Puffing Billy: Success factors for Australia’s first and leading preserved operating steam railway

Graeme Breydon

Abstract
There is no doubt that Puffing Billy (running on track through the Dandenong Ranges near Melbourne) is Australia’s favourite steam train and a world-class example of railway preservation. But what lies behind the classic image of a Baldwin-designed tank engine on the Monbulk Creek Trestle Bridge? This paper will provide a brief history of the Puffing Billy Railway, with emphasis on the past fifty years when it grew from Australia’s first such heritage railway enterprise (and third in the world) to one of the top six globally. It will look in detail at the financial and operating profile of the railway today, also examining the location, management structure and product range. In particular this paper will explore the importance of: timing — being first into a marketplace and first to tap into a support base; location — in relation to scenery, destinations, proximity to other attractions, proximity to markets and proximity to volunteer base; product diversity — driving up visits and asset utilisation in what is fundamentally a fixed-cost business; and, management and volunteer skill-base — having the diversity of skills and a culture that accommodates a mix of volunteers and paid staff at all levels throughout the organisation.

Construction and ‘Victorian Railways’ operations
The Puffing Billy Railway between Belgrave and Gembrook is all that remains of the 18½ mile (29.75 km) 2'6” (762.5 mm) gauge line, which originally operated from Upper Ferntree Gully from 1900 to 1953 (Cuffley 1987). The railway was closed on 30 April 1953 due to a landslide that blocked the track, but also because of sustained operating losses. In its original form the railway was one of four low cost narrow gauge lines constructed at the beginning of the twentieth century to open up remote areas of the state for settlement. The other three similar lines ran between Moe and Walhalla in the Baw Baw Ranges and Wanganella and Whitfield, both in northeast Victoria, and Colac and Crowes in the Otway Ranges in south central Victoria. Despite the initial economies of construction, narrow gauge railways proved expensive in labour. With the high costs of trans-shipping freight at the terminal interchange stations and the development of more efficient road transport, these little railways fell into decline, were closed and with the exception of Puffing Billy, dismantled. Due to its proximity to the city of Melbourne, the Upper Ferntree Gully to Gembrook railway became well known to Melbourne people for its scenic attraction. For two generations it served the community as a common carrier for farmers and timber cutters and a source of pleasure to picnic groups.

Preservation Society era
After the railway’s closure in 1953, public interest in the line with its friendly little train resulted in the formation of the Puffing Billy Preservation Society (PBPS) in 1955. Following formation of the Festiniog and Talyllyn societies in the UK, the PBPS was only the third such steam railway preservation group globally. However, several US tramway groups and groups restoring equipment for operation away from their original line also pre-date the PBPS. The PBPS was a self-help voluntary group which ensured the life of the train until 1958, at which time the only available section for operation was resumed by the then Victorian Railways (VR) to make way for the extension of an electric train network between Upper Ferntree Gully and Belgrave.

With the blessing of the Victorian Railways and assistance from the Citizen Military Forces, the PBPS threw its entire resources into restoration of the remaining part of the line, focusing initially on the Belgrave-Menzies Creek section. A new terminus was built at Belgrave, and the large landslide was bypassed and after considerable effort the little train returned triumphantly to the hills on 28 July 1962. In 1965 the next section, Menzies Creek to Emerald (township) reopened, followed by construction of carriage repair shops (1967) and a locomotive depot (1973-75). The period 1973 to 1975 also saw rebuilding of the Emerald-Lakeside section.

By the early 1970s, with annual patronage climbing steadily from 125,000 to 165,000, it was evident that the venture was successful, but the administrative arrangements between VR and PBPS were grossly cumbersome. The Society knew that change was necessary if success was to be sustained. In 1973 the investigations and negotiations for a better structure commenced.

The Emerald Tourist Railway Board and consolidation
The Emerald Tourist Railway Act 1977 formed the Emerald Tourist Railway Board to assume ownership and control of the railway from the Victorian Railways from 1 October 1977. The Act specified that the Society would nominate four board members. Over time, it became customary for the government nominees to also be appointed from within the Puffing Billy family, giving the Society effective day-to-day control of the enterprise in an era where direct transfer of public assets to a private organisation would not have been acceptable.

