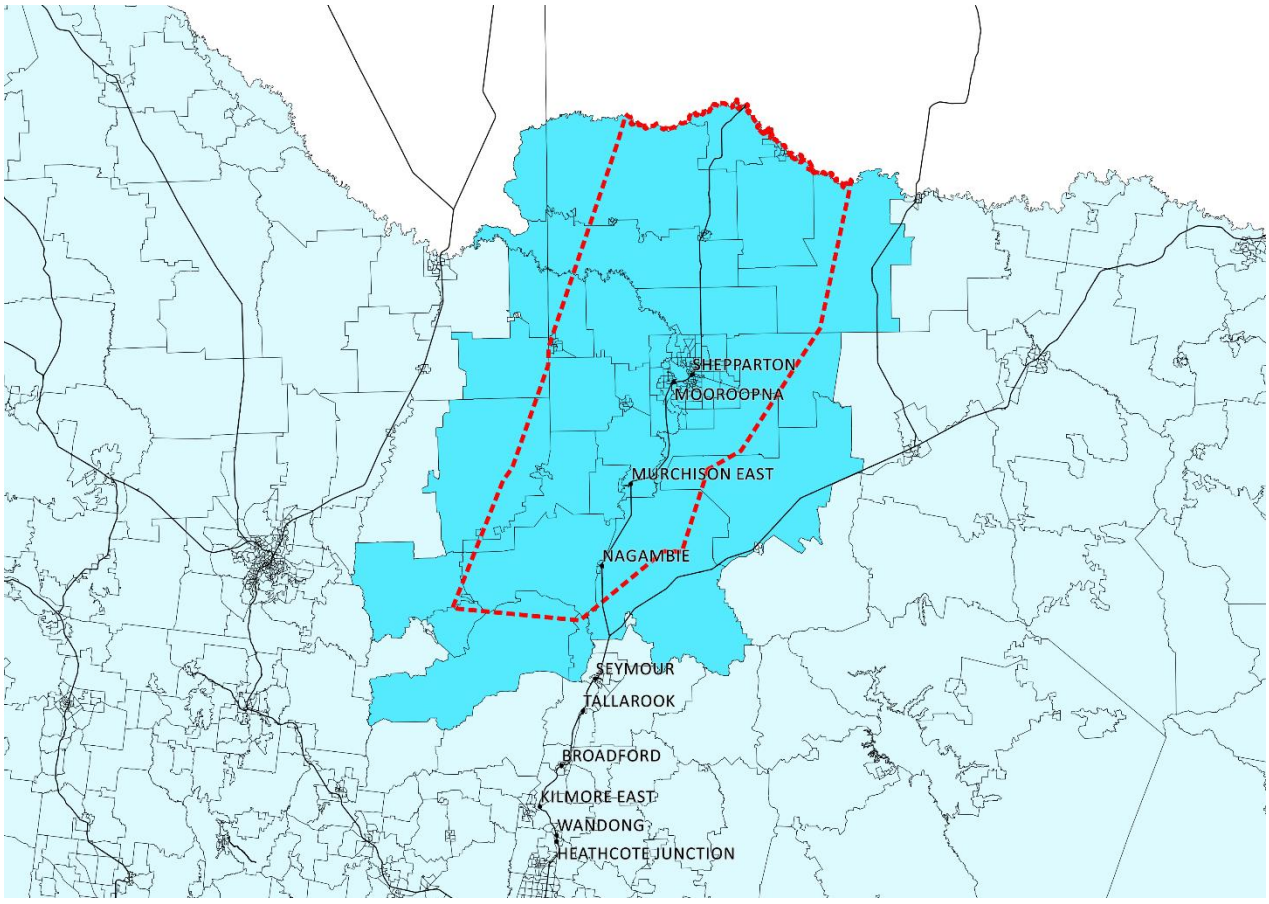
This was done by determining the areas for which these stations were the closest option (by a 'crow flies' measure) compared to alternative stations on alternative rail lines. The boundary of this area is shown as the dashed red line in Figure 3 below.

Population and employment projections for this catchment were estimated using an area-overlap procedure. This allocates a proportion of the total Travel Zone (TZ) population forecast or employment forecast, based on the area proportion of the TZ within the red boundary shown. For TZs entirely within the catchment, 100% of the population or employment was considered within the catchment. For a TZ where 10% of the area is within the red boundary, 10% of the population or employment was considered as falling within the catchment.

This catchment serves as an estimate only. There may be passengers from outside this area that use the Shepparton rail service (such as the Yarrawonga and Echuca area) as well as passengers within the area that use alternative services. Factors such as driving distance and times will affect whether passengers use the Shepparton line or an alternative rail services.

Regardless of these nuances the approach employed provides, in aggregate, a reasonable indication of the size of the population that might access the Shepparton service now and in the future.

FIGURE 3. TRAVEL ZONES IN THE SHEPPARTON RAIL CATCHMENT



Source: SGSEP Pty Ltd.

