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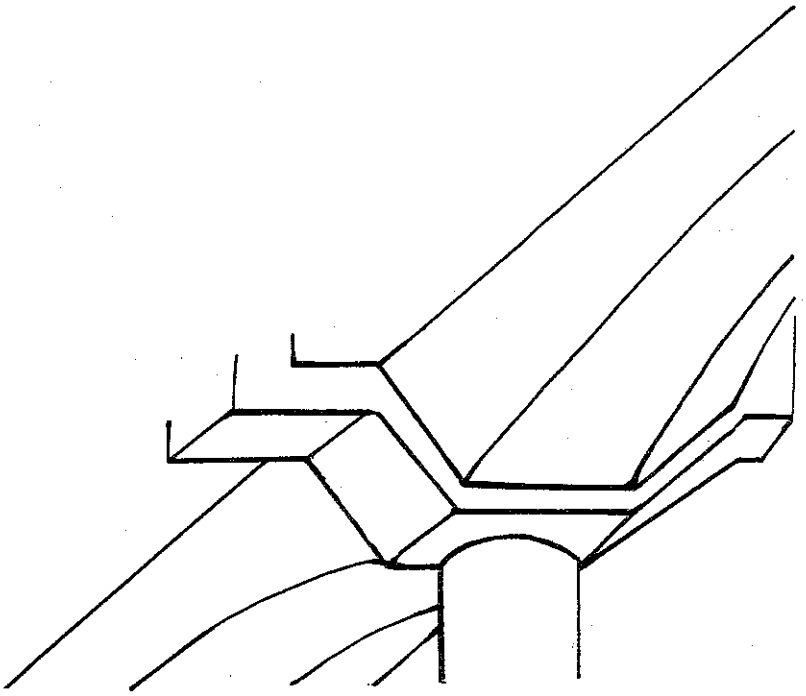

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The History of the Mangapurua Valley Settlement and the "Bridge To Nowhere"

Chris Munn[1]

Synopsis. This paper discusses the history of the settlement in the Mangapurua Valley, which was established after the First World War for returned servicemen. The settlement of the valley is described, along with the reasons behind the construction of the bridge over the Mangapurua Stream, (known as "The Bridge to Nowhere"). Details on the bridge are given, together with a summary of the results of a condition survey, which was commissioned by the Department of Conservation (DOC) and undertaken by ***Contech*** in March 1994.

INTRODUCTION

Because of the number of papers presented on condition surveys etc in the past, it was decided to present a paper on a concrete structure that has an interesting past and a new future as a tourist destination on the Wanganui River. For this reason this subject has been approached from a historical standpoint, rather than the usual technical angle. A summary of the results of the survey are presented, but the emphasis of this paper is on why the bridge was built and why the valley (and hence the bridge) was abandoned. Its importance to tourism is also discussed, along with its Historic Places Trust registration. The significance of this registration, as it affects restoration alternatives is also briefly discussed.

In February of 1994 ***Contech*** was invited by the Department of Conservation (DOC) to submit a tender for a condition Survey on the Mangapurua Bridge, which is also known as The Bridge To Nowhere. This tender was accepted and the work carried out in March of the same year.

LOCATION AND EARLY HISTORY

The bridge spans the Mangapurua Stream 35 kms beyond Pipiriki, in the most remote section of the Whanganui National Park. Access is possible by a two day tramp from the Mangapurua Trig or a 40 minute walk from the Wanganui River. Helicopters are permitted only for management purposes. The site itself is now largely reverted to native bush, with the only signs of its past history being several large pine trees and the remains of several settler's homes.

So what is the history behind these abandoned homes and sporadic pine trees?

THE FIRST SETTLERS

It was recognised by the Government of the Right Hon. Mr Massey, in 1915, that a large number of soldiers returning from the First World War would want to "go on the land". Many areas of New Zealand were studied with a view to settlement by returned servicemen, however when The Discharged Soldiers' Settlement Act was passed on July 17, 1916, pressure grew upon the Lands and Survey Department to quickly identify empty land suitable for development into farms.

