Engineers Australia
Engineering Heritage Victoria

Nomination for Recognition
under the
Engineering Heritage Australia Heritage Recognition Program
for the

Goldfields Railways - Melbourne, Bendigo & Echuca Railway

May 2012

Cover Photograph

Malmsbury Viaduct has been in continuous railway service for 150 years. It was completed in October 1860, two years before the opening of the Melbourne to Bendigo Railway in October 1862.

The train is a V/Line class N diesel-electric locomotive hauling an N type carriage set on its way south to Melbourne.

The white concrete structure in the lower right hand corner of the photograph is the aqueduct from Malmsbury Reservoir to Bendigo which passes under the viaduct beside the Coliban River.

It should be noted that the viaduct now carries only a single Irish Broad Gauge (5'3") track although it carried two tracks for most of its life.

This image was taken from the Malmsbury Botanic Gardens, downstream from the viaduct, probably in 2007 or 2008.

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1 Introduction

The Extent of the Nomination

In the preparation of this nomination considerable discussion occurred as to the boundaries of the nomination. The two Goldfield Railways (Melbourne to Bendigo and Geelong to Ballarat) were commenced at the same time and were built to similar design standards. Consideration was given by Engineering Heritage Victoria to making a nomination for the two railways together as there is such synergy in timing, design, construction and purpose of the two projects.

It was however resolved that the two projects have such individual merit and significance that they should be nominated separately.

A second-order question was then addressed as to how far the nomination should go in a northerly direction. Whilst the Goldfield Railway element of the Melbourne to Echuca Railway was met when the railway reached Bendigo it was always intended to proceed immediately to Echuca and hence add to the railway the traffic which would be generated by connecting the Port of Echuca on the Murray River to the Port of Melbourne by rail.

It was therefore decided to treat the railway from Melbourne to Echuca as a single nomination and name it Melbourne, Bendigo & Echuca Railway.

Terminology in Relation to Bendigo[1]

The City of Bendigo grew rapidly during its Golden Years however it did not decline as so many cities founded on the fleeting enthusiasm of a Gold Rush did. Today it is a city of 90,000 people with fine public buildings and a strong feeling of community, enterprise and prosperity.

Its colourful past and present is connected to its name. It fought off the typically colonial practice of naming places after familiar locations in the United Kingdom and adopted a home-grown name which is both unique and colourful.

Nevertheless it did take 37 years to reach the conclusion that the right name for the place should be Bendigo. The name was formally changed to Bendigo in 1891.

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[1] The current name dates to the Victorian Gold Rush as a shortened form of Bendigo Creek goldfields, simply "Bendigo Creek" or "Bendigo's Valley". The creek was named after a famous local boxer and shepherd who had earned the nickname Bendigo in reference to the Nottingham prize-fighter, William Abednego Thompson, generally known as “Bendigo Thompson”.

Its first official name was Castleton after the mining town Castleton, Derbyshire, England. Sandhurst, after Royal Military academy Sandhurst, became the official designation for the settlement in 1854 although the nickname Bendigo remained popular.

After a plebiscite in 1891 the city was renamed to the popular Bendigo, although the name Sandhurst has a legacy is still used by some as an alternative name for the city.

For example the Roman Catholic Diocese of Sandhurst, is based in Bendigo and covers 41 parishes in central and north eastern Victoria.

In this document the city is referred to as Bendigo in most places without reference to its name at the time that the railway was built - Sandhurst. This reflects respect for the locals who fought to change the name and remain proud of it.

Early Concepts of the Function of the Railway

The Melbourne to Bendigo Railway was originally thought of as the line that would form the Main Melbourne to Sydney railway line, running via Echuca. Promoters of the railway were the Melbourne Mount Alexander and Murray River Railway Company, established in 1853, but the scheme was taken over by the Victorian Government in 1856[2]. The line was completed to Bendigo in 1862 and to Echuca in 1864.

Opening up of Rail Transport to the Murray Darling River System

The extension of the railway to Echuca quickly changed the dynamic of the Murray/Darling river trade. The Port of Echuca became the principal port on the vast river system for both exports, mainly consisting of wool, and imports of all the goods required for the operation of the sheep stations and other enterprises along the rivers. The efficient heavy rail connection from Echuca to Melbourne together with the dominant position of the Port of Melbourne helped to cement this route as the dominant route to the Inland of northern Victoria and southern NSW.

[2] Ken McInnes, 1998. Also R Lee, The Railways of Victoria 1854 - 2004, p25-26.

2 Heritage Award Nomination Letter

The Administrator
Engineering Heritage Australia
Engineers Australia
11 National Circuit
BARTON ACT 2600

Name of Work:

Goldfields Railways - Melbourne, Bendigo & Echuca Railway

The above-mentioned work is nominated to be awarded recognition under the terms of the Engineering Heritage Australia Heritage Recognition Program.

Location: Between the major towns of Melbourne (Spencer Street Railway Station), Williamstown, Castlemaine, Bendigo and Echuca. Total distance is approximately 251 km. Refer to the map at Appendix 6. Grid references of the most significant termini are:

Melbourne, Spencer Street (now Southern Cross) Station:
37°49'02.60" S
144°57'06.59" E

Bendigo Railway Station:
36°45'55.54" S
144°16'57.94" E

Echuca Railway Station:
36°7'50.22" S
144°45'12.2" E

Owner (name & address): VicTrack, GPO Box 1681, MELBOURNE VIC 3001.

The owner of the land where the interpretation panel will be erected, Macedon Ranges Shire Council, has been advised of this nomination and a letter of agreement is attached at Appendix 10.

Access to site: Most parts of the railway, which is in operation, are readily accessible. Railway lines in Victoria are not generally fenced. Great care should be taken when in the vicinity of railway lines as operating trains present a constant danger.

Nominating Body: Engineering Heritage Victoria

Miles Pierce
Chair, Engineering Heritage Victoria
Date: 20 May 2012

3 Heritage Assessment

3.1 Basic Data:

3.1.1 Item Name: Goldfields Railways - Melbourne, Bendigo & Echuca Railway

3.1.2 Other/Former Names: Melbourne, Mount Alexander and Murray River Railway. This railway is also referred to as one of the Goldfields Railways, the other Goldfield Railway being the Geelong to Ballarat Railway.

3.1.3 Location: Major locations/stations along the route are:

Williamstown
Melbourne
Sunbury
Lancefield Road
New Gisborne
Woodend
Carlsruhe
Kyneton
Malmsbury
Taradale
Elphinstone
Chewton
Castlemaine
Harcourt
Ravenswood
Bendigo (previously Sandhurst)
Goornong
Elmore (previously Runnymede)
Rochester
Echuca
Echuca Wharf

Major structures of note along the route are:

Bridge over Saltwater (now Maribyrnong) River [Williamstown to Melbourne]
37°47'54.00" S
144°54'59.39" E
Embankment Newells Paddock near Flemington [Williamstown to Melbourne]
37°47'52.44" S
144°54'45.21" E
Viaduct over Jackson's Creek, Sunbury [Melbourne to Sunbury]
37°34'11.79" S
144°44'17.47" E
Stone Railway Bridge over Riddell's Creek, Riddell's Creek
37°27'56.06" S
144°40'28.94" E
Viaduct over Coliban River, Malmsbury
37°11'30.99" S
144°22'49.14" E

Viaduct over Back Creek, Taradale
37°8'24.92" S
144°21'22.98" E
Tunnel, Elphinstone Western Portal [Castlemaine to Ravenswood]
37°06'19.8" S
144°18'17.24" E
Tunnel, Big Hill [Ravenswood to Bendigo]
36°51'18.27" S
144°13'50'47" E
Elevation 1179 feet (359 metres)

Between the major towns of Melbourne (Spencer Street Railway Station), Williamstown, Castlemaine, Bendigo and Echuca. Total distance 155 miles 65 chains (251km). Grid references of the most significant termini are:

Melbourne, Spencer Street (now Southern Cross) Station:
37°49'02.60" S
144°57'06.59" E

Williamstown Railway Station:
37°51'40.86" S
144°54'09.75" E

Castlemaine Railway Station:
37°03'47.05" S
144°12'50.40" E

Bendigo Railway Station:
36°45'55.54" S
144°16'57.94" E

Echuca Railway Station:
36°7'50.22" S
144°45'12.2" E
Elevation 321 feet (98 metres)

3.1.4 Address: As above

3.1.5 Suburb/Nearest Town: As above

3.1.6 State: Victoria

3.1.7 Local Govt. Areas: Refer to Appendix 1 for further details.

City of Melbourne
City of Hobsons Bay
City of Maribyrnong
City of Moonee Valley
City of Brimbank
City of Hume
Shire of Macedon Ranges
City of Greater Bendigo
Shire of Campaspe

3.1.8 Owner: VicTrack. It should be noted that the proposed locations for marking are not on railway property but are located on council property adjacent to it.

3.1.9 Current Use: Railway line

3.1.10 Former Use: Railway line

3.1.11 Designer: Victorian Railways

3.1.12 Maker/Builder: Builder: Cornish & Bruce, main contractors (Melbourne to Bendigo)

Collier & Barry, main contractor (Bendigo to Echuca)

3.1.13 Year Started: Melbourne to Bendigo**:** 1858

Bendigo to Echuca: 1863[3]

3.1.14 Year Completed: Melbourne to Bendigo: 1862

Bendigo to Echuca: 1864

3.1.15 Physical Description:

The lengths of the railways were:

Melbourne to Bendigo	100 miles	162 km
Bendigo to Echuca	54 miles	87.5 km
TOTAL	154 miles	249.5 km

Railway line including the following significant features:

- Railway permanent way including earthworks track-work and other associated ancillary equipment
- Bridges, viaducts and culverts
- Tunnels (2)
- Railway stations and other buildings

3.1.16 Physical Condition: Maps of the railway alignment including details of its location in the Melbourne area are at Appendix 6.

Most of the assets are fully maintained and still perform the function of an operating railway line although some elements no longer perform their intended task such as some railway station buildings.

3.1.17 Modifications and Dates: No modifications to the original construction have been discovered in the early days after construction except for the addition of some branch lines from the original line as detailed in Appendix 6.

Over the years some stations along the line have been closed although in some cases the old station buildings remain in other uses.

In 2005 the two track layout between Kyneton and Bendigo was changed to single track with long passing loops for unknown reasons. Refer to Appendix 2 and “Later Changes” on p14.

Presumably there have been changes to signalling equipment during the life of the line.

The suburban electrified section has been progressively extended and at the time of writing is about to be commissioned as far as Sunbury to form part of the Melbourne suburban network. Refer to Appendix 2.

[3] Tenders were called in 1863 however the actual date of commencement is not known.

3.1.18 Historical Notes:

Early Work and Government Involvement

Early railways in the Melbourne metropolitan area had been built by private companies and were quite successful. The first non-metropolitan railway was the Melbourne to Geelong Railway which traversed quite easy country from a railway construction perspective. Nevertheless the company set up to build it by Act of Parliament in 1853 failed before the line was completed and it was taken over by the government in 1855.

Another private venture, the Melbourne, Mount Alexander and Murray River Railway Company aimed to build a link between Spencer Street Station in Melbourne and Williamstown then build from Melbourne to Sandhurst (later Bendigo) and then on to Echuca. This enterprise started badly with investors reluctant to put capital into the venture. By the time the government took over the project in 1856 the company had only carried out some earthworks on the Melbourne to Williamstown line.

In March 1855 Governor Hotham suggested that the colony could build railways itself using borrowed capital from London markets. A Legislative Council Committee was quickly set up to examine the proposal. It recommended that the government should build railways in Victoria and that funding should be obtained from the London Bond Market. The priorities should be firstly to complete the link between Spencer Street and Williamstown followed by the simultaneous construction of lines from Melbourne to Mount Alexander and from Geelong to Ballarat.[4]

The Government was fortunate at this time to have Andrew Clarke, Royal Engineer at its disposal as Surveyor-General and nominated member of the Victorian Legislative Council. Clarke negotiated with the Melbourne, Mount Alexander and Murray River Railway (MMA&MRR) Company to sell the line to the government for £68,100. The Victorian Legislative Council approved this purchase and simultaneously created the Victorian Railways Department in the Crown Land Office on 19 March 1856. The sale occurred on 23 May 1856. The Victorian Railways Department became the Victorian Railways under a Board of Commissioners in 1883.

George Christian Darbyshire, the District Surveyor of Williamstown and Alexander Galt, an accountant, were appointed to audit the books and works of MMA&MRR.[5]

Clarke set his surveyors to work without delay and they quickly established a base survey, establishing locations by large-scale triangulation and levels by the building of permanent bench marks. Clarke's people immediately went to the next step and established likely routes for railways through areas thought to be desirable for the future of the colony.

George Christian Darbyshire was appointed Engineer-in-Chief and Robert Watson was appointed as his deputy on 1 April 1856.[6] Their first task was to carry out the design and construction of the line to Bendigo. From this small office came the beginnings of the Victorian Railways, still a year in the future, and the concepts that led to the finely graded

[4] Robert Lee, The Railways of Victoria 1854-2004, 2007, page 25.

[5] Ibid page 26-27. A date for this appointment has not been found however it seems likely that it would have been after March 1856 and before the acquiring of the shares of MMA&MRR by the government in May 1856.

[6] Ibid page 27.

sweeping curves of the railway line we see today, apparently taking the Great Dividing Range in its stride.[7]

Whilst work was getting under way to build the line to Bendigo there was also work to be done closer to Melbourne. The MMA&MRR had only carried out earthworks for the railway between Melbourne (Spencer Street) and Williamstown at the time that the company was purchased by the Government. This link line was essential to the proper working of the first two main country railways being contemplated by the Victorian Railways - to Ballarat and Bendigo. The line included a substantial bridge over the Saltwater River (now called the Maribyrnong River) between South Kensington and Footscray. Refer to location at Appendix 6. The bridge was a single span but at 220 feet it remained the longest span railway bridge in Australia for 75 years. Refer to Appendix 2 for more details of this bridge.

The Bendigo Line

Following the discovery of gold in Sandhurst, there was strong support for the construction of a railway to link the region to Melbourne. In July 1855, a resolution was sent to the Governor of Victoria on the desirability of a rail link.[8]

History smiled on this railway and it was never going to be just another "development railway" as happened all too often elsewhere in Australia and in the other colonies. It was built to British standards of the day through country as soft to the eye as any in Australia. It was also built to the superior Irish Broad Gauge of 5 feet 3 inches for double track working. Coming out of the northern suburbs of Melbourne the first obstacle was the Great Dividing Range which is at 570 metres at the point where the track crosses it near Mount Macedon. This was achieved with gradients never steeper than1 in 50 and often 1 in 90. Track radius was also kept large so that the track could accommodate high speed trains.

Beyond the Great Divide there are several significant structures. The Malmsbury Viaduct remains impressive with its 5 stone arch spans and a height of 25 metres at the centre. The spans are 18.3 metres.[9] This is followed by the Taradale Viaduct, 5 spans of 37.6 metres (abutment spans) or 39.6 metres (centre spans) with the highest point being 35 metres above the valley floor. There are two tunnels: the Elphinstone Tunnel and the Big Hill Tunnel. These impressive structures are described further at Appendix 2.

Darbyshire's Assistants

At the time that the work in Victoria was starting there was a slump in railway construction in United Kingdom and many engineers with railway experience were unemployed. Some of these emigrated to the Colonies in order to find work in their areas of experience. Darbyshire employed the following engineers in his office to work on the railways:

- Robert Adams CE, most senior engineer under Darbyshire. He had more than 20 years experience on a string of projects and it is known that Darbyshire valued him very highly.
- William Bryson CE, Head Draftsman. His work concentrated on the design of large structures such as bridges and viaducts.

[7] Brian Harper, The true history of the design of the Melbourne, Mount Alexander and Murray River Railway, presented at the 12th National Conference on Engineering Heritage, Toowoomba, 2003, pages 83-84

[8] Royal Historical Society of Victoria, The Sandhurst Line, web site last updated 15 December 2010.

[9] Robert Lee, The Railways of Victoria 1854-2004, 2007, page84.

- William O'Hara, Senior Draftsman, he had experience in the design of masonry structures and was undoubtedly used in this capacity within the team.
- William Zeal was involved in both the preliminary survey work and in the setting out of the adopted line.
- William Hull worked on preliminary surveys and in supervision of construction as a senior supervising engineer. He had carried out similar tasks for the Great Western Railway before leaving England.
- George Knight came from a family of contractors. His work experience was on the East and West India docks and on the Birmingham Junction Railway.

All these engineers possessed the skills to design and supervise the construction of the Melbourne to Bendigo Railway. The quality of their work is there for us to see 150 years later, still in railway service, still demonstrating the zenith of railway design and construction in Australia.[10]

Construction of the Lines

Tenders were called for construction of a number of railways totalling 206 miles of track in December 1857. Tenders closed on 24 March 1858 with no less than 133 tenders being received. The professional board took exactly a month to assess the tenders.

A contract was let to Cornish and Bruce for the Footscray to Sandhurst (now Bendigo) line for £3,356,937.2s.2d ($6.714 million) to commence work on 1 June 1858 and complete the work by 31 July 1861. The current day (2010) value of this contract would have been $302 million.[11]

After the first contractor was passed-over a contract was awarded to Evans, Murray and Company for the Geelong to Ballarat line to commence work on 1 June 1858 and complete the work by 31 July 1861.[12]

Cornish and Bruce made quick early progress with the Melbourne to Sunbury section being officially opened on 13 January 1859.

There were however many problems. George Darbyshire fell victim to dirty politics when he was targeted by the Argus newspaper which performed a successful character assassination of him. The accusations were malicious and exaggerated if not downright false, but he was replaced by Thomas Higinbotham who had more direct railway experience.[13]

William Cornish died in March 1859 not long after the completion of the Sunbury section. However the partnership survived and John Bruce carried on alone, moving to Castlemaine to be closer to the contract work.

Bruce attempted to drive down labour costs and amongst other follies brought 500 masons from Germany to undercut local wages. This ploy failed as the German masons cooperated with the men that they were supposed to supplant.

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[10] Robert Lee, The Railways of Victoria 1854-2004, 2007, pages 87-88.

[11] Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

[12] Robert Lee, The Railways of Victoria 1854-2004, 2007, page 42.

[13] Ibid pages 43-44

Further staged completions of the line were:

- Woodend (11 July 1861 for passengers and 14 October 1861 for goods)
- Kyneton (April 1862)
- Castlemaine (15 October 1862)
- Bendigo (Sandhurst) (20 October 1862)

Following the official opening of the Bendigo line on 20 October 1862 by the Governor of Victoria Sir Henry Barkly, a banquet was held for 800 guests, followed by a grand ball, with dancing until dawn. The evening was well organized and a huge success until the visitors made their way to the station to catch the 5.30am train back to Melbourne. Confusion reigned as there was insufficient water for the engines and exhausted visitors were obliged to stream back to town in search of accommodation, but the shortage was such that many were obliged to bed down on pews in local churches. The train eventually left about midday and to add to the confusion, sparks from the engine ignited a grand gum tree arch erected at the station and it burned to the ground![14]

The work was contracted under schedule of rates type of contracts. Due to careful management of quantities by the Victorian Railways the work was completed considerably below budget with a saving of £324,000 ($648,000) or nearly 10%. The current day (2010) dollar value of this saving would have been $29.16 million.[15]

Bendigo to Echuca

The extension of the line from Bendigo to Echuca was a relatively simple matter as that part of the line was across plain country without any significant engineering challenges. This section was laid as single track although the earthworks and bridges were built for a second track which was never laid. Tenders were called for the work in 1863 and the work was completed on 19 September 1864.[16] The contractor for the work was Collier and Barry[17]

The completion of the line to Echuca connected the Port of Echuca which grew to be the most important port on the Murray-Darling River System and opened up trade between the inland waterways and Melbourne with its important maritime connections to the rest of the world. The National significance of this connection is explored in Appendix 8.

