# Honeysuckle Reservoir decommissioning

**Christopher Dwyer**

Earth Tech, PO Box 165 Wangaratta, 3676. Web: www.earthtech.com.au, Email: chris.dwyer@earthtech.com.au

## Abstract

Often significant investment is required for the restoration of a relatively small reach of waterway. The Honeysuckle Reservoir decommissioning project at Violet Town in North East Victoria is one such example. A relatively small (120ML) on-stream storage was decommissioned in 2005 as the reservoir did not meet ANCOLD safety standards and could not continually supply a potable water supply. The project faced many technical and environmental challenges while also managing often hostile public perceptions. The design and construction process recognised the importance of maintaining the overall focus on the primary aims of the project which were to safely remove an unsafe structure, without mobilising sediment which could have a detrimental impact upon stream health downstream. At the same time the project aimed to maximise the potential to provide other stream health benefits to native fish, vegetation and platypus. The end result is a relatively small 300m restored reach of creek, with many stream health risks removed.

## Keywords

Reservoir decommissioning, risk management, sediment mobilisation

## Introduction

The Honeysuckle Reservoir was constructed in the early 1960's to supply water to the town of Violet Town in North East Victoria (Figure 1). The reservoir was constructed on Honeysuckle Creek, approximately eight kilometres south east of the town, and consisted of an earthen embankment and concrete spillway.

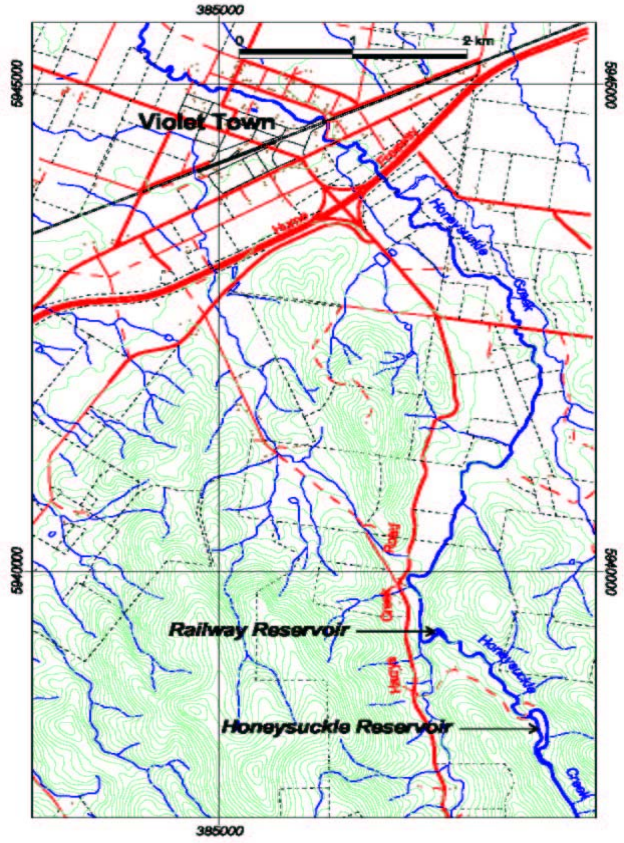


**Figure 1. Locality plan.**

In the late 1990's the owner and manager of the reservoir Goulburn Valley Water completed a dam safety review of the structure. The review found the spillway was not large enough to satisfy ANCOLD standards; these are safety standards for large dams in Australia. Furthermore the stability of the earthen embankment did not meet ANCOLD standards. Goulburn Valley Water had also experienced ongoing water supply issues from the reservoir. The storage proved to be unreliable in the volume of water that could be stored and supplied, and the quality of water supplied often required extensive treatment.

As a consequence of the non-compliance of the reservoir structure with current day standards, Goulburn Valley Water installed a piped water supply to Violet Town from nearby Euroa, following consultation with the local community.

The next stage of the project was to remove the unsafe structure, and in the process ensure sediment in the base of the reservoir (Figure 2) did not pose a major risk to the local environment, or those downstream of the site.

In completing the decommissioning process other stream health benefits were obtained, however the primary focus of risk minimisation was achieved.


**Figure 2. Honeysuckle Reservoir prior to decommissioning.**

## Methods

A number of investigations on site, and via a desk top review were undertaken to determine the most appropriate means for decommissioning the reservoir. These measures would remove the risk of the unsafe structure, minimise the risk of sediment mobilisation, and provide other stream health benefits. The findings of these investigations are summarised.

*Sediment survey*
A feature sediment survey of the site established that approximately 23,000 $m^3$ of sediment, was held within the bed of the reservoir. Sediment varied in depth from 0.5m to approximately 2m through the bed of the reservoir.

*Sediment sampling*
Sediment samples were taken at four sites within the reservoir area. Copper concentrations were moderate on the surface sample at each site. This may have been due to copper sulphate dosing undertaken in the past to control algal outbreaks. Samples taken at surface level showed moderate concentrations of 200mg/kg to 96mg/kg. Given all surface samples for the sediments contained moderate copper contamination remedial actions needed to be taken (ANZECC guidelines). The decommissioning process therefore provided

remedial actions, including removing mobile sand in the upper reach, and avoiding mobilising sediment in the lower reach.

*Feature survey*
The stream bed upstream and downstream of the structure has a grade of approximately 100:1. Replicating this grade through the existing reservoir necessitates the construction of several grade control structures along the reconstructed bed, maintaining the bed in a stable condition and providing pool riffle sequences.

*Fish populations likely to be present within and in the vicinity of the Reservoir*
A fish survey was undertaken to collect baseline data on species presence and relative abundance. Galaxia and Blackfish were recorded upstream and downstream of the reservoir while a community of Australian Smelt were recorded downstream of the reservoir, but not upstream of the reservoir.
Of the species recorded from Honeysuckle Creek in the present survey, only Australian Smelt are migratory. The removal of the Honeysuckle Reservoir therefore allows Smelt to freely pass along the stream and reunites gene pools of Blackfish and Galaxias.

