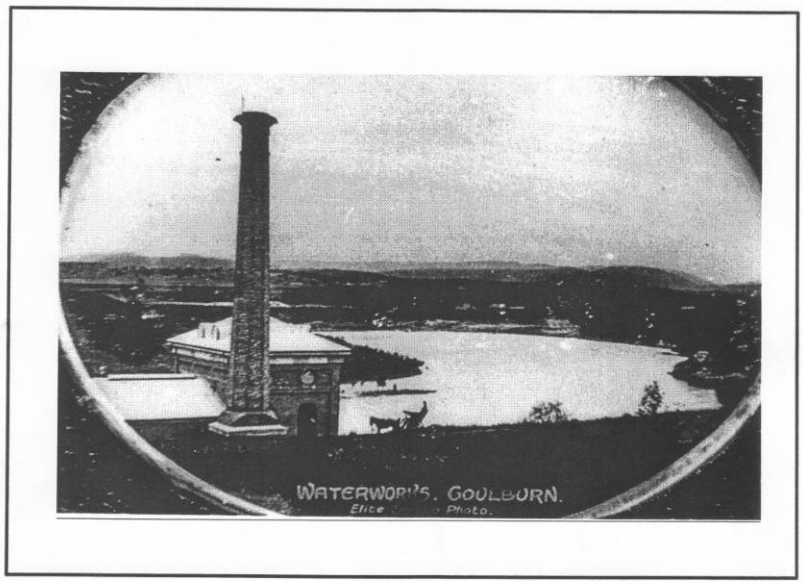
AINSWORTH heritage



GOULBURN WATERWORKS

Conservation Management Plan

August 2010

PO Box 385 Billinudgel NSW 2483 | Tel: 02 6680 2548
| www.ainsworthheritage.com.au |

For more information contact janea@ainsworthheritage.com.au

Document Name	Goulburn Waterworks Conservation Management Plan		
Project No.	09-011		
Version/Date	Author/s	Reviewed	Reviewer
Draft – 20/01/2010	JA	20/01/2010	MA
Final – 25/08/2010	JA		

Table of Contents

SECTION A:

Investigation of Significance

1.0 Introduction

1.1 Preamble

The heritage listed Goulburn Waterworks had a previous Conservation Management Plan (CMP) prepared in July 2006, however, the site has subsequently undergone extensive changes and a new CMP is required to guide the management and conservation of the site and its significant collection of associated machinery. Accordingly, Ainsworth Heritage was commissioned by Goulburn Mulwaree Council to prepare a new Conservation Management Plan (CMP) for the Goulburn Waterworks.

The Goulburn Waterworks were constructed in 1885 as a steam operated pumping facility which provided Goulburn's first reticulated water supply. Goulbourn Waterworks, being the only complete, workable beam engine powered municipal water supply left in its original location in the Southern Hemisphere, is an extremely rare and significant complex. The pumphouse still contains the original Appleby Bros. Beam Engine pump and Galloway Boilers, and the buildings and engine are of national significance. The site operates as a museum with regular tours and activities.

1.2 Aims

A key requirement of the CMP was the need to focus the document on the future management of the site. As such, only a review and update of the site history, description and significance was undertaken for this new CMP, with efforts focused on the provision of clear guidelines for the day-to-day and long-term care of the site. In addition, capital works plans, maintenance schedules and restoration guidance were included.

Specifically, the CMP will provide:

- An update of the site history, description and significance;
- Restoration and conservation actions for all internal and external features and fittings of the Pumphouse and boiler building and chimney;
- Advice relating to mechanical repairs and restoration required for the steam engines, boilers and their settings;
- On-going management requirements for each object, building and the overall site;
- A prioritised workplan and maintenance schedule for short, medium and long-term works; and
- Cost estimates for the works and maintenance schedules.

1.3 Methodology

This report was prepared in accordance with the guidelines and articles of the *Australia ICOMOS Burra Charter, 1999,* James Semple Kerr's *The Conservation Plan* and the methodology outlined in the NSW Heritage Branch documents *Conservation Management Documents* and *Assessing Heritage Significance*.

1.4 Outline of Report Sections

The CMP has three distinct sections; the investigation of significance, the assessment of significance and the management of significance. The sections have not been prepared as stand alone reports and each section should be read as part of the entire report. The report structure is outlined in the following table.

REPORT SECTION	REPORT CHAPTER	
Section A: Investigation of Significance	00	Executive Summary
	01	Introduction
	02	Contextual History
	03	Site Specific History
	04	Physical Analysis
Section B: Assessment of Significance	05	Comparative Analysis
	06	Assessment of Significance
Section C: Management of Significance	07	Opportunities and Obligations
	08	Conservation Policy
	09	Maintenance, Stabilisation, Restoration and Re-use

1.5 Scope and Limitations

The scope of this CMP is limited to the Waterworks and its immediate surroundings, as illustrated in Figure 1.2 below.

This investigation does not assess any indigenous cultural heritage or potential indigenous archaeological resources within the site and no sub-surface investigations, geophysical/remote sensing, engineer's assessment of the buildings or measured plans were carried out as part of this assessment.

At the requirement of the client, the associated Foreman's Residence was not investigated; rather the focus of the report was on the Waterworks and the machinery within.

1.6 Author Identification

The field inspection was undertaken by Jane Ainsworth and Roger Parris on the 22, 23 and 24 July 2009. On the 22 July 2009, Graham Clegg from the Powerhouse Museum joined the site inspection. On each day, volunteers from the Waterworks accompanied the site inspections.

This report was prepared by Jane Ainsworth and Roger Parris with additional assistance from Matt Alexander.

1.7 Location & Curtilage

Goulburn Waterworks are sited on the Wollondilly River on the north-west edge of the town of Goulburn, which is located inland from the NSW South Coast between Sydney and Canberra.

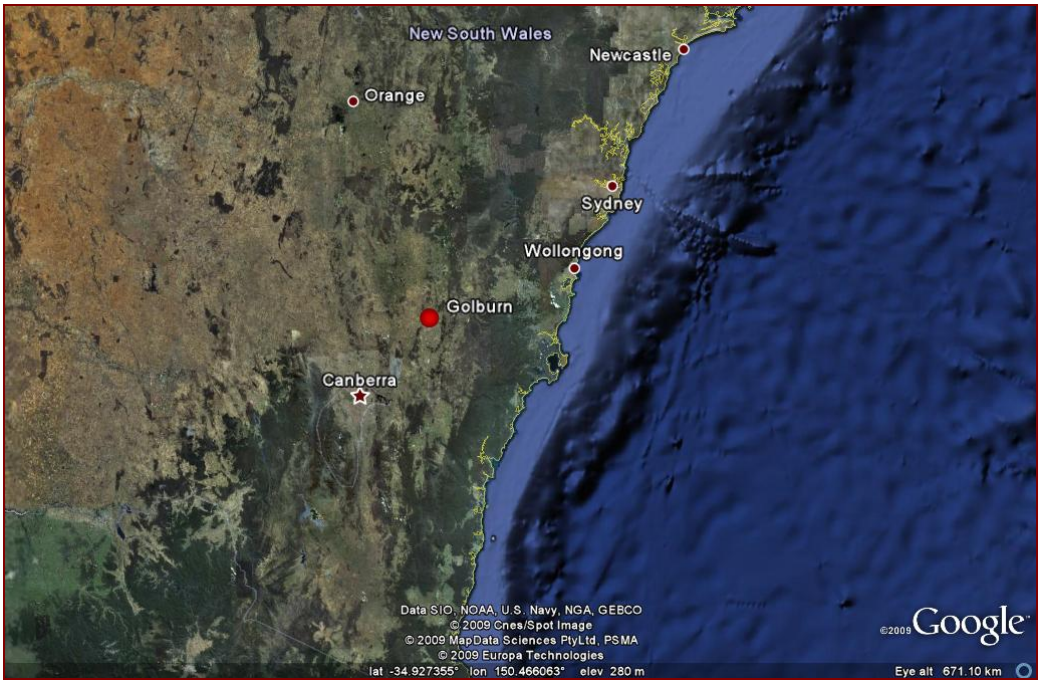


Figure 1.1: Map illustrating the location of Goulburn in relation to Sydney, NSW and Canberra, ACT (Image courtesy of Google Earth).

Figure 1.2: The curtilage of the Goulburn Waterworks adjacent to the Wollondilly River (Image courtesy of Google Earth).

1.8 Previous Research

The Goulburn Waterworks have been the subject of several investigations regarding the site's heritage significance, including:

- Goulburn Pumping Station Heritage Paint Scheme, 1990; and
- Goulburn Steam Museum Conservation Management Plan, 1996.

1.9 Heritage Listings

The Goulburn Waterworks is listed on several statutory and non-statutory heritage registers in Australia, including:

- NSW State Heritage Register (statutory);
- Goulburn Mulwaree Council LEP Heritage Schedule (statutory);
- Register of the National Estate (non-statutory); and
- Register of the National Trust of Australia NSW (non-statutory).

1.10 Acknowledgments

The following organisations are thanked for their contribution to this report:

- Goulburn Mulwaree Council – Jason Moroney and Julianne Salway;
- Goulburn Waterworks volunteers – Ken Ainsworth, Ian McCormack and all others;
- Bruce MacDonald;
- National Trust of Australia (NSW);
- Engineering Heritage Committee – Sydney Branch of the Institute of Engineers Australia;
- Graham Clegg – Powerhouse Museum; and
- David James Appleby, descendent of Charles Appleby.

"*Don't fail to remember that engineers and fireman are in control of the great underlying force of modern civilisation; hence, do nothing to lower the dignity of the profession*"[1]

2.0 The Goulburn Waterworks in Context

Built in 1883, the Goulburn Waterworks provided a reticulated water system for the supply of water of Goulburn residents. The Waterworks, initially powered by steam, operated with dual electricity and steam from 1918 and then purely electricity from 1932. The site continued to be the main water source for Goulburn until 1977.

This section discusses the major historical context which influenced the development of the Goulburn Waterworks, including the development of water supply technology and sanitation, steam power, engines and boilers and the engineers of the 1800s.

2.1 Water Supply in the 1800s

Water supply in Australia was a continual issue and problem for the European settlers, who had a preconceived notion of continual and plentiful water supplies. However, the characteristics of Australia's water source's were significantly different from those of Great Britain; its Rivers were small in comparison with those of Europe and its streams ran inconsistently year-to-year, often running dry over summer. Drought and flood were common and reliable water sources were hard to come by. The importance of water

---

[1] Hawkins, N. 1903. *Maxims and Instructions for the Boiler Room*. Theo Audel & Co, New York, p.47.

quality was recognised early on, in a General Order issued on 14 October 1802 to the inhabitants of early Sydney:

> *If any person whatever is detected in throwing any filth into the stream of fresh water, cleaning fish, washing, erecting pig-sties near it, or taking water but at the tanks, on conviction before a magistrate, their houses will be taken down and forfeit £5 for each offence to the Orphan Fund.*[2]

In the major cities (Sydney, Melbourne, Brisbane, Hobart etc) public water supply schemes were implemented from the early days with varying success and were continually upgraded. In the regional towns, however, water supply was generally sourced from private wells, dams and creeks until late in the 1800s.

The provision of water supply and sewerage was established as a local government responsibility by the *Municipalities Act 1867*. Since 1880 however, the Public Works Department had responsibility for the design and construction of water supply and sewerage schemes for country towns in New South Wales; in that year the *Metropolitan Water and Sewerage Act* and *Country Towns Water and Sewerage Act* were passed to deal separately with the problems of providing these services for metropolitan and rural areas. These Acts gave the Minister for Public Works power to construct works for country town services, managed by country councils, and to oversight councils' operation of these services.

---

[2] Fellows of the Australian Academy of Technological Sciences and Engineering. 2001. *Technology in Australia 1788 – 1988. A condensed history of Australian technological innovation and adaptation during the first two hundred years (online version).* Australian Academy of Technological Sciences and Engineering.

The steady growth of Australia's major cities and regional towns in the late 19th Century, caused by the expansion of agricultural production, the discovery of gold in several States and the influx of thousands of miners from around the world, led to the need for vastly expanded water supplies to serve the industries and inhabitants of these rapidly growing towns. These factors, together with the climatic extremes of the country and the cost of transporting materials over large distances, combined to create significantly larger and more costly systems than those to which the early water supply engineers were accustomed.[3]

Subsequently, with the passing of the *Country Towns and Sewerage Act of 1880*, many regional towns took advantage of the government incentives and assistance, resulting in a proliferation of waterworks throughout Australian regional towns. Initially,16 towns constructed waterworks at the overall cost of £352,456.[4] These included waterworks in Deniliquin, Lismore, Bourke, Belranald, Dubbo, Armidale, Temora, Lithgow, Orange, Woollongong, Richmond, Junee, Goulburn, Albury and Wagga Wagga.[5] The waterworks were constructed by the Department of Public Works and after construction, were handed to the Municipal Councils for their control.

2.2 Engineering & Engineers

On 30 September 1859, the Department of Lands and Public Works was divided into two Departments: the Department of Lands and the Department of Public Works. The Department of Public Works was responsible for:

- Railways;

---

[3] *Ibid*.

[4] Woodhart, Rv Norman. 1983. *The Goulburn Waterworks 1883-1922.* Unpublished manuscript held by Goulburn-Mulwaree Regional Council. p.1.

[5] *Ibid.,* p.1.

- Electric Telegraph;
- Roads;
- The Colonial Architect;
- Harbours and River Navigation;
- Steam Dredges and Cranes;
- Fitz Roy Dry Dock (Cockatoo Island); and
- Works of Defence (Fortification or Military Works Branch).

Accordingly, the Department was in charge of a massive building program which sought to establish NSW as the premier colony and later, a state, and also to provide a world class program of infrastructure development. With the involvement of the NSW Public Works Department in the building of the state's water supply system came the involvement of a group of highly qualified, experienced and well known engineers who were employed by the department.

Goulburn Waterworks was associated with several notable engineers, including:

- Designer – Edward Orpen Moriarty, Engineer-In-Chief of the Harbours and Rivers Branch of the NSW Public Works Department;
- Director of Works, Engineer Henry Allaster Moriarty, District Engineer, Goulburn, for the NSW Public Works Department;
- Appleby Bros Engineers; and
- Resident Engineer – Edward Jacob Woodhart.

2.2.1 Edward Orpen Moriarty

Edward Orpen Moriarty (1825-1896), the eldest son of Ella and Francis Moriarty, was born in County Kerry and educated at Trinity College in Dublin. After working briefly as a cadet constructing the breakwater on the Isle of

Portland, his family left the UK and reached Sydney where he set up as a consulting engineer and surveyor. On 1 June 1849, he became an assistant in the Surveyor-General's Department and later, from 1853-55, he was engineer and surveyor (later chairman) for the Steam Navigation Board.[6] In 1953, Moriarty married Leila H Geary.[7]

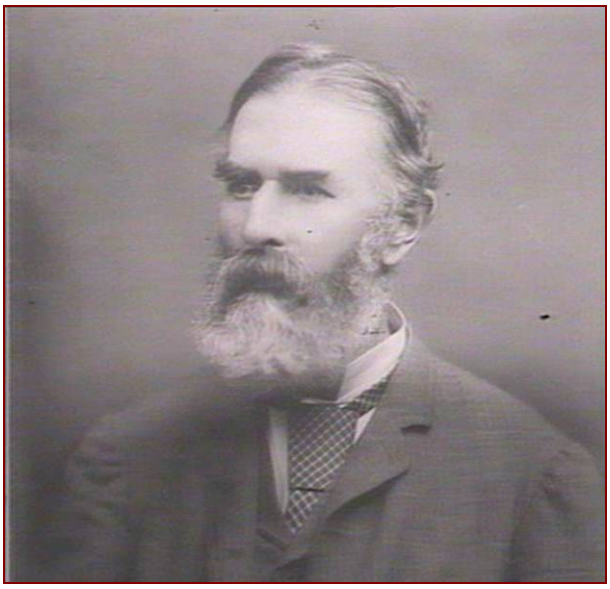


Figure 2.1: Edward Orphen Moriarty (Image courtesy of the NSW State Library, Government Printing Office Image #1/08239).

Moriarty's career progressed rapidly and he took the position as engineer for the Hunter River improvements from 1855-58. In October 1858, Moriarty reached the pinnacle of his career when he became Engineer-In-Chief for Harbours and River Navigation in the NSW Department of Works, with a salary of £1100. In January-October 1862, Moriarty became the Commissioner and Engineer-In-Chief for Roads and, in 1865, a superannuation fund commissioner. During his career, Moriarty controlled the building of water

[6] Australian Dictionary of Biography, Online Edition. Moriarty, Edward Orpen. http://adbonline.anu.edu.au/biogs/A050528b.htm.

[7] NSW Registry of Births, Deaths and Marriages. http://www.bdm.nsw.gov.au/.

supply schemes for Wollongong, Bathurst, Wagga Wagga, Albury, Goulburn and Hunter Valley towns. Subsequently, in 1867 he was a Commissioner for Sydney's water supply and, in 1869-70, President of the Hunter River Floods Commission.[8]

Moriarty was a lieutenant in the Volunteer Artillery and, as captain from 1869, served on the commission on defence from foreign aggression and on the board for inspecting and maintaining the supply of colonial warlike stores. In 1871-73 he was captain of the Engineers Corps, Volunteer Rifles. Moriarty's prime works included the Pyrmont Bridge, Wollongong Breakwater Lighthouse, Trial Bay Breakwater, Prospect Reservoir and the Upper Nepean Water Scheme, among many others.[9]

2.2.2 Henry Allaster Moriarty

Henry, nephew of Edward, was born in 1864 and died in 1928. He served as the District Engineer in Goulburn for the Public Works Department (PWD) from 1881-1928. The date of his death and the date to which he served as engineer are both 1928, indicating that at his age of death (64 years) he was still working for the PWD. It is likely that he had little to do with the waterworks after 1883, as on completion they were handed from the PWD to the municipality of Goulburn, whereas Moriarty continued to be employed by the PWD until his death. Unfortunately, there is very little readily available information regarding Henry Moriarty; extensive research would need to be undertaken however his role in the Waterworks'' history is not extensive enough to justify this.

---

[8] Australian Dictionary of Biography, Online Edition. Moriarty, Edward Orpen. http://adbonline.anu.edu.au/biogs/A050528b.htm.

[9] *Ibid*.

2.2.3 Edward Jacob Woodhart

Edward Jacob Woodhart (1858-1922) was appointed as Goulburn Waterworks' first Residing Engineer in 1887, when Goulburn Council took over the operation of the site. Woodhart had trained as a Ship's Engineer, serving as 3rd, 2nd and Chief Engineer on the SS Derwent and the SS Balmain for four years, to gain his Certificate of Competency and become qualified as a First Class Engineer.[10] Woodhart then went on to work for the Harbours and Rivers Branch of the Public Works Department on 22 June 1866 as the Engineer and Master of the dredge *Ioto*, which worked the Nambucca River in northern NSW. [11] In 1886, at age 29, he received a telegram from Edward Moriarty asking him to accept the position of Engineer for the Goulburn Waterworks, at an annual salary of 200 pounds plus new house and fuel. On the 17 December 1886, the *North Coast Times* noted that the Captain of the *Ioto* had relocated to take charge of the water supply at Goulburn.[12]

Woodhart spent the rest of his life in Goulburn. He was married to Ella Harris (1875-1962) and lived with her and their 12 children (of whom only one did not survive infancy) at the house which was provided as part of his employment.[13] He continued to work at the site for 36 years; and on 7 August 1922 he suffered a heart attack and died whilst at work.

2.2.4 Appleby Bros Engineers

Appleby Bros engineers, builders of the Appleby Beam Engine which is Goulburn Waterworks' prime piece of engineering equipment, commenced business in London (Emerson Street and Sumner Street, Southwark). The

---

[10] Woodhart, Rev Norman. 1983. *The Goulburn Waterworks 1883-1922* (unpublished research paper held by Goulburn Mulwaree Council.

[11] *Ibid*.

[12] *Ibid*.

[13] http://users.tpg.com.au/users/mhillman/hillman/f31.htm

company was founded in 1858 by Charles James Appleby (1828-1908), who was joined a year later by his brother Thomas Hodgson Appleby. Charles had gained his experience working initially at the Renishaw Iron Works which had been founded by his grandfather Thomas, and by the mid 1800s was one of the largest ironworks in Britain – it did not close until 1999.[14]

Charles Appleby then went on to gain further engineering experience with Messrs. Sharp, Roberts and Company, later with Messrs. Whitworth, and finally with Messrs. James Nasmyth and Company. Charles later worked in Russia to superintend the erection of the first Russian steam-hammer and subsequently to work on the St Petersburg-Moscow railway.[15] During his life he was awarded the Companion of the Imperial Order of Joseph of Austria and a Chevalier of the Legion of Honour. He died of heart failure at his residence, The Hermitage, in Red-Hill London on 26 April 1908.[16]

On establishing Appleby Bros, the "…*firm rapidly acquired a prominent position as builders of cranes and contractors' machinery, and as advisors as to the plant to be employed in the construction and equipment of docks, harbours, railways and other works…*"[17] and among other things were one of the pioneers of the self propelled travelling crane and established various patents for their creations.[18] In 1869, the company published *Appleby's Handbook of Machinery*, which became a famously utilitarian book and saw numerous editions published over the following 30 years. Their company letterhead proclaimed "*Highest Award for Cranes at the International*

---

[14] Tudsbery, J H T (ed), 1908. Obituary – Charles James Appleby. *Minutes and Proceedings of The Institution of Civil Engineers; with other selected and abstracted papers. Vol CLXXII.* The Institution, London, p.307-308.

[15] *Ibid*, p.307.

[16] *Op cit.,* p.308.

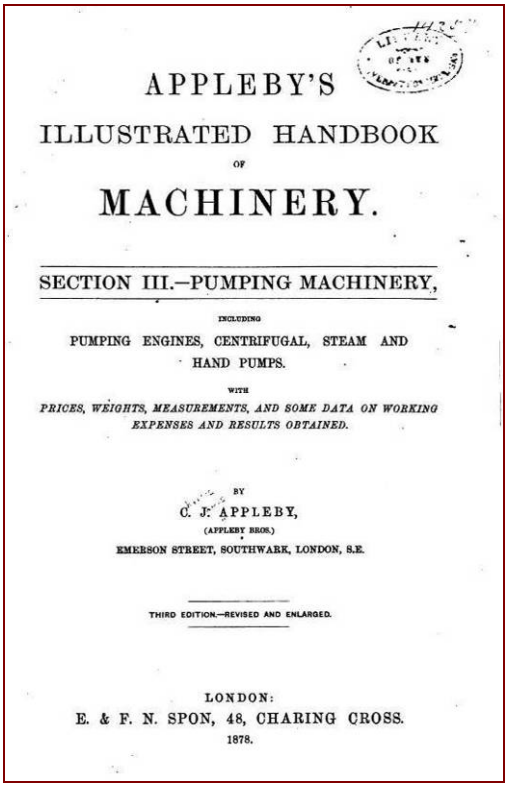
[17] *Ibid*, p. 307.

[18] NZ Cranes, http://www.nzcranes.org/MANUFACT.HTML#appleby.

Exhibitions since 1862 in London, Paris, Philadelphia, Vienna, Amsterdam, Adelaide, Melbourne & At the Paris Exhibition of 1889."

Figure 2.3: James Appleby (seated left) with sons Thomas Hodgson (standing) and Charles James Appleby (right) (Image courtesy of Mr John Steede, UK, Appleby Family historian).

Figure 2.4: James Appleby, father of Charles and Thomas (source unknown).



APPLEBY'S

ILLUSTRATED HANDBOOK

OF

MACHINERY.

SECTION III.—PUMPING MACHINERY,

INCLUDING

PUMPING ENGINES, CENTRIFUGAL, STEAM AND HAND PUMPS.

WITH

PRICES, WEIGHTS, MEASUREMENTS, AND SOME DATA ON WORKING EXPENSES AND RESULTS OBTAINED.

BY

C. J. APPLEBY,

(APPLEBY BROS.)

EMERSON STREET, SOUTHWARK, LONDON, S.E.

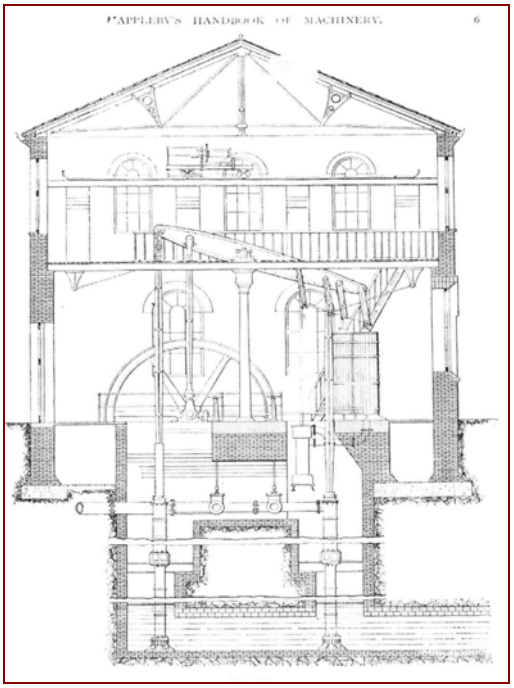
THIRD EDITION.—REVISED AND ENLARGED.

LONDON:

E. & F. N. SPON, 48, CHARING CROSS.

1878.

Figure 2.5: Front page of Appleby's Illustrated Handbook of Machinery[19] http://www.archive.org/details/applebysillustr10applgoog).



APPLEBY'S HANDBOOK OF MACHINERY. 6

Figure 2.6: Illustration of an Appleby beam engine from *Appleby's Illustrated Handbook of Machinery, Section III – Pumping Machinery*, page 6. 1901 Edition.[20]

[19] This entire volume is available to download for free at http://www.archive.org/details/applebysillustr10applgoog

[20] http://www.archive.org/details/applebysillustr10applgoog.

Charles Appleby was known to have travelled widely to secure contracts; as well as supplying vertical engine cranes for the Bengal Railway (India) and plant and rolling stock to the Sudan Railway (Egypt), they supplied the beam engines for four Australian waterworks.[21] Charles Appleby's second son, Francis James, was involved in the construction of the Australian engines at the companies' foundries in London and in 1884, with the approval of Sir John Fowler (consulting engineer to the government of New South Wales), was appointed to take charge of the delivery and erection of the pumping equipment for Goulburn, Albury, Wagga-Wagga and Bathurst Waterworks.[22] Appleby Bros Engineers underwent several changes throughout its history; in 1872, the company Renishaw Ironworks came under Appleby & Co., in 1886, Appleby Bros opened new works in East Greenwich which provided large foundries and boiler shops and the outgrown Southwark works were closed; in 1897/8, the company saw a reorganisation and subsequent name change to Jessop and Appleby (London and Leicester) Ltd under the nominal direction of Vickers Sons & Co. Charles Appleby retired from the company in May 1898. This arrangement continued until a 1908 merge with The Temperley Transporter Co which witnessed a subsequent name change to The Appleby Crane and Transporter Co.Ltd. However in 1910, following financial strife, the Greenwich works were closed and the Appleby name disappeared from the lists of crane makers.[23]

---

[21] NZ Cranes, *op.cit.*

[22] Tudsbery, J H T (ed), 1902. Obituary - Frank James Appleby. *Minutes and Proceedings of The Institution of Civil Engineers; with other selected and abstracted papers. Vol CXLVII.* The Institution, London, p.421. NB: Frank Appleby, after spending several years in India and Canada, then went on to settle in Sydney NSW until his death ion 1901.

[23] NZ Cranes, http://www.nzcranes.org/MANUFACT.HTML#appleby.

2.3 Engines & Boilers

Steam engines and the boilers which powered these engines were fundamental apparatuses of industrial sites throughout the 19th century. This section briefly describes their role and function, so that the descriptions and significance in the following chapters can be more thoroughly understood.