Later Changes

The line has since been electrified from Melbourne to Sydenham and has eleven stations which are part of the Melbourne suburban network.[18]

The line was modified between Kyneton and Bendigo under the Regional Fast Rail Project in 2005. The reduction of the line from 2 tracks to single track was a part of this project.[19]

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[14] Royal Historical Society of Victoria, The Sandhurst Line, web site last updated 15 December 2010.

[15] Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

[16] Robert Lee, The Railways of Victoria 1854-2004, 2007, page 43-52.

[17] The Argus, Melbourne, Wednesday 20 January, 1864, page 7.

[18] Wikipedia, Bendigo Railway Line,

[19] Wikipedia, Bendigo Railway Line,

Branch Lines

Refer to map of Branch lines at Appendix 6.

The Lancefield branch line was opened from Clarkefield (north of Sunbury) to Lancefield in 1881, and extended to Kilmore in 1892 to connect with the Heathcote railway line. This line was completely closed by 1956.

The Daylesford branch line was opened from Carlsruhe (between Woodend and Kyneton) to Daylesford in 1880. This line was closed in 1978. Part of this line, between Daylesford and Bullarto is now operated by the Daylesford Spa Country Railway as a tourist railway. This line was connected with a line from Ballarat in 1887.

A branch line was built between Redesdale Junction (north of Kyneton) and Redesdale by1900. It was closed in the 1950s.

The Maldon branch line was opened from Castlemaine to Maldon in 1884 and Shelbourne in 1891, although the railway had originally been planned to run to Laanecoorie. The line from Maldon to Shelbourne was closed in 1969 due to bush fire damage. The branch line closed in 1976. The Victorian Goldfields Railway has restored the line and operates trains between Castlemaine and Maldon for tourists.

A branch line was built from Bendigo to Heathcote in 1888 and connected to a line from Kilmore in 1890. The Bendigo - Heathcote line closed in 1958. The Heathcote Junction to Heathcote branch was closed in November 1968.

The line was extended across the Murray River to connect with the private Deniliquin and Moama Railway Company from Moama to Barnes and Deniliquin in 1876. This company was taken over by Victorian Railways in 1923.

A branch line was built from Elmore to Cohuna in 1910 and it was closed in the 1980s.

A branch line was built from Barnes to Moulamein and Balranald in 1926. The Moulamein - Balranald section was closed in the 1980s.

In 1996 the passenger service to Echuca was reinstated for the first time since 1983, when a twice-weekly service from Bendigo was started. Since 2007, there is one train to/from Melbourne on weekdays and two on weekends, with the train speed between Bendigo and Echuca limited to 80 km/h.

The Swan Hill line was extended north from Eaglehawk (just north of Bendigo on the line to Inglewood) in 1882, reaching Swan Hill in 1890. It remains in use today.

The Robinvale line was opened from Bendigo to Inglewood in 1876, Korong Vale in 1882, Boort in 1883, Quambatook in 1894, Ultima in 1900, Chillingolah in 1909, Manangatang in 1914, Annuello in 1921 and Robinvale in 1924. This line currently only handles grain trains.

Victorian Railways commenced construction of a railway to Koorakee and Lette in New South Wales in 1924, but this railway was never completed. The Murray River bridge between Robinvale and Euston was instead converted to a road bridge.

A short branch line was built from Wedderburn Junction (south of Korong Vale) to Wedderburn in the 1880s and it was closed in the 1980s. There is currently no passenger service on this line.

The Kulwin line was opened from Korong Vale to Wycheproof in 1883, Sea Lake in 1895, Nandaly in 1914, Mittyack in 1919 and Kulwin in 1919. This line currently only handles grain trains. Until late 2006, rural rail network lessee Pacific National had mothballed the Mittyack to Kulwin section but this has been recently re-opened to traffic despite the poor grain harvest. There has not been passenger service on this line since before 1984.[20]

[20] Wikipedia, Bendigo Railway Line,

3.1.19 Heritage Listings

3.1.19.1 Heritage Victoria:

Heritage Victoria has a number of listings for buildings and bridges in the Victorian Heritage Register[21] relevant to this railway but each covers only part of the railway:

Name: Railway Bridge[22], Sunbury Hill

Location: over tributary to Jacksons Creek, Sunbury (Kismet Creek)

Victorian Heritage Register Number: H1964

Heritage Overlay Number: H064

Name: Railway Bridge[23], Sunbury

Location: over Jacksons Creek, Sunbury

Victorian Heritage Register Number: H1692

Heritage Overlay Number: H061

Name: Road over Rail Bridge

Location: Gisborne-Kilmore Road, Riddells Creek

Victorian Heritage Register Number: H1828

Heritage Overlay Number: H081

Name: Rail Bridge

Location: over Riddells Creek, Riddells Creek

Victorian Heritage Register Number: H1437

Heritage Overlay Number: H0215

Name: New Gisborne Railway Station Complex

Location: Station Road, New Gisborne

Victorian Heritage Register Number: H1581

Heritage Overlay Number: H0250

[21] These listings have all been transcribed from the Victorian Heritage Register.

[22] A tall bluestone viaduct of 5 semi-circular arches

[23] An unusual “U” section wrought iron box girder viaduct which has since had a mid span props added.

Name: Kyneton Railway Station Complex
Location: Mollison Street, Kyneton
Victorian Heritage Register Number: H1602
Heritage Overlay Number: H0168

Name: Malmsbury Rail Bridge
Location: over Coliban River, Malmsbury
Victorian Heritage Register Number: H1434
Heritage Overlay Number: H059

Name: Taradale Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Station Street Taradale
Victorian Heritage Register Number: H1595
Heritage Overlay Number: H0867

Name: Elphinstone Railway Precinct
Location: Wright Street, Elphinstone
Victorian Heritage Register Number: H1782
Heritage Overlay Number: H0775

Name: Chewton Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Fryerstown Road, Chewton
Victorian Heritage Register Number: H1780
Heritage Overlay Number: H0987

Name: Castlemaine Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Kennedy Street, Castlemaine
Victorian Heritage Register Number: H1664
Heritage Overlay Number: H0670

Name: Blackjack Road Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Blackjack Road, Harcourt
Victorian Heritage Register Number: H1783
Heritage Overlay Number: H0990

Name: Harcourt Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Symes Street, Harcourt
Victorian Heritage Register Number: H1785
Heritage Overlay Number: H0809

Name: Porcupine Hill Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Fogarty Gap Road, Ravenswood
Victorian Heritage Register Number: H1784
Heritage Overlay Number: H0998

Name: Ravenswood Railway Precinct
Location: Ravenswood South and Harcourt North
Victorian Heritage Register Number: H1786
Heritage Overlay Number: H0994

Name: Big Hill Railway Precinct (Murray Valley Railway, Melbourne to Echuca)
Location: Big Hill off Calder Highway
Victorian Heritage Register Number: H1787
Heritage Overlay Number: H0711

Name: Kangaroo Flat Railway Station Complex
Location: Short Street, Kangaroo Flat
Victorian Heritage Register Number: H1565
Heritage Overlay Number: H0704

Name: Elmore Railway Station and Water Tower
Location: Railway Place, Elmore
Victorian Heritage Register Number: H1672
Heritage Overlay Number: H0418

Name: Echuca Railway Station Complex
Location: Sturt Street, Echuca
Victorian Heritage Register Number: H1059
Heritage Overlay Number: H04

Note that dates of listing are not available for the above listings.

3.1.19.2 National Trust of Australia (Victoria)

Classification File Number B5323 - Mt Alexander/Murray Valley Rail Line.

This listing covers the whole of the works described in this nomination.

This listing was first classified on 30/9/1982 and was subsequently revised on 1/10/1990 and 3/8/1998.

National Trust of Australia (Victoria) has a number of other listings for buildings and bridges relevant to this railway but each covers only part of the railway:

National Trust File Number	Name of Listing	Location of Listing	Date of First Classification	Date of Revised Classification
B5323	Mt Alexander/Murray Valley Rail Line	Between Melbourne and Echuca	30/9/1982	1/10/1990 3/8/1998
B1787	Kismet Creek Rail Bridge	Blind Creek, Rupertswood, Sunbury		
B2644	Railway Viaduct No.2	Jackson Creek, Sunbury		
B5319	Station and Goods Shed, Riddell	Riddells Creek Railway Station		
B4912	Railway Station	Carlsruhe		
B3847	Railway Station and Goods Shed	Kyneton		
B1288	Rail Bridge on Coliban River	Malmsbury Viaduct		
B2993	Humped Bridge over Railway	Calder Highway, Taradale		
B3931	Railway Buildings	Taradale		
B3848	Station and Goods Shed, Elphinstone	Elphinstone		
B3849	Station and Goods Shed, Castlemaine	Castlemaine		
B2659	Railway viaduct Barkers Creek	Barkers Creek	11//3/1971	3/8/1998
B3215	Railway Buildings, Bendigo	Railway Place, Bendigo		
B5767	Water Tower (circular)	Elmore	11/6/1981	3/8/1998
B5746	Rail Bridge	Campaspe River, Rochester		

B3173	Railway Cottage	Pakenham Street, Echuca	7/7/1969	
B3554	Railway Station	Sturt Street, Echuca		
B2601	Engine Shed	Sturt Street, Echuca	7/7/1969 (part of Historic Area)	9/12/1976 3/8/1998

3.2 Assessment of Significance

3.2.1 Historical significance: See Historical Notes above.

3.2.2 Historic Individuals or Association: See Appendix 3 which details 4 individuals involved in the railway:

Andrew Clarke

John Christian Darbyshire

Thomas Higinbotham

Joseph Brady

3.2.3 Creative or Technical Achievement: The circumstances of the construction of this railway (and the simultaneously constructed Geelong to Ballarat Railway) made them unique in Australian railway history. At the time of their commencement the Colony of Victoria was going through a period of great wealth and community confidence as a consequence of the extremely rich goldfields, particularly in the vicinity of Ballarat and Bendigo.

The Victorian Colonial Government was going through the process of discovering that private railway companies did not have the capability to build and operate railways. In particular these companies lacked the ability to raise the large capital sums required. The Government made the key decision to build and operate railways itself, commenced the process of setting up the Victorian Railways and purchasing those private railways then in existence or under construction.

The Government had the benefit of very competent advice from within its departments in the persons of Captain Andrew Clarke, Royal Engineer, Surveyor-General and George Darbyshire, Engineer-in-Chief of Railways.

As a consequence the Government was presented with plans for railways which were based largely on standards then in use in the United Kingdom and which would prove to ensure long term assets suitable for development of the railway system over the next 150 years.

In fact no other railways were ever constructed to such standards in Australia.

High levels of creative engineering and aesthetic design were assured, delivered by a team of hand-picked experts recruited by Clarke and Darbyshire. The high level of technical achievement was characterised by a balance between high technical standards combined with diligent assessment of needs so that the railway was entirely fit-for-purpose but without being extravagant.

We can see these characteristics today most obviously in the great viaducts at Taradale and Malmsbury which remain in service, largely as they were built but carrying much heavier traffic than when they were first built. Their designers had the extraordinary ability to look far into the future and see what would constitute a competent railway at least a century and a half later.

However it can be argued that the greatest technical achievement of the line was the careful design of grades and curves over the considerable height of the Great Dividing Range. This is more difficult for the unskilled eye to observe but the great sweeping curves and consistent gradients, never exceeding 1 in 50, represent a masterpiece of civil engineering.

3.2.4 Research Potential: The history of the railway has been well researched as have the key events, such as the Gold Rush and the development of the Murray/Darling river trade,

which it relates too. Most of the technical features of the railway are extant and therefore require limited research.

3.2.5 Social: The social impact of the railway in its early days was great as it provided an economical and convenient transport mechanism for Bendigo and all the towns between Melbourne and Bendigo. This was important until the emergence of economical and reliable road transport in the early decades of the 20th Century when rail transport became less important.

There has been a resurgence of railway passenger traffic in recent years as Melbourne has grown to such a huge city and the expanding population is more likely to find quieter places to live in and around regional towns like Kyneton, Castlemaine and Bendigo and to commute to Melbourne by rail to work.

3.2.6 Rarity: The high quality design of the railway could be said to have an element of rarity as far as Australian experience is concerned. Only the Geelong to Ballarat line has been built to similar high standards anywhere else in Australia.

The use of large viaducts made entirely of stone is also rare in Australia. As such the great viaduct at Malmsbury is a rarity in Australia although it would appear less rare in a United Kingdom setting.

The fine architectural features of the majority of the stations, large and small, along the railway has a degree of rarity in that most later railway stations were built to lesser, more utilitarian standards.

3.2.7 Representativeness: If this railway is compared to British railways of the same period it can be said to be highly representative of that era of railway construction. However if it is compared to Australian railways of the same era it displays higher standards of design and construction than are typical of that era of railway construction in Australia.

This endows this railway (and the closely associated Geelong to Ballarat Railway) with important significance as representing the highest standards of railway construction in Australia, and the earliest major government railway projects in Australia.

3.2.8 Integrity/Intactness: The line is remarkably intact for its age. The only significant changes are as follows:

- The reduction of the line from Kyneton to Bendigo from two tracks to one. This is a recent change (2005) and is reversible.
- The addition of steel inter-pier supports in the 1930s to increase the loading capacity of the Taradale Viaduct.
- Replacement of the original 1858/59 220 foot span tubular wrought iron Saltwater Bridge over the Maribyrnong River with a 220 foot span steel Pratt truss in 1911.

3.2.9 Statements of Significance:

3.2.9.1 General Statement of significance:

The following Statement of Significance has been written for this nomination to reflect the whole railway rather than just components of it:

The railway from Melbourne to Echuca, sometimes referred to as the Murray Valley Railway, opened in stages between February 1859 and September 1864 reaching the important waypoint of Bendigo (then known as Sandhurst) on 20 October 1862.

The Melbourne to Bendigo section of the railway is significant, incorporating high engineering and aesthetic standards and showing great sympathy for the country through which it travels. The major elements of significance are the civil works and the permanent way of the railway; the major engineering structures of the railway including viaducts, bridges and tunnels and the buildings associated with the railway, particularly the railway precincts at major railway stations.

This section was built to the very high standards adopted for the construction of railways at the time in the United Kingdom. The only other railway in Australia built to such high standards was the Geelong to Ballarat Railway, constructed at the same time and by the same design team as this railway. A team of highly competent engineers was assembled to carry out the design and supervision of the work.

The size of the project, the Colony's largest capital works project at that time, is of significance. A labour force of more than 6000 men was employed by railway contractor Cornish and Bruce to construct the railway.

The railway made an important contribution to defining the character of the Victorian Railways which was formed at the beginning of the project. The Victorian Railways set about building main lines in several directions earlier than their counterparts in New South Wales. In Victoria main lines had reached Geelong, Ballarat and Bendigo by 1862, all of which led to further main line extensions and extensive branch line developments. Meanwhile in New South Wales the first line between Sydney and Parramatta Junction was built in 1854 but the Main Western Line via the Zig Zag at Lapstone in the Blue Mountains was not opened until 1867; the Main Southern Line did not reach Goulburn until 1869; the South Coast Line did not reach Wollongong until 1884 and the connection between Sydney and Newcastle was not opened via the Hawkesbury River Bridge until 1889.[24] The Victorian Railways maintained this lead into the 20th century and ultimately achieved a much more comprehensive railway network than any other Australian state.

Several individual items of engineering significance were constructed as part of the Melbourne to Echuca Railway.

The two great viaducts at Malmsbury and Taradale, the former, a bluestone structure of classic proportions and the latter incorporating massive wrought iron box girders designed as continuous structures through the five spans, remain amongst the most impressive railway structures in Australia of any era. The design of Taradale Viaduct was an early example of multi-span design of metal girders as opposed to the single span, pin-jointed designs used previously.

The Saltwater Bridge across the Maribyrnong River near Footscray remained the longest single span of metal bridge in Australia for decades, at a span of 220 feet,

[24] Refer Appendix 5.

although unfortunately it was eventually replaced by a steel Pratt truss bridge of the same span and supported on the same bluestone abutments. This very long bridge span, so early in the Victorian Railways history, is very significant.

The numerous stone bridges and culverts along the line are also significant due to the highly aesthetic design and high standards of construction used throughout, even for modest structures.

The two tunnels at Elphinstone and Big Hill are significant as long railway tunnels, by Australian standards, build through very difficult hard rock using the crude and dangerous blasting techniques of the time.

The significance of the Melbourne to Echuca Railway in connecting the Port of Echuca and its river trade in three states is of National Significance as it had a pivotal effect on the economic development of all three states, Victoria, NSW and SA, until the river trade dwindled in the 1890s[25].

The railway is significant because it incorporates components of historical, engineering, architectural and scientific interest to the State of Victoria.

3.2.9.2 Statement from National Trust of Australia (Victoria) Listing number B5323 for Mt Alexander/Murray Valley Rail Line:

This statement covers the whole of the railway covered by this nomination:

"Statement of Significance

Opened in five stages from 10/2/59 to 19/9/64, this railway, known initially as the Melbourne, Mt Alexander and Murray River Railway by its promoters, and later, during construction, as the Melbourne and River Murray Railway, as the largest of the Colony's first two trunk lines.

It is significant for its close adoption of English engineering and architectural standards and survives as a monument to the work of engineers-in-chief George Christian Darbyshire (1856-1860) and more particularly Thomas Higinbotham (1860-1878).

The diversity in the design and choice of construction materials of buildings and structures is greater than any of the other trunk lines, the level of integrity of the whole line being higher. Materials selection, ranging from bluestone and granite to monochrome and bichrome brickwork was influenced not only by the natural resources of the localities through which the line passed, but also by forms of architectural expression commonly accepted at the time.

Thus, the use of bi-chrome brickwork occurs in the central goldfields where its use was generally popular. The range of bridge and viaduct designs includes girder bridges and round, three centred and segmentally arched openings, whilst the scale of the viaducts compare with the Geelong-Ballarat main trunk line.

This railway also recalls the work of the major contractors for the line and structures and provides evidence of their capabilities and of the role of the railway in developing the Colony's engineering and building skills.

Apart from the line contractors, other firms directly involved were J Shire law and Co (sleepers), R Fulton, Langlands Brothers and Co, William Crossley (water supply), B

[25] Refer to Appendix 8

Moreland, Langlands Brothers and Co (platelayers lorries), E Chambers (iron pins, traversers), Miller and Macquinstan (luggage vans and steam engines) and various contractors for building works.

The line is important also an expression of the importance in capturing the Murray River and Riverina trade for the Port of Melbourne whilst it also recalls the significance of the Castlemaine and Bendigo goldfields during the 1860s.

The route of the line recalls the lobbying of landowners and townspeople to have the railway diverted in their interests, and the stonework is an important expression of the work of local and imported masons. It recalls the tough line adopted by the major contractors, Messrs Cornish and Bruce on wages and working conditions and their decision to import 400 German masons to compete with local members of the Stonemason's Society. With a labour force of more than 6,000 men, the Echuca railway remains as the Colony's largest single endeavour of its time.

