

CONSTRUCTION OF HUME DAM

An article by Joe Wooding, *Albury & District Historical Society*, April 2013

The Hume Dam surely stands as an icon of early 20th century Australian engineering skills. Construction on this massive project commenced in 1919 and at completion in 1936, was rated second only to the world's largest dam, the Elephant Butte Dam on the Rio Grande Texas. Nearly 4 million cubic yards of earth and rock along with 532,900 cubic yards of concrete had been used.

When Hume and Hovell trekked through in November 1824, they were remarkably close to the present dam site, crossing the Milewa, the Nurongong and the Narantheran, the native names for the Murray, Mitta and Kiewa Rivers encountered on their epic journey south. Downstream, was the crossing place at Bungambrewatah which they had failed to find earlier due to a high river level but left their mark on a well known gum, which we know as The Hovell Tree.

When Assistant Surveyor T S Townsend was instructed in July 1838, to proceed to the Murray and make a careful survey of the ground, he mapped these rivers and many other features. One was the Bouna Creek, which he notes empties itself into lagoons. His report and maps forwarded to Sydney included one titled 'Survey of Part of the Murray River and the Ground Near Bungambrewatah.' Albury was proclaimed in 1839 and one of the original thoroughfares named Nurongong Street, the native name of the Mitta.



This map appeared in the *Albury Banner and Wodonga Express* on November 28, 1919, the day that the first sod of the Hume Weir project was turned by the Governor-General

To best understand the dam project, a little geography is provided. After turning south at Bowna, the Murray basically follows the base of Hawksview Hill until it turns west below Hume Weir village and then turns north-west about 1 km directly upstream of the spillway. It was at this point the confluence of the Mitta with the Murray occurred. Our largest river then flows through or over the Hume Dam before turning west on its long journey to the sea.

The river itself is New South Wales territory, hence becoming that state's responsibility to build a concrete spillway incorporating 4 outlet valves with 3 more for future electricity generation as well as the concrete training walls on each side of the river. Victoria had charge of the earthen embankment which stretched for well over a kilometre across the flood plain. It was far more than a huge pile of dirt. Throughout the entire length of the embankment runs a reinforced concrete core wall. It was truly massive but has not been seen since completion as the roadway has been built over the top of it. Bedded 900mm into solid granite, the wall has a base 1.8m wide, tapering to a narrower top, but still wide enough to carry a light rail for carting concrete and other material along the works. A photo shows the wall completely dwarfing several men, horses and drays standing beside it. The concrete was produced from thousands of tons of sand and rubble tailings, railed from Chiltern valley mines and crushed on site.

The filling upstream of the wall was all clay, the theory being that clay would set like a brick and be impervious to water. On the downstream side, runs a course gravel drain covered by soil that was much more porous than the clay. The wall was keyed into the Victorian end of the spillway, using pitch to seal the joints but was not entirely successful. This is just one of several problems being remedied with the multimillion dollar upgrade in progress in 2013.

As early as 1863, it was realized that some form of water management was needed to ease the boom and bust flows of the river system. Lochs and weirs were advocated but when representatives of the three colonies, NSW, Victoria and South Australia, met in Melbourne, not surprisingly, the talks came to nothing. Difficulties with border customs, bridge and punt tolls, along with self interest, made the necessary compromises between the parties impossible. By the 1880s, navigation of the rivers was largely usurped by the expanding railway system but calls for irrigation were being heard. Many conferences and several Royal Commissions were staged but it is sufficient to say, nothing concrete was achieved until after 1901, when a fourth player emerged, the new Federal Government.

In 1914, a wide ranging agreement was reached and the next year, the Parliaments of the four governments ratified the 'River Murray Waters Act' 1915.

Planning began, 25 sites were investigated. One was across the narrows at Cumberoona where 600,000 acre ft could be impounded but would not trap the waters of the Mitta. Another was downstream at Bungowannah trapping the water of all three rivers but this did not appeal for many reasons.

In all, 158 test bores were drilled to ascertain the depth to bedrock at various locations. On October 15, 1918, the NSW Government had decided the site just below the Mitta junction and where the majority of the test bores were drilled, was the best available for the dam. Victoria concurred. The bedrock was gray granite and nearly 13m for most of the river bed but sank to nearly 30m on the Victorian side. Apparently this deeper rock was not picked up with the test bores. One NSW engineer resigned, while another died, it is said, from stress. There was some talk of abandoning the project.

