



*Main Truss Spans*

*Charles Dearling 2006*

## CONSERVATION MANAGEMENT PLAN

### THARWA BRIDGE

for

ROADS ACT

by

PHILIP LEESON ARCHITECTS PTY LTD

ENDORSED BY THE ACT HERITAGE COUNCIL ON 5<sup>TH</sup> MARCH 2009

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## 1.0 EXECUTIVE SUMMARY

- 1.1 This Conservation Management Plan has been prepared for Roads ACT in accordance with the conservation principles outlined in the Australia ICOMOS Burra Charter 1999.
- 1.2 The Plan consists of a comprehensive conservation analysis based on historical and physical overview, an assessment of cultural significance, conservation policies for the bridge and surrounds and strategies for implementation of those policies. Appendices provide a detailed chronology of historical events, a brief discussion of the heritage impact of likely proposals and a typical maintenance program.
- 1.3 Tharwa Bridge was listed on the ACT Heritage Register in 1998 at which time a brief assessment of significance was undertaken and a citation written. It was listed on the Register of the National Estate in 1983.
- 1.4 Due to decades of ad hoc maintenance and periods of neglect the physical condition of the bridge is poor. It has been closed to traffic since 2005. Expert advice suggests it is no longer feasible to restore and conserve the bulk of the existing structure, notably the main timber truss spans.
- 1.5 In 2008 the ACT Government approved a project to reconstruct Tharwa Bridge to match the original but to support a greatly increased traffic loading. Stage 1 of this project involved works to allow the existing bridge to be reopened to light traffic. The works were guided by a Statement of Heritage Impact prepared by the ACT Heritage Unit and based on the existing citation. Stage 2 includes the reconstruction works to be guided by this CMP.
- 1.6 This assessment finds that Tharwa Bridge and remains of the ford are significant as evidence of ancient indigenous and early European river crossings of the Murrumbidgee. The 1895 Allan Truss bridge is significant as a continuance of the tradition of river crossing at this location, for its technical achievement, rarity, aesthetic qualities and community associations.
- 1.7 The primary conservation policy is to reconstruct the bridge, matching the original design and fabric as closely as possible within the constraints of the required loading, cost factors inherent in practical design and buildability proposals, maintenance requirements and public and occupational health and safety.

## 2.0 INTRODUCTION

### 2.1 INTRODUCTION

In April 2008 Philip Leeson Architects were approached by The ACT Heritage Unit to assist them in preparing a Conservation Management Plan (CMP) for the reconstruction of Tharwa Bridge. Philip Leeson Architects were contracted by ACT Procurement Solutions in May 2008.

The purpose of the CMP is to provide guidance to the asset owner, Roads ACT, for both immediate proposed reconstruction works, future works and ongoing maintenance.

### 2.2 METHODOLOGY

#### 2.2.1 The Burra Charter

The methodology for this Conservation Management Plan is consistent with the approach and processes identified in *the Australia ICOMOS Burra Charter, 1999* (Burra Charter) recognised by all levels of government as the national heritage standard for heritage conservation.

#### 2.2.2 Definitions

Where identified, this Conservation Management Plan is referred to as the 'Plan'.

The terms fabric, conservations, maintenance, preservation, restoration, reconstruction adaptation, compatible use and cultural significance used in this Plan are as defined in the Burra Charter.

#### 2.2.3 Study Team

The Study team for this project comprised:

David Hobbes, Heritage Architect, Associate of Philip Leeson Architects Pty. Ltd.  
Marilyn Truscott, Heritage Consultant  
Can Ercan, Conservation Officer ACT Heritage Unit  
Ross Schofield, Roads ACT, Contract Management

Ray Wedgwood formerly Chief Bridge Engineer, NSW RTA  
Brian Pearson, formerly Chief Bridge Engineer, NSW DMR  
Gary Barker, Heritage Engineer UNSW @ ADFA

The latter group were appointed by the ACT Government as the peer review team for the restoration of Tharwa Bridge and to provide advice to Roads ACT, Heritage Section.

The majority of the text was prepared by David Hobbes. Can Ercan provided technical assistance and advised on policy, strategy and heritage impact.

Ross Schofield provided advice “ from the coalface” on operational and maintenance requirements, Brian Pearson and Ray Wedgwood prepared the historical outline of bridge building and truss bridge design, Marilyn Truscott prepared the historical outline on general history of the Tharwa area, prepared the timeline and assisted with the assessment of significance and the peer review team generally provided invaluable information regarding the structural behaviour and the relative merits of proposals.

### **2.2.5 Project Tasks**

Preparation of the CMP included the following tasks:

- collation of background history of bridge design and the Tharwa area
- three field inspections of the Bridge to investigate its current condition and to discuss potential reconstruction proposals
- review of statutory and non-statutory registers to determine existing listings and constraints,
- review of existing structural, archaeological and archival reports to determine broader issues which may affect future works,
- a series of three working meetings with the Peer Review Team to discuss heritage significance, the physical assessment and structural behaviour of bridge components, and relative merits of potential reconstruction proposals with regard to heritage significance, construction, operational and maintenance constraints
- the presentation of a written report summarising the results of these tasks, the heritage significance of this Bridge and the provision of recommendations in relation to the reconstruction and ongoing maintenance of the Bridge.
- Following review of a draft CMP in August 2008 the ACT Heritage Council endorsed in principle the conservation policies with a view to their inclusion with the development application for Stage 2 works. They also requested that the historical background and assessment of heritage significance be enhanced to more thoroughly address the rural, transport, social, political, Aboriginal and cultural significance of the river crossing and the bridge. This work was completed by Marilyn Truscott, Heritage Consultant, in January 2009.

### **2.2.6 Photography**

The majority of the photographs in this report were taken by Charles Dearing in December 2006 for *Archival Recording & Heritage Assessment Tharwa Bridge, Tharwa ACT*.

### 2.3 THE STUDY AREA

The Tharwa Bridge spans the Murrumbidgee River to connect Tharwa Drive, Tuggeranong, with the village of Tharwa and is illustrated in Figures 1 and 2 below. It is located approximately 34 km south of Canberra.



Figure 1. Aerial photo of Tharwa Bridge and surrounding areas.

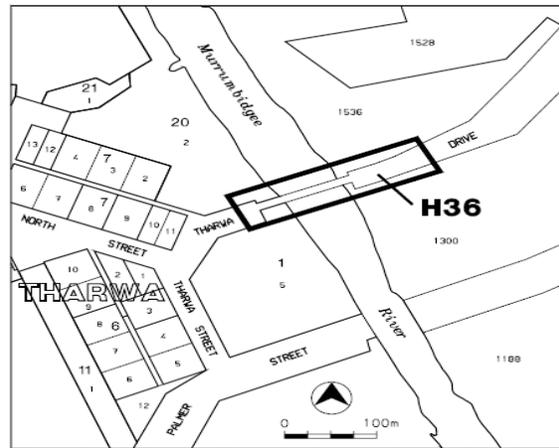


Figure 2. Section and block of Tharwa Bridge.

#### 2.3.1 Curtilage

This assessment finds the curtilage for this CMP to extend 50m to the north and south of the bridge (i.e. downstream and upstream of the river) and to the approach span abutments on the east and west.

### 3.0 HISTORICAL BACKGROUND

#### 3.1 HISTORY OF CROSSING THE MURRUMBIDGEE RIVER AT THARWA UP TO THE CONSTRUCTION OF THE BRIDGE

*This brief historical account prepared by Marilyn Truscott is drawn from research presented in the timeline at Appendix 1, where specific dates are cited. The following is a summary of that information.*

At the time of European settlement, Indigenous Australians had been living, hunting and gathering and practising cultural traditions in the area around the Murrumbidgee River crossing at present-day Tharwa for thousands of years. The Birrigai Rockshelter near Tidbinbilla shows evidence of human occupation back some 21,000 years, being sporadic until some 3000 years ago (Flood et al 1987). The Pleistocene era, the last Ice Age, ended some 10,000 years ago, but before then the area was colder and the environment open treeless plains much like the top of the Australian Alps today. The evidence possibly indicates intermittent summer use.

More intensive occupation is witnessed in the archaeological evidence at Birrigai from 3000 years ago, well after the end of the Ice Age, and the onset of the Holocene, with the climate and environment the same as today. The Murrumbidgee River flowed along the same course, but at the time of settlement in the upper reaches consisted of more shallow and discontinuous channels dissipating the energy of floodwaters. Crossing the Murrumbidgee is understood to have taken place at various fords between deeper pools of water including the area of today's Tharwa Bridge, attested by the concentrations of cultural remains, especially stone artefacts, located each side of the river.

Early explorers and naturalists, such as Charles Throsby, his nephew, Charles Throsby Smith, and Captain Mark Currie were charged by government to find good pastureland and large rivers flowing inland. Between 1820 and 1824, 5 parties closely approached to where the Tharwa Bridge is today. In August 1821, Joseph Wild, part of Charles Throsby's party glimpsed 'Snowy Mountains to SW' from the south of Lake George, thought to be the snow-covered Brindabellas. Later that year the 'Limestone Plains' were found in a search for the 'great western river' (the Murrumbidgee) and eventually in March 1821, it was reached near Pine Island. The area was named 'Isabella Plains' (today's Tuggeranong). It was Currie with Brigadier Major Ovens and Joseph Wild who camped on the banks of the Murrumbidgee River opposite present-day Tharwa on 2 June 1823. Botanist Allan Cunningham went a step further, crossing the river at that location and camping on 15 April 1824 near the present Mount Tennant, naming it Mount Currie.

Their reports to Governor Macquarie of fine, lush pastoral opportunities tempted settlers to the 'Limestone Plains' (today's Canberra), the first being Joshua John Moore who took up 'Canberry' at today's Acton in 1824, followed by Robert Campbell taking up land as 'Duntroon' a year later. Many of these early holdings

were managed by ticket of leave convicts and isolated huts sheltered shepherds guarding flocks as there were no fences. This landrush led to others squatting southwards through the Tuggeranong Valley, extending past the 'limits of occupation' as set by the colonial authorities in 1826. This limit area was expanded in 1829 to include the County of Murray as far south as Michelago, with the Murrumbidgee River as the western boundary.

The area beyond these limits appears to have been a haven for Indigenous groups who had been removed from their lands. West of the Murrumbidgee was also a refuge for escaped convicts, such as John Tennant and his group, who in 1827, raided and robbed those on the new holdings; they were captured in early 1828. Later Garret Cotter, a former convict, was banished by the Goulburn court to west of the Murrumbidgee, where he was befriended by OnYong, who was seen as a leader of the local Aboriginal group resisting colonisation.

The first to take up land on the eastern side near the location of the Tharwa Bridge were John Lanyon and James Wright in 1834. But it is possible that Timothy Beard, an early squatter of Queanbeyan went beyond the 'limits', had a shepherd's hut in this location. Lanyon left, but soon Wright, who stayed, was taking his stock across the Murrumbidgee. Others took up land on the west side of the river, the County of Cowley being surveyed in 1836, pushing ever further along the mountain river valleys. At that time, the river consisted of deep pools and sandy areas, readily crossed other than in the spring or after a storm upriver.

The census of 1828 recorded 91 Europeans living in the Queanbeyan area, but by 1841, 557 persons are recorded extending north-south from Gungahlin to Michelago. 'Lanyon' had 59 residents, and across the river in the recently surveyed County of Cowley, a separate census records 150 people. This number does not include local Aborigines, many of whom were employed on the pastoral holdings. People in the southern part of this area to the west used the Tharwa ford, those in the north other river crossings. The route to the market in London for the district's fine wool during the 1830s boom was long - taking days if not weeks, to Goulburn via Queanbeyan then Sydney along bad tracks and roads disrupted by creeks and rivers.

The economic slump of the 1840s, with a drop in wool prices, a recession in England, a drought in Australia (1838-1844), and the end of assigned convict labour, impacted on the district. The resultant debts saw mortgaged land and changes in ownership, and contractions of some larger holdings. James Wright sold 'Lanyon' to the Cunningham family, who already had land across the river, and moved across the ford to his property 'Cuppacumbalong' in 1847-48. He with others in the district continued lobbying the colonial government for better roads, resulting in the Queanbeyan-Monaro road being upgraded.

European settlement with tree clearing, grazing stock and drainage, are thought to have impacted on river flow, including of the Murrumbidgee. A major flood in 1852, scoured exceptionally steep river banks, making fording the river more difficult. Further heavy floods followed in the early 1870s. Wright replaced a

heavy log canoe with a punt at the Tharwa crossing, which continued to be used and was offered to the public after 'Cuppacumbalong' was sold to the de Salis family in 1856. This was used even for sheep and wool bales when it was not possible to ford but sudden flash floods made crossing unpredictable as well as cumbersome, people and stock often being stranded on the 'wrong side'.

The discovery of gold in 1851 in NSW and Victoria had workers leaving to try their luck, and resulted in a doubling of the Australian population in a year. A rush of 10,000 hopeful miners to Kiandra in the Australian Alps in 1859-60, saw many crossing via the Tharwa ford. The local graziers supplied meat and other supplies, and later many disappointed men were available as labour. This added to the local population and in 1861, Tharwa was proclaimed as a village, the first of those in what is now the Australian Capital Territory, still only accessible by the river ford. By this time increasing numbers of pastoralists had moved to, or included, cattle in their stock and had both sheep and cattle as well as upland properties and 'snow leases' allocated in country high above the river. 'Hidden' along the Little Gudgenby River was one of the reserves for Aboriginal people, formed by the Board of Protection, also known as 'Cuppacumbalong'. But it is clear that many Aborigines continued to work on pastoral properties, but in ever dwindling numbers, with 'full-bloods' recorded as only one, 'Queen Nellie' Hamilton.

Transport slowly improved, the railway arriving in 1887 at the 'Tuggeranong' siding on the Goulburn-Cooma line beside the Queanbeyan-Cooma road, some 15 km from the Murrumbidgee crossing at Tharwa. But poor roads and river crossings were still a major issue for transporting stock and other goods, and local landowners continued to lobby for improved access to market. Leopold de Salis, and later his sons, William and George, living at 'Cuppacumbalong' at Tharwa, were members for Queanbeyan in the NSW Legislation Assembly between 1864 and 1884 with barely a break. This was still a time when those with sufficient income and land could afford to stand for parliament, often permitting their interests a greater voice. In this case, the opportunity was taken to lobby for more reliable access for those west of the Murrumbidgee.

The member for Queanbeyan from 1885 to 1904, Edward W O'Sullivan continued this push for infrastructure within his seat, and for the interests of the pastoralists, such as Cunningham at 'Lanyon' and 'Tuggeranong', and de Salis at 'Cuppacumbalong'. John Gale who returned to Queanbeyan as editor of the newspaper also influenced O'Sullivan with proposals for the tourism and development opportunities across the Murrumbidgee, at a time when as well as the economic depression of the 1890s was beginning to hit, alpine recreation was becoming popular. O'Sullivan was active on the parliament's committee for public works (and later the Minister for Public Works, 1899-1904), and thus able to foster a survey of two options for a bridge over the Murrumbidgee, the Tharwa ford site being recommended and approved in 1892. The bridge was designed in 1893 by the Department of Public Works senior engineer, Percy Allan; mindful of keeping costs down, his Allan truss was seen as an economic solution.

Despite delays in starting the construction of the bridge in 1894 due to impassable roads, the bridge was finished in record time and a major official opening held on 27 March 1895. A public holiday was declared, local dignitaries attending and some 1500 locals, with speeches, bands playing and later a cricket match and formal ball, among the festivities.

### 3.2 HISTORY AFTER THE CONSTRUCTION OF THE BRIDGE

The pastoralists east and west of the Tharwa Bridge continued to affect opinion and events in the district. They and other influential residents formed the Queanbeyan Federal City Committee in October 1899 to lobby for their district to be considered for a national capital after federation. They succeeded in 1908 when the Yass-Canberra area was selected.

The Tharwa Bridge proved to be a major asset to the pastoral industry and a ready access for the Tharwa community and those living west of the Murrumbidgee. Over time, the claim that it would assist development of this area for tourism was proven as Australians increasingly had the means, as car ownership increased, and the time, as annual recreation leave increased, to access the historic and natural pleasures of the area west of the Murrumbidgee. The alpine national parks, including Namadgi in the ACT, are often accessed via the Tharwa Bridge, for skiing in winter, and bushwalking and fishing in summer.

### 3.3 HISTORY OF EARLY BRIDGE DESIGN AND CONSTRUCTION IN THE COLONIES

*This section was prepared by Brian Pearson and Ray Wedgwood. References have not been cited.*

The first bridge was constructed in the Colony of New South Wales in 1788. This bridge was a simple timber structure erected over the Tank Stream, near what is now the intersection of Bridge and Pitt Streets, Sydney. It had only a short life and was replaced with a stone arch bridge in 1804.

Prior to the arrival of David Lennox in the Colony in 1832, NSW was without expert knowledge in bridge design and construction. Lennox, who had worked with the famous bridge engineer Thomas Telford, was appointed by Major Thomas Mitchell, the Surveyor General, to the position of Superintendent of Bridges for NSW in 1833.

During the first sixty years of the Colony, the majority of bridges were built from stone or timber, in the same manner as bridges being designed and constructed in Britain and Europe. Stone was the bridge building material of choice for major crossings in NSW, with construction costs kept low by the use of convict labour. However, with the cessation of convict transportation in the 1840s and the subsequent rise in labour costs, bridge designers were forced to explore the use of other materials for bridge construction.

Stone arch bridges built by Lennox in NSW and which are still carrying traffic comprise the following:

Horseshoe Bridge at Mitchells Pass	(1833)
Lansdowne Bridge over Prospect Creek	(1836)
Lennox Bridge over Parramatta River at Parramatta	(1839)

In 1844 Lennox moved south to Melbourne as Superintendent of Bridges. He retired in 1854, three years after the colony of Victoria was formally established. His most important work while in Melbourne was the first Victoria Bridge over the Yarra.

In Van Diemens Land (renamed Tasmania in 1855) three magnificent masonry bridges still carry traffic some 180 years after construction. These are the Richmond Bridge over the Coal River (1825), the Ross Bridge over the Macquarie River (1836) and the bridge at Campbell Town over the Elizabeth River (1838), midway between Hobart and Launceston.

#### 3.3.1 THE DEVELOPMENT OF THE RAIL AND ROAD NETWORK IN NEW SOUTH WALES

Public funding for the development of the rail and road network was a significant component in the economic growth of Colonial NSW. Transport was an important link for agriculture and trade, with the lack of suitable roads and

river crossings delaying the benefits of a growing economy. The adjacent colonies of Queensland, Victoria and South Australia prospered from the redirection of commodity movements as a result of the poor transport network in NSW during the period 1860 to 1880. From the late 1870's Victoria and NSW systematically constructed railways to reduce reliance on riverboats. The last profitable riverboat trading routes were to Echuca on the Murray River and on the Lower Murrumbidgee to Balranald. Railways from Victoria tapped this trade when lines were constructed from Bendigo to Echuca in 1864, Echuca to Deniliquin in 1867, to Moulamein in 1925, Balranald in 1926 and to Stoney Crossing on the Wakool in 1928.