Addition to Citation for Melbourne to Echuca Railway Line 1/10/90 Double Head Rail: The surviving lengths of double head rail with chairs on this railway compare with one surviving similar remnant on the Geelong to Ballarat railway and are representative of permanent way construction techniques applied exclusively to the two trunk railways of the 1860's. In this respect they are rare survivors and may be unique at the national level and of technical importance at the international level to the extent that they enhance contemporary understanding of early railway building technology. Surviving lengths of chaired double head rail survive at Kyneton, Ravenswood and Bendigo on this railway and include a number of different types of cast iron intermediate and joint chairs with hardwood keys and metal pins. The Ravenswood siding is of special significance for the diversity of chair types and for the sequence of chairs recalling rail lengths known to be associated with construction of the line in 1862. The Bendigo goods shed siding is important for its association with the goods shed itself and also to the extent that its protected location ensures its continued existence, in situ, as opposed to the other remaining installations which are subject to deterioration through lack of use”

3.2.9.3. Statement from Heritage Victoria:

There is no single Statement of Significance for the railway in the Victorian Heritage Register as there is no listing for the railway as a whole. Rather individual components are listed.

(i) The following Statement of Significance relating to the Malmsbury Viaduct is taken from the Victorian Heritage Register and is typical of those in the Register:

“Statement of Significance

What is significant?

The Rail Bridge, over Coliban River, Malmsbury, is a large, 500 feet long, rusticated basalt structure, erected in 1859 by Cornish and Bruce for the Victorian Railways. It carries the Melbourne-Bendigo Rail line (originally known as the Sandhurst line) over the Coliban River and comprises a five-span, segmented arch structure catering for two tracks and is faced with rusticated masonry.

How is it significant?

The Rail Bridge over Coliban River, Malmsbury is historically and architecturally significant to the State of Victoria.

Why is it significant?

The Rail Bridge at Malmsbury is historically significant as a representative example of a bridge built the period of the 'main trunk lines', c.1857 - c.1869. Built in 1859, the structure is one of the earliest railway bridges of its size constructed in Victoria.

The bridge is architecturally significant as one of the largest engineering structures built in Victoria during the 'main trunk line' era. It is a representative and essentially intact example of a large railway bridge, designed according to nineteenth century building techniques and standard engineering practice, including classically derived detailing".

(ii) The following Statement of significance relating to the Taradale Viaduct is taken from the Victorian Heritage Register and is typical of those in the Register:

"Statement of Significance

The Taradale railway precinct forms part of the Murray Valley Railway (Melbourne to Echuca line). Opened in five stages from February 1859 to September 1864, the Murray Valley Railway was the largest of the Colony's first two main trunk lines. The inability of the line's original private promoters - the Melbourne, Mount Alexander and Murray River Company - to raise sufficient funds to construct the line, led to the government purchasing the company and embracing a public railway system. The Government's decision to construct the line in 1856 was accompanied by the formation of the Victorian Railways Department. The building of the line during the early 1860s reflected the strategic economic issues of the day: servicing the important goldfields of Castlemaine and Bendigo, and capturing the Murray River and Riverina trade for the Port of Melbourne. With a labour force of more than 6,000 men, the Melbourne to Echuca line was the Colony's largest capital works project of its time. The line is still used today for public transport and freight services and comprises a very large number of structures and facilities of varying ages, conditions and degrees of operational and business significance.

The Taradale railway precinct is of historical and scientific importance to the State of Victoria.

The Taradale railway precinct (comprising the Taradale viaduct, station complex and two culverts) is historically and scientifically significant as an integral part of the railway line and an important representative sample of one of the earliest and grandest capital works projects in Victorian history. The four features comprising the precinct are all substantially intact and provide a crucial reminder of the adoption of English engineering and architectural standards and the role of the Victorian Railway Department in developing the Colony's engineering expertise.

The Taradale Station is of architectural significance as an important and intact example of a station complex on the line. The railway station is also significant as an essentially intact example of the "Carlsruhe' style of station building. At the time of its construction the nearby viaduct was the largest Australian metal girder bridge and had the second largest span (after the Barwon River Bridge, at Geelong). It is also significant as one of the oldest existing metal bridges in Australia. The two culverts, one at either end of the station, are excellent examples

of two of the three culvert design types used on the Kyneton to Bendigo section of the line. The Taradale railway precinct makes an important contribution in defining the character of the Victorian railway network".

3.2.10 Statement of Significance to Victorian criteria[26]:

The following Statement of Significance has been written for this nomination to reflect the whole Melbourne-Echuca Railway rather than just components of it. This Statement is written to comply with the requirements of the Heritage Council of Victoria. (Many of the Statements of Significance here will apply equally to the Geelong-Ballarat Railway which was built at about the same time.):

Criteria for assessing cultural heritage significance

The following Criteria for assessing post-contact cultural heritage were adopted by the (Victorian) Heritage Council on 7 August 2008 pursuant to Sections 8(1)(c) and 8(2) of the (Victorian) Heritage Act 1995. The criteria were still relevant as at January 2012, and clearly apply to the Melbourne-Echuca Railway as a post-contact artefact. (Items of pre-contact aboriginal cultural heritage are assessed under a separate system in Victoria.)

For a place or object to be included in the Victorian Heritage Register it must meet at least one of the criteria. The Melbourne-Echuca Railway meets several criteria.

Criterion A:

Importance to the course, or pattern, of Victoria's cultural history.

A1: The Melbourne-Echuca Railway represented the decision of the Victorian Colonial (later State) Government to undertake or commission major infrastructure projects itself for the benefit of the whole colony, rather than rely on ad hoc development initiated by private companies driven by the hope of private profit.

A2: The Melbourne-Echuca Railway was also possibly the first Australian example of a colonial government borrowing long-term finance from the commercial Bond Market in UK to pay for major infrastructure projects of long-term benefit to the colony, rather than waiting for approval and funding from the Colonial Office in London. It was the Colony's largest capital works project at that time, and was certainly a very successful example of a major infrastructure project planned by the Victorian Government and implemented by private contractors under government oversight.

A3: The Melbourne-Echuca Railway and its sister Geelong-Ballarat Railway were the first strategic railways built in Australia to serve and develop large areas of a colony/state, as distinct from several earlier short mostly-private railways built to service mines or

[26] Section written by Carl Doring, 31 January 2012

logging, or just to make a quick profit by providing a link between capital cities and existing nearby towns or ports.

A4: The Melbourne-Echuca Railway and its sister Geelong-Ballarat Railway have played a major role in the settlement, commercial development and general growth of Victoria, and continue to play a major though reduced role today.

A5: The extent and high quality of the Melbourne-Echuca Railway and its sister Geelong-Ballarat Railway represent the prosperity, optimism and growing independence of the Victorian colony at the time of their construction.

A6: The extension of the Melbourne-Echuca Railway into southern NSW, and the link between the railway and the river port at Echuca, represents the then importance of the river and rail transport systems, and the then lesser importance of the rural road network for major freight and passenger transport[27]. It also represents the ambition to extend the commercial if not political influence of Victoria into southern NSW.

Criterion B:

Possession of uncommon, rare or endangered aspects of Victoria's cultural history.

Surviving sections of double-head rail in cast iron chairs are now very rare in Victoria. The Goldfields Railways were originally built with this type of rail construction, the prevailing standard in Britain at the time, however very little now remains in Victoria. The authors are only aware of short sections in sidings at Ballarat Railway Station still existing.

Criterion C:

Potential to yield information that will contribute to an understanding of Victoria's cultural history.

None noted.

Criterion D:

Importance in demonstrating the principal characteristics of a class of cultural places and objects.

The Melbourne-Echuca Railway was the first and perhaps best major railway line built in Australia in the 19th Century, outstanding in the design and high quality of the railway line itself and of its associated bridges, viaducts and station buildings, most of which have survived virtually intact. No less than four bridges along the line and 14 of its station buildings or station precincts have been recognised individually as each being of State Significance in its own right. As a whole the system is of high integrity and has at least State Significance overall.

[27] Refer Appendix 8.

Criterion E:

Importance in exhibiting particular aesthetic characteristics.

Many of the Melbourne-Echuca Railway station buildings and some of its bridges and viaducts are of both high technical and high aesthetic quality, and represent outstanding examples of the industrial aesthetic standards of their day. As noted above, 18 components of this railway are already recognised individually as having State Significance in their own right, and aesthetic qualities would have featured in the factors leading to many of those assessments.

Criterion F:

Importance in demonstrating a high degree of creative or technical achievement at a particular period.

F1: The Melbourne-Echuca Railway was laid out with excellent gradients and gentle curvatures showing great sympathy for the country through which it travels, and was built to the highest standards of its day. Although it was the first extensive railway built in Australia, the high quality of its design and construction is evidenced by the fact that it has remained in use and substantially intact for 150 years, whereas most other railways of about the same age have been extensively modified to enable ongoing use, or have been abandoned or bypassed.

F2: The original Saltwater River Bridge, opened in 1859 as a 220 feet long tubular wrought-iron box-girder single span bridge, which was a major achievement in bridge building in Australia for its day. It remained the longest single-span bridge in Australia until 1889. Although the tubular bridge was replaced by a steel Pratt truss in 1911, the original abutments are still there and are still in use carrying a 220 foot single-span (Pratt) railway bridge.

F3: The Taradale Viaduct, constructed 1858-1862, was an early example of continuous multi-span design of metal girders as opposed to the single span, pin-jointed structures used previously.

F4: The Elphinstone and Big Hill Tunnels were major engineering works of their day (1859-62), especially Big Hill which was driven 390m through granite. The Redbank Tunnel between Picton and Mittagong in NSW was built in c1867, driven through much easier sandstone.

Criterion G:

Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. This includes the significance of a place to Indigenous peoples as part of their continuing and developing cultural traditions.

No

Criterion H:

Special association with the life or works of a person, or group of persons, of importance in Victoria's history.

Several notable engineers were closely associated with the Melbourne-Echuca Railway, namely:

H1: **(Sir) Andrew Clarke:** Military engineer with the Royal Engineers in England. Surveyor General and Commissioner for Lands in Victoria, and briefly Member for South Melbourne in the Victorian Legislative Assembly.

H2: **John Christian Darbyshire:** Civil Engineer in England and Australia. Briefly the Engineer for the private Melbourne and Mount Alexander Railway 1855-56, then Engineer-in-Chief of the Victorian Railways 1856-1860 and again in 1891-1898. He was also for a time Engineer for Construction and Surveys in the Victorian Railways, and a member of the Victorian Survey Department, rising to Surveyor General.

H3: **Thomas Higinbotham:** Engineer on British railways for several years, then moved to Melbourne in 1857 and was soon appointed Inspector-General of Roads and Bridges. Was Engineer-in-Chief of Victorian Railways 1860-1878, but was dismissed along with many other senior public officials in 1878. Was reappointed Engineer-in-Chief in 1880, but died soon after.

(Further biographical details of these men are given in Appendix 3 of this nomination.)

3.2.11 Statement of Significance to National criteria[28]:

The Australian Heritage Commission (AHC) has defined eight criteria (a) to (h) for assessment of National (Heritage) Significance, with a note that the cultural aspect of a National heritage criterion means the Indigenous cultural aspect, the non-Indigenous cultural aspect, or both. This contrasts with the above listed Victorian criteria which are specific to post-contact cultural heritage, while Victoria's pre-contact indigenous cultural heritage is treated separately.

National Cultural Heritage Criteria (a) to (g) are very similar to the Victorian criteria A to G, but the National criteria are differently worded. National criterion (h) is specific to indigenous aboriginal culture, and for reasons already explained does not have a direct equivalent in the above-listed Victorian post-contact cultural heritage criteria. The AHC criteria (as at January 2012) are given below, with reference back to the equivalent Victorian criteria in 3.2.10 above where the Melbourne-Echuca Railway meets the criteria.

[28] Section written by Carl Doring, 31 January 2012

The National Heritage Criteria for a place are any or all of the following (listed below with comments as to whether the Melbourne-Echuca Railway meets the criteria):

(a)

the place has outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history;

Yes. See Victorian Criterion A in 3.2.10.

(b)

the place has outstanding heritage value to the nation because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history;

Yes. See Victorian Criterion B in 3.2.10.

(c)

the place has outstanding heritage value to the nation because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history;

None noted.

(d)

the place has outstanding heritage value to the nation because of the place's importance in demonstrating the principal characteristics of:

(i) a class of Australia's natural or cultural places; or

(ii) a class of Australia's natural or cultural environments;

Yes. See Victorian Criterion D in 3.2.10.

(e)

the place has outstanding heritage value to the nation because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

Yes. See Victorian Criterion E in 3.2.10.

(f)

the place has outstanding heritage value to the nation because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period;

Yes. See Victorian Criterion F in 3.2.10.

(g)

the place has outstanding heritage value to the nation because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;

No.

(h) the place has outstanding heritage value to the nation because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

Yes. See Victorian Criterion H in 3.2.10.

(i)

the place has outstanding heritage value to the nation because of the place's importance as part of Indigenous tradition.

No.

3.2.12 Area of Significance: NATIONAL and STATE (Victorian)[29]

National significance is claimed for the Melbourne-Echuca Railway for the reasons stated in 3.2.11 above (with reference back to 3.2.10). In particular it was one of only two Australian railways of that era (the Geelong to Ballarat Railway being the other one, built at the same time and designed by the same team) that were built to full state-of-the-art British standards of the day.

These two Victorian railways were also the first in Australia to be built to serve and develop large parts of a state or colony, rather than just provide a short link between a state capital and a nearby already-developed town or port.

State significance is also claimed for this railway as a whole (not just isolated components), for the reasons quoted in 3.2.10 above.

[29] Section written by Carl Doring, 31 January 2012

4 Interpretation Plan:

4.1 General Approach:

The ceremony should preferably be held on **Saturday 20 October 2012** which is the 150th anniversary of the opening of the line to Bendigo.

Locations for interpretation of this railway require some thought. The nomination is for the whole railway however most public attention is focussed on the iconic structures of the railway - primarily on Taradale and Malmsbury Viaducts because of their close location to well-travelled roads.

Railways stations are also high visibility remnants of the railway, however for the purposes of our recognition they are less suitable for interpretation as they are primarily architectural works rather than engineering works.

The two tunnels are of high significance however, as for all railway tunnels, they are not easily seen and are not likely to be visited by large numbers of people.

Hence it is suggested that the two viaducts might be the best places to look for suitable locations for marking and interpretation panels. Both can be approached on minor council roads. Interpretation panels would need to be customised to reflect the story of each viaduct as well as the wider story of the railway. This concept fits well into our present interpretation thinking.

As the two viaducts are not far apart (8.5 km) it is proposed to hold a single ceremony at one of the two sites with a guided tour to the other site as part of the celebrations. Although the two sites are close they are in different Local Government areas. Taradale is in the Mount Alexander Shire and Malmsbury is in the Macedon Ranges Shire. Discussions have resulted in the selection of Macedon Ranges Shire Council as the co-sponsor and that the ceremony will be held at the Malmsbury Botanical Gardens adjacent to the Malmsbury Viaduct. A suitable site for the erection of an interpretation panel marking has been located at Malmsbury Botanical Gardens with a superb view over the river to the viaduct. This site has been discussed with the Macedon Ranges Shire Council whose land it is on and they have agreed to the location and method proposed.

4.2 Possible Interpretation themes for Interpretation Panel:

The following subjects could be considered as themes for the interpretation panels:

- The formation of the Victorian Railways and the purchase of the Melbourne, Mount Alexander and Murray River Railway Company.
- One or more of the three men who were instrumental in the building of the railway - Andrew Clarke, George Darbyshire and Thomas Higinbotham.
- The construction of the line by contractors Cornish and Bruce and Collier and Barrty.
- Details of the Malmsbury Viaducts near which the interpretation panels will be erected. Note that there are already interpretation panels erected in the Malmsbury Botanical Gardens relating to the viaduct.

4.3 Preliminary Design of Interpretation Panel:

Refer to Appendix 7

5. References:

5.1 Lee, Robert S, *The Railways of Victoria 1854 - 2004*, Melbourne University Publishing Limited, 2007.

5.2 Harper, Brian, *The true history of the design of the Melbourne, Mount Alexander and Murray River Railway*, Institution of Engineers, Australia, Australian Journal of Multi-disciplinary Engineering, Vol 3, No.1, 2004.

5.3 Mills, John, *Australia's mixed gauge railway system: a reassessment of its origi*ns, Journal of the Royal Australian Historical Society, Volume 96 Part 1, June 2010

5.4 Australian Railway Historical Society, Victorian Division, web site as at December 2010.

This nomination was prepared by a committee of Engineering Heritage Victoria consisting of the following members:

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Appendix 1

Local Government Areas Covered by the two Goldfields Railways

Start of Coverage[30]	End of coverage	Local Government Area
Echuca	6 km south of Rochester	Shire of Campaspe
6 km south of Rochester	**Bendigo**	City of Greater Bendigo
Bendigo	Ravenswood	City of Greater Bendigo
Ravenswood	2 km north of Malmsbury	Shire of Mount Alexander
2 km north of Malmsbury	Just north of Malmsbury	Shire of Hepburn
Just north of Malmsbury	5 km south of Riddell's Creek	Shire of Macedon Ranges
5 km south of Riddell's Creek	Diggers Rest	Shire of Hume
Diggers Rest	Calder Raceway	Shire of Melton
Calder Raceway	Sunshine	City of Brimbank
Sunshine	Maribyrnong River	City of Maribyrnong
Maribyrnong River	**Southern Cross Railway Station (previously Spencer Street Railway Station)**	City of Melbourne
Southern Cross Railway Station (previously Spencer Street Railway Station)	Maribyrnong River	City of Melbourne
Maribyrnong River	Yarraville	City of Maribyrnong
Yarraville	Newport (connection to Geelong)	City of Hobsons Bay
Newport (connection to Geelong)	**Williamstown**	City of Hobsons Bay
Geelong	Moorabool Viaduct	City of Greater Geelong
Moorabool Viaduct	5 km south of Elaine	Golden Plains Shire
5 km south of Elaine	Warrenheip	Shire of Moorabool
Warrenheip	**Ballarat**	City of Ballarat

Main terminus stations are marked in bold

[30] Moving south from Echuca to Melbourne and Williamstown then north west from Geelong to Ballarat.

Appendix 2

Major Engineering Features of the Melbourne to Bendigo Line

1) **Saltwater River Bridge**
2) **Malmsbury Viaduct**
3) **Taradale Viaduct**
4) **Elphinstone Tunnel**
5) **Big Hill Tunnel**
6) **Notes on Trackwork**

1) Saltwater (now Maribyrnong) River Bridge[31]

This bridge was originally a single span riveted wrought iron box girder structure of 220 feet span, and was officially opened for use in January 1859[32]. The bridge was originally designed with two tracks. It remained the longest bridge span in Australia until 1889. In 1911 the original bridge was replaced by a steel Pratt truss bridge using the same abutments. Later again a new bridge was added alongside immediately upstream from the original bridge. This carries another two tracks on the same line between Spencer Street and Williamstown/Geelong.

The original bridge metal work was supplied by Messrs William Fairbairn and Sons, Manchester, England, under the supervision of Brunel in 1857. The replacement steel structure was supplied by Mephan Ferguson, Melbourne, in 1919[33].

The bridges in 2010 with the old bridge structure replaced by a new Pratt truss (1911) and the second bridge with 2 welded plate girder spans behind with a mid-river pier.

[31] See illustration of the original bridge in Lee page 37.

[32] Note that Lee says 200 foot span, page 37.

[33] Ken McInnes, 1998.

The original bluestone abutment and tower of the
Saltwater River Bridge. The construction is of very high quality.

2) Malmsbury Viaduct

This rusticated and finely dressed bluestone arch viaduct consists of five 60 foot (18.3 m) spans with the maximum height above the valley floor being 25 m. It crosses the Coliban River. The huge cut waters are provided to help channel the river which runs skew to the structure[34].