Population and employment forecasts to 2051

The population forecasts used in the CBA are based on Victoria in the Future data from 2016 (Table 2). The employment forecasts used are based on modelling prepared by SGS (Table 3). These forecasts are used for both the Base Case and Project Case.[1]

TABLE 2. POPULATION FORECASTS

	2016	2021	2026	2031	2036	2041	2046	2051
Nagambie	5,300	5,300	5,400	5,800	6,000	6,100	6,200	6,300
Murchison	3,100	3,200	3,200	3,300	3,400	3,500	3,600	3,700
Mooroopna	7,700	6,700	5,800	5,200	4,800	4,500	4,300	4,200
Shepparton	59,100	61,700	64,600	68,100	72,100	76,500	81,100	85,700
Total	75,200	76,900	79,000	82,400	86,300	90,600	95,200	99,900

Source: SGS analysis of VIF, 2015.

TABLE 3. EMPLOYMENT FORECASTS

	2016	2021	2026	2031	2036	2041	2046	2051
Nagambie	2,400	2,600	2,700	2,700	2,800	3,000	2,600	2,700
Murchison	1,300	1,300	1,400	1,400	1,500	1,600	1,800	1,800
Mooroopna	4,100	4,400	4,600	4,900	5,200	5,700	6,000	6,400
Shepparton	30,500	32,900	34,500	37,000	39,200	42,400	45,300	47,700
Total	38,300	41,200	43,200	46,000	48,700	52,700	55,700	58,600

Source: SGS Economics and Planning Pty Ltd

2.3 Current and projected rail patronage

Current patronage

In 2016 Shepparton was served by three northbound and four southbound services on weekdays and two services in each direction on Saturday and Sunday. Patronage data for 2016 suggests that, on average, around 200 passengers boarded and alighted from the Shepparton rail services between the Shepparton and Nagambie stations per day in 2016 (see Table 4 and Table 5). The data also suggests average daily boardings were slightly higher than the average daily alights (224 vs 200).

If November was a typical number, the total implied annual passengers numbers are 73,100 alights and 81,800 boardings. 78% of boardings and alights are at Shepparton Station, 7% at Mooroopna, 12% at Murchison East and 3% at Nagambie.

The total number of trips in both directions, 155,000, is roughly double the population within the catchment identified above (75,100). Based on this metric, the number of passengers using the service is approximate double the population in the catchment.

TABLE 4. AVERAGE DAILY ALIGHTS NOVEMBER 2016 (NORTHBOUND)

	Nagambie	Murchison East	Mooroopna	Shepparton	Total
Weekday	7	24	14	157	202
Saturday	5	28	13	148	195
Sunday	5	22	19	152	197
Weighted average	6	24	14	155	200
Implied passengers per annum					73,100

Source: PTV, 2017.

[1] If service improvements were to attract additional growth above the base projections, this would most likely be the diversion of growth from other locations within Victoria, rather than a net increase for the state as a whole. Additional growth beyond current projections for Shepparton could be the result of diversion of households from Bendigo or greenfield areas on Melbourne's urban fringe. Such shifts in the patterns of growth within the state may not constitute a net benefit (or cost), if the resulting travel behaviours, productivity and human capital outcomes of the diverted households was unaffected by their change in location.

TABLE 5. AVERAGE DAILY BOARDINGS NOVEMBER 2016 (SOUTHBOUND)

	Shepparton	Mooroopna	Murchison East	Nagambie	Total
Weekday	182	13	30	6	232
Saturday	157	18	28	4	207
Sunday	169	13	18	4	204
Weighted average	176	14	28	6	224
Implied passengers per annum					81,800

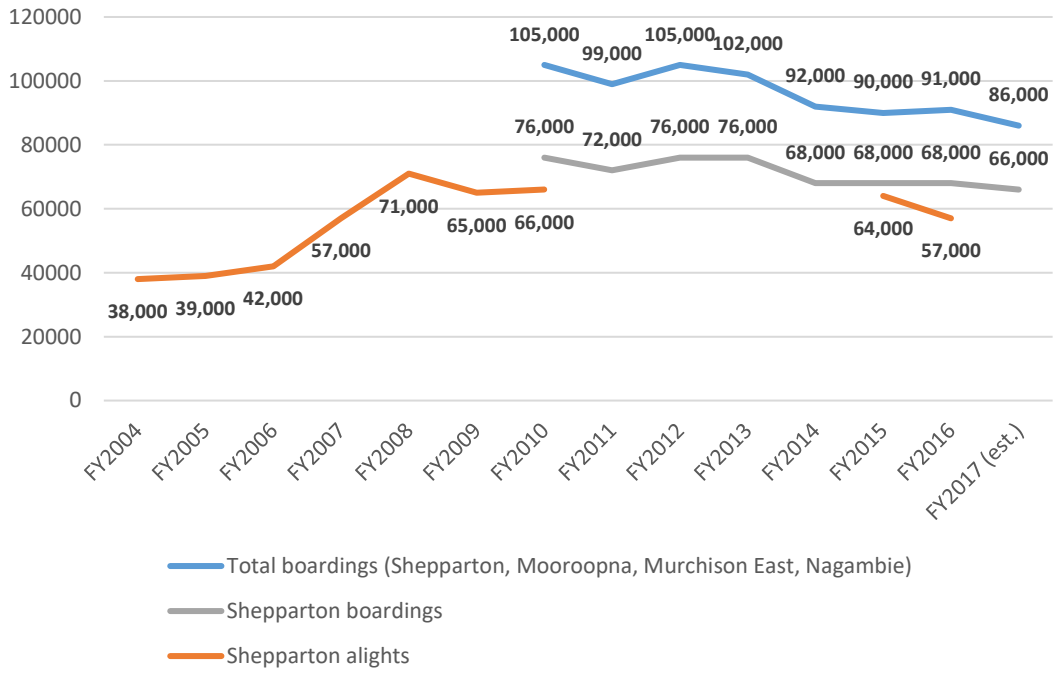
Source: PTV, 2017.