*Other native fauna likely to be present within and in the vicinity of the Reservoir*
Although not endangered Platypus were anecdotally known to be present at the site. Ballarat University was engaged to establish the existence of platypus and to assess the potential impact of the removal of the weir pool on platypus, and to identify potential benefits that could be gained from the decommissioning process. Although burrows were found, no platypus was seen at the site. The main findings were the removal of the reservoir would maintain water levels at a constant elevation year round, benefiting species, in particular platypus.

*Site constraints*
When considering options for the actual decommissioning of the reservoir, the site posed a number of problems regarding silt location and other geographical features. These constraints included:

- The contaminated silt in the vicinity of the embankment was wide in area and deep. Removal or relocation within the reservoir would be difficult.
- The embankment had a limited volume of fill which could be utilised to build bunding walls should they be utilised.
- There were limited sites available within the reservoir to store embankment fill and silt.
- Mobilisation of any sediment would have an adverse impact on Honeysuckle Creek downstream, as such any structure had to hold silt in place. If it were to be mobilised this could only be at a time when the sediment could be diluted such that would have a minimal impact downstream.

*Design options considered*
Four options were considered for the decommissioning of the reservoir. Each option aimed to satisfy each of the two main criteria:

- Remove the existing reservoir safety risk.
- Have no negative impact on Honeysuckle Creek downstream (i.e. no sediment mobilisation).

Additional benefits were then also considered:

- Leave a regime in place that will require minimum maintenance.
- Provide a regime that will encourage ecosystem diversity (including the provision of fish passage).
- Minimise the cost of decommissioning.

The following options for decommissioning were considered:

- Option 1 – Recreate original low flow channel via silt removal and rock chutes.

- Option 2 – Recreate low flow channel using bunding walls.
- Option 3 – Leave a low level pool in the vicinity of the existing embankment.
- Option 4 – Scour silt from reservoir through water regime management.

Option four was finally agreed upon as it was the option that best satisfied all criteria.

**Results**

Detailed design then proceeded with the final design consisting of a number of innovative features.

In the vicinity of the former embankment, a 96m long by 27m wide rock chute was constructed. This chute was designed to withstand a 100 ARI flood event. In the occurrence of a larger flood event some damage to this chute could be expected. In this instance the mobilisation of sediment could occur. Sediment transport analysis was undertaken which determined under such an event sediment would become highly diluted, with most sediment dropping out on floodplains where the impact of sedimentation would be negligible.

A rock fishway was incorporated into the main chute to facilitate fish passage upstream. The chute consists of continuous "vee" shaped arrangements down the fishway. Each vee diverts flow to the outside of the channel, reducing velocity and creating resting pools. The fishway is approximately 100m in length, and drops 6m; it provides a number of resting points, low velocity zones and on average approximately 30cm depth of flow. As such the fishway is designed to provide passage for both large and small bodied fish.

Three smaller chutes are located upstream of the low level pool created by the main chute.

The site was revegetated, with wetland planting a feature around the low level pool. The construction of the main chute necessitated the removal of several mature native trees. The revegetation of the site provides adequate vegetation Net Gain to compensate these losses.

Given the Honeysuckle Creek catchment consists of highly erosive granitic material, it is anticipated the low level pool will silt up in the longer term. The volume of sediment in and out of the former reservoir area should then balance.

No formal monitoring has occurred since the completion of the project. In the longer term the authority may elect to undertake monitoring to assess the success of fish passage through the fishway, as well as ongoing water quality changes.

**Figure 3. Commencing the embankment removal**

**Figure 4. Embankment with initial breach in place**

## Discussion

Following the completion of the detailed design, approval for the decommissioning works was provided by the licensing authority Goulburn Murray Water. Approval for the vegetation removal was sought from Strathbogie Shire. The decommissioning process was also supported by the Victorian government through the Department of Sustainability and Environment. Such was the discontent in some community quarters, regarding the removal of a reservoir, the native vegetation removal was challenged at the Victorian Civil and Administrative Tribunal (VCAT). This challenge to the project at VCAT demonstrated the importance of establishing the primary aims of the project and secondary benefits; it also revealed the importance of thorough planning and following statutory process. While opponents aimed to discredit the project on several fronts, the proposed Honeysuckle Reservoir decommissioning project was able to proceed.

Construction works proceeded largely without issue. The material in the embankment was relocated on site to a stockpile above the 100 year ARI flood level. The main challenge was to remove the embankment (Figure 3), while maintaining flows down Honeysuckle Creek. Given the large catchment area and the propensity of the site to flooding and water logging, a five day window of opportunity with dry weather was found when the embankment was breached, with flows then allowed to pass over the main chute (Figure 4).

## Conclusion

When undertaking major risk management activities on, or in the vicinity of waterways it is important to keep the key focus of the project on the major risks to be managed.

In the case of the Honeysuckle Reservoir decommissioning some stream health benefits have been achieved in the form of:

- Localised improvement in fish passage (a barrier remains downstream) (Figure 5).
- Localised improvement in riparian vegetation via revegetation (poor riparian vegetation exists upstream and downstream of the site) (Figure 6).
- Improved platypus habitat via more consistent water levels (Centre for Environmental Management University of Ballarat, 2004).

In excess of $500,000 of works were invested in removing the structure and rehabilitating 300m of creek. Importantly in this instance the cost of the project should be measured by the risk removed, rather than simply the measurable improvements to stream health.

**Figure 5. Main chute with completed fishway.**

**Figure 6. Revegetation 2007.**


## Acknowledgments

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