The structure was built by main contractor Cornish & Bruce, under the direction of George Darbyshire for the Victorian Railways[35].

The viaduct was built during 1859 and 1860 with the foundation stone being laid on 25 October 1859. The bridge was completed on 24 October 1860 and a celebration of the 150th anniversary of this event was held in 2010 with the Malmsbury Historical Society taking a leading part in the celebrations.

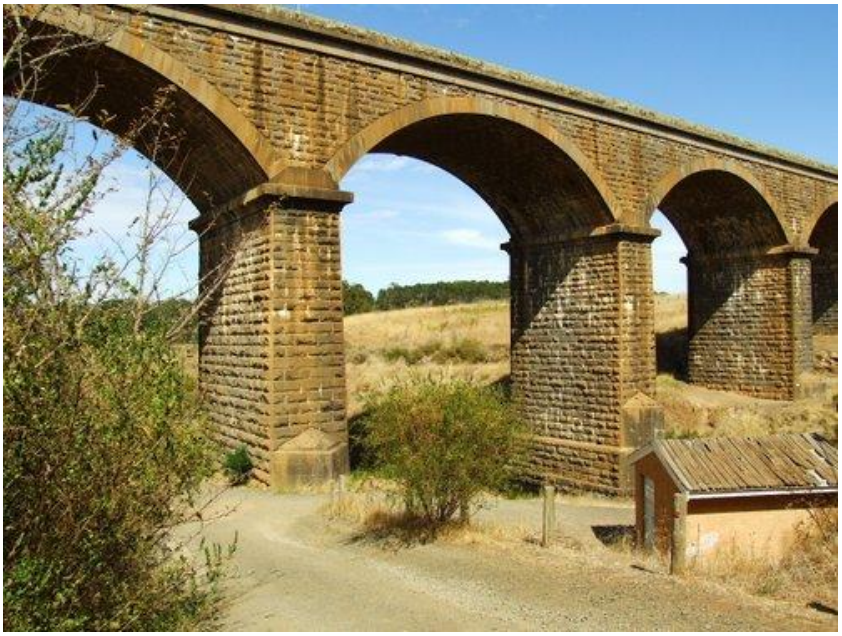
The bluestone was taken from a quarry at the east end of Malmsbury and carried to the construction site by drays. 132,000 cubic feet of rock are incorporated in the structure.

It is the largest masonry structure in Victoria. The bridge, one of the largest 19th century engineering structures in Victoria, exemplifies the massive scale of the 19th century railway

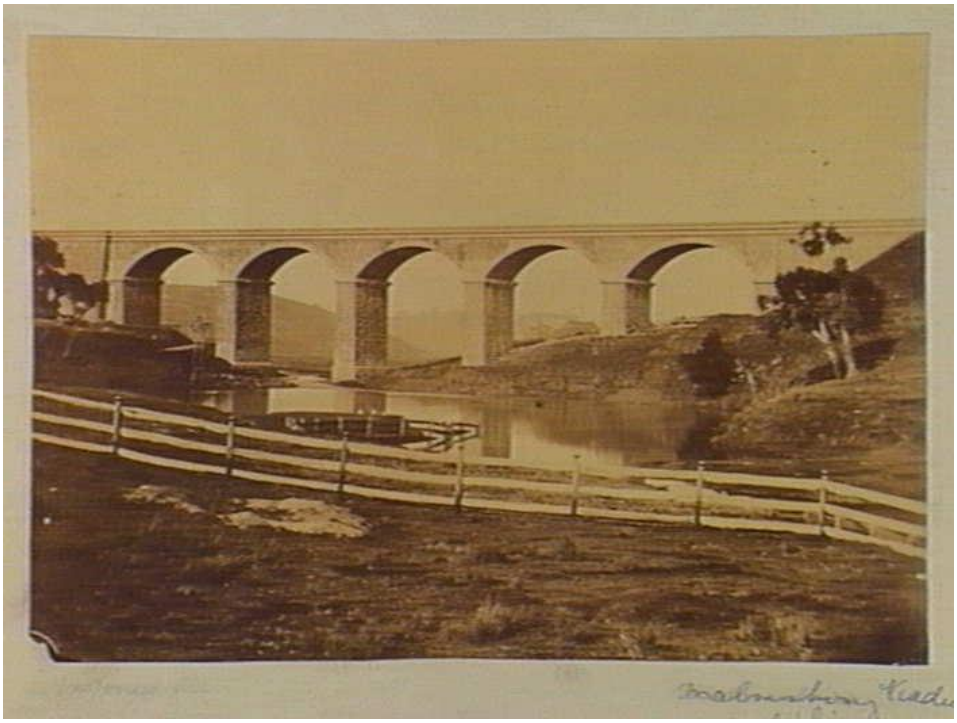
[34] Ken McInnes, 1998

[35] Ken McInnes, 1998

undertakings. The viaduct is built according to classically derived structural engineering practice, and is representative of bridge building techniques now lost"[36]



Malmsbury Viaduct



Malmsbury Viaduct in 1861 just after it was completed

[36] Ken McInnes, 1998.

Malmsbury Viaduct in 2011 from the location where the interpretation panel is proposed to be erected in the Malmsbury Botanical Gardens

3) Taradale Viaduct

This large two track deck-type viaduct over Back Creek consists of 5 spans of wrought iron box girders supported on bluestone piers. There are 4 similar box girders side-by-side each being 2400mm deep by 610 mm wide of riveted construction and are continuous through the 5 spans.

The total length of the structure is about 800 feet with the bridge itself being 660 feet (198 metres). The spans are 3 by 130 feet (39.6 m) in the centre and the end spans adjacent to the abutments are 123 feet (37.6 m). The highest point above the valley floor is 117 feet (36 metres). The girders are supported on roller bearings, made up of 13 x 3½ inch wrought iron rollers between cast iron bearing plates on all supports except where they are fixed at Pier No.3[37]

The spans were propped with steel trestles at each mid span in 1933/34[38].

The Taradale viaduct was erected in 1861.

The structure includes regularly coursed bluestone piers and abutments.

A high wrought iron riveted balustrade with “VR” in panels, runs along the entire length of the bridge on both sides.[39]

An interpretation panel, not attributed to any organisation, is mounted on the steelwork of the prop immediately south of the road under the viaduct. It reads as follows:

[37] Ken McInnes, 1998.

[38] Date based on the interpretation panel detailed in following paragraph.

[39] Ken McInnes 1998.

"TARADALE RAILWAY VIADUCT This viaduct was constructed by contractors, Cornish and Bruce, between 1858 & 1862. The rail service from Melbourne to Bendigo commenced on 20th October 1862. The structure stands 120 feet (36.6m) above Back Creek. It has five spans totalling 650 feet (198.3m) & a total length, including end buttresses, of 828 feet (251.6m). The chiselled bluestone buttresses & original columns surmounted the steel (sic) girders. The fine iron railings continue to form an impressive & elegant backdrop to the village. Construction cost was 230,000 pounds ($460,000).[40] With the increase in rail traffic as the country developed & the heavier railway rolling stock, it was deemed necessary to strengthen the structure. In 1933-34 the fabricated steel columns were added. The viaduct carries two tracks & is still in frequent daily use for freight & passenger traffic."

The following should be noted in relation to this panel:

- The beams are wrought iron, not steel as stated.

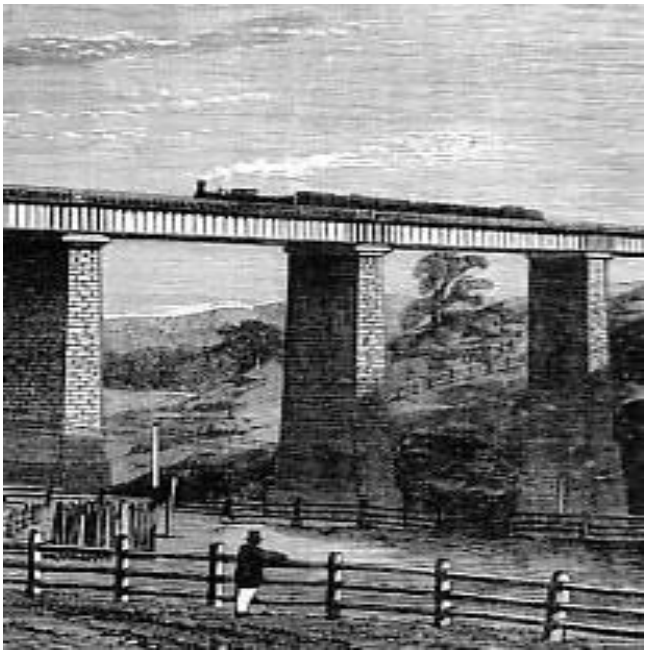
A 7-8km remnant section of the old southbound ("Up") track passes over the Taradale Viaduct, beside the upgraded "fast rail" track. It starts about 1.5km south of the viaduct (just north of the160km marker and the bluestone bridge under Petherbridge Rd) and finishes just short of the entrance to the Elphinstone Tunnel. It was not upgraded like the main track, and still retains the older, lighter rails, fixed to ageing wooden sleepers with dog spikes, but is in regular use. It is one of several long passing loops retained on the Kyneton-Bendigo "single" section, together taking up perhaps 20-30% of its total length[41].

"The Taradale Railway viaduct is one of Australia's most important early metal bridges. It is the largest and oldest intact metal railway bridge in Australia. It is one of the largest 19th century engineering structures in Victoria, and it exemplifies the massive scale of 19th century railway undertakings. With its 198 metre box girders, continuous over all spans, it is the largest box girder bridge constructed in the 19th century in Australia".[42]

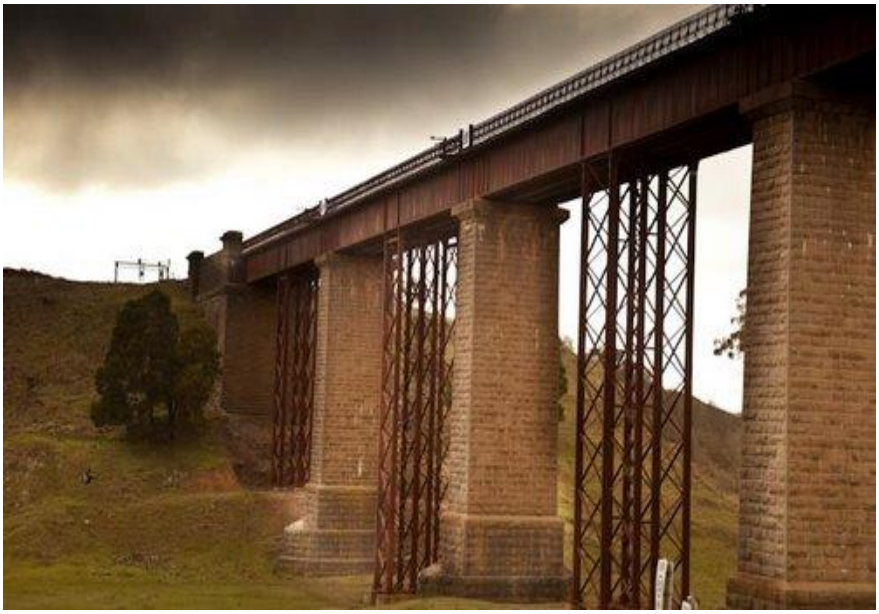
[40] The current day (2010) dollar value of this contract would have been $20.7 million. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

[41] Information provided by Ian Thomas, President, Malmsbury Historical Society on 2 November 2011.

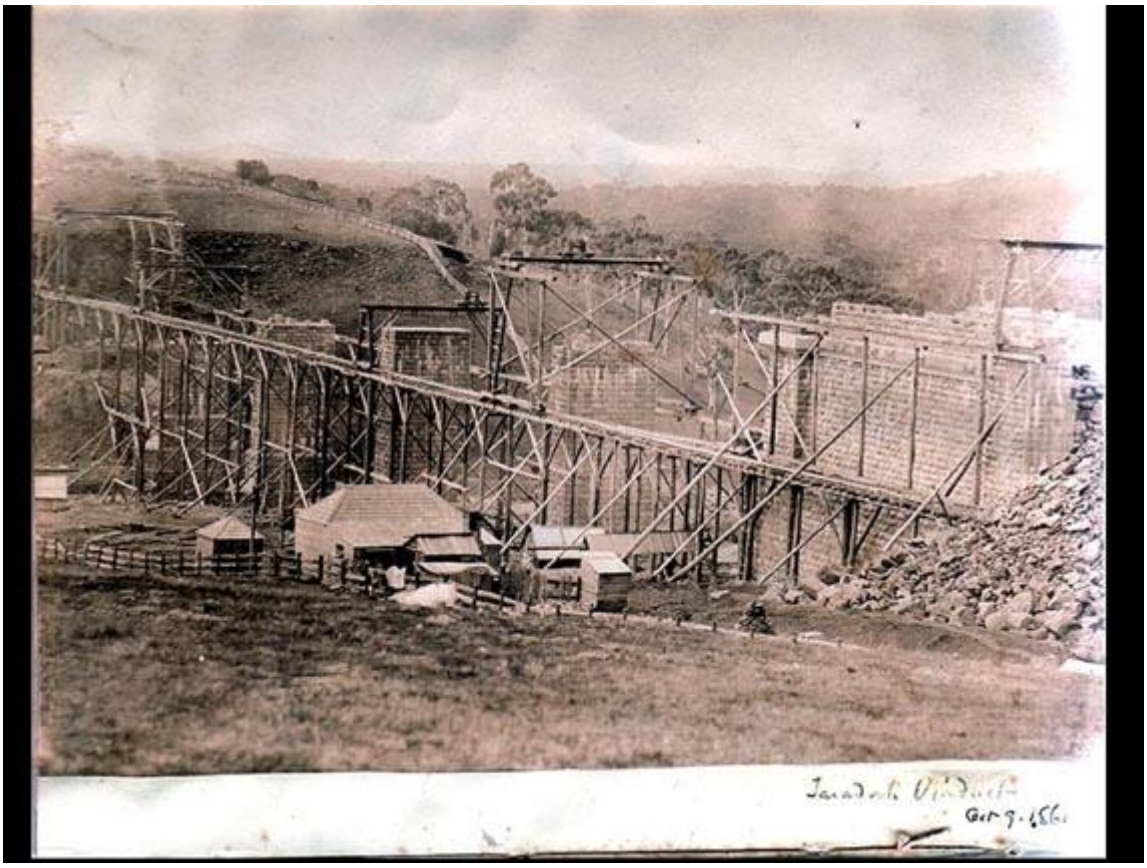
[42] Ken McInnes 1998.



Etching of the Taradale Viaduct as originally built



Taradale Viaduct with its less-than-elegant modern steel props



Taradale Viaduct under construction in 1860

The four wrought iron box section continuous beam of the Taradale Viaduct, 2010, southern abutment

4) Elphinstone Tunnel

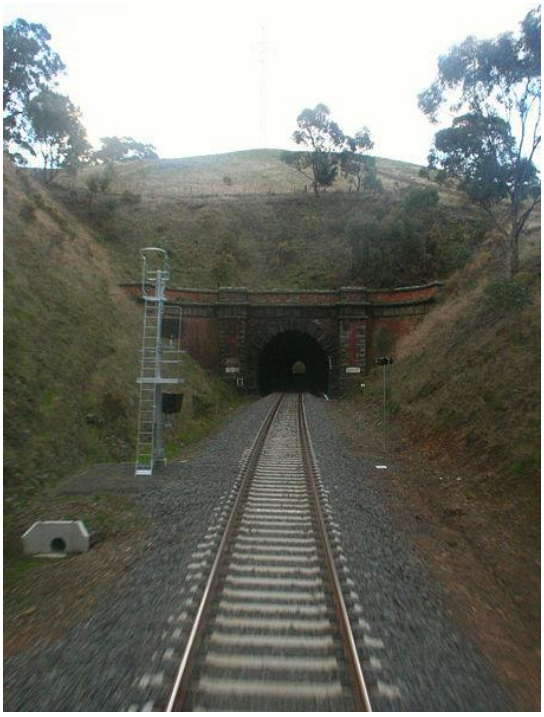
Length of tunnel 385 m. The main road between Elphinstone and Castlemaine (B180) crosses the railway above the tunnel. The tunnel was built using simple “tap and black powder” techniques. It was completed in 1862.

Elphinstone Tunnel (Eastern Portal) with a Steamrail train hauled by Hudson steam locomotives R707 and R761, probably in 2009. Note that there is only one track.

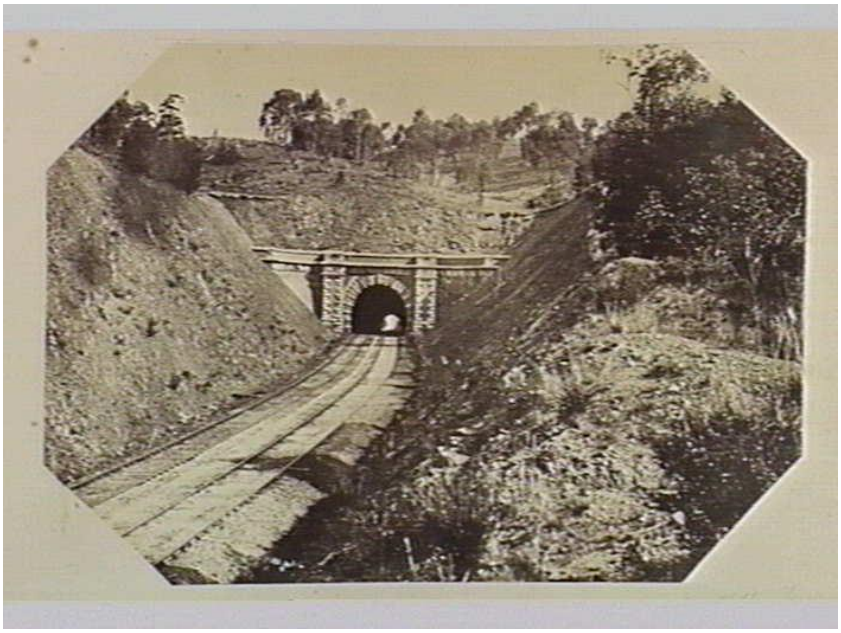
Elphinstone Tunnel (Western Portal) in 2011

5) Big Hill Tunnel

Length of tunnel 390 m. This tunnel was a significant challenge as it was built using ‘tap and black powder’ excavation through solid granite. It was completed in 1862. The tunnel was built for two tracks but now carries only one track.



Southern Portal of Big Hill Tunnel, 2006. Note that there is now only one track.



Big Hill Tunnel shortly after it was constructed

6) Notes on Track Work

The original line was double-track all the way to Bendigo, including through the Elphinstone and Big Hill tunnels, until the Fast Rail "upgrade" about 6-8 years ago. It is thought that the line was always operated as dedicated "up" and "down" tracks, and never equipped to operate as duplicate 2-way tracks.

Track near its highest point where it crosses under the M79 Calder Highway near Macedon in July 2011

The line was converted to a single track with the fairly long passing loops from Kyneton to Bendigo.