Longer term passengers trends

Total patronage for the four station north of Seymour has been progressively declining since 2010. This data could be interpreted as indicating that demand for passenger rail, based on the current level of services, has peaked. Despite population growth, the number of passengers using the service has apparently decrease. Passenger boarding at Shepparton Station have declined by 10,000 since 2010.

The number of passengers alighting at Shepparton increased between 2004 and 2016 from fewer than 40,000 passengers per annum to around 57,000 in 2016. Passengers alighting at Shepparton peaked at in 2008 at 71,000 passengers per annum.

FIGURE 4. BOARDINGS (ALL STATIONS AND SHEPPARTON) AND ALIGHTS (SHEPPARTON ONLY)

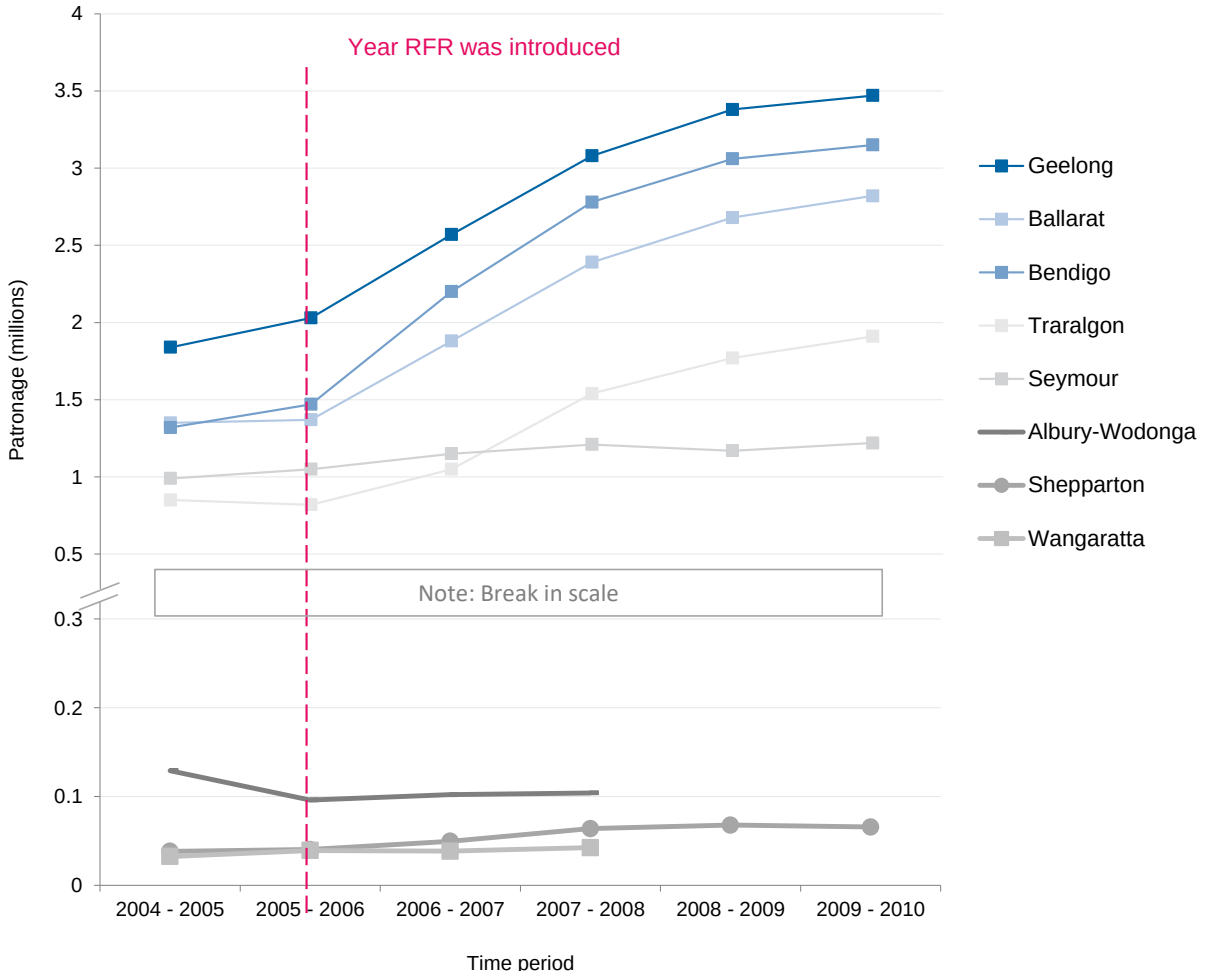


Source: V/Line (Total boardings series 2010 to 2017); PTV (Shepparton data, 2015 and 2016); GHD (Shepparton data, 2004 to 2010).

