



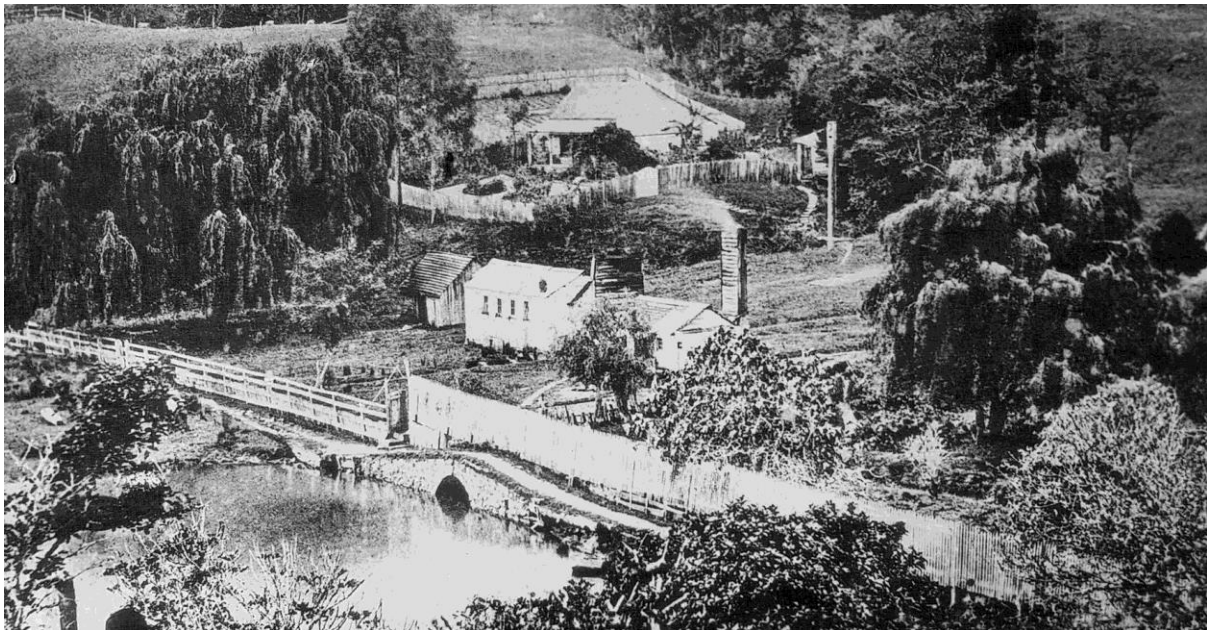
## Bridge of the Month No86, February 2018 Kohukohu, New Zealand



Hard to believe how the last two months have raced by. When Sue died I booked a flight to New Zealand to spend a bit of time with my daughter Liz and her family. That visit is one third gone already.

As the months end raced up it occurred to me that I should just look for an arch nearby. There are very few in New Zealand but Google tuned up this, probably the oldest stone bridge in New Zealand, which surely means the oldest bridge because the others would have been timber and would long have rotted out. To my amazement it is only 45 minutes' drive so I took advantage of (another) sunny day and went for a ride.

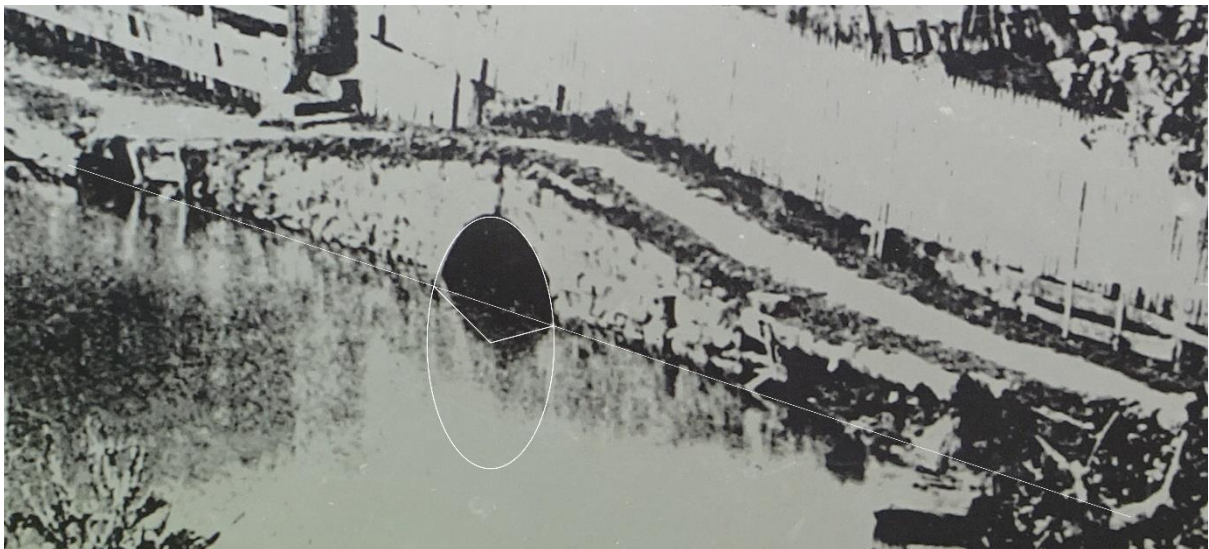
Location first: [Kohukohu](#) is on the north shore of Hokianga Harbour. Start by zooming out on the location and appreciate that. Liz and Pete's farm is [here](#). The bridge itself is now wedged [between the school and the bowling green](#) with access along the stream bank from the main road. It wasn't always so wedged as this photo from 1860, taken from the display board, shows.