The rationale for the "singling" of the line was a realisation that there was insufficient clearance in the heritage tunnels and under a number of arched road bridges on the Kyneton-Bendigo section to accommodate the extra swaying of the high-speed (or at least, higher-speed) trains already ordered. There were apparently no issues with loading of any bridges. The clearance issue was "solved" by laying a single track under the centre of the arched constructions, and in the case of the Daylesford Road Bridge, on a bend close to the Malmsbury Station, by using the secondary platform (serviced by a rudimentary shelter shed without toilets, rather than a waiting room in a substantial bluestone building with veranda) to give a broader curving approach. Other suggested solutions, such as lowering the line (to the original base or below) or re-ordering trains of a more rounded profile (like London tube trains) or with hi-tech suspensions, were all rejected. The "problem" structures were

predominantly on the Kyneton-Bendigo section, although one road bridge between Riddells Creek and (New) Gisborne was rebuilt to accommodate the double track there[43].

The railway has been electrified as far as Sydenham (known as the Sydenham Line for many years. Sydenham station is now called Watergardens although the line is still known as the Sydenham Line.

In 26 June 2010 The Ministry of Transport announced that work had begun on the project to extend the electrification to Sunbury. This project is anticipated to be completed in 2012. The present status of the project at November 2011 is not known although physical work is reported to be under way.

Trackwork at Woodend in 2010, looking south with a bridge over a minor road in the foreground.

[43] Ian Thomas, President, Malmsbury Historical Society. Email dated 7 November 2011.

Appendix 3
Historic Individuals or Association:

3.1) Andrew Clarke
3.2) John Christian Darbyshire
3.3) Thomas Higinbotham
3.4) Joseph Brady

3.1) Andrew Clarke[44]

CLARKE, Sir ANDREW (1824-1902), military engineer and public servant, was born on 27 July 1824 at Southsea, Hampshire, England, the eldest son of Andrew Clarke and his wife Frances Jackson, née Lardner. His first years were spent in India with his parents but later, while his father was serving abroad, he was brought up by his paternal grandfather and two uncles, one of whom was the father of Marcus Clarke, at the family home, Belmont, near Lifford, Ireland. He was educated at The King's School, Canterbury, and at Portora School,

[44] Betty Malone, 'Clarke, Sir Andrew (1824 - 1902)', *Australian Dictionary of Biography*, Volume 3, Melbourne University Press, 1969, pp 409-411.

Enniskillen, Ireland. At 16 he entered the Royal Military Academy at Woolwich, where one of his teachers was Michael Faraday. He graduated in 1844, was commissioned a second lieutenant in the Royal Engineers and after a year of further study at Chatham was sent to the Fermoy district in Ireland at the height of the disastrous famine there.

In 1846 Clarke was nominated to the Oregon Boundary Commission. His father, then governor of Western Australia, urged him instead to come to Australia with the hope of gaining a professional post with him later. As a lieutenant in command of a detachment of Royal Sappers and Miners Clarke sailed with the new lieutenant-governor, Sir William Denison in the *Windermere* and arrived at Hobart Town on 26 January 1847. His father's death next month left Clarke with little motive for remaining in the colonies but he continued to superintend convict labour and to survey the area around Hobart and design wharf accommodation. He and Denison became firm friends.

His next tour of duty, from September 1848, was with Governor Sir George Grey in New Zealand. There he and his detachment worked primarily on road building, and Clarke first revealed his gift for dealing with native problems and native peoples when he was sent on a special peace-making mission to the Bay of Islands.

In 1849 he returned to Hobart as private secretary to Denison. In May 1850 he wrote to his uncle, enthusiastic about Denison's help and friendship. 'I have fortunately been thrown across one who is now my guide … Had it not been for him I should have been but a mere drudging sub. of Engineers, still dreaming on and still castle-building; now I find myself, it is true but at the lowest rungs of the ladder, but the ladder is there'. Clarke was ambitious. Although his letters reveal him as a man of action and impatient of red tape he never made a hasty judgment, especially of any move connected with his own career. While in Hobart he had avowed his deepest ambition: 'I am trying to seize the golden opportunity … which may lead ultimately not alone to wealth, but that which I prize still higher, the establishment of a name and character'.

Clarke found the confinement of an office irksome, but proved conscientious and tactful, mediating between Denison and the community in the controversy over transportation and showing resource with an unexpected influx of 150 military pensioners and their families. He dealt tactfully with immigrants seeking official posts, and found time to collect fifty tons of local products for The Great Exhibition in London. He was also an official nominee in the Legislative Council in 1851-53. More congenial duties were the control of the mounted police and the relaxation of occasional hunting and shooting expeditions with Denison.

Invited in March 1853 to replace Robert Hoddle as Surveyor-General of Victoria at a salary of £1200 ($2400),[45] he decided to accept and arrived at Melbourne in May. Clarke entered enthusiastically into his new duties, reorganizing the department, travelling widely in the colony, noting routes for roads and railways, supervising surveys and land sales. His success and energy resulted in more land being sold in the next eighteen months than since 1836. He also initiated the Roads Boards that preceded the introduction of local government. When discontent increased on the Bendigo goldfields he was sent to Tasmania to recruit police reinforcements.

[45] In current day (2010) dollars this salary would have been equivalent to $108,000 per annum. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

Clarke entered the Victorian Legislative Council in August 1853 as an official representative. He was active in the drafting of the new constitution and in debates revealed himself as more liberal and progressive than most of his colleagues. He was also responsible for the drafting and successful inauguration in December 1854 of the Municipal Institutions Act, which provided for local government, based on the English model, in the fast-growing suburbs of Melbourne, on the goldfields and in the country. Writing to his uncle in 1857 he reported, 'This Act has done more to establish order and good government and to create a healthy conservative feeling than even I ever anticipated'.

The new Constitution Act, proclaimed in November 1855, altered the status of the Victorian executive, which then became responsible to the Victorian parliament and not to the Colonial Office. When reappointed, Clarke became entitled to a civil pension of £800 in addition to his army pay. This dual income must have been of great assistance to an official who admitted that he lived out of Melbourne on a small farming property in order to make ends meet, but until 1886, when he retired from the Royal Engineers, the pension led to controversy with the Victorian government whenever he accepted other paid appointments.

At the elections in 1856 Clarke refused an invitation to stand for Bendigo. Instead he spent £700 ($1400)[46] in a vigorous but successful campaign against David Blair for South Melbourne in the Legislative Assembly. This seat he held till he left the colony. He joined the first cabinet, under William Haines, as Surveyor-General and Commissioner for Lands. In February 1858, when his moving of a successful amendment to Haines's electoral bill was followed by the government's resignation, Sir Henry Barkly invited Clarke to form a government but he failed to get the support he needed, and declined. In March he was appointed permanent head of the Lands and Surveys Department. At this stage he decided to return to England. He had sought to rejoin his regiment when the Crimean War broke out, and never forgot that he was a soldier by profession. He seems to have been conscious that he had lost face by his failure to form a ministry and wrote that 'a graceful retreat at this moment is my best policy'. He also planned to seek appointment as first governor of the Moreton Bay District while in London.

Clarke paid a farewell visit to Denison in Sydney and returned to Melbourne for a banquet given in his honour by the Freemasons of which he was grand master. He was optimistic about his record in Victoria, and in a letter to his uncle commented, 'I think I leave Victoria … at a good time, in tolerable favour with the country, my name connected with much of its national progress, and that I will not soon be forgotten'. The *Argus*, 11 August 1858, was less complimentary, observing that despite his creditable start 'that promise has been but half fulfilled … It is not apprehended anywhere that the colony will suffer material loss or inconvenience from [his] absence'. Whatever critics might say, the list of his successes was impressive. Much of the colony's scientific, material and artistic development stemmed from Clarke's interest and effort. From his appointment in 1853 he was responsible for much of the planning of Victoria's first railways, and his formal proposals for a government-controlled railway system were examined by a select committee and made law in 1857. Despite the derision of his more conservative colleagues, he was able to install the first electric telegraph from Melbourne to Williamstown and to report in November 1857 that the service had reached the borders of New South Wales and South Australia.

[46] In current day (2010) dollars this sum would have been equivalent to $63,000. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1860 and 2010 (150 years) of 45.

Clarke initiated the Museum of Natural History and controlled the spending of grants for its exhibits from 1853 on, and he held office in both the Victorian Institute for the Advancement of Science and the Philosophical Society of Victoria, becoming president on their amalgamation as the Philosophical Institute (later Royal Society of Victoria) in July 1855. He designed the building for the first Melbourne Industrial Exhibition in which the exhibits for the Paris Exhibition were displayed. He made sure that land was set aside for public reserves, helped to enlarge the St Kilda cemetery and selected the sites for the Botanic Gardens and St Paul's Anglican Cathedral. He also made certain that Melbourne should have a pure water supply, and the first meteorological statistics were begun under his tutelage. On his way to Britain he visited Italy and was so impressed by the art treasures there that he wrote to the Victorian government urging them to found an art gallery. With Hugh Childers he selected the first of its works of art.

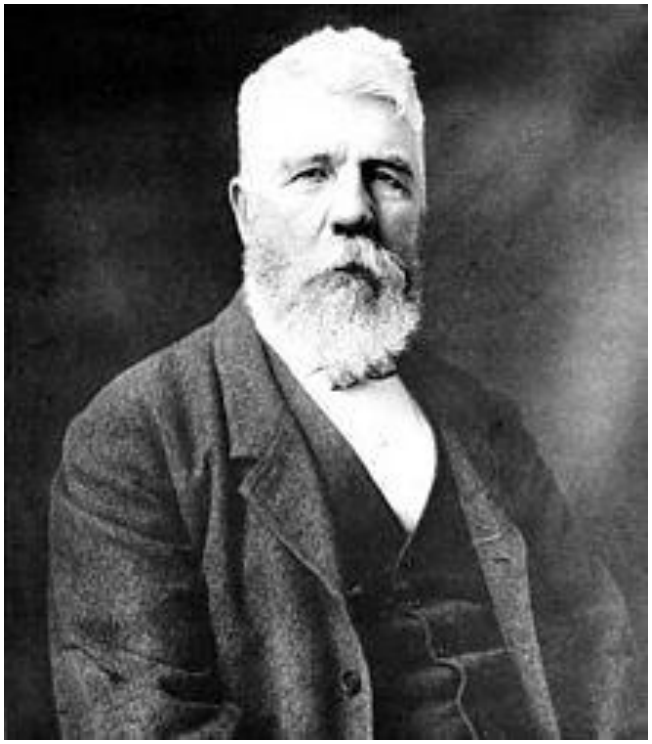
In London Clarke failed to secure the governorship of Queensland and spent many months on barrack duty at Colchester. He served in 1859-64 on the Gold Coast and in England. In 1864-73 he was director of works at the Admiralty, and in 1873-75 governor of the Straits Settlements. He was on the council of the Viceroy of India in 1875-80, commandant of the School of Military Engineering at Chatham in 1881-82 and inspector-general of fortifications in England in 1882-86. He was responsible for the design and construction of the floating dock at Bermuda and the navy docks of Portsmouth, Chatham and Malta. He also promoted the Brennan torpedo. He gradually mounted the ladder of promotion until he became lieutenant-general, and was appointed C B (civil) in 1869, K C M G in 1873, C I E in 1877 and G C M G in 1885. After his retirement from the army, he unsuccessfully contested Chatham for the House of Commons in 1886 and 1892 as a follower of Gladstone and home rule.

Clarke never lost his interest in the Australian colonies and was often asked to carry out official commissions in Britain for the Victorian and Tasmanian governments. In Birmingham he helped to found the Colonial Emigration Society. Commissioned in 1859 to buy arms for Victoria's defence, he firmly refused to allow the government to foist obsolete weapons on the colonists, weathering both the British government's opposition and the criticisms of the Victorian government over the delay.

Clarke was a special agent for Victoria from April to August 1864 and acted as agent-general briefly in 1886 and 1891 and longer in 1893. He was appointed agent-general in 1899-1902 and at times served in the same capacity for Tasmania. He fought for moderate postal charges to the colonies, was an important spokesman on their behalf when German colonization of the Pacific Islands made the Australian governments anxious for British intervention and annexation of the New Hebrides and south-east New Guinea. His help to Victoria in the financial depression of the 1890s was particularly valuable. In 1899 he acted as Australian representative at the International Commercial Congress in Philadelphia and on the board of the Pacific Telegraph Cable Co. His last service was to help in steering the Commonwealth bill through the British parliament in 1900 when he replaced Alfred Deakin as delegate for Victoria. Clarke died at his home in Portland Place, London, on 29 March 1902. He was predeceased by his wife, Mary Margaret MacKillop, whom he had married in London on 17 September 1867, and was survived by their only child, Elinor Mary de Winton.

Colourful as was his career, the man himself was equally interesting. Bulky and ruggedly handsome, with strong features and soldierly stance, hasty but kind, he had the gift of universal popularity. Contemporaries labelled him tactful, genial and ardent and admired his zeal and ability. The colonists christened him 'Spicy Andrew'. He was not deeply religious: both Denison and General Gordon tried to convert him to an interest in the Bible without success. He was, rather, a scientist, a humanitarian and an idealist, and these traits, coupled with his practical approach to colonial problems, made him popular.

3.2) George Christian Darbyshire[47]



George Christian Darbyshire (1820-1898) was an English and Australian civil engineer. He was the second son of George Darbyshire, also a surveyor and railway engineer.

Early life

Darbyshire was born at sea in 1820 and spent his early life in Derby, England. His father, George was a Civil Engineer who worked for George Stephenson. His mother was Elizabeth Darbyshire, née Smith. Later Darbyshire worked under Robert Stephenson and was involved on the various lines in the north engineered by Robert Stephenson. He married his wife Maria Wragg in 1846 when he was aged 21. Maria was the daughter of Samuel Wragg, an engineer who also worked for George Stephenson, and the widow of a man called Stafford who was killed in an accident.

Training

Darbyshire, in evidence to the Select Committee on the Chewton Railway Station given on 12 June 1863 related that his whole railway experience in Britain had been on the Midland Railway. Robert Stephenson was engineer for the Midland Railway on which construction began in February 1837. The Midland Railway, under Hudson became an extensive system

[47] Biography adapted from Wikipedia.

through construction and acquisitions. George Darbyshire's brother, John Darbyshire who also came out to Victoria, became Mining Surveyor and later Inspector of Mines with the Victorian government Mines Department.

However, George Darbyshire may also have trained as a surveyor in England, being initially employed by his father in the firm of George Darbyshire and Sons, then with his brother in the partnership John and George C Darbyshire. They were responsible for a number of surveys for Tithe Maps in around 1839-41.

Migration to Australia

George Darbyshire travelled to Australia with his wife Maria on the *Pemambuco* arriving in Melbourne on 7 July 1853 and became Engineer of Construction and District Surveyor under Victorian Government at Williamstown in 1854. He was also appointed Deputy Surveyor-General of Victoria on 9 April 1857, to the Board of Science on 4 June 1858, and Territorial Magistrate for Wyndham on 7 April 1865.

George Darbyshire's migration to Victoria coincides with the end in Britain of what is now termed the 'railway mania'. The drop off in competing proposals and line construction saw many men who had entered the new profession of civil engineer become unemployed. The obituaries of a number of these early members of the profession published by the ICE refer to the member being forced to retreat to the family property to be supported through the downturn, or for those from less well established families to find employment overseas.

Victorian Railways

George Darbyshire took up a post as Engineer for the Melbourne and Mount Alexander Railway in 1855. He was then appointed Engineer-in-Chief of the Victorian Railways from 1 April 1856 until 17 May 1860 when he was replaced by Thomas Higinbotham.

The Victorian Government Railway Department was established as part of the Board of Land and Works in 1856. Among Darbyshire's first responsibilities was supervising the design and construction of the Melbourne to Bendigo and Echuca line.

Darbyshire saw himself as an engineer, and was recruited to the Survey Department by the Surveyor-General Andrew Clarke, as an engineer. In response to a question when appearing before the Select Committee upon the Railways on 4 May 1860 to describe an engineer he stated – *A man who has actually been employed for some years, having actual experience in the working and construction is a civil engineer, as compared with the man who has no experience in works of construction.*

George Darbyshire was well experienced in railway work when he came to Victoria and was highly skilled in surveying for, and designing a railway line. A small but significant example is that the lines were set out with the section in the stations above the general grade and at a flatter grade than the line. This produced a situation where the trains approached the platform on an up-grade that aided braking, and departed on a down grade that aided starting. Higinbotham was not aware of this detail in design and changed some station locations after he took over to the detriment of efficient running. The Chewton Station had to be abandoned because the trains to Castlemaine could not stop on the grade at the point where Higinbotham placed it, and the trains to Melbourne were unable to start again up the grade if they stopped at the station.

Surveying and Later Career

In the 1860s and 1870s, Darbyshire was a licensed surveyor undertaking township and rural surveys for government and private practice. He may also have won a tender for surveying part of the Victoria/South Australia Border, and was responsible for the Town Plan of Lorne in 1871.

Darbyshire had risen to District Surveyor at Williamstown, the most senior position in the Department under the Deputy Surveyor-General, when Clarke directed him to carry out surveys for country rail lines.

He accepted the appointment as Chief Engineer of the Railways on the condition that he retained his substantive appointment as District Surveyor Williamstown and could return to that at any time. He acted as Deputy Surveyor-General from May to July 1857 while holding the position of Engineer-in-Chief. He returned to his position as District Surveyor on resigning his position as Engineer-in-Chief Railways.

Darbyshire was also Surveyor-General in 1857 and reported extensively on railway and bridge engineering to a number of Select Committees and is credited with the design of a number of early and important railway structures such as the Saltwater River Bridge on the Maribyrnong River. He was responsible for the design of the Geelong to Ballarat railway as well as that to Bendigo and Echuca. As Engineer-in-Chief, he was responsible for supervising the design of five major iron bridges, including the Warren truss Moorabool Viaduct, the plate girder bridge at Jackson's Creek, and in particular, the five span continuous box girder viaduct at Taradale. In Britain at the time they were tentatively doing two span continuous girders.

Darbyshire remained in the Survey Department and became Surveyor-General. He was one of the 137 officials removed from office on "Black Wednesday" on 8 January 1878 when the Government was denied supply. He, like a number of other senior officers, was not reappointed.

Darbyshire returned to the railway department in 1881 as Engineer for Construction and Surveys, laying out many new lines. On the unexpected death of Robert Watson in 1891 he again became Engineer-in-Chief, a position he held until near his death.

In other areas of interest, Darbyshire was appointed as a trustee of the Werribee Cemetery in February 1865. He is listed in 1891 in the first list published of Licensed Surveyors under the Transfer of Land Act, 1890 with his address as Railway Department, Melbourne.

Darbyshire had offices in Temple Court on Collins Street but resided at a substantial property at The Grange in Wyndham, Werribee where he contributed to the local community as Magistrate. In his last years he moved to Power Street Hawthorn, where he lived out his life as a Pensioner of the Victorian Government (Railways) and where he died on 5 March 1898 aged 78 years. He was buried at Werribee Cemetery.

3.3) Thomas Higinbotham[48]

Thomas Higinbotham (1819-1880), engineer and civil servant, was born in Dublin, the third son of Henry Higinbotham, merchant, and his wife Sarah, née Wilson. Educated in Dublin at Castle Dawson School and the Royal Dublin Society House, Higinbotham moved to London about 1839. At first he worked for a firm that promoted railway companies, and often appeared before parliamentary committees on railways. He then worked for several years as an engineer on British railroads and won high repute in his profession. He was elected a member of the Institution of Civil Engineers on 7 February 1854.

In 1857 Higinbotham followed his younger brother George to Melbourne. He joined his brother's household first at Emerald Hill and after 1860 near the beach at Brighton in a villa which Thomas was chiefly responsible for designing. He never married and lived with his brother, sister-in-law, nephews and nieces till 1880 in a relationship characterized by remarkable tolerance, friendship and respect despite strong differences in political opinion.