In response to this redirection of trade, successive NSW governments recognised the need to invest capital in developing and improving the transport network of their State. By the late 1880s, rail had reached the far outskirts of NSW and provided a means of economically transporting agricultural produce. Roads were an important component in the transportation of goods and produce, and also provided vital work for hundreds of people engaged in such movement of this material.

The development and expansion of the railways generated an increase in freight movement, as well as providing a more accessible and economic means of travel to the public. This increase in the use of rail was also influential in the demand for the improvement and expansion of the road network, with bridge design and construction an important component. However, the capital expenditure required to support the development and construction of such infrastructure was a substantial commitment of funds and resources which at the time, NSW was unable to readily provide. While the bordering Colony of Victoria was prospering in the economic boom of the 1850s gold rush, the larger and under-resourced Colony of NSW did not experience the same economic benefits. The consequence of this lack of funding was that in order to improve the transport network, capital often had to be sought from Britain at high rates of interest.

### 3.3.2 HISTORY OF TIMBER TRUSS BRIDGE DESIGN IN NEW SOUTH WALES

Design and construction of bridges in NSW during the 1850s came under the control of the Colonial Architects Edmund Blackett (1849-54), William Weaver (1854-6) and Alexander Dawson until 1859. Through their architectural training it is presumed they would have been aware of the work of Palladio and his drawings of timber roof and bridge trusses. In the absence of other influences, the Colonial Architect's office tended to draw heavily on British designs and technology, adapting them to local conditions. In addition, there were no publications on bridge design coming out of America at this time, as fierce commercial competition between American bridge builders meant that the precise details of their designs and the manner in which they were constructed were not widely available.

At the time the Public Works Department was established in 1859, the major road bridge types being constructed in NSW were the masonry arches of David Lennox and the laminated timber arches designed by the Colonial Architect's office. The timber laminated arch design was of British origin. The unsuitability of the design to Australian conditions soon became apparent when the inner laminates of the arches began to rot and proved very difficult to replace.

The failure of the timber laminated arch design forced bridge designers to look for other alternatives. Naturally masonry and iron bridges would have presented more durable alternatives, but the cost of constructing both types was prohibitive. The cessation of convict transportation in the 1840s meant the supply of cheap stonemasons disappeared and the size of NSW and the scale of public works required in the mid-1850s meant the Colony had to borrow heavily from Britain in order to fund the works. An 1861 parliamentary decree seeking to minimise expenditure made it a requirement that local materials be used wherever possible in construction projects, thus keeping costly imports, particularly iron, to a minimum. It was this decree that set NSW on the path to becoming "the timber truss bridge state".

NSW was fortunate to have abundant hardwood forests, the timber from which was strong and durable and so was eminently suited to the construction of bridges at a relatively low cost. Therefore, because of a combination of factors, the timber truss bridge became a regular feature on the road system of NSW. The various types of trusses are practical and aesthetically pleasing solutions to the ongoing problem of providing bridges that are cost effective and able to accommodate the increasing needs of road traffic.

### 3.3.3 SUMMARY OF THE EVOLUTION OF TIMBER TRUSS DESIGNS

The following is a summary of the design evolution of timber truss bridges. There were five types generally used between 1860 and the late 1930s, comprising;

#### **Old Public Works Department truss**

The basic style was imported from Europe by British engineers and was a modified version of early timber roof trusses. The design was later improved by the Public Works Department (PWD) under the direction of William C Bennett, Commissioner for Roads. It was subsequently adopted and referred to as the Old PWD Truss (OPWD). The top chords and principals were each made from a single piece of timber, as was each of the diagonals. The top chord had a secondary support in the centre creating a double thickness member. The bottom chords comprised three vertical timber laminates bolted together. The vertical connections were made from single iron rods taken through the chords, thus creating points of weakness. The design made such bridges difficult and expensive to build and maintain.

The Old PWD design incorporated some redundant elements which were omitted from the later truss designs. As noted above a supplementary timber

element was attached to the underside of the top chord at mid span above the central diagonals. In essence this member acts as a butting block to assist in transferring forces from the diagonals into the top chord as well as increasing the stiffness in the top chord. Other elements which were omitted from later designs are the additional timber vertical and cross members supporting each end principal of the trusses.

Unique to the Old PWD and its successor, the McDonald truss is the manner in which the butting blocks are placed. The butting blocks are situated on top of the bottom chord at each end of the truss with the end principals abutting them. The butting blocks perform the important function of transferring the load from compression in the principal to tension in the bottom chord. In later designs these forces were transferred through cast iron shoes, which were notched into the timber bottom chords.

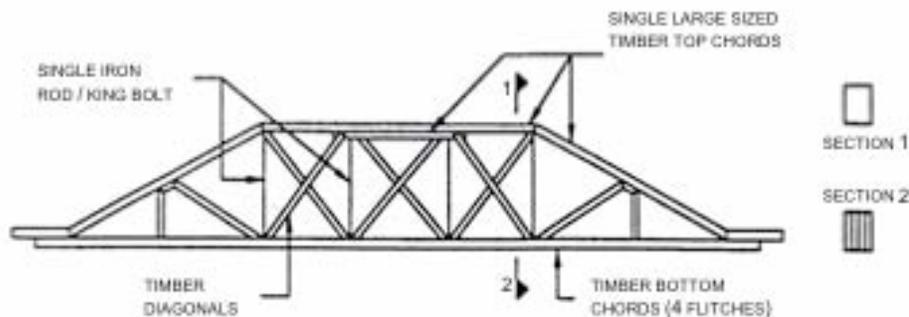


Figure 2.1 Schematic diagram of Old Public Works Department Truss (OPWD), (derived from DMR 1987)

Figure 1 Old Public Works Dept. Truss

Also unique to the Old PWD truss design is the use of a single timber member to form each large end principal. All later designs used double components, known as flitches, separated by a spacer block. The latter required smaller, more readily available sizes and also facilitated replacement of deteriorated or damaged principals under traffic, as the load on the principal could be temporarily transferred to a single member during replacement works.

### The McDonald truss

The truss was designed by John A McDonald (an expatriate English engineer) when he joined the PWD in 1879 as Engineer for Bridges. It was designed primarily with the aim of being easier to build and maintain and to support greater loads than the Old PWD truss. This design, much like its predecessor, was influenced by European truss designs. The basic McDonald truss design used a single thickness top chord with double timber principals, which were splayed to provide more stability for the top chord, and double tension rods made from Iron. The vertical rods were placed on the outside of the chord and were connected using cast

iron cradles, thus eliminating the need to drill through the chords. The compression diagonals and bottom chord continued to be made from timber. This design produced a truss that was cheaper to make, able to span a greater distance and easier to maintain. The McDonald truss continued the use of the traditional timber bottom chord; it was not until de Burgh's 1899 truss design that the merits of steel lower chords were realised in practice. McDonald truss bridges were constructed throughout the period 1886 to 1893.

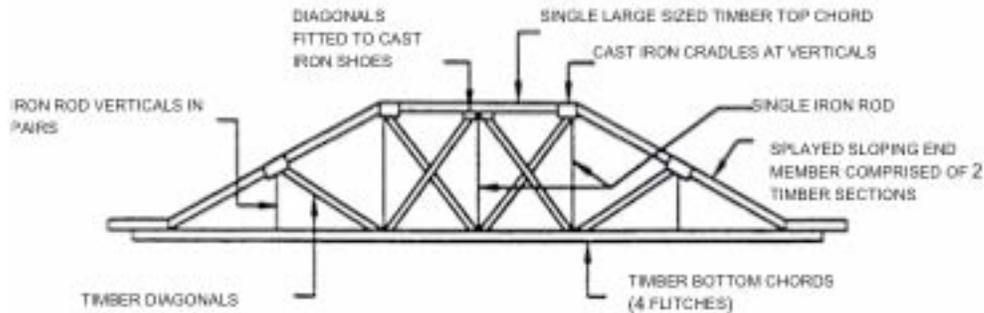


Figure 2.2 Schematic diagram of a McDonald Truss (derived from DMR 1987)

Figure 2 McDonald Truss

### The Allan truss

The Allan truss was designed by Percy Allan, chief PWD draftsman and engineer. It utilised principles of engineering science and theory which incorporated data relating to structural behaviour of trusses and the strength of Australian hardwood timbers. The Allan Truss represented a shift towards a more scientific approach and was introduced during the economic downturn of the 1890s. The design, which utilised two parallel half trusses bolted together to form a complete truss, required smaller sizes of timber than were needed in earlier trusses and had the advantage of being both cheaper and easier to maintain. The Allan Truss saw the introduction of spaced double chord members and all diagonal members set at the same angle. This allowed any shrinkage of timber to be taken up by simply tightening the vertical rods. These basic design principles meant that the structure was still self supporting when any one member was out of service which allowed for easier maintenance because any of the members could be replaced without having to close the bridge.

Percy Allan was the first Australian engineer to be appointed Chief Bridge Engineer, a position he achieved in 1896. He was an outstanding engineer for his time and in 1911 was appointed Chief Engineer for Public Works, a position he held until his retirement in 1927. His greatest achievement with respect to bridges were his 1902 Pymont Bridge and his 1903 Glebe Island Bridge, claimed to be the first electrically operated swing span bridges in the world.

Fortunately for Allan and his successors, Sydney University appointed W H Warren as its first Professor of Engineering in 1883. He set up an extensive program of tests on all the local hardwoods and published the results in 1893. These results enabled Allan to undertake timber bridge design with a degree of confidence inspired by Warren's research. Allan reported in 1924 in a paper entitled "Highway Bridge Construction – Practice in New South Wales"<sup>1</sup> that his truss designs were extremely economical with respect to the use of materials. [1 Paper published in Industrial Australia and Mining Standard, 21 August 1924] He wrote as follows:-

*"In the superstructures of one 90ft. (27.4m) span carrying a 15ft. (4.6m) deck, there is 500 cub. ft. less timber than in the 1886 type of truss, which, in conjunction with the greater ease in framing together (notably in the bottom chord, where no fitting is required) the fewer bolt holes to be bored, and the short length of timber employed, effects a large saving in cost of each span.*

*The economy is more marked when it is considered that the old trusses were designed to carry a 15ft. carriageway, whereas the Allan trusses were designed to carry two 5ft. (1.5m) footways in addition to a 15ft. carriageway. Thus it will be seen that the later design of truss bridge offers greater facilities for traffic at a much reduced cost."*

The Allan truss was a giant leap forward from the earlier designs. It provided the following improvements:

- Cast iron shoes at all joints reduced problems with dampness, allowed simple square shaping at the ends of timbers and ensured a better distribution of forces through structurally sound joints. They also made renewal of half members much easier.
- The adoption of open top and bottom chords for easier painting, which also reduced the decay due to the entry of water between the members in a built up chord.
- Omission of counter-braces in all except the centre panels which resulted in single diagonal webs and thus eliminated redundant cross-members.
- Placing of all webs on the same angle so that any shrinkage of the timber could be taken up by the tightening of suspension rods.
- All diagonal braces and the sloping end members (principals) of spaced construction, which greatly increased their buckling strengths for a modest increase in construction costs.
- The use of sawn flitches in all braces, bowed to prevent warping and twisting.
- The provision of footways.

- The absence of overhead cross braces spanning the roadway eliminated a height limitation on loads being carried.
- All joints and surfaces of members left accessible for inspection and maintenance.
- The use of external iron clamps almost eliminated drilling of timbers for the large diameter suspension rods.
- Cross girders placed at panel points to eliminate bending in the bottom chord.
- Well designed splices (a direct result of Warren's earlier program of timber testing) enabling shorter pieces of timber to be used.
- Any member could be renewed without destroying the overall structural integrity of the truss. It was easy to replace half members with minimal disruption to traffic.

Due to Allan, timber truss road bridges were relatively cheap and remained serviceable for longer periods than the earlier designs. The first Allan truss was constructed in 1894 and the last Allan truss bridge was built over Mill Creek near Wisemans Ferry in 1929.

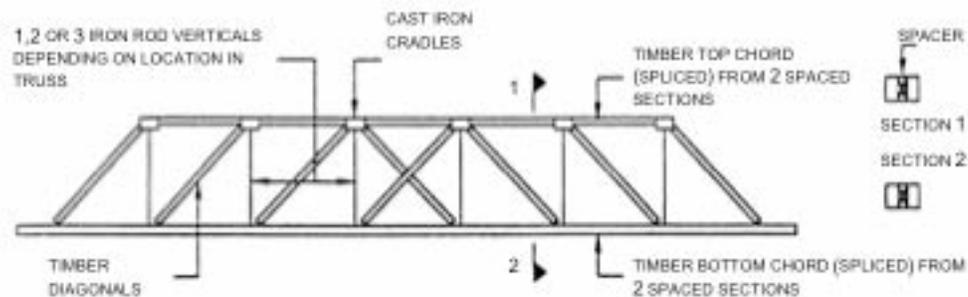


Figure 2.3 Schematic diagram of an Allan Truss (derived from DMR 1987)

Figure 3 Detail of Allan Truss construction

### The De Burgh truss

The de Burgh truss was designed by Ernest McCartney de Burgh, a British expatriate engineer, who had worked in the PWD since 1885. The de Burgh truss was possibly based on the American Pratt style truss but was modified to include steel bottom chords, vertical posts and diagonal tension members. A later modification to the truss was the replacement of the sloping end members with the conventional Pratt truss squared ends. This truss design incorporated features of the Allan truss but changed some details to include a steel bottom chord which resulted overall in a stiffer, more robust truss. However, the pins along the bottom steel chord made replacement and maintenance of this feature difficult. De Burgh truss designs were used for a relatively short length of time between 1900 and 1905.

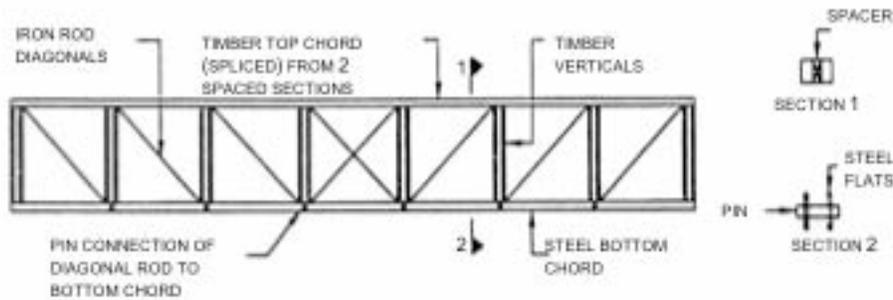


Figure 2.4 Schematic diagram of a de Burgh Truss (derived from DMR 1987)

Figure 4 De Burgh Truss

### The Dare truss

The Dare truss was designed by Harvey Dare and was a design used extensively in NSW in the period 1906 to 1935. It is a variation of the Allan truss design, substituting a pair of steel channels for the bottom chord. The Dare truss proved to be a very successful composite truss design, which was relatively simple to maintain.

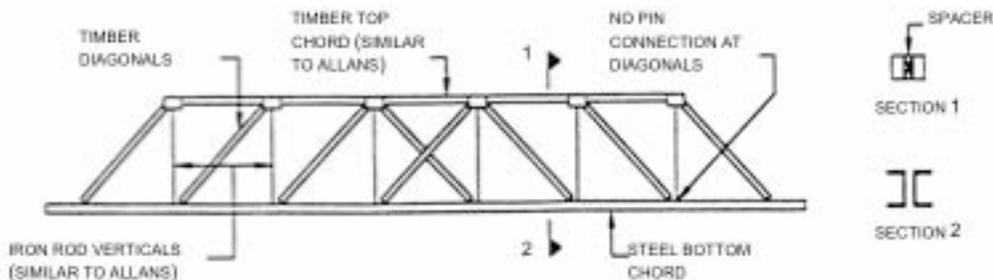


Figure 2.5 Schematic diagram of a Dare Truss (derived from DMR 1987)

Figure 5 Dare Truss

### 3.3.4 PREVALENCE OF THE TIMBER AND COMPOSITE TRUSS BRIDGES

The number of truss bridges in the above five groups constructed in the decades commencing 1850 and concluding 1930 is 407. Details are shown in the following schedule which includes Tharwa Bridge.

Decade Commencing	Bridge Type					Total
	Old PWD	McDonald	Allan	De Burgh	Dare	
1850	22					22
1860	73					73
1870	39					39
1880	13	23				36
1890		68	47			115
1900			16	20	12	48
1910			4		15	19
1920			38		12	50
1930					5	5
TOTAL	147	91	105	20	44	407

The most prolific decade for construction of timber truss bridges was 1890-1900 during which 115 bridges were built, comprising 68 McDonald trusses and 47 Allan trusses.

In 2007 at least 66 timber truss bridges remained, including Tharwa Bridge. As there is no central authority responsible for all timber truss bridges the number for which Local Government is responsible could be underestimated in the preparation of the schedule hereunder for bridges remaining.

Bridge Type	Old PWD	McDonald	Allan	De Burgh	Dare	Total
Number constructed	147	91	105	20	44	407
Number remaining	2	5	28	9	22	66
Percentage remaining	1.4	5.5	26.7	45.0	50.0	16.2

The De Burgh and Dare bridges were provided with steel bottom chords and this feature may have assisted in their longevity (45 and 50 per cent remaining), over that of the Allan trusses (26.7 percent remaining). In addition, the average age of the Allan trusses is higher than that of the de Burgh and Dare trusses and hence the percentage remaining could be expected to be lower than that of the latter trusses.

### 3.4 RECENT HISTORY OF THARWA BRIDGE

Tharwa Bridge was built by the NSW Department of Public Works. In 1928 responsibility for road bridges in NSW was transferred to the newly formed department of Main Roads NSW (DMR) and in 1989 the Road Traffic Authority (RTA) NSW was formed from the NSW DMR, Department of Motor Transport and Traffic Authority.

In 1911 with the proclamation of the Australian Capital Territory, Tharwa Bridge became the responsibility of successive Federal and Territorial government departments, lately Roads ACT.

The first major modifications were made to the bridge in 1936/1937 when the three of the five original timber trestles were replaced with the concrete piers visible today. In 1939-40 the remaining two main span trestles were replaced and the timber approach spans were dismantled and replaced by steel beams with a concrete deck structure supported by concrete piers.

In 1965 a 25 tonne limit was placed on the bridge because of signs of deterioration and in 1977 this limit was reduced further to allow a maximum capacity of 5 tonnes across the bridge. In 1978, the National Capital Development Commission (NCDC) proposed that the old bridge be demolished and a new bridge be constructed a short distance upstream on the grounds that restoration of the bridge was not feasible. Extensive public debate regarding the heritage value of the bridge resulted in the nomination of the bridge to the Register of the National Estate in 1982, its registration in 1983 and the initiation of restoration work to the bridge by 1984.

