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Workshops: the centre of railway

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Workshops are an essential part of a railway system. Their main functions include building new rolling stock and or locomotives, repairing, overhauling and maintaining locomotives, carriages and wagons.

"The main principle…[for]…laying out a workshop is that the various units of the shop should be so arranged in relation to each other that –

(a) Materials to be worked upon pass readily from operation to operation with a minimum of handling and interference with each other, arrangements being made for the heaviest materials to be moved the shortest distance and with a maximum of assistance from crane power;

(b) Operations of a similar character are located in the same vicinity to facilitate effective supervision and the maximum use of modern equipment and methods;

(c) With increase in production necessitating growth of workshops, the objectives referred to under (a) and (b) are unimpaired

"It is unavoidable that these considerations conflict with each other to some extent. In a plant manufacturing a single commodity it is a relatively simple matter to reconcile these conditions. In a workshop fulfilling the functions of both manufacturing and repairing locomotives, carriages and wagons, however, the lay-out is much more difficult and demands the most expert handling" (Harris & Cameron, 1929: 5).

❑ *Railway, railroad, workshop, locomotive, manufacture, museum, industrial, heritage.*

V. Macno
Arts Tasmania




The Ipswich Railway Workshops, built in North Ipswich in the late nineteenth century, were of their day. Although small by international standards and in some ways unequal to the complex logistics of locomotive manufacturing, they typify railway workshops from the late nineteenth century.

A common feature amongst railway workshops around Australia and the world was that there was often not enough thought to the future. The consequences of this can be seen in examples of railway workshops from across Australia and New Zealand that have been either upgraded, consolidated, closed or all three. Analysis of developments and operations of railway workshops provides clear evidence that they have all experienced change as a result of external factors and world trends such as changing political and economic climates, war, depression, technological changes and globalisation.

A brief historical and contemporary overview of a selection of railway workshops from Queensland, Australia and New Zealand, highlights some of the similarities and differences of the Ipswich Railway Workshops. Examining a selection of railway workshops that are either currently operational and or have been retained for heritage purposes from Australia and across the United Kingdom, the United States of America, Europe and Asia underlines the popularity of these places as centres of railway heritage. This examination also highlights the rarity of continued operation of the historical railway workshops at Ipswich (Figure 1).

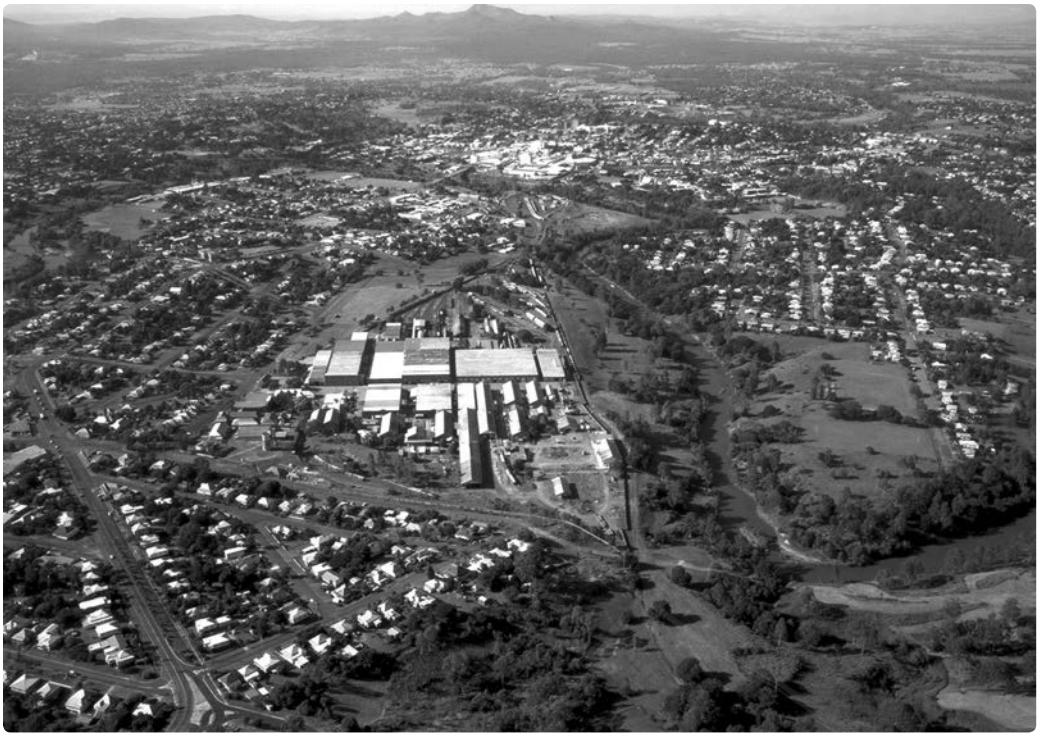

FIG. 1. Ipswich Workshops aerial view from the northern end. 1969. Image courtesy TWRM/QR..

THE RAIL REVOLUTION IN QUEENSLAND

When Queensland became a separate colony in 1859, Queenslanders faced the major challenge of how to overcome the state's vast distances with almost no roads and no suitable waterways. The Rail Revolution had swept through Britain in the 1830s and 1840s, transforming the country. Many Queenslanders who had emigrated from Britain had seen first-hand that rail was an efficient and reliable means of transporting goods and people.

A private company, the Moreton Bay Tramway Company, was formed to build the first line in the colony from Ipswich to Toowoomba. The Company was unable to raise sufficient finance and in 1863 the Queensland government agreed to build the first line. This was a significant decision, as it established the policy that the main rail network in the colony would be publicly, rather than privately, owned. This was different from the main rail networks in Britain and North America, which were developed by private companies but reflected a common occurrence in Australia where in almost all the states the State government assumed responsibility from failed commercial initiatives for the operation of railways.

In 1863, the Queensland Parliament authorised the construction of a line from Ipswich to Toowoomba. Ipswich rather than Brisbane was chosen as the terminus because it was a port and in the early 1860s boats could still navigate the Bremer River. Toowoomba was selected as the destination because it was the centre for the Darling Downs, which was developing as a rich wool growing area.

The story of rail in Queensland did not have one beginning but several. Queensland's first major network developed from Ipswich but other networks began from Rockhampton (1867) and Townsville (c.1880). Smaller lines were also built from Maryborough (1881), Bundaberg (1881), Mackay (1885) and Cairns (1887). A British firm of railway builders, Peto Brassey and Betts, was awarded the contract to construct the first stage from Ipswich to Bigge's Camp, now Grandchester. The opening of the first railway line was celebrated on 31 July 1865.

Queensland had joined the Rail Revolution.

IPSWICH RAILWAY WORKSHOPS

The start of the railways in Queensland required provision being made to receive permanent way material and rolling stock. These were brought out in sailing vessels from England to Moreton Bay and then forwarded to Ipswich using small paddle steamers along the Brisbane and Bremer Rivers to a small wharf on the river's north bank just below the Immigration Depot. The first rails were laid from this wharf to the yards at North Ipswich. Early loads of material were hauled to the workshops by teams of horses. This process continued till the first four locomotives arrived (named Premier, Faugh-a-Ballagh, Lady Bowen and Pioneer). A receiving store and several small sheds were erected to receive the rollingstock. This was the start of the first railway shops in Queensland (W.B.D., 1910, cited in McDonald, 2001: 367).

The Ipswich Railway Workshops, located in North Ipswich, were an essential part of Queensland railways (Figure 2). Here, generations of blacksmiths, carpenters, painters, metalworkers and other craftsmen built, repaired and maintained locomotives, wagons, carriages and rail motors. The development and construction of the Ipswich Railway Workshops happened over a number of years. They were first established in 1864, and were used initially

to assemble and maintain the locomotives and rolling stock imported from Britain. As the first railway workshops in Queensland they were a significant part of Queensland's first railway, which was constructed from Ipswich to Bigges Camp (now Grandchester) and opened in 1865 (Buchanan et al, 1995).

It was reported in the 1879 Select Committee Report that "the Ipswich shops are well provided with shed accommodation, and with admirable tools amply sufficient for all purposes of repairs, and not inadequate for construction purposes, if that should be required" (Anon 1879: 4). The Select Committee was established "…to inquire into… the past and present working of the Railway Workshops at Ipswich, Toowoomba and Rockhampton…".[1]

As the railway system developed and expanded, the Workshops site became overcrowded. They were expanded from 1884 to 1888, into a location about one kilometre north of the original site, and became the largest in the State. From 1900 substantial brick structures were constructed either side of a central traverser linking the workshop buildings. A number of railway sidings linked some of the workshops. The workshop buildings were extended as the workload increased. The new buildings and extensions reveal marked variation in both construction materials and design. [2]

One of the main external factors to influence the Ipswich Workshops was the advent of World War II when very little new work was carried out due to heavy production associated with the war effort, extended work schedules and scarcity of materials.

With the ascendancy of workshops at Redbank, activities at the Ipswich Railway Workshops were dramatically scaled down. In 2002 a museum was opened on part of the site. The Ipswich Railway Workshops have continued operating alongside the museum, servicing QR's heritage fleet. The establishment of a museum at the site of a railway workshops is common at many other former railway workshop sites, however the continued operation of the Ipswich Railway Workshops in parallel with the operation of a museum is unique in Australia.