After a short time in private practice in Melbourne, Higinbotham was appointed Inspector-General of Roads and Bridges. In 1860 he became Engineer-in-Chief of the Victorian Railways. He supervised the surveying and construction of all new Victorian lines and also guided the settlement of such railway questions as city stations and facilities and the lighting of trains. He fearlessly contested proposals that he considered unsound, such as cheap narrow-gauge lines, and showed great vision in advocating a railway renewals fund, construction of Melbourne's outer-circle railway and adaptations to permit unbroken rail traffic between Sydney and Melbourne. At the government's request in 1874-75 he investigated and reported on the latest developments in railway construction and management in Europe, America and India. With other senior public officials he was removed from office in January 1878 by the Berry government. In the next two years he was invited by the South Australian, Tasmanian and New Zealand governments to report on their railway systems. In March 1880 the Service government reappointed him Engineer-in-Chief of the Victorian Railways, but the ministry soon fell and he was unhappy under its successor. He had decided to resign but died in his sleep on 5 September.

Thomas Higinbotham

[48] This biography is reproduced from the Australian Dictionary of Biography, online version.

Higinbotham was one of that select band of English railway engineers who exercised a profound influence on the development of Australian communications in the second half of the nineteenth century. They provided practically the only mark of distinction in the Australian colonies' railway departments of the day. But their efforts were not enough to provide firm foundations for sound management as political pressures developed. Though Higinbotham did not live to see the change, his own Victorian service became the first candidate for management by public corporation when the system of political control was formally discredited in 1883.

Higinbotham was an Anglican and for many years a member of the Royal Society of Victoria. His loss was greatly lamented by a society in which public officials of such widely-acknowledged integrity were all too rare. His property, valued at £21,000 ($42,000)[49], was left to his brother George and his family with the request that the family name be changed to Verner, the maiden name of his paternal grandmother. This odd request was not a condition and was therefore ignored.

[49] In current day (2010) dollars this estate would have been valued at $2.206 million. Phillips Brett, *The Australian Phillips Curve in the Long Run,* July 2007. Figure 1 of this paper shows Australian Consumer Price Index from 1850 to 2006. Extrapolating this curve from 2006 to 2010 at 3% per annum gives a ratio of prices between 1880 and 2010 (130 years) of 52.5.

3.4) Joseph Brady (1824-1908)[50] [51]

Joseph Brady

Joseph Brady was the engineer supervising construction for Cornish and Bruce, especially the Malmsbury Viaduct, Taradale Viaduct, Big Hill Tunnel, and Elphinstone Tunnel[52]. This section of the railway was regarded as the most challenging.

Joseph Brady (1828-1908), civil engineer, was born on 18 August 1828 near Enniskillen, County Fermanagh, Ireland. Under his father in 1842-44 he served on the Title Commutation Survey in England and became proficient in field surveying and draftsmanship. He was then employed as an assistant engineer with Charles B. Vignoles, a past president of the Institution of Civil Engineers, on railway surveys in Kent and Lincolnshire and on the construction of the Skipton, Sedbergh and Lancaster railway. Soon after this was opened in 1850 Bradley migrated in the *Argyle* to Sydney, where he became a draftsman with the newly-established Sydney Railway Co.

In January 1851 Brady resigned to carry out surveys and prepare drawings for the Yan Yean water scheme for Melbourne under James Blackburn, the city surveyor. When the work was finished he applied successfully for appointment as assistant engineer with the Sydney Railway Co. on 24 July 1851. He carried out surveys and construction works on the company's railway between Sydney and Parramatta, and had special charge of the surveys and later the construction of the railway from Sydney to the iron-mines at Mittagong Range, near Goulburn. For some time he also acted as chief engineer to the company while carrying

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[50] Kerr, C. F., 'Brady, Joseph (1828–1908)', Australian Dictionary of Biography, National Centre of Biography, Australian National University, http://adb.anu.edu.au/biography/brady-joseph-3042/text4449, accessed 20 May 2012. This article was first published in hardcopy in *Australian Dictionary of Biography*, Volume 3, (MUP), 1969.

[51] 'Obituary: Joseph Brady', *Minutes of Proceedings of the Institution of Civil Engineers* (London), vol 174, 1908, pp 374-76

[52] Ken McInnes, email 14 May 2012.

out his other duties. Soon after a new chief was appointed, he resigned in 1857 and returned to Victoria.

In 1858-63 he was engineer to the Sandhurst (Bendigo) waterworks, where he designed and constructed the original town reservoir and reticulation. He then became engineer to Cornish & Bruce, contractors for the Melbourne to Sandhurst railway, and took charge of the section between Woodend and Castlemaine, the heaviest works on the line. While employed there Brady won the Victorian government's premium of £500 for the best scheme for a water supply to the Bendigo and Mount Alexander goldfields, and he was appointed to survey and design this system now known as the Coliban River water supply.

Brady next visited Queensland, intending to contract for railway construction; instead he contracted to improve navigation on the Brisbane and Bremer Rivers between Brisbane and Ipswich, a task involving much submarine blasting. When this contract was partly completed the Victorian government recommended him as engineer to the Brisbane Board of Water Works. He accepted the position and his river contract was terminated by agreement, with Brady receiving half the contract amount. Although the Queensland *Government Gazette* records only his appointment as engineer of harbours and rivers on 21 January 1865, other sources indicate that he served as engineer to the Board of Water Works, successfully undertaking the Enoggera Water Works, and the design and supervision of construction of the reservoir, gravitational works and reticulation for the city of Brisbane in 1865-67. At the same time he reported on the Bremer River railway bridge and the unsatisfactory progress of the contractor for the Brisbane-Dalby railway. Clearly the Queensland government used this versatile engineer in many capacities.

On 3 August 1867 Brady accepted a government offer to manage the Brisbane-Dalby railway construction, under the direction of the chief engineer, at a salary of £600 with a monthly bonus of £25 if the work cost no more than the original contract. Brady not only earned the bonus but was also given a testimonial and handsome presents by the mayor and citizens of Dalby. An inscribed silver claret jug was, a century later, in the possession of a grandson in Adelaide.

He returned to Victoria in 1869 and took charge for O'Grady, Legatt & Noonan, contractors to the Victorian Railways, for building the first section of the new north-eastern line from Melbourne to Seymour, including the heavy bridge over the Goulburn River. In 1871 Brady was again engineer to the Bendigo waterworks, where he constructed an additional reservoir, large settling ponds and extensions to the town reticulation. Soon after these works were completed in 1873 a government department took over country water supplies and Brady was appointed engineer for the Bendigo district of the Goulburn River Water Supply, under the department's chief engineer, George Gordon.

In 1877 Brady applied successfully for appointment as engineer to the new Melbourne Harbor Trust. He had already left his mark on many civil engineering works of importance, and in this office he gave outstanding service to the commissioners and the colony of Victoria. Not only did he carry out the basic development of the Port of Melbourne but his force of character, experience and sound judgment enabled him to provide convincing argument against very powerful opposition in favour of the developmental scheme provided by the trust's consultants, Sir John Coode & Son. While in no way detracting from the major virtues of the consultants' scheme, Brady's changes saved much expenditure at a time when finance for the new port was difficult, reduced the time of construction by several years at a time when harbour accommodation was inadequate and, what proved of greatest value, made the port structures more readily adaptable to changing shipping patterns, so that eighty years later modern ships are accommodated at what are still basically his original structures. The changes that had these marked effects were the building of Victoria Dock as one large

dock instead of as three small ones and the substitution of durable Australian hardwood for masonry construction. In the fourteen years that Brady served the trust he was responsible for the spending of some £3,500,000 on works of the port, about half of which was on the Coode development. When he resigned in 1891 the Harbor Trust Commission gave him £1500 for valuable service. He engaged in private practice as a consultant and arbitrator until 1894 when he retired from professional pursuits.

Brady had been elected an associate member of the Institution of Civil Engineers, London, on 7 December 1875 and became a full member on 3 December 1878. His papers on 'Geelong and Sandhurst Water Supplies' (1878-79) and 'Early railway construction in New South Wales' (1904-05) were published in the institution's *Proceedings*. He died on 8 July 1908 at his home, Allowah, Staniland Grove, Elsternwick.

At St Mary's Cathedral, Sydney, on 14 February 1854 Brady married Adelaide Sarah, a daughter of Henry Keck governor of Darlinghurst gaol. Of their seven surviving children, the eldest son, Lyndon Francis, was a pioneer in the Western Australia timber business and an early manager of Millar Karri and Jarrah Co.; the only daughter to marry was Georgina whose husband, Edward Wardell, was master of the Melbourne Mint.

Appendix 4

Time Line for Victorian Railway Development 1839 to 1874[53]

1839 - Government Surveyor Robert Hoddle makes provision for railway linking Melbourne and Hobsons Bay.

1851 - September 7th: Public meeting calls for a railway linking Melbourne to Sandridge (Port Melbourne)

1853 - January 20th: Government approves the establishment of the Melbourne and Hobsons Bay Railway Company.

1853 - February 8th: Government approves the establishment of the Geelong and Melbourne Railway Company and the Melbourne, Mount Alexander and Murray River Railway Company.

1854 - September 12th: Opening of the Melbourne and Hobsons Bay Railway using a locally constructed locomotive. This is possibly the first locomotive hauled train in the Southern Hemisphere.

1854 - December 25th: First imported locomotive of the Melbourne & Hobsons Bay Railway Co enters service.

1855 - Victorian Colonial Government conducts various enquiries and surveys are carried out for country railways.

1856 - April 1 Victorian Government Railway Department established as part of the Board of Land and Works. George Christian Darbyshire appointed as Engineer-in-Chief.

1856 - May 23rd: Government takes over the Melbourne, Mount Alexander and Murray River Railway Co.

1857 - May 13th: Melbourne & Hobsons Bay Railway line to St Kilda opened.

1857 - June 25th: Geelong and Melbourne Railway opened.

1857 - June Government approves the establishment of the St Kilda and Brighton Railway Co.

1857 - November 24th: Government approves the establishment of the Melbourne and Suburban Railway Company. On the same day a series of Acts were passed approving the construction by the Government of railways linking Melbourne to Echuca and Geelong to Ballarat.

1858 - March: Contracts let for the construction of railways between Melbourne and Bendigo (Cornish and Bruce) and Geelong and Ballarat (Evans, Merry and Co).

[53] Australian Railway Historical Society, Victorian Division, Railway History in Victoria 1839-1900, from their web site, December 2010.

1858 - May 12th & 31st: First five locomotives for the Victorian Railways delivered from George England & Co.

1858 - June 7th : Work begins on the Melbourne Bendigo Line.

1858 - July 23rd: Work commences on the Melbourne and Essendon Railway Company.

1858 - July: Second batch of ten locomotives ordered from Beyer Peacock & Co. Five passenger engines and five goods engines. Later J and P Classes.

1858 - August 26: Work begins of the Geelong to Ballarat Line.

1858 - First Spencer Street Station constructed.

1859 - January 13: Opening of the Government Railway from Melbourne to Williamstown and Melbourne to Sunbury.

1859 - June: Third order for locomotives, ten saddle tank locomotives placed with George England & Co (7) and Slaughter Gruning & Co (3). Possibly for the Williamstown branch. Later L Class.

1860 - May 17th: Thomas Higinbotham replaces Darbyshire as Engineer-in-Chief.

1860 - September: 3rd Colonial Government takes over the Geelong & Melbourne Railway Co.

1860 - Second order of locomotives delivered during this year.

1861 - July 8th: Sunbury to Woodend opened.

1861 - Additional orders for goods and passenger locomotives (B Class & O Class) placed with a number of British manufacturers The first of these locomotives were delivered in July/August 1862. Successive orders were placed for locomotives of these classes into the 1880's.

1862 - March 29th: Geelong to Ballarat line completed.

1862 - April 10th: Geelong to Ballarat line opened.

1862 - March 31st: Melbourne & Suburban Railway Co is purchased at auction by the Melbourne Railway Company.

1862 - April 25th: Woodend to Kyneton opened.

1862 - May: Melbourne Railway Co takes over the operation of the St Kilda and Brighton Railway Co.

1862 - October 7th: First locomotive reaches Bendigo.

1862 - October 20th: Official opening of the Melbourne to Bendigo Railway. Another Official Opening was held at Castlemaine on 15th October.

1863 - Tenders called for the railway from Bendigo to Echuca.

1864 - July 1st : Melbourne & Essendon Railway Co. closes and locomotives disposed of to South Australia and New Zealand. Colonial Government eventually purchases the line in 1867.

1864 - September 19th: Railway to Echuca opened.

1865 - June 15th: St Kilda and Brighton Railway Co taken over by Melbourne & Hobsons Bay United Railway Co.

1865 - June 30th: Melbourne Railway Co amalgamates with the Melbourne & Hobsons Bay United Railway Co.

1867 - August 27th: Government purchases the Melbourne & Essendon Railway Co. As prelude to the construction of the North East Line to Wodonga.

1869 - Surveys conducted for the North East Line.

1870 - Tenders let for the North East Line.

1870 - October 18th: Thomas Higinbotham submits a series of proposals for lines to link towns in Western Victoria. Because the lines were colour coded on the map the resulting discussions become known as "the Battle of the Coloured Lines.

1871 - January 9th: Government resumes services to Essendon.

1872 - April 18th: North East Line opened to School House Lane, just south of Seymour.

1872 - August 26th: North East Line reaches Seymour following the completion of the Goulburn River bridge.

1872 - Victorian Railway builds its first locomotive at the old Williamstown Workshops, No 100.

1873 - November 21st: North East Line completed to Wodonga.

1873/74 - Phoenix Foundry of Ballarat builds ten goods locomotives (Q Class) for the North East Line. The Phoenix Foundry was ultimately to build 352 locomotives for the Victorian Railways by 1904.

Appendix 5

Time Line for NSW Railway Development 1849 to 1969[54]

1849 The Sydney Railway company came into existence and planned to build a railway from Sydney to Parramatta Junction.

1852 NSW Govt Act stipulates 5'-3" broad gauge (Irish gauge) for all NSW passenger railways. Act communicated to Victoria and SA, who agree to use 5'-3" rolling stock for their own proposed railways.

1853 NSW Govt Act changes NSW railways gauge to the British so-called Standard Gauge (4'-8½") following recommendations from London. (Victoria's so far private railways are already committed to 5'-3" gauge.)

1855- The property of the Sydney Railway Company was transferred to the NSW Government and the line was completed on 26 September 1855.

1855-1881- Construction of railway from Parramatta Junction to Albury. This line reached Goulburn in 1869, Yass Junction in 1876, Wagga Wagga in 1879 and Albury in 1881.

1857-1888- Newcastle to East Maitland line opened 1857. Numerous further extensions and branches added to form the separate Great North Railway (GNR) up to 1888, including to Wallangarra (on the Queensland border).

1863-1885- The Main Western Line reached Penrith in 1863 and was built over the Blue Mountains using the Great Zig Zag at Lapstone in 1867 reaching Lithgow in 1869. This line was extended to Bathurst in 1876, Orange in 1877, Dubbo in 1888 and Bourke in 1885.

1883- The interconnection with Victoria in the form of a Broad Gauge line from Wodonga to Albury station, with passengers and freight having to change trains at Albury.

1885-1914- A branch line was built from Goulburn to Queanbeyan in 1885, extended to Cooma in 1887 and a short branch line from this branch was completed to Canberra in 1914.

1889- Sydney connected to Newcastle after the completion of a bridge over the Hawkesbury River. The GNR joins the main NSW railway network.

1893- The Illawarra Line to Wollongong and Nowra was completed.

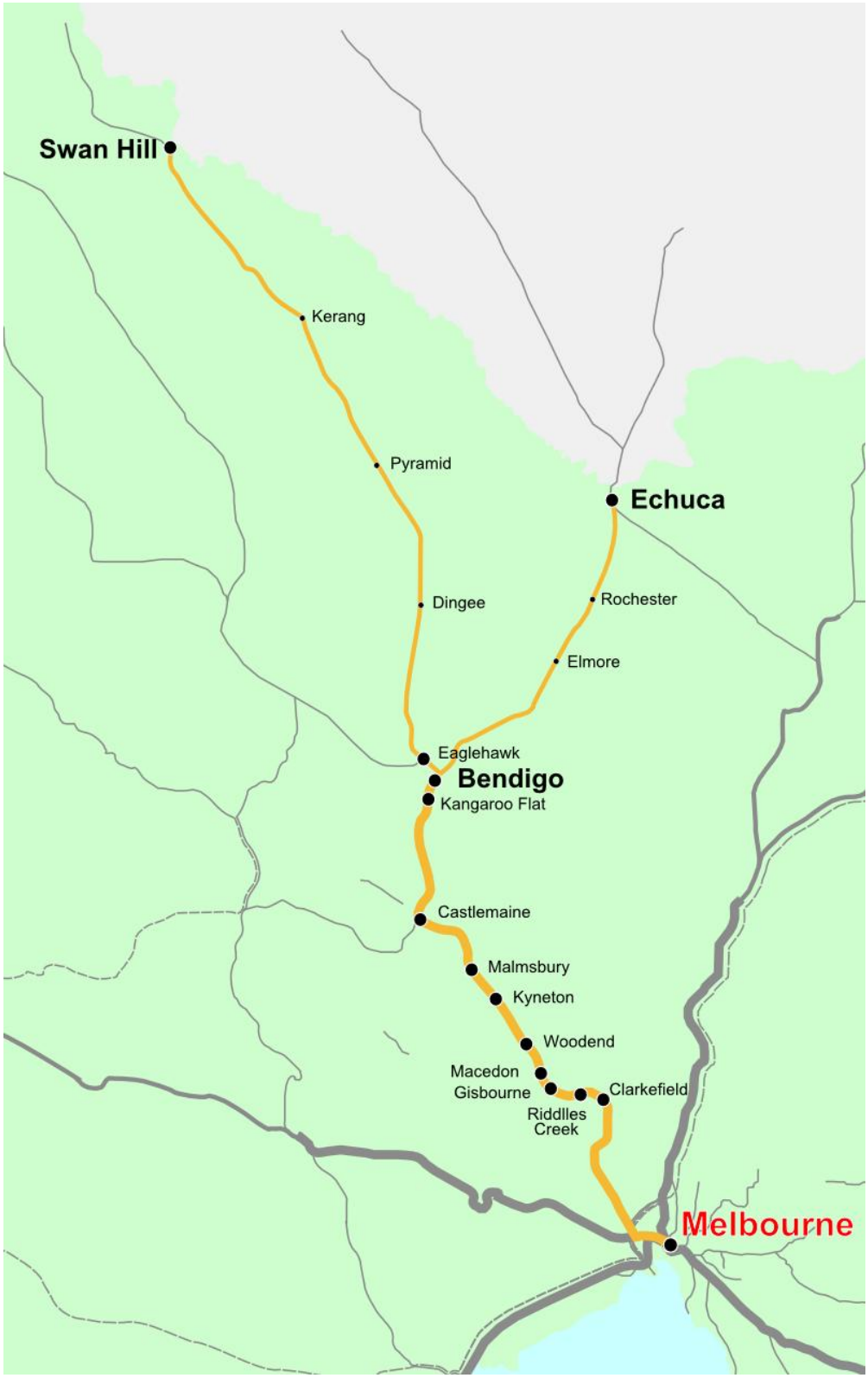
1905-1932- The North coast Line from Sydney to Brisbane was completed with the completion of the bridge at Grafton in 1932.

1926- Work began on electrifying the Sydney urban network.