Patronage and Regional Fast Rail

The introduction of the Regional Fast Rail (RFR) services to other regional centres coincided with significant increases in passenger numbers (see Figure 5). In the case of the Bendigo service, passenger numbers more than doubled over a four year period, with around 1.5 million passengers using the services in 2005/6 increasing to over three million by 2009/10. Passenger numbers on the Traralgon service also doubled over a four year period. All services that benefited from RFR service improvements experienced increases in passenger numbers of at least 1 million passenger in the period shown.

FIGURE 5. REGIONAL FAST RAIL IMPACTS ON PATRONAGE ACROSS VICTORIA



Source: GHD, 2017.

Patronage of an improved rail service for Shepparton

It is assumed that improvements in the frequency, speed and reliability of rail services to Shepparton will also result in higher patronage. The CBA assumes that the proposed rail improvements (the Project Case) will provide eight services a day on weekdays and seven services a day on weekends. Travel times will be reduced by 10 to 20 minutes and the quality of the rolling stock will be improved with newer VLocity trains replacing the older locomotive-hauled trains.

A key question for estimating the benefits of the improved passenger rail service is estimating the magnitude of the likely patronage increase.

The current service provides capacity for approximately 550,000 trips. The estimated number of passengers boarding and alighting at Shepparton, Mooroopna, Murchison East and Nagambiee stations of 155,000 per annum equates to an *average* occupancy of 28%. Occupancy of individual services between Shepparton and Nagambie varies signficantly; from as low as 5% for the early morning weekday service to Melbourne, and up to 60% for the Sunday evening service from Melbourne.

Under the Project Case capacity will increase to around 1.7 million trips per annum (870,000 trips in either direction); approximately 3 times the capacity of the current service.

A doubling of patronage (300,000 passenger per annum) would utilise, on average, 18% of the capacity on offer; a 150% increase in patronage (390,000 passengers per annum) would utilise 23% of the capacity; and a 200% increase in patronage (465,000 passengers per annum) would utilise an average of 27% of the available capacity – which would almost match the current occupancy rate.

2.4 Evidence of latent demand for passenger rail services

Previous reports and consultation associated with this project had suggested significant potential latent demand for passenger rail service between Shepparton to Melbourne. Key findings include:

- Council employees make an estimate 500 trips per annum to Melbourne via car for meetings and professional development. A larger proportion of these trips could be made using the rail service in more frequent and reliable.
- Goulburn Valley Health employees also make a significant number of trips to Melbourne for training and professional development. Most trips are made by car due to limited frequency of the existing passenger rail service.
- Both staff and students from the two Universities (La Trobe and University of Melbourne) and the GOTAFE would be potential users of improved passenger rail services.
- A survey conducted by Council in 2014 (sample size: 2,127) found that respondents would use passenger rail services more often if the services were more frequent (1,763 responses), faster (1,385 responses) and more direct services to and from Melbourne (1,179 responses) (Greater Shepparton City Council, 2014).
- Significant numbers of rail passengers from Shepparton and surrounds currently drive to Seymour in order to accesses the more frequent services that depart that station.
- With the ageing of the population the proportion of older residents in and around Shepparton is increasing. These residents are more likely to choose rail as an alternative to driving to avoid long drives, driving at night, or driving in heavy traffic.

3. Base Case and Project Case

This chapter describes the Base Case and Base Case to be tested in the cost-benefit analysis.

3.1 Base Case

As of January 2017 Shepparton has been served by four return rail services to Melbourne on weekdays and two on weekends with an average journey time of 2½ hours (Table 6).

TABLE 6. BASE CASE SHEPPARTON TO MELBOURNE RAIL TIMETABLE

To Melbourne		From Melbourne	
Shepparton Dep.	Melbourne Arr.	Melbourne Dep.	Shepparton Arr.
Weekdays			
5.15 am	7.59 am	9.32 am	12.07 pm
6.31 am	9.10 am	12.52 pm	3.23 pm
12.50 pm	3.15 pm	4.31 pm	7.21 pm
4.06 pm	6.35 pm	7.08 pm	9.45 pm
Saturdays			
7.04 am	9.28 am	9.12 am	11.41 am
4.05 pm	6.29pm	6.32 pm	9.05 pm
Sundays			
7.15 am	9.39 am	9.30 am	12.06 pm
5.05 pm	7.2 9pm	6.32 pm	9.05 pm

Source: GHD, 2017.

Passenger numbers

Under the Base Case it is assumed that the 2016 levels of patronage, as a proportion of total population, and the implied mode split of rail vs non-rail travel, will continue into the future. Data from PTV suggest that, on average, 200 passengers board and alight the Shepparton rail services between Shepparton and Nagambie per day on both weekdays and weekends.

The total number of trips in both directions is 155,000. This is roughly double the population within the catchment of 75,100. The Base Case assumes the relationship between rail patronage and the catchment population will remain constant and patronage will therefore increase each year at the same rate as population growth.