2.3.1 Boilers

The 1903 Maxims and Instructions for the Boiler Room[24] states that:

> *The steam boiler in its simplest form was simply a closed vessel partly filled with water and which was heated by a fire box.*

The boiler was thus the means by which power was supplied to the engines so that they were able to activate the pumps at the waterworks. Boilers comprised two major components – the furnace and the shell, that is, the area where the fuel was burnt and the area which contains the water to be heated and thus turned to steam. Steam boilers took many forms, the main being stationary boilers, marine boilers and locomotive boilers. Those at Goulburn Waterworks were stationary Galloway boilers, which were considered an improvement on the earlier Lancashire boilers and "…*the most economical boiler in England."*[25] In the Galloway boiler: "…*the flue is sustained and stiffened by the introduction of numerous conical tubes, flanged at the two ends and riveted across the flue."*[26] The purpose of these tubes is to increase the heating surface area and improve circulation within the boiler, by carrying water via the tubes through the hottest part of the

---

[24] Hawkins, N. 1903. *Maxims and Instructions for the Boiler Room*. Theo Audel & Co, New York.
[25] *Ibid.*, p.59.
[26] *Ibid.*, p.58.

boiler. Lancashire boilers and Galloway boilers are often confused, as Lancashire boilers were often retrofitted with Galloway tubes. Hawkins' 1903 edition of *Maxims and Instructions for the Boiler Room* provides a useful description of the parts of a Galloway boiler and their functions.

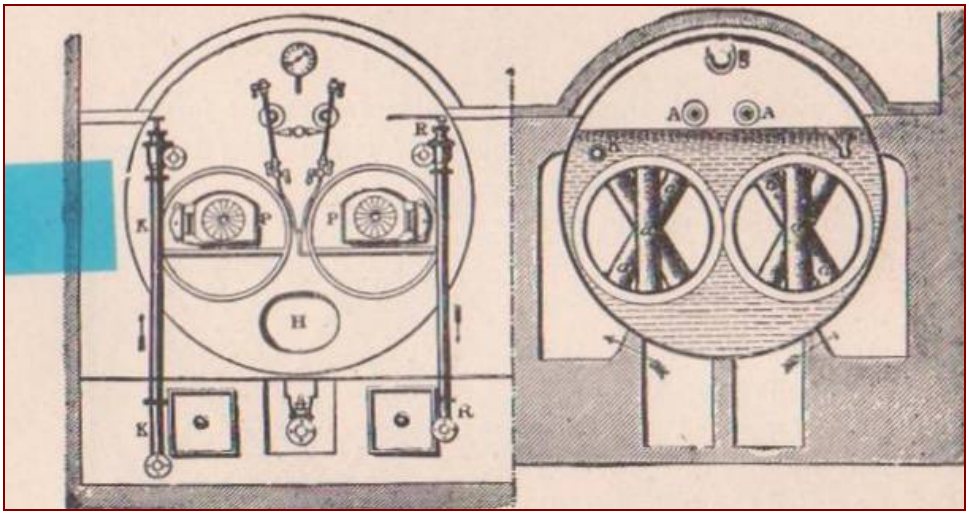


Figure 2.7: The longitudinal general arrangement of fittings and tubes within a stationary Galloway Boiler (Hawkins, N. 1903. *Maxims and Instructions for the Boiler Room*. P.58).

2.3.2 Engines

The purpose of the boilers was to create steam; this steam was then pumped to the engines for which it acted as the power for the engine to function. Steam engines rapidly advanced from the early 1700s designs of Newcommen and the major advances made by James Watt. There are many types of steam engines based on various schools of engineering thought; however, the main steam engine at Goulburn, the Appleby Beam Engine, is a Woolf type cross compounding engine.

In the Woolf type of compound engine, high pressure steam from the boiler expands in a high pressure cylinder and then enters one or more subsequent

lower pressure cylinders. Subsequently, the complete expansion of the steam occurs across multiple cylinders, reducing heat lost as less steam expansion occurs in each cylinder. This reduces the magnitude of cylinder heating and cooling, increasing the efficiency of the engine.[27] The Goulburn engine is known as a 'cross' compound because both of the cylinders are located next to each other. Other advantages include:

- The temperature range is smaller and thus cylinder condensation is reduced;
- Pressure difference is less in each cylinder, so steam leakage at the piston valves is less;
- Turning movement is more uniform, so balancing is easier and a smaller flywheel may be used;
- Only the smaller cylinder needs to be built to withstand the highest pressure, so the overall weight of the engine is reduced;
- Components are subject to less strain so can be lighter; and
- Reciprocating parts of the engine are lighter reducing the engine vibrations.[28]

[27] Wikipedia article *Compound Engines*. http://en.wikipedia.org/wiki/Compound_engine

[28] *Ibid.*

3.0 Site Specific History

This section will discuss in detail the development of the Goulburn Waterworks from the late 1800s to the present.

3.1 The Water Supply System

Although the Waterworks are the specific focus of this report, the related elements are important to understanding how the town of Goulburn was supplied with water. As an overview, the water supply system consisted of the following elements:

- Marsden Weir: Located to the north of town, on the Wollondilly River. The weir insured that a semi-permanent supply of water was available for pumping by the waterworks. ;
- The waterworks: Located on the Wollondilly River approximately 500m upstream from Marsden Weir. The waterworks housed the boilers and pumps which pumped the water from the Wollondilly River;
- The settling tanks: The water was pumped from the waterworks to the settling tanks, which were located between the waterworks and the town. The settling tanks held 2,788,000 imperial gallons (12,674,499 litres) of water. The purpose of this was that while the water was stored in these tanks, the mud, earth and other debris would have a chance to 'settle' to the bottom of the tanks, leaving the water above cleaner and better for general consumption;
- Filter tanks: These were built in 1910-1911 after complaints about the cleanliness of Goulburn's water. The two filter tanks allowed for

filtering of the settled water through sand and gravel to provide further filtration; and

- Service Tanks: The cleaned and cleared water would rest here until it was ready to be fed via gravity to the individual houses and businesses of Goulburn.

The entire network was of course assisted by a network of pipelines which ran between each stage of the process to transport the water – some of the pipelines were fed by steam or electric pump (i.e. those from the weir to the waterworks and then the waterworks to the settling tanks) and others by gravity (i.e. those from the settling tanks to the filter Tanks and then the filter tanks to the service tank).

3.2 The Early Water Supply[29]

Goulburn's first water supply was obtained from Blackshaw's wells; two wells sunk by Zachariah Hawkins on the Eastgrove flats. The water was taken into town by a licensed waterman and sold at 9 pence per cask. A public meeting as held in 1856, at Woodward's Commercial Hotel, to consider the erection of a pump on the banks of the Mulwaree *for free use and for fire purposes*, however nothing was done. In 1867, when the railway line was constructed through Goulburn, access to Blackshaw's pumps was cut off and the municipality enquired from the government:

> *"What provision has been made…for supplying the Borough with water, only one very inconvenient crossing (over the railway) having been left."*

[29] *Section 3.12 – The Early Water Supply* is largely derived from the 1996 CMP for Goulburn Waterworks by Garry Dutaillis & Associates Pty.Ltd, with supplementary material added where necessary.

Subsequently, a dam and reservoir in Auburn Street (now the Drill Hall site) was proposed. This proposal was followed by several other schemes for water supply between 1869 and 1875 and in the meantime, permission had been granted to use the railway water tank in the event of a fire.

The various proposed schemes included:

- Thorn's water hole;
- A tube well on the Clinton Street allotment (near the present day site of Country Energy's Clinton Street energy substation);
- A scheme *contiguous to Bradley's 100 acres on Bungonia Road*;
- A well (place unspecified) with a force pump and a 20,000 gallon tank;
- A water works company proposed by J N Hampshire in 1870; and
- Reservoirs behind the present Trinity High School site.

However, nothing came of any of these schemes and water supply continued to be a fundamental issue to the residents of Goulburn, who were forced to rely on watercarts and wells on private property.[30]

3.3 Establishing the Water Scheme

In 1877, the Government of New South Wales commissioned a report into the supply of water to Goulburn, which was undertaken by W Clark, a member of the Institute of Civil Engineers.[31] Clarke's report investigated the feasibility of a water scheme to supply the town with 250,000 imperial gallons (1,136,522 litres) per day. Clarke investigated four sources of water, with all schemes requiring the pumping of the water to a secondary reservoir on a highpoint in Goulburn, which due to its height, afforded good working

[30] Clark, W. 1877. *Report to the Government of New South Wales on the Supply of Water for the Town of Goulburn.* Government Printer, Sydney.
[31].Ibid.

pressure over most of the town. The four schemes focused on water from the following sources:

- The Wollondilly;
- Mulwaree Ponds;
- Sully Ponds [sic][32]; and
- Green Gully Creek.

The weakness of all these schemes was that only the Wollondilly could claim any sort of permanence, although even the Wollondilly could cease running during prolonged drought.

Eventually the proposed scheme, which used the Wollondilly, was successful. It involved the following:

> *"A reservoir can be formed by the construction of a dam with an area of about 6 acres, containing 32,000 cubic yards of earthwork. It will store 19 million gallons[33] of water, sufficient for two months' supply. In this scheme, the engine is proposed to be fixed at a point 24 chains[34] (c.528 yards) above Marsden's Bridge, where there is a waterhole in the course of the river…having a capacity below low water in the river of about 8.5 million gallons[35].*
>
> *An engine 27 horsepower, with boilers in duplicate, will be fixed above the flood line at the margin of this hole…and will be capable of forcing the daily supply of water to a height of 164 feet[36] through a 12 inch pipe in about eight hours.*

[32] Clarke's report notes that the ponds are called 'Sully Ponds' however this is most likely the ponds which are today known as 'Sooley Ponds'.
[33] 86,375,715 litres.
[34] 482 metres.
[35] 3,864,176 litres.
[36] Approximately 50 metres.

> *The water will be drawn from the reservoir to 20 feet below the top water line…by a pipe 10 inches in diameter, 25.5 chains[37] in length, laid in a tunnel through the hill about 14 chains[38] in length to the filters.*
>
> *The filters are circular in plan, each capable of filtering half a day's supply in twenty-four hours. The tanks are 68 feet in diameter, and 8 feet deep,[39] with sloping sides…lined with concrete. Two filters at first would be sufficient, but land for a third should be taken, which can be constructed when found necessary. The filters …will deliver water to the service reservoir.*
>
> *The service reservoir, in Cowper Street, is 60 feet in diameter, 15 feet deep,[40] lined with brickwork in cement, capable of holding 250,000 gallons,[41] and covered with a corrugated iron roof. At this point the distribution of the water through the mains in the town will commence."[42]*

The total cost of the works described above was estimated to cost £19,606, plus the management of these works following establishment, which was estimated to be £31,000.[43] These estimates were very low, as the actual cost eventually totaled £67,000.

---

[37] 512 metres.
[38] 281 metres.
[39] Approximately 20 x 2,4 metres.
[40] Approximately 18.2 x 2.5 metres.
[41] 1,136,522 litres.
[42] *Ibid.*
[43] *Ibid*.

3.4 Constructing the Waterworks

There was an initial delay in constructing the Waterworks. The Sydney Morning Herald noted on Saturday 27 May 1882, that the Mayor of Goulburn (Mr Hawkins) and his Alderman (Alderman Wombey) met with the Minister for Works to gain an explanation for the delay. The minister explained that:

> *"…all necessary steps had been taken to get the project underway. The survey had been made, and the plans completed, for pumping the water into town, and the only thing that was causing the delay now was the non-arrival of machinery from England."*[44]

However, by 1883, construction of the Goulburn's water supply had begun with the construction of a weir on the Wollondilly River (Marsden's Weir). This was followed, from 1883 to 1885, by the construction of the main pumphouse building and chimney stack. Installation of the main Appleby Beam engines for pumping the water began in 1883. By 1885, the pumphouse buildings were complete, although the settling system was still under construction.[45] The successful contractors for the construction works were H.G. Evans & Sons of Wagga Wagga and Ball & Stubbs of Goulburn, with the machinery installed by Appleby Bros of London.

On 1 March 1887, the site was handed from the Public Works Department to Goulburn Council[46] and, in 1889, demand peaked for water in Goulburn and Council subsequently installed two California pumps (both worked by horses) at the Marsden Weir. By 1890, the entire water pumping system was fully operational.

---

[44] Sydney Morning Herald. 27 March 1882. Page 7. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply

[45] Chamberlain, Brian. 1998. *Goulburn's Water Storage System* (unpublished research paper held by Goulburn Mulwaree Council).

[46] Woodhart, Rev Norman. 1983. *The Goulburn Waterworks 1883-1922* (unpublished research paper held by Goulburn Mulwaree Council).

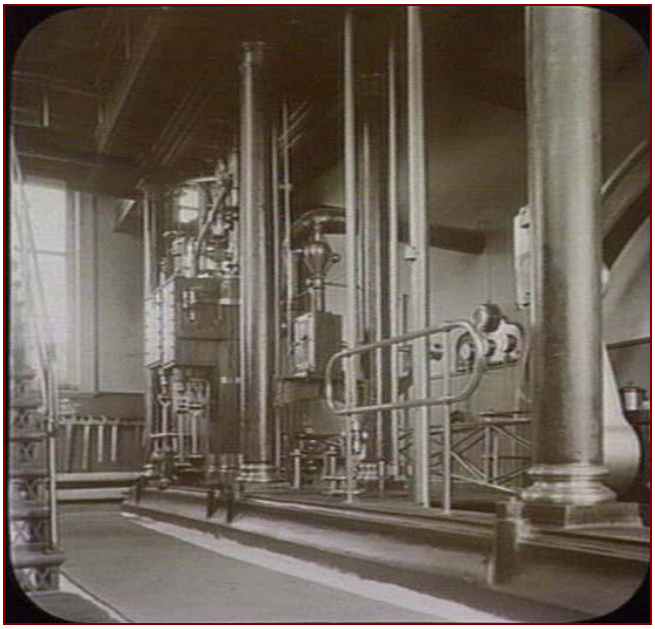


Figure 3.1: Goulburn Waterworks Appleby Beam Engine c. 1880-1935 (State Library of Victoria Accession number H91.300/409).

3.5 The Steam Days; Operations 1890 -1918

The site began operating in 1888 as Goulburn's main supply of water, using the Appleby beam steam engines and Lancashire boilers, although not always smoothly. However, as early as 1890, complaints were being made about the water of Goulburn which was said to be "…*as yellow as a Chinaman's face."*[47] Although the water was treated in the settling tanks before being pumped to users, it was clearly not enough to ensure a clean water supply.

In 1897, a secondary steam driven pump was installed at the waterworks in a purpose-built annex on the northern elevation of the pumphouse building. Tenders had originally been called in 1895 for the pump; however the two tenders received were well over the Council's budget and so were not at that stage awarded.[48] Nonetheless, in 1897 Council went ahead with a tender

[47] Garry Dutaillis & Associates Pty Ltd. 1996. *Goulburn Steam Museum Conservation Management Plan.* Unpublished report prepared for Goulburn City Council.

[48] Sydney Morning Herald. 1895. Page 7. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply.

from B.T.Ball & Sons for the supply and installation of a US designed Blake & Co horizontal supplementary steam driven pump at the cost of £2,455.[49]

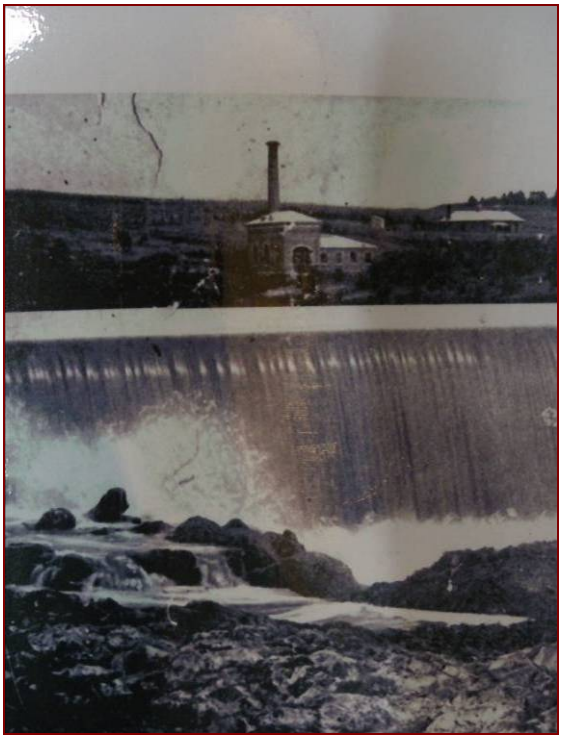


Figure 3.2: Goulburn Waterworks seen from Marsden Weir in the late 1890s (Image courtesy of Goulburn City Council).

The Goulburn Waterworks continued to operate and effectively supply water to the town during the late 1800s and early 1900s – by 1893, the town of Goulburn had approximately 26 miles (41.8km) of mains water pipes.[50] In 1899, during severe drought, the town's water supply ran dry and Council realised that over Summer the Wollondilly River was often little more than a series of connected water holes and was forced to pump water temporarily form a waterhole upstream from the waterworks, on the edge of the Rossiville Estate. This marked the beginning of Council's quest to be able to supply Goulburn with permanent water in any conditions and, in 1916, a new weir was permanently built at the Rossiville waterhole for back-up water storage. This was likely also built in response to Goulburn's new sewerage

[49] *Sydney Morning Herald*. 24 September 1987. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply.

[50] Woodhart, *op.cit*, p.4.

system, which was established in 1915 and put additional pressure on Goulburn's water supply.

3.6 Electricity & Steam; Operations 1918-1932

1918 heralded a new era for the Waterworks with the introduction of electric pumps. Although these operated in tandem with the steam pumps until 1932, it was the beginning of the steam era's demise at the site. The electric pumps, centrifugal pumps, were located in the annex which had been established for the earlier supplementary pumps, installed in 1897. Goulburn was one of the first locations in NSW to have electric pumps installed as part of its water reticulation system. The pumps and motors are no longer at the site however, the sub-floor pumps are still in situ within Annex 1.

The site suffered a major loss in 1922 when its Chief Engineer Woodhart, who had been working at the site for 27 years, suffered a heart attack and died at work. In 1924 the chimney stack, which by now was 39 years old, was strengthened with iron clamps which are still in place. Finally, in 1927, Council built a third weir approximately 2km upstream from the Rossidale Weir on Sooley Creek, again as an attempt to ensure adequate supplies of water to Goulburn in all weather extremes.

3.7 Electricity Dominates; Operations 1932-1977

In 1932, the Appleby steam pumps were shut down and though left in situ, have not pumped water at the site since. The Appleby engines are the only early engines which operated at the site which are still in situ – the 1897 Blake steam pumps and the 1932 electric pumps have disappeared; however the 1918 electric pumps still exist beneath the Hick Hargreaves Engine.

Presumably this occurred because the sheer size and complexity of the Appleby engines would have rendered removal very difficult.

In 1950, Goulburn's present water filtration plant was built opposite the site of the original filtration plant. This upgrading reflected the continual struggle of Goulburn Council in ensuring the town's water quality and quantity.

Luckily for the site, in 1957 Bruce McDonald, an engineer and steam enthusiast, began his involvement with the waterworks and gained permission from Goulburn Council to restore the redundant Appleby beam engine. From 1968, the Goulburn Waterworks operated as a museum of engines, in conjunction with the electric pumps still supplying some of Goulburn water supply.

In 1977, the Rossi Pumping Station took over as the supplier of Goulburn's water and the Goulburn Waterworks on the Wollondilly River was shut down completely. Nonetheless, the Goulburn Steam Museum took advantage of the situation and, as well as continuing to operate the engine museum, undertook to make the site a premier steam and engine museum. It was during this period that a grant was made available under the Regional Employment Development Scheme (1975), which saw some of this funding used for the installation of the Hick Hargreaves engine now on display in the annex. The Hick Hargreaves was acquired c1961 by the late E.M. Baldwin of Baldwin Engineering Castle Hill and was donated to the Goulburn Steam Museum in 1970. Mr Bruce MacDonald first installed a cane locomotive in the side of the boiler house to provide steam to operate the Appleby engine. This was replaced by a colonial boiler and later a steam crane boiler before the present Spencer Hopwood boiler was installed to run the steam engine.

From 1962 to 1968, the museum operated on weekends only; however, in 1968 the museum became a full time operation.

In 1969, a narrow gauge railway was laid at the site with the intention of exhibiting working locomotives.

3.8 Recent Times

The steam museum continued a large scale acquisition process until the 1990s and the site became the home of an immense collection of steam engines and related paraphernalia. However, in the 1990s it was clear that the heyday of the Steam Museum site had passed and the site was now struggling with a lack of volunteers, donations and care. Accordingly, in 1996 a Conservation Management Plan was prepared for the site with the particular goal of establishing a future, sustainable path for the site. As such, the following conservation management policies and practices were put into place:

- To firmly establish Goulburn Water Works site as a historic site in the southern region of NSW;
- To maintain the integrity of the historic nature of the site by the display of items and materials related to the site;
- To ensure Council commitment to the maintenance and upkeep of the site;
- To provide tourist interest sufficient to enable the maintenance of the site to be assisted by finance from visitors;
- To recognize the efforts of the local community in the use and upgrading of the site over the past 40 years;
- To address the need for the long term plan for the site and set down guidelines and limits for the full development of the site's potential;

- To ensure systems are set in place for the proper recording of historic information on the site according to national and international conservation standards; and
- To ensure the long term protection of this recognized item of our national cultural heritage.

The CMP and subsequent works to the site have thus set out to rationalise the collections; retaining at the site only that which was directly related to the history of the site. Subsequently, a process of deaccessioning was implemented and most of the exhibits and items relocated to other museums. An auction and tender process in 2001 assisted with the removal of items and raised $50,000 for landscaping works at the site. The site underwent major catch-up maintenance, repainting, new roofing and gutters, road widening, establishment of a new carpark etc. Goulburn Council now coordinates the care and maintenance of the site and its long-term protection was established via listing on the NSW State Heritage Register in 1999.

4.0 Physical Analysis

The following section details the physical description and condition analysis of the overall site, the Waterworks pumphouse building and the historic machinery contained within it. Unless indicated otherwise, all images in this section were taken by Ainsworth Heritage in July 2009.

4.1 Site and Setting

The Goulburn Waterworks is sited on the edge of the Wollondilly River, approximately 2.5kms northwest of the town centre. The Waterworks are located on a narrow length of land which stretches from the entrance on Fitzroy Road/Crookwell Street, west along the river bank (see Figure 4.1). The long, narrow site is bounded by a natural rock outcrop to the south and the Wollondilly River to the north.

The pumphouse and other buildings are located at the western end of the site, on a natural plateau, adjacent to the river. The road which leads into the site forks before reaching the pumphouse, with a lower branch leading directly to the pumphouse and an upper branch leading to a new car parking area and the Fireman's Cottage located on the hill behind the pumphouse. Vegetation at the site is generally sparse, comprising native and exotic grasses and with some scattered trees along the riverbank.

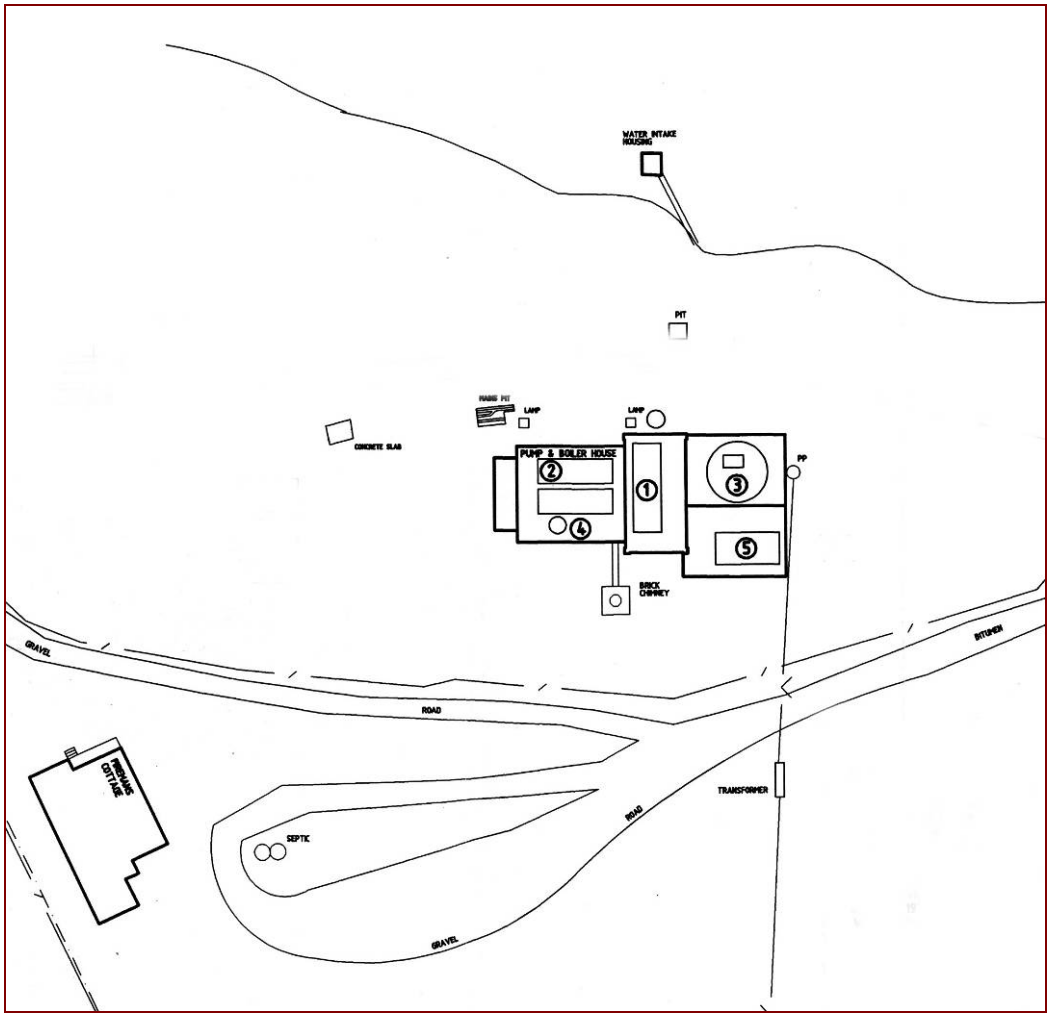


Figure 4.1: Survey Plan of the Goulburn Waterworks site (this plan is based on an earlier plan Garry Dutallis & Associates, 1996).

The surrounding residential areas are beginning to encroach on the historic setting of the Goulburn Waterworks (see Figure 4.2). Originally isolated from town, the Waterworks is now surrounded on most sides by modern residences; with little buffer other than the river to the north. The large clear area to the site's south is at present, under development consideration for a residential subdivision, which will result in the site being surrounded on all sides by urban areas (see aerial image below).

Figure 4.2: Modern aerial image of the site (enclosed by the red line) showing the encroachment of modern residential areas around the Waterworks (Image courtesy of Google Earth).

Figure 4.3: Looking north-west from the Waterworks.

Figure 4.4: Looking north-east across the site.

Figure 4.5: Looking east from the site.

Figure 4.6: Looking west from Marsden's Weir to the Pumphouse.

4.2 Waterworks Pumphouse

The Waterworks pumphouse is the main building of the site. Originally, it comprised the main, double height, room housing the Appleby beam pumping engine and the single story boiler house containing the two horizontal Galloway boilers. However, it was extended over time to include two annexes at the eastern end of the site to house further supplementary elements. The following building plan shows the layout of the rooms and is coloured to show the phases of construction.

