Historical Archaeology of Water Management at Beechworth

Jodi Turnbull, Peter Davies and Susan Lawrence
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# Contents

1 | Introduction 1  
   Limitations 2  

2 | Historical Context 3  
   Beechworth landscape history 3  
   Historical background 4  
   Water management and regulations at Beechworth 9  
   Archaeology of water management in Australia 12  
   Beechworth archaeological context 14  

3 | John Martin Dietrich Pund 16  
   Pund’s environmental legacy 23  

4 | Water Races at Beechworth 25  
   Fieldwork 25  
   John Pund’s water races 28  
   Baarmutha hydraulic sluicing area 31  
   Upper Nine Mile Creek hydraulic sluicing area 34  

5 | Interpretation 38  

Glossary 41  

References 45  

Index 48  

Appendix 1: Water Rights Licences in the Beechworth District in 1866 49  
Appendix 2: Water Rights Licences in the Beechworth District in 1884 51  
Appendix 3: Maps 54
Figures

**Figure 1:** Location of the study area  
**Figure 2:** Historical rainfall data for January and June in Beechworth  
**Figure 3:** Variations in sluice-heads in Victoria’s mining districts in 1868 (Smyth 1980: 405)  
**Figure 4:** Night and day water races at Stanley  
**Figure 5:** Mining sites recorded by Heritage Victoria around Beechworth and in the study area  
**Figure 6:** Chinese sluicing near Beechworth (National Library of Australia nla.pic-an7497154-v)  
**Figure 7:** Pund’s WR 442 sources of supply at upper Nine Mile Creek (VPRS 6784/0004/2)  
**Figure 8:** Lease application from 1895 by Wallace, Telford and Pund of the United Sluicing Company for WR 626 (VPRS 6784/0006/3)  
**Figure 9:** Pund’s race through his and Dettmann’s properties at Three Mile Creek  
**Figure 10:** Pund’s mining leases c. 1890  
**Figure 11:** Pund’s Perseverance Tunnel (Bourke Museum, Beechworth)  
**Figure 12:** Pund’s water races c. 1915  
**Figure 13:** Detail of Pund’s WR 442 with fluming over Europa Gully (VPRS 6784/0004/2)  
**Figure 14:** Opposition to Pund’s mining claim, 1918 (OMA 8 June 1918: 2f)  
**Figure 15:** Cadastral boundaries of water races at Deep Creek, Beechworth  
**Figure 16:** Water races south of Beechworth  
**Figure 17:** LiDAR imagery at Baarmutha  
**Figure 18:** Location of sites identified during survey  
**Figure 19:** Areas surveyed during fieldwork overlaid with historical races  
**Figure 20:** Deep cutting for Pund’s water race No. 442  
**Figure 21:** Pund’s water race No. 442  
**Figure 22:** Pund’s sources of supply on WR 442 at upper Nine Mile Creek (VPRS 6784/0004/2)  
**Figure 23:** One of Pund’s large sludge dams at Three Mile  
**Figure 24:** Deeply sluiced gully east of Buckland Gap Road, formerly the United Sluicing Co  
**Figure 25:** Wooden flume base carrying one race over another  
**Figure 26:** Well preserved puddler under a bed of pine  
**Figure 27:** Wooden bridge on old track to Stanley, crossing Back Creek and Shand’s WR 435  
**Figure 28:** ‘Sources of supply’ on Friedrich Kassebaum’s race, upper Nine Mile, WR 452 (VPRS 6784/0002/2)  
**Figure 29:** ‘Source of supply’ springs near Nine Mile  
**Figure 30:** Major water races between Stanley and Baarmutha looking south  
**Figure 31:** Water race networks south of Beechworth  
**Figure 32:** Surveyed alternative section of Donald Fletcher’s WR 521 on Silver Creek (PROV 6784/0003/1)
Abbreviations

BoS – Board of Science Reports
BS – Ballarat Star
CMI – Constitution and Murray Intelligencer
GG – Victoria Government Gazette
MGJ – Mining and Geological Journal, Department of Mines, Victoria
MSR – Reports of the Mining Surveyors and Registrars
MSV – Mineral Statistics of Victoria
OMA – Ovens and Murray Advertiser
WR – Water Right Licence

Acknowledgements

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1 | Introduction

The Beechworth goldfield was an important centre of water management in colonial Victoria. Originally known as the Ovens goldfield, the district comprises numerous alluvial gold mining areas linked by complex water race systems. Hydraulic sluicing predominated in the latter part of the 19th century, and like most goldfields in Victoria the region often suffered dramatic seasonal and yearly fluctuations in water availability. Beechworth’s unique geomorphology presented challenges for recovering alluvial gold and for storing and distributing water. As a result the complexity of water distribution systems and management that emerged at Beechworth was influential in the development of mining and water legislation for the entire colony. In this book we present the results of research relating to:

1. the leading role played by Beechworth gold miners in developing laws and regulations about water management in Victoria;
2. the nature of historical water management practices at Beechworth; and
3. the archaeological evidence of such practices.

Our study area focuses on an area to the south of Beechworth that includes upper Nine Mile Creek$^1$ at Stanley and Three Mile Creek at Baarmutha (Figure 1). This area was selected in part due to the large number of historic water race plans preserved and available for the locality. The area was necessarily large due to the original extent of water management features. The study area comprises a mix of Crown and private land now used for agriculture, historic

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1 In this report, Nine Mile Creek at Stanley is referred to as the upper Nine Mile area in order to distinguish it from various gold workings downstream, but some historical references refer to Nine Mile Creek at Stanley as Lower Nine Mile Creek.
reserves and pine plantations. Several parts of the study area are included in the Beechworth Historic Park or bushland creek reserves. In some of these places, however, the dense scrub obscures many features. In other areas, despite agricultural practices and forestry plantations, many water races and dam features survive. We have not attempted to consider every example of water management identified in the study area. Instead, we have targeted water races and features that constituted water systems, and which we have been able to identify both in archaeological contexts and historical sources.

This volume begins with contextual information including a brief outline of the geology and hydrology of the Beechworth area. We provide a summary of mining history at Beechworth and describe water management regulations developed on the goldfield. The archaeological background of water management in Australia is discussed and previous work in the region is summarised. This is followed by a case study of John Pund, a major Beechworth sluicer and water monopoliser. We then present the results of extensive mapping of historical races south of Beechworth, with a range of maps recording water races included as an appendix.

This research is part of a larger study, *Cultural Landscapes of Colonial Water Management in Victoria’s Central Highlands*, funded by the Australian Research Council (DP110100437) and carried out with the support of La Trobe University. The project is overseen by Susan Lawrence and Peter Davies, with assistance from Jodi Turnbull.

The primary aims of the broader project are to:
- record and analyse the physical evidence of 19th-century water management, including mining dams and races, used for the capture, storage and distribution of water;
- document the environmental changes that resulted from using the water, including erosion, sedimentation and salinity;
- investigate adaptations of technology in new environments and industries, changes in water management strategies through time, and the ecological effects of different kinds and scales of water technology; and
- provide historical context for modern concerns with water, sustainability and climate change.

**Limitations**

Our focus in this research has been to investigate the archaeology of water management rather than gold mining, even though these are closely related, so this book contains little information on mining techniques and impacts. The volume focuses principally on the activities of John Pund, although there were many other important figures in Beechworth’s mining and water management history. It is also important to note that the Beechworth area contains many more races, dams and other water features associated with alluvial and hydraulic mining than we have mapped and presented in this report.

There is limited evidence relating to miners’ water use in records of the former Department of Mines. Many original maps and documents have been transferred to Public Records Office Victoria. Archives relating to mining leases and water rights, locality plans and original correspondence are frequently not preserved from the earliest mining period (pre-1858) and the available information for later years provides a sketchy, incomplete story. Newspapers have provided a great deal of historical information in this project, partly restricted by the limited online availability of the *Constitution and Ovens Mining Intelligencer* and *The Ovens and Murray Advertiser* (1855, 1857-1866, 1914-1918).

The large study area comprises public reserves, pine plantations and private land. A large portion of this is inaccessible, therefore limiting the survey to readily accessible areas. LiDAR imagery sourced from the University of Melbourne was only available for the Three Mile and Hodgson Creek areas near Baarmutha.
Historical Context

Beechworth Landscape History

Beechworth is located about 40 km east of Wangaratta in the north-eastern foothills of the Great Dividing Range. The region, known as the Victorian Central Uplands, comprises a belt of elevated country extending east-west through central Victoria. Its crest forms a sinuous divide between rivers that flow northward to the Murray River and those that take a more direct southward route to the ocean. Large granite mountains rise in the east, funnelling water down narrow gorges and waterfalls before flowing onto the flat plains west of Beechworth (in the Ovens River catchment), concentrating into Reedy Creek and Hodgson Creek before draining into the Ovens River (Rowan et al. 1999). Nine Mile Creek, originating south-east of Beechworth at Stanley within the Kiewa River catchment, drains into Yackandandah Creek and thence north into the Murray River. Creeks are fed by relatively high rainfall which, over the last 150 years, has averaged around 1000 mm per annum (Australian Bureau of Meteorology). Rainfall in this region, however, is highly variable, as indicated by statistics for January and June below (Figure 2). Heavy summer rainfall and dry winters occur regularly and long droughts (particularly in 1865-1869, 1879-1886) affected the region in the 19th century.

The region abounds with subterranean springs and underground aquifers which drain...
into waterways. Gold around Beechworth derived from quartz reefs intersecting Ordovician sedimentary rocks and was unusually fine, distributed in thin layers or floors of gravel, necessitating the sluicing of large areas as the most efficient way of mining.

Historical Background

In the 1830s the Theddora-mittung Aboriginal people would have seen an exploring party crossing the Ovens River at Wangaratta. Major Thomas Mitchell blazed a trail southward, and pastoralists quickly followed with grazing sheep on large pastoral runs such as Woorajay, Tarrawinge, Bontherambo and Carraragarmungee. Many corroborees were held on the lagoon at Bontherambo station where it was reported that the leading dancer wore a silk top hat, and that the leading dancer gave presents to the participants and directed other dancers (Whittaker 1963: 14, 22). Alfred Howitt (1996: 565) reported initiation ceremonies on the upper Ovens River where boys’ teeth were knocked out. Initiation ceremonies were often held in conjunction with great feasts of Bogong moths, which saw clans moving seasonally from the low-lying valleys into the high mountains (Wesson 2000: 68, 91). Shortly after settlement in the region the ‘Faithful Massacre’ occurred near Benalla and this had a profound effect on Aboriginal-European relations in the district (McMillan 1994). The incident occurred after George Faithful took up the Bontherambo run and sent a party of men south toward Benalla to look for more grazing land. Faithful’s men were attacked by a group of Aboriginal people, with up to 12 of Faithful’s group murdered (Bride 1969: 219). An unknown number of Aboriginal people were killed in the reprisal raids that followed (McMillan 1994).

Faithful abandoned Bontherambo and Rev. Joseph Docker took up the run six weeks later. Docker trained Aboriginal people in station work from the time of his arrival at Bontherambo (Woods 1985: 4). He employed up to 14 men as shepherds, for chopping wood and rendering sheep. He found them to be excellent servants, loyal and honest (Docker, cited in McMillan 1994: 179). A system of Honorary Correspondents Depots was established by the Central Board for the Protection of Aborigines from the 1860s. Station owners were appointed as Honorary Correspondents to supply rations to Aboriginal people, and were required to report to the Board on the condition of people in the area. The closest Honorary Correspondents to the study area were at Tarrawinge station (Registered Aboriginal Place No. 5.4-73), 11 km south of Wangaratta and Carrumungie station at Reidsdale (Registered Aboriginal Place No. 5.4-72) 8 km south of Wangaratta. Wesson suggests the depopulation of Aboriginal people in the north-east was rapid and catastrophic. In 1840 it was reported that there were about 1624 Aboriginal people in the region (Wesson 2000: 59-60). By the 1870s Wesson (2000: 59) estimated the population had declined by 97% with only 37 people recorded in the area in 1877.

David Reid’s run, Woorajay, encompassed the later site of Beechworth and included barren ranges, expansive alluvial plains and valuable creek and river frontage. Little did he know at the time how much gold lay beneath the land and in fact Reid and many of his men left the station in 1851 to join the diggers around Castlemaine (Woods 1985: 10). In 1852 Reid gave permission to a prospecting party to prospect his run, and within a few years all the nearby creeks had been well worked (Henderson 1861). William Howitt (1972: 98-126) and Charlie Bird (writing as ‘Alpha’ 1915) provide detailed first-hand descriptions of some of the earliest prospecting forays along the creeks at Beechworth. Howitt described the Ovens diggings in January 1853:

It requires from ten to fourteen men to work a claim, for the water pours in so fast as to require a good number of them constantly bailing it out; this done by both buckets and pumps ... Many of these wet diggings are from ten to twenty feet deep; and not only are they thus flooded with fetid water, but the sides continually tumble in, and require to be cased with slabs or sheets of stringy-bark ... Imagine, therefore, the Herculean and incessant labour of these wet diggings; for they must be worked day and night, or they become filled with water to the brim ... These deep and unshapely abysses, are black with mud, in which lie beams and poles, and masses of stringy-bark; other holes worked out, or whence the people have been driven out by the over-powering force of water; and amidst all this sludge and filth and confusion, swarms of people, many of them gentlemen of birth and education, all labouring as for life! (Howitt 1972: 177-179)
The Beechworth (Ovens) goldfield was divided into wet and dry diggings, i.e. those on drier higher land and those along the creeks. The wetter ground required significant capital to work, as miners dealt with constant flooding. Diggers often banded together in groups of eight or more and used the paddocking method, which involved sinking the entire claim to bedrock quickly, careful slabbing of the claim, frenzied bailing out, and removal of all the washdirt before cradling and panning. After the easy gold was won, the nature of the remaining gold, being thinly distributed in layers of gravel, meant that large volumes of washdirt needed to be processed with large volumes of water. Goldfield administrators made special allowances for larger leases at Beechworth. Men with capital took out these large leases and hired labour to work it, creating a class of men at Beechworth known as the ‘big bosses’, or ‘monkeys’, so named after their top hats and tails (Woods 1985: 46). Those working wet ground also used water wheels to pump water from claims, and networks of races were dug in order to drive water wheels. As the lower, wet ground was worked out, miners turned to the higher ground. Costly diversion of water to higher ground was practised on a large scale and hydraulic sluicing became the main form of mining in the mid to late 19th century, with large companies employing many men on wages. Small-scale diggers, without capital for long races, were limited to close proximity to creeks (which quickly became worked out) and preferred to work alone or in small parties – they became known as ‘punchers’. They strongly opposed company mining and hired labour and the divisions between punchers and monkeys extended to political divisions, with the ‘monkey’s’ candidate winning the 1855 election for a representative to the Legislative Council (Woods 1985: 46-47). The divisions on the Beechworth goldfield extended into religious, social, ethnic and nationalistic realms (O’Brien 2005). The divide between those who had control of water and those who did not was just one more reason for division in this community. John Flinn, a clerk at Stanley, referred to those who monopolised water as ‘water squatters’ (Report 1862-63: 486).