When operations commenced in the early 1960s, there were only two operating locomotives: 6A and 7A. In the later part of that decade 14A was also added, followed by 12A in the early 1970s. They were owned and maintained by the Victorian Railways. It is fair to say that although the locomotives were overhauled in some form, in reality they were past the point of
economic life and were not reliable compared with today's standards. This was at the time the main reason why the PBPS approached the state government to take ownership of the railway including all four available NA locomotives. When the Board was formed in 1977 the then new running shed was fitted out with some general machine tools and became the PBR engineering workshops. The first major locomotive capital project for the Board was the complete rebuild of locomotive 8A; which was purchased from the Beaumaris City Council. At the completion of this project in 1982 the locomotive was returned to traffic, complete with a brand new all steel-welded boiler.

For a very short period the PBPS was fortunate to have five NAs at their disposal. Soon afterwards 12A and 6A were removed from traffic, in very poor condition. In the early days of the Board it was identified that the boilers of the running fleet would have to be replaced sooner rather than later. Subsequently four new boilers were purchased and fitted as locomotives were progressively overhauled. At one point in the summer of 1984 only one locomotive was available for traffic. Locomotives 8A, 7A and 14A were the only ones available in the 1980s. At this time 12A was in workshops for a major rebuild and which was not completed until 1992 (Gardner 2005).

Carriages underwent a similar massive re-build program with marine ply replacing rotted tongue-and-groove board sides and roofs, stripping down of bogies, rebuilding of worn couplers, and a program of periodic under gear inspections and annual lifts. Much of this work was done in primitive conditions, often in the open air and with inadequate lifting gear, usually hand-powered. Additional carriages were constructed to accommodate wheelchair patrons and meet growth in patronage. A similar effort was put into upgrading the track in the 1980s, with re-railing and installation at steep places over the entire operating section, progressive eradication of blackberries, rebuilding of drainage, and significant re-construction of the Monbulk Creek Trestle Bridge. Although some shortcuts were taken, (such as ‘stealing’ good-condition roofs, striping down of bogies, rebuilding of worn couplers, and marine ply replacing rotted tongue-and-grove board sides and roofs, stripping down of bogies, rebuilding of worn couplers), the blackberries, rebuilding of drainage, and significant re-

Puffing Billy today
(The following collated from Emerald Tourist Railway Board Annual Reports)

<table>
<thead>
<tr>
<th>KPI</th>
<th>2000/01</th>
<th>2001/02</th>
<th>2002/03</th>
<th>2003/04</th>
<th>2004/05</th>
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<tbody>
<tr>
<td>Passengers</td>
<td>256,091</td>
<td>259,185</td>
<td>244,851</td>
<td>238,199</td>
<td>248,852</td>
</tr>
<tr>
<td>Ticket Revenue</td>
<td>$3,353,749</td>
<td>$3,523,090</td>
<td>$3,456,002</td>
<td>$3,389,319</td>
<td>$3,714,837</td>
</tr>
<tr>
<td>Shop Sales</td>
<td>$638,611</td>
<td>$667,060</td>
<td>$617,437</td>
<td>$629,971</td>
<td>$793,945</td>
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<tr>
<td>Contracts</td>
<td>Nil</td>
<td>$337,162</td>
<td>$514,862</td>
<td>$140,922</td>
<td>$296,213</td>
</tr>
<tr>
<td>Grants (PBPS)</td>
<td>$73,999</td>
<td>$120,000</td>
<td>$176,000</td>
<td>$150,00</td>
<td>$282,120</td>
</tr>
<tr>
<td>Grants (Other)</td>
<td>$215,170</td>
<td>$53,016</td>
<td>$224,000</td>
<td>$734,420</td>
<td>$320,472</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>$4,486,582</td>
<td>$4,920,822</td>
<td>$5,200,427</td>
<td>$5,250,844</td>
<td>$5,804,969</td>
</tr>
<tr>
<td>Days Operated</td>
<td>364</td>
<td>364</td>
<td>364</td>
<td>365</td>
<td>364</td>
</tr>
<tr>
<td>Revenue Trips</td>
<td>1801</td>
<td>1605</td>
<td>1555</td>
<td>1555</td>
<td>1571</td>
</tr>
<tr>
<td>Train km</td>
<td>47,984</td>
<td>46,762</td>
<td>50,405</td>
<td>49,103</td>
<td>46,251</td>
</tr>
<tr>
<td>Steam Haulage</td>
<td>93%</td>
<td>95%</td>
<td>90%</td>
<td>93%</td>
<td>95%</td>
</tr>
</tbody>
</table>