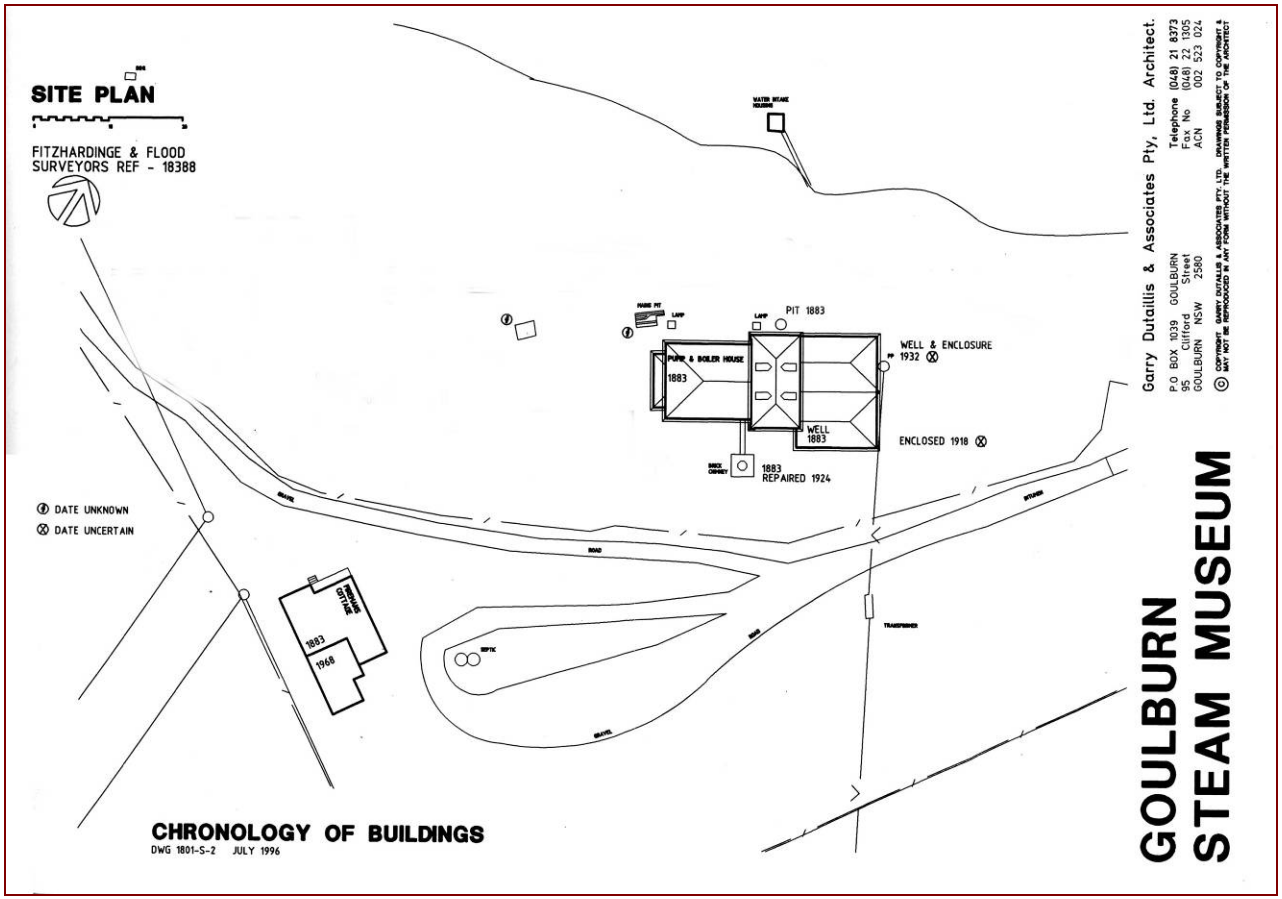


Figure 4.7: Layout of the Waterworks' Pumphouse building, showing the chronology of the building's development (plan edited slightly from the original contained in the 1996 CMP).

4.2.1 Exterior Description

The Waterworks' pumphouse is built in the Victorian Georgian style of architecture, displaying characteristic features of this style including symmetrical layout, verandah with posts resembling colonnades, a medium pitched roof and simple rectangular forms. It is oriented east-west, with the front entrance facing north to the Wollondilly River.

Figure 4.8: North-Western elevation of the Pumphouse, showing the original double story pumphouse with projecting Boiler Room and verandah.

Figure 4.9: North-Eastern elevation of the Pumphouse, showing the original pumphouse with projecting Boiler Room to the right of the image and the additional rear annexes to the left of the image.

The pumphouse is a large, double height building constructed predominantly of red brick laid in the Flemish bond pattern, highlighted with pale sandstone

decorative elements (base course/footings, window sills, bracketed eaves, corbels and mouldings). It features a set of double doors at its main entrance with fanlights and sidelight and simple arched sash window forms to the rest of the building. The building and projecting Boiler Room has a hipped gable roof of green corrugated iron with arched louvered vents.

The boiler room's western elevation features an open-ended room with a simple colonnaded verandah, presumably to increase air flow and ventilation surrounding the boilers.

Figure 4.10: Pumphouse northern elevation showing main door.

Figure 4.11: Boiler Room northern elevation showing window arrangement.

Figure 4.12: Annex northern elevation – note lack of detailing compared with Pumphouse and Boiler Room.

Figure 4.13: Boiler Room (with Pumphouse to rear) western elevation with verandah.

The two rear (eastern) annexes, which were constructed at later dates from the main pumphouse, lack the decorative sandstone elements. Instead, they feature brick corbels under the roof line and their sash windows feature only a simple sandstone window sill. Although some effort was made to match the red brick of the pump house on the annexes' northern elevations (those elevations which join the pumphouse), the exterior brick to the eastern elevation is markedly different in colour, featuring bricks of a mid-brown colour.

Figure 4.14: Annex eastern elevation – note lack of detailing compared with Pumphouse and Boiler Room and the different brick colour.

Figure 4.15: Annex eastern elevation – note lack of detailing compared with Pumphouse and Boiler Room and the different brick colour.

To the south, projecting from the Boiler Room, is the large, 22 metre tall chimney stack. The rectangular base of the chimney is exposed, contrasting red and pale yellow rebated brick panels with sandstone footings and corbel. Above this is the chimney stack which is constructed of rendered brick, with supporting wrought iron clamps. The chimney is connected to the Boiler house via an arched tunnel which comprises rough sandstone blocks and bricks. The entire southern elevation is surrounded by a large cutting into the hillside, above which is the site's carpark.

Figure 4.16: Chimney stack base with contrasting brick work plus sandstone base and corbel.

Figure 4.17: Chimney stack showing iron clamps.

4.2.2 Boiler Room – Interior

The interior of the boiler room consists of a large open space dominated by two large, horizontal Galloway boilers. The Boiler room is open on its western end, which features three brick arches supported by columns and is protected from the elements by a colonnaded verandah – for security reasons a steel gate on rollers is extended across this opening when the site is closed. The Boiler Room comprises brick walls, painted white, and an exposed roof framed with steel rafters, tension rods and web sections which create a truss effect. There are also four windows arranged along each of the north and south walls. The room is dominated by the horizontal boilers, which are set into a brick platform with a paved sandstone top. A staircase leading to the adjacent Appleby Engine Room is placed over the tunnel leading from the boilers to the chimney stack. The room is characterised by a utilitarian feel; with a lack of embellishment and concentration of functional elements.

Figure 4.18: Brick arches to western elevation of the Boiler Room.

Figure 4.19: Interior of the Boiler Room looking north-east showing horizontal boilers.

Figure 4.20: Looking south-west across the top of the horizontal boilers.

Figure 4.21: Boiler room roof.

Figure 4.22: Interior of Boiler Room window.

Figure 4.23: Door leading from Boiler Room into the Appleby Engine Room.

4.2.3 Appleby Engine Room – Interior

The Appleby Engine Room, a large double-height room with concrete floor, though the most elaborate of all the rooms within the pumphouse, is still characterised by function before form. The brick walls are rendered and painted, with a moulded dado line. The room features the main entrance door with fanlights to the northern elevation and two large, double hung sash windows with moulded timber architraves to the southern elevation. Previously, there were a further three windows on the eastern elevation however these were filled-in when the annexes were built onto the eastern elevation. The walls are painted a buff colour and the timber detailing is painted a mid-brown. The ceiling is beautifully lined with dark timber panelling laid on the diagonal and a large timber king post and trusses.

The room is dominated by the 1880s Appleby Beam Engine which is set into the floor of the long western side of the room (for more detail on the engine, see Section 4.3 – Machinery). The upper reaches of the room and engine are accessed by a balustraded, wrought iron staircase and platform supported by classic steel columns and ornately moulded timber beams. There is a staircase set into the floor on the eastern side of the room which leads to the lower levels of the pumping equipment.

Figure 4.24: Interior ceiling of the Appleby Engine Room.

Figure 4.25: Detail of the Engine Room ceiling.

Figure 4.26: Interior of the Appleby Engine Room looking south, with the beam engine on the right and stairs leading to access gallery to the left.

Figure 4.27: Appleby Beam Engine.

Figure 4.28: Internal door leading from the Appleby Engine Room into the Boiler Room.

Figure 4.29: Bricked-in eastern elevation window.

Figure 4.30: Internal door leading from the Appleby Engine Room into the southern annex.

Figure 4.31: Staircase set into the floor of the Appleby Engine Room, allowing access to the lower levels of the pumping equipment.

4.2.4 Annexes

There is some confusion and uncertainty regarding the dates that the two Annexes were built and different accounts are found in various secondary sources.[51] The following information attempts to syntheses these various sources.

The northern annex was built 1897 to house the supplementary steam pumps (which were later replaced in 1918). Figure 4.86 shows the original 1897 front wall of the northern annex; this is the only 1897 section to survive in the current northern annex.

The southern annex well was sunk 1918 to house first electric (Kelly Lewis) pumping gear; it is possible this annex was shorter than the northern annex as the brick columns and corbels stop short of the eave level, see figure 4.32

[51] The information in this section is gleaned from the site inspection, the 1996 CMP and by notes from Tim Geyer.

south-east wall. As such, it is quite likely that an annex was established here in 1897 until at least 1924 – and at some point hence, the annex underwent changes to its existing form. The archive plans available indicate that the current southern annex was designed in 1924 to house the electric pumps, which were installed in 1932; so it is likely that this annex was built between 1924 and 1932.

Both annexes appear to have been altered to the 1924 plan when the 1932 electric pump gear was installed into the Northern Annex. At this time also, the Blake pumps were removed to install Clyde motors, which were also subsequently removed to install 1950/60s motors.

4.2.4.1 Southern Annex

The southern annex, which was constructed between 1924 and 1932, is accessed via a door in the eastern wall of the Appleby Engine Room. It comprises a simple rectangular room of painted brickwork with a timber-lined floor and is well lit with natural sunlight which enters via three, single hung sash windows with fanlights on the southern wall and folding doors with fanlights plus two windows on the eastern wall. It has an unlined galvanised corrugated iron roof (made by Lysaughts) with exposed timber supports and trusses. The main focus of this room is currently for site interpretation, with exhibition cabinets and information panels.

Central within the room is a Hicks Hargreaves engine which is used as a museum piece, as it was never installed at the site when the site was operable. Adjacent to the engine is a small man-hole allowing access to the sub-floor pumping equipment associated with the electric pumps (now removed) which once operated in this room – the 1932 electric engines. The

subfloor area comprises two round timber platforms accessed via narrow steel ladders.

Figure 4.32: Southern Annex looking south-east across the Hicks Hargreaves display engine.

Figure 4.33: The Hicks Hargreaves display engine.

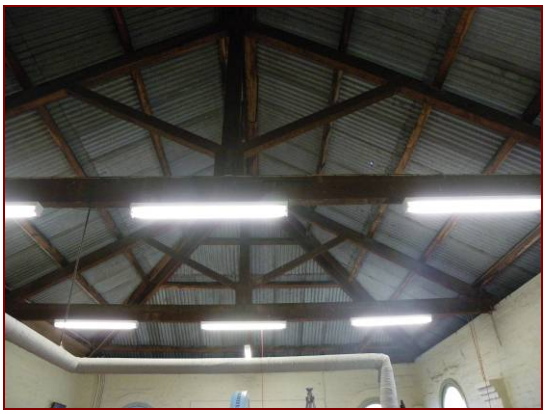


Figure 4.34: Internal roof structure of the southern Annex.

Figure 4.35: Lysaughts orb on the underside of the roof material in the southern Annex.

Figure 4.36: Floor inside the pump well under the Hicks Hargreaves Engine.

Figure 4.37: Ladder from the first sub-floor area down to the pump equipment under the Hicks Hargreaves Engine.

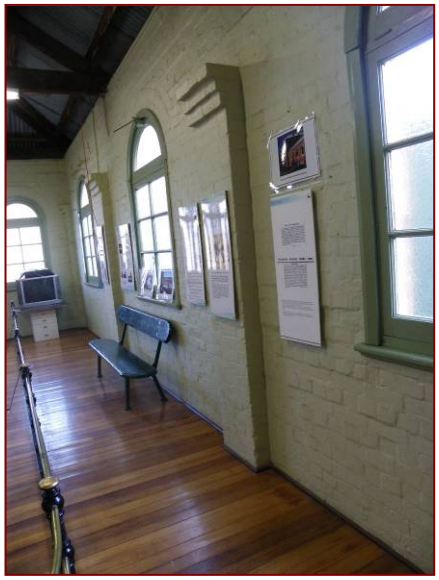


Figure 4.38: Window arrangement in the southern Annex.

Figure 4.39: Southern annex with display cases (on right) for interpretative material.

4.2.5 Northern Annex – Interior

The Northern Annex was constructed in stages from 1897 to an unknown date. The room is accessed via the Southern Annex and there is a large step down into the Northern Annex. Apart from the northern wall and possibly the roof trusses, nothing else survives from the 1897 annex or the 1918 electric pumps which operated from this room.

The Annex comprises painted brick walls, a concrete floor and a large concrete pump well. There are two arched sash windows and a small single door on the northern wall, another arched window plus folding doors on the eastern wall, and two large windows on the interior western wall. These latter two were the original Waterworks eastern elevation external windows – they now face into the annex and one is in filled with bricks. The roof comprises a timber truss system with a large timber king post and corrugated galvanised iron sheeting. An overhead crane rests on timber supports for assistance with the maintenance of the electric pumps.

The northern annex is now dominated by a large pump well set into the floor to house the 1960s electric pumps. The pump well is approximately four metres in diameter and six metres deep, surrounded by a safety rail at the top.

Figure 4.40: Northern Annex looking northeast across the pump well.

Figure 4.41: Northern Annex looking west across the pump well toward the original 1880s Appleby Engine Room.

Figure 4.42: Northern Annex showing timber support system for the overhead crane.

Figure 4.43: The interior of the pump well with the 1960s electric pumps.

Figure 4.44: Northern annexes timber trusses and overhead crane.

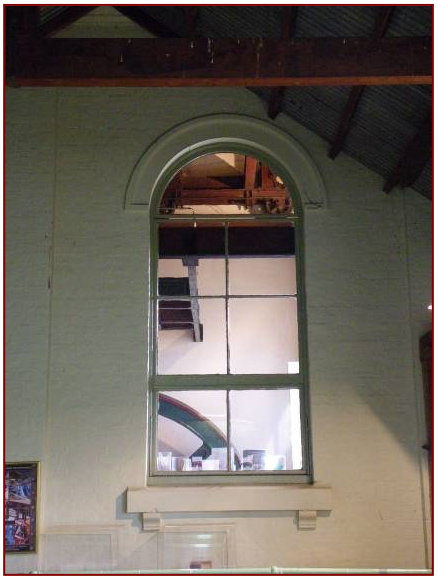


Figure 4.45: Window from the 1880s Appleby Engine Room.

4.2.6 Chimney – Subsurface and Interior

The interior of the chimney, which was built between 1883 and 1885, consists of unpainted bricks throughout the tunnel and the chimney. The condition assessment in Section 4.2.7 discusses the interior of the chimney in more detail, as it is in poor condition.

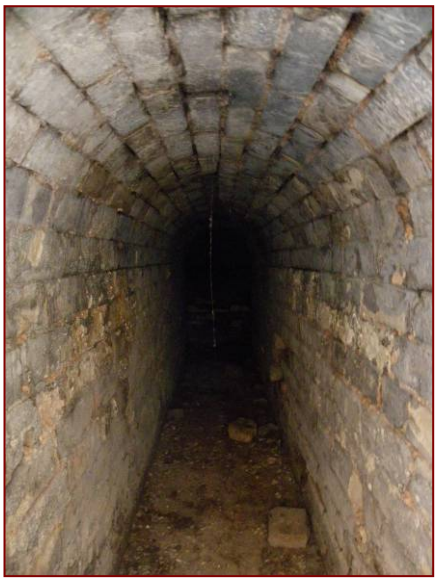


Figure 4.46: Interior tunnel from the Boiler Room to the chimney stack.

Figure 4.47: The interior of the chimney stack, looking upwards.

4.2.7 Condition Assessment

Overall, the Goulburn Waterworks is in good condition and is well maintained. Although there are some small maintenance issues, the maintenance schedule provided in Chapter 9, as long as they are implemented, will address these small issues.

However, the condition of certain elements of the site does warrant some discussion as it provides the basis for later recommendations regarding future works. The bulk of these conditions are caused by damp issues at the site; a major issue which needs to be addressed.

Damp and water penetration is appearing in many areas of the site. The Waterworks are located on low ground directly adjacent to the Wollondilly River which has a high water table. In addition, the cutting directly behind the southern elevation of the site has caused further damps issues, with inadequate or no drainage both at the base of the cutting or above the cutting. The land above the cutting has also been turned into a hard surfaced carparking area, creating additional run-off over the cutting.

Figure 4.47: Looking across the carpark which is located behind and above the site (Image by Goulburn Mulwaree Council).

Figure 4.48: The area behind the Waterworks buildings, to the south, with the large cutting.

4.2.7.1 Chimney Stack & tunnel – Cracking, Damp & Salt Attack

The exterior of the chimney is suffering from damp issues which are evident in several ways:

- Algae growth on sandstone and render;
- Loss of external render;
- Loss/failure of mortar between bricks;
- Salt attack on sandstone;
- Delamination (small amounts only) of some sandstone and bricks;
- Cracking (this may or may not be caused by the damp – a structural assessment is required); and
- Heat affected damage to brick flue.

Figure 4.49: Cracking of the render on the upper areas of the chimney.

Figure 4.50: Loss of mortar and delamination of bricks on chimney base.

Figure 4.51: Algae, salt attack and delamination of sandstone.

Figure 4.52: Algae, salt attack and loss of mortar.

Figure 4.53: Algae growth and cracking of render on the chimney stack.

Figure 4.54: Loss of mortar and salt attack.

The interior of the chimney is also suffering from the damp, with severe issues including:

- Loss/failure of mortar;
- Severe salt attack; and
- Severe delamination of bricks.

Figure 4.55: Almost complete loss of mortar within the tunnel.

Figure 4.56: Advanced salt attack on the bricks and mortar, in the tunnel.

Figure 4.57: Salt attack and brick delamination in the tunnel.

Figure 4.58: Salt attack and brick delamination in the tunnel.

Figure 4.59: Almost complete loss of mortar and salt attack within the base of the chimney.

Figure 4.60: Loss of mortar and the beginnings of salt attack (white patches) within the base of the chimney.

Figure 4.61: Severe and advanced salt attack within the chimney, resulting in delamination of the bricks.

Figure 4.62: Severe and advanced salt attack within the chimney, resulting in delamination of the bricks.

4.2.7.2 Southern Annex Sub floor pump well – Damp and Corrosion

The general structural condition of the pump well and the girders, which carry both the floor and the seventeen tonnes of the Hick Hargreaves engine are very poor. The entire pump well shows extensive evidence of issues caused by water entering the well during periods of wet weather – rusting and subsequent corrosion of steel and iron elements, corrosion of concrete where it is in contact with corroded steel, and rot to timber elements, as outlined below.

- The girders are covered in rust and heavily corroded in places, as are most of the welds, due to incursion of damp and lack of protective films;
- Of particular concern is degradation of the concrete where the girders enter it; it appears that the damp has caused the corrosion of the girder which in turn has set off a reaction causing 'concrete cancer' – a condition commonly found when steel reinforcing corrodes within concrete. Nonetheless, this diagnosis needs to be confirmed by an engineer with specific experience in understanding and treating concrete degradation, as it is essential to first have a full understanding of the cause and extent of the breakdown before it can be treated; and
- The final issue is the severe rot of many of the floor boards on both of the sub-floor levels, again caused by damp issues and lack of ventilation.

Figure 4.63: Corrosion of steel girders within southern annex pump well (Image courtesy of Ian McCormack).

Figure 4.64: Corrosion of steel girders, rot in floor board underside and evidence of salt on concrete walls in pump well (Image courtesy of Ian McCormack)..

Figure 4.65: Degradation of concrete where steel girder is in contact with the concrete pump well (Image courtesy of Ian McCormack).

Figure 4.66: Severe rust and corrosion on lower floor of pump well affecting steel supports and pumping equipment (Image courtesy of Ian McCormack).

Figure 4.67: Damp, rot and degradation of timber floorboards on first level of pump well.

Figure 4.68: Damp, rot and degradation of timber floorboards on first level of pump well.

4.2.7.3 Southern Annex Floor – Rot

Within the southern annex, the area of timber flooring above the pump well as suffered from damp and rot, presumably as a result of the damp issues affecting the pump well immediately below. The affected floorboards were cut out and replaced in late July 2009.

Figure 4.69: Replacement of rotted floorboards in southern annex, above pumpwell.

Figure 4.70: Replacement of rotted floorboards in southern annex, above pumpwell.

4.2.7.4 Appleby Engine Room – Subfloor Engine Area Damp and Salt Attack

The Appleby Beam Steam Engine is set into the floor of the Engine floor and access to the sub-floor elements (the engine bed and well) of the machinery is via staircase. The staircase, structural elements of the sub-floor area and parts of the pumping equipment in this area are all affected by damp issues, including:

- Paint bubbling on walls of staircase;
- Slight evidence of salt on exterior of painted bricks;
- Mildew and mould on exterior bricks; and
- Rusting of pumping equipment (image unavailable).

Figure 4.71: Bubbling paint on wall above staircase leading down to the sub-floor area.

Figure 4.72: Small amounts of failing limewash and salt on walls within subfloor area.

Figure 4.73: Small amounts of failing limewash and salt on walls within subfloor area, plus mildew on base of wall.

Figure 4.74: Looking up the stairs into the Appleby Engine Room.

4.2.7.5 Annexes – External East Wall Damp

The external eastern wall of both annexes are both suffering from moderate damp issues. The issues are caused by rising damp from the external ground, problems with downpipes and built up garden beds around the walls. Additionally, the dampness is exacerbated by the damming affect of the

roadway to the north of the building, which restricts water flow away from the building. The dampness is resulting in:

- Failing mortar;
- Growth of mould, mildew and algae; and
- Some salt attack.

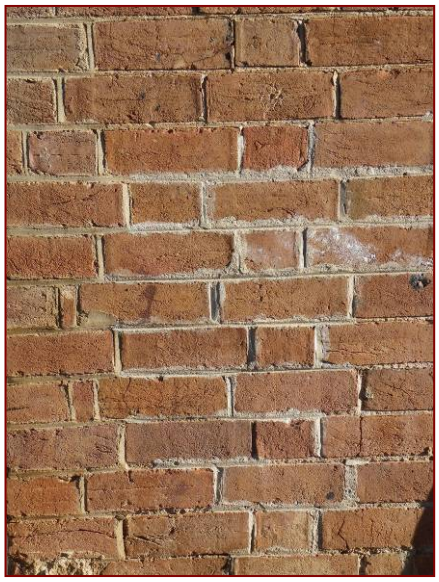


Figure 4.75: Replaced mortar where it had previously failed.

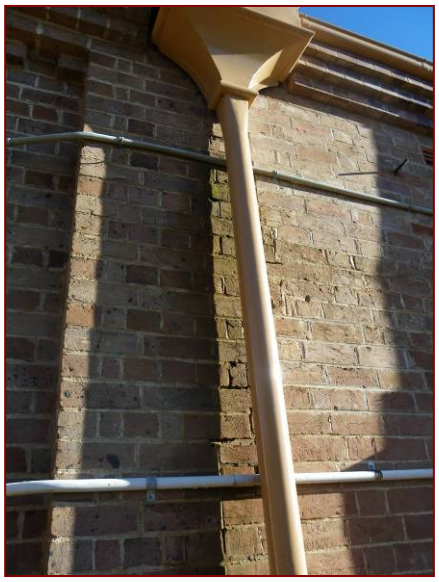


Figure 4.76: Damp and algae behind failing downpipe.

Figure 4.77: Garden beds built against the external walls, build up of algae on the ground and damp issues behind the downpipe.

Figure 4.78: Damp causing mildew and mould to sandstone corbels underneath a failing downpipe.

4.2.7.6 External Walls – Mortar Pointing Failure & Damp Issues

The majority of the external walls are suffering from issues arising from damp and failing mortar in the joints of the brick walls. In many places, the failing mortar has been inappropriately replaced with concrete based modern mortars which are exacerbating the problem – concrete mortars do not allow the building to breath or move and thus trap water and moisture within the building, and they also crack and fall out when the building moves (for example during periods of drought when the ground dries out). In addition, the red oxide coating and lime mortar pointing, both applied sometime between 1897 and 1918 are failing and the oxide is 'washing'. The following issues are common occurrences on the exterior of the building:

- Algae growth, particularly on the exterior south wall;
- Mould growth, particularly on the exterior south wall and where gutters are failing; and
- Failing mortar.

Figure 4.79: Failed mortar replaced inappropriately with concrete mortar – north elevation.

Figure 4.80: Failed mortar (missing) and cracks – north elevation.

Figure 4.81: Failed mortar and cracking, upper north-west corner of Pumphouse building.

Figure 4.82: Algae growth, southern elevation.

Figure 4.83: Algae on sandstone window sill, south elevation Boiler Room.

Figure 4.84: Failed mortar, algae growth and the beginnings of salt attack, southern elevation.

Figure 4.85: Failed mortar, inappropriate concrete mortar and the beginnings of salt attack, southern elevation.

Figure 4.86: Raised garden beds against northern wall of the Northern Annex – this will be contributing to the damp problems.

4.3 Machinery

This section describes the machinery and other items of movable heritage contained within the Goulburn Waterworks.

4.3.1 Appleby Engine Room: Appleby Beam Engine

4.3.1.2 Description

The Appleby beam engine was installed in 1883 and commenced operation soon afterwards; it is known as a Beam engine because of the large overhead rocking beam that transmits motion from the pistons to the cranks. It is a six pillar, Woolf type cross compound engine normally operating at 20 strokes a minute and delivering 120 horse power which was capable of pumping 30,000 imperial gallons of water per hour (which converts to approx 130,000 litres per hour). It is currently operated approximately one day a month at reduced speed.

The engine operated in tandem with the two boilers, which were located in the adjacent room. The boilers, only one of which would have operated at a time (the other undergoing maintenance), were fired by wood or coal, to produce high temperature steam that was piped through to the beam engine in the adjacent room. This steam entered the valve chest on the cylinders from where it was then transmitted to the cylinders by means of a valve mechanism. The action of the steam on the pistons caused them to reciprocate. Rods connect the pistons to the beam at one end, and to the crank at the other; this converts the 'rocking' motion to rotary motion which makes the flywheel turn, giving a smooth and continuous action for the pumping of water.

It should be noted that beam engines were supplanted by horizontal and vertical engines for most uses in the second half of the nineteenth century

but were retained for water pumping to which they were ideally suited. Technically, the Appleby Beam Engine is not remarkable however, aesthetically, it represents the best quality engineering practice of its era – a time when considerable public funds and pride were vested in public utilities. The following specifications are relevant for the engine:[52]

Engine Element	Data
Bore HP	15 inches with 49 & ¾ inch stroke
Bore LP	26" inches with 66 inch stroke
Engine Configuration	Woolf compound
Stroke	5 feet (HP cylinder and crankshaft)
Steam Pressure	60 psi
Valve Gear	Variable cutoff Myer
Flywheel diameter	17 feet
Flywheel weight	Approximately 22.7 tonnes
Depth of pump well	42 feet (12.8 metres)
Beam Length (hp centreline to crankshaft centreline)	20 feet
Pump	Single stage
Built	1883
Commissioned	1886
Retired	1932
Restored	1958

[52] Ridgen, Glenn. 2003. *Proposal to Nominate Goulburn Waterworks as a Historic Engineering Marker.* Report prepared for the Engineering Heritage Committee, Sydney Division, Institute of Engineers Australia and Appleby, C. 1901. *Appleby's Handbook of Machinery, Section III, Pumping Machinery*

Engine Element	Data
Air pump	Edwards vacuum pump
Boilers	Galloway type
Boiler pressure	80 PSI

4.3.1.2 Condition

The Appleby engine is in remarkably good condition for its age and history, and praise should be given to its original restorer Bruce McDonald and the countless dedicated volunteers who have continued to maintain the engine since the 1950s.

The only major problem is the considerable wear and consequent steam leakage on the valve gear rods (the valve gear controls in the inlet and outlet of steam to the cylinders). Repair is also required to the valve actuating mechanism and valve rods, as well as investigation of a knock in the cylinder area, possibly emanating from the underfloor condensing cylinder.

In addition, any engine of this age will encounter minor maintenance problems from time to time and the Appleby Engine is no exception. For example, there are gaskets that need replacing on the steam inlet; however, this issue is relatively easily addressed.

Figure 4.87: The Appleby Beam Engine, looking from the NE corner of the room across the fly wheel well.

Figure 4.88: The Appleby Beam Engine, looking from the south-west corner of the room at the steam cylinders.

Figure 4.89: The steam cylinders and valve gear chests.

Figure 4.90: The valve gear chests with the worn valve gear rods.

Figure 4.91: Looking directly down onto the flywheel.

Figure 4.92: The beam and upper level access platform.