Water was vital to all branches of gold mining to help separate the gold from its surrounding matrix. The Board of Science (BoS) reported in 1859:

From the nature of the ground, a large supply of water is absolutely necessary, and it appears that the investment of capital in races, etc is remunerative. Mr Grimes, speaking of the Pennyweight Flat says it contains an area of 200 acres, which would pay well for sluicing, and would employ 1000 men for three years if water were to be had. And so it is with the One, Two and Three Mile Creeks, Spring Creek and the Woolshed Divisions. (BoS February 1859: 15)

Initially miners used pans and cradles but soon more water-hungry ground sluices, long toms and puddling machines appeared. The long tom was thought to have been first used at Beechworth. ‘Alpha’ [a puncher] recollected that a miner named Dew Beater (so called on account of the great quantity of dirt he was able to wash in his tom (Craig 1983: 61) invented a new type of cradle called the ‘Long Tom’ at Europa Gully on Nine Mile Creek, Beechworth. It was made as follows:

A box 12 ft long and 10 inches deep, 12 inches wide at its upper and 30 inches at the lower end. For about 4 feet from the entrance and upward the top a sheet of iron perforated with holes of approximately 3/4 inch diameter was securely nailed underneath the plate of iron so as to catch the gravel as it fell through the holes by the washing process. Above was placed a riffle box set at such an angle as to retain the course gold, and keep itself clear from a superfluity of gravel. As the gold fell into the riffle box it was caught on baize or blanket which at knock-off time was carefully washed in a tub or pan. Dew Beater’s tom was very unique in its way, its chief foundation being formed of packing cases he had obtained at Snake Valley [upper Nine Mile Creek], the cracks of the Tom being neatly covered by melting coffee tins in the fire and using the remains. (Craig 1983: 3)

Box sluicing, however, quickly gave way to ground sluicing, a mining technique where a flow of water run over the ground was used to break down the gold-bearing deposits and thus assist the manual separation of gold from the earth. The first mention of hydraulic hoses for washing gold at Stanley was reported in 1859 (MSR August 1859).

By the late 1860s hydraulic sluicing had become the dominant form of alluvial mining at Beechworth. This method used huge volumes of water to direct a jet of high-pressure water
2. Historical Context

to break down alluvial deposits (Birrell 2005: 310-312; Smyth 1980: 131). A single hydraulic sluicing operation at Beechworth in 1886 used two sluice-heads of water per day, or 1.6 megalitres. The process caused deep gullies, erosion and heavy sludge flows leading to damaging downstream floods, but at the time the environmental impacts were rarely considered (Lawrence and Davies 2014).

Although water was relatively abundant on the Ovens diggings compared with other goldfields, the nature of the gold, which was extremely fine and distributed thinly in layers, required more water to separate it from large volumes of washdirt. Effective alluvial and hydraulic mining needed a reliable and constant supply of water, but Victoria’s climate often did not provide this, with creeks usually running dry in summer. This forced mining to a complete halt in dry months while in winter water often went to waste as miners had little way of storing excess seasonal flows. The hilly landscape was not suited to large storage dams and there was a multitude of small dams at Beechworth fed by hundreds of miles of tangled water races. Robert Brough Smyth was dismayed at the ‘almost embarrassing multiplicity of small reservoirs’ on the goldfield (Report 1867: 15-16). Poorly built and hastily constructed races and dams often failed, thus necessitating regulation.

Beechworth Bye Law No. 37 specified that:

The embankments of all reservoirs, having a storage capacity of more than five hundred thousand gallons [2.27 ML] shall be formed of earth, with or without a facing of any other material and shall be of the following dimensions: the base of the embankment shall be four feet wide in addition of five feet for every foot it is in height. The front of the embankment shall have a slope of not less than three feet for every foot in height, and the back shall have a slope of not less than two feet for every foot in height. The top of the embankment, when finished, shall not be less than four feet in width. There shall be a bye-wash formed at least three feet below the level of the top of the embankment, which shall not be less than four feet wide.

(GG 20 April 1866: 865)

A severe drought in the mid 1860s caused many races to run dry and miners increased their efforts to tap springs and store water. Tapping springs affected the water table and nearby races to the extent that bye laws were introduced to protect the interests of others. No person was allowed to open a drain or tunnel into any spring in the Beechworth division at a distance of less than 100 yards (91 m) from any previously dug drain or tunnel, unless with the

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John Pund gave in evidence to the 1886 inquiry (Sludge Board of Enquiry 1887: 3) that one sluice-head in Beechworth = 178,560 gallons per 24 hours = 0.81 ML. Sluice-heads in the early phase of alluvial mining at Beechworth, however, involved smaller volumes of water. A common measure at Beechworth in 1860, for example, was for one sluice-head to equal 36,000 gallons (163,656 litres) flowing over a 12-hour day, or 50 gallons (227 litres) per minute (Report 1859-60: 10).
consent of the race owner (Bye Law No.27, GG 7 August 1866: 1691).

By the late 1860s even the springs had dried up (MSR June 1869). Those miners who persisted spent dry periods maintaining and deepening races were rewarded with the heaviest falls on record in 1870, and many races were reported in as good working order as when first constructed (MSR September 1870).

From the earliest days water was seen as a valuable commodity and control of it was eagerly sought. At Stanley, ‘Alpha’ [Charlie Bird] complained of the monopoly, describing the sluicers at Nine Mile as:

... coining money. None could interfere with them. Having sluiceheads of water, secured by licence from the mining department, they eventually had everything in their hands, enabling them to control operations all along the creek. (1915: 35)

Alpha revealed that a ‘A Canadian named Reilly, with Californian experience of the value of water for sluicing purposes ... commenced to cut a race for water at the head of the creek, and, being high ground, commanded the whole of the surrounding country’. He complained:

Why this man was granted this right was a mystery to me. Its possession prevented its use for mining purposes by anyone, except by purchasing it from the Canadian – a scandalous monopoly, that should not have existed for an hour. But this monopoly exists even to the present day. (1915: 36)

The warden reported in 1871:

Returns of water are impossible to give. Sellers of water have no gauges. It is generally whatever may be in the race, sometimes none at all. At others 1 or 2 heads and at others 5-6 heads depending on the season. The water is either sold before it comes to the owner’s claim, or after it leaves them as tail water. No race owner makes a practice of selling it by gauges, for a month or a year, the buyer taking his chance of the quantity. The only instance in which water is sold by the gauge head (120 gallons per minute) is that of the Beechworth Municipal Council to the Calder Co. The price paid is 1 pound per week of six 12 hour days. This is considered high by the miners, but it would not have been, given that the purchasers were able to sell it (at the same figure) before it reached the claim. Miners will give from 1 pound to 1.10 s per week for water to work their claims. The gauge head (120 gallons per minute) is not sufficient to work any sluicing claim. (MSR March 1871)

The Government did little to establish a secure water supply for Beechworth, preferring to leave this to private enterprise (Report 1862-63: 5). Various schemes were proposed, and in some cases large sums of money spent, in order to secure reliable water supplies for mining and domestic purposes. John Alston Wallace, for example, pioneered the Ovens Gold Fields Water Company from around 1860, a plan intended to deliver water to Beechworth via a series of dams and races, including a reservoir (No. 1) holding 122 million gallons (Report 1859-60: 12, Q107). Despite spending almost £40,000 on works, however, the company failed by 1866. Historian Carole Woods (1985: 100) observed that the company had misjudged the porous nature of the gathering ground and the output of springs, and lacked capital to complete crucial sections of the network. No reliable scheme was implemented; Beechworth did not secure Government assistance offered in 1862 for the establishment of goldfield town water supplies. Miners thus continued to source water from the creeks and springs, extending races and building ever more dams in an ad hoc fashion. Beechworth itself relied on water from Hurdle Swamp. An expensive scheme to expand Hurdle Swamp resulted in the establishment of Kerferd Reservoir in the mid 1870s but much wrangling with water race owners and miners, who had certain legal rights to the water, meant great financial losses to the council (Woods 1985: 126). The municipal council began selling Lake Kerferd water back to some miners at the price of 36 shillings per sluice-head for 12 hours. ‘They are now letting 8 sluice-heads, which will keep eight or ten claims at work, as the water can be utilised after leaving the first or second claim in which it is used’ (MSR December 1880).

A sluice-head was a measure of water flowing through a gauge box over 12 or 24 hours.

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1 Several water supply schemes were also pursued at Yackandandah during the 1860s, including two reservoirs at Little Clear Creek, completed in 1861; and the proposed enlargement of a dam known as Lake Harvey on Kinchington Creek in 1865 (Barnard 2012 vol. 2: 2614; McMahon and Wild 2008: 917-918).
hours, measured in gallons (Smyth 1980: 405; see also Davies et al. 2013: 29). A miner could divert one or more sluice-heads according to the extent of his permit. The exact measure of water was determined by local bye laws; the measure of one sluice-head differing between the various mining districts of Victoria (Figure 3). For example in 1859, Beechworth Mining Bye Law No. 125 (GG 6 September 1859: 1885) stated that a miner was entitled to a stream of water running 12 hours in each day to be gauged by a box six feet long, 12 inches wide, and six inches deep, with an opening of one and one-eighth inch. Those lucky enough to have secured 24-hour rights under an earlier permit issued by the Commissioner or Warden (Report 1862: 2) were allowed to keep their entitlement. The bye law specified that the box was to be:

... fixed on a dead level in the race, immediately below the spot where the race receives its last supply: the race to be made perfectly level for a distance of not less than twelve feet immediately above the box, where an overshot* shall be formed extending one entire side of a corresponding height with the sides of the box, and in race conveying more than one head of water the box to be increased in width by twelve inches for every additional head of water the race may be permitted to carry. (Beechworth Bye Law No. 125 GG No. 143 6 September 1859: 1886; see also Report 1859-60: 19-21)

By 1868 the gauge box was lengthened to 12 feet and positioning of the box relaxed: ‘gauges shall be placed level in the race, by the owners of the race, at a distance not exceeding 20 yards from the point where such race heads’ (Beechworth Bye Law No. 25 GG No. 143 6 September 1859: 1886; see also Report 1859-60: 19-21).

*An overshot allowed the excess water to flow back into the creek (Report 1862-63: 375).

Larger mining companies such as the Rocky Mountain Extended, Parkinson Alluvials, Pund & Co, Fletcher & Co, and Beechworth Consolidated

<table>
<thead>
<tr>
<th>District.</th>
<th>Division.</th>
<th>Sinice-boxes.</th>
<th>Number of gallons per twenty-four hours.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BALLARAT (g)</td>
<td>All divisions</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td>BEECHWORTH (b)</td>
<td>All divisions</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td></td>
<td>except Buckland</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td></td>
<td>Goulburn Mitta-Mitta Woolshed</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td></td>
<td>Yackandandah (for bank water-rights)</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td></td>
<td>Yackandandah (for creek water-rights)</td>
<td>12 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td>SANDHURST (c)</td>
<td>All divisions</td>
<td>6 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td>MARYBOROUGH (d)</td>
<td>All divisions</td>
<td>12 feet</td>
<td>20 ins.</td>
</tr>
<tr>
<td>CASTLEMAINE (e)</td>
<td>All divisions</td>
<td>6 feet</td>
<td>10 ins.</td>
</tr>
<tr>
<td>ARARAT (f)</td>
<td>All divisions</td>
<td>6 feet</td>
<td>12 ins.</td>
</tr>
<tr>
<td>GIPPSLAND (g)</td>
<td>All divisions except Kobana East Tarraville</td>
<td>16 ins.</td>
<td>24 in.</td>
</tr>
</tbody>
</table>

Figure 3: Variations in sluice-heads in Victoria’s mining districts in 1868 (Smyth 1980: 405)
Mining began to monopolise water supplies. With major investments they dug deep tail races and tunnels, blasting through rock to drain claims and source spring water. Alluvial mining declined in the 1870 and 1880s but was stimulated again during the depression of the 1890s. Gold production in the north-east over the final years of the 19th century never reached the peaks of the 1850 and 1860s, and the hydraulic sluicing mining boom was over by the early 20th century, with dredging taking over as the major method for producing gold (Lloyd 2006: 259).

**Water Management and Regulations at Beechworth**

Water management became very complicated at Beechworth due to the unique conditions of the goldfield, with water rights divided into many classes, such as creek, bank, spring, day rights, night rights, and motive power rights. As a result, Beechworth led Victoria in water race construction and water management legislation. Spring rights derived water from natural springs and entitled owners to all the water they could obtain (which made them highly desirable), were independent of the creek and could be diverted anywhere. Creek rights were limited to the claim within or adjacent to the creek and terminated with such claims. Bank rights essentially entitled the miner to divert water from the creek to any number of claims higher on the banks (Beechworth Bye Law No. 17 GG 10 May 1861: 926). Creek rights were superior to Bank rights as holders of the former could command the holders of bank rights to cease diverting water until the creek rights were supplied with the quantity allowed to them. For a time this made the water supply for bank rights so uncertain that none would go to the expense of constructing permanent works, but had to contend with box-sluicing which needed only a small quantity of water except in case of a few who owned spring rights (Report 1879: 41). Night and day rights entitled a miner to use water for a 12-hour period (Report 1860-61: 2) (Figure 4). Motive power rights entitled the miner to water to operate water wheels for pumping water from wet claims.