In 1994 further restoration work was carried out by the ACT Department of Urban Services. In 1998 Tharwa Bridge was registered on the ACT Heritage Register.

The last major upgrade involved replacement of the main deck in 2001. However significant deterioration continued, notably rotting of major timbers and by 2005 it had been declared unsafe and closed to traffic.

### 3.5 RECONSTRUCTION OF THARWA BRIDGE

In 2008, the decision was made to reconstruct the bridge and to retain its historic use as a road bridge but to upgrade its load capacity to Austroads T44 design (44 tonnes).

Notwithstanding the main reconstruction project there was pressure to reopen the bridge to at least light traffic as soon as possible. To this end Stage1 works were undertaken, guided by a Statement of Heritage Impact prepared by the ACT Heritage Unit and based on the existing ACT Heritage Register citation. The bridge re-opened to light traffic in August 2008.

The Stage 1 works included the following:

- Erection of a steel beam underslung assembly supported on the existing headstocks for the four truss spans to support the timber bridge deck;
- Removal of existing Bailey panels currently located on three of the truss spans;
- Temporary support to the pier crossheads;
- Removal of temporary cross girders associated with the Bailey panels;
- Removal of the existing timber Allan trusses;
- Inspection and replacement of deteriorated cross girders;
- Inspection and replacement of deteriorated stringers;
- Provision of new traffic barriers and timber kerb for the bridge deck;
- Provision of suitable signage at both approaches to advise heavy vehicles not to use the bridge; and
- Maintenance of Telstra phone cable across the Murrumbidgee River.
- Replacement of abutment gravel boards and rebuild road surface.
- Replace top rails in steel
- Form expansion joints in concrete approach decks

## 4.0 PHYSICAL ASSESSMENT

### 4.1 BRIEF DESCRIPTION

Tharwa Bridge spans the Murrumbidgee River just to the east of the township of Tharwa. The bridge is in the vicinity of both aboriginal and early European river crossing points and the track leading to a river ford used for the second half of the nineteenth century is still evident below the eastern approaches.

The black and white painted bridge comprises four main spans, each 27.45m long of timber Allan Truss construction, and eight approach spans comprising steel beams carrying a reinforced concrete deck. It is 181.5 m long overall, and the superstructure is carried 12 m above water level on concrete piers. The single lane deck is 4.6m between kerbs.

The bridge forms a focal element rising 12m above the river with the backdrop of the Murrumbidgee Valley and the Brindabella Hills rising to the south and west. The overall effect is highly picturesque and aesthetically pleasing and particularly enjoyed from each road approach, the township of Tharwa and from the park on the western bank.

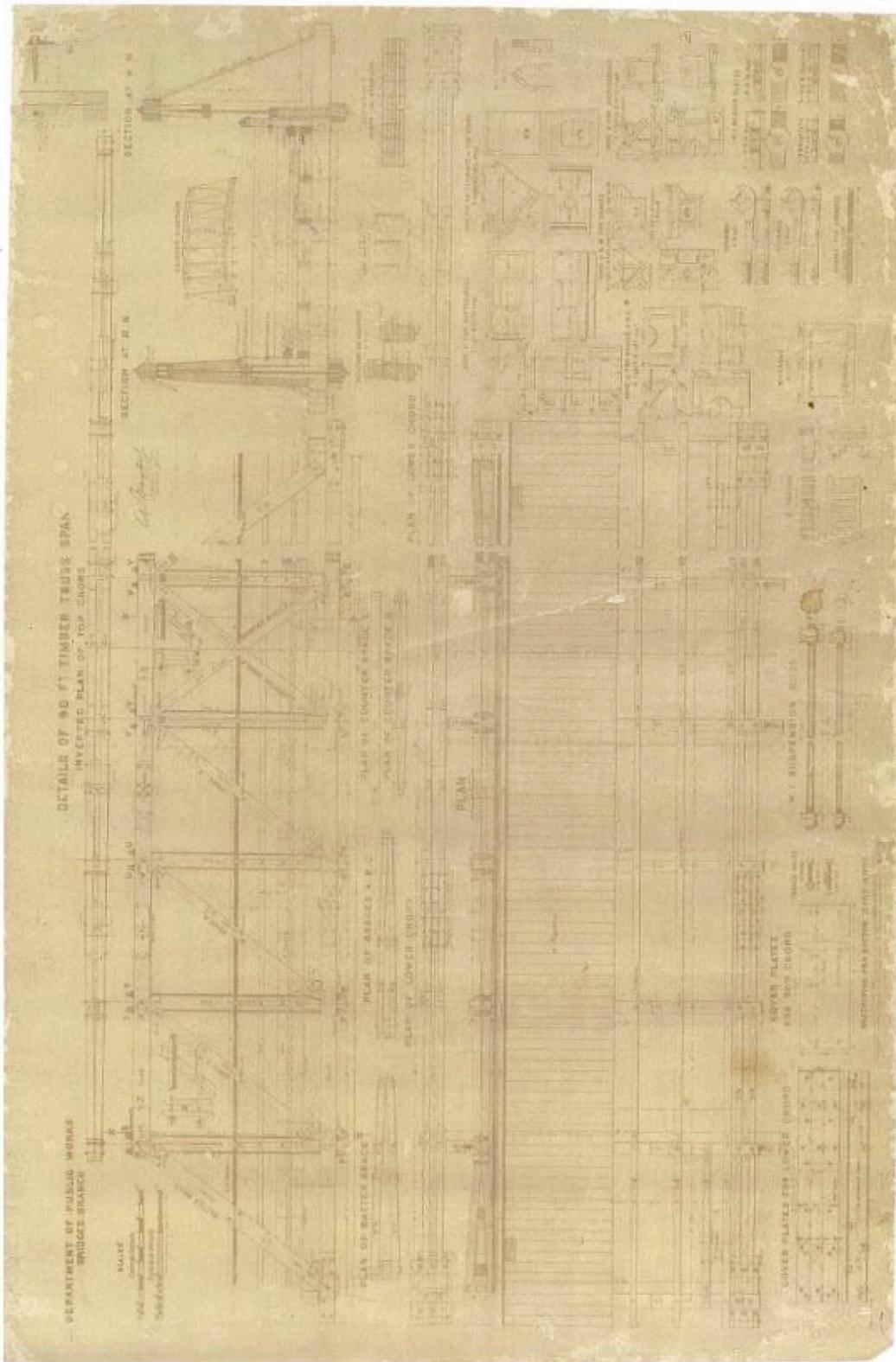


Figure 6 Original Drawing 1

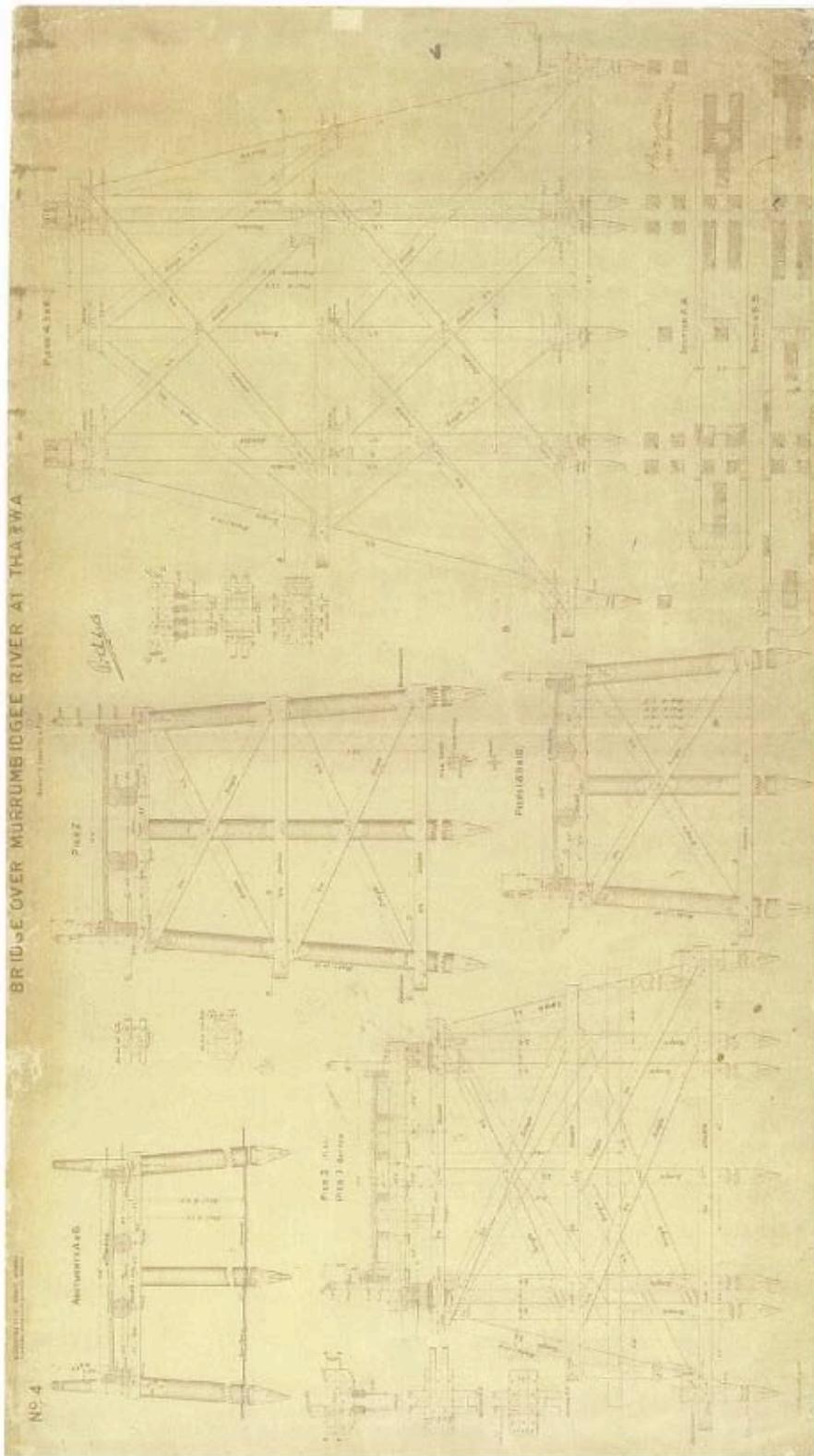


Figure 7 Original Drawing 2

4.2 PHYSICAL ASSESSMENT BY ELEMENT

This section analyses the main elements of the bridge and environs. It provides an original description, existing description and condition followed by a brief summary.

**4.2.1 Original Ford**

The river ford crossed just downstream of the bridge. The approach track and cutting are still visible on the eastern bank, however since the construction of the Tharwa Bridge, the ford area on the Lanyon side has been highly disturbed. During high water levels and floods, scouring of the bank has occurred which has resulted in the removal of the lower level of the ford where it reaches the riverbed. The ford area is currently covered by low vegetation. The approach track has been used on several occasions since the 1930s to provide access for alterations and repair of the bridge, including the Stage 1 works but its basic form is still apparent.



*Track and cutting to ford on eastern downstream side of bridge during Stage 1 works.*



*Track and cutting in natural state.*

<b>Physical Assessment Summary</b>
Condition: Fair
Modifications: Road base and fencing provide protection during Stage 1
Integrity: High

**4.2.2 Park**



*Park on western bank*

A public park on the western side is accessed from Tharwa village. It extends north and south of the bridge approaches and down to the river's edge. It includes toilets, picnic tables, and a number of interpretative signs of the bridge and crossing.

The park provides excellent viewing points of the original ford area, the access track, both river banks and wider landscape to the north and south, and of bridge itself, including an impressive view of the piers and deck soaring overhead.

This area provided site offices, parking, and a platform for cranes and scaffolding for the Stage 1 works. It is anticipated that this use will continue during Stage 2 works.

The park will require remediation on completion of all works.

<b>Physical Assessment Summary</b>
Condition: Fair
Modifications: Road base, works sheds, platforms for Stage 1.
Integrity: High

**4.2.3 European Cultural Heritage Material**

During the progress of the Stage 1 works there were several finds relating to nineteenth century use of the river crossing and the early history of the bridge. These are outlined in Charles Dearling's report of May 2008 and include a bullock chain, animal bones, items from a European rubbish dump such as bottles and a doll's arm together with evidence of several burning events.

#### 4.2.4 Aboriginal Cultural Heritage Material

Indigenous heritage surveys have been undertaken by Charles Dearing for both north and south of the bridge. He reports that no Aboriginal cultural material or sites were recorded in the immediate area of the bridge or ford and assigns low to nil Aboriginal archaeological sensitivity due to highly disturbed nature of the area.

Areas along the riverbank to the south were noted as having a high potential to contain Aboriginal burials. The presence of Aboriginal artefacts on the Lanyon side upstream of the approach road shows Aboriginal people indeed used the area.

Without consultation it cannot be stated that it has value against this criterion, but it is highly likely and will need to be undertaken by the ACT Heritage Unit, as not part of this CMP brief.

#### 4.2.5 Bridge Abutments



*Western abutment*

*Eastern abutment*

The two bridge abutments, Abutment A on the Tharwa (west) side and Abutment B on the Lanyon (east) side retain the fill material of the approach embankments and support the end span girders under the approach decks.

The original abutments comprised hardwood restraining piles driven into the earth banks with timber plank sheathing laid horizontally behind. Piles were typically constructed from ironbark, tallwood or grey box timber, whilst sheathing was lesser durability class blackbutt, grey box, brush box or tallwood,

In c.1939-40 the original abutments were replaced with reinforced concrete, of a form and composition typical for its time. At some later time due to subsequent settlement steel channel cross girders were placed adjacent to both abutments supported on 2 steel columns. The end span girder of the upstream eastern approach deck is raised approximately 70mm clear of this cross girder, indicating some movement.

The abutments have settled, are badly cracked and in need of replacement. There is no record of any concrete test cores having been taken from either abutment to determine composition.

Timber gravel boards retain the earth behind the abutments. The existing boards are in poor condition, being either rotten or burnt. As a result loose fill is spilling out over the tops of the abutments and the asphalt road base is sinking relative to the approach decks. Stage 1 works include the replacement of gravel boards with a reinforced concrete wall, and realignment of the road surface on each side.

It is recommended that a more detailed condition report be prepared.

<b>Physical Assessment Summary</b>
Condition: Poor (to be confirmed)
Modifications: Original timber abutments replaced in c. 1939-40. Age of existing gravel boards unknown
Integrity: Nil

**4.2.6 Approach Piers**



*Western approach piers*

The approach piers supporting the eastern and western approach decks are located at 9.3m intervals typically, with shorter spans at each end.

The original piers comprised timber trestles founded on timber piles driven as deep as possible in accordance with typical procedures at the time.

In c.1939-40 the original timber piers were replaced with reinforced concrete portal frames with spread concrete footings. It is assumed the concrete was bulk mixed and hand placed with only steel rods used to compact it.

The approach piers appear to be in good condition based on visual inspection and display no distress under their loading to date.

It is recommended that a more detailed condition report be prepared.

<b>Physical Assessment Summary</b>
Condition: Good (To be confirmed)
Modifications: Originals replaced in c.1939-40
Integrity: Nil

**4.2.7 Main Piers**



Main piers

The main piers are located at 27.4m intervals supporting the main truss spans. The original piers comprised timber trestles founded on timber piles driven as deep as possible in accordance with typical procedures at the time.

In 1936 three of the five timber trestles were replaced with reinforced concrete webbed wall type piers constructed in the same location as the original piers. The remaining two trestles were replaced in 1939-40. The new piers were founded on both the original timber piles and additional timber piles which were driven on either side, necessitating wider webs than would otherwise have been required. It is noted that the headstocks of the new piers were also wider than necessary, perhaps allowing for future deck widening, or replacement of the original truss spans.

GHD reports that specimens were taken from four of the five piers and pile caps, with one pier being inaccessible. This established the size and spacing of steel reinforcement and concluded that the reinforcement was less than required by current design codes and that the concrete was of low strength. There is some slight misalignment of the piers, probably due to faults in the construction formwork rather than movement over time.

<b>Physical Assessment Summary</b>
Condition: Poor in relation to current loading requirements
Modifications: Originals replaced in 1936, 1939-40
Integrity: Nil

**4.2.8 Approach Spans**



*Approach spans*

The original approach spans comprised c.100mm x 200mm timber planks spanning over 4 timber girders. The centre two girders were trimmed round logs of c. 500mm dia. The edge girders were 300mm x 350mm squared up logs.

In 1939-40 the original spans were replaced with steel girders, 400mm x 200mm generally and 325mm x 125mm for the short spans adjacent to the abutments, spaced at c. 2m, supporting a reinforced concrete deck with a 25mm bituminous road surface.

Connell Wagner report that based on the design loading at the time of construction the concrete deck is possibly under reinforced and the girders inadequate to support a T44 loading. This is the subject of ongoing investigation.

<b>Physical Assessment Summary</b>
Condition: Fair (to be confirmed)
Modifications: Original replaced in 1939-40
Integrity: Nil

**4.2.9 Main Truss Spans**



*General view of main truss spans*

*Individual truss span*

The four main spans consist of Allan Trusses, each 27.4m long. Each span consists of two individual timber trusses between which the road deck is suspended. Each truss is made of top chords, hangers (generally wrought iron rods), diagonals, including the principal diagonals at each end, and the bottom chords, with joints consisting of cast iron shoes. Truss supports consist of timber corbels and backing blocks. The trusses are separated by timber cross girders sitting on the bottom chords of each truss adjacent to each panel point. These timber cross girders in turn support longitudinal timber stringers, which in turn support transverse decking planks to make up the running surface of the bridge.

The truss spans appear largely as per the original. However it is assumed that most timber members have been replaced over time as per the original design intention.

Connell Wagner Consulting Engineers advise that almost all of the existing timber elements forming the trusses have deteriorated significantly and cannot be reused in replacement trusses. This deterioration is primarily typical timber rot or decay forming on the inside of the timber and then spreading out, gradually reducing the member strength. This form of deterioration is generally not visible from the outside of the member and makes timber strength assessment difficult unless timber boring is undertaken. A recent regular series of timber borings on the bridge have confirmed the unserviceability of the timber truss members and the need for replacement.

<b>Physical Assessment Summary</b>
Condition: Poor
Modifications: Periodic replacement of members. Extent unknown
Integrity: Appearance – High. Fabric - Low

#### 4.2.10 Hangers



*Hangers*

The hangers are black painted wrought iron rods. These are 50mm diameter towards the ends of each truss (to reduce stress concentrations) and 38mm diameter in the centre. Each rod is supported by wrought iron clamps above the top chord and below the bottom chord with washers and nuts on rolled threads at the ends. There is no record of replacement and it is likely that the originals survive in place.

The hangers are believed to be in a satisfactory condition but nuts may not be able to be moved. They are probably inadequate to support a T44 loading. This is the subject of ongoing investigation.