FIG. 2. Ipswich Railway Workshops overall view of the northern end, including Powerhouse c.1920. Image courtesy TWRM/QR.

TOOWOOMBA WORKSHOPS

Because of the isolation of the railway systems within South East Queensland and the central coast and as the railways were developed individually without connection, it became necessary to establish railway workshops around other parts of Queensland, in addition to the main workshop at Ipswich. It was noted in the 1879 Report of the Select Committee that the workshops at Toowoomba (established in c.1867) were little more than a "… temporary repairing shop…".[3] Despite this, the Toowoomba Workshops continued to be expanded and refurbished over the years and included new machine tools in 1879, a new wagon repair shop in 1901 and more machinery in 1914 (Figures 3 and 4).

FIG. 3. Construction of Toowoomba Locomotive Sheds, c.1910. Image courtesy TWRM/QR.

Work began in 1919 to build a locomotive depot at Willowburn and new workshops were built in 1928 to replace facilities in the Toowoomba yard. The 1928 Queensland Railways Annual Report (QRAR) noted that

> the important work of providing better accommodation for the stabling and repair of locomotives at Toowoomba is almost completed, and the transfer of the depot from Toowoomba to [nearby]

FIG. 4. Willowburn Roundhouse, plus the Workshops, Toowoomba, c 1930. Image courtesy TWRM/QR.

> Willowburn will be effected shortly (QRAR, 1928: 30).

The new Willowburn Depot was to provide a roundhouse for 29 engines and an elevated gravity coal stage of 390 tons coal capacity. The 1928 Report also noted that "… after a recent inspection, a high railroad official from America referred to this depot as the finest "lay out" of a locomotive depot he had ever seen" (QRAR, 1928: 30).[4] The Willowburn Workshops were periodically upgraded and are still operational today.

ROCKHAMPTON RAILWAY WORKSHOPS

The original Rockhampton Railway Workshops were constructed on an old gaol site and established c.1876, following Ipswich and Toowoomba. It was the third main Government Railway Workshops to be established in Queensland (EPA, nd). They consisted of a partial roundhouse (erected in 1877) with seven roads, that had been redeveloped from the former Machine Shop and Electricians Shop on the railway reserve area bounded by Denison, South, Campbell and Stanley Streets. The location was changed in the early part of the twentieth century. Changes to the administration of the railways in the early 1910s led to a state wide expansion in infrastructure and the construction of many new facilities. In October 1909 estimates and plans were prepared for a new Roundhouse, completed in November 1914, for the Rockhampton Workshops with triple the capacity of the existing building (EPA, nd).

In the 1910 Queensland Railways Annual Report, the Locomotive Engineer stated that although

> …[the Rockhampton] Workshops were built many years ago, and, though they have done good service, the time has now arrived when the question of providing larger shops, equipped with modern machinery, tools, &c., should be considered" (QRAR, 1910: 97).

Construction on the shops was slightly delayed due to the shortages caused by the World War I. As a result there were discussions about expansion and by 1918 a number of new locomotive workshops were completed and included up to date plant and equipment; a Machine Shop, a Paint Shop, a Carriage Repair Shop; the Timber Mill, the Boiler Erecting Shop, the Coppersmith's and the Electrician's Shop (Figure 5).

FIG. 5. Rockhampton Workshops and Roundhouse, c.1920. Image courtesy TWRM/QR.

The Rockhampton Railway Workshops demonstrates the evolution of the Queensland Railways system and the growth of the Central Division based in Rockhampton. The site, including the Roundhouse, workshops buildings, tracks and other buildings spread over a large area, provides evidence that Rockhampton was historically a major railway terminus (Figure 6). The Rockhampton Roundhouse in particular is significant as the only example of a full circle roundhouse in Queensland, and as one of only two extant examples in Australia. The Rockhampton Railway

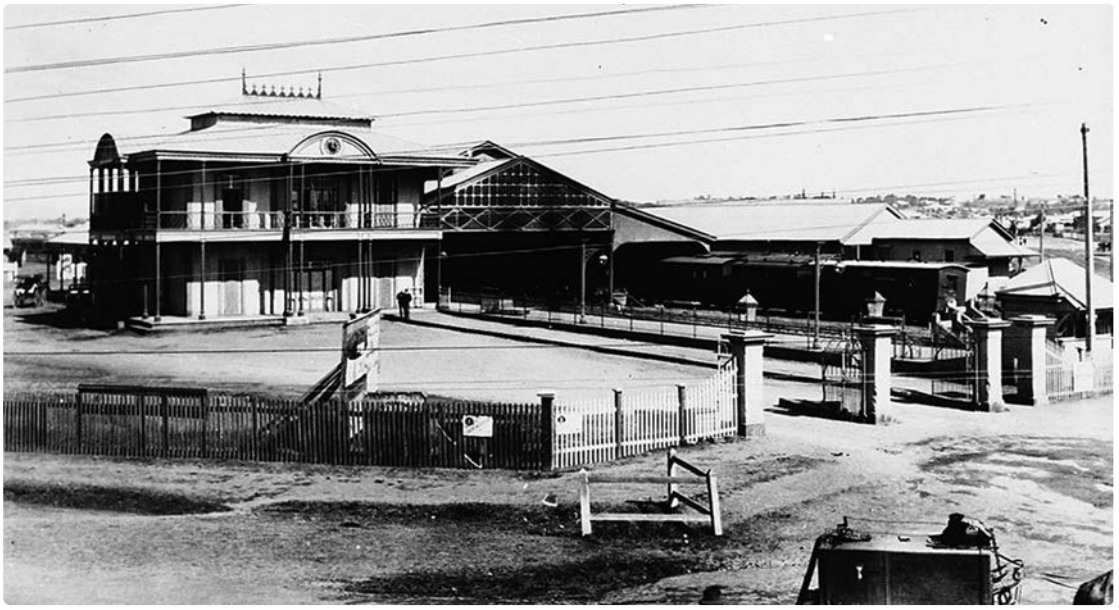

FIG. 6. Rockhampton Station with original entrance gates, c.1900. Image courtesy TWRM/QR.

Workshops, particularly the Roundhouse, demonstrates the evolutionary change of the motive power of Queensland Railways from steam to diesel-electric and electric.

The Rockhampton Railway Workshops continue to function as an operational workshop maintaining and repairing rolling stock. Buildings are used for the repair of wagons, for the modification of wagons and locomotives and for general running maintenance. The Rockhampton Railway Workshops are recognised as the major workshop site for QR National in north Queensland (QR National, nd). Today, the Rollingstock and Component Services (RACS) Group is responsible for the overhaul, manufacture and heavy maintenance requirements of an extensive rolling stock fleet, (which include locomotives, wagons and carriages) and also manages component maintenance for rolling stock. In 2008 there were 480 employees and it continues to be a major contributor to the local economy and community. RACS Rockhampton specialises in the repair and overhaul of electric and diesel locomotives, wagons, wheels and rollingstock components.

OTHER QUEENSLAND WORKSHOPS

The Townsville Workshops were developed in two phases. The first was the North Yard established in c.1880 and closed in June 1996. (Figures 7 and 8) These yards were at their peak during the 1930s with over 1000 workers employed. The second phase was the South Yard which began operating in 1940 and is still in use today (EPA, nd). The CEO for QR in 2007, Lance Hockridge, commented during a visit to Townsville at the time that "…Townsville is QR's major northern centre not only for East Coast passenger and freight services, but also as the connection for the vital freight corridor to the North West mineral province…" (QR National, 2007).

The Northgate Workshops, approximately 9km north east of the Brisbane CBD, were opened in 1915 to "supply station

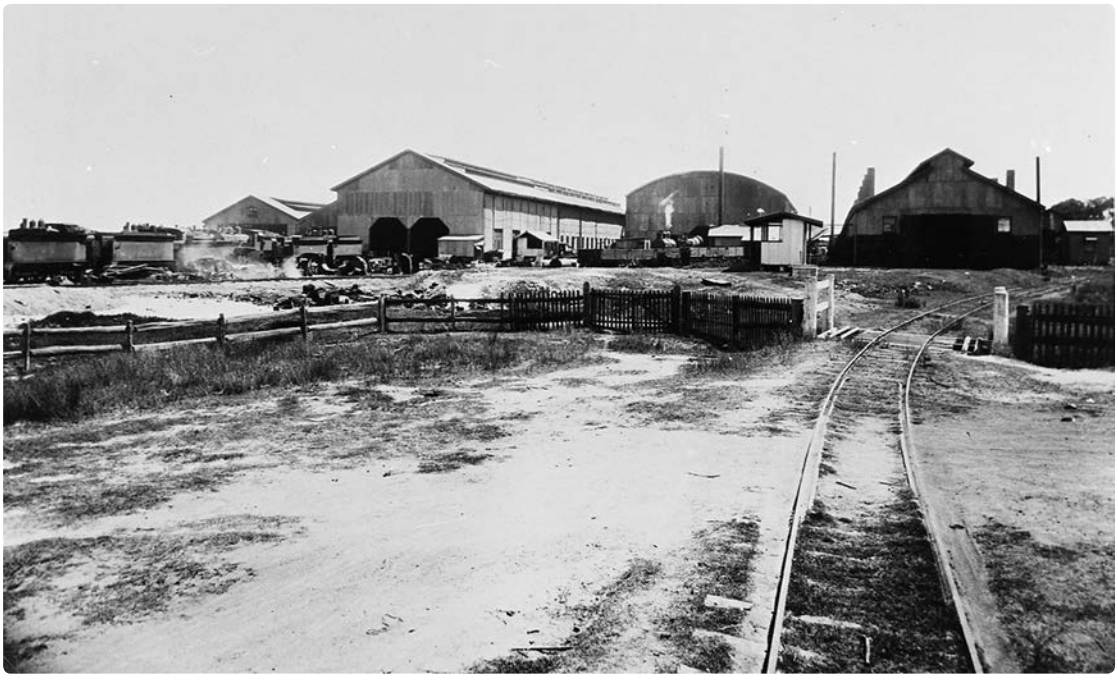

FIG. 7. Townsville Workshops, showing a view of the western end, the Blacksmith Shop, Boiler Shop, Erecting and Running Sheds, 1936. Image courtesy TWRM/QR.

