

Hillas Creek Bridge

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Item

Name of Item	Hillas Creek Bridge
Item Number	4309569
Type of Item	Built
Item Sub-Type	Pre-1948 Concrete Slab and Arch Bridges
Roadloc	
Address	**** Hume Highway, former alignment Gundagai 2722
Local Government Area	Gundagai
Owner	Roads and Traffic Authority
Current Use	Not in use
Former Use	Road bridge

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Statement of significance

Statement of significance	<p>As one of only two reinforced concrete bowstring arch road bridges built in NSW, the Hillas Creek Bridge has rarity value at a State level. The unusual design of the bridge makes it aesthetically distinctive, and is of technical interest. It demonstrates a high level of creativity in using the engineering developments of the 1930s to satisfy the new demands of motor vehicle transport, at the same time creating a graceful and attractive structure. The bridge has generated interest and appreciation within both the professional engineering community and the local community since its construction. Locally, the bridge is known as 'The Little Sydney Harbour Bridge'.</p> <p>This bridge has been assessed as being of State significance.</p>
Date Significance Updated	28 January 2004

Description

Designer	Karmalsky & Britton
Builder	****
Construction years	**** - 1938
Physical description	<p>This reinforced concrete bowstring arch bridge crosses Hillas Creek, a tributary of the Murrumbidgee River. It carried two lanes of traffic, but has now been bypassed by replacement structures on an improved alignment with dual carriageways and increased shoulder widths. The main span is 34.1 m, with the deck structure providing the stabilising tie for the two arches. The arches are rectangular in form with 12 hangers each framing to underdeck transverse members which in turn support the deck slab. (The end hangers are cast as integral with the deck and arch, thus masking their presence and action) The single approach spans at each end of the arch consist of three longitudinal support beams which have curved soffits approaching the abutment walls and cantilevers beyond that to the end of the deck, a design style particular to that era. The abutments are of wall type with right angle returns. The railing system consists of concrete end posts with two rectangular rails on the approaches, with a similar system on the main span but with a corbel along the road face giving a continuous line of protection past the hangers. Between the approach and main spans, the arch terminates in a relatively massive endpost thickened by an upcurved upper surface. The detailing of the endposts on this bridge is different from that of Shark Creek bridge. Other differences include the different approach spans and cast-in end hangers. The piers supporting the main span of Hillas Creek are taller and of comparatively slender appearance relative to Shark Creek.</p>
Physical Condition and/or Archaeological Potential	<p>Original condition assessment: 'Beneath the main arch there is evidence of the construction system used for the bridge in the form of timber pile heads visible through the sand, and concrete pads on the northern bank. These originally supported falsework which carried the concrete whilst it was cast and until it was self supporting.' (Last updated: 28/01/2004.) 2007-08 condition update: 'N/A.' (Last updated: 17/4/09.)</p>

Modifications and dates	The bridge was by-passed in 1983 with the opening of dual carriageways which cross upstream of the bridge.
Date condition updated	17 April 2009