![Figure 4: Night and day water races at Stanley](image-url)
Water management at Beechworth caused considerable administrative headaches. Important questions that emerged included: What was the legal basis, if any, for the diversion of water on the goldfields? To whom did the water actually belong? Who had the right to divert and sell water? (see Davies and Lawrence 2014 for more detail). There were two main legal doctrines that were applied. British common law was based on the riparian principle, where only those people who owned land beside a river could use water for their reasonable needs. They belonged to a community of users who could not reduce the flow to downstream users. Riparian owners thus did not ‘possess’ the water but enjoyed a right of access. A more recent doctrine was that of ‘prior appropriation’ which had developed on the California and Colorado goldfields. The first person who came to a stream and claimed its water, or a part of it, acquired a vested right to the water. This made the water a commodity, a form of personal property. The first in line was the first in right and that right was unrelated to the ownership of land (Kanazawa 2006; Schorr 2012).

Most gold mining in colonial Victoria took place on public land, with the result that water laws and rights were negotiated in this public domain. Both land and minerals were vested in the Crown until leased or sold to individuals or parties. When a miner wanted to dig a race to extract water from a creek, he applied for a permit from the local goldfields commissioner. Beechworth led the goldfields in this area, with the first permits issued in 1853 (Report 1879: 41). Initially the permits were simple verbal agreements and later ones were notices nailed to a nearby tree without any maps or declared boundaries. Many of these vague permits changed hands, often for thousands of pounds, in the belief that they gave good title to water.

A new class of miner began to emerge in the late 1850s, the ‘water merchant’. Those with enough capital quickly gained permits to dig long races that could supply the diggings. Whereas previously miners would pay carters to take washdirt to the water, they could now purchase water from the nearest convenient race and commence more productive ground-sluicing. For many, the effort of digging and the cost of carting large quantities of washdirt were prohibitive, so miners willingly began to pay between £2 and £4 per week for a given quantity of water. Water was thus becoming a commodity, a resource to be bought and sold.

The legal validity of early permits, however, was very uncertain and was frequently contested in the courts, as it became difficult to prove what rights each permit actually conferred (Report 1867: 9; Woods 1985: 98). This was true in many mining centres, such as Creswick (see Davies et al. 2013) but was especially the case in the Beechworth district where miners often preferred tunnelling into hills to tap springs at their source rather than building large dams. This frequently lead to nearby creeks and gullies running dry and much of the impetus for legal reform relating to water diversions came from conflicts over the ‘minute subdivision of water’ in this district (Smyth 1980: 400).

Tensions arose among miners in the 1850s and early 1860s when claiming first, second and subsequent water rights under the permit system, based on the date of registration, a process which reflected the prior appropriation model used in the United States. Bye laws in the Beechworth district, for example, specified that ‘superiority among rights of the same class shall be determined by priority of occupation, the earlier occupier having the superior right’ to available water (Beechworth Bye Law No. 21 GG 2 May 1862: 761).

In 1858 a decision in the Beechworth Court of Mines (Hooper vs Mayzen) reverberated through the colony and shook confidence in the legal validity of water rights and permits. Judge Thomas Cope judged that water licenses taken out before the 1857 *Goldfields Amendment Act* had no legal value, prompting much anguish and demonstration among the miners affected (*The Argus* 24 August 1858; OMA 18 August 1858; Woods 1985: 97-100).

At the same time, another Beechworth case also presided over by Judge Thomas Cope set a precedent for allowing parallel races which essentially interfered with a rival’s water supply. Miners thus began cutting deeper and deeper races and tunnels to tap the water table, effectively draining their rival’s race dry (Report 1862-63: 349). Litigation was rife and in 1861 a Commission was appointed to enquire into the subject of water rights in the Beechworth district (Report 1860-61). Its brief was to examine the origin of the system of water rights, the best means of preventing litigation and the mode in which the right to take water for mining
purposes from springs and creeks should be regulated in future.

As a direct result of the 1861 Beechworth commission, water right licenses were introduced across the colony in 1862 under the Amending Act (25 Vic. 148). These licences were valid for 15 years and gave the miner the right to cut and use races and dams. The Act established penalties for wrongfully interfering with water from a race or reservoir, and required that a formal surveyed plan be lodged with the District Mining Surveyor. The license was intended to override previous permits and it was thought that miners would gladly transfer their old permits to new licenses. Indeed at Beechworth many applications for races under the new mining statute were ‘coming in from all sides’ and ‘the miners generally considered the licence more secure than the warden’s permit’ (MSR June 1866: 18). Many, however, preferred to continue to operate under their vaguer earlier water permits, which in many cases were less restrictive than the new licenses.

The regulations made under the 1865 Mining Statute (29 Vic. 291) did not differ from those previously in force, but they did create confusion and uncertainty among miners by inferring that water licences granted under the 1865 Statute superseded any rights acquired previously under the bye laws (Report 1867: 8).

In reality the 1862 and 1865 Acts failed to clarify water rights and litigation continued. In 1867 a government board comprising G. V. Smith, W. H. Gaunt, P. Wright and R. Brough Smyth was appointed to enquire and report on how the legislation to date had unfolded at Beechworth (Report 1867). The board members claimed they were ‘now in a position to suggest useful amendments, and to indicate a mode of action, which if adopted, will have the effect of restoring order where there is at present disorder, and of removing the difficulties under which race owners and miners labour’ (Report 1867: 3-4).

The following extracts illustrate some of the issues reported by the board in 1867 that existed under the 1865 Mining Statute:

- The total quantity of water applied for by the race owners frequently exceeded that which could theoretically be derived from the drainage area within which the races were cut, even if all the water of the streams was diverted.
- Water applied for by one, is again, at a lower level, the subject of an application from another.
- Many have applied for quantities of water greatly in excess of those named in the permits they possess.
- Many permits had been lost and it was very difficult to prove what rights they conferred.
- Permits had been assigned and transferred, and it was no longer easy to say what was the value of them, or to whom they rightfully belonged.
- Many permits did not state what quantity of water was to be diverted.
- First and secondary rights continued to confuse in cases where races had been abandoned and subsequently applied for.
- Licences granted under the 1862 Act (25 Vic. 148) authorised the holder to divert water without reference to the rights (of a different kind) of others.
- Where races intersect lands occupied as claims, it is often difficult to work the claims in the vicinity of such races. At present, race licences virtually monopolise rich ground [adjacent to their race for the entire length].

The board made many suggestions including: each race owner should be required to apply for a licence; careful and accurate surveys must be made of all the races and all the drainage areas within which races have been cut; preference should be given to creek claims, then bank rights; supply and delivery points must be mapped and fixed and quantities stated and a gauge box installed; miners should be allowed to alter another race or construct flumes to carry another’s race over auriferous ground so that it can be worked; licensees should not have control over tail water; and the Governor in Council should be able to revoke the licence upon payment of compensation in the hope that the ‘wasteful and extravagant system of diverting water, under which so many diverse interests have been created, will in time give place to schemes devised by competent engineers, whereby the storm waters will be made available for the uses of the miner and agriculturalist to the fullest extent’ (Report 1867: 12).

The board found, significantly, that licences issued under the 1865 Mining Statute did not override rights acquired under bye laws, and it
was suggested that the surrender of these be accepted and new licences issued. ‘Licensees will no doubt readily surrender their licences, if the opportunity of getting better titles to their properties be afforded them’. The board concluded that the current system was ‘bad’, but many excellent works have nevertheless been constructed, and these, and the privileges belonging to them, should be secured to the holders (Report 1867: 13). There was clearly a strong interest in protecting water management systems in which miners had invested heavily since the earliest days.

It is not entirely clear how these proposals took effect, although many suggestions were implemented under local bye laws. Many miners did not surrender their early privileges in exchange for new water right licences as hoped and still clung to their vague, somewhat less restrictive privileges granted under earlier bye laws. Thus well into the late 1890s some miners were still operating under permits and privileges granted in the 1850s. Obviously this was a point of contention, for those with 15-year Water Right Licences were paying annual rent (£400 in total) and also had insecurity of tenure at expiry while those diverting water under Miner’s Rights and bye laws paid no fees (other than their modest Miner’s Right fee) and titles were unchallenged (Report 1879: 40). Capitalists were more inclined to take out licences as these acted as security for borrowing more money. Beechworth sluicer Donald Fletcher wrote to a government board in 1879 that:

... when money had to be borrowed to construct races, tail-races, and reservoirs, necessary to work old and abandoned ground profitably, the banks accepted a water-right license and a gold-mining lease as tangible security, something that could not be rendered valueless unless with the consent of the Mining Department. (Report 1879: 41)

Nevertheless, over the next 10-15 years miners across Victoria settled into a relatively stable period with better understanding of the security of their rights conferred under various Acts. Problems arose again, however, when the 15-year licences began to expire. Renewal was not automatic and nervousness abounded in the late 1870s. There was no clarity for miners about what would happen as licences expired and work on some leases at Beechworth even come to a halt due to the uncertainty (Report 1879: 38, 40-41). An enquiry in 1879 examined, among other things, the impact of the 15-year licences at Beechworth. Some miners began protesting against the monopoly that water right owners now held and advocated licence expiry followed by auction. Some argued water should not be diverted out of natural catchments. Large water right holders such as Donald Fletcher and John Hambleton hailed the licensing system a success and not surprisingly advocated renewal for a 10-year period with increased water allowances (Report 1879: 38, 40-41). The flurry of activity in relation to water rights in the 1880s suggests that licenses were renewed and many took the opportunity to amalgamate and buy others out.

By the late 19th century alluvial mining was in decline across Victoria and most effort went into deep lead and reef mining. The intense battles over water in the mid-19th century were largely over and the principle of public ownership of water had been established, while allowing for private extraction and use. The security of tenure provided by the 1865 Mining Statute encouraged capitalists and entrepreneurs to invest confidently in water races and reservoirs, resulting in the buy-out and consolidation of many smaller water rights into more effective supply systems. This understanding of public ownership provided the foundation for new laws relating to irrigation on the northern plains in the 1880s. These laws effectively nationalised State ownership of Victoria’s surface water and watercourses (Powell 1989: 113-114). Control of water was centralised and managed for the ‘collective good’. These ideas were soon extended to and enacted in the other colonies.

Archaeology of Water Management in Australia

Water management has been an important focus of Australian archaeological research in both Indigenous and European contexts. Much of the archaeological focus on water in the colonial period has been on the exploitation of water as a source of industrial energy. Water mills, for example, were an important source of power in 19th-century Australia, with hundreds used for flour-milling and ore processing (Davies and Lawrence 2013b). The archaeology of water mills has been studied in detail by Warwick...
Pearson, especially in terms of technology transfer from Britain and its adaptation to colonial climates and the local availability of engineering skills (Pearson 1996, 1997, 1998). Hydraulic power was also developed, with a massive steam-driven complex built in Newcastle during the 1870s to power cranes loading coal from the wharves (Bairstow 1986). Hydro-electricity was first generated in Australia at Gara River in northern New South Wales in 1895 (Gojak 1988). Although the plant closed after only a few years, the remains of a dam wall, extensive concrete and timber fluming, and fragments of machinery from the power station reveal a faith in the technology that was belied by the environmental and economic conditions of the time.

Water was also vital for agriculture. Detailed archaeological research in the Adelaide Hills, for example, has revealed that settlers in the area relied heavily on creeks and permanent springs for water, bringing traditional techniques from their homelands and adapting them to local conditions. Farms, orchards and market gardens established in the narrow, fertile valleys supplied fresh fruit and vegetables for the rapidly growing city of Adelaide. The control and management of water was vital, however, in a climate of long dry summers and occasional torrential rains. Archaeological survey has identified more than 100 stone features associated with water control in the Adelaide Hills (Smith 2006, 2007). Farmers forced meandering creeks into stone-lined channels, so they could grow irrigated crops along fertile flood plains. Water races for irrigation included in-ground channels and wooden pipes. More than 40 wells and cisterns were also documented, often associated with natural springs in market gardening areas. Survey also identified occasional sluice gates, agricultural terraces and water wheels. By the late 19th century, however, new technologies and changing settlement patterns resulted in the abandonment of much of this infrastructure.

Market gardens and water systems were also developed by Chinese settlers, who became successful growers of European foods for a largely European market. At Yong Kit’s garden settlement on the Loddon River in central Victoria, archaeological survey revealed a complex system of terraces, vegetation, paths and household debris, dating from the late 19th and early 20th century (Stanin 2004). Crops were planted in straight, parallel rows and furrows, dug to the very edge of the property. There were also shallow rectangular wells placed along the furrows, indicating the use of manual watering techniques. There were, however, no internal fences or divisions to show individual ownership, only separate areas devoted to different crops. The remains suggest dependence on traditional agricultural methods, frugality and co-operative labour, similar to the pattern documented for market gardens in suburban Sydney, Perth and Melbourne (Morris 2001).

The archaeology of water management has also been studied in the context of remote outback pastoralism. Michael Pearson (1984) studied an elaborate wool-scouring complex near Tibooburra in north-western NSW. The complex was built in 1897 just as the Federation drought was beginning to bite. Pipes, channels and dams were constructed to ensure that water used in wool processing was captured and reused as efficiently as possible, with the complex continuing in use until the 1920s. Recent work on Wellshot Station in central western Queensland has documented the use of surface and ground water in off-stream and in-stream storages in the 1880s and 1890s (Godwin and L’Oste-Brown 2012).