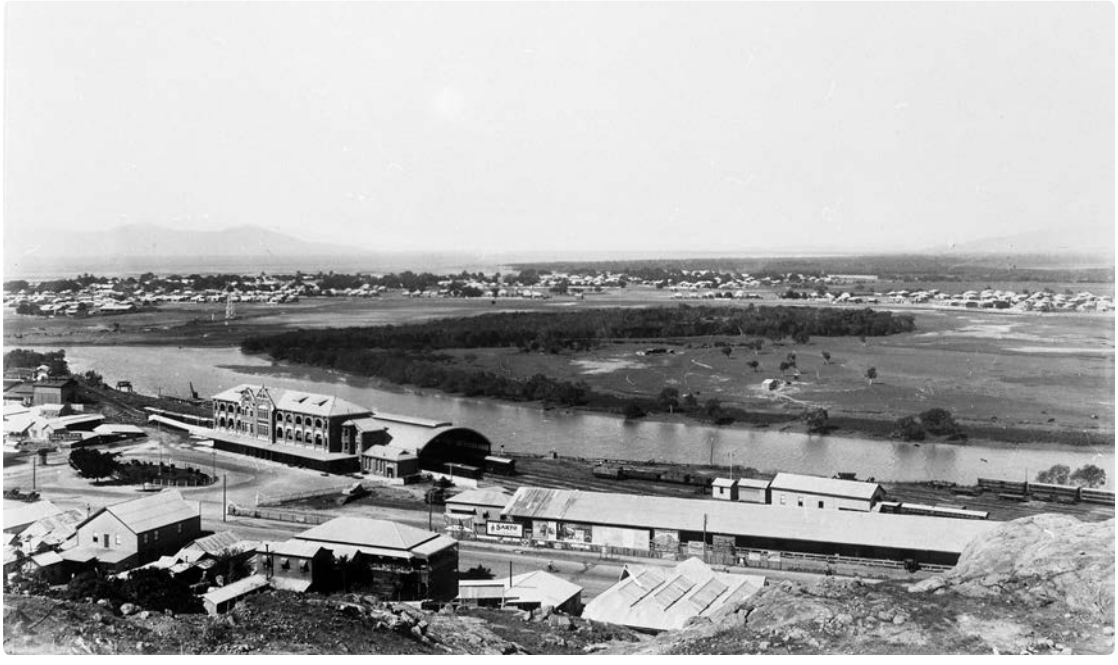

FIG. 8. Townsville Railway Station, Workshops and town, c.1920. Image courtesy TWRM/QR.

furniture, bridges, buffer stops, signals, track maintenance, vehicles, concrete castings and to repair motor vehicles" (Kerr, 1998: 180). Land was acquired in 1949 for additional space at Banyo to facilitate the expansion of the engineering branch. In 1950, plans were drawn up for the complete relocation of the Northgate workshops to Banyo. The transfer was complete by 1960 and the Northgate Workshops closed in 1985 (Flesser, nd).

REDBANK: THE CENTRE OF EXCELLENCE

By 1950, the principal railway workshops at Ipswich, Rockhampton and Townsville had reached the stage where they were incapable of effective and efficient expansion within their existing sites. The first step was to establish new modern workshops at locations that would allow for ample expansion and future development. The Queensland Government approved the resumption of approximately 240 acres at Redbank, 307 acres at Parkhurst near Rockhampton, and 502 acres at Stuart near Townsville (Queensland Railways, 1950).

The construction of a new railway workshop at Redbank, which opened in 1958, and the reduction of steam locomotive operations saw the decline of the Ipswich Railway Workshops (Buchanan et al, 1995). Redbank was selected because of its reasonable proximity to Ipswich where the great bulk of the workshops employees live, whilst also reducing the journey for those employees who live in Brisbane (Queensland Railways, 1950).

A contemporary comment in a Queensland Rail publication, *What Have We Done*, stated in 1956, that

> the basic concept of the [Redbank] workshops is one of modern up-to-date equipment housed in well ventilated and adequately lighted buildings which have an external appearance possessing architectural appeal. The whole layout has been designed to ensure the easy passage of rolling stock through the various stages of service and repair. The shops are large enough to prevent congestion (Queensland Railways, 1956: 31-32).

In 1984 the Workshops were extended to include additional capacity to overhaul diesel-electric locomotives and overhead crane runways were extended to cover this new facility (QRAR, 1984: 5-9). In July 1993, it was announced that Redbank would be developed as a "Centre of Excellence" and would receive a $40 million upgrade (Buchanan, 2004: 152). In 1994, tenders were called for the first upgrade to be completed by 1997, making the layout and design of the Redbank Railway Workshops the "…most efficient enterprise of its kind in Australia" (QRAR, 1994: 19).

LOCOMOTIVE DEPOTS IN QUEENSLAND

Running maintenance and repairs were undertaken at many locomotive depots across the state. These included Roma, Mayne, Maryborough and Normanton. Most of these depots have been closed. The depot at Roma Street, Brisbane, opened in c.1875 and was relocated to Mayne in 1927. The main reasons behind the relocation are stated in the 1894 Queensland Rail Annual Report and included the difficulties in repairing the locomotives and rolling stock in the Southern Division, detachment from the Ipswich Railway Workshops and the shops at Maryborough being too small to meet the increased demand (QRAR, 1894: 56). By 1950, Mayne Junction [was]…a self-contained rolling-stock depot, conforming to modern railway practice, and containing complete facilities for the cleaning and repair of locomotives and carriages, and the

marshalling and repair of wagons" (QRAR, 1950: 20).

The function of this depot was reduced to only include the wheel lathe, for re-profiling locomotive wheels, because it was too costly to move.

The Maryborough Workshops began operation in c.1880. The 1929 Royal Commission recommended that once the capacity at the Ipswich and Rockhampton workshops increased "…the responsibility for major overhaul of locomotives, cars and vans should be transferred from Maryborough to either or both of these locations" (Harris and Cameron, 1929:6). The 1985 Queensland Rail Annual Report reported that the reorganisation of the Maryborough Workshops was proceeding. This was to involve "…the consolidation of facilities including either demolition or upgrading…to suit the limited role planned for [this] centre" (QRAR, 1985:11). It was completely closed by 1987. More recently, Downer EDI Rail operated the commercial company that designed, manufactured and serviced a range of rolling stock and locomotives in Maryborough and elsewhere. Downer Edi Rail was formed partly as a result of a merger of Walkers Pty Limited, which began operations in Queensland in 1868, and Clyde Engineering which was formed in 1898 (Downer Group, nd) and the company continues to evolve.

Other minor workshop facilities were provided at loco depots, established in the 1880s in and around Queensland. These include Bundaberg, Gympie, Mackay, Cairns, Emerald, Wolloongabba, Alpha, Innisfail, Wacol Wagon Repair Shop, Charters Towers, Cloncurry, Hughenden, Wallangarra and Warwick. With the development of the central Queensland coalfields, major railway depots have been built at Jilalan, Coppabella, Pring and Callemondah to service locomotives and repair wagons.

WORKSHOPS IN NEW SOUTH WALES

The network of railway workshops in New South Wales included locomotive workshops at Eveleigh, Cardiff, Chullora, the Wagon Maintenance Centre at Clyde, Railway Workshops at Newcastle, Bathurst and Goulburn, the Electric Car Workshops at Chullora (Elcar), the Suburban Car Workshop Redfern, and S.T.S at Chullora (New South Wales State Records, nd).

The Eveleigh Railway Workshops site in Redfern (Sydney) represents the phenomenal growth of the railway system that took place in the late nineteenth century and early twentieth century. They started in 1887 and were once the largest and most technologically advanced workshops in the southern hemisphere. They were originally conceived in 1872-75 by John Whitton, who was one of the most influential figures in the history of the New South Wales railways. The main functions performed at these workshops included building and overhauling rolling stock and locomotives, manufacturing metal components and upholstering and painting train carriages (Taska, 2003: 68). They lasted over 100 years.