<b>Physical Assessment Summary</b>
Condition: Fair. May be inadequate for T44 load (to be confirmed)
Modifications: Extent of replacement unknown
Integrity: High. Assume most original members exist

**4.2.11 Shoes**



*Bottom shoes*



*Top shoes*

Cast iron shoes are located at the intersection of horizontal and diagonal timber truss members. There is no record of replacement and it is likely that most originals survive in place. Roads ACT report that there is extensive cracking and movement in the shoes, and that they are difficult to access for repairs. Impact loading tends to cause cracking of the cast iron. This was a known source of weakness in the original design.

<b>Physical Assessment Summary</b>
Condition: Poor
Modifications: Periodic strengthening. Extent of replacement unknown
Integrity: High. Assume most original members exist

**4.2.12 Splice Plates**



*Flanged plates on top chord*

Splice plates are used to join shorter timber lengths to make up the required length of each truss member. The originals were cast iron. Newer plates are steel. Originally flanged plates were used only on the truss top chords, which are subject to compression. Over time plates have been modified in an ad hoc manner. The use of shorter timbers has required more splice plates, and the convention of flanged plates on top chords is not always followed.

The condition of the plates is unknown. Roads ACT advise that the plates often conceal timber rot.

<b>Physical Assessment Summary</b>
Condition: TBA
Modifications: Extent of replacement unknown.
Integrity: Moderate. Assumed some original members exist

#### 4.2.13 Sway Braces



*Sway braces*

External sway braces connect the top chord to the cross girder to prevent lateral deflection. The original braces were fabricated from 100mm x 60mm wrought iron T sections and were located at the first, fourth, fifth and eighth panel points of each nine panel truss.

The existing braces appear to be fabricated from two slightly larger steel angles fixed back to back to form a 'T' with its back facing inward to the road deck. They are located at various asymmetric points.

There is no record of replacement but it appears most if not all braces have been replaced.

There is significant lateral deflection of the top chord suggesting the braces are inadequate. This would be exacerbated under a T44 loading.

<b>Physical Assessment Summary</b>
Condition: Poor. Inadequate for T44 load
Modifications: Extent of replacement unknown. Assumed few original members exist.
Integrity: Low

**4.2.14 Cross Girders**



General view cross girders



Close up, showing bottom chord

The main span deck is supported on 250mm x 375mm hardwood cross girders which are bolted to the truss bottom chord.

There is no record of replacement but it is likely that all originals have been replaced over time. Roads ACT report their condition as poor. They are comprehensively rotted due to moisture seeping through the road deck. They are the greatest ongoing maintenance issue on the bridge.

<b>Physical Assessment Summary</b>
Condition: Poor
Modifications: Periodically replaced
Integrity: Low. Assume no original members exist

**4.2.15 Main Deck**



*Main deck top view*



*View from underside*

The main deck consists of closely spaced transverse planks, each 200mm wide and 100m deep, spiked into longitudinal hardwood stringers bolted to the cross girders. The stringers are c. 150mm wide and are nominally 275mm deep, varying slightly to provide deck camber.

The existing deck planks were installed in 2001 and have a sprayed bitumen surface.

Transverse deck planks shrink, become loose and allow moisture through, which causes deterioration and rot of lower timber members. The effect of the rough ride caused by worn transverse planks increases the dynamic impact from vehicles.

In c. 1980 50mm thick longitudinal running boards were placed under the wheel tracks on each side of the main deck. These added strength and significant transverse stiffness to the bridge and evened out impact load. The boards were removed in 2001 following complaints by cyclists that the gaps between the boards caught their tyres.

The condition of the deck planks is fair. They have suffered heavy wear due to vibration and have rotted due to moisture on the road surface. They are due for replacement.

<b>Physical Assessment Summary</b>
Condition: Fair
Modifications: All members have been periodically replaced
Integrity: Nil

**4.2.16 Railings**



General view of railings



Refuge

The railings are traditional timber ordnance rails approximately 1200mm high above the main deck level. They consist of timber posts 150mm x 100mm, a kerb rail 200mm x 200 mm, a midrail 100mm x 75mm checked into the posts and a top rail 100mm x 100 mm set at 45 degrees. The posts are spaced at c. 2.4m on the main spans and 1.8m on the approaches.

There are 2 pedestrian refuges on each side of the bridge consisting of a railed platform supported on extended cross girders and accessed through a break in the handrail. It is unclear when these were first constructed. They do not appear on the original drawings, but are visible in early photographs.

The railing retains its original form, although the extent of member replacement is unknown.

The railing appears poor on visual inspection. However it has no structural capacity and does not comply with regulations for traffic barriers to AS5100.1 and AS5100.2

<b>Physical Assessment Summary</b>
Condition: Poor. Does not comply with current safety barrier regulations
Modifications: Members have been periodically replaced
Integrity: Moderate. Assume no original members exist.

**4.2.17 Lighting & Services**

The bridge has no history of lighting save for those which were installed as a safety measure in 2005 to illuminate the concrete barriers blocking entry to the main deck. Wiring is provided discretely under the handrails.

There is a Telstra cable on the downstream side of the bridge and a street light cable on the upstream side, both running in a 50mm dia. conduit along the tops of the kerbs.

**4.2.18 Paint Colours**



*Current colour hierarchy*

Early photographs suggest the original bridge had all timbers painted white and all iron/steel elements black.

This hierarchy largely remains for the upper portion, however the cross girders, deck stringers and truss bottom chords are currently painted black, and parts of the truss diagonals and railing posts are painted black up to the mid rail height.

<b>Physical Assessment Summary</b>
Condition: Poor
Modifications: Departs from original colour hierarchy in some respects
Integrity: Moderate.

**4.2.19 Maintenance Rail**



*Maintenance rail at bottom*

A rolled steel joist is suspended from the truss bottom chords on each side of the main span. This is not original. It was installed in c. 2001 to provide support for a maintenance gantry. The beam is not sufficiently rigid for its purpose due to deterioration of the timber bottom chord.

<b>Physical Assessment Summary</b>
Condition: Poor.
Modifications: Non original element
Integrity: Nil

## 5.3 SUMMARY OF PHYSICAL CONDITION

### 5.3.1 Environs

The access track and cutting to the original ford and the park have been affected during past bridge works, including the current Stage 1 stabilisation. They will require protection and management during the bridge reconstruction works and restoration on completion.

### 5.3.2 Bridge

The Tharwa Bridge is in a severely deteriorated condition. The bridge is closed to all vehicles and pedestrians. The condition of most elements is the subject of continuing analysis by Connell Wagner. Initial indications are:

- The abutments are in poor condition and will require replacement
- The approach piers and spans may require replacement, depending on analysis of load carrying capacity.
- The main piers may require strengthening or replacement depending on analysis of load carrying capacity.
- The main truss timbers and cross girders are extensively rotted and require replacement.
- Iron and steel elements are in fair to poor condition. They will be difficult to remove intact and there is doubt as to their adequacy to support the increased load requirement.
- The main deck is in poor condition and requires replacement
- The railings are poor condition and require replacement to comply with current safety standards
- The maintenance rails require replacement to comply with current safety standards and operational requirements.



*General deterioration*

## 5.0 ASSESSMENT OF SIGNIFICANCE

### 5.1 HERITAGE STATUS

The Tharwa Bridge was entered into the Register of the National Estate (RNE) in 1983 and the ACT Heritage Register in 1998.

### 5.2 ASSESSMENT OF SIGNIFICANCE

Analysis of the Documentary and Physical evidence against the criteria as specified in Section 10 of the ACT Heritage Act 2004 is as follows:

**(a) demonstrates a high degree of technical or creative achievement (or both) by showing qualities of innovation, discovery, invention or an exceptionally fine level of application of existing techniques or approaches.**

Tharwa Bridge is a definitive example of an Allan truss timber bridge. The design combined engineering theory with the testing of the structural behaviour of trusses and the strength of Australian hardwood timbers and represented a shift towards a more scientific approach to structural design.

The truss design based on this data represents an innovative achievement in bridge construction during the economic downturn of the 1890s, and resulted in a structure which was cheaper to build and maintain.

The more modern pier and approach spans are not significant historically, as these types of structures are comparatively common. They do have some significance in demonstrating the evolutionary development of the bridge and as examples of best practice of their time.

**(b) exhibits outstanding design or aesthetic qualities valued by the community or cultural group.**

Tharwa Bridge is highly valued for its aesthetic qualities. The predominantly white painted bridge forms a focal element rising 12m above the river with the backdrop of the Murrumbidgee Valley and the Brindabella Hills rising to the south and west. The overall effect is highly picturesque and highly visible from each road approach, the township of Tharwa and from the park on the western bank.

**(c) it is important as evidence of a distinctive way of life, taste, tradition, religion, land use, custom, process, design or function that is no longer practised, is in danger of being lost, or is of exceptional interest.**

The crossing at this point of the Murrumbidgee River, as a river ford and subsequent Tharwa Bridge, provide evidence of past lifeways, land uses and customs that no longer exist. Used for thousands of years by Aboriginal people, including during the 19<sup>th</sup> century, the crossing was also a natural ford for early European settlers as they took over more and more land for pastoral use, even when west of the Murrumbidgee was beyond the 'limits of occupation'. The crossing enabled pastoralists to move stock across to the rich riverside pastures

and later the high country snow leases, and to get their wool to market in London – via a long, difficult journey over bad roads and other river crossings to Sydney. [the initial attraction was the river pasture, and the 'high country' was largely limited to summer grazing on 'snow leases']

Gold found at Kiandra in the high Alps, brought a short, sharp rush of thousands who used this ford in 1859-60, and afterwards a growth in population and the formation of the township of Tharwa. This resulted in decades of lobbying, for better roads and for a bridge, by the pastoralists living either side of the river, typically at that time also influential as community leaders and members of parliament. These locals' argument, put by then MP, E W O'Sullivan, that the bridge would bring tourism and other economic opportunities to the district, demonstrates the growing awareness of the romantic and recreational benefits of the High Country across the river.

The Tharwa Bridge was the seventh bridge built across the Murrumbidgee River at a time when improved road access and transport and communication facilities, such as rail and telegraph, were seen as essential to the growth and development of New South Wales. This was during a major economic downturn and the onset of the extensive 'Federation Drought', when such government construction projects were also seen as important employment opportunities.

The timber truss bridge made use of readily available material, suited to the construction skills available at the time. Timber is now rarely if ever used in new bridge construction, nor is the form of design found in this bridge which facilitates ease of replacement of smaller individual members without great expense or disruption. This was a response to the difficulty of obtaining large timbers and also the remoteness of the bridge from major sources of timber in northern New South Wales and the limitations of road and rail transport at the time.

**(d) it is highly valued by the community or a cultural group for reasons of strong or special religious, spiritual, cultural, educational or social associations.**

The local community of Tharwa and other residents of the western bank of the Murrumbidgee River have demonstrated strong commitment to the retention and continued usage of the Bridge for its historical associations and the ongoing communication it facilitates. The Canberra community value the bridge as indicated in the 2007 survey as a heritage site as well as the gateway to the natural and cultural heritage and recreational facilities offered by Tidbinbilla Nature Reserve and Namadgi National Park,

**(e) it is significant to the ACT because of its importance as part of local aboriginal tradition.**

The crossing has evidence of use by Indigenous groups from the Holocene on and probably earlier, as well as being a favoured campsite during early European settlement. The opening ceremony of the Tharwa Bridge included Queen Nellie Hamilton, a leader in the community.

Without consultation it cannot be stated that it has value against this criterion, but it is highly likely and will need to be undertaken by the ACT Heritage Unit in consultation with local ROAs, as not part of this CMP brief.

**(f) it is a rare or unique example of its kind, or is rare or unique in its comparative intactness.**

Tharwa Bridge is the oldest remaining Allan truss bridge of those built in the 19th Century in NSW (now the ACT). The bridge is the only example of this bridge type in the ACT. The timber truss spans form the oldest standing bridge structure in the ACT.

**(g) it is a notable example of a kind of place or object and demonstrates the main characteristics of that kind**

Tharwa Bridge is a notable example of the Allan truss bridge and the only remaining example with 4 truss spans. It demonstrates the main characteristics of Allan Truss design which utilised two parallel half trusses bolted together to form a complete truss, required smaller sizes of timber than were needed in earlier trusses and had the advantage of being both cheaper and easier to maintain. The Allan Truss saw the introduction of spaced double chord members and all diagonal members set at the same angle. This allows any shrinkage of timber to be taken up by simply tightening the vertical rods which enabled the bridge to be constructed in only ten months. These basic design principles meant that the structure was still self supporting when any one member was out of service which allowed for easier maintenance because any of the members could be replaced without having to close the bridge.

**(h) it has strong or special associations with a person, group, event, development or cultural phase in local or national history.**

The river ford and subsequent bridge have a strong association with the expansion of pastoral development west of the Murrumbidgee River into the high country of NSW and with the short goldrush by thousands to Kiandra in 1859-60 [it lasted one year only!]. The Tharwa Bridge and the river ford which predates it are especially associated with some key pastoralist families: Wright, Cunningham and de Salis, who had properties either side of the river and were influential beyond the Queanbeyan district, including in the NSW Parliament, and later with E W O'Sullivan MP who lobbied hard for the area to be the site of the federal capital. Their influence was crucial in the decision to locate this bridge across the Murrumbidgee, the seventh at the time, at Tharwa, a route that led only to a few pastoral properties. Their assurances to authorities that the bridge would lead to tourism opportunities, was not realised for another half century.

The bridge was constructed towards the end of a major development phase for NSW bridges and roads which facilitated economic growth through increased communication and trade. The cheaper and more rational Allan truss design was also partly a response to the major economic downturn of the 1890s.

Percy Allan, the designer of the bridge, was responsible for more than 550 bridges throughout New South Wales. He was appointed Engineer-in-Chief of Bridges in 1896. In his repertoire are many innovative and remarkable structures including the lift bridge over the Murray River at Swan Hill and the swing bridges at Pymont and Glebe Island in Sydney.

### 5.3 STATEMENT OF SIGNIFICANCE

Tharwa Bridge is a definitive example of an Allan truss timber bridge and demonstrates the main characteristics of the type. It is the oldest remaining example of such bridges built in nineteenth century NSW, the only remaining example with 4 truss spans, the only example of the type in the ACT and the oldest bridge structure in the ACT.

The Allan truss design combined engineering theory with scientific testing of materials resulting in an innovative structure for the economically depressed 1890s which was cheaper to build and easier to maintain. Such construction is now extremely rare and as such the bridge provides an invaluable teaching opportunity.

The designer of the bridge, Percy Allan, was responsible for more than 550 bridges throughout New South Wales. Appointed NSW Engineer-in-Chief of Bridges in 1896 his work includes many innovative and remarkable structures.

The predominantly white painted bridge rises high above the Murrumbidgee River with the backdrop of the Murrumbidgee Valley and the Brindabella Hills. The overall effect is highly picturesque and valued for its aesthetic beauty and as a gateway to the recreational and natural attractions of the ACT High country parks and reserves.

The bridge and its site are significant in demonstrating 19th century European settlement and pastoral development of the district. The river ford is important as a crossing used over thousands of years by Aborigines and for the early European settlers. The bridge demonstrates the pastoralists' influence in economic and political events and decisions at the time, along with the then MP, E W O'Sullivan, critical to the NSW government's decision to build the Tharwa Bridge. The bridge provided a high level all-weather crossing at Tharwa, enabling improved trade and community links at a time when the economic downturn and 'Federation Drought' meant such greater access enabled continued economic viability.

## 6.0 OPPORTUNITIES AND CONSTRAINTS

The following section outlines issues which have had an effect on policy development in this CMP.

### 6.1 RECONSTRUCTION

Due to ad hoc maintenance processes and numerous false starts in reaching and implementing a decision to restore or reconstruct the bridge, the existing fabric has deteriorated to a point where there is no option other than to reconstruct the greater portion of the bridge. The policies and strategies put forward in this CMP are therefore written on the basis of reconstruction rather than conservation and / or restoration.

### 6.2 TRAFFIC LOADING

The bridge is to remain in use as a road bridge to comply with an Austroads T44 loading (44 tonnes) to allow for trucks and large tourist buses. This has an effect on the structural behaviour of the reconstructed truss elements and the exact dimension and nature of connections which may make exact matching of original elements not feasible.

### 6.3 SAFETY

As the bridge is to remain in use as a road bridge, design for reconstruction is constrained by the need to comply with current strength and safety regulations such as AS 5100 for traffic safety barriers and various requirements for Occupational Health and Safety of construction and maintenance workers.

### 6.4 ROAD LEVEL

Until 1992 bridge design was required to consider a 1:100 year flood event. Current regulations require consideration of a 1:2000 year event, which would require raising the bridge deck level by c. 1m. The ACT government has accepted that any restoration of the bridge would be at the existing levels - i.e. it would accept the flood risk that this presents and has done so since 1895.

## 7.0 CONSERVATION POLICIES

### 7.1 INTRODUCTION

The conservation policies set out in this section are a guide for the reconstruction and future maintenance of Tharwa Bridge and associated elements in order to retain and protect the cultural significance of the river ford and the bridge.

### 7.2 POLICIES RELATING TO CULTURAL SIGNIFICANCE

- 7.2.1 The trackway and embankment leading to the original river ford should be conserved as remnants of a significant and now rare nineteenth century low level river crossing.
- 7.2.2 The main Allan truss spans of Tharwa Bridge should be reconstructed to retain its significance as the oldest, longest and continuous use Allan truss bridge in Australia.

Changes to the approach spans and piers should be as unobtrusive as possible so as not to detract from the form of the Allan truss spans.

- 7.2.3 The bridge should remain in use as a road bridge open to traffic up to the agreed T44 design loading.
- 7.2.4 The picturesque setting of the bridge should be conserved.
- 7.2.5 The bridge should be returned to its original colour scheme. All timbers shall be painted white and all iron/steel elements black.
- 7.2.6 The reconstructed bridge should be properly maintained to conserve its significance in the future.

### 7.3 POLICIES RELATING TO THE USE OF THIS CMP

- 7.3.1 This CMP is owned by Roads ACT.
- 7.3.2 When endorsed by the ACT Heritage Council this CMP should be formally adopted by Roads ACT as a guide to the reconstruction and future conservation and management of the bridge and environs.
- 7.3.3 This CMP should be maintained as a publicly accessible document.
- 7.3.4 This CMP, accompanying volumes and appendixes shall be the single source of all information (reports, tests, approvals, work as executed

records etc) relating to the reconstruction and ongoing maintenance of Tharwa Bridge and its associated elements.

- 7.3.5 It is recommended that this CMP be reviewed at five year intervals in order to accommodate changes in legislation, management practices and alterations to the structure. Review may be required at shorter intervals if major legislative or usage changes occur.

#### 7.4 POLICIES RELATING TO BRIDGE OWNERSHIP

- 7.4.1 The bridge is public property under the care and control of Roads ACT. It should be retained in public ownership. Should Roads ACT cease to be responsible for the care and control of the bridge, ownership should be transferred to another public authority.