3.2 Project Case

The Project Case is based on Scenario 2A as described by GHD in their report *Shepparton Passenger Services Project, Shepparton Passenger Improvements* (2017). Under this scenario Shepparton will be served by eight return rail services to Melbourne on weekdays and seven on weekends as shown in the table below, with a journey times of between 2 hours and 10 minutes and 2 hours and 20 minutes.

To allow a more frequent and faster rail service, additional rolling stock and other upgrades will be required[2]. Rolling stock upgrades will be to the VLocity type, with a requirements for 4 x 3-car sets. The costs of the addition rolling stock has been estimated at $85,000,000 (GHD, 2017).

[2] Requirements taken from GHD (2016) Service Plans report (draft)

The rail corridor between Seymour and Shepparton will need to be upgraded to meet operating and safety requirements of the new rolling stock. The total costs of these upgrade, include a 30% contingency has been estimated at $101,000,000 (GHD, 2017).

TABLE 7. BASE CASE SHEPPARTON TO MELBOURNE RAIL TIMETABLE

To Melbourne		From Melbourne	
Shepparton Dep.	Melbourne Arr.	Melbourne Dep.	Shepparton Arr.
Weekdays			
5.20 am	7.55 am	6.10 am	8.35 am
6.40 am	9.10 am	8.20 am	10.40 am
8.50 am	11.10 am	10.30 am	12.50pm
10.55 am	1.15 pm	12.40 pm	3.00 pm
1.05 pm	3.25 pm	2.50 pm	5.10 pm
3.15 pm	5.35 pm	4.40 pm	7.10 pm
5.25 pm	7.50 pm	6.55 pm	9.15 pm
7.25 pm	9.45 pm	10.00 pm	12.20 am
Weekends			
6.20 am	8.40am	7.15 am	9.35 am
7.45 am	10.05 am	9.20 am	11.40 am
9.50 am	12.10 am	11.25 am	1455 pm
11.55 am	2.15 pm	1.30 pm	3.50 pm
2.00 pm	4.20 pm	5.30 pm	7.45 pm
4.05 pm	6.25 pm	7.30 pm	9.50 pm
8.00 pm	10.20 pm	11.00 pm	1.20 am

Source: GHD, 2017. (Will need are non-secure version of the GHD report to copy and paste the revised timetable data.)

Passenger numbers

The Project Case assumes an increase in rail patronage as a result of both a shift in mode split towards rail and induced travel. Three patronage scenarios were tested: a doubling of passengers; a 2.5 times increase; and a tripping in passenger numbers, relative to the Base Case.

The current service provides capacity for approximately 550,000 trips (both directions). The current estimated annual passenger number of 155,000 equates to an average occupancy of 28%. Under the Base Case capacity will increase to 1.7 million trips per annum (both directions)

A 100% increase in patronage – 300,000 passenger per annum – would utilise, on average, 18% of the capacity on offer. A 150% increase in patronage – 390,000 passengers per annum – would utilise 23% of the total capacity. While a 200% increase in patronage – 465,000 passengers per annum – would utilise 27% of total capacity, matching the current average occupancy rate.

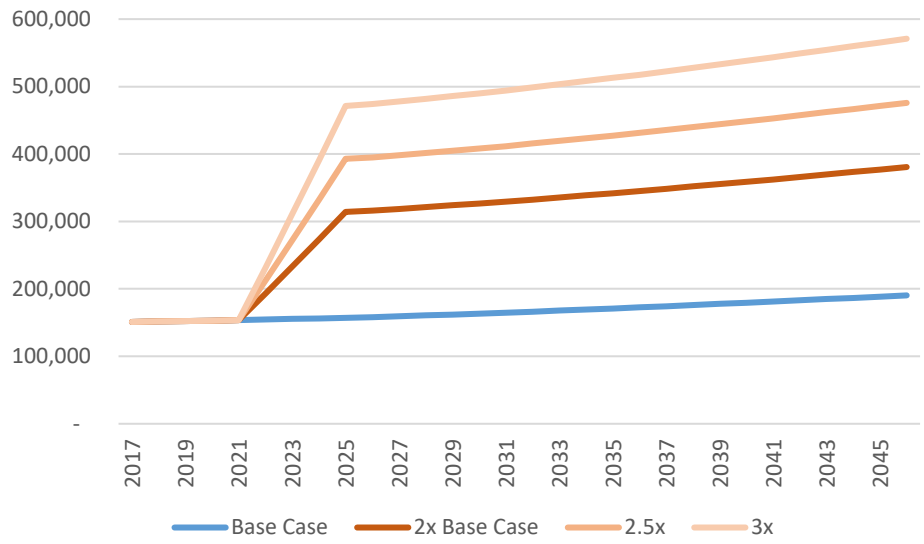
New passengers would be of two types: those that are already travelling by car in the Base Case and shift modes to the rail service; and those that were not travelling in the Base Case, but are induced to use the service in the Project Case because of the improvements to the timetable, service reliability and quality of the rolling stock. The 'mode shifting' passengers were assumed to be split between business and leisure trips on an equal basis. The induced passengers were all assumed be undertaking trips for leisure purposes.