By the early twentieth century the Eveleigh Railway Workshops (Figure 9) were employing over 3000 workers and due to the excess of work new workshops were built at Cardiff, near Newcastle, in 1927 and Chullora in 1937. The decision to build workshops at Cardiff was based on several factors including the growth and expansion of the Eveleigh Workshops, rail access and the site's close proximity to the city and residential centres enabling the utilisation of local labour (Preston, 1978). In the 1950s nearly 5000 workers built numerous steam locomotives and railway carriages every

FIG. 9. Railway Running Sheds, Eveleigh, 1892. Image courtesy State Library New South Wales, Image No GPO 1 – 08115.

year and repaired many hundreds more (Department of Sustainability, Environment, Water, Population and Community, nd).

The end of the Eveleigh Railway Workshops was primarily the result of organisational reforms introduced to the New South Wales railways in the early 1980s which were in essence a response to the economic recession of the times, the railways long standing public debt, economic rationalism and market driven politics (Taska, 2003: 68). The Eveleigh Railway Workshops site is now under the planning and development administration of the Redfern-Waterloo Authority which was established in December 2004.

Today, one of the main occupants at Eveleigh is the Australian Technology Park. The Park covers 13.9 hectares and is the premier scientific and technological research and development facility for New South Wales. It is home to approximately 100 Australian technology companies and over 1,200 employees. There are a number of projects being discussed and planned by the State Government for the site at a total estimated cost of $1.3 billion, including $550 million capital development cost. The site is destined to become a residential, commercial and cultural community with an increase for the Australian Technology Park's commercial capacity, 1260 residential dwellings, new community and cultural spaces, an upgrade of Redfern Station and the adaptive use of some of the heritage buildings (Redfern Waterloo Authority, nd).

The Civic Railway (Honeysuckle) Workshops in Newcastle began operation in 1856 and included a Locomotive Shed, a Carriage Repair Shop, a Carriage Painting Shop, a Machine Shop and a Blacksmith's Shop. They closed in 1958 when its functions were moved to the Chullora Workshops. The Goulburn Railway Workshops began operating in the 1870s and were one of the major railway centres in New South Wales. Like many other towns around Australia, Goulburn relied on the railway for its growth and development.

Today the Sydney CityRail network is serviced by four maintenance depots at Mortdale, Hornsby, Flemington and Redfern.

VICTORIAN WORKSHOPS

The first government railway workshops in Victoria began in 1858 at Point Gellibrand, Williamstown (Figure 10), to assemble locomotives and carriages imported from Britain (Australian Heritage Places Inventory, nd).

As the Williamstown workshops became quite inadequate for their task, the Board of Lands and Works relinquished its control which resulted in the railways becoming a separate entity and the creation of a new cabinet post — the Minister for Railways (Doenau, 1979: 250). After the 1880 International Exhibition closed, the Railways bought three annexes of the Exhibitions Buildings and erected one at Newport where it was used as the Newport Carriage Workshops. In 1883, the architects Breretin

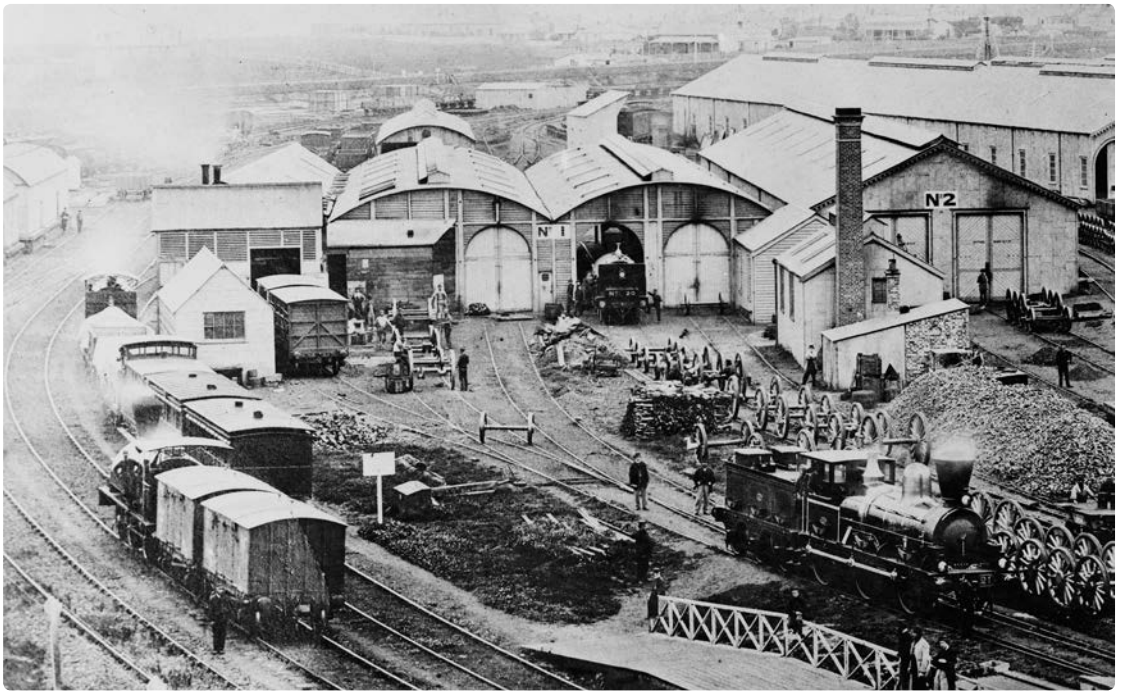

FIG.10. Railway Workshops Williamstown with 'O' Class and 'L' Class steam locomotives. Image courtesy Public Record Ofice of Victoria, Image Ni 12800P1.

and Lewis prepared designs for a new and much more ambitious railway workshop complex to be erected at Newport. This new complex was based on the design of British railway workshops and was constructed and equipped between 1886 and 1888 (Australian Heritage Places Inventory, nd). There were major expansions between 1905 and 1915, from 1925 to 1930 and again from 1939 to 1945 (Figure 11). At the peak of its operations in 1930 the staff at the Newport Railway Workshops increased to over 5000 workers. This original group of workshop buildings continued in use until 1992.

FIG.11. Aerial view of the Newport Railway Workshops with Williamstown Rifle Range in background and Williamstown Cemetery in middle ground, c.1969. Image courtesy Pulic Record Office of Victoria, Image No IN5441.

Additional workshop facilities were established at North Ballarat, North Bendigo, Jolimont, Geelong, North Melbourne, Spotswood and West Melbourne. The workshops at Jolimont opened in 1917 with the electrification of the suburban railway network. The workshops initially converted

suburban passenger carriages for electric operation and later maintained electric trains (Museum Victoria, nd).

A policy of decentralising workshop operations in the early 1900s saw the establishment of additional workshops at Bendigo and North Ballarat from 1913 to 1917. Both facilities concentrated mainly on repairs and maintenance, however, from 1919 to 1922 they built a total of 26 steam locomotives between them (Museum Victoria, nd).

Today, the Department of Transport is the lead agency responsible for the development and management of the public transport network in Victoria. Its responsibilities are divided amongst several divisions and authorities, including the construction and maintenance of rolling stock. There are a number of engineering companies contracted to construct new trains and maintain and repair carriages, such as Alstom Australia in Ballarat, United Group Rail, Siemens Rail Services in Melbourne, VLine in West Melbourne, Bombardier at Dandenong and EDI at Newport.

TASMANIA

The Launceston and Western Railway commenced in 1871 and operated the first public railway line in Tasmania. The Tasmanian Government Railways took over the company in 1872. The Launceston Railway Workshops, at Inveresk, consists of individual buildings and groups of buildings that demonstrate the development of railway policy, engineering, trades and operations in Tasmania over a period of 125 years from 1875 to the 1950s. By 1890 Launceston had become the main workshops for state wide railway operations (Figure 12).

A contemporary account of the Launceston Railway Workshops stated that the railways

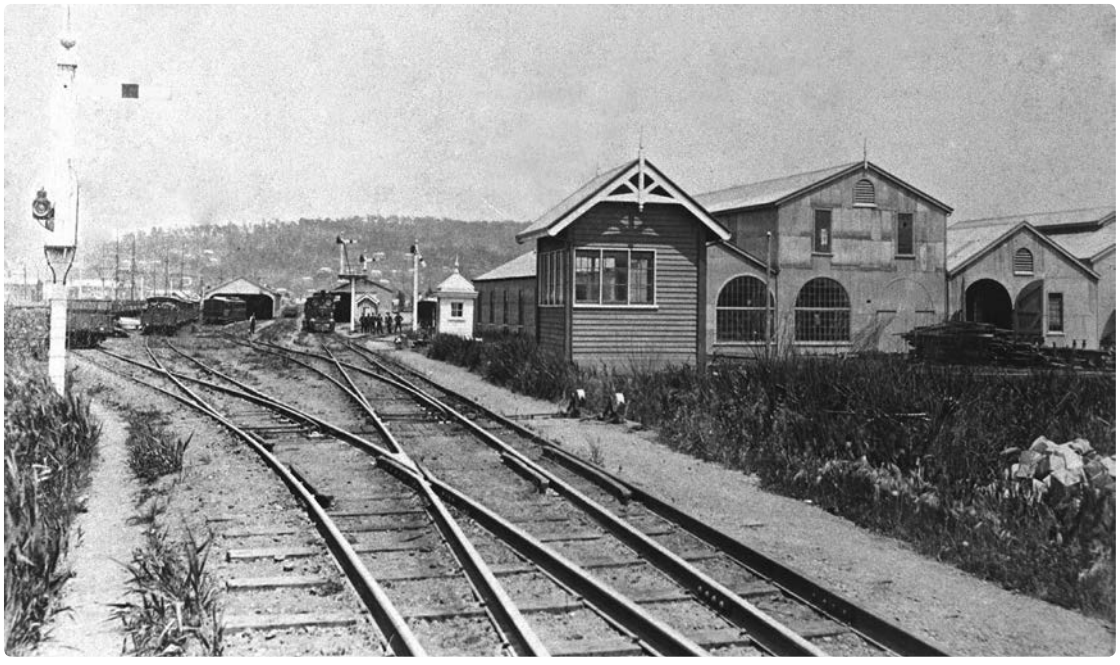

FIG.12. Launceston Railway Yard, c.1888. Image courtesy of the Sims Collection, Devonport Maritime Museum and Historical Society Inc.