The Wanganui River Valley was considered as suitable, and in particular the Mangapurua Valley. This area had been surveyed in 1909 but the failure of an adjacent settlement at Mangatiti at that time put the future plans for the Mangapurua Valley on hold. Despite this, the decision was made to proceed with the Mangapurua Valley as it had been surveyed and all of the sections pegged in 1909. The general description of the valley stated that ***"the block consists of undulating to steep hilly country, soil fair to good resting on sandstone and papa formation, and varying in altitude from 370 feet to about 1850 feet above sea level, all in virgin bush which, when cleared and grassed, will make good grazing country suitable for sheep and cattle."*** Thus, approximately 200 sale plans of the valley were distributed around the RSA clubs.

The opening of the areas was announced on November 8, 1916. There was immediate interest from many of the returned servicemen.

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The applicants were required to visit the area that they had applied for prior to attending an interview with the Land Board. This necessitated a 2 day trip up the Wanganui River followed by a tramp up the valley by the rough survey track.

At the site of the existing concrete bridge, there was initially a temporary cage (without sides for the first 6 months of its life) to enable easier access up the valley. This cage was held in low esteem by the valley residents and plans were drawn up for a more substantial timber suspension bridge, which was completed in 1920.

THE STRUGGLE TO SURVIVE

The expense of clearing the land exceeded the reimbursable rate offered by the Government. This put considerable strain on the resources of the settlers, many of whom went into debt to fund the extra costs. Thus, after all other costs, such as living expenses, the farmer had nothing left to pay for developing more land to improve his cash-flow. This problem was apparent as early as 1920. A slump in farm produce prices started in 1921 and continued through to 1927, followed by the Depression. The pressure on the families in the valley increased.

It was felt that an improved road from Raetahi would help to improve the economic viability of the valley. In 1935 the road was metalled and widened to 12 feet as far as the site of the bridge.

THE BRIDGE IS BUILT

The bridge itself was seen as an important link in the proposed road between Taranaki and the Waimarino. The timber suspension bridge was deteriorating rapidly due to the damp climate and regular maintenance was needed. Local knowledge was that no rimu structure would last more than 10 years and a decision on a replacement was urgently needed despite the lower end of the valley loosing its appeal.

In 1933 the PWD drew up the plans for a concrete arch bridge,and tenders called. (Steel and timber suspension bridge options were rejected due to the restricted access to the site and the lack of wind, together with the valley's reputation for fog and rain which would lead to rapid corrosion and rotting problems.) The contract was for labour only, with the PWD supplying and delivering all materials to site.

Only two tenders were received, namely:

Sandford and Brown @ approx. £403, and
E W Baker @ approx. £629

(The PWD estimate for the work was £667.)

Work commenced in January 1935. Unfortunately, the road became unpassable in March and all work ceased until spring. In September, Sandford and Brown wrote to the PWD requesting that the contract be cancelled, as the PWD had failed to maintain the supply of materials to the site, while they had continued to pay their workforce. They had also been forced to give their workforce a 10% pay increase by the Department of Labour. As an alternative to cancellation of the contract, they requested an increase in the contract sum. The PWD agreed to an increase of only £90 (even though labour rates had risen by 20%) and lent the contractor some additional plant. The bridge was completed on 5 June 1936 for a total contract payment of $1,197.17 or approximately £600 for labour, and £420 for transportation.

The opening of the bridge corresponded with the election of the first Labour Government. The Labour MP for the district was on record as opposing the development of the area as the soil was not stable and the settlers inexperienced. These views were expressed while in opposition, therefore when he was appointed Minister of Lands it was expected that there would be increased resistance from within Government to the expenditure of more funds in the valley. During this time, the prospect of the Raetihi-Stratford link (of-which the Mangapurua bridge was a vital keystone) slowly died.