Other key assumptions

The followings assumptions were also used in all Project Case scenarios:

- Design and construction commences in the 2018 financial year (17/18) and takes three years;
- Improved services commence operation in 2022 financial year (21/22);
- Increased patronage progressively ramps up between 2022 and 2025;
- Patronage settles at a new 'equilibrium' from year 2025 onwards (see Figure 6); and
- The split of new passengers between mode shift and induced travel types is 50:50, that is 50% of new rail passengers mode shift from car travel (assuming an average of 1.5 persons per vehicle) and 50% of new rail passengers are the result of induced travel (they would not have travelled, via any mode, in the Base Case).

FIGURE 6. BASE CASE AND PROJECT CASE PATRONAGE SCENARIOS (TOTAL PASSENGERS PER ANNUM)



Source: SGSEP Pty Ltd, 2017.

4. Costs and benefits

This chapter outlines the anticipated costs and benefits of improving passenger rail between Shepparton and Melbourne and the methods used to quantify and monetise them.

4.1 Overview

The proposed service improvements will reduce travel times between Shepparton and Melbourne and the intermediate stations and increase the number of rail services from four to eight on weekdays and two to seven on weekends. The CBA assumes that as a result of these improvements there will be an increase in the proportion of the population located along the corridor using the rail service.

4.2 Costs

The costs of the Project Case relative to the Base Case are:

- The procurement of additional rolling stock
- Upgrades to rail infrastructure to accommodate higher operating speeds and to provide storage of the additional rolling stock.
- Additional operating costs: vehicle operations and maintenance, track maintenance, customer service, security and so on.

A range of measurement strategies, principles, and assumptions were applied to quantify and monetise the impacts of the Project Case against the Base Case. The methods and data sources used to quantifying and valuing the costs are summarised in the table below.

TABLE 8. METHOD AND DATA SOURCES – COSTS

Cost item	Description/rationale	Method	Data source/s
Rolling stock	Procurement of rolling stock	Cost spread over two years	GHD, 2017.
Construction costs	Construction costs for upgrades (track improvements, level crossing improvements, stabling, contingencies)	Total cost spread over required construction period	GHD, 2017.
Additional operating costs	Additional costs for vehicle operations and maintenance, track maintenance, customer service, security.	Net additional operating costs	GHD, 2017.

Source: SGS Economics & Planning

4.3 Benefits

The benefits of the Project Case relative to the Base Case are:

- Travel time savings for existing users – current users of the rail service will benefit from travel time savings in the order of 15 minutes on average for the full journey between Shepparton and Southern Cross Station;
- User benefits for new users – which includes reduce vehicle operating costs and, in the case business trips, higher productivity during the duration of the journey;
- Increase business agglomeration – better linkages to other businesses in Victoria, particularly in Melbourne will enhance business productivity;
- Human capital improvements – households in Shepparton and nearby areas are expected to have better access to jobs and education, particularly in Melbourne, improving their skills and know how;
- Reduced VKT externalities – the reduction in VKT will generate savings in greenhouse gas emissions, other unwanted emissions, crashes and other externalities;
- Improved housing choice – the shift in pattern of development will increase housing choice for households in Shepparton and other communities on the rail corridor.
- Saved infrastructure costs (housing) – improved rail services might be expected to shift the balance of infill versus greenfield development in Shepparton and other communities on the rail corridor. Any savings in infrastructure costs between infill and greenfield development constitute a net benefit;
- Health benefits – higher PT mode share will likely result in increased physical activity via walking or cycling to and from stations, improving health outcomes.;
- Balanced spatial development of Victoria – it is anticipated that there will be a significant community willingness to pay to 'spread' development opportunities into regional Victoria through improved service provision in non-metro areas (even if this just 'holds the line' in terms of drift to the city); and
- Option and non-use value – the value of the service to non-users that existing regardless of the fact that they themselves do not receive direct user benefits.

The methods and data sources for quantifying and valuing the benefits are summarised in the table below.

Benefits not included

Not all of the identified benefits could be quantified reliably enough for inclusion in the CBA. Benefits associated with 'Balanced spatial development of Victoria' and 'Improved housing choice' have not been included in this assessment.

TABLE 9. METHOD AND DATA SOURCES – BENEFITS

Benefit item	Description/Rationale	Method	Data source/s
Travel time savings	Shortened travel and waiting time	Number of passengers x time saving x $14.99	BITRE parameter for value of time/patronage to be provided
User benefits (mode shift – business trips)	Travelling via rail as opposed to driving will generate costs savings and allow increased productivity of workers (active as opposed to passive work time)	Average Vehicle operating costs; margin increase in the value of active vs passive work time	BITRE parameters and SGS modelling
User benefits (mode shift – leisure trips)	Travelling via rail as opposed to driving will generate costs savings	Average Vehicle operating costs	BITRE parameters and SGS modelling
User benefits (induced travel)	Some users that would not have otherwise travelled will be induced to use the service as a result of the higher frequency and improved rolling stock.	Value of these trips proxied by the average value of leisure time and fares paid	BITRE parameters and SGS modelling
Business agglomeration	Better linkages to other businesses in Victoria, particularly in Melbourne.	EJD improvement	SGS modelling
Human capital improvements	Better access to jobs and social opportunities as a result of better connectivity	EJD improvement	SGS modelling
Reduced VKT externalities	Reduced externalities due to mode shift	Reduction in car km travelled	BITRE parameters
Saved infrastructure costs	Improved rail might shift the balance of infill versus greenfield development resulting in infrastructure cost savings.	Difference in infill vs greenfield infrastructure costs per dwelling x additional infill dwellings	Infraplan, 2013.
Health benefits	Increased physical activity via walking or cycling to and from stations will improve health outcomes.	Saved health care costs as a result of increased physical activity.	ATAP guidelines for valuing active transport.