'…undoubtedly played a foremost part in the development of the resources of the State and they must ever remain the chief carrying agency of the State' (Pratt, 1934: 615).

In 1993 the Australian National Railway relocated their workshop base to another site in Launceston and a year later all railway workshop activities ceased at Inveresk. In 2001 the Queen Victoria Museum and Art Gallery opened its Inveresk campus at the former Launceston Railway Workshops site.

The Tasmanian Main Line Railway began operating between Hobart and Launceston in 1876 with a locomotive shed and workshops alongside the Hobart railway station (but was soon after acquired by the Tasmanian government and amalgamated with the Launceston and Western Railway as part of the Tasmanian Government Railway). These facilities were extended from 1910 to 1915 and included a 42 bay roundhouse and workshop and a 75 ft (22.87m) turntable (Stokes, 2005).

The Emu Bay Railway Company was one of the longest lasting and successful private railway companies in Australia. It commenced operations in 1897 and used the same gauge, 3 foot and six inches (1.09 metres), as the Tasmanian Government Railway and Queensland Rail. The Emu Bay Railway Company was absorbed into Tasrail in 2004. An engine shed and workshops were located at Burnie for maintenance and repair of the company's rolling stock (Manny, 1961: 176).

WORKSHOPS IN SOUTH AUSTRALIA

The workshops were as crucial to the development of the South Australian railway system as they were to the development of the railway for the Colony as a whole.

The Islington Railway Workshops complex (Figure 13) was established in 1891 by the South Australian Railways Department and

FIG.13. Railway Workshops, Islington, c.1880. Image courtesy State Library of South Australia, Image No B4124.

continues as the major railway workshops and training centre for apprentices in South Australia (Australian Heritage Database, nd).

> …[the Islington Railway Workshops]…comprise an area of forty-seven and a half acres, of which eight and a half acres are under cover, while there are seven and a quarter miles of railway-line to facilitate the handling and transport of work from one department to the another. In extent, arrangement, equipment and general efficiency, it is claimed that this establishment is unsurpassed by any other…The various buildings are substantial structures of dressed stone, with brick facings, and the architectural style is uniform throughout… (Burgess, 1907).

The functions of the Islington Railway Workshops were transferred to Australian National in 1978 (Australian Heritage Database, nd) and has since been privatised.

Peterborough was originally settled to service the agricultural and pastoral endeavours of the 1870s. The railway officially opened there in January 1881 when the line from Jamestown

opened, connecting Port Pirie, Port Augusta, Adelaide and the mines at Broken Hill by rail tracks through Peterborough (Peterborough Tourism Inc., nd). Peterborough was one of the main locomotive depots servicing the 3'6" gauge network that operated through Peterborough to Broken Hill, in contrast to the 5'3" – broad gauge – network in the south eastern corner of the state serviced by Mile End (Fluck et al., 1986). Peterborough played a major part in the movement of the troops during World War II with troop trains moving throughout the state. Today the railway story is preserved in the Steamtown Museum, which is situated in part of the original Roundhouse (Peterborough Tourism Inc., nd).

As well as the South Australian Railways, South Australia was home to the Commonwealth Railways Workshops at Port Augusta (Figure 14). The Commonwealth Government acquired the narrow gauge Port Augusta to Oodnadatta line in 1911 (operated by the South Australian Railways until 1926). The Commonwealth was also responsible for the building of the Trans Australian Railway, which opened in 1917. The railway workshops at Port Augusta were vital to the Trans Australian Railway and the Central Australian Railways. The Official Opening Ceremony booklet for the Trans Australian Railway noted that the repair work would be carried out at the locomotive workshops and carriage sheds at the Port Augusta Railway Workshops (Anon, 1917: 12). The mechanical engineering workshops at Port Augusta were temporary until funds became available for more permanent workshops after the First World War. In 1925 improvements to the workshops included a new Blacksmith Shop and Foundry. In 1928 the workshops were redesigned to accommodate the railway being built to Alice Springs (Luke, 1997: 124). The workshops at Port Augusta were operated by the Commonwealth Railways

FIG.14. The Quorn Workshops as seen from the old water tank on the Port Augusta side of the railway depot, 1920. Image courtesy of the State Library of South Australia, Image no B55488.

until 1975. Their successor was Australian National Railways until 1997 when they were taken over by three private companies (Luke, 1997: 212).

WESTERN AUSTRALIAN WORKSHOPS

The need for a service that was capable of efficiently supporting Western Australia's expanding railway system led to the creation of the first government railway workshops in Fremantle (1886), the acquisition of the former Great Southern Railway Workshops in Albany and the creation of an integrated workshop in Midland 1904 (Figure 15). Initially the workshops were equipped to maintain and repair steam locomotives, carriages and wagons, but by 1908 carriages and wagons were being built and by the mid 1920s complete locomotives were being built (Rogers, 2006: 19).

The history and development of the Midland Government Railway Workshops has a number of similarities to the railway workshops around Australia in terms of operation, development and function. Similarities include the relationship and impact of the railway and surrounding community; the contributions made in the manufacture of munitions during World War II; social and cultural activities (sport and recreation); and types of trades and building architecture (saw tooth and gabled roofs and arched windows and door support structures) (Australian Heritage Database, nd). All of these have a clear resonance with the Railway Workshops at Ipswich.

Some specific examples of the experiences shared by the Midland and Ipswich Workshops include the camaraderie amongst the workers (and their families), social and cultural activities and the impact of external factors. The Midland Workshops set up the Welfare and Canteen Committee in 1923 to improve the conditions of the workers, encouraged social and sporting activities (football, watersports, cycling, picnics and concerts) and felt the impact of external factors (the 1930s Depression and both World Wars) on production and working conditions (Rogers, 2006: 19). The Queensland Railway Institute, a similar body, was established in 1894.[5] The Ipswich branch was formed in 1946.[6] It was set up to provide recreational and cultural facilities and activities to Queensland Railways employees, and included dances, Christmas parties, sporting clubs (football, cricket, tennis, bowling, etc), a library and a regular magazine. One of the main outside forces to influence the Ipswich Railway Workshops was the outbreak of World War II. At that time little new work was carried out due to heavy production, extended work schedules and scarcity of materials.

FIG.15. Aerial view of Midland's town centre looking east along the Great Eastern Highway. Commercial area (centre), Midland Railway Co. works (lower right quadrant, and surrounding residential areas. Image courtesy Midland Public Library, Local History Collection, Image B5101.

NORTHERN TERRITORY WORKSHOPS

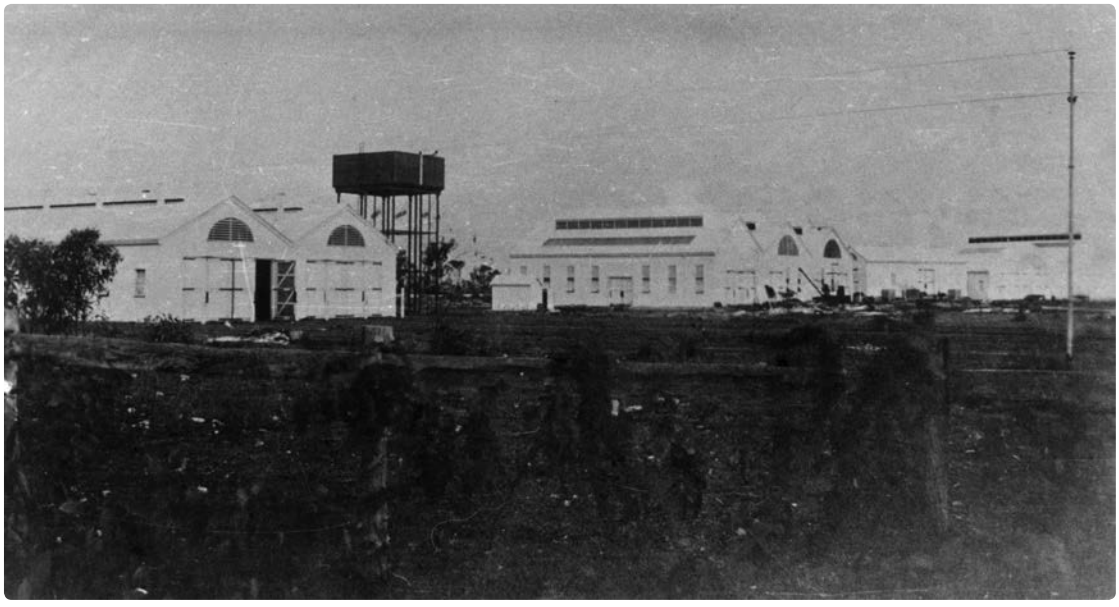

FIG 16. Railway buildings, 2½ Mile [Parap] – showing rows of railway workshops and water tower. Image courtesy Roger Nott Collection, Northern Territory Library and Information Services.