History

Historical notes	<p>The Wagga Wagga area is part of the Murrumbidgee region, which is Wiradjuri country. The Wiradjuri people found the Murrumbidgee River and the land between that river and the Lachlan River a home with abundant food in good variety. Like the people of the Monaro plain, the Wiradjuri migrated annually to the intervening alpine peaks to feast on bogong moths. (Regional Histories of New South Wales, p. 132)</p> <p>Squatters arrived in the Wagga Wagga area in the early 1830s and began to compete with the Wiradjuri for land. A long series of violent incidents ensued and, over the next decades, the Wiradjuri were driven away from the Murrumbidgee River, into the hilly country and into towns and the service of the new settlers. (Regional Histories of New South Wales, p. 132) The squatters began to develop transport routes for taking produce to markets at Yass, Goulburn and Sydney, and bringing supplies back. (Sherry Morris, 2003, p. 1) Land was quickly claimed along the Murrumbidgee River and soon claims were staked on its less reliable, tributaries. Hillas Creek was named after the Hillas family who were squatters in the area by the early 1830s (Sherry Morris, 1999, p. 19) In the early 1840s Wiradjuri resistance was still strong and had caused the abandonment several stations, but by the end of that decade the settlers were assured in their possession of the area, the gold rushes followed and the area was more extensively settled. Wagga town was established in 1847-9 (Regional Histories, p. 134) Pastoral activity continued, with sheep becoming the predominant stock by the latter decades of the nineteenth century, towns were established, land cleared and transport routes improved (Regional Histories, p. 135).</p> <p>The main route between Sydney and Melbourne passed though the Wagga Wagga area, known as the Port Phillip Road, later as the Great South Road or Hume Highway, following the route used by Sir Thomas Mitchell in 1836 (Sherry Morris, 1999, p. 29). The section from Sydney to Liverpool had been cleared, roughly formed and supplied with some bridges between 1813 and 1816. The route was surveyed and smoothed somewhat to Goulburn by 1822 and to Yass by 1847. From the 1830s inns sprang up along the route, and the first general store between Gundagai and Albury was opened near today's Tarcutta by Thomas Mate, in conjunction with an inn, by about 1840. (Sherry Morris, 1999, p. 29) Despite the declaration of the Great Southern Road, from near Sydney through Goulburn and Gundagai to Albury, as one of the three main roads in the colony under the Main Roads Management Act of June 1858, the southern parts of the route remained only a track. The route was patronised by coaches and bullock waggons, but in 1858 could still be described as a 'scarcely formed bullock track with its tottering bridges, rugged steeps and treacherous passes' (cited by Sherry Morris, 1999, p. 76) In the mid 1860s the Department of Public Works reported that the Southern Road between Gundagai and Albury had been improved, having been metalled in some sections, closest to Gundagai, and mostly cleared, with all creeks bridged between Adelong Creek (approximately 10 kilometres south of Gundagai) and Albury (DMR, 1976, p 48). The route of the Great Southern Road followed the Murrumbidgee River between Gundagai and Mundarlo where it departed from the River, and crossed Hillas Creek before climbing the steep Tarcutta Hill. (Sherry Morris, 2003 p. 1)</p> <p>Rail reached Wagga in 1878 and roads declined in importance for a time, except as far as they facilitated access to the rail line. (Sherry Morris, 2003 p. 2) In 1928 the Great South Road was proclaimed a State Highway under the Main Roads Act and named in honour of Hamilton Hume who, with Hovell, had charted an overland crossing to the Bass Strait in 1824.</p> <p>The bridge over Hillas Creek was one of more than 1,000 bridges built by the Main Roads Board cum Department of Main Roads (DMR) between 1925 and 1940, a period in which the Department's engineers were adapting existing standards of road and bridge design to meet the requirements of improved motor vehicle performance - bridges were generally wider than previously with an improved load capacity, and durable reinforced concrete became a favoured construction material. The principal types of bridges constructed in this period were: concrete slab; reinforced concrete beam; steel truss on concrete piers; and timber beam bridges. The few reinforced concrete arch bridges built in NSW in this period were significant due to the variety of designs employed. (DMR, 1976, pp. 169, 170) The bowstring arch design had been employed in timber and steel bridges, at a number of sites in New South Wales such as that across South Creek at Windsor, built in the 1870s (probably no longer extant) (Roadmakers p. 54) and the composite timber and steel bridge over the Lachlan River at Cowra built 1893, which uses several bowstring trusses (Roadmakers illustrations after p. 232) This type of arch differs from the traditional arch in that the outward thrusts of the arch, instead of being resisted by the ground of the abutments, are carried within the structure by the tie members along each side of the deck which tie the two ends of the arch together. In the 1930s, Department of Main Roads engineers, Vladimir Karmalsky and Alexander "Sandy" Britton pioneered the use of the bowstring principle