What is left is sadly neglected and has obviously been quarried for usable stone down the years.



The arch evident here is very much less of a curve than the original which I suspect was semi-circular or very nearly so. The lake shown in the 1860s photo obviously silted up long ago. Note that the elevated viewpoint marks this as the upstream side.



Stretching the ellipse shown here till it is a full circle gives the angle above water level as 144degrees.

Looking back at today's photos I think the surface level at the crown is roughly as original.



The spandrel walls and low parapets are long gone but it is interesting that the walls remain below arch crown level which is probably the top of solid backing. Did the quarriers take a clue from that or were the stones just better fixed?

Notice how the top half of the crown voussoirs are missing and there are cracks at a similar level in others. Looking at the upstream side shows a similar pattern. There is less access and more vegetation but here the split runs much of the way round the ring and suggests that the stones are bedded the wrong way.



To be fair to the masons, the stone came from Sydney, probably as ballast in a ship, so would have been far from the quarry and quite dry when dressed making bed spotting more difficult.



Hidden in the grass above are the lower stones of the spandrel, once again, still present below crown level.

Modern cameras allow some tricky stuff. I carry a SONY HX90V on my belt. It zooms from 24-720mm (35mm equivalent) and has remarkable light gathering power. It will also link to a mobile phone by wifi and allow you to operate the camera from a distance. I therefore try to carry some form of pole with me everywhere. A cheap selfy stick is a help but this small Monopod from Manfrotto has huge value as we will see.



By extending the pole under the bridge I was able to get a good view of general condition and some useful details.



Here we see the northern half of the arch and it is immediately obvious that the curve continues into the silt. There is a substantial crack/joint opening at both edges, the right hand (downstream) one is most visible. It is much wider at the crown than at the end and moves steadily out towards the edge at the end as well. This is surely caused by pushing out from the crown.

Note also that there is a second crack about 500mm in from the edge which is closed two stones up from the silt and quite wide by silt level. This is surely caused by foundation movement, with the edge being held up on slightly firmer ground or having some form of bigger foundation. It would be interesting to know whether this very soft ground was piled to support the bridge.

Also in this picture, note that the bottom two courses are clean and lacking mortar. Looking at this it would be easy to think that the bridge was built in dry stone but the higher areas disprove that. Up

there, vegetation has taken on the mortar and not been washed off so we can be reasonably sure that significant floods are very rare.



The south end of the crack is similar in form, though it seems to pass through at least one stone.



Even through the vegetation we can see that the mortar spreads across the face of the stone. This is probably "as built". The mortar will naturally spread across the centring as the bridge is built. The fact that it still does so reinforces the view that floods are rare.



The crack at the upstream edge follows a similar pattern. Much wider at the crown and moving towards the edge at silt level.



The south end of that crack is quite spectacular. It divides into 3 making it difficult to judge the width but it also passes through some stones. Here there is still mortar in some of the open joints but much of it has been washed out, presumably with water from above.



The upstream edge of the bridge is at the top of this picture and these stones are close to the arch crown. Note how that split stone bridges between the two sides and is set to become a jack, pushing the sides apart with even modest shear movement.



Finally, a look back on top. Note how thin the grass is on those sloping sides and how thick on top. The sides are clearly eroding faster than the grass can grow. There is very little cover left at all above the major cracks, but I suspect the soil slipping is part (along with mortar washout) of the cause for the width of these cracks.

The listing for the bridge by Heritage NZ is [here](#). The pictures from 10 years ago show the vegetation firmer on this downstream side but largely absent upstream. The text in the listing seems a little confused to an engineer but it seems unlikely that anyone involved had an engineering background. They certainly wouldn't have come across many arches unless they had worked eg in the UK beforehand.

So, that is February. Back to my holiday.

Bill