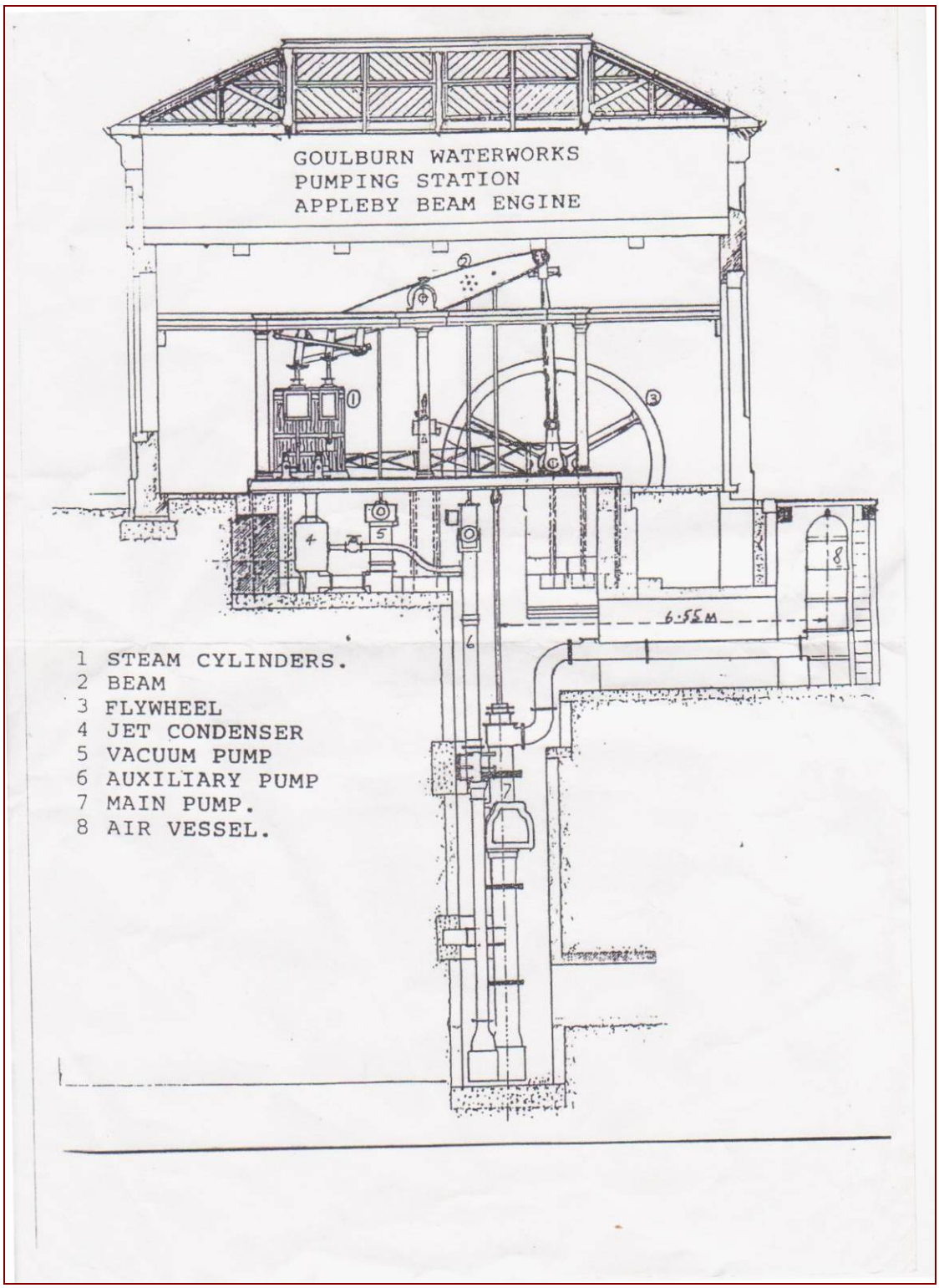


Figure 4.92: Cross Section of the Appleby Beam Engine.

4.3.2 Boiler Room – Galloway Boilers

These boilers were part of the original complex and were commissioned in 1886, however they are no longer operable. They supplied steam to the Appleby Beam Engine and the Blake Steam Pump until 1932 when steam operations ceased. It is not known when they were decommissioned for operational use but it was before 1958 when Mr Bruce McDonald started the restoration of the beam engine.

The two boilers are set into a brick platform with a paved sandstone top. Although not used, they are not sealed shut and their front doors can be open and the inside accessed. The Boilers are principally riveted construction of wrought iron sheets and fitted cast iron boiler mountings. The boilers are supported in a brick setting and are painted black with red trim and silver doors.

Figure 4.93: The two Galloway Boilers, looking north-east.

Figure 4.94: Looking across the top of the two Galloway Boilers.

Figure 4.95: Door to the Galloway Boiler interior.

Figure 4.96: Looking inside the Galloway Boiler.

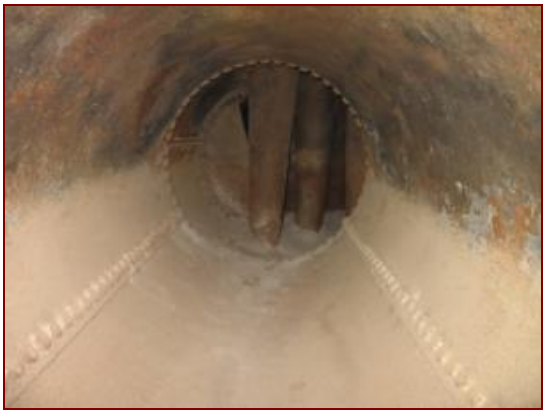


Figure 4.97: The Galloway tubes inside the boiler (Image courtesy of Roger Parris).

Figure 4.98: The upper parts of the Galloway Boiler.

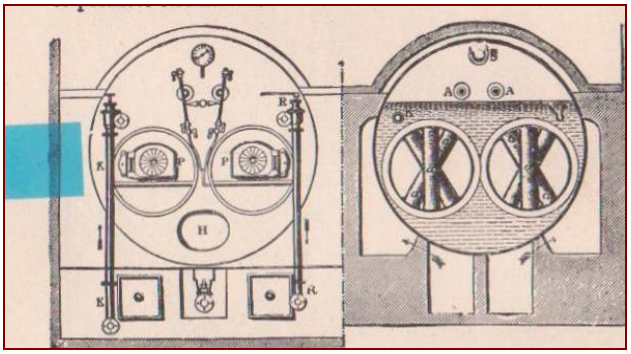


Figure 4.99: The layout of the boiler and tubes.

4.3.3 Boiler Room - Vertical Boiler

Since the Galloway boilers were decommissioned in 1932 and mothballed along with the engine, a series of relatively modern boilers have been introduced to the Boiler Room to provide steam for powering the Appleby Beam engine.

The current vertical boiler was built at the Stephenson Locomotive Works in Britain in 1965, Darlington, northern England, for Spencer Hopwood, 20 Grosvenor Gardens, London. It is one of three oil fired boilers (two Number 20 boilers and a Number 16) which were purchased as integral parts of pile drivers from the British Steel Piling Company by the Australian Army, however were believed not to have been used. The pile drivers were sold from the army second hand to Vibropile, a Victorian company, in 1967 and used on the Yarra River for bank stabilisation work. At the time they were believed to be the last steam pile driving rigs in operation. The pile drivers were then scrapped and the boilers were purchase by Monnier Concrete Products for use in pipe curing. One boiler went to Sydney and the other two remained in Melbourne.[53] The Waterworks boiler is the number 20; the boiler is in reasonable condition and works effectively, however, it is expected that re-tubing will be required in the near future. The modification of the water supply system to allow the increased use of rainwater (rather than townwater) may allow the life of the boiler and tubes to be extended.

[53] Information on the history of the vertical boiler was supplied by Goulburn Mulwaree Council.

Figure 4.100: The functional vertical boiler in the Boiler Room.

Figure 4.101: The functional vertical boiler in the Boiler Room.

4.3.4 Southern Annex – Hicks Hargreaves Horizontal Engine

The Hicks Hargreaves engine is a horizontal steam engine built by Hick Hargreaves of Bolton, England, in about 1864. The 1864 date is derived from the engine probably being the 70th produced in the series, as "70" is inscribed on the engine. The full history of the engine is not known but it is reputed to have worked on the Araluen gold fields. It also operated in a Sydney tannery for some years but became redundant in 1961 and was transferred to Goulburn in 1975 when the Waterworks functioned as a museum.

The engine is technically very interesting as it is a survivor of the first British built class of engines which used the very efficient and widely adopted Corliss valve developed by the American engineer Henry Corliss in 1849. The Hicks Hargreaves version was designed by Inglis and Spencer who had worked with Corliss in Canada.

The engine is generally in excellent condition apart from a worn bearing on the fly wheel shaft. The paint colours on the engine are unlikely to correspond to the original and paint samples should be taken to identify earlier colour schemes if possible. Appendix B provides further technical information on the Hicks Hargreaves engine.

Figure 4.102: The Hicks Hargreaves Engine.

Figure 4.103: The Hicks Hargreaves Engine.

4.3.5 Southern Annex - 1918 Sub-floor pumps

These pumps are located in a well in the floor underneath the Hicks Hargreaves engine. The pumps are presumed to be the originals installed in 1918. The pumps were built by the Melbourne company Kelly and Lewis, founded in 1899, and the motors by the UK firm Crompton and Co. This places the motors before 1927 as Crompton merged with Parkinson in that year to become Crompton-Parkinson. The pumps are of some significance as very early examples of electric water pumps used for a major reticulated water supply system.

The pumps and motors are in very poor condition. They are heavily corroded in many areas and some of the rust appears active. Conservation treatment of the pumps would be a lengthy and expensive task and, despite their significance, the likely benefits appear minimal.

Figure 4.104: Crompton Motors with severe active rust.

Figure 4.105: Crompton Motors with severe active rust.

4.3.6 Other Items

There are a number of miscellaneous items contained within the Waterworks which are detailed in the following table.

Location	Element	Details
Waterworks Building – Appleby Engine Room	Photo Collection	Various framed images of the waterworks
	Spanner Rack and Set	Set of large non-original spanners on a rack which was original to Wagga Wagga Waterworks and donated to Goulburn in 2005 by Peter Clifford (Manager – Riverina Water Service)
	Pressure Gauges	Three non-original pressure gauges set on a timber board
	Telephone	1920s style telephone
	Clock	Mid twentieth century timber electric wall clock (not original)
Waterworks Building – Boiler Room	Miscellaneous Workshop tools	Usual array of tools dating from many periods
Waterworks Building – Northern Annex	Electrical Control Cabinet	Controlled the electric pumps
	Storage Cabinet (grey)	For storage of bearings
	Overhead Crane	For accessing the electric

Location	Element	Details
		pumps
Waterworks Building – Southern Annex	Dobie McInnes' Indicator	For monitoring pressure changes in the cylinders – of the type originally supplied by Appleby's with the beam engine (non-original)
	19th century handpump	Typical nineteenth century style water hand pump
	Pressure gauges	Various examples
	Interpretative Material	Various framed copies of letters and information boards

4.4 Associated Elements

There are various other elements associated with the Waterworks that, although outside the scope and brief of this CMP, are important to the history of the site and should be considered in future CMPs. These elements include:

- Original Appleby plans, blue prints, contracts and specifications' which require investigation and conservation;
- Marsden Weir;
- Fireman's Cottage;
- Canteen Building;
- Settling ponds and reservoirs (located off site); and
- Early examples of water pipes (held by the Goulburn Museum).

SECTION B:

Assessment of Significance

5.0 Comparative Analysis

5.1 Introduction

A comparative analysis is an examination of a place in relation to similar places. It is used to assist the assessment of significance, in particular criterion F and G as set out in the *NSW Heritage Act*; rarity and representativeness. Accordingly, this section compares the history and physical evidence of the Goulburn Waterworks with other similar waterworks to assist in establishing the site's level of rarity and representative value.

In order to compare "like-with-like" the Goulburn waterworks was compared to other NSW waterworks of a similar age and design. The following examples will be examined:

- Wagga Wagga Waterworks, NSW;
- Bathurst Waterworks, NSW; and
- Albury Waterworks, NSW.

Each of these waterworks, like Goulburn, was designed by the Colonial Architect's Office and constructed under the supervision of the Public Works Department's Harbours and Rivers Branch. The pumphouses of each site are similarly designed to accommodate four identical Appleby Beam Engines, with only small architectural difference, namely door size and placement. Goulburn was unique in having a single action pump; the other three sites originally contained double-action pumps.

5.2 Wagga Wagga Waterworks

The Wagga Wagga Waterworks is still in use today, as part of a larger water supply complex which has been extended over time, and as such as been

well maintained. However, no original equipment from the 1880s survives; today the original 1880s pumphouse contains modern electric motors and pumps. The major change which has occurred to the site, along with the loss of original pumping equipment and engines, is the removal of the 1880s boiler house and chimney, which were demolished in 1987 to allow room for an extension to the rear of the pumphouse. The Wagga Wagga Waterworks is heritage listed locally on the Wagga Wagga City Council Heritage Register.

5.3 Bathurst Waterworks

The Bathurst Waterworks, on the Macquarie River, has survived with all its 1880s buildings intact including the pumphouse, boiler room and chimney. It also retains its 1924 and 1972 additions adjacent to the pumping house. However, like the Wagga Wagga Waterworks, all 1880s machinery and equipment has been removed. The Wagga Wagga Waterworks were subject to a Conservation Management Plan in 2006, which found that the site was: "…*structurally in good condition. The joinery is in poor condition with most glass missing and the opening protected by wire mesh. This leaves spaces open to infestation by vermin and pests, particularly wasps. The original cast iron floor of the 1886 pump room is in poor condition and is protected by temporary sheeting and safety barriers."*[54]

The Bathurst Waterworks is heritage listed locally on the Bathurst Regional Council Heritage Register.

[54] Hubert Architects. July 2006. *Bathurst Waterworks Conservation Management Plan*. Unpublished report prepared in conjunction with R. Ian Jack for Bathurst Regional Council.

Figure 5.1: Bathurst Waterworks, 2006 (Image Hubert Architects).

5.4 Albury Waterworks

The Albury Waterworks retains its pumphouse, however, its Boiler Room has been removed, unsympathetic annexes have been added and all nineteenth century equipment and machinery has been removed. The building however, appears to be in reasonable condition.

The Albury Waterworks is heritage listed locally on the Albury City Council Heritage Register.

5.5 Conclusion

The Goulburn Waterworks, when compared with the three sites of similar age and design in NSW, is of high significance. The Goulburn Waterworks displays all the characteristic architectural elements and features of this design however, more importantly, it retains all its original 1880s buildings

(pumphouse, boiler room and chimney). Bathurst Waterworks is the only other site to retain all its 1880s buildings. In this regard, Goulburn Waterworks is an excellent representative example of its type.

Of exceptional significance is the retention by Goulburn Waterworks of its 1880s machinery; its boilers, Appleby Steam Engine and pump wells. None of the other sites retain these objects; rather, they are empty buildings or have been converted to house modern pumping equipment. In addition, it appears that the Appleby Beam Steam Engine is the only one of type surviving in the southern hemisphere and the Hicks Hargreaves Engine is one of only three left in the world.[55] In this regard, Goulburn Waterworks has an extremely high level of rarity.

[55] Paris, Roger. 2009. *Goulburn Waterworks Machinery*. Unpublished Report prepared for Ainsworth Heritage.

6.0 Assessment of Significance

6.1 Introduction

An assessment of significance is carried out to establish the level of importance or value that a place, site or item may have to the community. Assessments of significance are based on an understanding of a place's history, together with a physical analysis and an appreciation of the comparative level of rarity or representativeness that a site possesses. Assessments of significance in NSW assess the level to which a place demonstrates the following criteria in order to produce a statement of significance:

- Historic significance;
- Associative;
- Aesthetic;
- Social;
- Scientific/Technical;
- Rarity; and
- Representativeness.

6.2 Previous Assessments of the Goulburn Waterworks

The Statement of Significance contained in the 1996 CMP is a replica of that contained in the Register of the National Estate citation for the Waterworks (included as Appendix C). This statement of significance was prepared in 1978 and reflects the site as it was when it operated as the Marsden Steam Museum. In addition, it does not address the current statutory criteria for assessing heritage significance. Unfortunately, the 1999 citation for the site,

as part of its State Heritage Register listing, did not update the citation. Accordingly, a full heritage assessment of the Goulburn Waterworks has been undertaken for this Conservation Management Plan.

6.3 Assessment of Significance

6.3.1 Criterion A: Historic Significance

An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural or natural history of the local area)

The Goulburn Waterworks was completed in 1887 to provide Goulburn's first permanent water supply and played an important role in improving the quality of life for the town's residents. The Waterworks were constructed as part of a large program of Public Works, which occurred in the late 1800s, to provide adequate water supply to regional towns following the implementation of the *Metropolitan Water and Sewerage Act* and *Country Towns Water and Sewerage Act* in 1880. The Waterworks represent the importance of the Public Works Department (PWD) and its engineers in the 1800s and the massive funds provided for such public works. The Waterworks continued to supply water to Goulburn until 1972 when they were shut down. The site has been an important museum for steam technology since that time.

Overall level of Historic Significance: ***State***

6.3.2 Criterion B: Associative Significance

An item has a strong or special association with the life or works of a person, or a group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area)

The Waterworks are associated with a number of prominent people and organisations including James Barnett, Edward Moriarty and the Appleby Bros Engineers. Barnett, a notable Colonial Government Architect, was responsible for the design of the buildings for this site and three others in the state. In addition Edward Moriarty, Engineer-In-Chief for Harbours and River Navigation in the NSW Department of Works, a notable colonial Engineer, controlled the building of water supply schemes for Wollongong, Bathurst, Wagga Wagga, Albury, Goulburn and Hunter Valley towns. Finally, the site is associated with the Appleby Bros Engineers, a major English firm of engineers and machinery designers, who designed, provided and oversaw the installation of the Beam Engine at the site.

Overall level of Associative Significance: ***State***

6.3.3 Criterion C: Aesthetic Significance

An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW

The Goulburn Waterworks, as one of a group of four similar waterworks in NSW, demonstrates a high level of aesthetic achievement by its designer, James Barnett, and of technical achievement by its chief engineer, Edward Moriarty.

The building is a very good example of the Victorian Georgian style applied to an important civic infrastructure building, featuring characteristic elements of this style including symmetrical layout, verandah with posts resembling colonnades, a medium pitched roof, simple rectangular forms and the use of recessed brickwork which use arched openings and contrasting tuckpointed brickwork and sandstone sills. The attention to

details of the design, such as the ceiling of the Appleby Engine Room and the staircase to access the upper sections of the beam engine, illustrates the importance of civic buildings in the late 1800s.

Overall level of Aesthetic Significance: ***State***

6.3.4 Criterion D: Social Significance

An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons

The level of intactness of the Goulburn Waterworks and its retention of its 1800s engines and equipment can be attributed to a dedicated group of volunteers who have ensured, since 1958, that the site has been restored, maintained and operated. These volunteers still maintain the site and buildings, operate the machinery once a month and open the site to visitors. Additionally, historic industrial heritage enthusiasts and the general public have come to recognise the importance and significance of the Waterworks over the course of the sites operations as a museum and as such, the site holds significance for the wider community of NSW.

Overall level of Social Significance: ***State***

6.3.5 Criterion E: Scientific/Technical Significance

An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)

The Goulburn Waterworks is the most intact of all four similar waterworks in NSW, both in terms of its buildings and its machinery. In particular, its *in situ* collection of 1800s engines and pumping machinery, which is the only surviving example of its type in Australia, contribute to the immense research potential of the site. The engine is a very fine example of late nineteenth century beam engine design and construction and is aesthetically very pleasing

Overall level of Technical/Scientific Significance: ***National***

6.3.6 Criterion F: Rarity

An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)

Only four waterworks of this scale are known to have been designed by James Barnett and Edward Moriarty. The Goulburn Waterworks retains all its original buildings which are remarkably intact and generally in good condition. The Appleby beam engine is an extremely rare engine. Apart from being the only beam engine in Australia operating in its original location, it is probably also the only Appleby beam engine to survive anywhere in the world. Neither Watkins nor Crowley, both noted authorities on stationary steam engines, identify any Appleby beam engines in the UK in their publications and survivors elsewhere are unlikely. In addition, the Hicks Hargreaves engine, though not original to the site, is technologically significant artefact in its own right and is an outstanding example of the engineering skills of the late 19th century. This engine is the first type to incorporate English built Inglis-Spencer Corliss valve and is the only engine of its type in Australia, with only two similar engines by the same maker

apparently exist in Britain. The Goulburn Waterworks engine is probably the oldest operating Hick Hargreaves engine in the world and the oldest British engine to incorporate the Corliss valve gear.

Overall level of Rarity: ***National***

6.3.7 Criterion G: Representativeness

An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or environments (or the local area's cultural or natural places or environments)

Barnett and Moriarty designed waterworks' buildings similar to Goulburn at Wollongong, Wagga Wagga and Albury. The Goulburn Waterworks, retaining all its 1880s buildings in intact and good condition, is a representative example of their work and displays characteristic elements such as a symmetrical layout, verandah with posts resembling colonnades, a medium pitched roof, simple rectangular forms and the use of recessed brickwork with use arched openings and contrasting tuckpointed brickwork and sandstone sills. Due to the site retaining its machinery and pumping equipment in situ and in operation, it has the potential for extensive interpretation as an example of a late 1800s Waterworks.

Overall level of Representativeness: ***State***

6.4 Summary Statement of Significance

The Goulburn Waterworks is of state significance for its historic, associative, social, aesthetic and representative values. The Waterworks is an excellent representative example of its type and demonstrates the culmination of

steam power technology in the late 1800s and the importance of public water utilities in that era.

The building and its machinery has a strong association with several prominent engineers and architects, including James Barnett, Edward Moriarty, the Appleby Bros and, at the local level, Edward Woodhart. The building and its original machinery are generally in good condition and demonstrate a remarkable level of integrity; the original steam driven process of water supply is clearly illustrated by the buildings, machinery and other associated features. One of only four surviving waterworks of this period in the state, Goulburn is the most intact, retaining all original buildings and steam-driven machinery.

The building itself is a fine and pleasing example of its type, which demonstrates a high level of aesthetic achievement related to the Victorian Georgian style of architecture, applied in this instance to an important civic infrastructure building.

In addition, the Goulburn Waterworks is of national significance for its scientific/technical and rarity values. The Waterworks contain the only steam beam engine in Australia which is still in its original location and is functional; in addition, it appears that this particular Appleby Beam Engine is one of only a handful surviving in the world. Additionally, the Hicks Hargreaves engine, though not original to the site, is highly significant in its own right, being possibly the oldest Hicks Hargreaves engine in the world and the oldest surviving British engine to incorporate a corliss valve gear. The collection, which primarily comprises the Appleby Beam Engine, the two Galloway Boilers, the Hicks Hargreaves Engine and the 1918 electric pumps, is a highly significant collection of engineering artifacts for Australia; this significance is

enhanced greatly by the bulk of the collection being located in their original site and remaining functional.

6.5 Schedule of Significant Elements

The following table ranks the significance of the various built and movable elements identified in the physical analysis (Chapter 4).

Elements are ranked in regards to their ability to demonstrate the Waterworks' heritage significance, their condition and their level of integrity (the amount of historic fabric that they retain). Generally, the following criterion for ranking elements is as follows:

GRADING	JUSTIFICATION	STATUS
Exceptional	Rare or outstanding place or item of state and/or national significance, exhibiting a high degree of intactness or other such quality and is interpretable to a high degree, although alteration or degradation may be evident	Fulfills criteria for listing on NSW State Heritage Register
High	Featuring a high degree of original or early fabric or demonstrative of a key part of the place's significance, with a degree of alteration which does not unduly detract from that significance	Fulfills criteria for listing on NSW State Heritage Register or Local Environmental Plan
Moderate	Altered or modified elements, or elements with little historic value that will contribute to the overall significance or working of the place	Fulfills criteria for listing on a Local Environmental Plan
Low	Difficult or unable to be interpreted, not an important function, often subject to alteration, detracting from the significance of the place	Does not meet criteria
Intrusive	Damaging the site's overall significance, an aspect of the site's significance and/or	Does not meet criteria

GRADING	JUSTIFICATION	STATUS
	significant fabric	

The following table outlines the elements of significance within the Waterworks site.

Table 6.1: Schedule of Significant Built Elements

Location	Element	Significance
Waterworks Building	Original Pumphouse (Appleby Engine Room and Boiler Room)	Exceptional
	Chimney	Exceptional
	Northern Annex	High
	Southern Annex	High
Marsden Weir	Entire Weir	Exceptional
Fireman's Cottage	Entire Cottage	High
Canteen Building	Entire building	Low
Landscaping elements	Carparks, picnic areas, play equipment, entrance gates	Low

Table 6.2: Schedule of Significant Movable Heritage Items

Location	Element	Significance
Waterworks Building – Appleby Engine Room	Appleby Beam Engine	Exceptional
	Cast iron stair and access to Appleby Engine	Exceptional
	Photo Collection	High

Location	Element	Significance
	Spanner Set	Moderate
	Pressure Gauges	Moderate
	Telephone	Moderate
	Telephone	Moderate
Waterworks Building – Boiler Room	Galloway Boilers x 2	Exceptional
	Vertical Boiler	High
	Miscellaneous Workshop tools	Moderate
Waterworks Building – Northern Annex	Electric pumps in pump well	High
	Electrical Control Cabinet	Moderate
	Storage Cabinet (grey)	Low
	Overhead Crane	High
Waterworks Building – Southern Annex	Hicks Hargreaves Engine	Exceptional
	Kelly & Lewis Pumps + Crompton Motors	High
	Richard's Indicator	High
	19th century handpump	Moderate
	Pressure gauges	Moderate
	Interpretative Material	Moderate
Council records	Original Appleby plans, blueprints, contracts etc	Exceptional

SECTION C:

Management of Significance

7.0 Identification of Issues

7.1 Introduction

This chapter of the report identifies the opportunities and obligations associated with the Goulburn Waterworks. The previous chapter (Chapter 6) established that the subject site is of state and national significance; this section goes on to identify the obligations which arise from this significance, both statutory and non-statutory. It also outlines various obligations and opportunities associated with managing the site's competing interests and the condition of the buildings.

7.2 Issues Arising from Significance

This Conservation Management Plan and its Assessment of Significance has established that Goulburn Waterworks is of state and national significance. Generally, the significance of the Waterworks requires that the following general procedures are undertaken:

- The site and its machinery should be maintained and conserved;
- The machinery (the vertical boiler, Appleby Engine and Hicks Hargreaves engine) should continue to be operated once a month;
- The site should continue to operate as a museum and should remain open to the public;
- Resources for the continued conservation and repair of the engines, and to assist with the drainage issues at the site, should be sought as a priority;

- If additional buildings are required, they should be carefully located and scaled to ensure they do not impact on the relationship of the current buildings and elements;
- Intrusive elements should be removed;
- The significance, historic setting, scale and form of the Waterworks should be respected if there is development in adjacent areas; and
- The policies and procedures of this CMP should be amalgamated into the operation and management of the site.

7.3 Statutory Heritage Listings

The management of Goulburn Waterworks has to comply with the legislative implications of its listing on the NSW State Heritage Register (SHR). The relevant statutory provisions of the SHR (and its governing Heritage Act) are outlined below.

The implications of this listing are as follows:

- The NSW Heritage Council becomes the joint consent authority with the local Council (Goulburn-Mulwaree Shire Council) for proposals which may effect the site's significance – this means work cannot proceed until a permit is received from the NSW Heritage Branch;
- If proposed works may disturb an archaeological relic, an application for a Section 60 Excavation Permit will need to be made to the NSW Heritage Council; and
- An application under Section 60 of the Act must be made to the NSW Heritage Council prior to the commencement of any such works.

7.3.1 Activities Requiring Heritage Council Approval

Specifically, the Heritage Act prescribes that approval from the NSW Heritage Council is required for the following types of works:

- Demolish the building or work;
- Damage or despoil the place, precinct or land, or any part of the place, precinct or land;
- Move, damage or destroy the relic or moveable object;
- Excavate any land for the purpose of exposing or moving the relic;
- Carry out any development in relation to the land on which the building, work or relic is situated, the land that comprises the place, or land within the precinct;
- Alter the building, work, relic or moveable object;
- Display any notice or advertisement on the place, building, work, relic, moveable object or land, or in the precinct; or
- Damage or destroy any tree or other vegetation on or remove any tree or other vegetation from the place, precinct or land.