The Canning Stock Route in Western Australia was surveyed and constructed between 1906 and 1910. The route extended for 1700 km between Halls Creek in the north and Wiluna in the south, crossing some of the most isolated desert country in Australia. Grimwade’s (1998) study of the stock route focused particularly on the wells which had been sunk to secure a supply of water for cattle. Fifty wells were sunk, varying in depth from 2.5 metres to almost 32 metres. Local timbers were used to line the shafts, and metal doors were fitted to the openings to prevent stock from falling in and polluting the water. Each well was also equipped with a hand windlass and a timber winding drum, along with metal watering troughs. The physical remains of the Canning Stock Route, which was used sporadically until 1959, reveal the tenacity and resourcefulness needed to survive in such a remote region.

Several archaeological studies of mining have also incorporated features associated with water management. Coroneos’ (1993) study of the Lisle-Denison goldfields in Tasmania, for example, documents the archaeological remains
of water races and dams associated with the various forms of alluvial mining employed in the area. Barry McGowan (2001) has reviewed the use of water and its environmental effects in the Shoalhaven goldfields of New South Wales. In New Zealand, the archaeology of water management has also been studied in many areas, especially in central Otago (e.g. Carpenter 2012; McCraw 2009; Salmon 1963: 121-123). Lawrence, Davies and Turnbull have examined several mining and water management landscapes around Creswick and Castlemaine in central Victoria (Davies and Lawrence 2013, 2014; Davies et al. 2011, 2013; Lawrence and Davies 2012, 2014; Turnbull 2012, 2013). Historian Colleen Bower (2013) has also documented the water races and the tin mining industry around Toora in south Gippsland. In general, however, the interplay between mining sites and water management remains largely under researched.

**Beechworth Archaeological Context**

Few archaeological studies have been undertaken in the Beechworth study area. Two heritage studies, however, have identified many of the larger and more obvious mining sites in the Indigo Shire including the Rutherglen and Chiltern areas. David Bannear’s (1999) investigation of mining heritage identified 18 mining sites in the Beechworth area. Several of these were mining landscapes including Six Mile Creek and Hodgson Creek at Baarmutha. Freeman (2000) followed up with the Indigo Shire Heritage study, noting many of Bannear’s sites, but also adding several others of local significance; notably the mining landscapes at One and Two Mile Creek diggings near Baarmutha.

Mining sites are notoriously difficult landscapes to interpret and record. As a result many sites in the Beechworth area, such as individual mine sites, are recorded in isolation from the surrounding mining landscape, while other sites are incorporated into large mining landscapes with many components. Numerical evidence for specific water management features is thus difficult to identify. Despite this limitation the available data (**Table 1** and **Figure 5**) suggest that examples of alluvial, hydraulic and quartz mining are well represented in the Beechworth area. Although only five water races and one mining dam are recorded on the Heritage Inventory, the alluvial mining landscapes include many of these water management features.

Seven sites have been recognised as having State significance and are included on the Victorian Heritage Register (**Figure 5**). Within the study area there are four sites listed on the Heritage Inventory, comprising two hydraulic sluicing landscapes (Hodgson Creek Alluvial Workings H8225-0082 and Six Mile Creek Alluvial and Reef Workings H8225-0083), one battery (Stanley Battery H8225-0028) and one Chinese/Pioneer settlement (Chinese Camp H8225-0120).

In recognition of the importance of gold mining heritage to Beechworth, the Beechworth Historical Park preserves a number of mining landscapes including One Mile, Two Mile and Six Mile Creek (Parks Victoria 2007). Three Mile Creek was originally included in the Park but was excised in 1989 due to its disturbed condition (Parks Victoria 2007: 1). Paradoxically, dramatically disturbed landscapes which present visually interesting and dramatic appearances, such as deep gullies and cliffs, often receive protection.

Thus while a strong recognition of mining heritage is already evident at Beechworth the role of water has not been apparent. Our research sheds new light on mining sites and landscapes by exploring how water was integral to mining, and by examining the ways in which various mining sites and landscapes may be linked by complex water management systems. The following case study of Beechworth alluvial miner John Pund illustrates the interconnectedness of water management systems and mining landscapes.

<table>
<thead>
<tr>
<th>Site Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alluvial Mining Landscape (including Hydraulic Sluicing)</td>
<td>16</td>
</tr>
<tr>
<td>Dredge</td>
<td>1</td>
</tr>
<tr>
<td>Mine (including battery sites)</td>
<td>6</td>
</tr>
<tr>
<td>Quartz Mining Landscape</td>
<td>1</td>
</tr>
<tr>
<td>Water Race</td>
<td>5</td>
</tr>
<tr>
<td>Mining Dam</td>
<td>1</td>
</tr>
<tr>
<td>Kiln</td>
<td>1</td>
</tr>
</tbody>
</table>

**Table 1**: Mining sites in the Beechworth area recorded by Heritage Victoria
Figure 5: Mining sites recorded by Heritage Victoria around Beechworth and in the study area
John Martin Dietrich Pund was a sail maker from Hamburg, Germany who arrived at Spring Creek in 1854 (Hilderbrand 2011: 5, 98). In the early days Pund was active at Yackandandah, Woolshed and Nine Mile (Stanley) although his main claims were at Three Mile (OMA 24 July 1915: 3). Pund married Emily Ada Sherry in 1859 and the couple had two daughters and a son born at Stanley before moving permanently to Three Mile in 1874 (Hilderbrand 2011: 98). Stanley was a town where water race owners were prominent.

Towards the end of 1855 tensions were high between miners at Woolshed and Three Mile. Three Mile was a dry ‘poor man’s diggings’ where the ground was workable in ordinary sized claims, averaging ½ oz of gold per man per day. In 1855 miners at Three Mile paid three shillings per load to have it carted 200 metres to the creek for washing. Carters made their money this way, but water merchants quickly appeared and, having no productive claims themselves, started digging races to sell water and put an end to the carting. The consequence, however, was that the Three Mile became flooded within a month and had to be abandoned. The same then occurred at the One Mile and Two Mile and many other diggings at Beechworth, with many miners and carters leaving the area in disgust. The economy suffered and it was claimed that 5000 miners left because of the ‘swamping tribe’ which made up only about 100 individuals (CMI 10 June 1858). Small claim holders demonstrated against Woolshed bosses who held claims in excess of the common limits, but the real cause of their agitation was dissatisfaction with the very existence of extended claims and employment of labour for wages (Woods 1985: 46).

By the 1860s the Three Mile area was abandoned to all but a few Chinese (Figure 6). Hodgson Creek, the downstream extension of Three Mile Creek, had been tried ‘a few years back’, at which time it had not been considered payable, but with lower labour and plant costs it was thought that the creek might now pay. The prospectors’ claim (a shaft sunk 30 feet on the lead) failed, but another paddock further down the creek gave better yields. After two years the prospectors abandoned their claim, and the mining registrar remarked, ‘If a tail-race could be brought up to this ground, and it worked by

Figure 6: Chinese sluicing near Beechworth (National Library of Australia nla.pic-an7497154-v)
sluicing, it would pay well, but it is too poor to pay for any other system of mining’ (Bannear 1999: 97).

John Pund saw potential in the Three Mile Diggings, provided a better water supply could be obtained. In 1865, with the introduction of the 15-year license, he wasted no time in securing a water right (No. 58) with J. Hendery, J. McRae, and J. Morrison and within five years they had excavated 12 miles (19 km) of race from Upper Nine Mile to Three Mile (OMA 10 October 1865: 4a; Register of Water Rights – Bourke Museum).

Pund went into partnership with Ah Sam in several mining ventures (Hilderbrand 2011: 334) and at one time he employed up to 20 men. The increased water supply from Pund’s and other races meant that Three Mile quickly became ‘sluicers paradise’. Long fully boxed tail races, some over a mile in length, ran down the valley emptying into Hodgson Creek (Report 1887: 8).

In order to fully realise his dreams, John Pund became naturalized in 1873 (Hilderbrand 2011: 98), a necessary requirement for purchasing land, and he began acquiring land in the Three Mile area, eventually becoming a substantial land holder.

In 1874 he bought out Ah Gee’s mining leases and dam and several other leases at Three Mile. In 1878 under the current bye laws which allowed unlimited dam size, he expanded this dam area at Kings (Ah Gee’s) Gully and pegged out a 100 x 500 yard (91 m x 457 m) claim. In 1881 Pund obtained another water right (No. 442) to bring 950,000 gallons (3.5 ML) from Nine Mile (GG 1881: 2422), clearing upwards of 1000 ounces of gold per quarter (MSR March 1883: 28). This long race sourced water from springs and tunnels at Upper Nine Mile Creek (Figure 7).

By the mid-1880s Pund was doing very well, having sold 657 ounces of gold to the bank from his Three Mile claim (Hilderbrand 2011: 98). Around this time he went into partnership with John Alston Wallace in another Three Mile claim. A brief mention of J. A. Wallace is warranted here due to his extensive interests in water management schemes in Victoria.

John Alston Wallace (1824-1901) was born in Scotland and worked briefly as a draper.
before migrating to Australia in 1852. He went to the Ovens goldfield and struck a rich claim at Spring Creek. With the profit he opened stores at Bendigo to supply the miners. He returned to the Ovens, opening more stores and hotels and becoming a highly successful entrepreneur by exemplifying ‘on a spectacular scale, the energy, enterprise and impulsive generosity so characteristic of the Ovens miners and traders during their days of youth and prosperity’ (Woods 1985: 52). He backed small mining concerns, encouraged prospecting and, as initiator and a director of the Ovens Gold Fields Water Company he promoted this bold though abortive project of water conservation for sluicing (Report 1859-60). In 1863 Wallace was a shareholder in some of the largest sluicing claims in the district. He was an outspoken supporter of the privatisation of water, believing that water made available by means of expensive races, flumes etc should be considered private property. He stated to a Royal Commission:

The water, the races, and the works should be considered as private property, the Government reserving the power to resume such waterworks etc, on paying the holders a fair equivalent for the outlay of capital, and also paying for the acquired value of such rights over and above, as also for the inconvenience of parting with the same. (Report 1862-63: 346, Q6302)

Wallace believed firmly in the monopolising of water in order to prevent wasting it:

... if the water was all collected [in one valley] and in the hands of one, and properly applied, any amount of water could be saved that is daily going to waste. (Report 1862-63: 346, Q6313)

Wallace suggested the race owner could and should sell excess water at a maximum of £4 per sluice-head and have the power to decide who gets it (Report 1862-63: 347, Q6330). The average prices paid for water at the time were between £1 and £4. According to Wallace, testifying to the Royal Mining Commission in 1862, prior to the 1865 Mining Statute which introduced water right licences, too many small, individual and inefficient water diversions and storages occurred. Many agreed and speculated that security of tenure which would enable races owners to lease water to others to save the expense of digging another wasteful race (Report 1862-63: 371). Entrepreneurs like Wallace took full advantage of the 15-year licences in 1865 and were able to borrow money using their licences as security.

In the 1860s he turned his attention to deep lead and reef mining. The Rose, Thistle and Shamrock reef near Harrietville was the most celebrated of his quartz-mining projects in the Bright-Myrtleford area, and he had similar interests in the Upper Goulburn district. Wallace made a major breakthrough in the separation of refractory ores at Bethanga and, after trying unsuccessfully to use non-union labour in the mid-1880s, employed about 150 men at the site (Philipp 1987: 135). He revived the Yackandandah field in the 1890s by pioneering steam-driven sluicing and dredging and he also introduced dredging at the Woolshed diggings near Beechworth (Matthews 1990: 12; Woods 1976). Wallace also had substantial sluicing interests at the McIvor diggings at Heathcote in Central Victoria (Bannear 1993: 24, 70).

Wallace was also associated with the introduction of hydraulic pump sluicing in Victoria in the 1880s. The principal difficulty was developing a gravel pump that could withstand the heavy wear and tear due to the lifting of boulders, gravel, sand, and other material. After repeated trials and much expense, a suitable centrifugal pump was devised and in 1892 the system was advanced so far as to permit regular working (Bannear 1993: 24). Wallace lost heavily in the 1890s depression but moved to Quat Quatta, a gracious mansion in Elsternwick, Melbourne, and on 11 September 1895 married his second wife Ada Rona Reid, aged 25; they had no children. He died of heart disease on 16 October 1901 (Woods 1976).

Wallace and Pund’s claim reused water from William Telford’s United Sluicing claim upstream. Telford, another major water monopoliser, was also chairman of directors of the Rocky Mountain Sluicing Company (Lloyd 2006: 42). This enterprise was one of Beechworth’s most notable companies, known for its extensive tail race tunnel under the town which drained tail water from the company’s sluice pit, a site now occupied by Lake Sambell.

Throughout the 1880s and 1890s, as the water right licences were expiring, there were...
many amalgamations and deviations of races. In 1881 Pund applied for WR 442, with 950,000 gallons from Nine Mile Creek for 10 years (GG 1881: 2422) (Map 11 in Appendix 3). Pund and Wallace then joined forces with the successful Telford’s United Sluicing Company (Figure 8) and then applied to take over Shand and Hambleton’s surrendered WR 626 (previously WR 14 and 435) to carry 400,000 gallons per day, claiming they had already invested £2000. The race commenced at upper Nine Mile Creek, Stanley and ran to Three Mile Creek (PROV VPRS 6784/0006/3).

These amalgamations meant that their water races were now the major channels supplying the upper Three Mile diggings. Pund’s son Percy (known as Jack) was also securing spring rights from Pund’s Perseverance Tunnel (Registration of water rights in the Beechworth Division – Beechworth Museum). Pund drained surface water from the land when he drove the Perseverance tunnel. He did not pay compensation to anyone, yet later in 1915 when the Council wanted to save the town from drought by driving a tunnel in Frenchman’s Gully, both Pund and Fletcher’s executors and shareholders objected on the grounds it would drain their water (OMA 5 June 1915). Pund’s descendants recall the network of races, both above and underground, which filled dams at night. A plug was pulled during the day, letting the dam water through to supply the hydraulic hoses (Hilderbrand 2011: 98). In 1891 John Pund went to court in an attempt to stop Heinrich C. A. Dettmann taking up a miner’s right on land through which Pund wanted to cut a race (Figure 9). Dettmann won the case, but Pund still cut the race, apparently tunnelling under Dettman (Hilderbrand 2011: 98). In later years, school boys would play in this tunnel as it was very near the school (Hilderbrand 2011: 99).