#### 7.5 POLICIES RELATING TO INTERPRETATION

- 7.5.1 The trackway, embankment and bridge should be suitably interpreted to describe the significance of the place, including the long use of the crossing prior to the construction of the bridge, and its importance in connecting Indigenous groups and early settlers to the area west of the Murrumbidgee. Such material should not detract from the significance of identified elements, shall not inhibit the safe passage of traffic and shall be of complementary scale and design.
- 7.5.2 An interpretation strategy and implementation plan should be prepared by an experienced consultant, and be implemented as part of Stage 2 works.
- 7.5.3 Part of the plan described above should specify that a representative sample of demolished elements such as timber, iron and steel should be curated and stored for interpretation as part of community displays, possibly at a museum. Decisions about a suitable curator and venue for display (eg. Canberra Museum & Gallery or the National Museum) should be made by the consultant preparing the Interpretation Plan.
- 7.5.4 A proper archival record should be kept of all existing elements prior to demolition (not withstanding those elements already removed as part of Stage 1 works). The record is to include technical details of materials including concrete strength, design of reinforcement, timber species and durability.
- 7.5.5 Public access to both river banks and to the park on the west bank should be maintained to allow appreciation of the bridge and river from below. The park shall be retained as a public recreation ground.

## 7.6 POLICIES RELATING TO NEW WORKS

- 7.6.1 All works other than routine maintenance will require a Heritage Impact Statement prepared by a suitably qualified person which shall be approved by the ACT Heritage Council. The statement shall outline how the recommendations of the CMP are to be fulfilled, shall assess the impact of any proposed works on the heritage significance of the place and identify steps taken to minimise any impact.
- 7.6.2 A Works Plan shall be prepared for all proposed works which shall be approved by the ACT Heritage Council. The plan shall identify in detail all works, procedures and measures proposed in relation to conservation, demolition and reconstruction.
- 7.6.3 Notwithstanding proposals foreshadowed by this CMP any proposed change from the original size, form and material of any element must be justified and proven by calculation prior to being approved. Where a change has been approved all test materials etc must be logged and form an appendix to this document.
- 7.6.4 The reconstruction and continuing maintenance of Tharwa Bridge is not to be used as an experimental opportunity for design innovation. Materials and methods used shall remain as close as possible to the original design intentions and material behaviour.
- 7.6.5 New materials (i.e. steel) must ensure no conflict with existing material behaviour. e.g., timber moisture rusts steel, acidic action may affect galvanising, conversely, steel galvanising may affect timber.
- 7.6.6 Proposals shall demonstrate that fire engineering issues have been addressed.

## 7.7 POLICIES RELATING TO MAINTENANCE

- 7.7.1 Annual inspections and regular maintenance are required to keep the bridge in a safe operating condition.
- 7.7.2 The agency responsible for the ownership and maintenance of the bridge shall prepare a maintenance manual that follows the intent of the CMP and in particular includes but is not limited to:
- The establishment of a management team, based on specialists from within and external to the ACT Government, that plans, monitors funding allocations including forecasts, liaises with the local community and oversees work to ensure the longevity of the structure.

- Methods to be used to maintain the structure including inspection
- requirements, examinations and adjustment of key components, skills of
- people and provision of training courses.
  
- Details of all structural components including type of material and engineering properties of new and replacement materials, including all structural drawings in paper and electronic format.
  
- Records of maintenance which include information and dates of repair or replacement.
  
- Records of maintenance methods and lessons learnt for the generational transfer of unique skills and knowledge.

7.7.3 Any attachments to the bridge which may be required to facilitate regular repairs and maintenance shall be located to have minimum visual impact on the form of the Allan truss spans.

## 7.8 POLICIES RELATING TO ARCHAEOLOGICAL DISCOVERIES

7.8.1 Any archaeological discoveries made during the course of new construction or maintenance activities shall result in the immediate notification of the ACT Heritage Unit and cessation of works until an assessment can be made.

## 8.0 STRATEGIES

The following are recommended strategies on an elemental basis for fulfilling the policy requirements;

### 8.1 TRACKWAY AND EMBANKMENT

8.1.1 Maintain public pedestrian access to the trackway on the eastern bank. Public vehicle access should not be allowed.

8.1.2 The trackway can be used as an access route for construction and maintenance vehicles and for temporary location of plant and equipment as long as significant fabric is undisturbed. Access for construction and maintenance should comply with the following:

- Any ground disturbance needs to be undertaken under the supervision of an archaeologist on a watching brief.
- Any work required only occurs on the floor/trackway of the ford. No disturbance of the batter areas and only limited disturbance of river banks is allowed. The limited disturbance is where the crane platform is required on the Lanyon bank adjacent to the downstream side of the bridge.
- A fence is erected about 1 metre out from the toe of the batter on the northern side of the ford on the Lanyon bank. The fence is to prevent any encroachment by machinery near the batter.
- Any track improvement work between the batter areas should entail only necessary leveling and use of fill material to provide a suitable trackway and work area.

Following the completion of the work that requires the use of the access through the old ford area, any remedial/rehabilitation work required is done. The required work/level of rehabilitation will need to be determined in conjunction with the ACT Heritage Council and ACT Heritage Unit.

### 8.2 PARK & RIVERBANKS

8.2.1 Maximise the public's appreciation of the bridge in its setting by retaining and enhancing the park on the Tharwa side.

8.2.2 Conserve the natural attributes of both riverbanks. This area is subject to a plan of management associated with Namadgi National Park. Seek details of this before proceeding with any rehabilitation works.

- 8.2.3 Utilise the parks and riverbanks to locate uplighting to illuminate the bridge.
- 8.2.4 The park can be used as an access route for construction and maintenance vehicles and for temporary location of plant and equipment as long as significant fabric is undisturbed.
- 8.2.5 Following the completion of the work that requires the use of the park, any remedial/rehabilitation work required is done. The required work/level of rehab will need to be determined in conjunction with the ACT Heritage Council and ACT Heritage Unit.

### 8.3 ABUTMENTS

- 8.3.1 Any replacement should be of unobtrusive design and material which does not detract from the visual impact of the bridge in its setting.

### 8.4 APPROACH PIERS

- 8.4.1 Replacement should be of unobtrusive design and material which does not detract from the visual impact of the bridge in its setting.
- 8.4.2 If the main piers are relocated (see 9.5.3) and a decision is taken to replace the approach piers at the same time or later, the opportunity should be taken to adjust their spacing to be at even intervals relative to the main spans.

### 8.5 MAIN PIERS

- 8.5.1 Replacements should be of unobtrusive design and material which does not detract from the visual impact of the bridge in its setting.
- 8.5.2 It is preferable that the piers replicate the existing column and web form in reinforced concrete, however the width of the splay may be reduced.
- 8.5.3 The piers may be relocated for buildability or economic reasons if thoroughly justified.

### 8.6 APPROACH SPANS

8.6.1 Replacements should be of unobtrusive design and material which does not detract from the visual impact of the bridge in its setting.

8.6.2 The existing road alignment and levels should be maintained.

#### 8.7 MAIN TRUSS TIMBERS

8.7.1 Match appearance, sizes, connections as closely as practical.

8.7.2 Timber sizes shall match the existing or change only slightly so as to retain existing relative proportions.

8.7.3 Select new timbers based on stress grade, strength and durability to maximise their lifespan and thus reduce frequency of future replacement.

8.7.4 New materials (i.e. steel) must ensure no conflict with existing material behaviour. e.g., timber moisture rusts steel, acidic action may affect galvanising, conversely, steel galvanising may affect timber.

#### 8.8 HANGERS

8.8.1 Maintain original engineering behaviour, size, proportion and general appearance as closely as possible.

8.8.2 Maintain the existing hierarchy of sizes, i.e. larger diameter rods at ends of truss spans.

8.8.3 Match existing fixings such as nuts and bolts.

8.8.4 The material should remain iron or steel but its exact composition may be changed to suit design, construction and maintenance requirements.

#### 8.9 SHOES

8.9.1 Maintain original engineering behaviour, size, proportion and general appearance where possible

8.9.2 The material should remain iron or steel but its exact composition may be changed to suit design, construction and maintenance requirements

#### 8.10 SWAY BRACES

8.10.1 Match the appearance of the original 'T' section profile and fixings as closely as possible.

8.10.2 The material should remain iron or steel but its exact composition may be changed to suit design, construction and maintenance requirements.

8.10.3 The angle may be changed to suit engineering requirements.

8.10.4 The brace locations may be changed to suit engineering requirements.

#### 8.11 SPLICE PLATES

8.11.1 Maintain the original size and shape including the hierarchy of flanged plates on the top chords and flat plates on the bottom chords.

8.11.2 The material should remain iron or steel but its exact composition may be changed to suit design, construction and maintenance requirements.

#### 8.12 CROSS GIRDERS

8.12.1 The size of the element shall match the existing as closely as possible.

8.12.2 The general appearance and detailing of the element shall match the existing as closely as possible. However the exact material may be changed to suit design, construction and maintenance requirements, i.e. may be changed from timber to steel if justified.

8.12.3 The length of the girders may be increased to accommodate sway braces of a wider angle.

8.12.4 The girders may be of equal length for ease of maintenance and replacement.

#### 8.13 MAIN DECK

8.13.1 The deck surface shall be maintained at the existing level.

8.13.2 The general appearance of the road surface shall match the existing bitumen seal.

8.13.3 The deck structure and its behaviour may be changed to suit load and maintenance requirements but must be thoroughly justified.

#### 8.14 SAFETY RAILS

8.14.1 The general appearance of the safety rails and kerbs should match the existing as closely as possible in terms of design, member size, proportions etc noting the constraining requirements of the Bridge Code, AS 5100.

8.14.2 The refuges should be reconstructed to match the existing form as closely as possible and remain accessible via gaps in the safety rail. However the deck material may be changed to suit maintenance requirements or to deter vandalism.

#### 8.15 PROTECTION

8.15.1 Adopt the original colour hierarchy. All timbers shall be white, all steel / iron elements shall be black, with the exception of bolt heads, nuts and washers which shall be white.

New steel elements, which replace original timber elements such as cross girders shall be white.

New steel elements required for strength such as truss chord strengthening plates shall be white so as not to detract from the appearance of the significant element.

8.15.2 Provide protection to all members in accordance with the RTA NSW Manual for Timber Truss Bridges and maintain in accordance with the cyclical maintenance plan.

8.15.3 When a timber member is to be reduced in size to fit into a steel element it should be tapered down rather than notched to avoid increasing stresses and weather flashing should be preformed, prefinished steel, of a colour to match its associated element, painted underside to reduce condensation, removable, and fixed to allow airflow. (In accordance with RTA NSW Manual for Timber Truss Bridges)

8.15.4 Protect timber from decay in accordance with the RTA NSW Manual for Timber Truss Bridges. Establish a termite monitoring protocol as part of the cyclical maintenance program.

#### 8.16 SERVICES

8.16.1 Services conduits should be located to have minimum visual impact.

8.16.2 Service conduits should be painted to match the element to which they are attached.

8.16.3 Lighting should not be fixed to the bridge structure.

8.16.4 Attachments should be detailed to allow proper access to all elements of the bridge for maintenance and repairs

8.16.5 Support rails for an under bridge maintenance gantry are permissible. Their design and detail should be as unobtrusive as possible so as not to detract from the visual impact of the bridge in its setting.

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## **10.0 APPENDICES**

- 1 Chronology of the Murrumbidgee River Crossing and Tharwa Bridge
- 2 Discussion of Reconstruction Proposals
- 3 Typical Cyclical Maintenance Schedule
- 4 Problems Encountered with Timber Truss Bridges
- 5 Tharwa Bridge Heritage Significance Study

**APPENDIX 1 CHRONOLOGY****CROSSING THE MURRUMBIDGEE RIVER AT THARWA BEFORE AND SINCE THE THARWA BRIDGE**

21,000BP Indigenous occupation of the district, evidenced by occupational layers at Birrigai Rockshelter, Tidbinbilla showing sporadic use of the shelter until 3000 years ago, when greater use occurs. This early occupation was during the height of the last glacial maximum of the Pleistocene [the last Ice Age], when the climate was some 6 to 7 degrees colder, similar to the top of Mt Kosciuszko today. (Flood et al 1987; Flood 1999:116)

3000BP Increased use of Birrigai Shelter by Indigenous people. The climate and environment of this area was by then the same as today, with the Murrumbidgee River fordable at present Tharwa.

*Prior to European settlement floodwaters within the headwater catchments of the Murrumbidgee River would have flowed across wide vegetated valley bottoms. Channels through these areas were shallow and discontinuous. The effect of smaller channels and the vegetated headwater floodplains would be to dissipate the energy of the floodwaters and a significant proportion of the total floodwave probably occurred overbank. (Olley & Scott 2002:28)*

Crossing the Murrumbidgee is understood to have taken place at various fords between deeper pools of water including in the area of today's Tharwa Bridge, attested by the concentrations of cultural remains, especially stone artefacts, either side of these areas today. (Winston & Barz 1981)

1820 21 August; first sighting of area west of the Murrumbidgee by Charles Throsby's exploration companion, Joseph Wild, from southern end of Lake George, described as 'Snowy Mountains to the SW' (thought to be the Brindabellas) (Andrews 1990:4; ABS 1931)

1820 October-December: Charles Throsby Smith (Charles Throsby's nephew), with Joseph Wild and James Vaughan sent to find the 'great western river' (Murrumbidgee). In December they found the 'limestone plains' of present Canberra (The Throsby Papers: Journal of Charles Throsby Smith, December 18 1820, cited in Andrews 1990).

1821 March: Charles Throsby with Joseph Wild and James Vaughan, first Europeans to reach the 'Murrumbidgee' River near Pine Island (The

- Throsby Papers: letter to Governor Macquarie, 10 May 1821, cited in Andrews 1990).
- 1823 Capt Mark Currie RN, led an excursion with Brigadier Major Ovens and Joseph Wild (latter with Throsby); 2 June camped on eastern side of Murrumbidgee opposite what is now Tharwa (Journal: An Excursion of the Southward of Lake George, June 1823, cited in Andrews 1990).
- 1824 Allan Cunningham, botanist, crossed the Murrumbidgee near present Tharwa on 15 April, naming present Mt Tennant, Mt Currie, the following day (Allan Cunningham Journal 1824, NSWAO, cited in Andrews 1990).
- 1824 First European settlement of larger Canberra district was by Joshua John Moore at present Acton, who named the property 'Canberry'. 'While it is not known exactly how many Aboriginal people lived in the Canberra area at this time, the estimated Indigenous population was 500 at the time of European settlement in 1824.' (ABS 2007)
- 1825 James Ainslie, overseer to Robert Campbell (Sydney merchant), took up land at 'Duntroon'; others followed moving southwards to the 'Isabella Plains' (now Tuggeranong), including James Murdoch whose land bordered the Murrumbidgee. Timothy Beard was an unauthorised squatter on the Queanbeyan run (reference to a hut where 'Lanyon' now is)
- 1826 'Limits of Occupation' (settlement) set by Government Orders fixing boundaries within which land could be purchased; set in September 1826, this did not include the land in question.
- 1827 Areas beyond the 'limits of occupation', such as the west side of Murrumbidgee, were seen as beyond the law, and resulted in convicts escaping there, and others being exiled. John Tennant was a convict who escaped in 1827 from a road-gang on the Great South Road, took to robbing in the Goulburn area, eventually making their way west of the Murrumbidgee. A reward was posted and he and other escapees were captured on January 1828 on the banks of the river in the area of today's 'Lanyon'; he died in 1837. Mt Currie was renamed Tennant after him. (Moore 1999:144-148).
- 1828 December: census showed 91 Europeans living in the area. Of these, 60 were located on the Canberry, Duntroon, Ginninderra, Jerrabomberra, Tuggeranong and Queanbeyan stations and the remaining 31 were located at Michelago and Jeir. Only five

females were counted in the area, three were married and the other two were children.' (ABS 2007)

The census noted James Murdoch at Tuggeranong, the W boundary being the Murrumbidgee River, and the southern third of a mile north of Point Hut crossing. (Moore 1999:3)

Nobody was known to live in the area west of the Murrumbidgee River at this time. (Moore 1999:4)

- 1829 'Limits of Occupation' (Nineteen Counties) were extended effective from 14 October 1829 to include the Country of Murray just surveyed and gazetted; this excluded land west of Murrumbidgee and south of Michelago.
- 1830s 'Wool boom' as a result of buoyant prices for Australian wool in London and increasing flow of capital into colony (Moore 1999:31)
- 1832 Garrett Cotter, a convict was assigned to a pastoralist in the Goulburn area in 1824, who also moved his cattle to graze to the Limestone Plains area and beyond the Murrumbidgee in the drought of 1827-28, meeting OnYong at the time. Accused of stealing, possibly a result of conflicts between his employer and other pastoralists, Cotter eventually came before the Goulburn Bench in 1832, where he was banished beyond the 'limits of occupation'. It is understood that the local Indigenous group assisted him. The Cotter river was later named after him.
- 1833 John Lanyon and James Wright squatted at land fronting Murrumbidgee opposite present Tharwa, named 'Lanyon'; April 1834 the land officially purchased; John Lanyon returns to England in 1837, shortly after Wright's brother William dies in an accident, having arrived in 1836; the partners had started to graze their sheep on the west side of the Murrumbidgee under the charge of shepherd Conlon, who lived in a hut near where 'Lambrigg' now stands (Moore 1999:51). Several other landowners also took the opportunity to squat across the river, grazing their flocks there, and using the Murrumbidgee ford at present Tharwa to cross.