In the Northern Territory the Palmerston Locomotive Yard and Workshops (Palmerston and Pine Creek Railway) began operation in 1886. The locomotive depot and main workshops were located two miles from Palmerston, at a place known as Parap. In 1911 the name was changed to the Northern Territory Railway and again in 1919 to the North Australia Railway. Over the years the workshops were known as Paraparap, Parap or 2½ Mile. They formed the railway workshops complex and encompassed a wide range of maintenance facilities. There was a large Locomotive Erecting Shop, Machine Shop, Blacksmith and Boiler Shop, Carriage and Wagon Repair Shop, Paint Shop and some smaller sheds and stores. A comprehensive network of sidings serviced all the buildings (Harvey 1968).

There were two distinct railway facilities. Close to the line, on its southern side, was the Locomotive Running Depot for the Palmerston area, complete with an engine shed large enough to stable four off-duty locomotives, the only turntable on the railway and a tall water tank and standpipes (TeAra, 2009). Beyond the locomotive depot stood a group of tall white iron sheds that were by far the largest buildings in the Territory at that time (Figure 16). They were painted with a wash consisting of slaked lime mixed with the appropriate amount of size. The effectiveness of this type of exterior was that it gleamed white in the tropical sun (Harvey, 1968: 38).

The Parap Workshops were designed to keep twenty locomotives in first class order without having to send them back to Adelaide. The reason for this being it was thought that twenty locomotives were the right number of locomotives to operate the railway through to the centre of the continent. Ten houses for mechanical branch staff were located across the road from the workshops

but only six were occupied in 1889 (Harvey, 1968: 54-55). The only workshops larger than these were in Adelaide. The Parap Workshops closed in 1980 with the closure of the narrow gauge North Australia Railway.

NEW ZEALAND WORKSHOPS

Like many countries, the railway network in New Zealand was primarily developed and operated by the state. Initially constructed by provincial governments, in the 1870s with a system of central government overtaking the provinces, the railways moved to a standard gauge of 3'6' across the country and the Public Works Department began managing the rail network, establishing railway workshops as part of that endeavour (Atkinson, 2007:13, 22).

Created in 1880, the New Zealand Railways Department was a government department charged with owning and maintaining New Zealand's rail infrastructure and operating the railway system. The Department was reformed in 1981 into the New Zealand Railways Corporation. Originally railway construction and operation came under the Public Works Department but eventually the role of operating the rail network was separated from that of the network's construction (TeAra, 2009).

The major railway workshops in New Zealand included: Addington Workshops (Christchurch), Hutt Workshops (Lower Hutt), Hillside Workshops (Dunedin), Easttown Workshops (Wanganui), and Otahuhu Workshops (Auckland). Other railway workshops included: New Market, Petone and Invercargill (TeAra, 2009).

The main activities of the Addington Railway Workshops (1880-1991) included the production and maintenance of steam locomotives, passenger carriages and goods wagons. At its peak hundreds were employed. At times the shops also manufactured gold dredges and aeroplane components. The first locomotive built for the New Zealand Railways was the W Class 192 at the Addington Workshops. Locomotive building ceased in the 1960s with the DSC class and the Addington Workshops finally closed in December 1990.

The Hillside Railway Workshops were established in Dunedin in 1875 (Atkinson, 2007:36). The workshops progressively expanded over the following years and by 1905 were the second largest engineering plant in New Zealand, employing 400 people (KiwiRail, 2011). The Workshops were reorganised in the late 1920s, with new equipment installed and additional buildings constructed. At its peak in the 1940s, the Hillside workshops employed around 1200 workers and was considered amongst the largest industrial complexes in the South Island, however by the 1950s rail transport was in decline (Atkinson, 2007: 37; IPENZ Engineers New Zealand, nd; KiwiRail, 2011).

The formation of the Hillside Railway Workshops Library in June 1884 (by the employees) is indicative of the importance of the social and cultural welfare of its employees. Just as the Queensland Railway Institute was established to broaden the knowledge and interests of the Queensland Railway employees so too did the Hillside Railway Workshops Library for its employees. The Library provided numerous social and cultural activities, including: a library containing fiction and non fiction books, journals, magazines, lectures and the construction of a Social Hall in 1912, with a piano for concerts (Hastings, 1928).

Today the Hillside Engineering Group is a trading division of the rail operator KiwiRail (formerly Toll NZ) in Dunedin, New Zealand. The workshops, located in Hillside

Road, are still one of South Dunedin's biggest employers and most imposing structures.

The rail connection from Wellington was established in 1874 and residential development began around the then village centre in High Street. With the growth of population came local government. In 1876 the provinces were abolished and counties set up, and within five years Lower Hutt had its own town board. It was constituted a borough in 1891 and became a city in 1941. During the second 50 years of growth the emphasis slowly changed from agriculture to housing and industry. The first major industrial concern was the Railway Workshops in 1929 (Bailey, 2009).[7]

The workshops were fitted out at the time with all new equipment, including some of the most modern machines capable of handling the building of new locomotives as well as other general overhaul and repair work. One of the biggest improvements from the point of view of the staff was the new ventilation system. At Petone, ventilation was rather primitive, relying on windows and roof vents, as well as circular stoves placed at strategic locations around the buildings (McClare, 1998).

Similar to the history of the development of the Ipswich Railway Workshops, some of the railway workshops in New Zealand also experienced the need for expansion and extension due to the increased demand. A report from the Minister of Railways, William Taverner, in 1928 read, in part:

> It was found possible by extension to the existing buildings at Hillside and Addington to carry out improvements that would suffice for many years to come, but the provision in the two main North Island shops was hopelessly inadequate, and consequently land had to be acquired at Lower Hutt and Otahuhu, and modern shops constructed thereon.

Today, although KiwiRail is the largest user of the workshops, ONTRACK also has a presence at the Hutt Workshops site. Occasionally, work is carried out at the workshops on behalf of other rail organisations, such as heritage rail groups. The workshops have also recently undertaken the refurbishment of several KiwiRail EO class electric locomotives which will be leased to the Greater Wellington Regional Council.[8] Only the Hutt and Hillside Workshops are still operating (TeAra, 2009).

THE REST OF THE WORLD

The rest of the world had a similar experience to that of Australia, in that, the railways were initially inspired by what was happening in the United Kingdom. Although it is beyond the scope of this paper to go into detail about all of the railway workshops around the world, a brief summary of a selection of countries has been included. The following examples highlight a selection of railway workshops that are either currently operational and or have been retained for heritage purposes from the United Kingdom, the United States of America, Europe and Asia.

UNITED KINGDOM

The United Kingdom is the home of the railway and the railway workshop. As railways became operational rather than experimental a place was needed where heavy engineering could take place and equipment could be housed. The first locomotive works in Britan, for a public railway, was Robert Stephenson's Forth Street Works at Newcastle-upon-Tyne, estabilised in 1823 as contract workshop associated with the Stockton & Darlington Railway (Larkin and Larkin, 1988: 1). The

first railway repair workshop was opened at New Shildon in Durham following the opening of the Stockton & Darlington Railway. The railway workshops of the 1830s were initially equipped to only handle repairs. In the 1840s a new phase in railway workshops began – eleven main workshops were established (Larkin and Larkin, 1988).

These main workshops became the engineering centre of each railway, where locomotives were designed, built and repaired. Most of the larger works had their own iron and brass foundries, machine, blacksmith and erecting shops.

By the 1850s railway mania in Britain was still in full swing. The demand from the smaller railways continued to increase ensuring that contract works were fully occupied producing rolling stock. By the late 1850s the larger railway companies were also producing rolling stock and equipment for overseas markets, such as India and Africa (Larkin and Larkin, 1988).

After World War I there was little capital investment available for the railway industry, which saw many of the railway companies in financial difficulty and facing increased competition with road vehicles (Larkin and Larkin, 1988). Railway companies were beginning to recognise the advantages of joining together to improve their chances of survival. Prior to the 1923 amalgamation of railways in Britain there were 120 independent railway companies. These companies had been almost entirely self sufficient, even to the extent of undertaking steel production for the manufacture of rolling stock and rail. As a result of the 1923 amalgamation, the "great four" railway groups came to the fore, consisting of:

- Great Western Railway (5 main works)
- London Midland & Scottish Railway (15 main works)
- London & North Eastern Railway (16 main works)
- Southern Railways (6 main works)

Company	Region
Great Western Railway	Western Region
London Midland & Scottish Railway	London Midland region and Scottish Region
London & North Eastern Railway	Eastern Region and North-Eastern Region
Southern Railway	Southern Region

These four companies were reflected in the six regions established in the 1948 nationalisation of British Rail:

The railway engineering works of the British Rail Board became British Rail Engineering Limited in 1970. By 1979 the organisational structure of the British Railway Board's railway operations still largely reflected that of the "great four" private railway companies, which had been merged to create British Railways in 1948 (Larkin and Larkin, 1988).