Additional statistical information is set out in an appendix to this paper.

The climb to Gembrook
It was not until 1988 that the organisation felt it was ready to tackle further extension beyond Lakeside and 1990 before a substantial start was made on the final ten kilometres towards the goal the Society has set itself in 1955. Some $2.26 million was raised for the civil engineering works including track, four bridges, level crossing equipment and station works (See Rails to Gembrook 1998 for details of the project). With the planning and subsequent opening of the Lakeside to Gembrook section the rebuild of Loco 6A was approved. After a five-year rebuild costing in the order of $600,000, 6A entered service in 2002. The long-term restoration of locomotive G42 was completed in 2004 with a completion cost of $1,700,000. Because the restoration took over twenty years to complete, in today's terms it would be around $2,500,000. In addition, construction of six steel-bodied NBH-type carriages was authorised to meet the expanded service needs, and major reconstruction of Lakeside Station (to provide two platform faces) was undertaken. The re-opening to Gembrook was celebrated in late 1998 and the 1998-99 financial-year saw a new (then) record annual patronage of 247,000 achieved, only to be broken in 2000-01 and again 2001-02 when a peak of 259,185 was reached.

Global comparisons
People often wonder how Puffing Billy’s passenger numbers compare to those of other Preserved Steam Railways. Although it is hard to get comprehensive comparable data there are certainly several busier preserved steam railways in the world than Puffing Billy, including the Strasburg Railroad, in Pennsylvania, USA, with some 390,041 passengers and the United Kingdom’s North Yorkshire Moors Railway with 304,000 passengers in the 2004 calendar year (Federal Railroad Administration 2005; Heritage Railway 2005). Nevertheless, it is certain that Puffing Billy ranks among the top half dozen, and that it is the busiest of the narrow gauge preserved lines.

Success factors
That such a busy undertaking has developed in Australia, with its lower population density than the US or UK, is at first glance
surprising. However, there are a number of factors that contribute to this. Some might be able to be reproduced by other similar ventures today but many are unique to the time and place concerned.

**Timing**

Puffing Billy was one of the first active heritage attractions in the Melbourne recreation market. It provided involvement and movement at a time when other heritage attractions, stately homes for example, were static and pre-dated the emergence of the open-air heritage parks. Puffing Billy was also first to tap into the Melbourne rail fan support base, though until the late 1970s this did not extend to driving, firing or acting as guard. Victoria now offers multiple choices for such people wanting to have some hands-on operating involvement.

**Location**

Puffing Billy is blessed with a location that provides: interesting scenery for patrons; a destination (Emerald Lake Park) rather than just a train-ride; proximity to other attractions for interstate/international tourists on a tight schedule or packaged day-tour; proximity to a large market (Melbourne suburbs for the locals and the city hotels for visitors); and, proximity to a large volunteer base.

**Product diversity**

A single railway line is fundamentally a fixed cost business, especially if much or all the labour is ‘free’ (although certainly not unlimited). Everything from land management costs to insurance, to sleeper replacements to carriage lifts and locomotive overhauls is more a function of time rather than of usage. Therefore using the same assets for multiple products can be financially attractive. Multiple products also generate reasons for return visits. Puffing Billy has developed a range of products including: family picnic trains to Emerald Lake Park, journeys by couples to Gembrook township with its country pub, interesting shops and monthly market, day out with Thomas the Tank Engine for younger kids and grandparents, the luncheon special and the dinner special (including weddings) plus events such as the Great Train Race and Santa specials. The diversity also provides protection against cyclical booms and busts with particular products.