THE DECLINE OF THE VALLEY

By 1937, the Waimarino County Council declined to accept responsibility for the maintenance of the last 10 miles of the road, a decision which meant that the lower half of the valley died. Productivity had halved in the 10 years to 1937 and more settlers were walking off the land. With the start of the Second World War, the rate of decline increased, but the final blow was in January 1942 when a severe downpour (150mm of rain in three hours) caused extensive slipping which closed 16 miles of road and completely isolated the valley. The estimate for repairs, at £10,385, was too great a sum to provide access for the 3 remaining settlers and the decision was taken to close the road from 31 March, 1942.

After the stripping of fences and one small bridge by the Land and Survey Department in 1943, the valley was abandoned. The recovered materials were then used by the department to assist in the establishment of new blocks of land elsewhere for a new influx of returnees.

Some basic statistics on the bridge are:

Span(total) : 130'
Arch span : 76'
Height above river : 130'
Concrete volume : 137 yd^3
Reinforcing Steel : 15 tons
Formwork / falsework : 17000 sup. feet

THE BRIDGE TODAY

After many years of neglect, public interest was rejuvenated in the bridge in the early 1980's, with an increasing number of people visiting the bridge. When the valley was abandoned, nature rapidly returned to the valley. The bridge deck was soon covered in long grass and small scrub, which was subsequently cleared in the early 1980's.

The Whanganui National Park is becoming increasingly more popular as more people become aware of what the area has to offer. Visitor numbers have increased to approximately 7000 per year from a figure of 2000 in 1989 and show signs of continuing at a rate of about 10% per year for the foreseeable future. In 1992, over 70% (6214 people) of river users visited the bridge.

The structure has now been registered by the New Zealand Historic Places Trust as a Category 1 historic place under the Historic Places Act 1993. Although registration does not put any management onus on the Department of Conservation, the Department has a mandate under other legislation to conserve historic resources on lands it administers. The bridge will continue to be maintained as an historic structure and vital access across the Mangapurua Stream.

The historic and tourism aspects of the bridge have made it important that, although repairs will be discernible from the original fabric, they alter the character as little as possible.

SURVEY RESULTS

Site investigation was carried out over a period of five days. All elements of the structure were examined, namely:

1. Abutments.
2. Arch foundation blocks
3. Arches
4. Transverse arch beams
5. Arch columns
6. Deck beams
7. Deck
8. Handrails.

The following tests were carried out on the structure: (In some locations, access restrictions dictated which tests were carried out, or the extent of those tests.)

1. Visual examination / photographic record.
2. Covermeter measurements.
3. Strength tests (Schmidt Hammer).
4. Electro-potential mapping (epm) for corrosion of the reinforcing.
5. Carbonation testing.
6. Chloride sampling.
7. Alkali-aggregate reactivity (AAR).
8. Moisture content testing.

REPAIR OPTIONS

The prime mechanism of deterioration on the bridge is deterioration due to carbonation attack to reinforcement with inadequate cover. The options available to repair the bridge and address the prime cause(s) of the deterioration are listed below.

(1). "Do nothing" option.
(2). Repairs using proprietary repair systems.
(3). Anti-carbonation coating system.

1. "Do nothing" option. In the short term, this alternative can sometimes appear as a very attractive proposition. The deterioration of the bridge is at the stage where if this option is chosen, significant deterioration of highly visible elements (such as the handrails), will cause serious long-term damage. This damage will be noticeable to visitors at the site and any repairs, when they are done will be even more visible, dependant upon the option(s) chosen. The deterioration of the reinforcing in the column stirrups is at the stage where the loss of steel cross section is such, that if repairs were to be carried out in the near future, then the replacement of corroded reinforcing steel would be minimal. Delays in these repairs could well mean that the replacement of some or all of the exposed stirrups could be necessary.

2. Repairs using proprietary repair systems. This option is the preferred solution to solve the problems on the bridge. The repairs would have a known track record with regards to durability performance and the service life of the repairs would be known. Some form of guarantee may be able to be offered on the repaired areas. The main disadvantage to this alternative is that it would be impossible to hide the fact that the bridge had been repaired, as the colour and surface texture of the repair system will be markedly different to that of

the parent concrete.