To build a large reservoir, lots of land needs to be resumed, in this case, prime river frontage. 15,582 acres in NSW were acquired, 87,268 in Victoria. Not everyone was pleased with the compensation offered. Appeals and Court cases ensued for nearly a decade after the work began. With construction commencing in November 1919, tent cities sprang up on both sides of the river. It was not long before more permanent buildings were erected.

On the Victorian side, the hamlet of Mitta Junction, which did have some infrastructure - buildings, houses, etc - became known as Ebdon Weir and the site for operations in that state. The higher ground in NSW was called Hume Weir and started from nothing.

Early in 1920, the title Hume Weir was officially bestowed on the whole project in honour of the explorer, after agitation from Albury Municipal Council. Originally it was called the Mitta Mitta Dam site. Massive amounts of infrastructure were needed. A metalled road from the main road at Wirlinga, now Old Sydney Road, was built to the site. A Hume Weir rail siding near North Street was established, from where vast amounts of stores, equipment and cement were conveyed to the NSW work site by a fleet of 10 solid rubber tyred Thornycroft motor lorries. In Victoria, a branch from the Wodonga to Cudgewa rail line was laid to Mitta Junction. A road bridge to link the two villages spanned the Murray just below the work site.

Two quarries were established. The one in Victoria provided earth fill and clay for the embankment. People may remember the very popular Hume Weir car race circuit established in this old quarry. Races were staged from 1959 to 1977. Originally, 2 steam locos running on a 1.05m gauge were used to haul trucks along the earthen bank. Eight more were added as the work progressed. The rail tracks constantly needed re-laying as the bank grew. Two steam grab cranes were used in the early excavation work at the quarry. Two navies were deployed. These were steam cranes which ran on the rail system. Much of this equipment was brought from Nagambie and Eildon. Horses on this site numbered over 500 and used to haul monkey-tailed scoops and drays.

In NSW, the well known stone quarry is on Hawksview Hill, overlooking the Bethanga Bridge. Four steam locos and numerous trucks were brought from Burrinjuck. They ran on a 900mm gauge. The rail system was extensive, rails ran to and from the quarry and the Bethanga Bridge site. Rail was also used inside the coffer dam to service the spillway foundation excavations. Photos show several different track gauges. Points and loops are also visible.

Horses and drays were mandatory but steam power was widely used and some of the machinery was extraordinary. In NSW, two huge cement mixers, capable of producing 900 cubic yards per day were operated. The mix was 5 crushed stone, 2½ sand and 1 cement. This was constantly tested to 3,000 psi. The crusher was a 30 ton Hadfield made in Sheffield, England. It was unloaded at the weir rail siding at North Street and with great difficulty, transported to the quarry by 2 large steam traction engines. One was brought from interstate, the other was on loan from the Albury Municipal Council. Crushers had been operating earlier as the Hadfield only arrived in 1925. A flying fox spanned the river from east to west with a large steel cable 400m long. On the Victorian bank, it was attached to a static 10m oregon pylon and securely anchored. On the NSW side, it was attached to a 10m mobile pylon from which it was operated and mounted on 4 parallel rails, enabling it to run 50m north and south, allowing coverage of almost the entire work site. 300 tons of concrete blocks were used as ballast on the mobile pylon. A trolley was attached to the cable, enabling loads of up to 10 tons to be placed almost anywhere on the work site. The Bucyrus steam shovel was capable of lifting 3½ cubic yards and the only machine on site using caterpillar tracks. It was a direct descendant of those used on the Panama Canal, which was completed in 1914.

The process of using crushed rock rather than smooth river gravel, and adding large rocks individually, produces what is known as cyclopean concrete. A 750mm wide concave rubberized conveyor belt carried the concrete, which could be retrieved at any point, by concrete shutes, for placement at the work site. Belts were pressure cleaned for their return journey. The huge rocks, some weighing up to 10 tons, called 'plums,' were cleaned with a high pressure hose

before being individually craned into the wet concrete. Some were completely buried, but many were left half exposed to key in the next batch of concrete. Steel reinforcing was only used near the top of the spillway. The structure is about 17% rock. At its base, the wall is 32m thick and double that if you take in the dissipater wall.