*The Murrumbidgee at Lanyon, during the years of James Wright's occupancy, consisted of large deep holes, between which the stream flowed gently over gravel beds during normal summer flow. Some of the holes were so deep that when two of the longest bamboo sticks were joined together they would not touch the bottom. The river abounded with fish and water fowl, it is on record that Michael Gallagher landed a fish that was so large that when a sapling passed through its gills and carried on the shoulders of two men the tail of the fish dragged on the ground. It was a giant*

*Murray Cod; they inhabited the river and were known to reach weights of over 100lbs. Nowadays the only specimens of this giant native fish are to be found in the large reservoirs of Burrinjuck Dam and the Hume Weir. The river was lined with large gum and mimosa trees along its gently sloping banks. (quoted in Olley & Scott 2002:27, from Moore 1982 quoting 1892 article in Queanbeyan Observer; see below further at 1852)*

- 1834 John Lhotsky, Polish naturalist, visited the Limestone Plains, the Monaro and Snowy Mountains, spending a week at Pialligo ('Duntroon'), noting that William Herbert squatted on land west of the Murrumbidgee in the Tharwa/Naas area, having a house where the present Naas homestead stands. (Moore 1999:4)

*George Webb visits 'Lanyon' and then moves across Murrumbidgee 'beyond the limits of occupation' and built a house on ridge just north of present Tharwa, his son, George was born that year (first known settler birth in area across the river) and, two years later when it was possible to take up licences 'beyond the limits'; Webb was granted Licence No.197 in the original list of February 1837, just north of present Tharwa (Moore 1999:59)*

- 1836 County of Cowley gazetted, first west of Murrumbidgee

*'James Larmer's sketch map of 4 July 1836 shows a road to Limestone Plains intersected by a road from Tidbinbilla to Tharwa' (Marshall et al 2008, based on reference in Kerr 1999:7, Figure 7, &App4:4). It should be noted that at this point this east-west track across the Murrumbidgee ford crossing did not lead to either 'Tharwa' or 'Tidbinbilla', as they did not yet exist.*

- 1837 James Ritchie purchased Block 60, County of Murray, unnamed parish (to the south of Lanyon blocks), through which the road / track to the ford across the Murrumbidgee ran, (Ritchie in 1838 to take up 'Boboyan', a high mountain run across the Murrumbidgee, and sold Block 60 to James Wright of 'Lanyon' in 1841):

*When Ritchie's portion was surveyed by James Larmer on 5 Feb 1838 Larmer marked in on the survey plan a road from Queanbeyan, the track passed through Wright's Portion 64 and, following the Murrumbidgee (about half a mile distant at Wright's southern boundary), it finally crossed the river about a quarter of a mile before Ritchie's southern boundary. At the crossing appears the note "Ford" and over the river the annotation "Mountain road to the S.W. part of Monero". A well-used track, this gave access to squattages outside the limits of location. (Ray 1981:20 citing James Larmer survey of 660 acres on the Murrumbidgee River [sic], County*

of Murray, parish unnamed, applied for by J Richie [sic]... 5  
February 1838)

- 1838 Map with date February 2<sup>nd</sup> 1838 shows James Ritchie's block 60, noting track across river as 'Crossing Place Rr' [unclear?river?] (SR: Surveyor General, Surveyors' Field Books, James Larmer, 2/5069, Book 452, p.37, in Kerr 1999:Appendix 4:5)

*By June, Wright had sheep grazing 13 miles from 'Lanyon' in the Naas valley (Ray 1981:20 quoting NSW Bench of Magistrates, Queanbeyan, Deposition books 1838, AONSW 4/5650, reel 677, p.14)*

- 1839 Henry Bingham, Commissioner of Crown Lands for Murrumbidgee District (District 7 after 1839 reorganisation of districts, NSW-SRA Record No.3496), visited Limestone Plains (then the general name for the Canberra area) in his role to report on population and stock, ... and adjudicate on land disputes, and visited area west of Murrumbidgee (beyond the 'limits of location') noting several properties, including James Wright 'Port Hole' (it is unclear whether this is today's 'Cuppacumbalong' (Dowling 2003), or 'Booroomba' (Marshall et al 2008; Ray 1982:20), registered as pasturage license (NSW Colonial Secretary. Commissioner of Crown Land, Co. Murray, Henry Bingham: Itinerary No.12 (AONSW X812)

George Webb takes up the first licence for the 'Tidbinbilly' run, Bingham having arbitrated a boundary dispute between Wright and Webb across the Murrumbidgee in Webb's favour.

Roads in the general area were described as bad at the time, for example, by an early traveller 'nothing but bush track with no bridges over water courses' (J Demarr 1893:47, cited in Andrews 1990:5)

- 1840s Economic downturn, contracting by 30%, resulting from the a continued low price of wool in the London market after 1837 and the 1839 English recession, and the 1838-1844 drought in NSW, with the Murrumbidgee ceasing to flow in 1840 (ABS 2007)

- 1841 Census: 557 persons in the [Queanbeyan] area including Gungahlin, Lanyon and Queanbeyan, 120 of whom were female. Yarralumla had the largest population with 108 persons, followed by Duntroon (85), Queanbeyan (72), Palmerville (68) and Lanyon (59). (ABS 2007) This excluded Aborigines.

The 1841 census of the County of Cowley mountain runs shows that 150 (excluding Aborigines) lived across the Murrumbidgee, the southern part of the county accessed via the Tharwa river crossing

(see Moore 1999:219-220, Appendix 2); other ford crossings developed to access this area along the Murrumbidgee to the north, at Point Hut, the Cotter and Uriarra.

The economic downturn this resulted in James Wright mortgaging (sequestering) 'Lanyon'. (Ray 1981; Kerr 1999)

The assignment of convicts to private settlers ended, convict transport having been suspended in 1840; this led to difficulties finding labour. (NSW Government Gazette 1841)

In September 1841, Wright forwarded a memorial from the residents of the district regarding the problem of roads, having already lobbied the Colonial Secretary by letter on this matter in 1840:

*The customary high road from Queanbeyan to the only ford over the Murrumbidgee River within miles, had also been stopped ... The memorial stated that the rapid settlement and increase of population in this district and to the Southwards, renders the definition of the public roads extremely desirable both on private and public grounds. (SR:Col. Sec, Main Series Letters Received, 4/3215, letter 42/1574, cited in Kerr 1999:32, Appendix 6:16).*

1845 Andrew Cunningham and family visit 'Lanyon' on way to take up a licence 'Congwarra' (near present Tidbinbilla Tracking Station), across the Murrumbidgee.

1847 Wright, having continued to live at 'Lanyon', was eventually forced to sell 'Lanyon' to Andrew Cunningham of 'Congwarra' and moved across the Murrumbidgee to live at 'Cuppacumbalong' at present Tharwa in late 1848. (Moore 1999:55)

At some stage, date uncertain, he established a private punt across the Murrumbidgee, replacing the heavy log canoe that he had used when still at 'Lanyon'. His son, William Davis Wright (1840-1924) recalls the difficulties crossing the river, packing sheep into the canoe and crossing carefully so it did not capsize (in his reminiscences in 1895, quoted in Ray 1981:31):

*Old Mr Thos Southwell and his sons of Ginninderra Creek mostly contracted with my father to carry his wool and store goods, I well recollect them carting the wool across the river a few bales at a time. The young Southwells each riding one of the bullocks. We mostly always had a large log canoe for crossing the river or taking goods over when the river was very high; but it was a great heavy, clumsy old thing; had to be paddled over ...*

OnYong, Aborigine described as 'leader of the Kamberri group' (Jackson-Nakano, 2007:X) resisted settlement, but overall there were no clashes. He befriended Garrett Cotter, and died at 'Cuppacumbalong' [the property or reserve, this is not clear] and buried near Tharwa Bridge (Dowling 2003).

Late 1840s/  
Early 1850s All major river valleys west of Murrumbidgee settled, river ford crossing at Tharwa used frequently by those at the following properties: 'Naas', 'Orroral', 'Freshford', 'Tidbinbilla', and 'Cuppacumbalong'.

1851 Census: 2562 non-Indigenous persons living in the Queanbeyan Police District, of which 1511 were men and 1051 were women. Children were not counted.

A trip to Goulburn took five days and a trip to Sydney took at least three weeks.

Gold was found in NSW and Victoria, causing a rush to Australia, doubling its population in one year.

1852 Major flood of Murrumbidgee River, flooding 'Cuppacumbalong' homestead.

The rivers were said to be smaller at the time of settlement in the 1820s, with 'development of the land, the clearing of native timbers, cultivation and the overstocking of pastures and the effects of the great rabbit plagues' resulted in greater floods and ensuing erosion with widening of the beds and the creation of steep river banks making rivers harder to cross. It is suggested that this flood caused major erosion of the bed of the Murrumbidgee River, with floods in 1870 and 1873 completing this destruction and the 'river at times provide an obstacle to the shipment of wool and other produce from the western side' (Moore 1999:163).

'Anecdotal reports of the reach near Tharwa indicate that the channel doubled in width from ~50m to ~100m, in 1852 after that year's flood (Olley & Scott 2002:26, from Moore 1982 quoting 1892 article in *Queanbeyan Observer*):

*This peaceful scene [see earlier description at 1833 above] altered dramatically after the record flood of 1852, the flood that has gone down in history as the Great Gundagai flood which caused the deaths of over ninety persons in that town. The bed of the river doubled in width, steep banks arose where formerly there had been only gentle sloping banks. Many of the giant trees that lined the stream were swept away and the pebbly bed of the stream disappeared, being covered by large quantities of sand which*

*completely filled the whole bed of the river for several miles. The deep holes disappeared and the large fish population were swept away and never returned to this stretch of the river. Another large flood in 1860, which rose to a height of only one foot below the 1852 height, completed the destruction of the original river structure.*

- 1853 Wright transferred 'Cuppacumbalong' to Robert Owen, due to labour and financial problems, but continued to live there.
- 1854 Wright's, with other district residents', lobbying finally succeeded in having the road from Queanbeyan to Yass and the Monaro marked out and resurveyed in 1854. (SR: Col Sec, Main Series Letters Received, 4/3214, letter 53/9873, in Kerr 1999:32)
- 1856 'Cuppacumbalong' was bought by Leopold Fane de Salis
- 1858 De Salis maintained the punt across the river, but made it public. The ropes were donated in 1858 by the government after completion of the Queens's Bridge across the Queanbeyan River that year (A Cunningham, 24 November 1858 – Colonial Architect, File on Queanbeyan Bridge Construction and Repairs 1854-1861 (AONSW 2/645), cited in Andrews 1990:88). The punt is said to be shown in a photograph of the de Salis family in c.1895, but it is unclear that it is a punt (NLA PIC/8938)
- The punt was also in some use for ferrying wool, two bales at a time, on the way to the Sydney road and the wool market. (Andrews 1990)
- 1859 Gold was discovered at Kiandra, causing a rush via the Queanbeyan area, many crossing at Tharwa to the field along the Gudgenby River and Shannon's Flat, as well as to the north through the Brindabella Range via the upper Cotter and the Uriarra crossing of the Murrumbidgee. As there were 10,000 at Kiandra over one year in 1860, there was after that a general increase in population of area and district, with the local properties providing meat and other provisions to the miners. Workers were however scarce during this rush, and the condition of the roads deteriorated (Andrews 1990:5). By this time increasing numbers of pastoralists had moved or included cattle in their stock and had 'snow leases' allocated in the High Country above the river.
- Rabbits released in mainland Australia on Christmas Eve 1859 and reached the NSW-Queensland border by 1886 suggesting that the archaeological evidence of Indigenous people using the Birrigai shelter and eating rabbits (Flood et al 1987) is quite late in the

history of the European settlement of the west side of the Murrumbidgee in this area.

- 1861 Tharwa was proclaimed a township, being the first so declared in the present Australian Capital Territory.
- The Kiandra gold rush ended, resulting in many seeking work including to the Queanbeyan district.
- 1864+ The de Salis family (and others) lobbied for a bridge across the Murrumbidgee, particularly as members for Queanbeyan of the NSW parliament (Moore 1999:165). (Leopold de Salis: Legislative Assembly 1864-1869, Legislative Council 1874-1898; son William de Salis: Legislative Assembly 1872-1874; son George de Salis: Legislative Assembly 1882-1884 (NSW-Plt 2008a). The de Salis family's membership of NSW parliament is before the changes in 1889 that paid members of parliament, allowing a much wider group to stand for parliament beyond those with independent means, such as pastoralists (NSW-Plt 2003).
- 1865 March: Mr W C Bennett, Engineer-in-Chief for Roads, gave to the NSW Parliament a 'Report of the State of the Roads in the Colony of New South Wales', outlining his aims in tackling the State's road problems:  
'(i) Removal of all complete interruptions to traffic, particularly to mail transit, by bridging the rivers and creeks ...' (Andrews 1990:5)
- 1869 Queanbeyan Tharwa road gazetted, see annotated map with 'Road R.772.1803 confirmed 17<sup>th</sup> September [this date crossed out] 5<sup>th</sup> October 1869' (Map of Parish of Gigerline, Kerr 1999:App4.)
- 1871 A 'suspension bridge' established by the Cunningham family to the north of the Tharwa ford crossing (the 'Red Rocks' site between Pine Island and the Kambah Pool) and used to bring sheep across from 'Freshford' on western side of Murrumbidgee to 'Tuggeranong'. (Moore 1999:165)
- 1873 1870 and 1873 saw two further severe floods along the Murrumbidgee, adding to the scouring and heightening of the banks. The river was prone to seasonal highs after the snow-melt, but random rises from storms in its upper reaches, making the ford impassable and using the punt dangerous, often stranding people and goods on the wrong side (Moore 1999:165):

*At the time of the great flood of November 1873, John Pike, a teamster at Tuggeranong, was held up by the swollen river with the Naas wool. When the river subsided sufficiently he floated his*

*wool across in the punt and then swam his bullocks through the stream. A rope was fastened onto the empty wagon and the bullocks pulled it into the stream. When the wagon was midstream it was caught by the current, breaking the rope. A search was made for the wagon with grappling irons but no trace of it could be found.*

*European settlement 180 years ago brought massive changes in land-use across the Murray-Darling Basin. The clearing of woodlands, the introduction of grazing stock, the drainage of valley bottoms, and the clearing of riparian vegetation caused a large increase in erosion. In less than one hundred years nearly every valley in south-eastern Australia was affected. Massive volumes of sediment were delivered to the rivers, and the form of the rivers, and the surrounding landscape, were changed dramatically. Vegetated valley floors were incised; clear flowing waters became turbid; deep pools abounded with fish and other life became dominated by algal growth. (Olley and Scott 2002:5)*

- 1883 The Board for the Protection of Aborigines was established in NSW and reserves set apart for Aborigines' use, resulting in many leaving their employment on pastoral properties. Reserves established in the region, included the Edgerton Aboriginal Reserve to the south-east of Yass, and Brungle Aboriginal Reserve near Tumut, as well as a reserve known as 'Cuppacumbalong'. This Aboriginal Reserve was west of the Murrumbidgee near Naas on the Little Gudenby; this reserve was revoked in 1898 as 'there were no Aborigines left in the district'. (Jackson-Nakano 2001:163-164, 137:Map15)
- 1885-1904 Edward William O'Sullivan (Tasmanian-born printer, journalist and politician, 1846-1910) won seat of Queanbeyan for NSW Legislative Assembly and held it until 1904 (NSW. Very active on Parliamentary Standing Committee on Public Works (1889-94) after *Public Works Act* 1888 passed, remarked as being very active, attending 250 meetings (NSW-Plt 2008b). He later became Minister for Public Works (1899-1904) and is seen as instrumental in many public works throughout the State, including Central Railway Station (1904; NSW-Plt 2008b; ADB).
- 1887 The Tuggeranong railway siding on part of Queanbeyan to Michelago leg was completed December 1887, three months after the Bungendore (1885) to Queanbeyan leg completion of the Goulburn (1869) to Cooma (1889) railway line (Shellshear 1990); this was some 15 km from the Murrumbidgee crossing at Tharwa across the Isabella Plains (Tuggeranong valley).
- 1890s Widespread economic downturn throughout Australia with bank crashes, especially in 1893 with a GDP contraction 18% and chronic

unemployment; the wool price fell by half between 1884-1894, and there was a very widespread and severe drought, the 'Federation Drought' (1895-1902) (ABS 2000); this affected the district, with bankruptcy for some pastoralists.

1890 It is said that about 300 Ngambri/Ngunawal still using traditional camping ground by river near Tharwa [Coltheart in Marshall et al indicates Wright 1923 and Avery 1994 have information but these have not been examined]. The census does not support this number of Aborigines in the area at this time, even including those who had moved to the reserves near Yass and Tumut after 1883. The 1889 figures for Queanbeyan indicate that there are 10 Aboriginal people in Queanbeyan [town or district?], one being a 'full-blood man', with the 1890s figures indicating a 'full-blood woman' in Michelago who is not Nellie Hamilton ('Queen Nellie') (Jackson-Nakano 2007:163), Others suggest the numbers represent Indigenous people travelling through, and that they are not locals (Lea-Scarlett 1968:21). Certainly the Indigenous population included some few individual Indigenous workers from de Salis' Queensland cattle properties brought to 'Cuppacumbalong'.

1891 Census: Queanbeyan population is 1262

It is suggested that O'Sullivan lobbied for infrastructure in his seat of Queanbeyan to mitigate the impact of the economic downturn, and certainly he was very active on the Parliamentary Standing Committee on Public Works (see above at 1885), but most of the Queanbeyan works, including the new Queanbeyan Bridge (1900), the Weir (1901) and Suspension Bridge (1901). are from his period as Minister for Public Works (Andrews 1990; Lea-Scarlett 1968:149). But all suggestions are that he lobbied actively in the early 1890s for a bridge across the Murrumbidgee in his electorate in order to access the alpine areas for tourism and to encourage more agricultural activities west of the river. In this it is said that he was influenced by John Gale (Moore 1999:172), but from 1890 Gale was running the newspaper in Junee and did not return to Queanbeyan until 1894 (ADB).

1892 Current village boundaries of Tharwa gazetted

The two competing sites of Red Rocks (between Pine Island and the Kambah Pool, favoured by de Salis family) and Tharwa (favoured by Cunningham family) were surveyed by the authorities with estimates of the costs [this seems wrong, surely the other way?]. The Tharwa site was favoured in the report although the cost estimate of £4000 was higher than at Red Rocks. (Moore 1999:165)x

- 1893 Tharwa Bridge was designed in the NSW Department of Public Works, by their senior draftsman and engineer, Percy Allan (Andrews 1990:10)
- 1894 Tenders for the bridge closed in March 1894, the lowest, of Christopher McClure, being in the sum of £4469.14.10 (*Goulburn Evening Penny Post*, 12 July 1894, cited in Andrews 1999:10)
- Timber and iron components for Tharwa Bridge brought from Sydney to Tuggeranong railway siding, but late autumn rains delayed road haulage to the site as the tracks were too boggy across the Isabella Plains.
- Construction in 1894 is depicted in a photograph, that includes a bullock team fording the river downstream to the bridge's north (the photo is reversed online at NLA PIC/8941, see Dearling 2008:20, Plate 2; Moore 1999:164, figure 116)
- The Union Bank foreclosed on de Salis at 'Cuppacumbalong' due to the economic downturn and the family moved in to 'Lambrigg', with their daughter, Nina, to whom they had gifted on her marriage to William Farrer in 1882, the de Salis family having selected it in 1864 (Moore 1999:126, 128).
- 1895 Bridge completed by contractor McClure from Croydon within 10 months instead of scheduled 18 months. It was the seventh bridge across the Murrumbidgee River at the time.  
27 March – official opening of bridge, it being declared a public holiday and some 15,000 [Full quote from *Queanbeyan Observer* will be inserted if possible, in the meantime see the version from the National Trust of Australia (ACT) (Attachment 1)]
- The local member of parliament, E W O'Sullivan, influenced by John Gale, had fostered the bridge idea with suggestions of benefits such as tourism to the Yarrangobilly Caves and the scenery of the alpine areas generally, something that was increasingly popular at the time (see Truscott et al 2006) and that small farms would spring up on the west bank of the Murrumbidgee in the wake of a bridge. Others scoffed at this: "'There is hardly an acre of land fit for the plough in the whole territory until Coolamon is reached", quietly commented Charles McKeahnie, who knew it better than the Member did.' (*Queanbeyan Observer* 29 March 1895)
- The return fare to Tharwa for the bridge opening in Allen O'Neill's four-horse bus was 5s (Lea-Scarlett 1968:98).