in reinforced concrete. In a 1935 article, 'Bowstring Arch With Temporary Hinge', the pair expounded the dynamics of the design, explaining the behaviour of the tied arch, and in particular describing a new method which they developed to limit bending stresses in the reinforced concrete arch members themselves. Whereas other bowstring arch builders had balanced the bending effect of adding the weight of the deck by using horizontal jacking of the tie members, the new concept incorporated an extra hinge in the arches at their crown which allowed the deck load to cause movement without generating bending stresses in the arch. After completion of the deck concreting, the hinges (formed by a star pattern of reinforcing bars) were infilled with concrete to give a final form with full bending strength across the crown. (Transactions of the Institution of Engineers Australia, Vol., 16, 1935, pp. 193-197, also 'Calculation of 112 ft Span Bowstring Arch with Temporary Eccentric Hinge', Institute of Engineers Australia Journal, Vol., 4, 1932, p. 333)</p> <p>Their theories were actualised in the Shark Creek Bridge near Grafton, built in 1935, and then the subject bridge over Hillas Creek, built in 1938. Both bridges excited continued interest in professional circles, with the Hillas Creek Bridge pictured under construction in the Department of Main Roads Annual Report of 1938-9, and both bridges featuring in a 1940 article by F C Cook and H W Cover, 'Reinforced Concrete Highway Bridges in New South Wales', in the Institution of Engineers Australia Journal.</p> <p>The bridge over Hillas Creek was constructed as part of the Tumbalong - Tarcutta Hume Highway deviation, the Department's first major construction in the South West division. The deviation was constructed in two stages. The first stage was carried under the Unemployment Relief Works Scheme, employing a large number of labourers to carrying out heavy manual labour for the deviation's earthworks. This section included the Hillas Creek bridge and was opened to traffic in 1938. The availability of unemployment relief subsidies decreased, and to cut costs, the second stage of works were carried out using new mechanical equipment as well as manual labour. The mechanised works were such a success that the department was prompted to acquire a substantial fleet of roadbuilding machinery (Sherry Morris, 2003, p. 19-20).</p> <p>The photograph of the bridge under construction, referred to above, shows the elaborate timber formwork required for the shaping and support of the poured concrete (DMR Annual Report 1938/9, pp. 19-21). A 1948 document reports that the construction of the Hillas Creek and Shark Creek Bridges was undertaken in different orders. The deck of the Hillas Creek Bridge was constructed first, on 3rd November 1938, with the upstream arch and hangers poured on 16th November, the downstream arch and hangers on 25th November and the central section of the deck completed in mid December. The formwork was removed on 12th and 13th December. On the Shark Creek Bridge, the arches were completed first, then the central section of the deck was poured, the hangers were then poured and then the temporary hinge was completed. (RTA General File 10/274.1200 Part 2)</p> <p>Minor repairs carried out on the bridge in 1953/4, the value of £67 pounds, in 1956/7, the value of 83 pounds, and in 1965/5 to the value of 43 pounds.(RTA Survey, Design and Construction File 2/178.150 Part 2) In 1977 one of the arches and a hanger sustained some accident damage, repaired in 1979 (RTA General file: 178.147).</p> <p>In 1983 a new deviation, 11.5 kilometres in length, bypassed the bowstring arch across Hillas Creek. The works were prompted by a series of accidents including one that resulted in a major diesel spill. The new section of road featured a dual carriageway, with twin concrete bridges across Hillas Creek, increasing the safety and amenity of that section of the Hume Highway.</p> <p>Although the bridge was no longer to be in use by traffic, it was recognised by those within the Department of Main Roads, the Heritage Council and the community that the structure held a unique place within the region and the State and should be retained. (RTA General File No. 2/178.1326, RTA General File No. 178.147) The bridge</p>
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had been listed on the Register of Australian Historic Bridges in 1982. A plaque was placed on the bridge in 1988, one of about 50 plaques intended to 'provide NSW residents and visitors with interesting details about the State's historic bridges' others included the bridge over the Hawkesbury River at Richmond and the sister bowstring arch over Shark Creek near Grafton. (RTA General File No. 178.147) The plaque notes that the bridge shares a unique design with the bowstring arch over Shark Creek near Grafton and that it was constructed as part of the Tumblong-Tarcutta Hume Highway deviation in the 1930s. The plaque also describes the basic structural properties of the bridge and notes that it has become known in the wider community as 'The Little Sydney Harbour Bridge'. A Gundagai Independent article of 11thOctober 1984, reporting the highway improvements which bypassed the bridge, notes that it will be retained: 'The Little Harbour Bridge will be a reminder of an era of motor transport, and an attraction for artists and photographers.' (RTA General File No. 178.147)