While some colour matching of the repair system is possible, the significantly different weathering characteristics that (will) exist between the repair and the rest of the bridge means that the repairs will quickly assume a different colour to the rest of the bridge. This phenomenon could be particularly relevant in this case, as the site of the bridge is renowned for the high rainfall and generally damp environment.

3. Anti-carbonation coating system. For long term protection, it is recommended that consideration be given to the application of a proven coating system to the structure. These coating systems are usually a two part system, which consist of a water-proofing silane-siloxane coating, followed by an acrylic coating to resist carbon dioxide. The acrylic coating is available as a clear coating, which would have the least visual impact on the bridge, however its use will mean that the appearance of the concrete will change to look like that of rain-dampened concrete. Perhaps more significant however, is the need to clean the surfaces with a biocide and high pressure water prior to any coating being applied. Once the coating was applied, the growth of moss etc. on the handrails and abutments would slow down. The visual impact of this alternative requires careful consideration.

The overall condition of the bridge is very good when the age of the bridge, its location and lack of previous maintenance are considered. The deterioration which is now evident is mainly attributable to placing methods which saw concrete being placed in formwork of relatively deep sections. This caused problems in maintaining cover to the reinforcing steel on at least one side of the columns above the arches. Additionally, compaction of the concrete in these same areas was less than required to achieve to achieve an optimum density. The consequence of this was to produce concrete that was of a lower density at the base of the longer columns (manifested by poor construction joints), together with areas of shadowing about the stirrup reinforcement.

There was evidence of AAR (alkali-aggregate reaction) in the past, however there is no evidence that this is an ongoing problem at present. The application of a coating system to the areas showing signs of AAR in the past, should be considered.

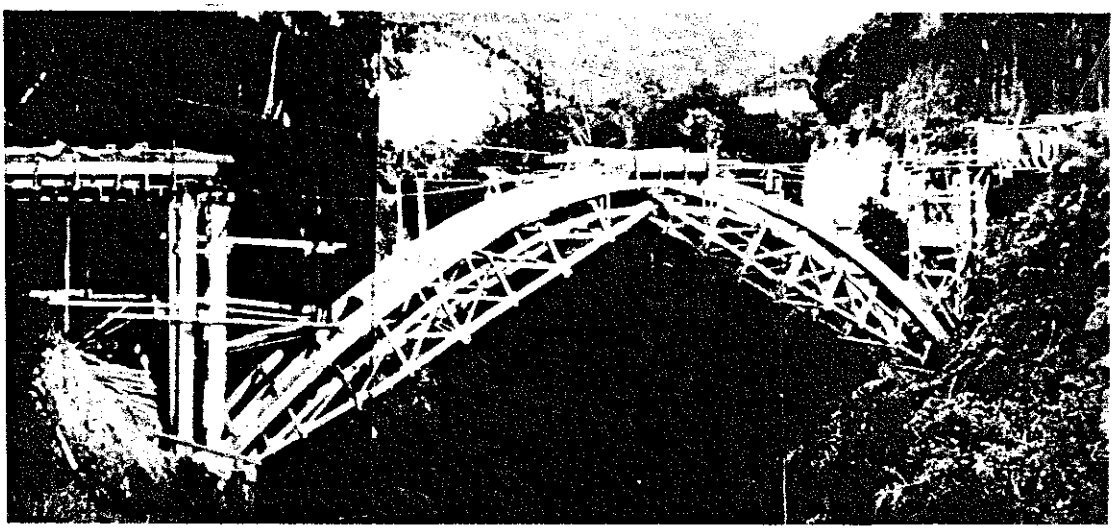
It is felt that most potential areas of deterioration have manifested themselves and that it is now important to carry out remedial work to halt any further deterioration of the reinforcement. Should this work be delayed then it would be necessary to consider replacement of reinforcement in some areas of the columns, which is an expensive operation.