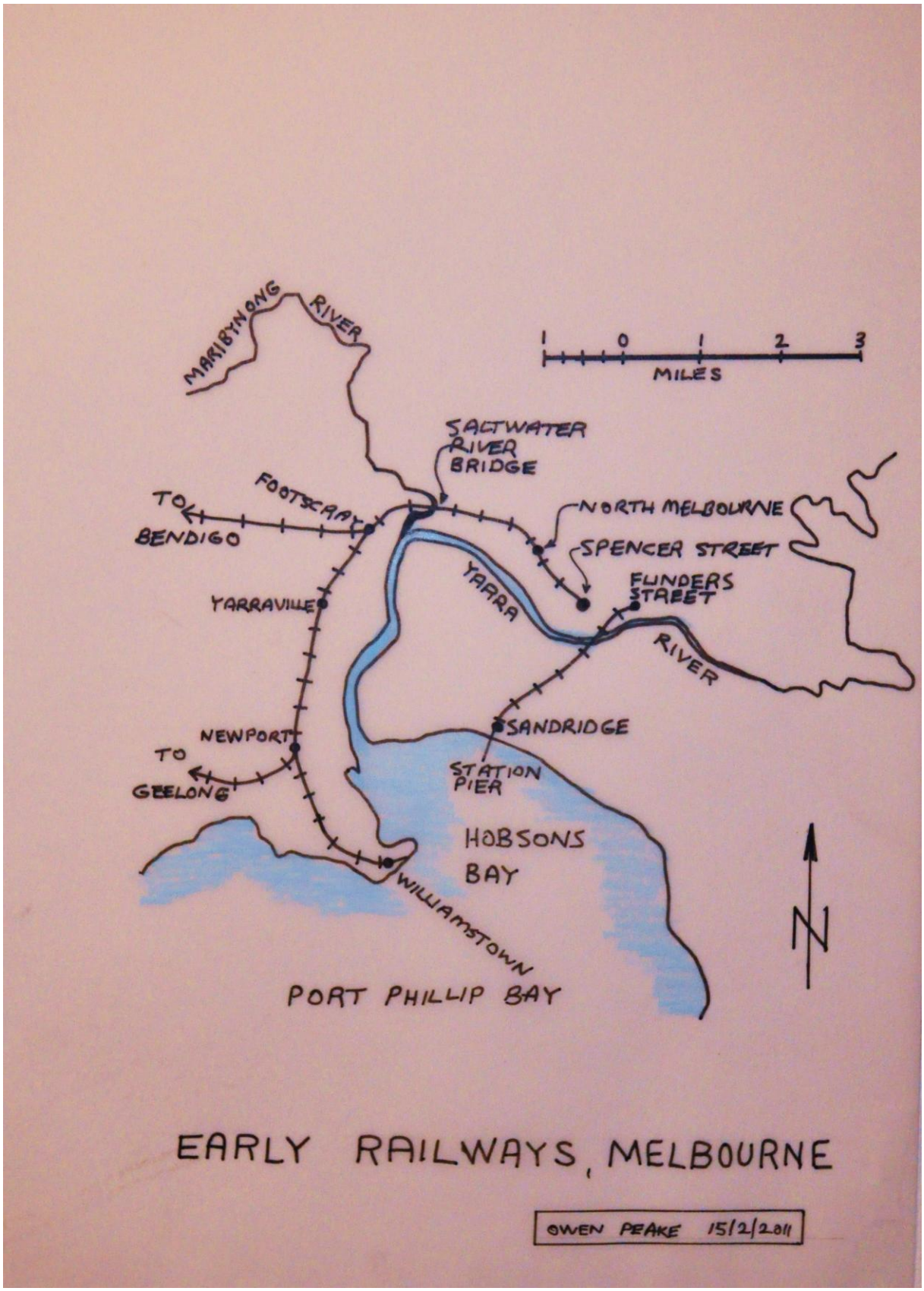
1927-1969- Main Line to Broken Hill was completed in 1927 and was connected to the South Australian Narrow Gauge system by the Silverton Tramway between Broken Hill and the SA border. In 1969 the South Australian section between the border and Port Pirie was converted to Standard Gauge. This facilitates a route between Sydney and Perth by Standard Gauge.

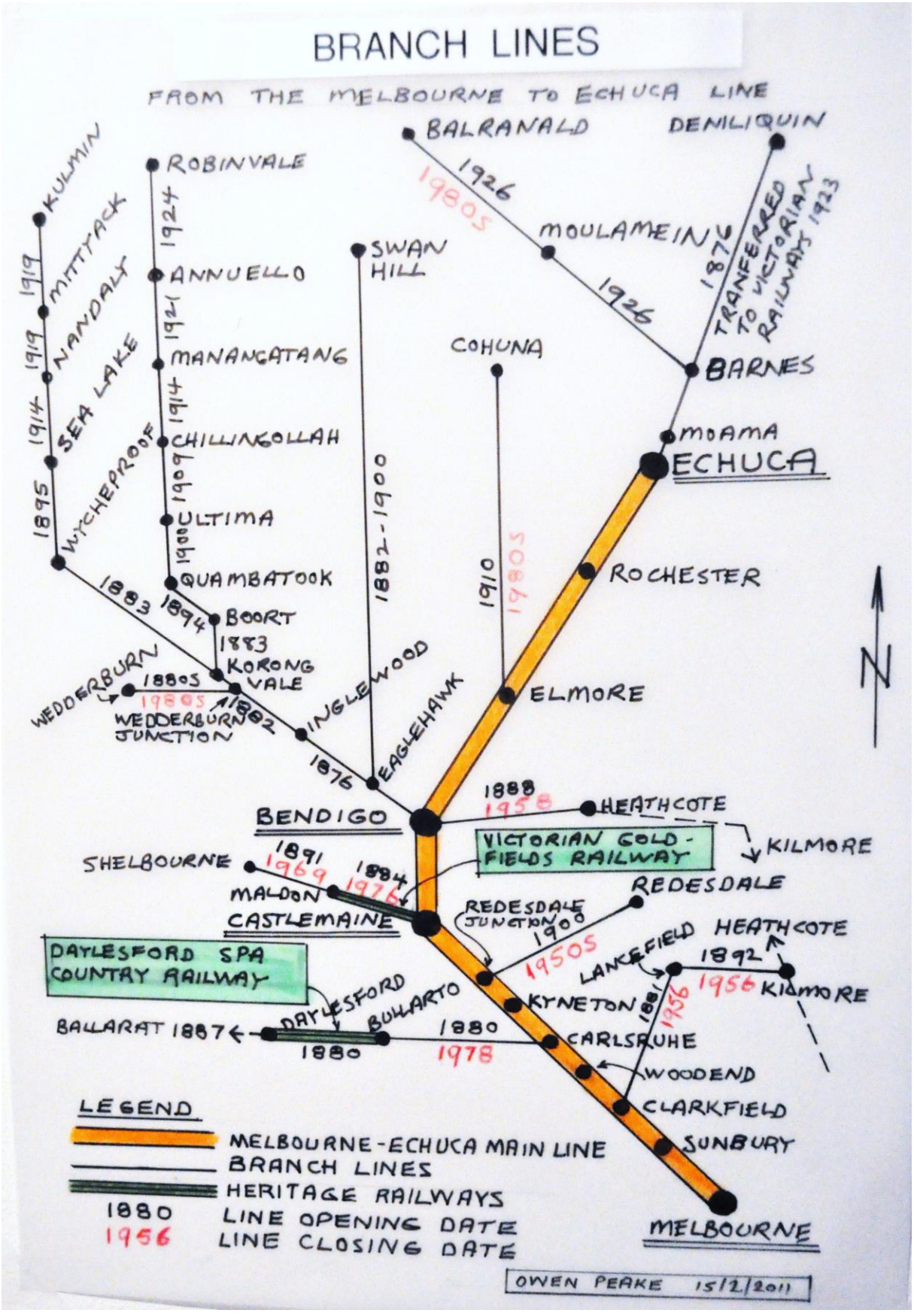
[54] Wikipedia, Rail Transport in New South Wales, version dated 22 February 2011.

Appendix 6
Maps of Railway Lines



Note that Riddelles Creek should de Riddells Creek or just Riddell




BRANCH LINES
FROM THE MELBOURNE TO ECHUCA LINE
BALRANALD
DENILIQUIN
1926
1980S
MOULAMEIN
1876
TRANFERRED TO VICTORIAN RAILWAYS 1923
1926
ROBINVALE
1924
KULWIN
1919
MITTYACK
1919
NANDALY
1914
SEA LAKE
1895
WYCHEPROOF
ANNUELLO
1921
MANANGATANG
1914
CHILLINGOLLAH
1909
ULTIMA
1900
QUAMBATOOK
SWAN HILL
1882-1900
COHUNA
1910
1980S
BARNES
MOAMA
ECHUCA
ROCHESTER
1883
1894
BOORT
1883
KORONG VALE
1880S
1980S
WEDDERBURN
1882
WEDDERBURN JUNCTION
INGLEWOOD
EAGLEHAWK
1876
ELMORE
1888
1958
HEATHCOTE
BENDIGO
VICTORIAN GOLD-FIELDS RAILWAY
KILMORE
SHELBOURNE
1891
1969
1884
1976
MALDON
CASTLEMAINE
REDESDALE
REDESDALE JUNCTION
1900
1950S
LANCEFIELD
HEATHCOTE
1892
1956
KILMORE
DAYLESFORD SPA COUNTRY RAILWAY
KYNETON
1881
1956
DAYLESFORD
BULLARTO
1880
1978
BALLARAT 1887
1880
CARLSRUHE
WOODEND
CLARKFIELD
SUNBURY
MELBOURNE
LEGEND
MELBOURNE-ECHUCA MAIN LINE
BRANCH LINES
HERITAGE RAILWAYS
1880 LINE OPENING DATE
1956 LINE CLOSING DATE
OWEN PEAKE 15/2/2011

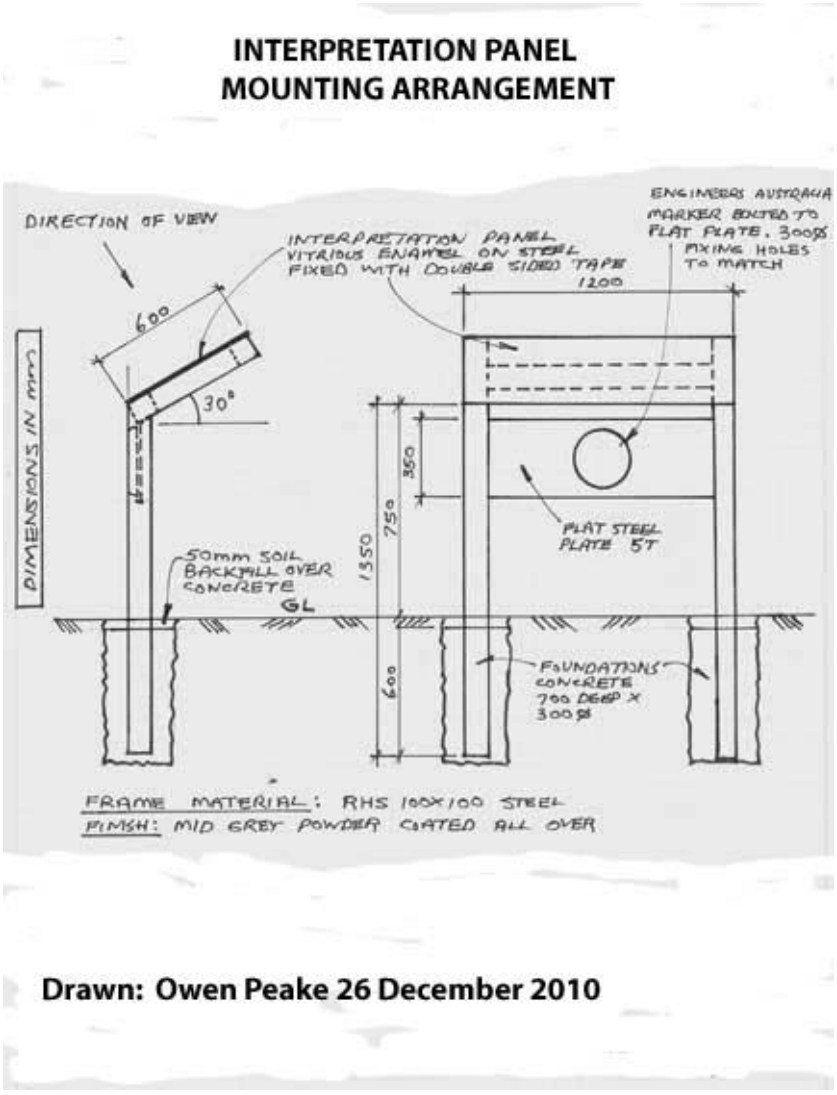
Appendix 7
Draft Interpretation Panel Design

General Attributes of the Interpretation Panel:

1) A title **"The Melbourne to Bendigo and Echuca Railway".**
2) Logos of Engineers Australia and the Macedon Ranges Shire Council.
3) A small scale representation of the EHA marker plate.
4) The date of the marking ceremony.
5) A background image of a drawing of one of the important parts of the structure of the Railway.
6) Brief captions for each photograph.

The Interpretation Panel:

1) Size to be nominally 1200 mm wide by 600 mm high.
2) The panel to be constructed of vitreous enamel on steel plate or 3M vinyl material on aluminium plate depending on the Council's budget.
3) To be mounted on a fully welded and powder-coated RHS steel frame as detailed below.
4) The selected location has a good view of the viaduct and is close to a public road in a place where people wishing to view the panel can park their cars and safely view the panel. The site is located within the Malmsbury Botanical Gardens. The site is located on the bank of the Coliban River adjacent to a small gazebo.
5) The orientation of the panel to be facing the viaduct so that when viewers look up they see the viaduct in full view.
6) The EHA marker to be mounted below the interpretation panel as shown below.



Themes

Four themes have been developed with a total of 511 words including headings but not including image captions. The text for these themes is below:

Theme 1

Formation of the Victorian Railways

In March 1855, after it became clear that private railway companies were struggling to finance and build railways in Victoria, Governor Hotham suggested that the colony could build railways itself using borrowed capital from London markets. A Legislative Council Committee was quickly set up and it recommended that the government should build railways from Melbourne to Bendigo (then known as Sandhurst) and from Geelong to Ballarat as a first step.

The Government was fortunate to have Andrew Clarke, Royal Engineer at its disposal as Surveyor-General. Clarke negotiated with the Melbourne, Mount Alexander and Murray River Railway Company to sell the line to the government in May 1856. The Victorian Railways Department was then created.

George Darbyshire was appointed Engineer-in-Chief and his first task was to carry out the design and construction of the railway to Bendigo. From his small office came the concepts that led to the finely graded sweeping curves of the railway we see today, taking the Great Dividing Range in its stride.

170 words

This theme to be accompanied by an image of Andrew Clarke.

Theme 2

Expert Team Assembled

Clarke who was a tactful and vigorous administrator assembled a team of railway engineers to carry out the work. George Darbyshire, the first Engineer-in-Chief, was an accomplished surveyor and administrator. He was replaced by Thomas Higinbotham who had extensive railway experience and went on to build many more railways in Victoria. These men in turn appointed engineers and draftsmen with appropriate experience. Most had come from the United Kingdom after working on railways there during the Golden Age of railway building.

Joseph Brady was supervising engineer to Cornish & Bruce, contractors for the Melbourne to Bendigo (Sandhurst) Railway, and took charge of the section between Woodend and Castlemaine, the heaviest works on the line, including the great viaducts at Malmsbury and Taradale and the tunnels at Elphinstone and Big Hill. He carried out much other important work in Victoria and elsewhere.

144 words

This theme to be accompanied by images of George Darbyshire and Thomas Higinbotham

Theme 3

Construction of the Railway

Tenders closed on 24 March 1858 with no less than 133 tenders being received. A contract was let to Cornish and Bruce for £3,356,937 to commence work on 1 June 1858 and complete the line by 31 July 1861.

Cornish and Bruce made quick early progress with the Melbourne to Sunbury section being officially opened on 13 January 1859.

The line was officially opened to Bendigo (Sandhurst) on 20 October 1862 by the Governor of Victoria, Sir Henry Barkly. A great banquet was held for 800 guests and this was followed by a grand ball.

The extension of the line to Echuca was a relatively simple matter as that part of the line was across plain country without any significant engineering challenges. Tenders were called for the work in 1863 and the work was completed in 1864 by contractors Collier and Barry.

146 words

This theme should be accompanied by a map of the railway route (as per Appendix 6) and an image of work being carried out on the railway.

Theme 4

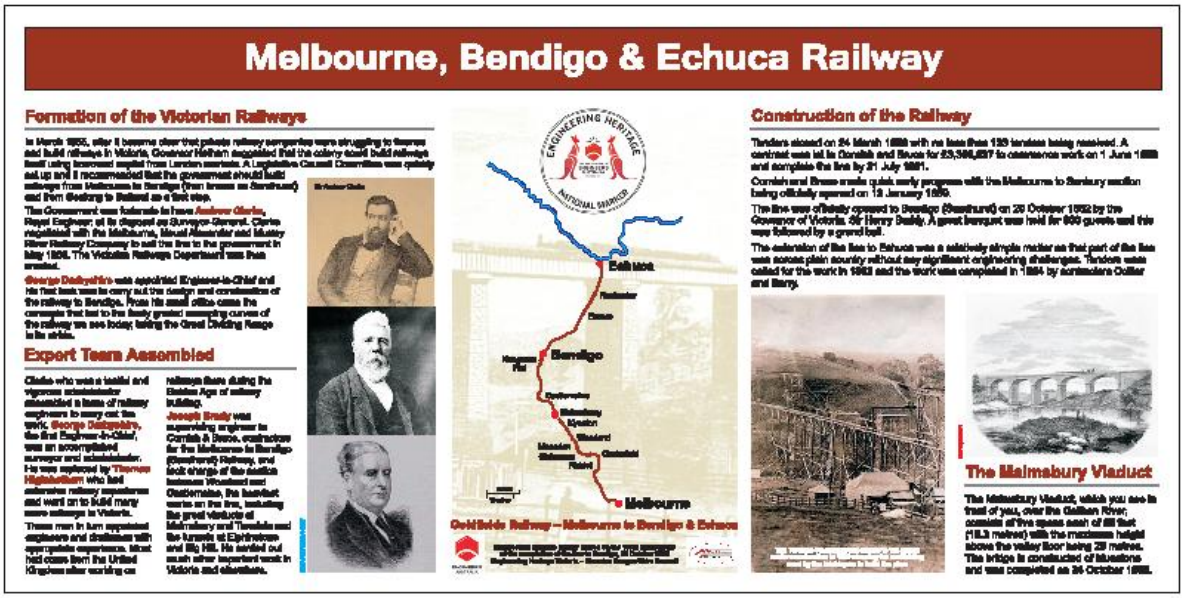
The Malmsbury Viaduct

The Malmsbury Viaduct, which you see in front of you, over the Coliban River, consists of five spans each of 60 feet (18.3 metres) with the maximum height above the valley floor being 25 metres. The bridge is constructed of bluestone and was completed on 24 October 1860.