Pund was also working along Two Mile Creek where it crosses the Buckland road and changed the course of the road slightly due to his workings. Described as a ‘big’ miner by this stage he had no hesitation moving roads if there was gold to be had (Hilderbrand 2011: 98). Pund was selling water to other miners at 19 shillings per week at Three Mile in the late 1890s (OMA 20 October 1917). The practice of sub-letting water was practised widely and for many this was the only way to remain viable (Report 1879: 40). Pund continued cutting new races in the 1890s to supply his expanding Three

Figure 8: Lease application from 1895 by Wallace, Telford and Pund of the United Sluicing Company for WR 626 (VPRS 6784/0006/3)

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5 Mining lease 2525 was transferred from J. D. Law to Pund, Telford and Wallace (GG 1 March 1895: 862). Mining lease 2654 was transferred from Law to Wallace, Telford and Pund (GG 5 April 1895: 1343). Leases 2674 and 509* (*lease on private property) were transferred from Trahir to J. M. D. Pund (GG 5 July 1895: 2580). Lease 3458 was issued to Pund, Wallace and Telford (United Sluicing) in lieu of 2525 and 3242 surrendered. Pund and Wallace were granted lease 3719, 20 acres (8 ha) for 15 years at an unknown location (GG 21 August 1896: 3620). Lease 4225 was issued to Pund and Wallace for 40 acres (16 ha) 15 years, in lieu of 2703 and 3458 (United Sluicing) (GG 22 April 1898: 1433). Water Right 772 was issued to Pund and Wallace in lieu of WR 474 (GG 26 August 1898: 3171).

6 The location of this tunnel is not certain but is likely to be at Stanley.
3. John Martin Dietrich Pund

Figure 9: Pund’s race through his and Dettmann’s properties at Three Mile Creek

Figure 10: Pund’s mining leases c. 1890
Mile claims and by this stage he had leases and miner’s rights for over 60 acres of auriferous land (Figure 10; Report 1887: 3).

During the early 20th century Pund & Co worked the Three Mile and Six Mile areas, averaging 1000 ounces per year (Lloyd 2006: 156). In 1908 Pund’s tunnel (Perseverance Tunnel, Figure 11) at Stanley was now in 3,000 ft (914 m), driven with the dual object of tapping water and cutting the Perseverance lode (Bannear nd: 9). The location of this tunnel is not clear but historical maps show the location of the Perseverance Reef at the head of Six Mile Creek near Stanley.

John Pund died aged 81 in 1915. His obituary described him as:

Being possessed of a master mind and tireless energy, Mr Pund soon became a mine owner, and as years rolled on he bought up and controlled almost the whole of the alluvial mining ground at the Three Mile and up the gully at the head of Buckland Gap [Six Mile]. He also possessed valuable water rights. Two or three years ago he expended a considerable sum in the purchase of several miles of large iron pipes to convey his race water from the hills to his claims at Three Mile. Wonderfully optimistic, energetic and resourceful, the late Mr Pund always saw success ahead of him, and few men have had more successes than came his way. He was a generous employer, who took a most kindly interest in his employees, many of whom had spent all their working years in his employ. During the recent drought his water supply almost completely failed, but he kept his men on doing work with pick and shovel, which had he waited for the rain, he might have carried out at one-fourth the cost. (OMA 24 July 1915: 3c)

By the time Pund died, total gold production from 70 acres totalled 24,803 ounces and he left behind an extensive system of water races (Lloyd 2006: 156; Figures 12 and 13). The network diverted water from the Kiewa catchment into the Ovens catchment, meandering at an efficient gradient between Stanley (690m ASL) and Baarmutha (530m ASL), delivering water to his claims at Two Mile, Three Mile and Six Mile.

John Pund’s success appears to have relied on the monopolization of water to the Three Mile diggings. The potential he saw at the Two Mile
Figure 12: Pund’s water races c. 1915

Figure 13: Detail of Pund’s WR 442 with fluming over Europa Gully (VPRS 6784/0004/2)
Mile, Three Mile and Six Mile fields were all realised by legislation that enabled the sourcing and diverting of water from springs and creeks from upper Nine Mile Creek at Stanley in the adjacent Kiewa catchment area.

After his death his enterprise was taken over for several years by his son Percy. In 1917 Percy used Ah Gee's old dam for spare water and began to blow the slum out in order to create another dam in the same area (OMA 20 October 1917: 4a). Percy was not suited to the business and soon sold to the Amalgamated Mining Company. With John Weir as its manager the company continued for 29 years using hydraulic sluicing, washing away some of the Baarmutha tennis courts and recreation area. Gravity brought water to the paddocks via the races and pipes that Pund & Co had installed. In the 25 years to 1944, GSG produced 20,298 ounces of gold. The following brief extracts from the *Mining and Geology Journal* provide some details:

- The face was about 14 feet high (MGJ July 1937).
- The average depth of alluvium was 12 feet (MGJ July 1938).
- A considerable area of shallow ground has been sluiced with payable results and additional settling dams have been constructed (MGJ September 1940: 172).
- Operations at the new site have been continuous (MGJ March 1941: 232).
- The sluicing plant has been moved to a new site but is working part time only on account of water shortages (MGJ March 1942: 340).
- Sluicing has been continuous, recent yields from small ydages being payable. Yardages have been small due to the clayed nature of the lead. Provisions made for the settlement of sludge water have proved satisfactory (MGJ September 1948: 29).
- Working as often as the supply of water will permit. Operations have been barely payable as the ground is composed of hard cement bands and gravel wash. Slum settlement is quite satisfactory (MGJ March 1950: 29).
- Sluicing was continued in Three Mile Creek but results were unpayable. The old slum settlement area below the railway line is being enlarged to affect all the settling, and thus avoid an unwieldy length of tail race to settling areas further downstream (MGJ September 1950).

**Pund’s Environmental Legacy**

The massive diversions of water required by hydraulic sluicing caused considerable environmental damage, particularly in the form of sludge choking up downstream waterways (Lawrence and Davies 2014). The effects of sluicing at Baarmutha were felt downstream along the Ovens River. In the 1870s at Tarrawongee, near Wangaratta, shire councillors estimated that 9884 acres of agricultural land had been inundated by sludge from the sluicers, particularly those at the Three Mile diggings (*The Argus* 7 September 1875). The Tarrawongee sludge channel was constructed at Government expense to alleviate the problem. At the 1887 Sludge Board of Enquiry at Beechworth, John Pund bore the brunt of complaints from farmers downstream. His water, which had been diverted from its natural catchment of the Kiewa River, now carried sludge as far as the Ovens River via Tarrawongee on Hodgson Creek. His method of managing the sludge, by running his tail water over old mining ground, was clearly not effective. Unconcerned by the problem, Pund’s evidence at the 1887 Enquiry emphasized that with more water he could be more profitable and more claims could be worked (Report 1887: 3).

Half-hearted regulations to manage sludge had been in place since 1858 but it took until 1904 for effective anti-sludge legislation to be passed (Lawrence and Davies 2014; McGowan 2001). By then the volumes of sludge in the north-east were so great that the new irrigation agriculture lobby was becoming increasingly agitated. In one year hydraulic sluicing and dredging together were responsible for processing 20 million tonnes of soil from 300 hectares of land in the north-east, creating canyons over 20 metres in depth (Report 1909: 10). To prevent further sludge, the 1904 Mines Act required miners to build large settling dams to settle the sediment before releasing the water back to the waterway. John Pund complied, building a number of settling dams at different stages over the next 10 years.

Settling dams did not solve the problems, however, and despite five previous government enquiries and various legislative controls the sludge problem continued. In 1914 the government launched yet another enquiry, concluding that most of the damage had
already been done. The Sludge Abatement Board reported in 1915 (the year Pund died) that Pund’s company had large settling arrangements and was working the only gravitation hydraulic plant on the Ovens and Buckland catchments.

This was no comfort, however, to farmers downstream from Three Mile, who were anxious that Pund’s leases (now operated by Mr Weir) not be renewed (Figure 14). The Ovens River Anti-Sludge Pollution Association objected to renewing Pund’s sluicing lease at Two Mile and Three Mile as they strongly believed that sluicing was responsible for the whole of the silting of the Ovens River where the Tarrawongee channel entered it. Pund was allegedly not holding back his sludge. The council offered no objection to the renewal provided the Mines Department exercised most stringently the clauses relating to the control of sluice mining (OMA 8 June 1918). Many believed, however, that the Sludge Abatement board had been a buffer between the miners and the farmers and had been of no use to the landowners and no protection to the Ovens River. The sluice setting dams recommended by the board to protect downstream areas simply silted up and released large quantities of sludge during floods. Mr Weir claimed that the company’s tailings stacks and slum dams did little damage and this was supported by a local farmer who claimed Pund’s dams were kept in good condition (OMA 12 June 1918). Percy Pund also became embroiled in court battles in 1917 over dam areas at Three Mile, and the case illustrates the complexities of management and site interpretation, where, in this case, old dams were sluiced out in order to construct dams of larger volume (OMA 20 February 1917).

The ongoing sludge problems downstream could not be blamed solely on Pund. In hindsight, the sludge issue was the cumulative result of decades of mining, large scale water diversion and lax government regulation.

Figure 14: Opposition to Pund’s mining claim, 1918 (OMA 8 June 1918: 2f)
4 | Water Races at Beechworth

Extensive examination of original documents and maps has identified the complex water management challenges faced by the miners and government officials. Public Record Office Victoria holds many original water right survey plans (required by the 1865 Mining Statute) which provide valuable insights into water management systems. High quality scans were obtained and geo-referenced for this research. In addition, the cadastral boundaries of many water rights were shown on early parish maps, and some still exist on current maps today as sinuous strands running through properties (Figure 15).

Aerial and LiDAR images also show some water management features. These sources provided the basis for mapping water races at Beechworth into a GIS system. We have geo-referenced and mapped only a small percentage of the water right licence plans from Beechworth held at PROV but this has been enough to indicate where water was being sourced and how far it was travelling before reaching mining claims (see Figure 16).

Details from water rights plans indicate that many of the sources of supply were springs. The maps also indicate locations of long boxed sluices, tunnels, lifting points (where water is pumped to a higher level), flumes and miners’ residences. Henry Grimes’ 1860 detailed survey maps of Three Mile and Six Mile Creeks show locations of Chinese gardens, churches, schools etc. According to available maps, the tunnels dug to open up the springs, in most cases, appeared to be quite substantial features with shafts from the surface descending into tunnels (possibly ventilation shafts).

LiDAR imagery provides another important avenue of research which is particularly useful in densely vegetated areas. Various features such as races and sluices were visible on LiDAR images obtained for the Baarmutha area (Figure 17). The geo-referenced data were integrated in MapInfo GIS software and in many instances the historically mapped features such as races, dams and sluiced areas corresponded with visible features on the LiDAR imagery.

Fieldwork

Our background historical research identified numerous water races and water management features on the Beechworth goldfield, along

Figure 15: Cadastral boundaries of water races at Deep Creek, Beechworth
Figure 16: Water races south of Beechworth
Figure 17: LiDAR imagery at Baarmutha
with ‘sources of supply’ such as tunnels and springs. We undertook archaeological survey at targeted locations in 2013 to identify and record significant features, including races, sluicing areas and sludge dams. We also targeted features relating to John Pund.

The survey examined the Three Mile Creek and Upper Nine Mile Creek areas, along with isolated sections along existing water races (Figure 18). Thick scrub, pine plantations and rough terrain limited access to some areas. The Two Mile area, for example, was entirely inaccessible due to bush undergrowth and many areas of Pund’s water race north of Stanley were in thick pine plantations.

The survey enabled us to identify many of the targeted features such as water races and dams. Large and impressive sludge dams and the locations of long, once boxed sluices or tail races were also identified. An unexpected result was the discovery of a relatively rare wooden flume base (see Figure 25) and a puddler (see Figure 26). Disappointingly, none of the ‘source of supply’ tunnels indicated on historical maps were identified and many examples appeared as rather natural looking spring soaks with little evidence of prior use. Sections of John Pund’s water race were readily identified, some sections even carrying running water and several of Pund’s large sludge dams were also found.

Fieldwork resulted in the recording of two hydraulic sluicing areas and Pund’s water race network. These have been submitted to the Heritage Victoria Inventory as H8225-0146 Nine Mile Creek Hydraulic Sluicing Area, H8225-0148 Baarmutha Hydraulic Sluicing Area and H8225-0147 Pund’s Water Races (Figure 18).

John Pund’s Water Races

This extensive water race network and subsidiary races runs between Upper Nine Mile and Three Mile for a total length of 28 km (see Maps 7, 8 and 12 in Appendix 3). The race network was mapped using historical plans and these were matched against some sections with existing cadastral boundaries (Figure 19). Small sections of the race were identified in the field wherever accessible and thus it is likely that much of the race is still extant, even through pine plantations (Figures 20 and 21). Pund’s race is a significant water system, varying in depth and width along its length and in places cut over one metre into the ground. At the end of Blackmore Lane Pund’s race is but one of 14 races, identified

Figure 18: Location of sites identified during survey
Figure 19: Areas surveyed during fieldwork overlaid with historical races
4. Water Races at Beechworth

Figure 20: Deep cutting for Pund’s water race No. 442

Figure 21: Pund’s water race No. 442
from historical maps, running roughly parallel around Spring Creek and onward to claims further north and west (see Shennan 1985: 21). Many of these races are still extant.

Pund’s tail race (WR 772, formerly Telford’s WR 474) was identifiable, with the aid of LiDAR, at Three Mile Creek as a long, straight shallow depression (see Map 7 in Appendix 3). This would have carried wooden sluice boxes, and later possibly iron pipes. Vegetation obscures evidence on the ground but on close inspection remains of this race are visible. Much of the tail race is on leased land in the Three Mile Creek gully. Water from this race would have emptied into Three Mile Creek or been diverted into large sludge dams downstream. Pund’s old slum settlement area below the railway line was enlarged in the 1950s (MGJ September 1950).