The privatisation of British Rail was the result of the Railways Act introduced by John Major's Conservative government in 1993. The rolling stock manufacturers suffered under privatisation with the hiatus in new orders for new trains caused by the restructuring process. Only the former British Rail research centre and associated British Rail Engineering Limited works, in Derby and Crewe, survive to the present day. Established in 1970, they are now owned by the Canadian company, Bombardier. In March 2002, the private company, Network Rail, was established to acquire Britain's rail network (Network Rail, nd). It was given a mandate by the Government to improve the safety, reliability and efficiency of the railway.

Today, the National Railway Museum (York), Locomotion (Shildon), and STEAM–Museum of the Great Western Railway provides visitors with the opportunity to experience, explore and learn about many aspects of the British railway industry, including the workshops. The National Railway Museum was established in 1975 and is situated on the former site of the York works of the London and North Eastern Railway (Figure 17). The workshop at the museum is a modern railway workshop, where the National Railway Museum maintains and conserves the working locomotives, carriages and wagons of the National Collection. The Workshop is viewed from The Works balcony, accessed from the Great Hall or Warehouse. The National Railway Museum is the largest railway museum in the world and its main role is to "…engage the broadest possible audience with the story of the train – the technology that brought to the world the era of the universal transport for people

FIG.17. The National Railway Museum (established in 1975) is situtated on part of the York works of the former London & North Eastern Railway. Image courtesy the National Railway Museum.

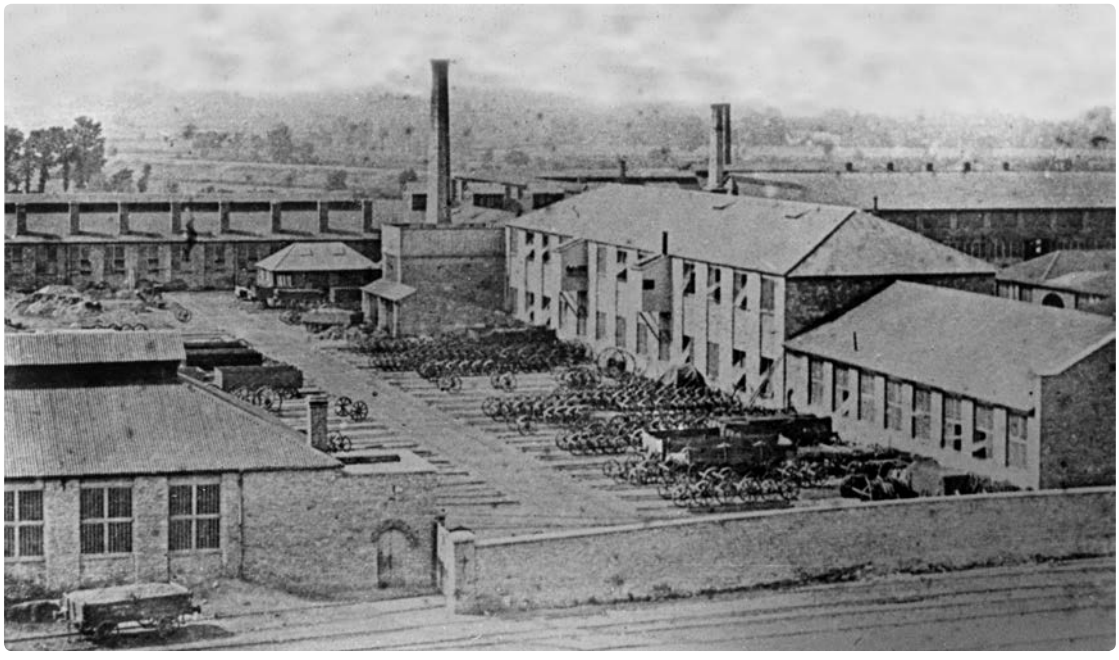

FIG.18. The photo was taken from St Marks Church and shows the Machine Shop which now houses STEAM Museum of the Great Western Railway, c.1869. Image courtesy STEAM Museum of the Great Western Railway.

and goods" (Scott, 2006: 5). Locomotion at Shildon was built in 2004 and is based on the former Timothy Hackworth Victorian Railway Museum, near its Soho Works on the Stockton and Darlington Railway. The Museum offers a number of experiences for its visitors, including: Heritage Open Days (visitors can go inside the Soho Engine Shed and learn more about Timothy Hackworth's role in the development of the railways) and Steam Gala (where five steam locomotives are operated: Duke of Gloucester, Bellerophon, Furness No.20, Eustace Forth and Green Arrow) (National Railway Museum, nd). The STEAM Museum opened in June 2000 and occupies the site of the original Swindon Workshops – famous as the place where many of the best steam locomotives in the world were manufactured (Figure 18). The museum tells "the remarkable story of the men and women who built, operated and travelled" on the Great Western Railway, affectionately known as 'God's Wonderful Railway' and gives visitors the chance to experience the sights and sounds of works.

UNITED STATES OF AMERICA

Steam locomotive design and manufacture in North America was concentrated at the Mt Clare Workshops, part of the Baltimore and Ohio Railroad (1829), Pennsylvania Railroad's Altoona Works (1850), and the Southern Pacific's Sacramento Shops (1863). Other well known locomotive builders include: the American Locomotive Company (1901), the Baldwin Locomotive Works (1831) and the Lima Locomotive Works (c.1876). These companies have their beginnings in the earliest days of the steam era and were dominant right up to the demise of the market in the late 1940s.

The Baltimore and Ohio Railroad was one of the oldest railroads in the United States and was the first common carrier railroad, laying the first commercial long-distance

FIG.19. B&O Railroad Museum, 2006. Image courtesy Bernadette McCormack.

track, building the first passenger station, and inventing America's unique railroad. Railroad work has been conducted at the Mt. Clare Shops for over 130 years and still continues today as part of the visitor experience at the Baltimore and Ohio (B&O) Railroad Museum, the birthplace of American railroading (Figure 19). The B&O Railroad Museum has been an affiliate of the Smithsonian Museum since 1999. It collects, preserves and interprets over 200 artefacts related to early American railroading to over 200,000 visitors a year (Baltimore and Ohio Railroad Museum, 2009).

The railway workshop at Altoona, servicing the Pennsylvania Railroad, was an important facility on the eastern side of the United States (McDonnell, 2008: 76). Construction on the Pennsylvania Railroad's Altoona Works started in 1850 with long building that housed a Machine Shop, Woodworking Shop, Blacksmith Shop, Locomotive Repair Shop and Foundry (Altoona Railroaders Memorial Museum, nd). This facility was later demolished to make room for continuing expansion. The Altoona Pennsylvania Railroad's contribution to the nation's transportation infrastructure, and to production standardisation, marks it as one of the most important contributors

to America's industrial revolution. By the 1920s, the Altoona railroad works employed 15,000 workers, and in 1929 several shops were merged together to make the Altoona Works (McDonnell, 2008:). By 1945 the Pennsylvania Railroad's facilities at Altoona had become the world's largest rail shop complex. Additional Pennsylvania Railroad repair facilities were located in Harrisburg, Pittsburgh, Mifflin, and Juniata, Pennsylvania (Altoona Railroaders Memorial Museum, nd).

Today approximately 5 acres (~2 hectares) of the former Altoona Pennsylvania Railroad's shops forms the Altoona Railroaders Memorial Museum. The Museum opened on 25 April 1998.

The Central Pacific Railway, founded in 1861, began construction at its Sacramento Shops site in 1863 (Figure 20). They constructed two buildings for materials storage and car repair and a third, containing one forge, for locomotive repair. By 1877 the complex had grown from 20 acres (8.1 hectares) to 50 acres (20.2 hectares). By 1922 the shops covered 145 acres (58.6 hectares) and by 1930s they had grown to 200 acres (80.9 hectares). When the shops opened in 1863 the staff consisted of 15 men. By 1898 the staff had increased to nearly 3,000 men (Dougherty, 2002).

By 1877 the Central Pacific Railway had also developed auxiliary shops in Oakland, Los Angeles, Tulare, Mojave, Rocklin, Truckee, Wadsworth, Carlin, Winemucca, Terrace, Wells and Red Bluff. These shops were used

FIG.20. View looking east across Sacramento River towards the Central Pacific Railroad passenger station (completed in 1879). McKeen Cars are visible in shed to right rear Southern Pacific steam locomotive No.1, 'C.P.Huntington', is on display in grassy area to right of palm trees. This locomotive is now on display at the California State Railroad Museum c.1939. Image courtesy California State Railroad Museum Library.

for equipment maintenance, repair, and even construction sites after the turn of the century. The Sacramento site remained the Central Pacific Railway largest shop facility until it was closed down in 1999 (Dougherty, 2002).

In 1997 the Southern Pacific Company merged with the Union Pacific, and facilities were consolidated. The Sacramento Shops were finally closed in December 1999 when the last contractors, no longer railroad employees, moved to new facilities in Rocklin, near the Union Pacific maintenance facility in Roseville (Altoona Railroaders Memorial Museum, nd).