If planned works come under the scope of the above dot points, a Section 60 Application *must* be made to the NSW Heritage Branch and approved prior to works commencing.

A Statement of Heritage Impact, prepared by an experienced heritage consultant, must accompany a Section 60 Application (or in the case of an Archaeological Permit, an Archaeological Assessment, prepared by a qualified archaeologist must accompany the application). The NSW Heritage Branch

guideline *Statements of Heritage Impact* should be used as the basis of any Impact Assessment prepared for the site. [56]

Chapter 9, which contains recommended works for the site and its machinery, notes if these works trigger the permit requirements of the NSW Heritage Act, and thus the need for an Impact Assessment.

7.3.2 Standard Exemptions from Heritage Branch Approval

The NSW Heritage Council has approved a series of standard exemptions for works which do not require Heritage Branch approval. The standard exemptions are designed for works of a minor nature which do not have an adverse impact on the significance of a place in any way. These exemptions generally apply maintenance and minor works, such as:

- Building maintenance;
- Minor repairs;
- Painting;
- Safety and security;
- Landscape maintenance; and
- Meeting required minimum standards of maintenance and repair.

However, the exemptions are very specific and the Heritage Branch document *Standard Exemptions for Works Requiring Heritage Council Approval* should be checked prior to any works proceeding (for up to date versions see www.heritage.nsw.gov.au/03_index.htm).

If it appears that works are exempt under the Standard Exemptions, the site owner must notify the Director of the NSW Heritage Branch and describe the proposed changes. If the Director is satisfied that the proposed works are

[56] http://www.heritage.nsw.gov.au/docs/hm_statementsofhi.pdf

exempt, the owner will be notified and works can proceed once written confirmation is received.

Site specific standard exemptions could be included in a heritage agreement or CMP for the site. Site specific standard exemptions could include routine maintenance works and works affecting elements noted as low significance (see Chapter 9.0). Site specific standard exemptions would assist the day-to-day management of the site and as such, any recommended minor works outlined in Chapter 9 of this report are indicated as being appropriate for site specific exemptions.

In addition, Goulburn Waterworks already has site specific exemptions gazetted (approved) for the following works:

> *(1) The maintenance of any building or item on the site where maintenance means the continuous protective care of existing material.*
>
> *(2) Garden maintenance including cultivation, weed control, the repair and maintenance of existing fences, gates and garden walls, pruning and tree surgery but not extensive lopping.*[57]

7.3.3 Minimum Standards of Maintenance and Repair

Items listed on the SHR must be maintained and repaired to the minimum standards set by the NSW Heritage Branch. Fines and penalties can apply if a place listed on the SHR is not maintained to these standards. Works to meet minimum standards of maintenance and repair are covered by Standard Exemption (i.e. A Section 60 Application for approval is not required). The minimum standards of maintenance and repair relate to:

---

[57] NSW State Heritage Register – citation "Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine."

- **Weather proofing:**

  Any weather proofing components, i.e. site drainage, gutters, roofs etc must be maintained and repaired to provide a reasonable level of protection against damage or deterioration due to weather.

- **Fire protection:**

  Vegetation, rubbish etc must be removed and is not allowed to accumulate. Any fire protection components must be maintained and repaired to ensure a reasonable level of protection against fire.

- **Security:**

  Fencing or security surveillance must be installed to secure the site. Any security components, i.e. fencing, must be maintained and repaired to ensure a reasonable level of security.

- **Essential maintenance:**

  Essential maintenance, such as pest eradication, structural repairs, landscape maintenance etc. must be regularly carried out whenever necessary.

The Goulburn Waterworks is currently meeting most of these *minimum* standards of maintenance and repair, however, they are not able to fully achieve these minimum standards due to long standing poor drainage issues.

7.4 Owner Requirements

The entire site is currently owned by Goulburn-Mulwaree Shire Council. Council undertook a large program of rationalising the collections of the site and subsequently deacquistioned many objects and displays following the 1996 Conservation Management Plan. In addition, Council also undertook a program of landscape and building maintenance (such as painting, new gutters etc).

Currently, Council is aspiring to continue operating the site once a month and to ensure that it become the premier example of an eighteenth century steam powered water supply in Australia. In particular, Council requires the CMP to provide advice regarding on-going maintenance and capital works for buildings and each of the items of machinery.

7.5 Condition of the Waterworks

The Goulburn Waterworks is suffering from damp issues, which have the potential to cause large structural problems. There is a clear and urgent need for an engineer's inspection and assessment of the chimney and sub-floor areas of the buildings. Following such a report, and its recommendations, the condition of the buildings will have to be balanced with the significance of site and available funds for repair and restoration works.

7.6 Stakeholder Opportunities

The Waterworks has a high level of social significance and the local community in particular hold the site in very high esteem; voluntarily maintaining the site, the machinery and the operating the steam engines once per month. These volunteers, who require Engine Driver and Basic Boiler Certificates to operate the plant, should be applauded for the immense time they have willingly dedicated to the site.

However, attracting and training new volunteers (especially those who can operate the boiler and engines), will become a major issue for the continued operation of the site and Council should develop a strategic plan to ensure that there is always trained staff/volunteers to operate the site.

Do as much as necessary but as little as possible"[58]

8.0 Conservation Policies

8.1 Introduction

This chapter of the report outlines policies for the future management of the Goulburn Waterworks within the framework of the significance outlined in Section 6 and the obligations and opportunities outlined in Chapter 7. This chapter outlines the general conservation recommendations and policies in regards to the site's:

- General Management;
- Fabric;
- Routine Maintenance;
- Public Safety;
- Future Use; and
- Interpretation.

Generally, all conservation, restoration and future use of the Goulburn Waterworks should aim to:

- Conserve and retain the steam engines and boilers in functional and operable condition;
- The inherent "industrial" feel of the site should be maintained and efforts made to ensure that the place does not become over-sanitised, as this would detract from its original character;

[58] Australia ICOMOS. 1999. *The Australia ICOMOS Burra Charter, 1999*.

- Retain the external and internal appearance of the buildings and the inter-relationship between the buildings as evidence of the original layout of the Waterworks;
- Ensure that the buildings are maintained in good structural condition to ensure their longevity;
- Retain the Waterworks and its setting as significant elements in the Wollondilly River landscape; and
- Ensure that all machinery original to the site is kept in situ.

8.2 General Management

8.2.1 Adoption of Burra Charter

The conservation and management of the Goulburn Waterworks should be carried out in accordance with the principles of the Australia ICOMOS Burra Charter, 1999. The articles which set out the principles of the Burra Charter are reproduced as follows:[59]

Article 2. Conservation and management

2.1 Places of cultural significance should be conserved.

2.2 The aim of conservation is to retain the cultural significance of a place.

2.3 Conservation is an integral part of good management of places of cultural significance.

2.4 Places of cultural significance should be safeguarded and not put at risk or left in a vulnerable state.

Article 3. Cautious approach

3.1 Conservation is based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing

[59] ICOMOS Australia. 1999. *Australia ICOMOS Burra Charter, 1999.*

as much as necessary but as little as possible. The traces of additions, alterations and earlier treatments to the fabric of a place are evidence of its history and uses which may be part of its significance. Conservation action should assist and not impede their understanding.

3.2 *Changes to a place should not distort the physical or other evidence it provides, nor be based on conjecture.*

Article 4. Knowledge, skills and techniques

4.1 *Conservation should make use of all the knowledge, skills and disciplines which can contribute to the study and care of the place.*

4.2 *Traditional techniques and materials are preferred for the conservation of significant fabric. In some circumstances modern techniques and materials which offer substantial conservation benefits may be appropriate. The use of modern materials and techniques must be supported by firm scientific evidence or by a body of experience.*

Article 5. Values

5.1 *Conservation of a place should identify and take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others.*

8.2.2 NSW Heritage Branch Best Practice Guidelines

Qualified and experienced consultants should be involved when designing and carrying out any work. The NSW Heritage Council guidelines should be used to ensure best practice procedures for managing the site, including:

- NSW Heritage Manual (all sections);
- Salt Attack and rising damp: A guide to salt damp in historic and older buildings;
- Statements of Heritage Impact; and

- Movable Heritage Principles.

8.2.3 Adoption and HO Review/Endorsement of the CMP

The conservation and management principles contained in this Conservation Management Plan should be adopted by the site owner, presently Goulburn-Mulwaree Shire Council, for the management of the site and its contents.

In addition, it would be advantageous for Council to consider having this CMP endorsed by the NSW Heritage Council. Endorsement can be useful for complex sites faced with multiple issues and can ensure that the level of significance, conservation policies and guidelines contained in a CMP are accepted by the NSW Heritage Council as the framework for works applications.

The Heritage Council advises the following fees for reviewing/endorsing a CMP (current at January 2010):

- $2000 + GST for a desk-top review;
- $4000 + GST for a review that involves site visits; and/or
- A negotiated fee for a large or complex CMP, or where the review will involve matters additional to the usual review process.

The Heritage Council advises the following timeframes for reviewing/ endorsing a CMP (current at January 2010):

- CMP submitted for standard review: 4 – 6 weeks; and
- CMP submitted for endorsement: 4 – 6 weeks for the review (not including the time it takes for the applicant to satisfactorily address any comments), plus a further 4-6 weeks for the CMP to be considered for endorsement by the Heritage Council.

8.2.4 Internal Review of Conservation Management Plan

This report (the CMP) should be reviewed and updated every five years or when it is found that the plan is out of date, whichever is lesser. Where necessary, the review should seek to incorporate new information, new best practice heritage procedures and changes in ownership, use or the management environment and their effect on the site.

8.2.5 Distribution of Conservation Management Plan

The adopted Conservation Management Plan should be distributed to the following places:

- Goulburn-Mulwaree Council Museum Department;
- NSW Heritage Branch Library;
- Goulburn-Mulwaree Council Library – Local Studies Collection; and
- Goulburn Historical Society.

8.2.6 Training

Training of Council staff, contractors, site volunteers and other relevant persons who will be involved in the management, repair and/or day-to-day operation of the site should be undertaken to raise awareness of the Waterworks' significance, its key features and the policies and practices for the site's management.

This will assist Council with the implementation of the Conservation Management Plan – a vital, long-term step in ensuring the success of the CMP.

8.3 Fabric

8.3.1 Archival Recording of Changes

Prior to any changes which may impact on the form or fabric of the Waterworks, other than general maintenance, a full archival recording should be undertaken to document those changes in accordance with NSW Heritage Branch Guidelines. If significant and extensive changes are being made, it may warrant a full archival recording of the entire site. This will ensure that a long-term record of changes to the site is retained in a central location. Goulburn Mulwaree Council will need to ensure that archival recording is undertaken and collated as required.

8.3.2 Significance of Fabric

The majority of the Waterworks' significance is contained in the fabric of site itself. As such, most built and movable elements of the site warrant in-situ conservation and retention of as much original fabric as possible. Relatively recent additions, unsympathetic alterations and the extremely poor condition of elements designed to be easily replaceable are of a lesser significance and can be more readily replaced if necessary. The following table shows the ranking of Goulburn Waterworks elements and should be used as a guide to future works which are not covered specifically in this CMP.

SIGNIFICANCE	POLICY	STIPULATIONS
Exceptional	Retain all fabric. Like for like replacement only for items which require periodic renewal. If alteration is required for the continued functioning of the Goulburn Waterworks, minimise the changes, minimise removal/obscuring of significant fabric and give preference to changes which are reversible.	Fabric of exceptional and high significance should be conserved and maintained to retain the significance of the Goulburn Waterworks; Fabric of exceptional and high significance can only be removed and/or replaced when it is assessed to be of a poor or failing condition and would hence affect the continued significance of the Goulburn Waterworks; and If fabric of exceptional or high significance must be replaced, alterations should also not be allowed that detract from the general proportions and understanding of the site.

High	Aim to retain all fabric. Like for like replacement only for items which require periodic renewal. If alteration is required for the continued functioning of the Goulburn Waterworks, minimise the changes, minimise removal/obscuring of significant fabric and give preference to changes which are reversible.	Fabric of exceptional and high significance should be conserved and maintained to retain the significance of the Goulburn Waterworks; Fabric of exceptional and high significance can only be removed and/or replaced when it is assessed to be of a poor or failing condition and would hence affect the continued significance of the Goulburn Waterworks; and If fabric of exceptional or high significance must be replaced, alterations should also not be allowed that detract from the general proportions and understanding of the site
Moderate	Aim to retain most fabric. If adaptation is necessary, more changes are permissible than for fabric of more considerable significance. However, the same principles apply.	Fabric of a moderate and low significance can be altered or removed where it is required to conserve the significance of the Goulburn Waterworks; and Fabric of moderate and low significance should be removed and/or replaced when it is assessed to be of a poor or failing condition and would hence affect the significance of the Goulburn Waterworks.

Low	Fabric of little significance may be retained or removed as required for the future use and operation of the Goulburn Waterworks, provided its removal would not impact or cause damage to more significant fabric.	Fabric of a moderate and low significance can be altered or removed where it is required to conserve the significance of the Goulburn Waterworks; and Fabric of moderate and low significance should be removed and/or replaced when it is assessed to be of a poor or failing condition and would hence affect the significance of the Goulburn Waterworks.
Intrusive	Intrusive fabric should be removed or altered to reduce intrusion when the opportunity arises, whilst minimising damage to adjacent significant fabric.	Intrusive fabric should be actively removed when circumstances allow; and If intrusive fabric is to be replaced, the replacement should enhance the general proportions, significance and understanding of the site.

8.3.3 Removal of Fabric

- Fabric can be replaced to facilitate the public safety of the Goulburn Waterworks;
- Fabric can and should be replaced where it is assessed to be of a poor or failing condition and would hence affect the significance of the Goulburn Waterworks or would contribute to further degradation of the Goulburn Waterworks. Replacement should be "like for like."

8.3.4 Conservation of Fabric

Intervention with significant fabric of the building is allowed where necessary to guide conservation work. Such intervention can include:

- Selective removal of mortar to determine the composition of the original mortar;
- Undertaking paint scrapes to the building or machinery to determine original colour schemes;
- Taking samples of salt attack to analyse salt content levels;
- Temporary removal of fabric where an experienced conservation practitioner has advised that conservation work is most appropriately carried out in a workshop;
- Taking samples of sub-floor concrete to analyse concrete cancer;
- Removing the worn vertical rods in Appleby steam engine to investigate methods for repair; and
- Circumstances where interference is the only method of determining the original composition or configuration of original fabric and where there is a good reason to need to understand the original composition or configuration of the building or machine.

8.4 Routine Maintenance

Goulburn Mulwaree Council should continue to develop the informal working group that meets on an 'ad-hoc' basis to discuss relevant issues associated with the Waterworks site. This will assist with ensuring that routine maintenance activities are carried out in an appropriate and timely fashion. It should be noted that as owner of the site, Council has the primary responsibility for ensuring that, in conjunction with the volunteers, all maintenance and inspections are carried out regularly and safely at the site.

8.4.1 Regular Inspection

Annual inspections of the Goulburn Waterworks and regular maintenance are required – programmed, preventative maintenance for historic sites can ensure that maintenance issues are speedily dealt with before they can cause more serious issues. In addition, regular maintenance is necessary to:

- Keep the site, buildings and machinery in safe, operable condition;
- Fulfil the obligations of the NSW Heritage Act;
- Maintain the minimum standards of maintenance and repair; and
- Ensure that the site's significance is not reduced through neglect.

A recommended maintenance schedule is contained in the following chapter. This works should be carried out as a priority and should occur cyclically.

8.4.2 Recording

Before any changes through routine maintenance are made to Goulburn Waterworks, its condition should be recorded. The recording should include:

- A basic description of the condition;
- Photographs documenting the current condition of site (before and after photographs);

- Description of the changes made; and
- The condition after the changes are made.

A copy of the record should be lodged with the NSW Heritage Branch. The site owner, Goulburn-Mulwaree Shire Council, should develop a standard recording sheet for this purpose.

8.4.3 Emergency Maintenance

Emergency maintenance is work that must be done immediately for health, safety or security reasons or that may result in the rapid deterioration of the structure or fabric if not done, such as roof repairs after a storm or repairing broken glass.

Emergency works should be carried out as soon as possible by Council and should attempt to follow the policies of this CMP; however, as speed is often the essence with emergency works, the most important proviso is to undertake them quickly and make sure the changes are reversible, so that they can be made more sympathetic at a later date if necessary. It is recognised that OH&S requirements may constrain the immediacy of any emergency work. Only appropriately trained staff or volunteers may undertake works in accordance with Council's OH&S policy and procedures

8.5 Safety & Security

8.5.1 Safety

The majority of the site is safely prepared for visitors: operating machinery is fenced off and safety barriers have been erected. It is recommended that the current level of safety is adequate and that if it is considered necessary to upgrade safety measures, they should be very carefully designed to ensure

that it does not detract from the significance of the site nor detract from the inherent “working” nature of the site.

8.5.2 Security

The site’s perimeter is currently fenced with large access gates, which are locked at night. All buildings are securely locked and, in addition, the Fireman’s Cottage is currently leased as a residence to ensure that there is a regularly presence at the site.

It is recommended that the current level of site security is maintained and, due to the level of significance of the site and its contents, should not be downgraded.

8.5.3 OH&S

All work at this Goulburn Waterworks must be in accordance with Council's OH&S policies and procedures, and the NSW *Occupational Health and Safety Act, 2000.* This includes working at heights, in confined spaces and around the boiler, engines, and other machinery and plant.

8.6 Future Work

8.6.1 Alterations

It is generally recognised that the site and equipment should be conserved in its entirety, with no alterations undertaken. However, if after careful consideration and appropriate consultation, it is determined that alteration is required; the following points must be noted. Any alterations that need to be made to the buildings, site or machinery should be undertaken as follows:

- Ensure all alterations to the buildings and machinery are reversible;

- Ensure that no alterations alter the external appearance, form or scale of the buildings;
- Ensure that alterations do not impact important site lines;
- Ensure alterations to not impeded the functionality of the machinery; and
- Ensure that wherever possible, alterations enhance the heritage significance of the site and its machinery, comprise necessary structural repairs or entail conservation works.

8.6.2 New Services

New services associated with the use of the site as a museum and example water pumping station should be allowed, however, all care must be taken to minimise their impact. The following principles should be implemented when installing new services:

- Installation of new services should be undertaken to minimise the impact of the services on fabric of significance of the building and important views of the building;
- New plant for services should be located to the rear of the building (the southern elevation) where they will have minimal impact on important views of the building;
- Where possible, new penetrations for services should be located where penetrations for services have been previously been made or where earlier openings have been closed up; and
- The installation of further toilet/visitor amenities should be in a separate building located to minimize impact on the 1800s buildings (i.e. located within the car park area or to the west of the current canteen building).

8.6.3 Sympathetic Design

Designs for any future development or buildings should only be considered in order to retain the economic viability of the site and should be a last option. If they are required, they should be:

- Sympathetic to the significance of the Goulburn Waterworks;
- Should be carried out in accordance with the policies contained in this CMP;
- Should be located so that they do not impeded any important viewlines to and from the site;
- Should be located so that they do not detract on the significant relationships between elements of the site (i.e. the Pumphouse, Fireman's Cottage, Marsden's Weir etc);
- Their use should be sympathetic to the industrial function of the site and its steaming days;
- Should be designed so that they do not overpower the form and character of the existing buildings; and
- The consideration of any future development or use should involve extensive community consultation and involvement.

8.6.4 Setting

The Goulburn Waterworks is a significant element in the Wollondilly River landscape.

Development within the site or adjacent to it should respect the setting of the site (the isolated riverine setting) and the site's important viewlines. These viewlines comprise:

- From Marsden Weir to the pumphouse and vice versa;
- Viewlines between each of the buildings;

- Views from the north bank of the Wollondilly River to the pumphouse and vice versa.

8.6.5 Major Conservation/Repair Works

The buildings are currently suffering from damp issues and severe salt attack, especially in sub-surface areas and in the southern elevation. There are several parts of the building which are likely to require, in addition to further investigation, substantial repair works to ensure the structural integrity of the main Pumphouse building and its chimney. The following chapter discusses these issues and recommendations in detail; however the following policies should be applied to any major programs of conservation and repair that occur at the site:

- Major programs of conservation and repair are likely to involve substantial fabric replacement and as such, the best and most appropriate methods should be thoroughly investigated before a final methodology is proposed;
- Major programs of conservation and repair should only occur when the structural and operable integrity of the building or machinery is threatened. They should not be carried out purely as a method of "beautification";
- Original materials from the building should be re-used in the repair works before new fabric is introduced;
- Thorough investigations of original fabric should be made prior to the works occurring so that original details can be matched. This includes matching original paint schemes and finishes, replicating original mortar compositions, fabricating

replacement machinery parts "like-for-like", investigating original structural compositions etc.;

- Any replacement parts are to be clearly identified as such and the original parts preserved and retained on site;
- Major conservation and repair works should undergo detailed recording before, during and after works to ensure a through record of the pre-works condition, the works themselves and the post-works condition is made;
- Major conservation and repair works should be overseen and coordinated by a heritage consultant with specific experience in conservation programs; and
- Tradesman (i.e. stonemasons) and specialists (i.e. engineers) should have particular experience relevant to work i.e. Engineers who have worked on historic buildings and are specialists in concrete cancer should be used for the Annex pump well assessment, and consultants with specific heritage experience relating to damp and salt should be used where appropriate etc.

8.6.6 Continued Operation of the Site

It is recommended that the Waterworks continue operating as closely to possible in the original manner and that to maintain the significant historic and educational values of the site. This includes not just ensuring that steaming days continue, but that the operation of the equipment of those days should be as accurate as possible. For instance, the operation of the vertical boiler to produce steam for the engines should be continued via the wood fired method. The consideration of other steam generating measures,

such as a gas fired boiler, air compressor or other means, must only be considered after all other alternatives to maintain the operation of the wood-fired boiler have been exhausted, and only after extensive consultation with all stakeholders.

8.7 Interpretation

8.7.1 On-Site Interpretation

The Goulburn Waterworks has an exceptional level of significance; however, this significance is not adequately interpreted at the site. Heritage interpretation should be incorporated more readily into the site. Whilst a Heritage Interpretation Plan for the site would be useful to assist with developing on-site interpretation, other interim measures could include:

- Inclusion of more historical information on the Waterworks' website;
- Inclusion of the CMP on the Waterworks' Website;
- Continuation of the public steaming days;
- On-site brochures detailing the history and significance of the site.

Permanent on site interpretation of the site, its history, its significance and its highly significant collections (machinery) should be developed via a Heritage Interpretation Plan when funds are available. This plan ensures a consistency to both the interpretative information and its presentation, in order to provide a greater level of professionalism and relevance to the site's interpretation.

8.7.2 Future interpretation – Collections Policy

From time to time the Goulburn Waterworks may be offered items of movable heritage that could be considered useful to the site, its interpretation and educational value. Goulburn Mulwaree Council should develop a collection

policy (with associated forms) for determining when, how and if an item should be accepted, and, if so, for ensuring that all details and provenance records are recorded.

8.8 Stakeholders & Volunteers

8.8.1 Relationship with Stakeholders

Goulburn-Mulwaree Shire Council should ensure that all relevant stakeholders are apprised of development and proposed works at the Goulburn Waterworks and have the opportunity to be involved, under supervision, if they so desire.

8.8.2 Continued Training of Volunteers

The volunteers should undergo training in this CMP and its implications, especially with regards to the policies and recommendations contained in Chapter 7, 8 and 9 of the report.

Goulburn-Mulwaree Shire Council should also develop a strategic plan to ensure that there are skilled and trained volunteers or Council staff to operate, maintain and service the historic machinery (especially with regards to the engine drivers and boiler license). The availability of such skills is rapidly diminishing and the earlier that Council develops and implements a strategy to counteract this, the easier it will be to operate the machinery in the long-term. For instance, Council, as part of this strategy, could consider engaging apprentices or other secondary or tertiary students to be involved in the technical side of the Waterworks.

The development and implementation of such as strategy should be undertaken as a priority.

8.8.3 Management of Volunteers

The volunteers currently develop their own maintenance and works schedules, often under the supervision of Ken Ainsworth, however this scheduling is often unsupervised. This unclear decision-making process at the site can inadvertently lead to decisions that may diminish the heritage value of some items and built elements.

To ensure that this inadvertent result is not continued, a clear management structure needs to be put in place and implemented at the site. To assist with the day-to-day operation of the site and to ease the bureaucratic burden on volunteers, it is recommended that the cyclical maintenance schedules contained in the following chapter, with their accompanying "do's and don'ts" checklists, be pre-approved by Council for the volunteers to implement. However, should the volunteers wish to undertake any work outside the scope of those schedules, approval from Council (to ensure that the works proposed are in accordance with the CMP) will be necessary.

No work, maintenance or otherwise, can be carried out without prior and explicit approval from Goulburn Mulwaree Council.

Any works should be checked, documented and supervised by an appropriate specialist conservator with technical or historical knowledge on steam machinery.

8.8.4 Authority for Decision Making

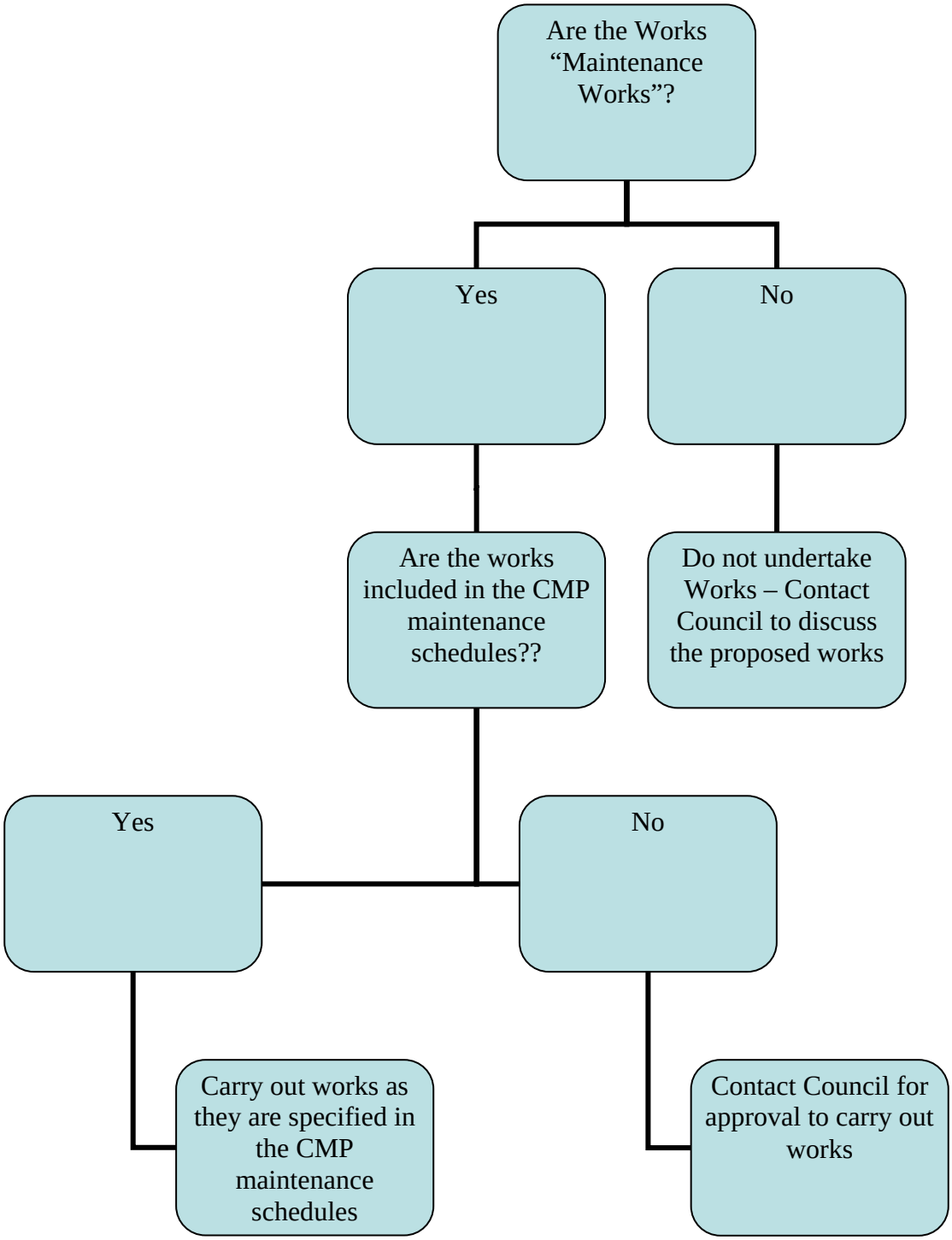
Goulburn Mulwaree Council (in conjunction with the NSW Heritage Branch and the NSW Powerhouse Museum as required) is the determining body for all decisions relating to building and machinery maintenance, repairs and displays that are undertaken at the Waterworks, as highlighted in other

sections of this document. In relation to any inconsistencies that may be found in this document, Goulburn Mulwaree Council (in conjunction with relevant experts as necessary) is to be considered the primary authority with respect to any activity at the Waterworks.