Further details on John Pund’s race are provided below in the description of the Baarmutha Sluicing area. The sources of supply tunnels for WR 442 indicated on historical plans at Upper Nine Mile (Figure 22) were not readily identifiable on the ground.

Baarmutha Hydraulic Sluicing Area

The Three Mile Creek area at Baarmutha was worked by alluvial and hydraulic sluice miners from 1852 until around 1950. The initial rush of miners worked the banks near the creeks by the simple methods of potholing, shallow shafts, pan and cradle, long toms, ground sluicing and puddling. Miners in this area initially paid carters to cart their washdirt to the nearest creek for washing, but water merchants soon constructed races to deliver water to the miners’ claims, charging them for water (CMI 10 June 1858). The area was quickly worked out and many European miners left, leaving Chinese miners to work the area. In 1865 John Pund secured a water right (No. 58) and within five years he had 12 miles of race from Upper Nine Mile to Three Mile (OMA 10 October 1865: 4a; Register of Water Rights – Bourke Museum). This was the beginning of the successful hydraulic sluicing company known as Pund & Co, which produced over 24,803 ounces of gold by the time of Pund’s death in 1915 (Lloyd 2006: 156). Under new managers the company continued as the GSG Amalgamated Mining Company until 1950,
Figure 23: One of Pund’s large sludge dams at Three Mile

Figure 24: Deeply sluiced gully east of Buckland Gap Road, formerly the United Sluicing Co
thus ending one of the region’s most successful mining operations.

This large site of 251 hectares commences near the junctions of Three Mile and Six Mile Creeks. It continues west along Three Mile Creek to the junction with Hodgson Creek and then continues for approximately 4.5 km westward along Hodgson Creek (see Maps 1-6 in Appendix 3). The site is a heavily sluiced landscape, the extent of which is only fully realised by viewing LiDAR imagery (see Figure 17). Survey identified evidence of long troughs in the earth where very long wooden sluice boxes once ran. One of these can be confidently associated with John Pund and at least three large sludge dams attributed to John Pund also occur in the site (Figure 23). Pund’s old sluim settlement area below the railway line was enlarged in the 1950s to affect all the settling, and thus avoid an unwieldy length of tail race to settling areas further downstream (MGJ September 1950: 38).

The most obvious feature of the site are deep sluiced gullies with perpendicular working faces, most impressive at the eastern end where Telford’s United Sluicing Company operated, later taken over by Pund. This part of the site is incorporated into the Beechworth Historical Park. At present the gullies are heavily vegetated with scrub and are difficult to access (Figure 24).

Other features include a rare surviving example of a small wooden flume base which carried one race over another which is possibly associated with WR 784 and mining lease 4440 (Figure 25). The structure has survived by virtue of being in a gully obscured by blackberries. Some of the boards have collapsed.

A puddler, perched on the edge of high sluiced cliffs, has survived the encroaching sluicing and represents an earlier phase of mining, most of which has been long since sluiced away (Figure 26). Although obscured by pine needles, the puddler appears very well preserved. Many
small dams, small ground sluices, pebble dumps, tail races, and head races occur in within the sluicing area. Historical maps indicate the locations of Chinese gardens, huts, church, and a school but the dense scrub currently hinders effective survey of these areas. The area where Three Mile Creek joins Hodgson Creek contains sludge dams, a 750 m tail race partly cut into rock, pebble dumps and head races. Pund also worked the Six Mile Creek a tributary of Three Mile Creek. Relatively few miners worked here, possibly due to lack of water. In 1860 a Mining Surveyor noted:

> At the head of this creek there is a tolerably good site for a reservoir. It commands all the other diggings but the gathering ranges adjoining are so low and limited, that the quantity of water that would be collected would be small. The rocks also crop out very much in this part of the district, which allows water to be absorbed, and prevents races from being of much service. (MSR August 1860: 209)

Reefs were worked at the upper end of Six Mile Creek from 1866. One of the early reefing parties was Ah Gee and Co, who also had alluvial claims on Three Mile. By the early 1900s, sections of Six Mile Creek were included in the sluicing claims of John Pund. In 1911, Fletcher was sluicing a claim at Six Mile by gravitation. Sluicing at Six Mile is likely to have continued until at least the 1920s, and possibly beyond, in the hands of large operators like GSG Amalgamated and Parkinson Alluvials (Bannear 1998: 98).

**Upper Nine Mile Creek Hydraulic Sluicing Area**

The Upper Nine Mile Hydraulic Sluicing area covers almost 80 hectares and preserves many features of hydraulic mining such as races, sluiced gullies, pebble dumps, a Chinese/Pioneer settlement site, an old wooden bridge and springs (Figure 27; also see Maps 9-11 in Appendix 3). The Upper Nine Mile Creek runs north-south through this area and was heavily sluiced during the gold rush, producing deep gullies and areas of broad, sluiced creek bed. Most of the area is within bush reserve but a number of springs occur to the east on Crown land and private property. Dense scrub obscures many surface features in the area, making detailed recording difficult.
The Upper Nine Mile area (originally known as Snake Gully) was first prospected by William Howitt, an intrepid traveller and social observer. Howitt provides rich details prospecting at Snake Gully (then unnamed) in February 1853:

"Our first business was to select a portion of the creek where, from its slope, from natural obstructions in it or otherwise, it appeared likely that the gold would lodge. Along the bank of such a portion we then cut a race, some twenty or thirty yards in length, through which we diverted the stream, leaving the channel dry by throwing a dam across. Immediately below us the miller and his men threw another dam across, and raced off another portion. (Howitt 1972: 205-206)"

Within days of finding splendid gold, others followed and ‘laid open’ the creeks. Charlie Bird (‘Alpha’) also describes early activity at Snake Gully. The diggers had to stand in water for hours as, owing to the small claims (12 x 12 feet), there was no chance to cut tail races to drain the ground. The whole creek was taken up already and Alpha’s party was forced to commence sinking on the edge of the swamp. Despite striking gold (about 3-4 oz per 40 buckets) the water forced them to abandon the claim, not wanting to spend time and effort in digging a race to drain. Later another party dug a race and made a fortune from it (Alpha 1915: 33).

Alpha then joined a sluicing party at the junction of Back Creek and Nine Mile Creek averaging 6 pounds per week. Alpha describes the sluicers at Nine Mile as ‘coining money’:

"None could interfere with them. Having sluiceheads of water, secured by licence from the Mining Department, they eventually had everything in their hands, enabling them to control operations all along the creek ... A Canadian named Reilly, with Californian experience of the value of water for sluicing purposes ... commenced to cut a race for water at the head of the creek, and, being high ground, commanded the whole of the surrounding country. [Alpha complained] Why this man was granted this right was a mystery to me. Its possession prevented its use for mining purposes by anyone, except by purchasing it from the Canadian – a scandalous monopoly, that should not have existed for an hour. But this monopoly exists even to the present day. Reilly realised big money from time to time with the race ... (Alpha 1915: 35-36)"
John Alston Wallace was quick to seize an opportunity and opened a store in 1853 and a hotel a year later (Woods 1985: 39, 52) and in 1858 he established the Nine Mile Prospecting Association – a group of paying subscribers and donors who prospected a three-mile radius of Snake Gully. If any payable gold was found the subscribers were notified (Craig nd: 52) and presumably were entitled to work the area or receive a share.

Chinese miners arrived (many without their protection tickets) around 1856 and over the next few years over 40 claims were dug by the Chinese. Historian Geoffrey Craig (1989) provides detailed lists of claim holders. They camped on Chinese Camp Hill and had a smaller camp at the lower Nine Mile. They had a Chinese butcher, one hotel and a temple. The Chinese were industrious and many donated to the Irish relief fund in 1862, but they were also known for selling adulterated gold, stealing from sluices (Craig 1989: 4) and were often accused of interfering with water supplies by cutting races (e.g. OMA 15 January 1857: 2b). In 1857 Snake Valley and Nine Mile were reported the busiest areas in the whole Ovens district, with an estimated 1500 Chinese. The camp was described in 1868 as:

... situated upon a hill ... There resides the celestial portion of our inhabitants. At present this village is reduced to one poor street, presenting a mere skeleton of its former greatness. It was once a busy, bustling, noisy town, redolent of evil smells, and deafening noise ... However all this is over and the few Chinese who are left have degenerated into a state of disrespectability, and assume the habits of their European brethren. (OMA 28 May 1868 cited in Craig 1989: 120)

The following extracts from the Mining Surveyors Reports provide more details for Stanley and Upper Nine Mile.

- The value of water, and the distress arising from the want of it in this district, may be understood from the fact that, in some cases, a sluice-head of water is used no less than eight times from its source until it falls into the creek again. In former times, when sluicing first commenced in this district, the third right had but a very scanty supply; now there are more than 100 rights, and each right gets a supply, if not all the year, at least (unless in a very dry season) from seven to nine months there from. Such have been the fruits of opening up Creek and Bank Springs. Very extensive operation in progress by Wallace’s Company,7 to bring water from a number of springs near the Bald Hills, for sluicing on a large scale the old worked ground left behind by ‘parties working with small streams’ – starting with tunnel nearly one mile long and 105 feet below the surface at deepest point (BoS June 1859: 8).
- Sluicing is almost the sole means used to extract the gold from the auriferous earth. Box sluicing is being generally superseded by ground sluicing, and the tail-races to convey the water for the latter operation are extensive and costly, some of them being through rock nearly the whole way for 900 yards (BoS Jun 1859: 15).
- Many claimholders at Stanley/Nine Mile in the 1860s employ Chinese, mainly for throwing out tailings from the end of sluices. Chinese also owners of some very good claims – pay high prices for them to Europeans – seldom take them up in the first instance, preferring to purchase proven claims (MSR May 1860: 108).
- On the Nine Mile some few parties, chiefly holders of spring rights, get sufficient water to work short hours, but the general average is not more than three days a week, and even those are not full working hours. The extensive tail races are progressing favourably. This method of working by means of a long tail race cut low enough to have the sluice in the bedrock, judging by the two in operation on the Nine Mile, is an excellent and remunerative plan of washing. The only drawback thereto is the great body of water required to work them efficiently, two ordinary sluice heads not being anything like sufficient; but with a large body of water I cannot see any other means of washing, especially on poor ground, half so efficient (MSR January 1860: 16).
- Water continues to be as valuable as ever. One sluice-head of clear water, and that but a small one, brings a rental of £9 sterling per

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7 Wallace’s grand scheme, the Ovens Goldfield Water Company (previously the Leviathan Company), failed for various reasons by 1866, notwithstanding heavy investment and considerable effort involved (see page 7; Woods 1985: 100).
4. Water Races at Beechworth

- During 10 years residence here [at Stanley] I have never witnessed such a number of dry races. Messrs Thomson and Party, race owners, are commencing to drive a tunnel which will effectually drain the ground, and enable the miners to work it with greater facility (MSR December 1865: 22).
- In 1908 Pund’s tunnel, Stanley, was in 3000 feet – driven with the dual object of tapping water (Pund sluicing at Three Mile) and cutting the Perseverance lode (Bannear nd: 9).

Several major races from Stanley have been mapped including WR 435 held Shand and Hambleton, Pendergast WR 423 and Pund WR 422 and evidence of these is identifiable on the ground. Many sources of supply are visible today as natural-looking soaks but no evidence of tunnels was identified in our survey (Figures 28 and 29).

Figure 28: ‘Sources of supply’ on Friedrich Kassebaum’s race, upper Nine Mile, WR 452 (VPRS 6784/0002/2)

Figure 29: ‘Source of supply’ springs near Nine Mile
Our research has identified and mapped two hydraulic sluice mining landscapes, at Baarmutha and Upper Nine Mile (Figures 30 and 31), linked by the water race complex of John Pund. Hydraulic sluicing landscapes and water races are common in the region but very few, if any, have been mapped accurately from their sources of supply to delivery points. This volume has explored various aspects of water management on the goldfields of north-east Victoria and from these we can draw some conclusions about the complexity and interconnectedness of mining sites in the study area. The two mining landscapes identified in this project, although about 10 km apart and within different water catchments, were linked by extensive water supply networks.

Water from Upper Nine Mile was diverted to supply mining at Three Mile and other mining localities south of Beechworth. The miners at lower Nine Mile must have suffered significantly from this disruption to water supply, and indeed the hydrology of the entire Nine Mile Creek catchment must have been altered by water diversions from the Kiewa catchment into the Ovens catchment. In 1879, for example, after many years of water diversions from the Kiewa catchment at Nine Mile Creek to supply miners at Beechworth (in the Ovens catchment), official complaints were made by a number of Yackandandah miners, who argued that such diversions deprived them of the water to which they were entitled (Report 1879: 38). Although the earliest Beechworth bye laws specifically stated that water should not be diverted from its natural watershed (Bye Law No. 31 GG 5 May 1858: 876) this was relaxed only a few months later to allow the diversion of surplus water out of the natural watershed, provided this did not impact downstream miners (Bye Law No. 137 GG 8 October 1858: 1851). Under this and subsequent bye laws water could be diverted from its natural watershed, being returned temporarily if needed by downstream miners, but the priority of right always remained with the water diverter (Bye law No. 129 GG 6 September 1859: 1886). Further research is required to reveal the impacts of such diversions on hydrology regimes.

In this project we have focused on one particular race network as an example of how water was diverted from Upper Nine Mile Creek (in the Kiewa catchment), around the ranges, into the Ovens River catchment. John Pund’s race (WR No. 442) provides a good example that can be mapped in its entirety. While much of this race is not readily accessible on the ground, we anticipate that much of it survives. Pund’s race is one of many lengthy races sourcing water from Nine Mile, each one holding an equally complex story. In this case, Pund eventually monopolised the Nine Mile water supply and took over...
Figure 31: Water race networks south of Beechworth

Water Races
(source: W.R. Licence Plans)
- Little WR 438
- Shand WR 435
- Pendergast WR 423
- Fletcher WR 492
- Rocky Mountain WR 924
- Pund WR 442 and subsidiary races
- Connolly WR 501
- Fletcher WR 521

Water Races
(source: cadastre, aerial, lidar imagery, historical maps)
- Unnamed race sections

Beechworth
Baarmutha
Lake Kerford
Stanley
many of the significant races at in the area. It is uncertain how amicable or fraught the transfers of water rights and leases were, but Pund recognised the potential of aggregating rights to available water supplies. Construction of mining water systems cost significant amounts of money and those with enough capital to endure tougher times were in a position to buy out less fortunate miners, particularly when water right licences expired. Although John Pund operated one of the most successful and long running sluicing companies at Beechworth, very little is written about him in local histories. Many of his contemporaries receive much more attention such as John Alston Wallace, Donald Fletcher and William Telford, to name a few. Together these men represented a water monopoly at Beechworth that secured mining success into the mid 20th century.