510 words

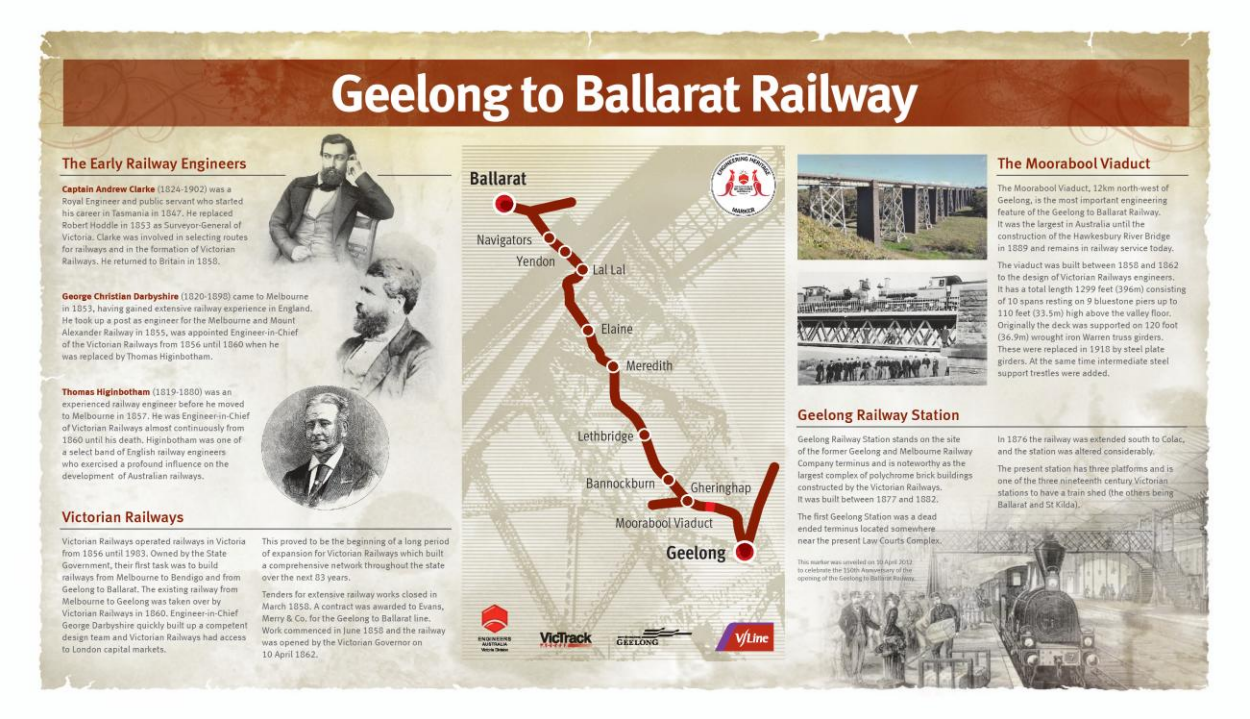
This theme to be accompanied by a photograph of Malmsbury Viaduct.

An early version of the artwork for the interpretation panels is shown below[55]:



[55] First draft produced by Richard Venus 1 July 2012.

The artwork of the panel should preferably follow the style of the panels prepared for Geelong and Ballarat completed in April 2012. The Geelong panel is reproduced below:



Appendix 8

River Trade in the Murray-Darling System and its Relationship to National Development[56]

Overview

During the period 1860 to 1890 the Murray-Darling River System was an important trade route particularly for the transport of wool to Australian coastal ports and the return trade of provisioning the sheep stations of the inland. River traders became partners in the booming wool industry and prospered during this period.

The river trade did not become a permanent part of the Australian transport system because other forms of transport competed with it and either provided better service or became economically more advantageous to end users due to government subsidies. For instance government owned railways competed with the river trade without having to recover the capital costs of the railway infrastructure which they used and highways, when they became available, were, and still are in most cases, provided at no cost to the users. The river trade was entirely private enterprise-driven and had to provide for the full cost of river boats, their operation, upkeep and profits.

During the period of river trade two other realities had to be faced by those using the rivers. The first was that the commercially attractive parts of the river system flowed through three bitterly competitive independent colonies (New South Wales, Victoria and South Australia) each frantically attempting to capture the river for their own purposes, or restrict trade, or both. Secondly, the environmental reality of the river system was, and still is to some extent, intensely seasonal as rivers levels prevented the flow of commence during long periods. This was particularly true on the Darling River. The rivers oscillated from raging torrents which broke their banks and made their courses difficult to follow to dry periods when they were no more than a string of waterholes.

Initially development of the river basin came out of Sydney with large grazing properties being set up in the vicinity of Mildura as early as 1846 and in 1848 at Murray Downs Station of 6000 square kilometres north of Swan Hill. Wool from these stations was initially transported by bullock wagon along roads which were essentially non-existent to the coastal ports for export.

The Murray River had been viewed as a possible route for navigation from the earliest settlement of South Australia. The expedition of Charles Sturt in 1829-30 suggested that the Murray and Darling could be navigable to fairly large boats. However it was not until the Governor of South Australia offered a prize for the first successful iron-hulled river boat to navigate from the mouth of the Murray to the junction with the Darling that the river trade became a reality.

[56] Reference is made to the un-attributed essay titled " River Trade in the Murray-Darling System, SA Vic, NSW, Qld to be found at www.travelling-australia.info/Infosheets/Rivertrade.html

First Journeys

In 1853 two vessels set off to claim the prize. The *Mary Ann* had been built to trade around the lower reaches of the river but Captain William Randall, who became a legend on the river, reached Moama. At the same time the *Lady Augusta* built in Sydney and sailed around the coast and through the treacherous Murray Mouth, captained by the equally legendary Francis Cadell towed the barge *Eureka* to Swan Hill where he loaded the barge with 5 tonnes of wool and returned to Goolwa.

Both captains subsequently commenced commercial operation on the river and by 1855 there were 5 paddle steamers in operation and more were being built. The river boats immediately offered lower transport costs to graziers and the trade grew quickly. The development of regular river transport encouraged more settlers to establish properties along the river and the more properties that developed the greater was the demand for river boat services.

The South Australian government built the *Grappler* in 1858 as a purpose-built "snagging" boat capable of lifting snags weighing up to 15 tonnes from the river. This service addressed one of the greatest hazards to the operation of river boats. Snags were a never-ending problem as dead trees toppled into the river and floods washed new debris down the river.

Quite quickly a specialised design of river boat, unique to the Murray-Darling System emerged. These boats had extremely shallow draughts, were almost invariable side-wheeled paddle steamers, which were wood-fired. They gathered their fuel from the forests on the river banks. They were often of composite construction, with iron (or later steel) elements combined with timber in construction techniques unique to these boats. The predominant timber which grew along the river banks was River Red Gum (*eucalyptus camaldulensis*), a hard, strong, rot-resistant structural timber which was ideal for the construction of river boats and very durable. Most boats had two decks and were up to 36 metres long displacing up to 225 tonnes. The main shipyard centres were Goolwa, Mannum, Morgan and Echuca.

Paddle steamers on the rivers carried freight and passengers but there were also specialised boats. In 1867 the *Prince Alfred* was built at Goolwa as a floating shop and other followed. Two mission boats *Etona* and *Glad Tidings* provided religious services to isolated communities along the rivers.

Connections to Sea Ports

At first it was thought that river boats could traverse the Murray Mouth and travel to established ports (primarily Adelaide) for transfer to seagoing ships. However there were many losses in the Murray Mouth and it soon became obvious that it was not a safe navigation proposition.

The first response to this reality was to build a horse drawn railway between Goolwa on Lake Alexandrina and Port Elliot on the coast. However Port Elliot proved to be inadequate and dangerous as it was not sheltered and was subject to heavy weather

from the Southern Ocean. In 1864 the Goolwa to Port Elliot Railway was extended to Victor Harbour which was a safer port than Port Elliot.

Goolwa's monopoly on the river trade declined after 1864 when the Victorian Government completed a railway from Melbourne to Echuca. The first trains reached Echuca in 1864 and gave fast and economical connection to the Port of Melbourne, then the largest port in the nation. The Echuca Wharf was first built in 1865 and was extended in 1867, 1877 and 1879, reaching a total length of 332 metres. This gave graziers in the inland the lowest cost route for the export of wool via Echuca and Melbourne.

During the 1870s wool output increased from 33,000 tonnes to 72,000 tonnes and the Port of Echuca thrived as the greatest of Australia's inland ports.

Competition from Other Railways

The South Australian government was not prepared to let Echuca win all the river trade. It built a railway from Adelaide to Morgan which was completed in 1878. Morgan had the advantage of being closer to the junction with the Darling than Echuca and this was sold as an advantage for graziers along the Darling River. Within a few years six trains per day were running between Adelaide and Morgan and the Port of Morgan was very busy.

In 1874 the Port of Echuca saw its busiest year with 240 river boats trading in the port.

Also in 1874 the Victorian Government opened the last section of the railway from Melbourne to Wodonga. Paddle steamers had previously carried freight between Echuca and Albury/Wodonga. Now this commerce went direct by rail from Melbourne and the river trade lost business.

Whilst this was going on New South Wales was slow to grasp the importance of rail connections to the river and only moved long after South Australia and Victoria had established dominance.

Development of the line from Goulburn to the south was incremental, eventually reaching Wagga Wagga on the Murrumbidgee River, but stopping 20 km short of Albury at Gerogery in 1880 for fear of encouraging trade with Victoria. To the west the line from Bathurst was extended incrementally to Condoblin on the Lachlan River and from Orange to Dubbo on the Macquarie River, finally reaching Bourke in 1885. These New South Wales railways captured much of the river trade to rail and reduced river trade further.

Later railways reached the Murray at Murray Bridge in South Australia and Mildura in Victoria and numerous other river ports in New South Wales. The age of river transport was over by the 1890s, made worse by a short period of severe economic constraint during that decade, and the rise of the railways lasted for some time in the early decades of the 20th century until the development of the road system in turn overtook the railways. The river trade had dwindled to such an extent that records of boat movements in the Port of Echuca were not kept after 1910.

It would be another 100 years before the Port of Echuca was again busy. Recent travellers passing through the Port of Echuca may find that they have to board their paddle steamer by walking over the decks of several other paddle steamers, moored side-by-side at the old wharf, to get to their particular boat. Tourists have now discovered the charm of the lazy movement of the paddles and the quiet progress along the river under steam. There are more paddle steamers on the Murray now than there were for most of the 20th century and in world terms the Murray has become the Mecca for paddle steamers.

The Rise of Road Transport

The 20th century saw an apparently un-stoppable rise in the use road transport as governments spent vast resources on providing road networks throughout the country. By the end of the Second World War living standards had reached a point where almost everyone expected to own a car and it became almost a patriotic duty to own a locally made Holden, or later a Ford Falcon. At the same time, having become essential equipment during the war and having proved its ruggedness and efficiency, the diesel engine found its way into trucks which quickly increased in capacity as the road system expanded. Bridges were upgraded to take higher axle-loads and trucks became the normal mode of transport for everything from bales of wool to the refrigerated containers delivering fresh fruit and vegetables to every supermarket in the country.

The Key Role of the Melbourne to Echuca Railway

The relentless improvement to transport systems has gone on from the First Settlement until today. The growth of the Murray-Darling river trade quickly replaced the bullock wagon and in a few decades the railway replaced the river trade.

Key events which stand at the intersection of these changes mark important economic changes which shaped the nation and helped to build the robust economy of the early 21st century. These events should be recognised for their National significance.

The voyages of the *Mary Ann* and the *Lady Augusta* up the Murray in 1854, was one such event. This started the river trade.

The opening of the railway between the Port of Melbourne and the Port of Echuca in 1864 was another. The combination of an efficient river transport system with a railway between a major seaport and the Port of Echuca changed everything in the short term and provided the graziers of the Riverina and the vast grazing lands of Western New South Wales with a better way to get their wool to market and to receive their supplies.

Appendix 9
Images and Captions

Riddells Creek Bridge. Typical of the many stone bridges on the line.

Castlemaine Signal Box and platforms.

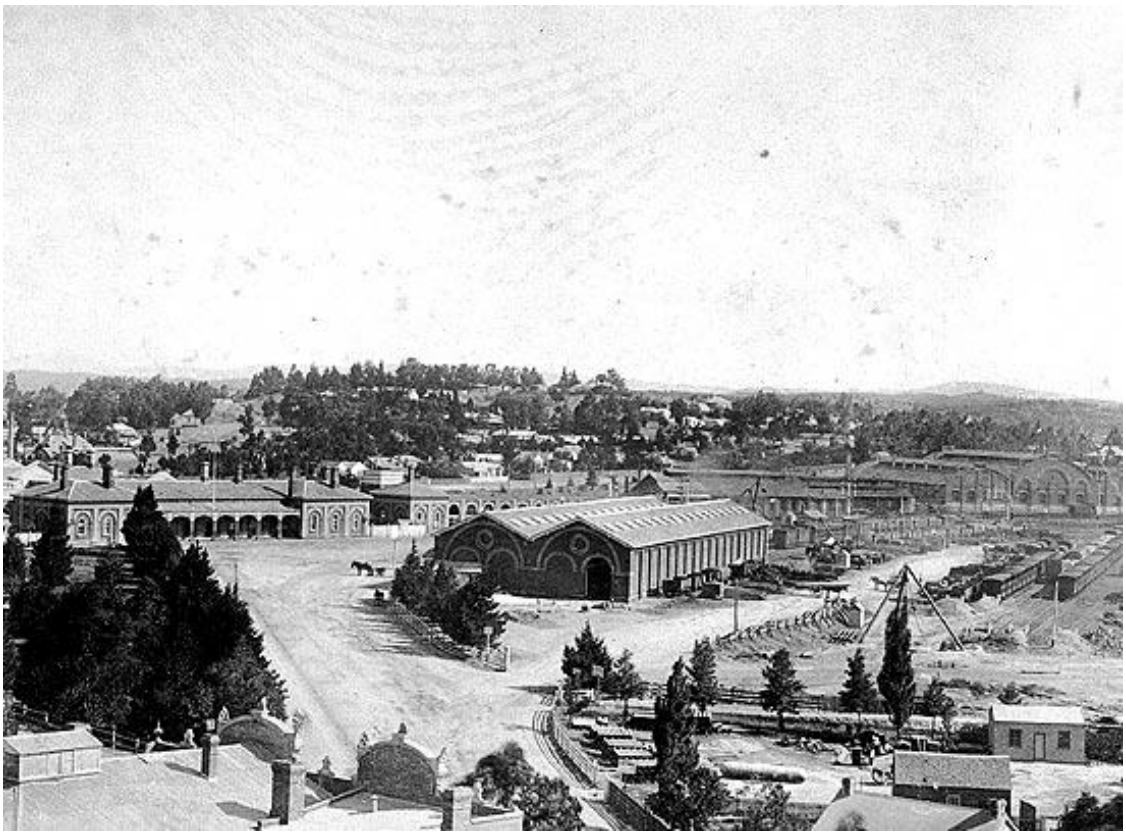
Bendigo Railway Station platforms and footbridge.

Echuca Railway Station.

Echuca Locomotive Shed.

Woodend Railway Station 1910

Kyneton Railway Station 1870



Bendigo Railway Station 1890

Appendix 10
Letter of Support from Macedon Ranges Shire Council

Our Ref: 11/17976
Infra Ref: 193244
File Ref: 7/3040/2805

All mail and tenders:
PO Box 151, Kyneton, Vic 3444
Tel: (03) 5422 0333
Fax: (03) 5422 3623
E: mrsc@mrsc.vic.gov.au
W: www.mrsc.vic.gov.au
ABN 42 686 389 537

14 February 2012

Owen Peake
Secretary
Engineering Heritage Victoria
Level 2, 21 Bedford Street
NORTH MELBOURNE VIC 3015

Dear Owen

Re: Heritage Recognition Ceremony

I refer to your email of 11 February 2012 regarding the planned ceremony to recognise the engineering heritage significance of the Melbourne to Bendigo and Echuca Railway on 20 October 2012.

As an acknowledgement of the great historical value of this project, Council is prepared to work with you towards the proposed ceremony.

As the Malmsbury Botanical Gardens is a public space, we are unable to make a specific booking, however to ensure you have the required space to hold the event, it is suggested that the area is marked out early on the morning of 20 October 2012.

We wish you every success with the ceremony.

Yours sincerely

Peter Johnston
Chief Executive Officer

Copy: Danielle Phyland, Tourism Marketing Coordinator

Kyneton Administration Centre 129 Mollison Street Hours: Mon–Fri 8.30am–5pm
Gisborne Administration Centre 40 Robertson Street Hours: Mon–Fri 8.30am–5pm
Romsey Service Centre 98 Main Street Hours: Mon–Fri 9.30am–5pm Open Thurs 9.30am–6pm
Woodend Service Centre cnr High and Forest streets Hours: Mon–Fri 9.30am–5pm Open Wed 9.30am–6pm

CHANGE CONTROL

VERSION 1	9 June 2010		Copied from shell document + Added additional headings based on recent changes to Guidelines
VERSION 2	29 June 2010	1200 words	Added Higinbotham Text from Steam Hammer nomination + completed Basic Data entry
VERSION 3	30 June 2010	1443 words	Added Basic Data
VERSION 4	2 July 2010	1651 words	Added Local Government Areas
VERSION 5	14July 2010	2118 words	Added some data, started text for Historical
VERSION 6	20 Dec 2010	9212 words	Work on Historical Notes and Appendices 1-4.
VERSION 7	22 Dec 2010	10807 words	Substantial completion of document.
VERSION 8	24 Dec 2010	11695 words body	Further work on Interpretation Panel Design
VERSION 9	26 Dec 2010	11737 words body	Check read.
VERSION 10	2 Jan 2011	12482 words body	Added material from site visit.
VERSION 11	2 Feb 2011	12781 words body	Comments from Dorings incorporated
VERSION 12	8 Feb 2011	12831 words body	Added current day dollar values and footnotes
VERSION 13	15 Feb 2011	13546 words body	Added 2 maps to Appendix 5. Reworked Statement of Significance
VERSION 14	17 Feb 2011	13650 words body	Minor editing.
VERSION 15	22 Feb 2011	14285 words body	Revision of Statement of significance.
VERSION 16	4 Mar 2011	14371 words body	Added railway length at 3.1.15
VERSION 17	7 Mar 2011	14371 words body	Changed name to Melbourne, Bendigo & Echuca Railway.
VERSION 18	7 Mar 2011	14371 words body	Added 1890 photograph of Bendigo Railway Station.
VERSION 19	19Mar 2011	15224 words body	Added NT Listings and Statement of significance.
VERSION 20	9April 2011	15224 words body	Added material from Ken McInnes
VERSION 21	30April 2011	17625 words body	Added appendix 8 on River Trade significance.
VERSION 22	7 May 2011	17625 words body	Added title in footer.
VERSION 23	25 June 2011	17715 words body	Minor edit and update index.
VERSION 24	6 Nov 2011	17773 words body	Corrections from Ian Thomas, Malmsbury Historical Society.
VERSION 25	11 Nov 2011	18130 words body	Corrections from Ian Thomas, Malmsbury Historical Society.
VERSION 26	16 Feb 2012	20901 words body	Add Statement of Significance by Carl Doring 3.2.10 to 3.2.12
VERSION 27	14 May 2012	20066 words body	Incorporated corrections from Carl Doring.
VERSION 28	14 May 2012	20144 words body	Incorporated Letter of Support from Macedon Ranges Shire .
VERSION 29	14 May 2012	19672 words body	Updated Interpretation Plan.
VERSION 30	14 May 2012	19672 words body	General edit and check.
VERSION 31	20 May 2012	20930 words body	Addition of section on Joseph Brady and some additional images.
VERSION 32	29 June 2012	21001 words body	Amendments to Interpretation Plan inc. adding Geelong panel.
VERSION 33	2 July 2012	21079 words body	Suggested changes by Carl Doring added.
VERSION 34	2 July 2012	21078 words body	Added Interpretation Panel design V1.