**The Culture and Skill Base**

For the entire preservation era Puffing Billy has had a tradition of paid staff and volunteers working together, firstly with Victorian Railway’s crews and then with the organisation’s own support staff. The protocols for such mixed teams at all levels in the organisation are mature and therefore not a source of significant conflict. There is widespread recognition that staff are there to support what is predominantly a volunteer run and managed railway and that, given the intensity of activity, volunteers cannot function without such support and supplementation. That said, a further strength is the diversity of technical and managerial skills and expertise available within the volunteer ranks. Railways are complex operations requiring consideration of a host of issues ranging across marketing, finance, law, engineering, town planning, IT, communications and many other disciplines besides railway operations. Given a competitive marketplace and increasing regulatory pressures, organisations cannot just maintain and run locomotives, live on the residual life of inherited track and carriages and rely on passing trade plus a cargo-cult mentality to sourcing of government grants for improvements.

**Appendix**

Every year some 250,000 people enjoy a ride on Australia’s premier preserved steam railway, Puffing Billy. They journey happily through the hills behind a great steam engine and return home happy after their experience ‘into the past’.

Few of these people give any thought to the extensive behind-the-scenes activity that goes into running the train and its railway. It is a nineteenth century railway still operating with the technology of that time, although some modern enhancements have been made such as level crossing warning lights and bells. The railway is very labour-intensive, something that people in the nineteenth century did not consider a disadvantage. There are no spare parts shops for steam engines and carriages. They must be made from scratch, often using techniques that are unknown by the tradesmen of today. For this reason, the railway must do nearly all of the repairs and servicing of rolling stock and motive power.

The cost of this is enormous. For example, coal is brought to the railway from New South Wales and Queensland collieries. By the time the coal is delivered by large trucks to our site at Belgrave the cost is over $140 per tonne. One trip will usually use just over one tonne. The cost of maintaining our Locomotive fleet is in excess of $500,000 each year.

The weight of a NA Class Locomotive is 34 tons 15cwt or 35 tonnes. The total length of the locomotive is 30 ft. 9ins. (9.4 m) over the buffers. The wheelbase is 21ft 10ins or 6.7 m. The normal operating steam pressure of the locomotive is 180 lbs per square inch.

On a return trip from Belgrave to Lakeside each locomotive consumes some 500 gallons (2,300 litres) of water and 1120 pounds (508 kg) of coal. The coal used on the railway comes to Belgrave by road transport from New South Wales and Queensland.

The Railway’s Rolling Stock currently comprises:

- **SNA Class Locomotives**: 31 open carriages
  - 1 ‘Climax’ Locomotive
  - 1 ‘G’ Class Locomotive
  - 1 ‘Peckett’ Locomotive
  - 2 ‘DeCauville’ Locomotives
  - 1 shunting Diesel Locomotive (NRT1)

- **Carriages**: 6 brakevan/passenger carriages
  - 4 Mt Lyell First Class carriages
  - 2 Brakevans
  - 22 Wagons
  - 2 mainline Diesel Locomotives (D21 and DH59)

The rail distance from Belgrave and heights above sea level are:

<table>
<thead>
<tr>
<th>Distance</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgrave</td>
<td>0</td>
</tr>
<tr>
<td>Trestle Bridge No 5</td>
<td>½ mile (1 km)</td>
</tr>
<tr>
<td>Selby</td>
<td>1½ miles (2.5 km)</td>
</tr>
<tr>
<td>Landslide</td>
<td>2½ miles (4 km)</td>
</tr>
<tr>
<td>Menzies Creek</td>
<td>3½ miles (5.5 km)</td>
</tr>
<tr>
<td>Clematis</td>
<td>5 miles (8 km)</td>
</tr>
<tr>
<td>Emerald</td>
<td>6 miles (9.5 km)</td>
</tr>
<tr>
<td>Nobellius Siding</td>
<td>6½ miles (10.5 km)</td>
</tr>
<tr>
<td>Nobellius</td>
<td>7 miles (11 km)</td>
</tr>
</tbody>
</table>
Lakeside 8 miles (12.5 km) 812 ft (247 m)
Wright 9 miles (14.5 km) 713 ft (217 m)
Trestle Bridge No 7 9½ miles (15 km)
Trestle Bridge No 8 10 miles (16 km)
Trestle Bridge No 9 10½ miles (17 km)
Cockatoo 11 miles (17.5 km) 619 ft (188 m)
Fielder 12 miles (19.5 km) 608 ft (245 m)
Bridge No 10 13 miles (21.5 km) 1057 ft (322 m)
Gembrook 15 miles (24 km) 1020 ft (311.8 m)