Source: SGS Economics & Planning

4.4 Other assumptions

Time frame

A 30 year time frame was used. Whilst such infrastructure investments tend to have a longer life span than this, 30 years is a reasonable timeframe within which to predict likely costs and benefits.

Discount rate

In guidance provided by the Department of Treasury and Finance infrastructure and/or public transport investments are classified as Category 2 investment and 7% discount rate is recommended when calculating the net present value (NPV). The convention was followed.

5. Findings

5.1 Cost benefit analysis

Three sets of findings are provided based on differing assumptions about the increase in passenger numbers under the Project Case being, a doubling, a 2.5x increase and a tripling, relative to the Base Case patronage assumptions.

The CBA results report on the net present value (NPV), which is the total benefits net of the total costs; and the benefit cost ratio (BCR), which is the total benefits divided by the total costs.

A BCR of greater than 1 suggests the Project Case would result in a net benefit to the community, whereas a BCR of less than one suggests a net loss. The magnitude of the net benefit or net loss is reflected by the NPV.

Findings based on a doubling of passenger numbers

The table below presents the findings of the cost benefit analysis assuming that patronage doubles (a 100% increase) in the Project Case. The net present value is a loss of $85 million and the benefit cost ratio is 0.58.

TABLE 10. CBA RESULTS – DOUBLING OF PATRONAGE RELATIVE TO THE BASE CASE

Cost and benefits	Value	Proportion of costs/benefits
Rolling stock – PV	$66,721,000	33%
Upgrade works – PV	$85,866,000	42%
Operating costs – PV	$51,424,000	25%
Total costs – PV	$204,011,000	100%
User benefits: mode shift passengers (business trips) – PV	$45,087,000	38%
User benefits: mode shift passengers (leisure trips) – PV	$12,587,000	11%
User benefits: induced travel passengers – PV	$41,753,000	35%
Travel time savings (existing passengers) – PV	$5,604,000	5%
Reduced VKT externalities – PV	$9,014,000	8%
Saved infrastructure costs – PV	$1,937,000	2%
Business agglomeration – PV	$1,344,000	1%
Human capital improvements – PV	$451,000	0%
Health benefits – PV	$799,000	1%
Total benefits – PV	$118,576,000	100%
Net Present Value	$(85,435,000)	
Benefit Cost Ratio	0.58	
Base Case passengers per annum by year 8*	157,126	
Base Case passengers per annum by year 8*	314,252	

PV = Present Value *4 years after completion of upgrades and introduction of new rolling stock.

Findings based on a 2.5 times increase in passenger numbers

The table below presents the findings of the cost benefit analysis assuming that patronage increases 2.5 times (a 150% increase) in the Project Case. The net present value is a loss of $31 million and the benefit cost ratio is 0.85.

TABLE 11. CBA RESULTS – 150% INCREASE IN PATRONAGE RELATIVE TO THE BASE CASE

Cost and benefits	Value	Proportion of costs/benefits
Rolling stock – PV	$66,721,000	33%
Upgrade works – PV	$85,866,000	42%
Operating costs – PV	$51,424,000	25%
Total costs – PV	$204,011,000	100%
User benefits: mode shift passengers (business trips) – PV	$67,631,000	39%
User benefits: mode shift passengers (leisure trips) – PV	$18,880,000	11%
User benefits: induced travel passengers – PV	$62,630,000	36%
Travel time savings (existing passengers) – PV	$5,604,000	3%
Reduced VKT externalities – PV	$13,521,000	8%
Saved infrastructure costs – PV	$1,937,000	1%
Business agglomeration – PV	$1,344,000	1%
Human capital improvements – PV	$451,000	0%
Health benefits – PV	$1,198,000	1%
Total benefits – PV	$173,196,000	100%
Net Present Value	$(30,815,000)	
Benefit Cost Ratio	0.85	
Passengers per annum by year 8*	392,815	

PV = Present Value *4 years after completion of upgrades and introduction of new rolling stock.

Findings based on tripling of passenger numbers

The table below presents the findings of the cost benefit analysis assuming that patronage triples (a 200% increase) in the Project Case. The net present value is positive, at $23 million, and the benefit cost ratio is 1.12.