For maintenance works, no maintenance work is to be undertaken which involves modification or replacement of any element without a written treatment proposal which has been approved by Council. Agreement to proceed may only occur after approval by authorised persons, which may include relevant consulting engineers and the Powerhouse Museum. This work, however minor, must first be formalised with a written treatment proposal followed by consultation with the consultative group. Written authorisation must be received before proceeding.

The following flow-chart can be used to illustrate this approval process.

Flowchart 1: Works Process for Volunteers



8.9 Indigenous Heritage

The *National Parks & Wildlife Act, 1974* (NPW Act) provides statutory protection to all Aboriginal objects or sites within NSW. Under the Act, Aboriginal objects (also referred to as 'Aboriginal sites', 'relics' or 'cultural material') are physical evidence of the use of an area by Aboriginal people. They can include:

- Physical objects, such as stone tools, Aboriginal-built fences and stockyards, scarred trees and the remains of fringe camps;
- Material deposited on the land, such as middens; and
- The ancestral remains of Aboriginal people.[60]

The NPW Act protects all Aboriginal objects and Aboriginal places in NSW. It is an offence to disturb, move, excavate, knowingly destroy/damage/deface, or cause the destruction/damage/defacement of an aboriginal object or place without the permission of Department of the Environment Climate Change and Water (DECCW) Cultural and Heritage Division.

Several stone artifacts were discovered at the site when the carparking area was constructed; these were relocated by the local Aboriginal group into a cairn on the western edge of the carpark. Although an Aboriginal Assessment of the site has not been undertaken, the discovery of these artefacts and the riverine environment indicates that there is potential for other artefacts/Aboriginal archaeology to exist.

As such, should any items of Aboriginal significance be located during activities or works, work should immediately cease and the archaeologists at the DECCW Cultural and Heritage Division should be contacted.

[60] National Parks & Wildlife Act, 1974

9.0 Maintenance, Restoration and Re-use

9.1 Introduction

This chapter of the report outlines the requirements and procedures for the maintenance, stabilisation, restoration and use of the Goulburn Waterworks. This chapter provides specific requirements and needs as well as recommended schedules works. Goulburn Mulwaree Council, as owner of the site, is primarily responsible for overseeing maintenance and restoration of the site. Any actions undertaken however should only be carried out in conjunction with specialists and the volunteers

The costings provided in this chapter are indicative only; they are broad estimates based on current knowledge of the site and may change drastically following more detailed assessments, such as engineers assessments etc.

It is imperative for the conservation of the Waterworks that Goulburn Mulwaree Council continue to allocate funding to allow basic maintenance of the site. Without this, the existing issues and problems affecting the site may progress until further extensive and costly repairs are required. Funding for the major repairs and capital works should be budgeted for annually. The scale of works required at the Waterworks may be outside the capability of existing Council budgets; in these instances funding from appropriate sources should be applied for annually to ensure that the major works can be carried out.'

9.2 Urgent Works

9.2.1 Works Related to Damp Issues

There are several issues at the site, all related to damp, which may be causing large structural problems for the buildings. In order to properly diagnose these issues (causes, extent, remediation options), unfortunately further assessment is required.

The building, particularly the Chimney and sub-surface areas beneath the Appleby Engine Room and the Southern Annex, are showing extensive signs of advanced salt attack, concrete cancer and timber rot. It is, however, especially important and fundamental when treating damp issues to correctly diagnose the cause of the damp before deciding in remediation methods; otherwise even more damage can occur in the long-term.[61] Although the Condition Assessment in Chapter 4 attempted a broad diagnosis, the extent and severity of the issues combined with the limited scope of the CMP all strongly indicate a situation where specialist expertise is required to undertake a detailed analysis, assessment and review of remediation options for the following elements:

- Exterior brick and stone work of the building, which is suffering from moderate salt attack, particularly on the exterior of the southern elevation and chimney;
- Interior of the chimney and tunnel, which is suffering from extensive and advanced salt attack which is likely to cause major issues with the chimney's structural integrity;

[61] David Young, 2008, for Heritage Council of NSW, Heritage Victoria, South Australian Department for Environment and Heritage Adelaide City Council. *Salt Attack and Rising Damp: A guide to salt damp in Historic and Older Buildings*.

- Southern Annex sub-floor (pumpwell) area, which is suffering extensive damp problems (timber rot, severe rusting of iron elements and salt attack) as well as concrete cancer which is likely to cause major issues with the chimney's structural integrity, especially as this pumpwell supports 17 tonnes of machinery above it; and
- Appleby Engine Sub-Floor, which is suffering from moderate-advanced salt attack which could over time cause major issues with the building's structural integrity;
- Site drainage and levels across the site need to be inspected to identify drainage and grading needs and specifications.

It is recommended that several specialists be commissioned to undertake such a report as a priority. These specialists should include:

- A heritage consultant with specific expertise and specialisation in treating damp and salt attack in historic buildings;[62]
- An engineer with specific expertise and specialisation in diagnosing structural remedies for heritage buildings, in particular masonry and concrete buildings;
- Drainage specialist to design a drainage system to keep water away from the buildings, in particular the southern elevations of the building.

Until major drainage issues are resolved, regular removal of water from the Southern Annex pumpwell should be carried out. This could be by means of a small 'sump pump' to remove the water to the exterior of the building.

[62] See page 30 of the document *Salt Attack and Rising Damp: A guide to salt damp in Historic and Older Buildings* by David Young for advice regarding such assessments.

9.2.2 Other Urgent Works

The vertical boiler may require re-tubing in the nest several years; an inspection should be a specialist experienced with historic boilers should be carried out to determine if re-tubing is necessary. The successful operation of the boiler is integral to the operation of the site as a whole.

9.3 Maintenance Works

Maintenance comprises routine, cyclical, non-destructive actions necessary to slow the deterioration of a historic place, such as periodic inspection, routine cyclical non-destructive cleaning, minor repairs and replacement of damaged or deteriorated materials that are impractical to save.

All buildings eventually decay due to sunlight, rain, wind and general 'wear and tear' and therefore they require continual attention if their condition is to be maintained. Modest annual spending on regular maintenance can reduce the need for costly repairs, protect the fabric of a heritage building and save money in the longer term.[63]

Under the provisions of the NSW Heritage Act, the site is required to be maintained to minimum standards of maintenance and repair. Routine maintenance work is exempt from Heritage Council Approval and as such, only notification is required for these works.

9.3.1 Weekly Maintenance Works

The following maintenance works should occur on a weekly basis by the volunteers.

---

[63] Province of Manitoba. 1999. *Heritage Building Maintenance Manual.*

- Undertake any emergency works, if necessary, such as replacing broken windows, replacing broken light bulbs, rectifying storm damage etc.;
- Clear the site and buildings of litter and vegetation (i.e. leaves);
- Check general cleanliness – clean where necessary i.e. dusting, sweeping etc.; and
- Ensure that no locks or windows have been tampered with – rectify if necessary.

9.3.2 Annual Cyclical Maintenance

Table 9.1: Cyclical Maintenance Schedule

Area	Element	Maintenance	Timing
Entire Site	Perimeter Fences	• Check condition of fencing – ensure any fence breaks, missing posts etc. are repaired and replaced; • Ensure all locks are working; and • Square and brace gates if they have dropped.	• Bi-Annually
	Roads	• Check condition of roads and grade if necessary.	• Annually
	Site Signs	• Check all site signs and ensure they are not weathering and are securely fastened. Replace if illegible.	• Annually
	Lawns	• Ensure lawns are slashed	• Bi-Monthly
	Landscaping	• Remove weeds in garden beds; • Ensure garden beds are not flush with building walls – remove if they are; and • Ensure no tree branches are over-hanging buildings or cables – remove if they are.	• Quarterly
	Storm water services	• Inspect for dish drains and sumps clear any rubbish, leaves or silt; • Check if water lies in sumps as this can indicate a total or partial blockage or inadequate fall in line; • Ensure hose taps discharge into gullies and ensure gullies and sump gratings are operable, not damaged and sit square; and • Check whether storm water drains into the sewer system.	• Bi-Annually
	Water	• Inspect taps for drips and ease of operation.	• Annually

Area	Element	Maintenance	Timing
	services	• Ensure taps and surface-run pipes secured to walls or supports; • Look for wet areas within the property grounds and gardens during dry periods – this can indicate a broken pipe. Investigate and fix as necessary.	
Pumphouse Building	Windows	• Inspect for loose or damaged moldings, architraves, decayed stiles at sill level, weathered sills, sashes that bind, noisy pulley wheels that need to be oiled and sash cords that are decayed or broken; • Inspect for loose or decayed sash joints and broken or cracked glass or putt; • Check internal faces around windows for stains that can indicate failed flashings; and • Clean glass every 6 months with a soft cloth and water with a dash of methylated spirits or vinegar. Polish with a clean chamois, paper towel or newspaper.	• Clean glass bi-annually; • Inspect annually; • Repaint as required after regular inspections and only after consultation with specialist or heritage consultant and with regard to relevant Acts and Charters. Undertake paint sampling to determine original paint colurs if required.
	Doors	• Inspect for loose jambs, decay at the threshold or damage from locks being forced; • Ensure that mouldings or stops are secure and that the doors operate satisfactorily?; • Check if the door requires a stop to prevent damage to the door or walls when opened; • Oil hinges every 1-2 years; • Tighten screws to hinges and locks as necessary; and • Use graphite to ease lock mechanisms as necessary. Do not oil locks.	• Annually
	Floors	• Re-sand and polish timber floors every 5 years;	• Inspect annually;

Area	Element	Maintenance	Timing
		• Regularly check the under floor spaces for fungal rot, borer and termite activity, as they are associated with high humidity, and hence high moisture levels, in adjacent masonry.	• Re-sand and polish every 5 years.
	Stonework	• Inspect for loose, fretted, broken or missing mortar joints to stones around windows, doors, along flashings and on cornices and other projections; • Check if the stone is crumbling or has surface salts; this can indicate a moisture problem; • Inspect for growth of algae and plants and remove if present; • Check for damage to pointing – make sure a log is kept of failed areas; • Check for water damage; and • Annually, replace any failed mortar using the same mortar mix as the original.	• Annually
	Brickwork	• Inspect for loose, fretted, broken or missing mortar joints to all bricks externally; • Internally, check for bubbling or cracked paint – this can indicate a damp problem; • Inspect for growth of algae and plants and remove if present; • Check if the brick is crumbling or has surface salts; this can indicate a moisture problem; • Check for damage to pointing – make sure a log is kept of failed areas; • Check for water damage; and • Annually, replace any failed mortar using the same mortar mix as the	• Annually

Area	Element	Maintenance	Timing
		original.	
	Paintwork	• Check condition of external paintwork for bubbling, cracking, fading or weathering; and • Repaint every 5 years.	• Inspect annually; • Repaint as required after regular inspections and only after consultation with specialist or heritage consultant and with regard to relevant Acts and Charters. Undertake paint sampling to determine original paint colours if required
	Eaves	• Repair and replace bird proofing where necessary; • Inspect for any animal nests and remove, such as hornets nests, bird nests etc; • Inspect for paint failure and/or decay to linings. This can indicate roof covering failure.	• Annually
	Corrugated Roof Covering	• Check condition of corrugated sheeting for loose screws, surface rust etc; • Repair (replace only if absolutely necessary) damaged and corroding sheets to ensure waterproofing; and • Check condition of flashing, for evidence of corrosion and to ensure they are properly dressed down.	• Annually
	Roof Drainage	• Clean guttering, sumps and rainwater heads of debris and leaf litter;	• Fortnightly in Autumn • Monthly for the rest of the year

Area	Element	Maintenance	Timing
		• Check condition of gutters and downpipes – make sure there are no leaks or corroded areas; • Inspect gutter and downpipe joints for cracks – if there are drips to the underside, repair immediately; • Replace/repair any loose or broken fastenings/brackets; • Check that storm water drains are clear and flowing; and • Ideally, roof drainage should be inspected during periods of heavy rain so that overflows and other failures can be identified and to check that there are enough downpipes, and that gutters and downpipes of sufficient size.	• Annually
	Ceiling	• Inspect the Appleby Engine Room for signs of water penetration, loose boards, mould etc; • Re-secure any loose boards in the Appleby Engine Room; • Re-varnish the Appleby Engine Room ceiling boards every 10 years; and • Inspect trusses in all ceilings for signs of rust, rot, damage or bending/warping (if the latter occurs, organize an Engineer's Inspection).	• Inspect Annually; • Re-varnish every 10 years.
	Safety & Security	• Ensure there are no trip hazards; • Replace smoke alarm batteries; • Ensure all external locks are in good working order; • Ensure that all building keys are still assigned to the correct people and superfluous keys have been returned; and • Ensure the site OH&S manual is up-to-date and all volunteers, staff and contractors have been trained/inducted.	• Annually

Area	Element	Maintenance	Timing
	Damp issues	• Inspect the buildings, internally and externally, for signs of damp issues (cracking and bubbling paint, leaking downpipes, algae growth on buildings, salt attack ('white' areas on bricks and stonework); and • Keep a log of inspections so that the rate of decay can be tracked.	• Bi-Annually
	Pests	• Inspect exterior and interior spaces for nesting of birds and insects - remove as necessary; and • Organise a, accredited pest inspection.	• Bi-Annually
	Southern Annex Sub Floor	• Regular removal of water from the pumpwell should be carried out. This could be by means of a small 'sump pump' installed to remove the water to the exterior of the building. This should continue until drainage problems at the site are revolved.	• Ad hoc basis, on inspection after moderate to heavy rainfall.
Appleby Beam Engine		• Inspect annually for excessive wear and tear on parts; and • Re-paint the engine every 5 years (initially take paint samples to determine original paint scheme).	• Inspect annually; • Repaint as required after regular inspections and only after consultation with specialist or heritage consultant and with regard to relevant Acts and Charters. Undertake paint sampling to determine original paint colours if required.
Hicks Hargreaves Engine		• Inspect annually for excessive wear and tear on parts; and • Re-paint engine every 5 years (initially take paint samples to determine original paint scheme).	• Inspect annually; • Repaint as required after regular inspections and only after consultation with specialist or

Area	Element	Maintenance	Timing
			heritage consultant and with regard to relevant Acts and Charters. Undertake paint sampling to determine original paint colours if required.
Galloway Boilers		• Some ashes remain in the flues, probably from the last firings in the 1930s. These should be removed by vacuuming as ashes often contain sulphur compounds and tend to absorb moisture. Together these can form sulphuric acid which is highly corrosive; • Ensure good air circulation is be maintained in the boilers by not sealing them; • After prolonged spells of wet weather it may be beneficial to use fans to increase circulation through the flues; and • Re-paint boilers every 5 years (initially take paint samples to determine original paint scheme).	• Inspect annually; • Repaint as required after regular inspections and only after consultation with specialist or heritage consultant and with regard to relevant Acts and Charters. Undertake paint sampling to determine original paint colours if required.
Vertical Boiler		• Inspect and maintain in accordance with the Boiler License requirements.	• Bi-annually
Electric Pumps - Northern Annex		• Annually clean with white spirit and a wipe over with an oily rag; • Do not paint unpainted pieces; and • Repaint painted pieces every 5 years.	• Clean bi-annually
Miscellaneous Items		• All miscellaneous items (framed photos, spanners, gauges etc) are in good condition; • Dust and clean items bi-annually; • Inspect annually for signs of deterioration in condition.	• Clean bi-annually; • Inspect Annually.

9.3.3 Activities to Avoid

When undertaking site maintenance, the following activities should be avoided:

- Planting trees near buildings;
- Allowing vehicles to park adjacent to buildings;
- Hosing leaves and debris into downpipe outlets or into storm water pits;
- Placing ladders or leaning objects onto soft copper or stainless steel gutters;
- Covering wall ventilators and damp-proof courses with soil or rubbish;
- Building up garden beds over damp-proof courses, planting close to walls or continual watering of walls;
- Applying anti-graffiti or protective coatings to stonework whose effectiveness has not been proven;
- Inappropriate cleaning of masonry, for example, strong water jet cleaning or detergents that can damage the masonry;
- Restricting fire exits with storage items;
- Installing fans or air-conditioners in windows;
- Replacing hardware not in keeping with the building;
- Painting surfaces never intended for painting, such as stone or face brick, or unpainted machinery;
- Using inappropriate paint colours;
- Installing one-way glass when carrying out glazing repairs;
- Excessive exposure to original lead-based paint;
- Storing materials externally rather than in buildings or storage spaces;
- Haphazard and uncoordinated installation of interpretation signs;

- Cleaning tubes in vertical boiler – these tubes are only to be cleaned after consultation with head engineer and as per other requirements (notifications etc) in this document;
- Inappropriate repairs and maintenance without authority, explicit permission from Goulburn Council and consultation with consent bodies; and
- Introduction of inappropriate materials, over-polishing, modification of components to simplify or aid working use, drilling or other intrusion into building fabric for hanging of signage or storage etc, over embellishment or sanitisation of engines or buildings, use of inappropriate representative equipment, or additional building work on the site.

9.4 Capital Works

Funding for the major repairs and capital works should be budgeted for annually. The scale of works required at the Waterworks may be outside the capability of existing Council budgets; however, funding from appropriate sources should be applied for to ensure that the major works can be carried out.

Regular sources of funding include:

- NSW Heritage Branch (State); and
- Department of Environment, Water, Heritage and the Arts (Federal).

9.4.1 Capital Works Schedules

Issues	Location	Element	Details	Priority	Estimated Cost
Damp issues and salt attack	Pumphouse	Exterior brick & stonework; Chimney; Southern elevation; Sub-floor areas	Commission further assessment, as detailed in 9.2	Urgent, High Priority	Estimated cost for report, including input from Engineer, heritage specialist and drainage

Issues	Location	Element	Details	Priority	Estimated Cost
Site Drainage	Entire Site	Entire site surrounding Pumphouse	Commission further assessment, as detailed in 9.2	Urgent, High Priority	specialist is $25,000 – $35,000**
Re-pointing brickwork	Pumphouse	Exterior of Pumphouse & chimney: in all areas where mortar is failing and also where concrete mortar has been used	Investigate original composition of mortar so it can be replicated; Ensure that colour of original mortar is matched; Ensure that good visual results are achieved by replacing mortar in visual blocks (i.e. between architectural features such as windows); Re-point all failing mortar joints; and Remove any concrete mortar and replace.	Moderate	$750-$1,110 per day (averaging 5 square metres/day). The amount of re-pointing will depend on the method chosen, i.e which visual blocks are chosen.
Appleby Engine	Appleby Engine	Valve gear rods (the valve gear controls	The job will be time consuming, demanding, complex and expensive. The	Moderate – should be	$45,000 – $50,000

Issues	Location	Element	Details	Priority	Estimated Cost
	Room	in the inlet and outlet of steam to the cylinders).	whole valve gear will have to be disassembled. Whilst some components can probably be re-machined, others will need to be replaced by newly manufactured replicas. Work to be carried out by appropriately qualified external contractors only . The work done should be thoroughly documented and any replica components identified as such and dated.	addressed within the next 24 months	
Hicks Hargreaves Engine	Southern Annex	Wheel bearing	Adjust and realign bearing on Hick Hargreaves engine and check and adjust level of fly wheel shaft. Investigate scored piston rod and leaking glands.	Low – within next 2 to 3 years	$3,000 – $5,000
Interpretation	Entire Site	Interpretation Plan	Commission an Interpretation Plan for the	Low – within	$15,000 – $20,000

Issues	Location	Element	Details	Priority	Estimated Cost
			entire site so that consistency is achieved across the site in its interpretative material and so that the site's significance is adequately reflected.	next 2-3 years	
Vertical boiler	Boiler House	Tubes	Re-tubing may be necessary due to the age of the boiler and deterioration by town water. An engineer inspection is required to determine if re-tubing is necessary. Modification of water supply to enable rain water, not town water, to be main source of water used in the boiler should be implemented.	Moderate - within next 1-2 years	$5,000

*** This cost is for the assessment and development of remediation options only. It does not include the actual cost of any on-site remediation works however it should include costings for the recommended options.*

10.0 Bibliography

Australian Dictionary of Biography, Online Edition. Moriarty, Edward Orpen. http://adbonline.anu.edu.au/biogs/A050528b.htm.

Australia ICOMOS. 2005. *The Australia ICOMOS Burra Charter.*

Chamberlain, Brian. 1998. *Goulburn's Water Storage System.* Unpublished research paper held by Goulburn Mulwaree Council.

Clark, W. 1877. *Report to the Government of New South Wales on the Supply of Water for the Town of Goulburn.* Government Printer, Sydney.

Fellows of the Australian Academy of Technological Sciences and Engineering. 2001. *Technology in Australia 1788 – 1988. A condensed history of Australian technological innovation and adaptation during the first two hundred years* (online version). Australian Academy of Technological Sciences and Engineering.

Garry Dutaillis & Associates Pty.Ltd. 1996. *Goulburn Waterworks Conservation Management Plan.* Unpublished report prepared for Goulburn Council.

Hawkins, N. 1903. *Maxims and Instructions for the Boiler Room*. Theo Audel & Co, New York.

Hubert Architects. July 2006. *Bathurst Waterworks Conservation Management Plan*. Unpublished report prepared in conjunction with R. Ian Jack for Bathurst Regional Council.

NSW Heritage Act, 1977.

NSW Registry of Births, Deaths and Marriages. http://www.bdm.nsw.gov.au/.

NSW State Heritage Register. *Citation: Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine.*

Paris, Roger. 2009. *Goulburn Waterworks Machinery*. Unpublished Report prepared for Ainsworth Heritage.
Register of the National Estate. *Citation: Goulburn Steam Museum.*

Sydney Morning Herald. 27 March 1882. Page 7. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply

Sydney Morning Herald. 24 September 1887. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply

Sydney Morning Herald. 1895. Page 7. Accessed via http://trove.nla.gov.au/result?q=goulburn+water+supply

Tudsbery, J H T (ed), 1902. Obituary – Frank James Appleby. *Minutes and Proceedings of The Institution of Civil Engineers; with other selected and abstracted papers. Vol CXLVII.* The Institution, London

Tudsbery, J H T (ed), 1908. Obituary – Charles James Appleby. *Minutes and Proceedings of The Institution of Civil Engineers; with other selected and abstracted papers. Vol CLXXII.* The Institution, London.

Wikipedia. *Compound Engines*.
http://en.wikipedia.org/wiki/Compound_engine

Woodhart, Rv Norman. 1983. *The Goulburn Waterworks 18883-1922.* Unpublished manuscript held by Goulburn-Mulwaree Regional Council.

Young, David. 2008. *Salt Attack and Rising Damp: A guide to salt damp in Historic and Older Buildings.* Published for Heritage Council of NSW, Heritage Victoria, South Australian Department for Environment and Heritage Adelaide City Council.

Websites

Google Books http://www.archive.org/details/applebysillustr10applgoog
NZ Cranes, http://www.nzcranes.org/MANUFACT.HTML#appleby.
Ancestors of Marc Hillman
http://users.tpg.com.au/users/mhillman/hillman/f31.htm

11.0 Appendices

Appendix A Project Brief

GOULBURN MULWAREE COUNCIL

Civic Centre 184-194 Bourke Street Goulburn NSW
Telephone: (02) 4823 4444 • Facsimile: (02) 4823 4456 • www.goulburn.nsw.gov.au
Correspondence to: Goulburn Mulwaree Council Locked Bag 22 Goulburn NSW 2580

2-3 weeks for fee proposal.

Contact: Jason Moroney
Reference: GOULBURN HISTORIC WATERWORKS

* 1996 - Conservation Mgmt Plan - Dutallis & Assoc's Architects (Site diff't now to then)

[redacted]

* 5 EOIs invited + Dept Commerce

* Timeframes: Has to be completed & invcd by end Sept '09.

*main issue is to ensure that it is a mgmt plan. Update hist & descrip'n only, then focus on mgmt end of policy.

23rd April 2009

Att: Matt Alexander
Ainsworth Heritage
PO Box 385
Billinudgel
NSW 2483

Dear Matt

Subject: Goulburn Historic Waterworks- conservation plan

Goulburn Mulwaree Council has allocated funding to the development of a 'Conservation Management Plan' for the Goulburn Historic Waterworks.

Your company is invited to quote on the preparation of this plan, as described below.

The Waterworks is situated on the Wollondilly River, at Marsden Weir Goulburn and is the original site of Goulburn's water supply scheme. The site comprises buildings and steam engine dating from the 1880's.

The main items of concern are:

- 1883 pump house comprising pump rooms, boiler room and annex's (1880's)
- Chimney (1885)
- Galloway boilers (1883)
- Appleby Beam engine (1883)
- Hicks Hargrave engine (1864-not original to site- installed on-site in 1970)

There have been several plans prepared in the past, which provide a level of information on the management required at the site. However it has been determined that it is now time to review and update this information into a current and useful management plan.

We would require the successful applicant to prepare a plan that meets the following aims:

- Develop a current conservation management plan that covers:
  - The Pumphouse & boiler building & chimney including
    - List actions required to ensure restoration and conservation to all parts of the building and chimney including (internally) floor and sub floor areas, walls, ceiling and (externally) chimney, sandstone features and brick work and other fixtures
  - Steam engines and boilers including
    - List mechanical repairs and restoration required to ensure continued safe operation and use of the engines, boilers, engine foundations and old boilers and other infrastructure
    - List suggested on-going management requirements

GOULBURN MULWAREE COUNCIL

Civic Centre 184-194 Bourke Street Goulburn NSW
Telephone: (02) 4823 4444 • Facsimile: (02) 4823 4456 • www.goulburn.nsw.gov.au
Correspondence to: Goulburn Mulwaree Council Locked Bag 22 Goulburn NSW 2580

- Information from the engineers who currently manage the steam engines will be available

- Is concise and user friendly
- Provides a list of prioritised actions
- Provides a proposed schedule of works
- Provides estimated costs for each action.
- Detailed information on the history or description of the site is not required. However, updates to the existing information, gained as a result of this project, should be included.
- Plan to be consistent with any requirements or criteria for this type of work as set by the Heritage Branch of the NSW Department of Planning (www.heritage.nsw.gov.au)

Council has allocated $15000 to this project; quotes above this amount are not able to be considered.