The mileposts situated along the line show the distance from Flinders Street Railway Station in Melbourne. Belgrave is 25.75 miles (42.5 km) from Flinders Street.

The road distance, Belgrave to Lakeside is 8 miles (12.5 km) and takes around 20 minutes to travel by car while to Gembrook adds a further 7 miles (11 km) and takes an additional 15 minutes travel by car. A local bus service also travels between Belgrave and Gembrook on weekdays.

The highest point on the line is near Fielder Bridge (1057 ft or 322 m above sea level). The lowest point is at the Trestle Bridge at Selby (662 ft or 202 m).

The steepest gradient occurs between Clematis and Emerald, nearly one mile averaging 1 in 30 – that is for every thirty feet travelled, the line rises one foot).

The maximum radius curve occurs at Landslide, 2 chains (132 ft.) 40 m radius. There are approximately 120 curves along the line, varying from 2 chains to 40 chains radius. The maximum line speed is 20 m.p.h. although in many places the speed is between 10 and 15 mph.

There are 17 level crossings along the line including 14 equipped with automatic flashing lights.

The rail gauge is 2ft. 6ins. (762 mm) between the inside edges of the rails. Rails are mainly 60-pounds/yard weight, with 66 pounds/yard on some sharp curves. Sleepers are laid at approximately 2,300 per mile and average 10 inches by 5 inches by 5 feet 6 inches in dimension (250 x 125 x 1650 mm).

The Trestle Bridge over the Monbulk Creek between Belgrave and Selby is 42 feet (12.8 m) high, has 14 spans and is 280 feet (85 m) long. However, the Trestle Bridge near Wright is 50 feet high, has 10 spans and is 200 feet (61 m) long.

The longest section of straight track is through Menzies Creek Station 825-ft (251 m). The only level stretch of line of approximately 400 ft. (121 m) is also located at Menzies Creek Station.

The Puffing Billy Preservation Society commenced restoration of the line between Lakeside and Gembrook in 1990. With much celebration the line to Gembrook was officially re-opened on 18th December 1998. The Railway also celebrated its 100th birthday on 18th December 2000 with a special Centenary re-enactment train to Gembrook.

All stations and railway buildings are connected by an internal automatic telephone system. There are some 186 telephone poles at a nominal spacing of 4 chains (70m) each. They are numbered from 1 to 186 starting at Belgrave to Lakeside. From Lakeside to Gembrook we utilise the public telephone system and in some locations along the line we have channelled underground.

The telephone wire used is 200lb/mile weight (3.1 mm diameter) galvanised iron. All trains and track trolleys have radio communication to our base at Belgrave, operating on a special frequency.

Puffing Billy trains can accommodate some 300 passengers depending on the number of carriages used on each train. Generally, the first train of the day is double headed (two engines) and can have 17 carriages. This caters for the many tour groups that ride on the train each day as part of organised tours of the Dandenong’s and other tourist regions.

There are specially designed carriages to accommodate passengers in wheelchairs. Trains operate every day of the year, except Christmas Day. Timetables vary throughout the year to cater for the holiday season. Generally, Puffing Billy operates three trains per day, however, on some key days up to six trains each day are operated.

Refreshment Rooms are located at our stations along the line and are staffed by volunteers. They sell hot and cold food and drinks and a variety of quality souvenirs including many publications.

There are over 950 members of the Society and a volunteer workforce in excess of 600.

**Bibliography**

Emerald Tourist Railway Board, Annual Reports.