- 1897 1 January: Nellie Hamilton, the last full-blooded Aborigine of the Ngunnawal people died.
- 1899 October: the Queanbeyan Federal City Committee formed 'to take steps to bring under notice of the Commissioner the claims of the Queanbeyan district ..in the matter of a suitable site for the nation's capital'. Its membership, amongst others, included those who had also lobbied for improved transport and other district developments, with E W O'Sullivan MP treasurer of the group, A J Cunningham and James Cunningham, grazier of 'Lanyon' and 'Tuggeranong' [and places west], F Campbell of 'Yarralumla' and John Gale editor, *Queanbeyan Observer* (NSW-Pit 1999); also part of the group were James Wright's son, William Davis Wright, stock and station agent, and William Farrer, Government wheat experimentalist at 'Lambrigg' (Lea-Scarlett 1968:150).
- 1901 1 January, the six colony states of Australia federated to form the Commonwealth of Australia, the only country as a continent.
- 1908 Yass-Canberra selected as the site for a capital for the newly federated country.
- 1909 The proposed boundaries for the new capital established, and largely driven by water considerations after the Federation Drought, incorporated the rivers west of the Murrumbidgee, the Cotter and Gudgenby.
- 1911 1 January, NSW ceded area for the Federal Capital Territory (now ACT) to the Commonwealth.
- 20<sup>th</sup> century Use of the bridge extended beyond those living west of the Murrumbidgee to recreational traffic between the wars before the Great Depression (XX), as Australians bought motor vehicles and annual recreation leave was granted then increased to three weeks in 1963 and to four weeks in 1974 (Truscott et al 2006). Popular destinations in the ACT have been Cuppacumbalong, Tharwa itself as an historic village, and the Tidbinbilla Nature Reserve, Namadgi National Park and the other alpine national parks, for bushwalking and fishing, and skiing in winter. Gale's and O'Sullivan's suggestions that a bridge at Tharwa would lead to tourism has been realised.
- 1936-37 Three of original 5 timber bridge trestles replaced with concrete piers.
- 1939-40 Remaining two timber bridge trestles replaced with concrete piers.
- 1965 25 tonne load limit placed on bridge.

- 1978 NCDC proposed to demolish bridge led to public lobbying for heritage listing.
- 1983 Listed on Register of the National Estate
- 1984 Restoration work undertaken
- 1994 Further restoration undertaken
- 1998 Listed on ACT Heritage Register
- 2001 Last major upgrade involving deck replacement
- 2005 Bridge declared unsafe and closed to traffic.
- 2007 4 December: ACT Government announces community consultation regarding future of Tharwa Bridge, the options being (Stanhope 2007):
- Option 1—proceeding with the decision to build a new bridge;
  - Option 2—rebuilding the bridge for light traffic—essentially returning the bridge to its original capacity;
  - Option 3—rebuilding the bridge to carry a 44-tonne weight (a fully-laden semi-trailer); or
  - Option 4—rebuilding the bridge to carry 44 tonnes and raising the deck to cope with a one-in-a-hundred-year flood
- 743 completed surveys were returned and 1000 ACT residents were contacted via a random telephone survey, (TAMS 2008) over 70% felt 'that a river crossing at Tharwa is necessary.' This level of support increased to 72% of survey form respondents and 85% of random telephone survey interviewees when provided with additional information that the Tharwa Bridge is over 112 years old and the only one of its type in Australia, and is rated by experts as having outstanding heritage value. (Tania Parkes 2008:5-6)
- 2008 23 January: The ACT Government announced that the historic bridge would be retained and rebuilt (Option 4) (Stanhope 2008)
- August: Stage 1 works completed and bridge re-opened to light traffic.

## APPENDIX 1 : ATTACHMENT 1

**The Grand Day the Bridge was Opened****Peter Dowling**

Wednesday 27 March 1895 was a special day for the Canberra region, so special in fact that it was declared a public holiday. Just after dawn that morning a cloud of dust began to rise high and long above the Tuggeranong Plain.<sup>1</sup> It marked the route of a continuous line of horse-drawn carriages packed with people making their way to the Murrumbidgee River. Everyone was dressed in their Sunday finery, men with dark suits, ties and best hats and the ladies in long flowing gowns and jewellery. On reaching the river they stepped down from their carriages, brushed off the clinging dust as best they could and jostled for positions along the bank of the river. At nine o'clock a half company of the Queanbeyan Mounted Rifles marched out from the town adding to the cloud of dust on the plain. By noon that Wednesday almost 1,500 dust sprinkled people had gathered. The biggest collection of people the district had seen. Their carriages had been parked in a nearby field kindly thrown open by Mr A. J. Cunningham J.P; the horses grazed nearby. The great occasion was the long-awaited opening of the Tharwa Bridge spanning the Murrumbidgee.



[not full photograph depicted in Dowling article, but just the central part]  
Dignitaries and the local militia at the opening of the Tharwa Bridge (L. Gillespie 1991)

The bridge was in its finery too, artistically decorated for the occasion. A kind of triumphal arch made of greenery marked each end of the bridge with a banner emblazoned with the word 'Welcome'. Along the length of the bridge were similar smaller decorations and ribbons; 'making the structure gay in its baptismal robes' was one description.

An official procession of the invited dignitaries was planned to start from Lanyon but had to be rerouted because of the thick dust still hanging over

the crowd. Instead a cavalcade travelling a much shorter route to the bridge was formed. It consisted of the Queanbeyan band, the Queanbeyan Mounted rifles, recently arrived on foot, Mrs Elizabeth McKeahnie of Booroomba (the oldest female resident in the district), who was to cut the ceremonial ribbon, the two local politicians Messers Edward O'Sullivan MP and Austin Chapman MP and the Mayor and Mayoress of Queanbeyan. Following them were the carriages of principal residents of the district and escorting horsemen. The cavalcade entered the bridge through the green arch and halted midway. Mrs McKeahnie was assisted from her carriage and presented with a 'handsome Morocco silk-lined case' containing a pair of gold-plated scissors by Mr O'Sullivan. The case bore the inscription:

'Presented to Mrs C. McKeahnie  
by C. McClure contractor,  
on performing the ceremony  
of christening Tharwa Bridge 27<sup>th</sup> March, 1895.

In the centre of the bridge where the procession had halted a bottle of Champagne was suspended by a blue ribbon. Mrs McKeahnie alighted from her carriage, stepped up to the ribbon and, as if launching a battleship, with deft action severed the ribbon with her new scissors. The bottle swung towards the side of the structure, crashed into a wooden beam and scattered its fizzing contents on the floor of the bridge. Mrs McKeahnie declared: 'I name this structure the Tharwa Bridge'. With that the 1,500 eager onlookers cheered with great gusto and the band played proudly. One or two of the grazing horses looked up and blinked at the strange scene.

The procession then made its way across the bridge where Mrs McKeahnie was presented to Mrs Cunningham and 'other prominent ladies.' A group photograph was then taken with the military contingent seated on their horses forming a background. At the front of group next to Edward O'Sullivan stood a special guest, Nellie Hamilton. Nellie (or Queen Nellie as she was then commonly referred) was believed to be the last surviving full-blood member of the Ngunnawal people of the Canberra/ Queanbeyan area.

Then came the official speeches. Amongst those giving discourse was Mr. George Fane DeSalis, son of Count Leopold Fane DeSalis formerly of Cuppacumbalong, the nearest property on the western side of the river. George DeSalis, standing on the seat of a carriage, referred to the importance of the bridge to the district and the advantages it would confer to the residents west of the river and to the years of inconvenience they had endured for want of an all weather crossing. Mr. Edward O'Sullivan MP, who had been instrumental in procuring government funding for the bridge, then climbed up into the carriage and, trying to avoid party politics, on this occasion at least, proclaimed that they were standing on the confines of

civilisation. The unbridged river, he said, had been a bar to progress and prosperity as for long periods of the year the people could neither get their stock to market nor procure provisions for their sustenance. It was this state of things which had animated him to agitate for so long for a bridge. As long as he was their local member, O'Sullivan claimed (now launching into politics), he would see that the communities on the western side of the river would suffer no more. Austin Chapman then stood and admitted that while he had first opposed the expense incurred by the government in building the bridge (£4,469.14.10) he could now see by the enthusiasm of the large crowd that building it had been desperately needed and that it was the right thing. Christopher McClure, the bridge contractor, was next and admitted in a short speech that he was a better bridge builder than a speech maker but nevertheless, thanked the people for the strong appreciation of his work.

The speeches completed, it was time to celebrate the opening of this new engineering marvel. The Queanbeyan Mounted Rifles gave a display of riding and tent-pegging; there were games for the children, a cricket match and even a baby show. By late afternoon the horses became restless and it was time to head for home although some stayed on for a formal ball held that evening. The long trek back across the Tuggeranong Plain began raising the dust once again. But despite long speeches and the soiled gowns the 1,500 people knew that the Tharwa Bridge did indeed represent a new boost to the economy of the region and more freedom of movement for the residents on either side of the river. It had indeed been a grand day.

#### **References**

Andrews, W.C. 1990 'Roads and Bridges' in Andrews (et al.) *Canberra's Engineering Heritage*, 2<sup>nd</sup> ed, Canberra Division The Institute of Engineers, Australia.

Gillespie, L. 1991 *Canberra 1820-1913* Australian Government Publishing Service, Canberra.

*The Queanbeyan Observer* Friday March 29, 1895

1 The last decade of the nineteenth century was marked by a debilitating drought. Known as the 'Federation Drought' it finally broke in 1902. Along with the drought the last decade was renowned for a severe economic depression which plunged many landholders into bankruptcy.



## APPENDIX 2

### DISCUSSION OF RECONSTRUCTION PROPOSALS

The following is a summary of proposals currently being discussed by Connell Wagner and the Peer Review Team for Stage 2 – the reconstruction of Tharwa Bridge to support a T44 traffic loading.

A commentary on relative heritage impacts is provided in *italics*.

#### **Abutments**

A detailed condition report is pending. Possible works, either now or in the future may include:

1. No change - *no impact*
2. Upgrade / strengthen existing - *low impact assuming little change to appearance*
3. Replace in reinforced concrete – *low to moderate impact depending on materials, form and detail.*

#### **Approach piers**

A detailed condition report is pending. Possible works, either now or in the future may include:

1. No change – *no impact*
2. Upgrade / strengthen existing – *low impact assuming little change to appearance.*
3. Replace in reinforced concrete, - *low to moderate impact depending on materials, form and detail.*

*If a decision is taken to relocate the main span piers, the approach piers, if also being replaced should be relocated to achieve a uniform spacing.*

#### **Main Piers**

The main piers are of insufficient strength to support T44 loading. Options under consideration for strengthening / replacement are:

1. Reconstruct the original timber trestles – *not recommended. The concrete piers for have existed for c.80 years and illustrate the development of the bridge over time. The original trestles were replaced because they caught flood debris and caused maintenance issues. For these reasons in*

*the late 1890s Allan himself changed to wrought iron cylinder piers for high bridges.*

2. Subject to satisfactory test loading retain existing piers and protect concrete with a sealing agent – *low impact assuming little change to appearance.*
3. Retain existing piers and strengthen by;
  - (i) new bored piles and headstocks, or pressure grout beneath existing footings
  - (ii) prestressed cables within piers to protect against flood forces
  - (iii) supplementary high strength concrete to pier tops for stressing anchorage.

*This proposal is considered to have low to moderate impact depending on the form and detail of pier tops and the potential for prestressed cables to shatter the existing concrete.*

4. Replace piers with new reinforced concrete on new bored concrete piles in existing location. Proposed pier shape retains column and web form but is more slender than existing.

*This proposal is considered to have moderate impact. The pier shape is slightly altered but more slender piers may emphasise the appearance of the timber truss spans which is desirable.*

5. Replace piers with new reinforced concrete on new bored concrete piles offset c. 6m from existing location.

*This proposal is considered to have moderate impact. The pier shape is slightly altered but more slender piers may emphasise the appearance of the timber truss spans which is desirable.*

*If piers moved, consider the visual impact of associated lengthened / truncated approach spans. Noted this could be addressed if approach piers are also moved.*

### **Approach Spans**

A detailed condition report is pending. Possible works, either now or in the future may include:

1. No change – *no impact*
2. Strengthen existing deck such as with carbon fibre strips or new girders.

*Low impact assuming little change to appearance.*

3. Replace as single lane with new steel girders and composite reinforced concrete deck. *Low impact assuming materials and form are similar to existing.*

### **Main trusses**

A decision has been made to demolish the existing trusses and reconstruct the main truss spans to support an Austroads T44 loading. Possible works may include:

1. Increase timber size. *Low to moderate impact assuming increase is minor and relative proportions are maintained.*
2. Strengthen bottom chord with steel member;
  - (i) Plate or channel - proven behaviour and historic convention  
Steel can take whole weight with timber being visual.
  - (ii) Tightenable steel stress bar placed longitudinally within the bottom chord - recent RTA NSW experience is that this loosens quickly as a result of the shortening of the timber bottom chord due to creep / shrinkage and the differential temperature effect.

High strength, easy to inspect. However thin bar under load will fail quickly in fire. Central location between chord flitches conflicts with hanger locations.

*Options 2(i) and (ii) will have low impact if steel is unobtrusive and allows chord flitches to remain dominant (paint colour?)*

*2(i) preferred for practical rather than heritage reasons.*

### **Hangers**

1. Replace with 300MPa steel with rolled threads.  
May need to be slightly larger diameter.  
Retain larger sizes at ends of trusses  
Apply suitable protection to control corrosion  
*Low impact assuming minimal increase in size and little change to visual appearance.*

**Shoes**

1. Replace in Spheroidal Graphite (SG) cast iron, replicating original method
2. Fabricate in welded structural steel plate - can be designed to avoid weakness at sharp points.

*Both options are low impact assuming little change to appearance. However NSW Heritage prefers castings rather than a welded fabrication noting that the RTA have used both methods on Allan truss restorations. Spheroidal Graphite (SG) performs well in service, is similar to the original and is weldable should maintenance be required.*

**Sway Braces**

1. Replace with mild steel in 'T' section to match originals  
*Low impact, closest match to originals*
2. Replace with mild steel in an alternative section, such as square hollow section if justified for structural reasons. *Moderate impact, some change in appearance, although not apparent unless close up.*
3. If justified for structural reasons increase angle at connection with top chord by fixing further out on cross girders (means all new cross girders will extend further out). *Moderate impact, some change in appearance, although not apparent unless close up.*
4. Locate at every panel point.  
*Moderate impact, some change in appearance, although not apparent unless close up.*

**Splice plates**

1. Replace with new steel plates.  
Address chemical interaction of steel and timber.  
*Low impact assuming match original convention of flanged plates to top chords only.*

**Cross Girders**

Replace:

1. With timber sections to match existing as closely as possible. *Low impact*
2. Fabricate steel box sections with closed ends to replicate timber.  
The timber top chords tend to bow inwards as a result of the deflection of the timber cross girders between the trusses causing the cantilever ends of the cross girders to lift. Steel easy to fabricate, stronger, lower maintenance.

*Moderate impact, some change in appearance, although not apparent unless close up. May be justified for technical and maintenance reasons.*

### **Main Deck**

1. Replace timbers to match existing with running planks and sprayed bitumen seal.

+ closest match to existing.

- prone to water penetration causing rot.
- prone to timber shrinkage
- fixing spikes tend to work loose
- prone to vibration and differential deflection especially from heavy vehicles, causing fixings to loosen and present a continual maintenance issue
- running planks can be hazardous to cyclists

*Low impact, but unsatisfactory for technical and maintenance reasons*

2. Replace with stress laminated timber deck with sprayed bitumen seal.

- + proven strength, accommodates higher loads
- + durable – 50 year life span vs. 8 years for planks
- + easy to position and in long lengths
- + eliminates need for support stringers, allowing deeper section without affecting finished deck level.
- + able to be tightened as required
- + tightness of members minimises moisture penetration
- + used on other restoration, reconstruction projects (e.g. Hinton Bridge over the Paterson River)

- not traditional and has an overtly modern appearance, i.e. homogenous bitumen road surface and highly “engineered” appearance when seen from below due to absence of stringers and joists

*Moderate to high impact. Consider options to replicate lattice of support when viewed from below. e.g. non structural steel “stringers” fixed between cross girders or purposeful incorporation of maintenance beam.*

### **Road Surface**

1. Sprayed bitumen.  
*Low impact, traditionally used.*

### **Rails**

Must be replaced in steel to comply with AS5100.

1. Likely to consist of kerb rail, mid rails and top rail of appearance similar to existing, except;  
- if using stress laminated road deck, bottom rail must sit c. 50mm above to allow water runoff

*Moderate impact assuming form and size and relative proportions as close as possible to original.*

**Maintenance Support Beam**

Required by OHS

Need to be made more rigid than existing

*Moderate impact but required for conservation of significance.  
Suspend below cross girders or deck as unobtrusively as possible.*

## APPENDIX 3

## TYPICAL MAINTENANCE SCHEDULE FOR TIMBER TRUSS BRIDGES

Table 1. The following is based on the typical maintenance schedule for timber truss bridges maintained by RTA NSW. Note that this is an indicative list only as bridge elements are inspected regularly and maintenance carried out when required.