We invite you to contact Council via the details below to discuss this project further:

Primary contact:
Jason Moroney
Parks Technical Officer
Phone 48234 473
Email: jason.moroney@goulburn.nsw.gov.au

Secondary contact:
Julianne Salway
Museums Officer (Mon-Wed)
Phone 48234 448
Email: julianne.salway@goulburn.nsw.gov.au

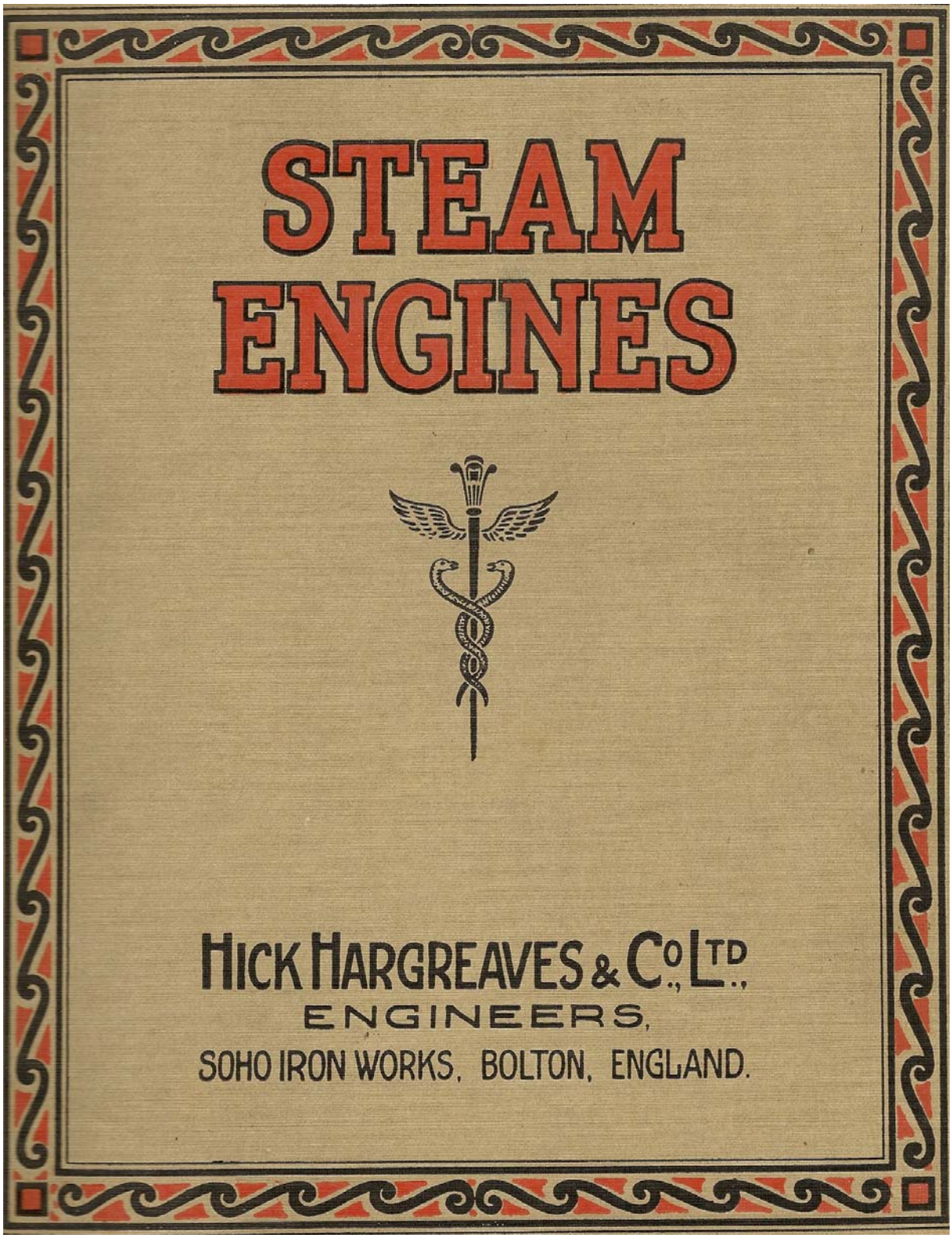
Attached is some brief information and photos that may assist you. We look forward to your reply.

Yours faithfully

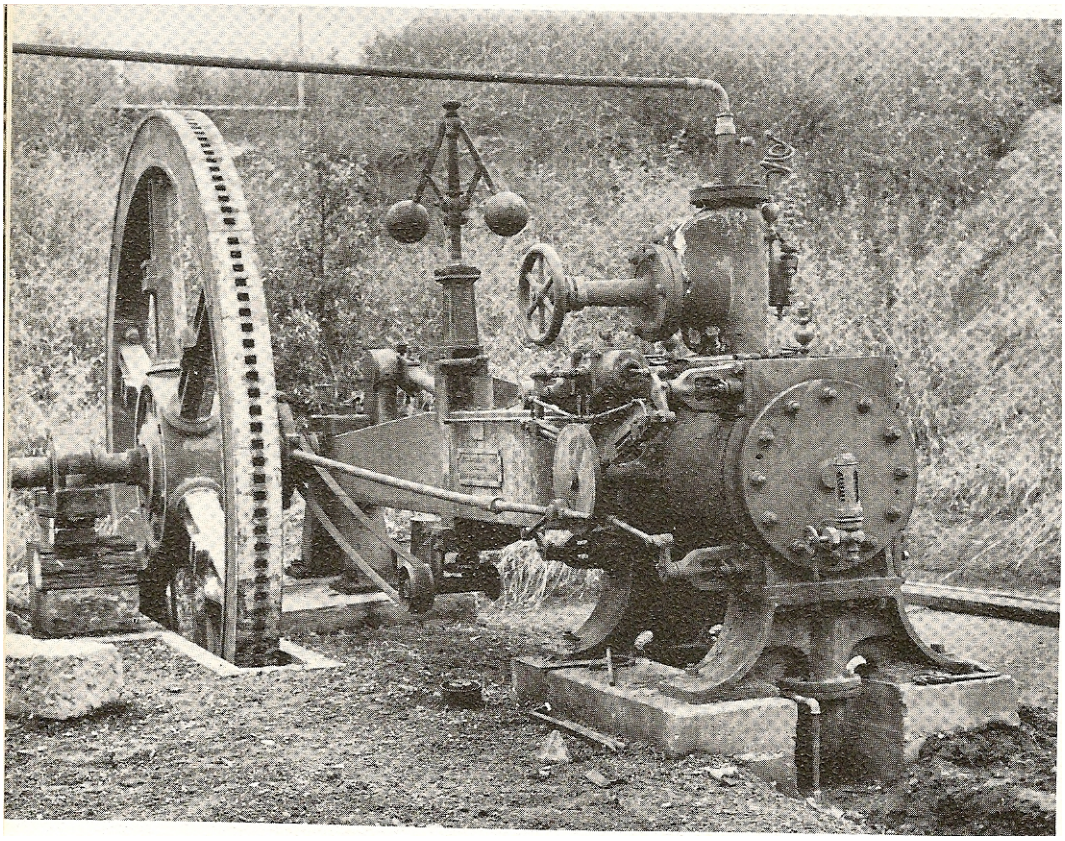
Jason Moroney
Parks Technical Officer

* Hard copy x 1
x digital report PDF.

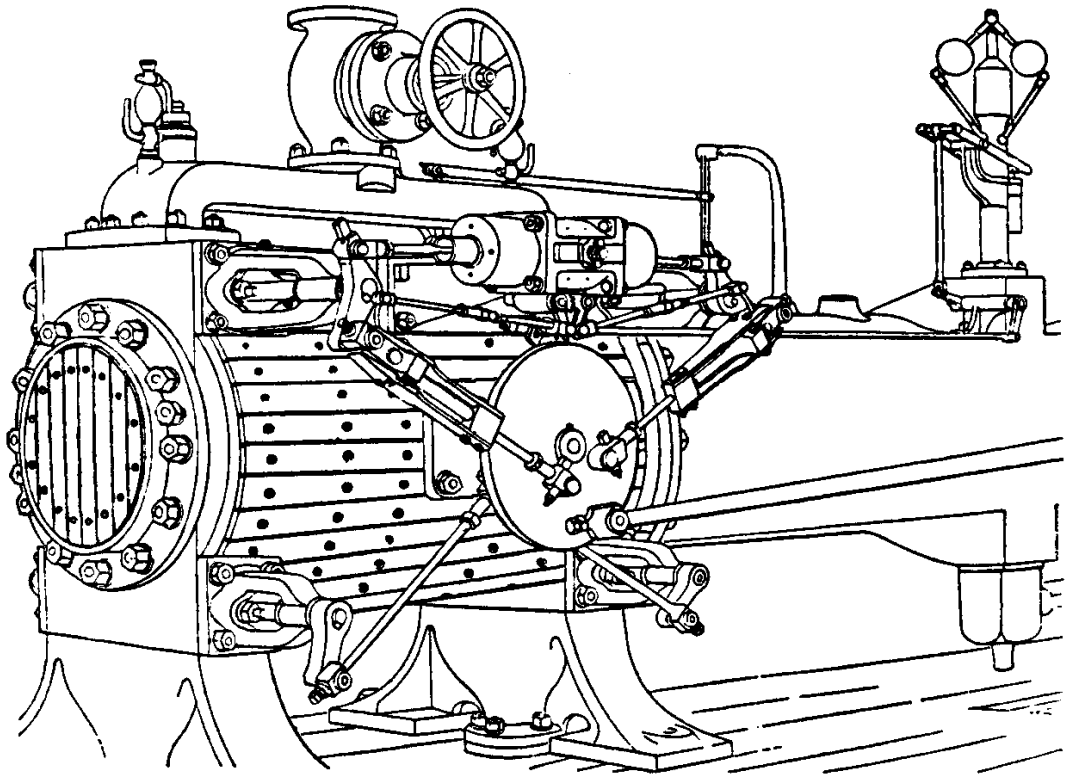
Appendix B Hicks Hargreaves Engine



Hick Hargreaves & Co. Was founded in 1833 by Benjamin Hick a close friend of James Naesmyth under the name Benjamin Hick & Son. In 1842 following the death of Benjamin the business was taken over by his son John who then went into partnership with William Hargreaves. The company became Hick Hargreaves & Co. Ltd. from around 1850



Hick Hargreaves Horizontal Mill Engine when first installed at the museum 1970



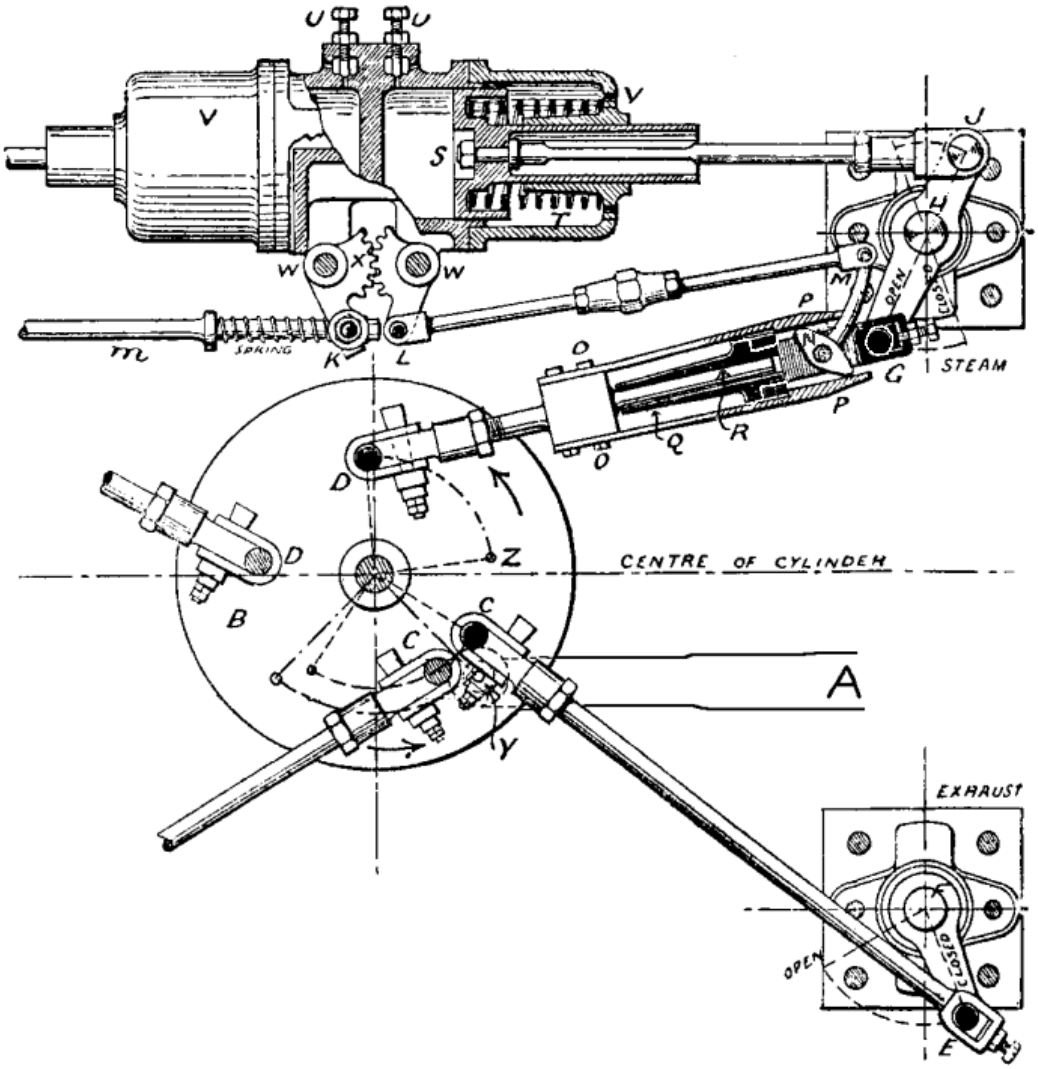
Hick Hargreaves Horizontal Mill Engine
Fitted with Inglis & Spencer improved Corliss Valve Gear

This outstanding example of an early horizontal mill engine was saved from destruction by Mr E M Baldwin. Mr Baldwin was the Managing Director of E M Baldwin Engineering of Castle Hill and he held a strong interest in the preservation of industrial engineering artefacts. This interest led to the amassing of considerable collection and the subsequent donation to our museum of the engine in 1970 only weeks before he passed away.

The history of the engine is somewhat obscure. It is believed the engine came to Australia possibly second hand and was used to drive ore crushing battery stampers in the Bell's Creek gold mine at Araluen. About 1896 the mining venture was abandoned. It then was sold to the Wright & Bruce wool scour at Botany where it worked until 1948.

The engine is of marked historical significance as it is the oldest of only three Hick Hargreaves engines existing worldwide incorporating Inglis and Spencer Corliss valve gear.

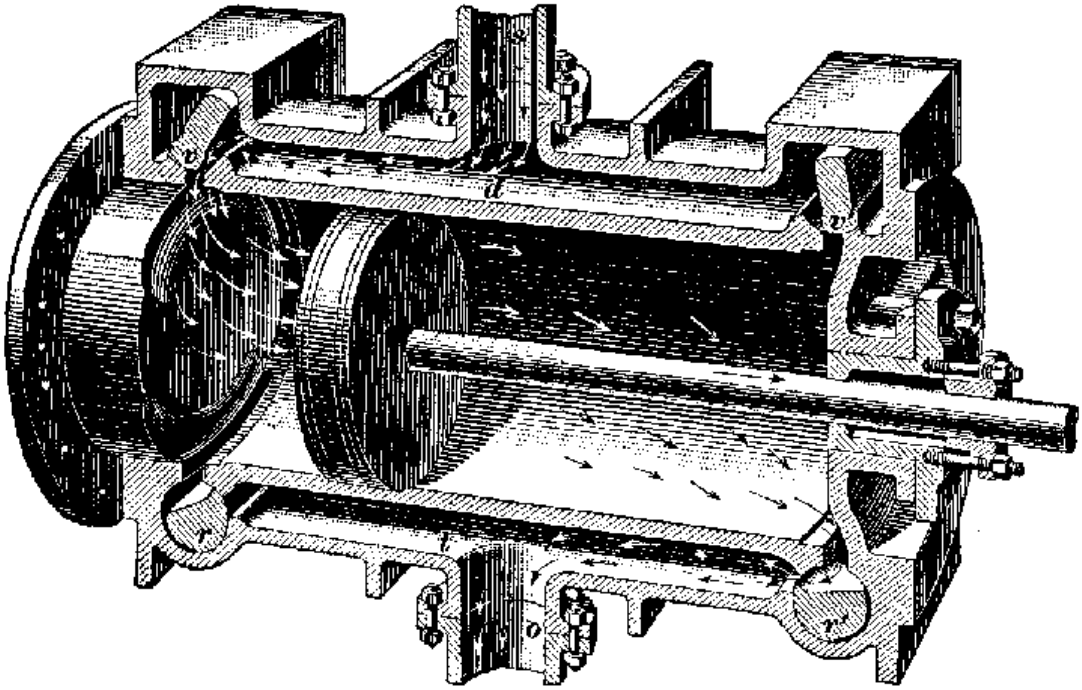
Two other engines are preserved in the UK they are a 50 HP number 303 built 1873 located in the Forncett Collection and a 100 HP number 519 built 1879 located at Chauntry Mill, Haverhill, Suffolk. The exact date of our engine is unknown as the engine number cannot be found. We can however approximately date the engine by the type of governor used. The governor on this engine is a Watt type patented by Bolton & Watt and was in common use until the invention of the Porter governor invented by an American, George Porter and patented in 1862. The Porter governor has far superior speed control characteristics and was quickly taken up by many of the engine manufacturers of the time. This type of governor is illustrated in the drawing above of a later engine and is the same as the type fitted to the Appleby Beam Engine. From these points we could assume our engine to pre date 1860 however other factors influenced the design of this engine. During the early 1860's William Inglis was a consulting engineer in Canada involved in the construction of vertical Corliss valve engines designed by an American, George Corliss. He was convinced by John Spencer that there was a future for improved design Corliss valve engines in Britain and in 1863 Inglis moved to Edinbrough then to Manchester in 1865 where he continued as a consulting engineer and worked with Spencer to refine the rather crude Corliss valve gear covered under US patent 6162 of March 1849 . By 1868 Inglis had teamed up with Hick Hargreaves as Engineering Manager and the firm had been producing his early valve gear from 1864 to the design below. From these facts our engine date lies close to 1864 and certainly earlier than 1873.



Early Inglis and Spencer valve gear operation

The governor rod M acts on a bell crank attached to the rear of shaft W. Shaft A is attached to the crankshaft eccentric and rotates the disc B back and forth in sequence with the piston motion. The governor when actuating to reduce engine speed draws rod M to the left which rotates the gear X moving pivot L to the right. This in turn rotates cam N and spreads apart the catch pawls P thus releasing the valve lever H. The spring T in the damper chamber draws the Corliss valve to the closed position thus preventing admission of steam to the cylinder. With the steam admission closed the exhaust valve continues to operate. When the engine reduces speed rod M moves to the right and allows the cam N to return to a position allowing the catch pawls to close around the latch R and commence normal valve operation.

This design of valve gear has several advantages over the slide valve. Firstly the admission of steam to the cylinder is rapid and precisely controlled, there are no heavy reciprocating parts like the slide valve consuming energy from the engine in overcome inertia and finally the resulting increase in efficiency relates to substantial fuel savings. The later types of Corliss valve engines were the most thermal efficient engines produced prior to the advent of later Uniflow design engines.

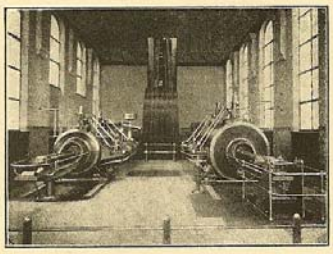


Cylinder cross section showing Corliss Valves

This diagram shows the steam passages and rotary valves within the cylinder casting. The item marked V are the steam inlet valves and R the exhaust valves. The steam enters the engine through the passage S and D and leaves through T and O.

Hick Hargreaves went on to produce thousands of Corliss valve engines of enormous proportions to drive the cotton processing mills of Britain and the world. They were one of Britain's more successful and enduring manufacturers spanning 170 years of operation. In November 1973 a four week strike crippled the company and in spite of efforts to recover the remaining business was absorbed into the BOC Group in 2002.

STEAM ENGINES



Hick, Hargreaves & Co. Ltd.

Head Office and Works :

Soho Ironworks, BOLTON, England.

ESTABLISHED 1833.

TELEGRAMS : "HICK, BOLTON." *TELEPHONE : 1373 (3 lines).*

LONDON OFFICE :

57, VICTORIA STREET, LONDON, S.W.1.

TELEGRAMS : "UMSHAWVAPO, SOWEST, LONDON."
TELEPHONE : VICTORIA 7310.

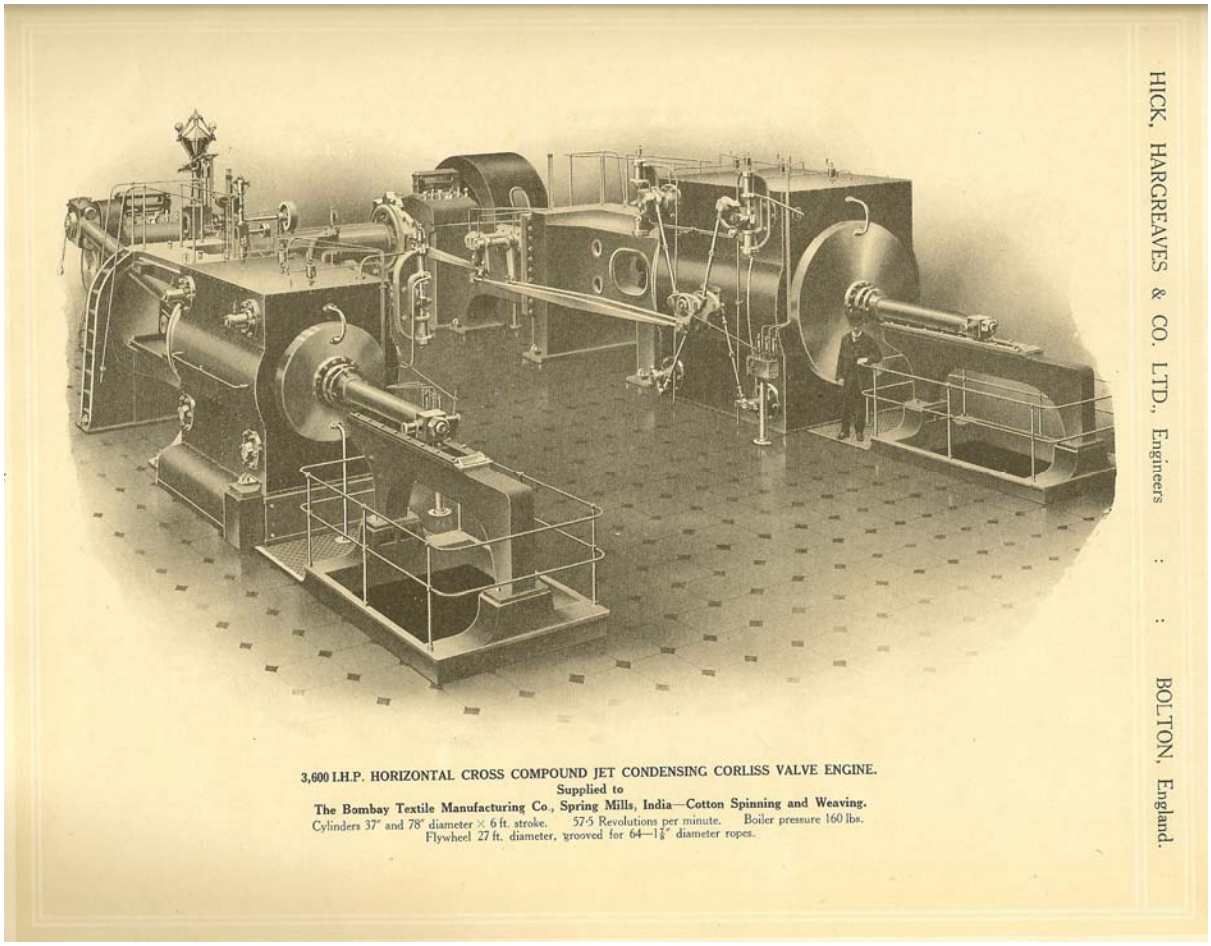
Scottish Agents :
LINWOOD & CO., 67, Hope Street, Glasgow.

S. Wales Agents :
BEST & BLAKE, 102, St. Mary Street, Cardiff.

CABLE CODES :

Bentley's. A B C (Fifth and Sixth Edition). Western Union (Universal Edition). A1 (1888). Lieber's Standard.

Contractors to H.M. Government, The Admiralty, War Office, India Office, Colonial Office, etc.



Note the man standing at the rear of the right hand cylinder.

Appendix C Heritage Register Citations

- Register of the National Estate
- NSW State Heritage Register
- Engineering Heritage Committee: Heritage Marker citation

Marsden Steam Museum, Crookwell Rd, Goulburn, NSW, Australia

Photographs:	
List:	Register of the National Estate
Class:	Historic
Legal Status:	Registered (21/03/1978)
Place ID:	1087
Place File No:	1/08/295/0007

Statement of Significance:

Dating from the 1880s, the former pumping station provided water to the city over a long period; consequently it has an important association with Goulburn's history and the development of local services which in turn improved the quality of life of Goulburn's inhabitants. (Criterion A.4)

The station still has its original beam steam engine, the only surviving beam engine in New South Wales still in working order on its original site. Of additional importance is the way in which the place reflects forms of technology which are now obsolete. (Criterion B.2)

Standing on a pleasant bend of the Wollondilly River, the place with its historic character has considerable amenity value. (Criterion E.1)

Official Values: Not Available

Description:

Goulburn's first water supply consisted of two wells and pumps beside the Mulwaree River. Water carriers carted the water through the town where it was sold. After the construction of the railway made access to these wells difficult, it was decided to build the Marsden Weir and associated pumping station on the Wollondilly River near the Crookwell Road. The project got underway in the 1880S. Designed by the Colonial Architect's Office, the pumping house was built by H.G.Evans and Son of Wagga. The beam-type steam engine, manufactured by Appleby Brothers of London, together with the boilers and other plant, were installed by Ball and Stubbs of Goulburn. In a ceremony on 31 December 1885, the final stone of the chimney was laid by Mrs J.F.Bastable. Edward Woodhart was appointed as the pumping station's first engineer and he held the position for 27 years. In 1889 two horse-powered Californian pumps were installed and later other additions were made to the station's pumping capacity. In 1918 the beam engine was superceded by electricity. Fortunately the engine was not scrapped (as were others of its type in the state) and in 1958 it was restored to working order. On 4 April 1970 the pumping station was reopened as the Marsden Weir Museum of Historic Engines. In addition to the beam engine, the museum also holds other steam machinery - such as the 1888 vintage Hebburn steam winding engine which saw service in the New South Wales coalfields (and which has a separate register record) -and a locomotive. The former pumping station is a brick and stone building consisting of a double-height section flanked by single storey wings. Roofs are corrugated iron. The double-height section has pilasters and an arched entrance, together with bracketted eaves below which is a course of plain stonework. The roof has arched louvred vents. The single storey sections also have bracketted eaves and an iron roof with a vent running along the ridgeline. Windows are arched and above them (commencing at about

the stringline) is a most unusual arched extra skin of brickwork with plain stone dressing. A verandah stands at the end of the building. A tall, slender stone and brick chimney stands beside the building.

History: Not Available

Condition and Integrity:

The former pumping station is still owned by Goulburn Council. As mentioned above, the building was converted to a museum in 1970. At the time of nomination in 1976 the place was reported to be in good condition and with a high level of integrity. (January 1992)

Location:

Site, building and machinery of former pumping station on the Wollondilly River off Crookwell Road, Goulburn.

Bibliography:

Wyatt, Ransome T., "The History of Goulburn", Goulburn 1941.
Bayley, William A., "Lilac City: The Story of Goulburn New South Wales", Goulburn 1954.
Lester Firth Associates, "Goulburn Heritage Study", Goulburn 1983.
"Goulburn Post", 6/4/1970.

NSW State Heritage Register citation: Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine

Note: There are incomplete details for a number of items listed in NSW. The Heritage Branch intends to develop or upgrade statements of significance and other information for these items as resources become available.

Item

Name of Item: Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine

Other Name/s: Goulburn Steam Museum Pump House

Type of Item: Built

Group/Collection: Utilities - Water

Category: Water Pump House/Pumping Station

Location: Lat:149.70400638 Long:-34.73694442

Primary Address: Wollondilly River, Goulburn, NSW 2580

Local Govt. Area: Goulburn Mulwaree

Property Description:

Lot/Volume Code	Lot/Volume Number	Section Number	Plan/Folio Code	Plan/Folio Number
PART LOT	1	-	DP	1119777
PART LOT	11	-	DP	1123614
LOT	4	-	DP	1126066
PART LOT	1	-	DP	951293

All Addresses

Street Address	Suburb/Town	LGA	Parish	County	Type
Wollondilly River	Goulburn	Goulburn Mulwaree	Goulburn	Cumberland	Primary
off Fitzroy Street	Goublburn	Goulburn Mulwaree	Goulburn	Argyle	Alternate
off River Street	Goulburn	Goulburn Mulwaree			Alternate

Owner/s

Organisation Name	Owner Category	Date Ownership Updated
Goulburn Mulwaree Council	Local Government	19 Mar 99

Description

Construction Years: 1885 - 1886

Physical Description: Set on the banks of the picturesque Wollondilly River at Marsden Weir, Goulburn, New South Wales.

Built in 1885, the steam operated pumping facility provided Goulburn's first reticulated water supply. The pumphouse still contains the original Appleby Bros. Beam Engine pump and Lancashire Boilers.

This unique facility is the only complete, workable beam engine powered municipal water supply left in its original location, in the Southern Hemisphere. The buildings and engine are of national significance and are listed on the NSW State Heritage Register (Goulburn Waterworks Museum, 2005, amended).

Current Use: Museum

Former Use: Municipal water supply system

History

Historical Notes: Set on the banks of the picturesque Wollondilly River at Marsden Weir, Goulburn, New South Wales.