We also observe the vital role played by mining surveyors in determining the alignment of water races and negotiating disputes between rival parties. The plan of Donald Fletcher’s water right on Silver Creek (No. 521), for example, was prepared by local mining surveyor Henry Davidson in 1883. It shows a complex alternative course that was surveyed to accommodate the sluicing claim of another party (Figure 32). There was often limited space in the hilly terrain to maintain gradients and alignments, and it was the responsibility of the mining surveyor to oversee and plan these landscapes of water management. By the 1880s, maps of water races provided an indispensable record of how mining water systems had developed through space and time.

This study has also observed the physical manifestation of water regulations. The tangle of races resulting from a lack of regulation in the early years is evident on the ground. Larger and well constructed races resulting from the introduction of the 1865 Mining Statute are evident; some still carry water. Mile-long tail races permitted under Bye law No. 22 (GG March 31 1868) at Three Mile Creek are etched into the ground. Springs that allowed miners to take as much water as they could under a Spring Right are still visible today. Large sludge dams, required by early-20th-century legislation, still exist, albeit grown over and hardly recognisable today. Water laws are inscribed into the landscape of the Beechworth goldfield today.

Figure 32: Surveyed alternative section of Donald Fletcher’s WR 521 on Silver Creek (PROV 6784/0003/1)
Glossary

This glossary defines terminology relating to water management on the Victorian goldfields. The definitions have been drawn from various sources including Davies et al. (2013), Pearson and McGowan (2000), Ritchie and Hooker (1998), Robert Brough Smyth (1980) and Tracey (1997). In addition some definitions have been coined by the authors for features observed in the field where no previous definition has been identified.

**Acre-foot**: a unit of water volume where the surface area is 1 acre and the depth is 1 foot, equal to 43,560 cubic feet, or 272,000 gallons (1.236 ML). The term was commonly used in Britain and North America in the 19th century, but less so in Australia, where gallons were the standard measure of water volume.

**Chute (Drain, Channel)**: short channel cut from a race to divert water often at a right angle from one race to another.

**Collection Point**: a catchment area along a race where seasonal rainfall is naturally funnelled into the race, characterised by a shallow entry point into the race on the uphill side. This feature is noted on dry races (i.e. races that rely on seasonal rainfall only).

**Dam**:

**Mining Dam**: a structure or embankment of earth, clay, masonry, concrete or timber built across a watercourse to impound water in a reservoir, usually for the purpose of alluvial mining. These dams typically have a triangular cross-section. Larger mining dams served to store water from wet seasons to ensure a continual supply of water through dry periods. Reservoirs tend to be used for the storage of potable water supplies. On the goldfields there appears to be little distinction between the two.

**Holding Dam**: water drawn from a supply race was stored in holding dams from where it would be conveyed by head races to individual claims (Ritchie and Hooker 1998: 7). Such dams could serve to lower the velocity of water flowing through the race by spreading it over a wider surface, before the water was then distributed to the working site (Tracey 1997: 7). Sluicing claims often worked throughout the night to take advantage of available water; however the construction of holding dams enabled the storage of night water so that it may be used in the day time (Smyth 1980: 131).

**Sluice Dam**: small dam (not more than 100 gallons) on the top of the bank above a sluicing claim into which water runs constantly, and from which the hose extends down to the bottom of the claim (Smyth 1980: 141).

**Retaining Dam**: dam wall across settling basin, often made of brush or timber, usually associated with hydraulic sluicing.

**Slum Dam**: settling basin for sludge.

**Diversionary Channel or Tunnel**: cutting that diverts water from its original stream bed, in order to allow the working of the stream bed; often used at horseshoe bends in creeks.

**Dredge**: floating vessel consisting of one or more pontoons on which various forms of dredging equipment were mounted in order to extract auriferous gravels from river beds, margins and terraces (Ritchie and Hooker 1998: 5-6). The term ‘Dredge Mining’ in Victoria includes the following systems: Bucket Dredges, Pumps/Hydraulic Sluices (Port Runner, Hydraulic Sluicing by Centrifuge), Jet Elevator and Rotary Hydraulic. Bucket dredges, hydraulic pump sluices and jet elevators were commonly in use in Victoria.

**Face**: the working face of an alluvial claim. Diggings typically commenced at or near a water source and extended back into older deposits, the working areas being referred to as the face. The height varied considerably, depending on the technology used. Ground sluicing produced faces with gradual slopes, hydraulic sluicing produced high steep faces.

**Flume**: wooden channelling used in conjunction with water races to convey water to a claim. Fluming was often built on trestles used to span gullies and depressions. A flume was also known as a ‘launder’ in Britain.
Ground Sluicing: mining technique where a flow of water was used to break down gold-bearing deposits and assist their manual excavation. The dislodged material was then directed through a sluice box in which the gold was trapped in riffles or in earthen or stone lined channels. Ground sluicing landscapes are characterised by several sluice points and gentle debris slopes at the points where the water has been run over the face. Tailing mounds were sometimes arranged to facilitate the placement of sluices and allow drainage into one or more tail races. The height of the face is rarely more than five metres, but this varies considerably and can be much less. Ground sluicing landscapes may have been reworked by hydraulic sluicing.

Head: vertical distance between the natural surface level of water and an outlet (see also Sluice-head).

Hydraulic Sluicing (Hydraulicking): a mining technique that directed a jet of high-pressure water against an alluvial deposit to break it down. Hydraulic sluice workings usually have steep working faces (compared to ground sluicing) because the water was directed upslope to undermine the work faces (Ritchie and Hooker 1998: 6).

Miner’s Right: a document created in 1855 under the Act to Amend the Laws relating to the Gold Fields (18 Vict. 37), which granted the holder the right to occupy land for a dwelling and take up a mining lease on Crown land under the mining bye laws of the district. Initially a miner’s right cost £1 but this was later reduced to five shillings per year. Amendments in 1857 permitted the holder to construct and use races and dams for gold mining. A consolidated miner’s right could be taken out for all the land held by a mining company on payment of an equal sum to that which would be paid for all the miners’ rights that the consolidated right represented (Birrell 1998: 33-34; Smyth 1980: 615-616; Mining Statute 1865, clause 4-8).

Mullock: waste material from a mining operation, specifically the overburden removed to get to the ore or washdirt.

Paddock: alluvial mining technique involving the systematic removal of topsoil from a claim and the excavation of washdirt down to bedrock. Paddocking was often associated with Chinese miners. Paddocks resemble large open pits or quarries, square of rectangular in form, up to 40 metres by 40 metres in area, with a face of about two metres, though the size and height can vary. They are located primarily on the lower water course and stream terraces where the wash is generally boulder free, but can also be found on high level auriferous drifts.

Polluted Water: first defined in the Sludge Act 1885 as ‘water containing in solution mineral or metallic salts or other mineral or metallic matters (derived from mineral or metallic products whilst under treatment) in such quantity as to render such water injurious to human being animals or birds (Sludge Act 1885: section 2); and refined in the Mines Act 1915 to specify ‘water containing any poisonous matter of more than 50 grains to one gallon or any noxious matter in such quantity to be injurious or detrimental to the public health, and water containing in suspension or solution any earthy or mineral substance more than 800 grains to the gallon’ (Mines Act 1915: section 488 (1) a, b). Earlier definitions refer only to sludge, that is, sediment load, without reference to possible poisons.

Puddler: a puddler or puddling machine consisted of a large ring-shaped trench up to 10 metres in diameter in which the washdirt and water were mixed. A water source or race must be close by and an outlet for the water from the puddler should be evident. In the centre of the puddler was a mound with a tall wooden pole acting as a pivot, to which was attached a wooden shaft extending over the trench and to which a horse was yoked. Some puddlers were driven by steam engines.

Race: see Water Race.

Reservoir: body of water stored and retained by embankments or walls (generally used to store potable water).

River/Creek right: the privilege of diverting water from a river or creek to work a claim (see also Water Permit).

Settling Basin: basin for letting sediment settle out of sludge.

Siphon: pipe used to convey water over or across an obstacle to a lower level. Inverted siphons descended into a valley and up the other side in a U-shape.
Slime: clayey portion of sludge (Report 1859: 8).

Sludge: thick semi-fluid waste water from alluvial mining or ore processing, carrying sediment comprised variously of clay, sand and gravel; mining debris consisting of the overburden, and the underlying wash, composed of quartz boulders and gravels, intermixed with clay and earth.

Sludge Channel: a channel constructed to divert and remove sludge. Local councils constructed sludge channels as a necessity to prevent the inundation of residential and business areas from mining sludge.

Sluice box:

1. long trough with riffles in the bottom, where washdirt was passed through with flowing water and the gold was trapped against the riffles. Commonly termed box sluicing and used where the bottom of the workings was below the adjacent creek bed and where, therefore, there was insufficient fall to get rid of the water and tailings. Water was conveyed into the box or sluice from a race or by hose, the washdirt was thrown in with shovels, and the stones were removed by use of a sluicing fork.

2. wooden box used as a gauge inserted in head of race to control flow of water; typically 12 feet long, 12 inches wide and six inches deep, open at both ends, with a transverse plate across the middle with a narrow gap at the bottom (often ½ inches high) through which water flowed. Water flow and volume was measured in sluice-heads over 24 hours (Smyth 1980: 405; Sankey 1871: 108-109; Tracey 1997: 7).

Sluice-Head: a measure of water that flowed through a gauge box in 24 hours, measured in gallons (Smyth 1980: 405). The gauge box was positioned at the point where the claim head race drew water from a branch or supply race. The exact measure of water was determined by local bye laws; the measure of one sluice-head varied substantially between the various mining districts of Victoria. The miner could divert one or more slice-heads, according to the extent of his permit or licence.

Slum: colloquial reference to slime.

Tail Water Right: licences to cut races for the use of tail water under the 36th Section of the Mining Statue 1865 (29 Vict. 291 Regulation No. 24). These were styled a water right.

Tailings: the solid waste from alluvial mining or ore processing. In alluvial mining the finer material was generally washed into waterways as sludge; cobbles and boulders remained either within the claim or adjacent. Alluvial tailings can be grouped into three basic categories: hand-stacked, mechanically-hydraulically stacked and dredge tailings (see Ritchie and Hooker 1998: 8). Tailings also included the fine sand fraction that came from crushing ores in stamp batteries.

Water Permit: verbal agreement or written permission (1853 to 1857) to use water for sluicing, granted by the relevant goldfields commissioner.

Water Privilege or Right: the right to divert water from a spring, lake, creek, gully or reservoir and cut, construct and use races and dams for mining purposes conferred by holders of a Miner’s Right, under the Amending Act 1857 (21 Vict. 32). The terms permit, privilege and water right were used interchangeably.

Water Race: a channel or aqueduct used for conducting water to a mining site. Major (supply) races commenced from a permanent source such as a dam or reservoir. Water was typically drawn from a major race and stored in shallow holding dams from where it would be conveyed by head races to individual claims. Minor (branch, subsidiary) races generally diverted water from a major race to localized diggings. Races are generally cut into the earth and subsoil with spoil placed on the lower side. Stone revetments were used to support races along the sides of steeper hills. Races followed the contours of hills, using tunnels, culverts, and metal and wooden fluming to cross gullies where necessary. Some races also conveyed water for domestic uses and market gardens. Races are occasionally referred to as ditches, an American term, in some early Australian mining literature.

Parallel Race: races running parallel in close proximity (<3 m) for varying distances. R. B. Smyth described the early practice of wasteful diversion where each miner took water where he could get it, cutting races parallel to one another and close together (1980: 398). A
parallel race may also be evidence of race repair where it was more convenient to cut a new section of race than repair sections.

**Tail Race:** channel below claim area for rapid discharge of water and sludge; typically built at steeper pitch than water race to increase rate of flow (Tracey 1997: 8). Tail races may be boxed with riffles in the upper section and paved with wooden blocks or flat rocks in the lower reaches to capture escaped gold. Tail race water could be diverted for reuse downstream by other miners.

**Head Race:** race transporting water from the supply race to individual mining claims. The head race was usually fitted with a gauge box to regulate the flow of water (as opposed to branch races which diverted water from the supply race to other parts of the mining field).

**Dry Race:** a race with no water storage facilities. The race collected water from seasonal rainfall only.

**Water Race Diversion Barrier:** a barrier placed in a race to divert water. A barrier could be constructed from any suitable material. Earthen examples have been noted at Creswick and historical documents refer to boards being placed across races for temporary diversions.

**Water Race Spoil:** mound of dirt excavated from the race during construction and placed on the down slope side of the race. This spoil can be eroded away or be quite obvious and in some cases the spoil mound may be greater than the expected excavated volume, suggesting the subsequent removal of accumulated silt from the race during the period of use.

**Water Right Grant:** conferred to holders of a Mining Lease under the *Amending Act* 1857 (21 Vict. 32). Also styled a water right.

**Water Rights Licence:**

(1) introduced under the *Amending Act* 1862 (25 Vict. 148), with applications forwarded to the Minister for Mines via the district Mining Wardens. Each application was registered in a single number sequence in chronological order. The last application in the volumes extant was registered in October 1947 although information was added to the entries until at least 1961.

(2) water rights licences were also issued under the *Land Act* 1862 (section 53 (2)). These were very similar to Water Rights Licence (1). Each application was also registered in a single number sequence in chronological order starting at No. 1.