Member	A Annual Maintenance A	B Three Yearly Maintenance Additional to A	C Nine Yearly Maintenance Additional to B
<b>Truss members</b>			
All timber chords	Check for damage Repair or replace as required  Check all caps, repair as necessary and fill with preservative  Check for and repair paint damage	Fill or refill all prepared holes with diffusing preservative  Refill all caps with preservative gel  Flood all joints with copper naphthenate oil  Remove metal flashing from all flashed members and inspect for damage or deterioration, repair as required	Loosen all joints and splices, coat with copper naphthenate gel
Lower timber chords	Examine and report on signs of weakness so that strengthening can be considered		
Splice & joints	Check for damage, repair or replace as required.  Check for paint damage & repair if required. Flood with copper naphthenate oil before repairing	Refill all caps with preservative gel  Flood all joints with copper naphthenate oil	Loosen all joints and splices, coat with copper naphthenate gel
Timber webs	Check for damage Repair or replace as required	Fill or refill all prepared holes with diffusing preservative	Loosen all joints and splices, coat with copper naphthenate oil

	Check for paint damage & repair if required		
Hangers	Check for damage Repair or replace as required Check hanger tension		Loosen all joints and splices, coat with copper naphthenate oil
Lateral Stays	Check for damage Repair or replace as required		Loosen all joints and splices, coat with copper naphthenate oil
Bolts	Check condition and replace or tighten as required	Flood all bolt holes with copper naphthenate oil	
All timber members	Protect and treat for termites if required		
Camber	Check & adjust		
<b>Deck and deck sheeting</b>			
Girders	Check all caps Repair as required and refill with preservative	Fill or refill all prepared holes with diffusing preservative  Refill all caps with preservative gel  Flood all joints with copper naphthenate oil	Loosen all joints and splices, coat with copper naphthenate oil
Timber decking	Check for damage Repair or replace as required  Check for loose bolts and tighten as required	Flood all joints with copper naphthenate oil	Loosen all joints and splices, coat with copper naphthenate oil
Timber sheeting	Check for damage Repair or replace as required	Check condition of seal coat and repair as required	Loosen all joints and splices, coat with copper naphthenate oil unless both decking and sheeting are preservative impregnated
Timber kerbs	Check for damage Repair or replace as required  Check for paint damage & repair if required	Flood all joints with copper naphthenate oil	Loosen all joints and splices, coat with copper naphthenate oil

	Check for loose bolts and tighten as required		
Timber handrail	Check for damage Repair or replace as required  Check for paint damage & repair if required  Check for loose bolts and tighten as required	Flood all joints with copper naphthenate oil	Loosen all joints and splices, coat with copper naphthenate oil
Bolts	Check condition. Tighten and replace as required. Where bolts are countersunk the holes are to be cleared of debris before tightening with box spanner. Replace failed lock washers	Flood all joints with copper naphthenate oil	
All timber members	Protect and treat for termites if required		

Table 2. Emergency situations and standard repair procedures

<b>Emergency type</b>	<b>Nature of damage</b>	<b>Procedure</b>
Flood	Impact from floating debris, debris catching on bridge elements, increased flows causing scour at piers & abutments	Check for scour around piers & abutments. Use a diver in deep water. Usual repair method to rectify scour is to place large stones or gabions in the eroded space. Take care not to damage piers when placing. Balance fill to avoid undue pressure on one side of a pile or footing. Over time sand and mud will be washed into spaces between stones.
Fire	Bridge timbers may be either burned to ash or only charred. In extreme heat iron or steel may melt.	Check timbers to determine structural; adequacy of reduced timber section. Check iron and steel for loss of galvanising, melting, distortion or cracking from either the fire or fire fighting activity. Replace affected members.
Traffic	Vehicle collision with structural members	Check timbers to determine damage. Assess structural adequacy of reduced

		<p>sections caused by gouging.                  Check joints for failed bearing surfaces of bolted connections. Deep scours not affecting structural adequacy can be rebuilt with epoxy after coating with copper naphthenate. Check iron and steel members for damage or deformation. Straighten bent compression members. Check bolted connections.</p>
<p>Vandalism</p>	<p>Varies, may include fire (see above)</p>	<p>Examine damage to structural members. Treat loss of section as required. Rectify paint damage to avoid moisture penetration which could lead to fungal decay.</p>

## APPENDIX 4

### BRIDGE OVER MURRUMBIDGEE RIVER AT THARWA HERITAGE SIGNIFICANCE

*Brian Pearson (former Chief Engineer, Bridges, DMR, NSW) and Ray Wedgwood (former Chief Bridge Engineer, RTA, NSW)*

#### INTRODUCTION

In January 2008 the ACT Government announced that the historic Allan truss bridge over the Murrumbidgee River at Tharwa would be restored and re-opened to traffic. The restoration would upgrade the traffic load capacity to a 44 tonne loading, this being the degree of restoration favoured by the ACT Government and community. Restoration may also require some strengthening of the approach span decks and some minor attention to the piers with respect to flood effects.

This submission provides an analysis of the significance of the Tharwa Bridge following its restoration. The methodology adopted by Consulting Engineer McMillan, Britton and Kell in a December 1998 report "Study of Relative Heritage Significance of the Timber Truss Road Bridges in NSW" has been followed, with appropriate assumptions where necessary.

Percy Allan's timber through-truss road bridges were introduced in 1894 and were a radical improvement in design over previous truss bridges. In brief, the advantages were ease of construction and maintenance combined with greater load carrying capacity. The order of completion of construction for the first Allan through-truss bridges was:

1. Glennies Creek, Camberwell (near Singleton), opened 12 August, 1894
2. Lower Wybong Creek via Denman, opened 12 October, 1894
3. Murrumbidgee River at Tharwa, opened 27 March, 1895
4. Murray River at Hawkesview near Hume Weir, opened 30 March, 1895

A total number of 105 Allan through-truss bridges were constructed in New South Wales, of which 26 remain, excluding Tharwa. Neither of the two bridges constructed before Tharwa still exists and are of less significance than Tharwa, being of two 90ft spans each, whereas Tharwa is of four 90ft spans. With the exception of Pymont Bridge, which is an under-truss style with the deck on top of the truss, Tharwa is the largest remaining Allan timber truss and was the largest at the time it was constructed.

## METHODOLOGY

In assessing the heritage importance and ranking of New South Wales' timber truss road bridges, MBK examined and rated the following factors with respect to each bridge:

- A. Technical significance
- B. Historical significance
- C. Social significance
- D. Aesthetic significance
- E. Regionality significance

The MBK descriptions of each of the criteria are quoted in italics hereunder:

### **A. Technical Significance Scoring**

*Each different type of truss was scored to a different average and range, depending on its relative significance. In addition up to 5 points for each special feature may be awarded. The range of scores given is to account for variations in standard features of the bridges (age, intactness etc.), not for special features.*

	<i>Reason (- each group of trusses have common reasons)</i>	<i>Average Score</i>	<i>Range</i>
<i>OPWD</i>	<i>Seminal and oldest Rare Many were built, but few remain</i>	<i>25</i>	<i>0</i>
<i>McDonald</i>	<i>Old Rare First t.t.r. bridges designed by NSW engineers</i>	<i>20</i>	<i>±1</i>
<i>Allan</i>	<i>Not as rare, but they were a big technical advance Many were built</i>	<i>16</i>	<i>±2</i>
<i>DeBurgh</i>	<i>Experiment with American Pratt truss design</i>	<i>13</i>	<i>±2</i>
<i>Dare</i>	<i>Similar to Allan trusses, but have maintenance advantages</i>	<i>12</i>	<i>±4</i>

### **B. Historical significance scoring**

*Each bridge was given a score for its historical significance for both local and state/nation wide significance. The bridges formed part of several major historical trends, such as expansion of the road network of NSW, and it is considered that this gives the entire group a significance, and each bridge carries an equal component of this historical significance.*

### **C. Social significance**

The bridges have some social significance for the whole community, and as such each gained 1 point in their social significance score. Most of their social significance comes from the interest from the local community, and was determined according to the response we received from the National Trust, historical societies, and councils, as well as information gathered during the bridge inspection process.

Each response received was rated as follows:

A-response enthusiastic

B-response interested and supportive

C-response lukewarm

D-response uninterested

E-no response

F-no organization

### **D. Aesthetic significance**

Aesthetic significance can be thought of as being made up of the following three components:

- Visual enhancement of landscape
- Landmark qualities
- Being a "gateway" to a town

Visual enhancement of the landscape and landmark qualities are essentially functions of the landscape type, and the span of the bridge, and was scored on this basis. The landscape surrounding each bridge can be classified according to topography, and vegetation, and correlations can be made between this and the score.

Visual enhancement also entails ideas of visual consistency of the bridge (or "unity in material and form" in Conservation Plan/Burra Charter language) with its surrounds. This is a key determining factor in the correlation of the landscape type and visual enhancement score.

Being a "gateway", strictly speaking, is a part of landmark qualities. However the distinction between this and being a landmark on the landscape in general is an important distinction in case of bridges, as the view point can be either from the road or from the general surrounds.

A maximum score of 3 was given for each of these three sub-criteria.

### **E. Regionality scoring**

Where there are high concentrations of bridges in an area, the significance of each bridge in the area is increased. Especially significant areas are where there were a variety of different historic bridges (not just timber truss road bridges but other types also) in an area. Such concentrations make it easy for someone who is interested in bridges to see different forms of construction in a range of applications, from a range of historical periods.

**Truss significance**

The trusses are certainly the most important part of the heritage significance of the bridges. In the case of the aesthetic significance this is clear, as the trusses dominate the appearance of the bridge.

When considered in terms of social significance, the heritage value of each bridge is primarily affected by the trusses, which are the outstanding visual feature of each bridge, and as such most people strongly associate the trusses with the bridge.

**ANALYSIS**

MBK provided an average scoring schedule for the 82 timber truss bridges in the survey. The schedule is reproduced hereunder:

Criteria	Average Score
<i>Technical significance</i>	15
<i>Historical significance</i>	10
<i>Social significance</i>	5
<i>Aesthetic significance</i>	7
<i>Regionality significance</i>	10

MBK assessed the bridges into the following groups and in order of merit as determined from the scoring results. The groups were:

1. Nationally Significant Bridges (16)
2. State Significant Bridges (21)
3. Regionally Significant Bridges (21)
4. Locally Significant Bridges (24)

The scoring assessment for bridges rated 1 to 5 of the 16 bridges of national significance are available from the score sheets and have been scheduled as follows:

Rank	Bridge	Technical	Historical	Social	Aesthetic	Regionality	Total
1	Dunmore (Allan)	29	11	6	9	20	75
2	Morpeth (Allan)	25	11	7	12	20	75
3	Monkerai (Old PWD)	23	11	7	9	20	70
4	Hampden (Allan)	25	11	7	12	5	60
5	Clarencetown (Old PWD)	27	11	5	9	20	72

It would appear from the score sheet that Clarencetown with a total score of 72 should rank No 3 instead of No 5.

The highest score in each of the five rating categories and the number of bridges achieving the highest score are listed below.

Category	Highest Score	No of bridges in highest score
Technical Significance	29	1
Historical Significance	11	24
Social Significance	7	15
Aesthetic Significance	12	8
Regionality Significance	20	20

Σ79

Thus the maximum possible score was 79. Both Dunmore and Morpeth bridges achieved highest actual score of 75

It will be noted that the tabulation below "1. Technical Significance Scoring" above shows an average score for Allan truss bridges of 16 with a range of ±2. However the five bridges above with highest rankings scored a range of 23 to 29 for Technical Significance, which exceeds considerably the schedule top limit of 16+2 or 18.

It will also be noted that the final comment under "4. Aesthetic Significance" above states that "A maximum score of 3 was given to each of these three sub-criteria" which are visual enhancement of the landscape, landmark qualities and being a "gateway" to a town. However, this total possible score of 9 is exceeded by eight bridges, each with a score of 12.

### ASSESSMENT OF THARWA BRIDGE POINT SCORE

We have assessed Tharwa on the basis of the scoring system adopted in the MBK report. Our assessment is tabulated hereunder against the highest achieved score for each category.

Category	Highest Score	Tharwa Assessment
Technical	29	25
Historical	11	11
Social	7	7
Aesthetic	12	13
Regionality	20	20
Total	79	76

On the basis of the above score the Tharwa Bridge would be of national significance and at the top level of the sixteen bridges of this ranking in the MBK listings, just above Dunmore and Morpeth bridges.

The reasoning behind the scoring is summarised hereunder:

#### 1. Technical Significance

The Allan through-truss was the first truss designed by an Australian and was a radical improvement over previous truss designs. It had a greater load carrying capacity, was of simpler construction, with more efficient use of Australia's strong and durable hardwoods and it permitted replacement of individual components with minimum disruption to traffic.

#### 2. Historical Significance

Tharwa Bridge was the largest Allan through-truss bridge at the time of construction and presently its four truss spans render it the largest Allan through-truss bridge in existence. It was built adjacent to the previous ford and ferry sites. The ford was used by Aboriginal people over the past 20,000 years to access the Bogong moths in the highland caves. Also, in the late 1850's, the crossing was used by prospectors to access the Kiandra goldfields. It provided a flood free crossing of the Murrumbidgee River and allowed the passage of the Monaro wool clip, stock, personnel and travellers in all weathers. It progressed the development and the wealth of this section of the nation.

The ACT community and many people outside the Territory voted for the retention and restoration of the Tharwa Bridge in lieu of its replacement by a concrete bridge. The Tharwa community was equally supportive for the retention of the bridge, recognizing the service it had rendered the community for more than a century.

#### 4. Aesthetic Significance

By virtue of its size, height and virtually unchanged idyllic setting the Tharwa Bridge stands proud and majestic as the gateway to the historic village of Tharwa, the Namadgi National Park and beyond to Brayshaw's Hut on the old

road to Adaminaby. In the MBK assessment eight bridges scored the maximum of 12 points for Aesthetic Significance. These bridges were:

- Goodradigbee River at Wee Jasper (Allan)
- Hampden Bridge over Murrumbidgee River at Wagga (Allan)
- Murray River at Swan Hill (Allan)
- Hunter River at Morpeth (Allan)
- Patterson River at Hinton (Allan)
- Murray River at Tooleybuc (Allan)
- MacDonald River at St Albans (De Burgh)
- Clarence River at Tabulam (De Burgh)

From our knowledge of these sites we believe that none is as magnificent as the Tharwa site. This bridge is elevated and sits comfortably in a waterway with gently sloping banks. It is a gateway to the historic village of Tharwa and beyond when approached from the north and is also a gateway to Canberra when approached from the south, thus linking the old with the new. We believe that it outranks the structures listed above with respect to Aesthetic Significance and hence we have awarded an additional point in this category.

#### 5. Regionality Significance

The Tharwa Bridge is located in a region where each of the four types of truss designs (McDonald, Allan, De Burgh and Dare) exists. These structures are:

1. Junction Bridge over the Tumut River near Tumut (McDonald 1892)
2. Rossi Bridge over the Wollondilly River at Goulburn (Allan 1898)
3. Lansdowne Bridge at Mulwaree Ponds (De Burgh 1902)
4. Wee Jasper Bridge over the Goodradigbee River (Dare 1923)

Also, there are other bridges at Canberra, Queanbeyan, Goulburn and Yass.

#### CONCLUSION

We would argue that the Tharwa Bridge has achieved a maximum point score for all but Technical Significance. In this classification a deduction of four points has been assessed for:

- (i) the replacement of the original timber decking of the truss spans by a waterproof stress laminated timber deck of equivalent mass and
- (ii) the replacement of selected hidden steel members, to enable the required T44 load capacity to be achieved.

In our view Tharwa Bridge is of exceptional national significance and without equal as a timber through-truss bridge.

## APPENDIX 5

### PROBLEMS ENCOUNTERED WITH TIMBER TRUSS BRIDGES

*Prepared by Brian Pearson and Ray Wedgwood*

Up to the 1970's DMR/RTA had simply repaired/replaced the existing truss members to their original condition e.g. size, timber species, connection details. As a result of this procedure, loads heavier than the design loads have been able to be carried by some timber truss bridges, provided they are in good condition and with appropriate controls on the loads e.g. slow speed (5 mph), limitation of other loads on deck.

In addition, RTA has improved the protection of timber members from the effects of water ingress, which causes rot of timber. Methods for protection against water ingress include the addition of flashing, application of grease, and improved protective coating (paint) systems.

Subsequent increases in legal load mean that the truss bridges cannot adequately cope with respect to the strength of members, particularly if the members have a significant amount of rot.

While most timber truss elements can require replacement, those especially susceptible are the timber cross girders and the truss bottom chords at splice points and at shoe locations where the cross-girders are bolted through the bottom chords.

The cast iron shoes frequently crack, as a result of overloading and of the brittleness of the cast iron.

With regard to the decking system, transverse deck planks wear and become loose and rattle and thus allow moisture through, which causes deterioration and rot of timber members beneath the deck such as stringers, cross girders and bottom chords.

Transverse planks in decks were susceptible to wear from vehicle wheels. To add to this effect, the rough ride caused by worn transverse planks increases the dynamic impact from vehicles.

This weakness led to the provision of running planks, initially just over the wheel tracks for a width of about 2ft (600mm). However, because of successful legal action taken by a careless motor cyclist who had a fall, DMR decreed in the 1980s that running planks should be applied to the full deck width. The full width running planks gave a smoother ride and some limited strengthening, but only resulted in limited benefit.

Then cyclists suffered accidents because their tyres caught in the narrow gap between running planks, resulting in the need for a better solution, which is why a full width rubber bitumen seal is now used. However its success is questionable.

Transverse decking planks are typically 100 mm thick and are connected to the longitudinal stringers by spikes. These spikes tend to work loose. Running planks are bolted to the decking planks. In recent years the RTA has upgraded longitudinal timber running planks from 2" (50mm) to 3" (75mm) when the 2" sheeting requires full replacement, for extra strength under heavy truck loads. The RTA is also ensuring sprayed rubber bitumen seal is applied to the timber deck to lock in bolts and timber, to waterproof decks and reduce cracks for cyclists. Running planks can also be bolted to timber stringers.

Bowing of the top chords of trusses can be a problem. This bowing is partially alleviated by external sloping struts attached to cantilevered extensions of cross girders. Truss spans exceeding 90 ft have upper cross bracing. These 100 ft and greater spans had a suitable height, required by design, to allow clearance for wool wagons. Spans of 90 ft and less did not have sufficient truss height to provide the required vertical clearance. For these spans if the cross girders developed a sag between the trusses, this resulted in the cantilever extension rising and the top chords bowing inwards. In addition, the sloping struts are not particularly effective in providing lateral resistance.

In investigating the load carrying capacity of many timber truss bridges it is generally found that the timber cross girders, which sit on and transfer load to the bottom chords of trusses have somewhat less theoretical load capacity than the truss members themselves which suggests that the designers of these bridges used the cross girders as a safety fuse to protect the truss members.

Railings are a form of timber ordnance fencing, consisting of a top rail mounted at an angle of 45 degrees, an intermediate rail (mounted square) and a timber kerb. This railing system is completely inadequate for current design vehicle barrier loads.

RTA Maintenance Manuals now contain OHS requirements for:

- Installation of scaffold access platforms including scaffold monorails.
- Installation of permanent secure attachment points for worker static lines for fall protection.

RTA have been working up to a particular solution, an example being Hinton Bridge over the Paterson River at Hinton, to resolve the problems associated with the need to safely carry increasingly heavier legal vehicle loads, including the impact effects from vehicles' dynamic performance, ie related to speed of vehicle and smoothness of running surface. The "Hinton solution" has included the following features:

*“The replacement of the deck system consisting of stringers, transverse planks and longitudinal running planking by a stress laminated timber deck supported by the cross girders. This replacement deck results in a waterproof decking which gives a smoother ride and reduces the impact loading from traffic.*

*The timber cross girders have been replaced by rectangular hollow steel members to improve the strength and stiffness of the cross girders.*

*The timber bottom chords have been strengthened by the addition of two 19mm thick steel plates attached to the inner faces of the bottom chord flitches.*

*The timber traffic railing has been replaced by a traffic barrier consisting of steel SHS and RHS members, in a manner that resembles the original railing.*

*The approach spans have been widened slightly to accommodate two traffic lanes. This reduces the one way length for progression into the single lane of the main spans and hence increases the safety aspect for motorists.”*

The above changes have been made sensitively in a manner to retain the appearance of the original timber bridge to avoid compromising its integrity and with the approval of the NSW Heritage Council.