TABLE 12. CBA RESULTS – TRIPLING OF PATRONAGE RELATIVE TO BASE CASE

Cost and benefits	Value	Proportion of costs/benefits
Rolling stock – PV	$66,721,000	33%
Upgrade works – PV	$85,866,000	42%
Operating costs – PV	$51,424,000	25%
Total costs – PV	$204,011,000	100%
User benefits: mode shift passengers (business trips) – PV	$90,174,000	40%
User benefits: mode shift passengers (leisure trips) – PV	$25,173,000	11%
User benefits: induced travel passengers – PV	$83,507,000	37%
Travel time savings (existing passengers) – PV	$5,604,000	2%
Reduced VKT externalities – PV	$18,028,000	8%
Saved infrastructure costs – PV	$1,937,000	1%
Business agglomeration – PV	$1,344,000	1%
Human capital improvements – PV	$451,000	0%
Health benefits – PV	$1,597,000	1%
Total benefits – PV	$227,816,000	100%
Net Present Value	$23,804,000	
Benefit Cost Ratio	1.12	
Base Case passengers per annum by year 8*	471,378	

PV = Present Value *4 years after completion of upgrades and introduction of new rolling stock.

Summary

The main benefits are the user benefits they would acrrue to the tree categories of new passengers. In each of the three patrongae scenarios these benefits total around 85% of the total benefits. Reduced externalities associated with vehcile usage are also a significant benefits at 8% of the total benefits.

The findings suggest that if the improved rail service attracted additional passengers in the order of 175% of the Base Case patronage the total benefits of the proposed upgrade would outweigh the total costs. This would be around 400,000 passengers per annum by 2030.

5.2 Sensitivity tests

The base CBA assumes that rail patronage under the Base Case will continue to increase with population growth and does not includes option and non-use value. Sensitivity analyses were undertaken to consider the impact on the findings of changing these assumptions.

Base Case patronage assumptions

The Base Case assumes patronage will increase at that same rate as population growth. However, given patronage appears to have been declining in recent years and it is plausible that the current service has achieved peak patronage. The first sensitivity test assumed that patronage in the Base Case does not increase over time. This has the effect of increasing the difference in patronage between the Base Case and Project Cases.

Option and non-use value

The second sensitivity test is includes option and non-use value benefits. Option and non-use value refers to the benefits experienced by the members of the community that do not use the service but value the *option* to use it and its value to others. A literature review by Laird et al (2009) suggested that option and non-use benefits can range from between 20% to 50% of the total economic value (TEV) of a good or service. They also found that option and non-use benefits were higher in more remote locations where populations placed a higher value on connectivity to the metropolitan core.

This test assumed that the option and non-use value benefit were just 20% of the TEV (the lower end of the range identified by Laird et al) and, therefore, the benefits identified in the base analysis would constitute 80% of the TEV.

Test combined

A third sensitivity test combined both test 1 and 2.

Findings

The table below summarises the results of applying the sensitivity tests for each patronage scenario.

Test 1, where it is assumed that Base Case patronage does not increase, provide a slight improvement to the BCR compared to the initial analysis. Test 2, the inclusion of option and non-use value, results in more significant improvements to the BCR. The combined test result in even higher BCRs.

TABLE 13. RESULTS OF SENSITIVITY TESTS

Patronage scenario relative to Base Case	Base results	Test 1: Base Case patronage does not increase	Test 2: Include non-use and option value benefits	Test 3: Tests 1 and 2 combined	Annual passengers by year 8*
	BCR	BCR	BCR	BCR	
2x patronage	0.58	0.63	0.73	0.79	300,000
2.5 patronage	0.85	0.90	1.06	1.13	400,000
3x patronage	1.12	1.17	1.40	1.46	500,000

* Four years after the introduction of the improved passenger rail service.

5.3 Distributional impacts

The benefits of an improved rail service will flow to passengers (and non-users) that have access to the service at the four affected stations: Shepparton, Mooroopna, Murchison East and Nagambie.

Without more detailed data on current and potential patronage it was not possible to provide a detailed assessment of the distributional impacts of the proposal.

The costs of the improvements will be borne by the State Government and therefore by the entire Victorian community.

5.4 Financial analysis

While the purpose of the CBA is to show which option is best from a whole community perspective, the financial analysis allows relevant parties to make a decision on whether or not this option is realistic from a financial perspective.

The financial costs and benefits of the project to the state are summarised in the table below.

Financial costs include the new rolling stock, infrastructure upgrades and additional operating costs. Financial benefits are and additional revenues from fares. The average fare revenue assumed to be $25 per trip.

TABLE 14. FINANCIAL ANALYSIS ($ MILLIONS)

	2018	2019	2020	2021	2021-2047	Total
Rolling stock - PV	$-	$-	$(34)	$(32)	$-	$(67)
Upgrade works - PV	$(24)	$(22)	$(21)	$(19)	$-	$(86)
Operating costs - PV	$-	$-	$-	$-	$(51)	$(51)
Total costs - PV	$(24)	$(22)	$(55)	$(52)	$(51)	$(204)
Revenue from fares - PV	$0	$0	$0	$0	$53	$54
Total benefits - PV	$0	$0	$0	$0	$53	$54
Net present value	$(24)	$(22)	$(55)	$(52)	$2	$(150)

Note: Figures in brackets are negative.

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