**Weir:** a dam in a river used to raise the level of water, which is diverted for milling, irrigation, etc. A dam constructed to raise the water level and thus elevation of a race.
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Whittaker, D. 1963, *Wangaratta, Being the History of the Township that Sprang up at the Ovens Crossing & Grew into a Modern City, 1824-1838-1963*. City of Wangaratta, Wangaratta.


**Maps**

Parish S34982 Stanley; Parish S33910 Stanley; Parish S34982 Stanley; Parish S33911 Stanley
Parish B34921 Beechworth; Parish B34921a Beechworth; Parish B34922 Beechworth; Parish B34923 Beechworth; Parish B34924 Beechworth; Parish B34925 Beechworth; Parish B34926 Beechworth


Grimes, H. 1860, Surveys of Three and Six Mile Creeks goldfields, Beechworth. Microfilm 1012/M/3, 4, 6 and 12 held at Department of Environment and Primary Industries [accessed March 2014].

**Public Records Office of Victoria**


**Bourke Museum Beechworth**

Register of Water Rights – Beechworth (various years)
Register of Claims – Beechworth
Register of Water Races – Beechworth
Aboriginal people  4
Ah Gee   17, 23, 34
Ah Sam   17
‘Alpha’ (Charlie Bird)   4, 5, 7, 35
Amalgamated Mining Co   23, 31, 34
Baarmutha   1, 2, 14, 21, 23, 25, 27, 28, 31-34, 38
Bontherambo run   4
Chinese   13, 14, 16, 25, 31, 34, 36, 42
Dettmann, Heinrich   19, 20
Docker, Rev Joseph   4
Europa Gully   5, 22
Faithful, George   4
Fletcher, Donald   8, 12, 19, 34, 40
Flinn, John   5
Grimes, Henry   5, 6, 25
Hambleton, John   12, 19, 37
Hendery, J   17
Hodgson Creek   2, 3, 14, 16, 17, 23, 33, 34
Howitt, Alfred   4
Howitt, William   4, 35
Hurdle Swamp (or Flat)   7
Hydraulic pump sluicing   18
Hydraulic sluicing   1, 2, 5-6, 9, 14, 19, 23, 28, 31-37, 38, 42
Kerferd Reservoir   7
McRae, J   17
‘Monkeys’   5
Morrison, J   17
One Mile Creek   14, 16
Ovens Gold Fields Water Company   7, 18
Ovens River   3, 4, 21, 23-24, 38
Parkinson Alluvials   8, 34
Perseverance tunnel   19, 21
‘Punchers’   5
Pund, John   2, 8, 14, 16-24, 28-34, 37, 38, 40
Pund, Percy   19, 23, 24
Reidy Creek   3
Reid, David   4
Reilly, John H   7, 35
Shand, R   19, 35, 37
Six Mile Creek   14, 21, 25, 33, 34
Sludge   4, 6, 23-24, 28, 31, 32, 33, 34, 40, 43
Sluice box   8, 31, 33, 43
Sluice-head   6, 7-8, 18, 35, 36, 43
Smyth, Robert Brough   6, 11
Snake Gully   5, 35-36
Spring Creek   5, 16, 18, 31
Stanley   1, 3, 5, 7, 9, 14, 16, 19, 21, 23, 28, 35, 36, 37, 38
Telford, William   18-19, 31, 33, 40
Three Mile Creek   1, 2, 5, 14, 16-17, 19-21, 23-24, 25, 28, 31-34, 37, 38, 40
Two Mile Creek   14, 16, 19, 21, 24, 28
United Sluicing Co (W Telford)   18-19, 32, 33
Upper Nine Mile Creek   1, 3, 5, 17, 19, 23, 28, 31, 34-37, 38
Wallace, John Alston   7, 17-19, 36, 40
Water management   1, 2, 9-14, 17, 25, 38, 40
Water rights   2, 9, 10-12, 18, 19, 21, 25, 40, 44
Weir, John   23-24
Yoorajay   4
Yackandandah Creek   3
Appendix 1: Water Rights Licences in the Beechworth District in 1866

Water Rights in force in 1866 (sources include GG 16 April 1866 and other dates; OMA 10 October 1865; Smyth 1980).

<table>
<thead>
<tr>
<th>WRL</th>
<th>Date</th>
<th>Licensee</th>
<th>Locality</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>20 Feb 1866</td>
<td>William Dumbrell [cancelled]</td>
<td>Belvoir, between Little and Murray Rivers</td>
<td>OMA 20 Feb 1866: 2a</td>
</tr>
<tr>
<td>8</td>
<td>14 Sept 1864</td>
<td>J C Davies</td>
<td>Race, Upper Nuggetty Gully</td>
<td>VGG 16 April 1866: 820</td>
</tr>
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<td>9</td>
<td>16 June 1864</td>
<td>T Laing</td>
<td>Race, Murray’s Creek, Buckland</td>
<td>VGG 16 April 1866: 820</td>
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<td>11</td>
<td>20 Sept 1864</td>
<td>D Behrens, A Stacpool, J Corrie, P Curran and C F McDougall</td>
<td>Race, Goulburn River, near Wood’s Point</td>
<td>VGG 16 April 1866: 825</td>
</tr>
<tr>
<td>14</td>
<td>17 Oct 1864</td>
<td>J Hambleton and P Berube</td>
<td>Race, Nine Mile Creek to Hurdle Flat</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>16</td>
<td>21 March 1865</td>
<td>W Welshman, S Cunningham and others</td>
<td>Reservoir and races, Dederang Creek to Yackandandah</td>
<td>VGG 16 April 1866: 820</td>
</tr>
<tr>
<td>18</td>
<td>31 Jan 1865</td>
<td>W C Hill and J Hendy</td>
<td>Race, Stanley</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>21</td>
<td>27 March 1865</td>
<td>R B Wood and others</td>
<td>Race, Morse’s Creek</td>
<td>VGG 16 April 1866: 820</td>
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<td>22</td>
<td>21 March 1865</td>
<td>W Kelly, T Smith, T Quin and P Casey</td>
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<td>23</td>
<td>21 March 1865</td>
<td>D Lorimer, W Morison, J Milne and W Neelly</td>
<td>Race, Stanley</td>
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<td>24</td>
<td>27 Jan 1865</td>
<td>D Lorimer and others [applic refused]</td>
<td>Frenchman’s Creek, near Nine Mile Creek, Stanley</td>
<td>VGG 27 Jan 1865: 196</td>
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<td>25</td>
<td>27 March 1865</td>
<td>J A Wallace</td>
<td>Race and reservoir, near Bright</td>
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<td>26</td>
<td>21 March 1865</td>
<td>J Whitehead, A Bell and others</td>
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<tr>
<td>27</td>
<td>21 March 1865</td>
<td>A Dunn, J Predergast, J Hendry and R Kelly</td>
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<td>28</td>
<td>21 March 1865</td>
<td>G Rawes, A Koford, W Rawes and others</td>
<td>Race, Stanley</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>29</td>
<td>21 March 1865</td>
<td>J KcKenzie, R Macleash, J Fannon and G Armstrong</td>
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<td>VGG 16 April 1866: 820</td>
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<td>34</td>
<td>23 June 1865</td>
<td>J Wood</td>
<td>Race and reservoir, Burbogie Creek to Murphy’s Gully</td>
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<tr>
<td>36</td>
<td></td>
<td>J Hendry &amp; Co</td>
<td>Race, Clear Creek to Lower Flat, Buckland River</td>
<td>Smyth 1979: 406</td>
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<tr>
<td>39</td>
<td>18 Aug 1865</td>
<td>S Stewart, H Morgan and J McLean</td>
<td>Race, Nine Mile Creek to Hurdle Flat</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>45</td>
<td>25 Aug 1865</td>
<td>J Hambleton and P Berube</td>
<td>Race, Nine Mile Creek to Hurdle Flat</td>
<td>VGG 16 April 1866: 820</td>
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<td>46</td>
<td>18 Aug 1865</td>
<td>J Brown and W Wheeler</td>
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<tr>
<td>52</td>
<td>9 Dec 1865</td>
<td>Gilbert Power and Thomas Harvey</td>
<td>Race and reservoir, Kinchington’s Creek, Yackandandah</td>
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<td>53</td>
<td>30 Aug 1865</td>
<td>T A Singleton and S Ackman</td>
<td>Race, Stander’s Branch, Black River</td>
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<td>54</td>
<td>12 Sept 1865</td>
<td>J Wilson, J Vallance, P Power and others</td>
<td>Race, Hurdle Creek to Beechworth</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>55</td>
<td>4 Sept 1865</td>
<td>J Wilson, J Vallance, P Power and others</td>
<td>Race, Nine Mile Creek to Beechworth</td>
<td>VGG 16 April 1866: 820</td>
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<tr>
<td>56</td>
<td>4 Nov 1865</td>
<td>Joseph Story (Garibaldi Quartz Crushing Co)</td>
<td>Race 1 mile long, Garibaldi Creek</td>
<td>VGG 16 April 1866: 825</td>
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<tr>
<td>57</td>
<td>12 Sept 1865</td>
<td>T Little</td>
<td>Race, Upper Nine Mile to Ration Hill</td>
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<td>4 Sept 1865</td>
<td>J Pund, J Hendry, J McRae and J Morrison</td>
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<td>J Burke, D R Mateer and R O Edwards</td>
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<td>Races, near Stanley</td>
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<td>3 Oct 1865</td>
<td>D Fraser, senior and others</td>
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<td>M Chappell</td>
<td>Race, from Nine Mile Creek to Europe Gully</td>
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<td>E C Howard</td>
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<td>10 Oct 1865</td>
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<td>R Gill</td>
<td>Race, Jungle Creek</td>
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<td>W Davidson</td>
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<td>D McLeod and G O Molesworth</td>
<td>Three Mile Creek</td>
<td>VGG 2 Feb 1866: 289</td>
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<tr>
<td>2 Feb 1866</td>
<td>J Smith and M Hobart</td>
<td>Rocky Creek to Three Mile Creek</td>
<td>VGG 2 Feb 1866: 289</td>
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<tr>
<td>2 Feb 1866</td>
<td>D McLeod, T Tomkies and G O Molesworth</td>
<td>Head of Upper Three Mile Creek</td>
<td>VGG 2 Feb 1866: 289</td>
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<tr>
<td>20 March 1866</td>
<td>U B Grant, B Harrington and J Campbell</td>
<td>Race from Left branch of Buckland River, 3,686,400 gallons per day</td>
<td>VGG 20 March 1866: 647</td>
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<td>4 April 1866</td>
<td>P A Wind</td>
<td>Race and reservoir, from Clear Creek</td>
<td>VGG 16 April 1866: 820</td>
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<td>20 March 1866</td>
<td>Charles Connolly and others</td>
<td>Race from Deep Creek to Madman’s Gully, 750,000 gallons per day</td>
<td>VGG 20 March 1866: 647</td>
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<td>20 April 1866</td>
<td>R Bailey</td>
<td>Pheasant Creek, near Spring Hill, race to conduct 1 million gal per day</td>
<td>VGG 20 April 1866: 867</td>
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<td>Charles Connolly &amp; Co</td>
<td>Hurdle Flat to One Mile Creek</td>
<td>VGG 18 May 1866: 1076</td>
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<td>Robert Burns Extended G M Co</td>
<td>Wood’s Point</td>
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<td>Smith and Hobart</td>
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<td>Smyth 1979: 406</td>
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### Appendix 2: Water Rights Licences in the Beechworth District in 1884

Water Rights in force in 1884 (primary source is MSV 1885).

<table>
<thead>
<tr>
<th>WRL</th>
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<th>Licensee</th>
<th>Locality</th>
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<td>355</td>
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<tr>
<td>359</td>
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<td>Three Mile Creek</td>
<td>MSV 1884: 54</td>
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<td>360</td>
<td>3 Dec 1874</td>
<td>H Probst</td>
<td>Upper Three Mile Creek</td>
<td>MSV 1884: 54</td>
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<td>Owens River</td>
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<td>403</td>
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<td>Magpie Creek</td>
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<td>Spring Creek 1 million</td>
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<td>Stanley</td>
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<td>Frenchman’s Gully</td>
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<td>Stanley</td>
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<td>Head of Buckland Gap Gully</td>
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<td>Springs, Nine Mile Creek</td>
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<td>Lower Nine Mile Creek</td>
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<td>Name/Company</td>
<td>Location/Creek</td>
<td>Daily Flow (gallons per day)</td>
<td>Notes</td>
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<td>Name</td>
<td>Location</td>
<td>Capacity</td>
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<td>L Henderson</td>
<td>Koetong</td>
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<td>Hurtle Creek</td>
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<td>Murmungee</td>
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<td>J Wighton</td>
<td>Nine Mile Creek</td>
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<td>513</td>
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<td>J Pendergast and others</td>
<td>Parish of Stanley</td>
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<td>514</td>
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<td>The Cobungra G M Co No Liability</td>
<td>Cobungra</td>
<td>11 million gallons per day</td>
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<td>517</td>
<td>28 May 1884</td>
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<td>Madman’s Gully</td>
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<td>Madman’s Gully extension of WRL 463</td>
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<td>Yackandandah</td>
<td>Matthews 1990: 7</td>
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Map 9: Extent of Upper Nine Mile Creek Hydraulic Sluicing Area H8225-0146
Map 10
Plan of Upper Nine Mile Hydraulic Sluicing Area

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<th>EASTING</th>
<th>NORTHING</th>
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<tr>
<td>1. Wooden Bridge</td>
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<td>2. Source of Supply</td>
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<td>5,970,630.63</td>
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<td>3. Shand’s Water Race</td>
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<td>4. Ruth’s Water Race</td>
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Location of races plotted from geo-referenced water right survey plans VRPS 674A. Many sections are still intact. Coordinates are provided in GDA94 MGA55.
Map 11
Detail of Shand and Hambletons WR 435
Survey Plan 1881
VPRS 6784-0004-1

This map provides a good example of the level of detail obtained from many water right survey plans. Once geo-referenced, features from these maps can be ground truthed.