Today parts of the Sacramento Shops survive as part of the California State Railroad Museum, opened in 1981. The Museum complex consists of six original, reconstructed, and new buildings with over 225,000 square feet (20, 903 square metres) of total exhibit space and attracts over 500,000 visitors annually (California State Railroad Museum, 2009).

EUROPE

As had also occurred in Australia, during the nineteenth century France and Belgium established their first railways for coal mines. In c.1829 Marc Seguin, engineer, built 12 steam locomotives at the Lyons-Perrache and St. Etienne Railway Shops (Harter, 2005: 137). Although most of the early French railway lines began with imported English engines, a small locomotive industry began to emerge in the early to middle nineteenth century. Towards the latter part of the nineteenth century the government was encouraged to be more involved with the railways and after passing the 1842 Railway Law, seventy-seven railway companies were merged into six (Harter, 2005: 137-156).

French railways started in the 1830s, developing more slowly than those in some other countries. One railway heritage location that presents a collection of steam locomotives is the Froissy Dompierre Light Railway, a narrow-gauge railway located in the Somme. Established in 1970 as a working museum, it is run as a heritage railway by the Association Picarde pour la Préservation et l'Entretien des Véhicules Anciens. This location is the only surviving example 1'11□" (600mm) gauge railways of the battlefields of World War I (Comite du Tourisme de la Somme, nd). The museum located near the line terminus, the Military and Industrial Railways Museum (Musée des chemins de fer Militaires et Industriels), features a large collection of 600mm gauge railway material, together with locomotives and rolling stock related to both rail in war and industrial railways (APPEVA, nd).

There is also a museum located in the 1910 heritage listed French National Railway Company's (Société Nationale des Chemins de fer Français) rail depot at Longueville in the Seine-et-Marne. It houses a collection of vehicles and a dozen or so steam locomotives dating from the beginning of the century of French railway transport. It has been operated and managed by AJECTA (Association de Jeunes pour l"Entretien et la Conservation des Trains d'Autrefois) since 1970 (RuralRail France, nd).

The railway development in Germany began on 7 December 1835 when the first German train ran between Nürnberg and Fürth. Both the locomotive and its driver were English. The locomotive Adler (Eagle) was built by Robert Stephenson and Co. in Newcastle, and the driver was Mr. William Wilson, who stayed on in Germany. The railways of Germany were nationalised in 1920, but after World War II, the railways were split again, one each for East and West Germany. On 1 January 1994, after the re-unification of the two halves of Germany, the Deutsche Bahn AG was formed, and the railway systems were merged once again (Oxlade, 2003).

One notable German railway workshop is the Halle P depot which dates back to 1863, when the "Werkstatt Halle" opened up as a workshop for repairing rail vehicles. The arrival of new and bigger locomotives, such as the large Prussian locomotives, soon made it necessary to increase the size of the engine shed. In 1908, eight bays with longer tracks and inspection pits were added. It subsequently became the Halle Locomotive Testing Facility (LVA) in 1951. In what later became the Locomotive Testing and Development Facility (VES-M), tests were performed on the latest developments in steam, electric and diesel locomotive engineering.

Today, Engine Shed IV houses the DB Museum Halle (Saale), a branch of the Nuremberg Transport Museum, where the locomotives looked after by the BSW Group are on display (Deutsche Bahn AG, 2009). In 1902 the Meiningen Railway Shop, until then titled Secondary Workshop of the Erfurt District Railway Inspection, was declared Main Railway Workshop. Since the premises opposite Meiningen station were unsuitable for further extension, activities commenced in 1910 to build a new railway workshop at the bottom of the Drachenberg hill (Deutsche Bahn AG, 2009). In the first stage, the new assembly comprised the new boiler shop, mechanical workshop, erecting shop, spare storage, the old foundry, wagon shop, indoor pool, canteen and office building. By 1914 the number of staff had increased to 800 and increased even further to 1,600 in 1918 (Deutsche Bahn AG, 2009). Today the activities include the maintenance and manufacture of rolling stock and a public activity – the Meiningen Steam Locomotive Days (Deutsche Bahn AG, 2009).

ASIA

On the subcontinent, the Jamalpur site was the first railway workshop facilities in India, opened in February 1862 for the East Indian Railway. At its peak it employed over 12,000 people. There was an earlier attempt to set up workshop facilities at Howrah but it proved unsuccessful because of problems with procuring supplies and getting skilled labour. The Jamalpur site was chosen for its proximity both to the Sahibganj loop, which was the main trunk route at the time, and to the communities of gunsmiths and other mechanical craftsmen in Bihar. The entire workshop was flattened by an earthquake on 15 January 1934. A new Railway Workshops was built at Rampur (India Railways, nd).

Other notable railway workshops in India include: the Chittranjan Locomotive Works, founded in 1947; and the Diesel Locomotive Works in Varanasi, set up in 1961. The Chittranjan Locomotive Works were established in 1950 to manufacture steam locomotives. In 1968 the works switched to producing diesel locomotives and steam was phased out by 1973. In turn diesel locomotive production ceased in 1994. In 2010 Chittranjan Locomotive Works was the only large-scale manufacturer of electric locomotives in India. (India Railways, nd). The Diesel Locomotive Works in Varanasi were set up in 1961 as a technical collaboration with the American Locomotive Company to manufacture diesel electric locomotives in Sri Lanka, Malaysia, Vietnam, Bangladesh and Tanzania (Diesel Locomotive Works, nd).

Today the Indian railway system is managed through zones and operating divisions. There are six production units manufacturing rolling stock, wheels and axles and other ancillary components to meet railway requirements (Indian Railways, nd).

The first railway in Japan began in 1872, but the first locomotive was not built until 1893. In the formative period after 1872 the Japanese

government hired 300 foreign nationals (most of them British) as civil engineers, general managers, locomotive builders and drivers. Among them were Henry and Richard Francis Trevithick, grandsons of the English locomotive pioneer (Bagwell, 2001). The Japanese railway industry had a good record of engineering innovation. As early as 1919 it decided to replace screw couplings on its 41,661 freight wagons with American-type automatic couplers which were safer, especially on narrow gauge lines.

The Central Japan Railway Company is a recent organisation and began operation in 1987. In 1991, they took over the Tokaido Shinkansen facilities (Central Japan Railway Co., nd).

Rail transport in China began in the late 1870s with foreign assistance. As a large network it has a number of manufacturing locations. The Dalian Locomotive and Rolling Stock Works was founded in 1899. Today it mainly manufactures Dali Brand DF series diesel electric locomotives, city-trans trams, rolling stock, DL240, 280 diesel engines, various locomotive parts and other types of diesel electric locomotives. "The factory site covers a land area of 900,000 sq meters. Beautiful scenery makes the factory like a garden of attraction" (Dalian Locomotive and Rolling Stock Co Ltd, nd). The Qishuyan Locomotive & Rolling Stock Works, established in 1905, operates under the China South Locomotive & Rolling Stock Industry Corperation and is the manufacturing and service base for the main rail communication transportation equipment for the Chinese railway. Currently the Qishuyan Locomotive & Rolling Stock Works employs over 10,000 people. It covers an area of 1.76 million square metres. The main outputs for this workshop include: the construction and maintenance of diesel engines for passenger and freight and construction of a variety of wagons (CSR Qishuyan Locomotive Co. Ltd, 2009).

CONCLUSION

Whilst railway workshops can be simple or complex they are also unique and can be found on every continent. The papers in this volume focus on the Ipswich Railway Workshops to reveal many aspects of just how unique workshops are and what makes railway workshops function and operate.

In simple terms the functions of a railway workshop can extend across building, repairing, overhauling and maintaining locomotives, carriages and wagons. The complexity of railway workshop is aligned to a number of factors, including the pace and development of towns and cities; the timing of the introduction of rail transport; developments in rail technology (such as steam to diesel to electric), economic viability and changing political climate. However, as is apparent from the chapters in this volume, railway workshops were much more than just places for construction and repair of locomotives and rolling stock. While the functions and operations of the Ipswich Railway Workshops can be seen as typical of railway workshops around Queensland, Australia and the world, they also come into focus as having a vibrant and complex working history.

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❑ ENDNOTES

1 Report of the Select Committee Queensland Parliamentary Votes and Proceedings 1879, Vol 2, p.4

2 Report of the Select Committee Queensland Parliamentary Votes and Proceedings 1879, Vol 2. p.4

3 Report of the Select Committee Queensland Parliamentary Votes and Proceedings 1879, Vol 2, p.5. The main purpose of the 1879 Report of the Select Committee on the Railway Workshops was to "…inquire into…the best mode of maintaining [an] adequate supply of locomotives and railway rolling stock, whether by contract or at the workshops…at Ipswich, Toowoomba and Rockhampton"

4 Willowburn is a suburb within Toowoomba, Queensland

5 Queensland Rail Weekly Notice 29/92, 1992

6 Queensland Railways Institute Magazine, June 1948

7 The Hutt Workshops were preceded by a workshops facility at Petone adjacent to the railway station there. It had operated from 1876 until its obsolescence and replacement in 1929.

8 RailScene News, 2008. New Zealand Railfan 14 (3): 20