As the main durability concern of the structure is carbonation attack, it is recommended that the application of an anti-carbonation coating be applied to the bridge once the repairs have been completed.
Any repair work undertaken would need to allow for the fact that the structure is located in a National Park. Care would need to be exercised (to minimize damage to surrounding bush) in the location and disestablishment of temporary accommodation and access systems. The removal of all debris from site would also be necessary.

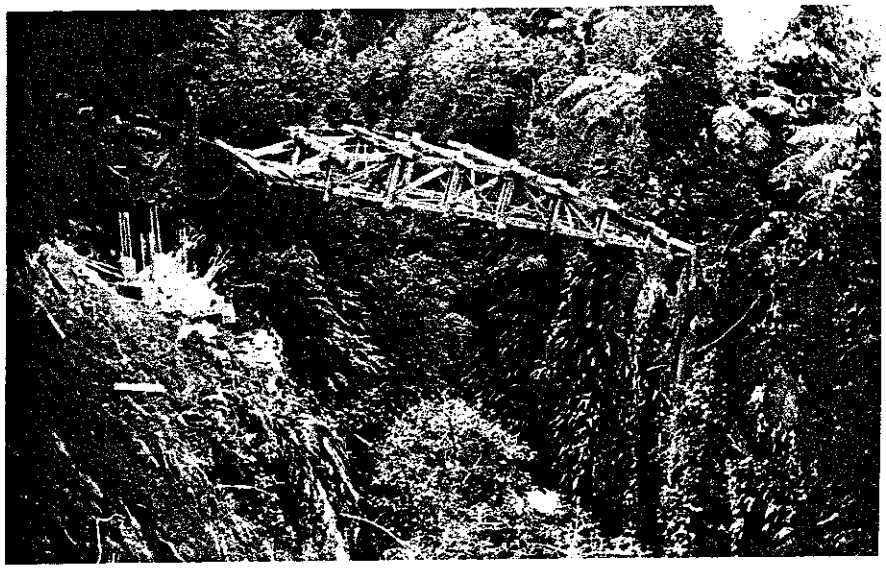
Acknowledgements. *The author would like to acknowledge the permission of the author of "The Bridge to Nowhere", Arthur Bates, to use information and photographs contained in his book. The permission of the Department of Conservation, as owners of the structure, to present an outline of the findings of the condition survey, is also acknowledged.*

Falsework completed

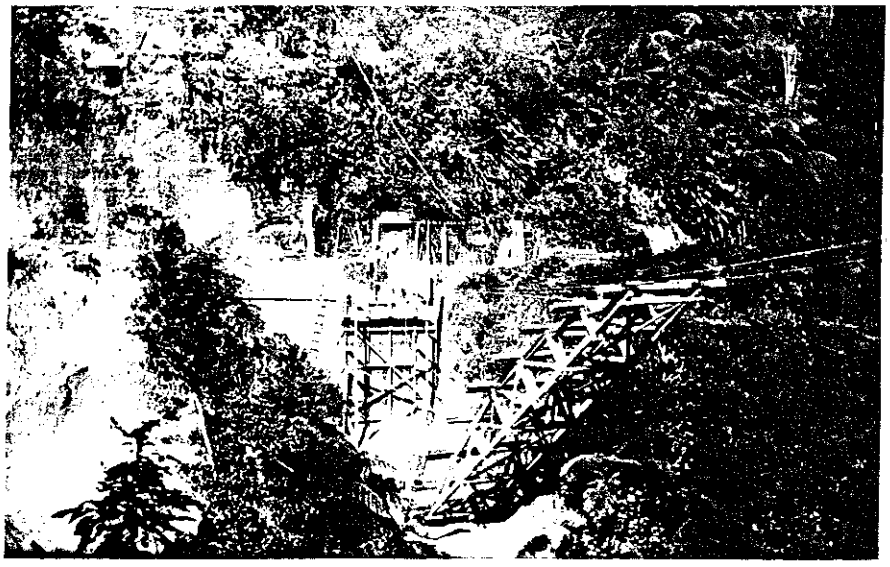
Most of the arch completed, deck pours commenced



Launching Arch Falsework



Western Abutment and Arch Falsework



The Bridge Upon Completion