Maintenance work was carried out in 1986/7, after traffic was transferred to the new Hillas Creek twin concrete bridges, to bring the bridge to a good and stable condition where it might be retained successfully and require little work in the foreseeable future. Cracking and spalling on hangers and railings was repaired, including several places where reinforcement had been exposed. (RTA General File No. 178.147) Discussions continue within the Roads and Traffic Authority about the best way to provide a safe and amenable area for public access to the bridge.

Listings

Heritage Listing	Reference Number	Gazette Number	Gazette Page
Heritage Act - s.170 NSW State agency heritage register			

Assessment of Significance

Historical Significance	The bridge was built as part of the Tumblong-Tarcutta deviation, a major roadworks project of the late 1930s, which was partly funded under the significant Unemployment Relief Works Programme. The deviation was a significant improvement to the highway.
Historical Association	The bridge has a strong association with Vladimir Karmalsky and Alexander Britton, Department of Main Roads engineers, who designed it.
Aesthetic/Technical Significance	The bridge is aesthetically distinctive, having a visually striking superstructure. The bridge has a high level of technical significance, being one of only two examples in New South Wales (and possibly elsewhere) of the reinforced bowstring arch with temporary eccentric hinge, a construction feature which limited bending effects on the arch in a manner not previously done.
Social Significance	The bridge's design generated interest in the professional engineering community at its time of design and construction and for some years afterwards. When the bridge was superseded in the 1980s, its significance was widely appreciated within the Department of Main Roads and wider community and provision was made for its retention. The bridge is known as 'The Little Harbour Bridge' within the local community.
Research Significance	****
Rarity	The bridge is rare both on a local and a State level, being one of only two reinforced concrete bowstring arch bridges to be built in New South Wales.
Representativeness	****
Integrity/Intactness	****
Assessed Significance	State

References

Type	Author	Year	Title
Written	Heritage Office and Department of Urban Affairs and Planning	1996	Regional Histories of New South Wales
Written	Sherry Morris	1999	Wagga Wagga - A History
Written	Department of Main Roads (DMR)	1976	The Roadmakers
Written	Sherry Morris	2003	Then and Now: 75 Years 1928-2003, RTA South West Region, NSW,

Study details

Title	Year	Author	Inspected by	Guidelines used
Pre-1948 RTA Controlled Concrete Slab and Concrete Arch Bridges in NSW	2004	Burns and Roe Worley and Heritage Assessment And History (HAAH)		Yes

Custom fields

RTA Region	South West
Bridge Number	6307
CARMS File Number	****
Property Number	Bridge
Conservation Management Plan	****

Images



View north from Hume Highway with Hilla Creek Bridge in distance



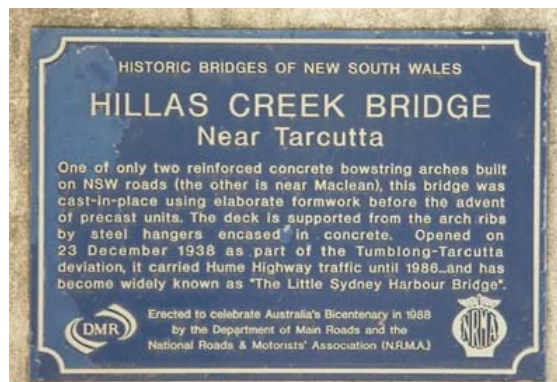
View of southern approach span showing curved soffit to abutment wall with cantilever approach slab behind. Note also the ribbed pier detail



Concrete pad on northern side of creek originally used to support falsework



View north across bridge on centreline



Plaque on bridge recording historical details



View south under main span showing heads of timber piles used to support falsework for construction



Oblique view of bridge from south



View of main span from east looking downstream



Centreline view under northern approach span with three girders, showing approach slab extending beyond abutment wall

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