As well as road works in the villages, many other amenities were provided. Residences, barracks, stores, recreation halls, a post office and police presence were established. Electricity was installed for lighting only, and turned off at 11 pm. A church for the Church of England was transported from beyond Wagga. A casualty ward, a doctor with a phone and motor vehicle were provided. Dances and pictures, obviously silent, as 'talkies' were not seen in Albury until 1928, were enjoyed. The school had 66 pupils in 1921. The baker, milkman, greengrocer and butcher called regularly as did the ice man. Sport attracted many. Tennis, golf, cricket and football were played, not without success. Both Ebden Weir and Hume Weir competed in the 'A' Grade competition of the Albury & Border Cricket Association. In 1930 and again in 1931, Weir United were premiers in the O&M Football League.

Manual labour was harsh with a 48 hour week, later reduced to 44 hours. Picks, shovels and bare hands were often the only method of filling drays. Returned soldiers from the Great War were given preference for employment, followed by married men. Estimated numbers of workmen vary greatly. At the peak of construction around 1927, numbers given were Victoria 355, NSW 650, Bethanga Bridge 89.

With such a large workforce and dangerous working conditions, accidents were always waiting to happen. The first and worst occurred on October 21, 1921 when Jacob Gehrig snr 60, George Pearce, about 70, and William Wakeford, 17, were killed while attempting to retrieve unexploded blasting powder. Newspaper reports were graphic, if not ghoulish. Gehrig was killed instantly when the powder detonated. He was blasted nearly 130m. The other 2 suffered horrific injuries and died shortly afterwards. On July 24, 1925, John McNamara, 43, fell from the elevated back verandah of his house, striking a wood horse. He died in Albury District Hospital, leaving a wife and 7 children. On March 30, 1928, John Glen, 60, was working on the face of the stone quarry when he fell 20m to his death. On April 16, 1935, Jack Newman, 37, a carpenter, was killed, leaving a widow and 3 children, when he fell onto concrete from wooden decking, 12m above. In a bizarre twist, a workmate, Jack Meades, was hit by a car and killed in Mate Street, Albury while riding his bicycle home after attending Newman's funeral.

Suggestions that 8 or 9 fatalities occurred during construction, cannot be substantiated. Several non-fatal accidents were recorded. One concerned Hugh Cornell, who fell twice in 1935. The first time into the water, the second he broke both collar bones and suffered severe wrist injuries. The height of his falls were not given.

Late in 1927, the Defence Department were constructing ammunition stores on an 800 acre site at Hawksview, Wirlinga. Local speculation was rife. An Airfield and Aviation School were touted, along with a seaplane facility at the nearby Hume Weir. The ammo dump is still there, but the rest came to nothing.

The Weir was officially opened by the Governor-General, Lord Gowrie, on November 21, 1936. The *Albury Banner* recorded:

CLOSING an electric valve control circuit which released the water through two giant needle valves, the Governor-General (Lord Gowrie) on Saturday forenoon officially opened the Hume Dam, the greatest irrigation work in the Southern Hemisphere and one of the most important in the world. It cost £5,550,000 to construct, and is located nine miles from Albury.

<http://trove.nla.gov.au/ndp/del/article/112700584>

In 1957, the Power Station was completed with 2 turbines now capable of producing 58 Mw which is not large in the electricity industry. As a comparison, Albury's peak demand for summer of 2013 was 110 Mw.

The 1960s saw a large increase in the weir's pondage, necessitating protracted works on the dam. One aspect was to open the old stone quarry and supply thousands of tons of granite to stabilize the clay bank of the earthen wall. This work was done from large barges specially acquired for the job.

Providing anything but a very rudimentary overview in a few pages on such a huge project, is beyond the capabilities of the author but hopefully it may encourage people to make their own assessments from the large amount of print, electronic and photographic material available.

Sources:

Border Morning Mail - various issues

Albury Banner - various issues

Canberra Times

Institute of Riverina Studies - *50 Years at the Hume Reservoir* by K J Swan

A Short History of the River Murray Works by J H O Eaton, I.S.O., M.Inst.C.E., M.I.E. Aust 1945

DVD - *Hume Reservoir* - Produced by A&DHS, narrated by Gerry Curtis

Albury & District Historical Society Bulletins

Various photographs

Photographs to illustrate the construction of the Hume Weir can be found in a 'photo gallery' on the Albury & District Historical Society website at <https://alburyhistory.org.au/resources/photos/>