Built in 1885, the steam operated pumping facility provided Goulburn's first reticulated water supply. The pumphouse still contains the original Appleby Bros. Beam Engine pump and Lancashire Boilers.

Goulburn Waterworks: 1886
Becoming operational in January 1886, the Waterworks, on the banks of the Wollondilly River, provided a reticulated water supply to the growing City of Goulburn .

The pumphouse was powered by timber - wood piles fired the boilers 24 hours a day, seven days a week.

Before 1886 the residents of Goulburn would have collected water in tanks or wells, or purchased supplies from a carter. The demand of the growing city resulted in the Rivers and Harbours Board installing a waterworks on the Wollondilly River at Rocky Point powered by a steam operated beam engine. Water was pumped from the river to a filtration plant and reservoir, then gravity fed to residents of the city.

Appleby Beam Engine
The original 1883 Appleby Bros. steam engine situated inside the pumphouse was one of four installed in Pumphouses around NSW. The others were at Wagga Wagga, Albury (both scrapped in 1936) and Bathurst . The steam engine is known as a beam engine because of the large overhead rocking beam that transmits motion from the pistons to the cranks.

This great beam engine, of the type first invented by Thomas Newcomen in 1712, is an example of the powerhouse that drove the Industrial Revolution. Originally designed for pumping water out of mines in the UK it was improved by Watt, Smeaton, Maudsley and other engineers of the steam age until it became a very efficient and reliable engine.

Apart from mines and water supplies, many thousands were used to drive factory machinery in the 18th and 19th centuries - some four operated in factories in Goulburn - until they were superseded by electric motors in the early 20th century.

Goulburn's Beam Engine 1883
The Goulburn Waterworks engine is of medium size and produces 120 horse power. It has compound cylinders and a jet condenser. The fly wheel is 5 metres in diameter and at 18 r.p.m. the pumps delivered 660,000 litres of water per hour.

The two boilers that produce the steam that powers the engine, are located in the western wing of the building.

Fired by wood or coal, they produce high temperature steam that is piped through

to the beam engine in the central part of the building. Only one boiler would have been operational at any one time. The other being shut down for regular cleaning and maintenance.

Steam from the boilers enters the valve chest on the cylinders from where it is transmitted to the cylinders by means of a valve mechanism. The action of the steam on the pistons causes them to reciprocate. Rods connect the pistons to the beam at one end, and to the crank at the other. This converts the 'rocking' motion to rotary motion which makes the flywheel turn, giving a smooth and continuous action

By 1918 the beam engine had became obsolete when electric motors were installed.

Idle for many years, Goulburn's Beam Engine was restored in 1958.

The Pumphouse
The east wing of the building houses a horizontal steam engine, the Hick Hargreave (see separate page) and the early dynamo room with its electric pump.

The Waterworks is notable not just for its historic steam engine, but for the elegant Victorian building that houses the beam engine and boilers. Only metres away further up the hill stands the original fireman's cottage, also of Victorian design.

Horizontal Engine by Hick, Hargreaves & Co., England , c 1860.
From 1968 the Goulburn Waterworks operated as a museum of engines. It was during this period that a grant was made available under the Regional Employment Development Scheme (1975) which saw some of this funding used for the installation of the Hick Hargreaves engine now on display and operational on steaming days, in the annexe of the pumphouse.

The single cylinder horizontal engine measures 9 metres in length, weighs 17 tons with the flywheel being 4 metres in diameter.
It was originally used to power equipment in a Sydney tannery, becoming discarded in 1961. It was reported that it had been acquired to represent the nest stage of steam engine development after the beam type engine (Goulburn Waterworks Museum, 2005).

Historic Themes

Australian Theme (abbrev)	New South Wales Theme	Local Theme
3. Economy - Developing local, regional and national economies	Technology - Activities and processes associated with the knowledge or use of mechanical arts and applied sciences	Technologies for reticulated water supply -
4. Settlement - Building settlements, towns and cities	Land tenure - Activities and processes for identifying forms of ownership and occupancy of land and water, both Aboriginal and non-Aboriginal	Changing land uses - from rural to suburban -
4. Settlement - Building settlements, towns and cities	Towns, suburbs and villages - Activities associated with creating, planning and managing urban functions, landscapes and lifestyles in towns, suburbs and villages	Creating landmark structures and places in regional settings -
4. Settlement - Building settlements, towns and	Towns, suburbs and villages - Activities associated with creating, planning and managing urban functions,	Developing civic infrastructure and amenity

4. Settlement - Building settlements, towns and cities	Utilities - Activities associated with the provision of services, especially on a communal basis	Providing drinking water -
5. Working - Working	Labour - Activities associated with work practises and	Working on public

Assessment Criteria Items are assessed against the **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

Procedures /Exemptions

Section of Act	Description	Title	Comments	Action Date
57(2)	Exemption to allow work	Heritage Act	maintenance & gardens Order Under Section 57(2) to exempt the following activities from Section 57(1): (1) The maintenance of any building or item on the site where maintenance means the continuous protective care of existing material. (2) Garden maintenance including cultivation, weed control, the repair and maintenance of existing fences, gates and garden walls, pruning and tree surgery but not extensive lopping.	Jun 26 1987
57(2)	Exemption to allow work	Standard Exemptions	SCHEDULE OF STANDARD EXEMPTIONS HERITAGE ACT 1977 Notice of Order Under Section 57 (2) of the Heritage Act 1977 I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order: 1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and 2. grant standard exemptions from subsection 57(1) of the Heritage Act 1977, described in the Schedule attached. FRANK SARTOR Minister for Planning Sydney, 11 July 2008 To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below.	Sep 5 2008

Standard Exemptions for Works Requiring Heritage Council Approval

Listings

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page

Heritage Act - State Heritage Register		00356	02 Apr 99	27	1546
Heritage Act - Permanent Conservation Order - former		00356	29 Jun 87	109	3639

References, Internet links & Images

Type	Author	Year	Title	Internet Links
Written	Goulburn Waterworks Museum	2005	Goulburn Waterworks Museum	**Click here**

Note: Internet links may be to web pages, documents or images.

(Click on Thumbnail for Full Size Image and Image Details)

Data Source

The information for this entry comes from the following source:

Name: Heritage Office

Database Number: 5045044

File Number: S90/05331 & HC 32906

Every effort has been made to ensure that information contained in the State Heritage Inventory is correct. If you find any errors or omissions please send your comments to the **Database Manager**.

Proposal to Nominate

GOULBURN WATERWORKS

as a

Historic Engineering Marker

By
Glenn Rigden
Engineering Heritage Committee
Sydney Division IEA
January 2003

Contents

Appendixes

Introduction

Located on the banks of the Wollondilly River, on the Northwestern outskirts of Goulburn, the **GOULBURN WATERWORKS,** which includes the steam pumping station and weir, is virtually fully intact after its construction in the 1880s and use up to 1977. It is an excellent representation of the municipal water supply stations installed through out New South Wales during that period and displays the development of these systems over the past century.

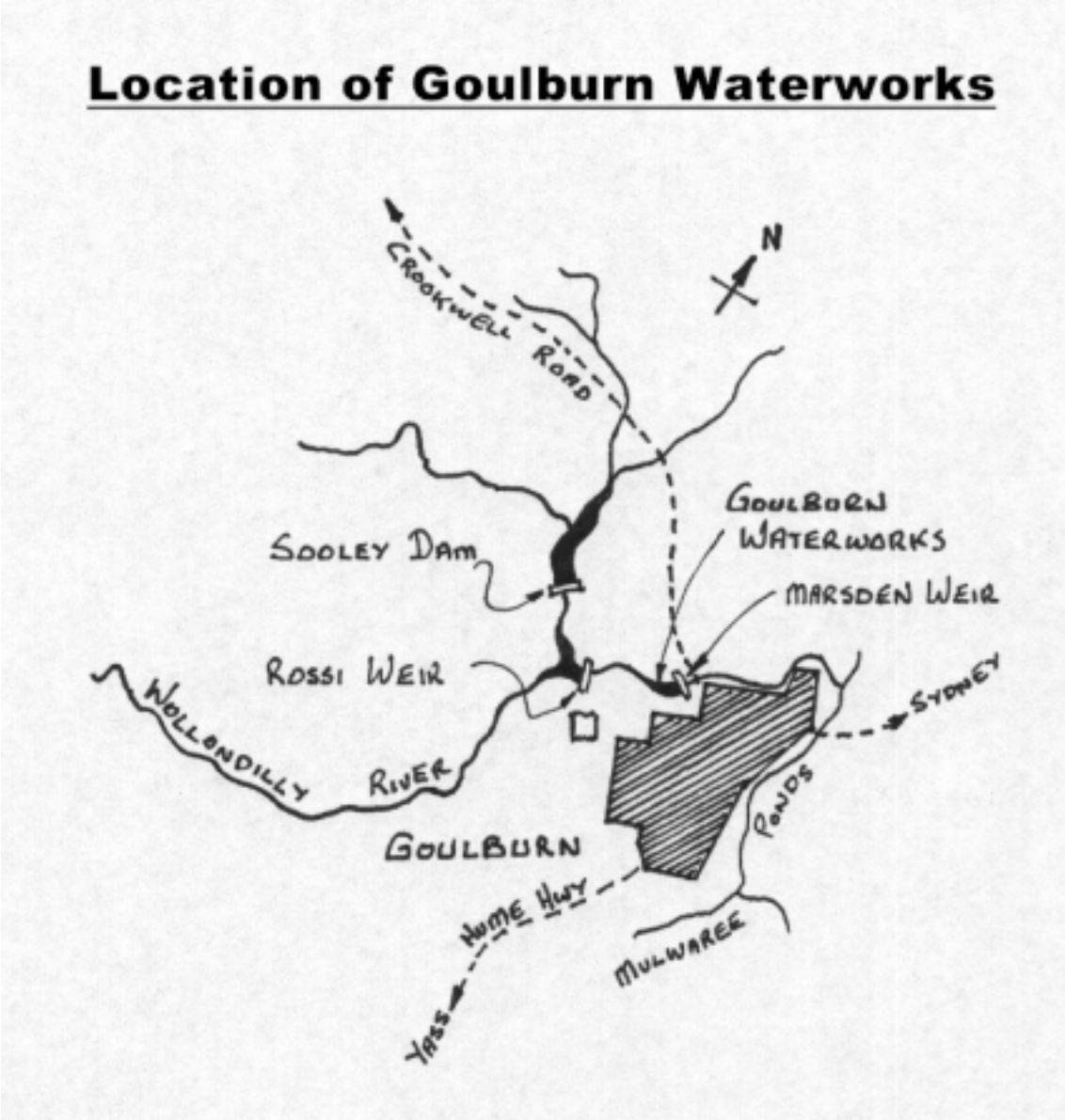
The Goulburn Waterworks was originally installed with a compound beam pumping engine. It was upgraded a number of times with additional steam pumping engines and finally electric pumps, most of which are still intact in the original building. The original beam pumping engine is still operational and is most probably the only remaining beam engine still intact in its original location in the Southern hemisphere.

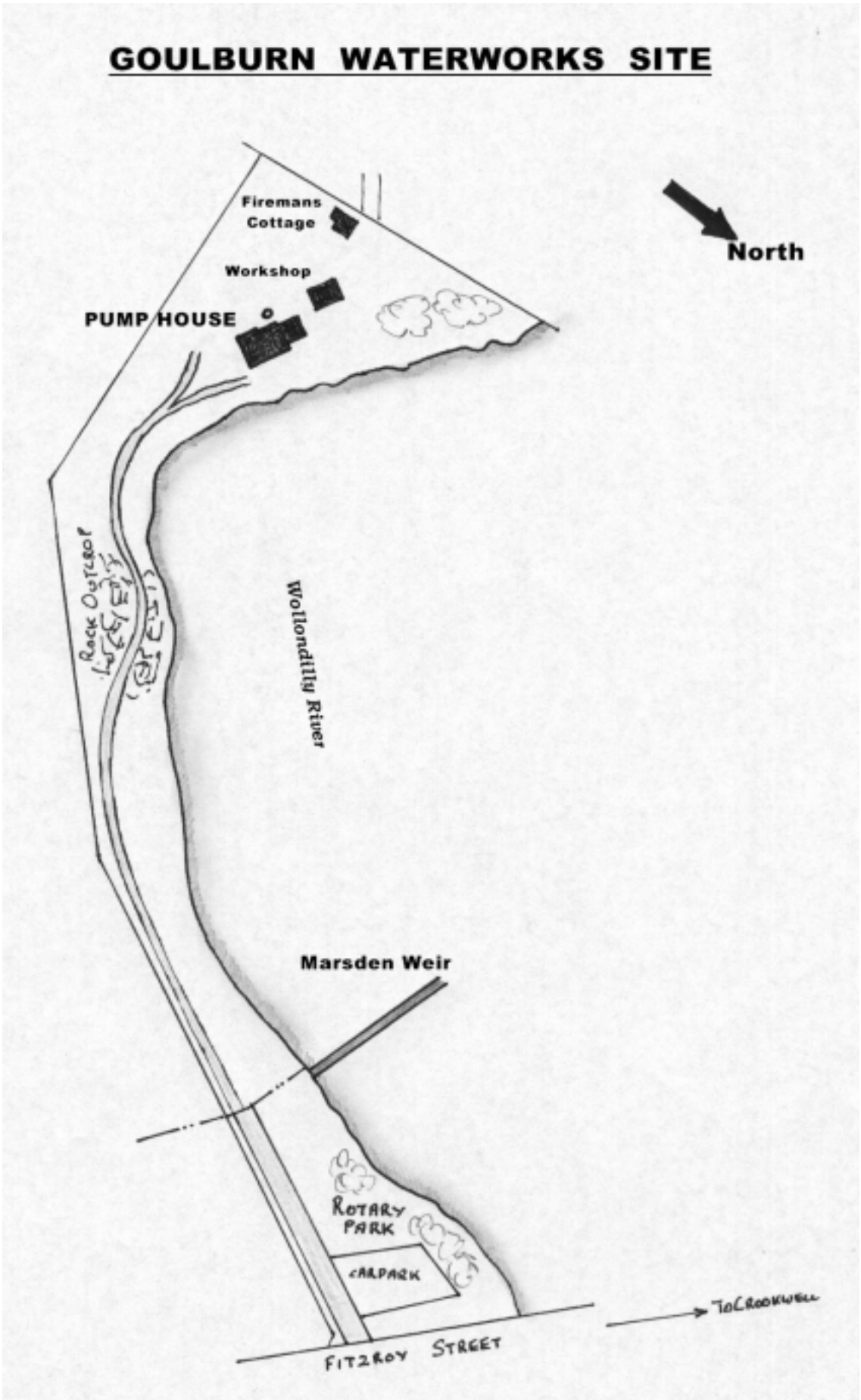
The site has excellent heritage preservation potential in that the original buildings including pump house, boiler house and engineer's residence are intact. The original weir, Marsden Weir, which supplied the city's water is still standing, and the engine and boilers are still in place with the engine being operational off an alternate vertical steam boiler.

The Goulburn City Council took control after the Steam Museum that occupied the site since the 1950s closed down with the death of the proprietor. The aim of the council is to develop the site into a heritage precinct and park preserving as much of the original waterworks infrastructure as possible. A 'Friends of the Waterworks' preservation group maintains the engine and organises running days for public exhibition.

Marsden Weir looking back at the Waterworks

Location & Site Map




GOULBURN WATERWORKS SITE
Firemans Cottage
Workshop
PUMP HOUSE
North
Rock Outcrop
Wollondilly River
Marsden Weir
ROTARY PARK
CARPARK
FITZROY STREET
To Crookwell

Basic History

"In 1876 the Past President of the Institution of Civil Engineers, Mr (William) Clark was selected by the Colonial Office and appointed by the Government of New South Wales, to advise and report upon the water supply and drainage of Sydney. During a residence of two gears (sic) in the Australasian colonies, he prepared several schemes of a like description, embracing the towns of Port Adelaide, Newcastle, Bathurst, Goulburn, Orange, Maitland, Brisbane[3] …

The Goulburn Waterworks were commenced in about 1883, at about the same time as 3 other waterworks at Bathurst, Albury & Wagga Wagga following a legislative change to the supply of town water in NSW. The Waterworks were built on the Wollondilly River to supply fresh water to the City of Goulburn, 1.3 kilometres away.

The waterworks were designed / specified by E.O. Moriartry, Engineer in Chief of the Harbours & Rivers Branch of the NSW Public Works Department. The supply and construction was undertaken by contractors to the Public Works, completed in 1886 and handed over in 1887 to the Goulburn Council with Mr. Edward Jacob Woodhart being the first residing engineer. He held office for 27 years until his death at work on the Waterworks site.

The pump and compound beam engine were supplied and installed by Appleby Brothers of London complete with Lancashire boilers with Galloway's Patent tubes.

In 1897, a US made Blake horizontal steam engine and supplementary pumping system. were installed in an annex to the original building of 1883.

Early Photo of Pump House Building
Date unknown prior to 1997

In 1918, an electric pumping system was installed on the site, being one of the first water reticulation systems to be electrically driven . Up to 1932 both the Appleby Beam Engine and electric pumps supplied water to Goulburn, until additional electric pumps were installed and the beam engine was decommissioned. The waterworks continued to operate up to 1977 when it was decommissioned after a new pumping station was built at Rossi Weir upstream from the Marsden Weir at this site.

The pumphouse, site and waterworks machinery were nominated and listed on the register of the National Estate (AHC) in 1978.

Today the complete brick pump house building, boiler house, Lancashire boilers, beam engine, electric pumps, brick chimney and pump wells still exist. The beam engine is still operable.

[3] Vide State Papers. New South Wales and South Australia, 1877, 1878". (Quote from The Institution of Civil Engineers Memoirs [1880-1881]).

Nomination Form

Australian Historic Engineering Plaquing

The Administrator
Engineering Heritage Australia
The Institution of Engineers, Australia
Engineering House
11 National Circuit
BARTON ACT 2600

Name of work : **Goulburn Waterworks**

The above-mentioned work is nominated to be awarded a:

- ~~National Engineering Landmark~~
- **Historic Engineering Marker**

Location : **Crookwell Road (Fitzroy Street)**

GOULBURN NSW (1.3 km from city centre)

Owner: **Goulburn City Council**

The owner has been advised of this nomination, and a letter of agreement is attached.

Access to site: **Road access to site and parkland off Crookwell Road.**

Site is currently open on nominated open days to the public or by appointment with the Council.

Nominating Body: **IEAust Heritage Committee Sydney Division**

Glenn Rigden
Chair

Date: .....

.....

.....

Engineering Heritage Australia

Plaquing Nomination Assessment Form

BASIC DATA

Item Name : **GOULBURN WATERWORKS**

Other/Former Names : **Goulburn Steam Museum**

Location : Wollondilly River GOULBURN NSW

Address : Crookwell Road (Fitzroy St) Goulburn

Suburb/Nearest Town : (Marsden) GOULBURN

State: NSW

Local Govt. Area : Goulburn City Council

Owner : Goulburn City Council

Current Use: Heritage Precinct

Former Use : Water Supply Pumping Station then Steam Museum

Designer : E. O. Moriarty

Maker/Builder : Contractors to the Public Works Department of NSW Were :-

- H G Evans & Sons of Wagga;
- Ball & Stubbs of Goulburn; and
- Appleby Brothers, London supplied and installed the mechanical plant.

Year Started : 1883 **Year Completed : 1886**

Physical Description

Goulburn Waterworks is a steam driven (converted to electric) municipal water pumping station and weir located adjacent to the Wollondilly River. The Waterworks supplied water to the city of Goulburn.

Marsden Weir

The site consists of the Marsden Weir situated on the Wollondilly River a few hundred metres upstream from the Crookwell Road (Fitzroy St) crossing of the river at a site known as Rocky Falls. The weir holds 273 Ml (Megalitres) which was equivalent to 6 months supply of water for a town's population of 11,000. The weir is of concrete (Portland Cement) construction standing about 7 metres (24 ft) high and 121 metres (400 ft) in length with a top width of one metre (3'6").

Marsden Weir

The Pumping Station

The pumping station is located about 500 metres upstream (west) from the Marsden Weir at Rocky Point on the southern bank of the river. The single pump house building is of brick and stone construction, consisting of a double height section flanked by single storey wings, the Eastern wing being the 1897 additional annex. Roofs are corrugated iron. The double height section has pilasters and an arched entrance, together with bracketed eaves below which is a course of plain stonework. The roof has arched louvered vents. The single storey sections also have bracketed eaves and iron roof with a vent running along the ridge line. Windows are arched and above them is a most unusual arched extra skin of brickwork with plain stone dressing. A verandah

stands on the western end of the building covering the open boiler house. A tall slender stone and brick chimney stands behind the building.
All four pumping stations including Bathurst, Albury, and Wagga had similar pump house buildings.

The pumps draw water through a lined tunnel which connects the pump house well located within the building to the Marsden Weir reservoir over a distance of about 100 metres. The original pumping engine is a Woolf type compound beam engine driving a single stage reciprocating pump connected to the engine beam. This engine is powered by two Lancashire boilers fitted with Galloways patent tubes. Both the engine and boilers were supplied and installed by Messrs. Appleby Bros. of London.

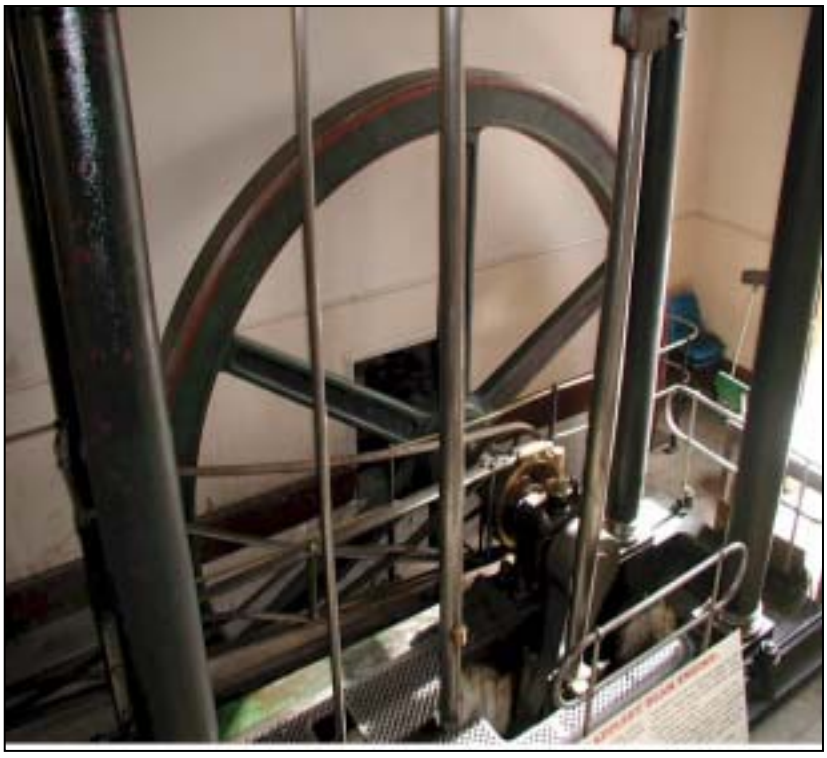
A second semi dry well in the eastern annex houses the electric pumps while a stationary horizontal mill engine most likely covers another well at the rear of the building.

The pumps transferred the water from the river reservoir to the water treatment works and storage reservoir located closer to town in River Street. From here the water was gravity fed to the town of Goulburn.

The site encompasses the Marsden Weir, the pump house, engineer's residence and parkland adjacent to the Weir.

Pump & Boiler House
Looking into Boilers

Main Building
Looking West
At
Later Annexes



Appleby Beam
Pumping Engine
Fly Wheel End

The Beam Engine

The beam-pumping engine is one of the most significant parts of this heritage site.

Notes On The 'Appleby' Beam Pumping Engine as supplied by the International Stationary Steam Engine Society - ISSES.

The engine bears a nameplate that reads APPLEBY BROS, ENGINEERS, 1883, LONDON. The engine is a Woolf type compound beam engine of medium size that would have been classed as "Best Waterworks Practice" at the time. Technically the engine is not remarkable but aesthetically it has elements of the best quality engineering from an era when public utilities were built by communities and were a source of great pride and prestige.

Basic data for the engine as follows :

Bore HP	9"
Bore LP	18"
Engine configuration	Woolf compound
Stroke	5 feet (HP cylinder and crankshaft)
Steam Pressure	60 psi
Valve gear	slide valves with Myer cutoff gear
Flywheel diameter	17 feet
Flywheel weight	25 tonnes
Depth of Pump Well	42 feet
Beam length (hp centreline to crankshaft centreline)	20 feet
Pump	single stage (two stage at Wagga, Albury and Bathurst)
Build date	1883
Commissioned	1886
Retired	1932
Restored	1958
Air pump overhaul	1992
Boilers	Lancashire type with 16 Galloway tubes (2 off)

The engine is now a rare survivor in a country that has lost much of its engineering heritage from the Steam Age. Even in recent times there was reason to have concern about its continued preservation despite the fact that it is now the only beam engine of any size still in its original setting in Australia and one of only a handful of beam engines in any setting in the country.

The engine was part of an order by the New South Wales Public Works Department for four apparently identical engines, pumps, boiler plant and some associated equipment such as cranes for the engine houses. Similar engine and boiler houses and civil works were built to house the engines and boiler plant at the other three sites. At Goulburn, the local contractors were H G Evans & Sons of Wagga and Ball & Stubbs of Goulburn. There is nothing known of the other tenderers but a contract was awarded to Appleby Brothers, London for the supply of the mechanical plant.

The four engines were to go into water supply service at Wagga Wagga, Albury, Bathurst and Goulburn. The above sequence being the sequence of construction. The engines were identical as far as records indicate but there were some minor differences

between the reciprocating pumps to suit the hydraulic situations at each site. The pumps were of two-stage type except at Goulburn where the pump was single stage.

At all four locations buildings remain intact and in one case, Albury, the buildings still contain vertical shaft electric driven centrifugal pumping plant. At the other three sites the old plant has gone, however at Goulburn the installation is almost complete with the engine and pumps still installed and operational and the boilers still installed but not serviceable.

The Goulburn site (Marsden Weir) has had a colourful recent history. Although the site has been owned by the Goulburn City Council for a long time, it was for many years after the steam plant went out of service, leased to steam enthusiasts to operate a steam museum. This arrangement started in about 1957 at the instigation of a Mr. Bruce McDonald. Over the years this expanded to include railway equipment, other steam engines including a large heritage significant winding engine and a great deal of derelict equipment and memorabilia. In the last couple of years the Goulburn City Council has taken back the site and restored it to something resembling its original status as a steam pumping station.

The role of Appleby Brothers as the suppliers of the equipment is clouded in mystery. Appleby Brothers were not renowned suppliers of steam engines however they had a catalogue containing mechanical plants for many industries including utilities, mining and manufacturing. The company no longer exists and it is unclear how it manufactured its products. There are only one or two other engines known internationally that bear the name Appleby. A small mill engine at Sarsons Malt Vinegar Works, London was in service up until 1985. It was an 8” bore by 14” stoke horizontal single cylinder engine. (Refer SERG Bulletin Vol 8 No.1.) However the Forncett Industrial Steam Museum has a small horizontal mill engine bearing the nameplate Jessop & Appleby, Leicester built in 1897. No connection has been established to date between Appleby Brothers and Jessop & Appleby but they may be connected. The Sarsons engine and the Forncett engine appear nearly identical except that they are opposite hand.

It is unclear how Appleby manufactured its products and why there are so few examples of the engines. The answer may lie in the specialisation of Appleby Brothers. If they mainly supplied to the mining industry for example they might have had quite large production volumes whilst not making many steam engines. How they produced such a refined and elegant engine in these circumstances is harder to fathom. There is no doubt that the designer of the Goulburn engine was schooled in the very best steam engine design practice of the day. Perhaps their Chief Engineer had come from a steam engine builder and he only seldom had the opportunity to design a steam engine. The motion, the proportions and details of the parallel linkage that connects the piston rods to the beam and the valve operating linkages around the cylinders are impressive. A single eccentric drove the motion from the crankshaft in the conventional way. The detailing of the bearing blocks, links and rods in this system is particularly grand.

The NSW Public Works Department clearly had good engineering skills at that time to have accommodated, installed and commissioned so expertly, the four engines. The involvement of engineer H.A. Moriarty, one of several renowned engineers of the same family in that era, is sufficient evidence that the work would have been carried out to a

high standard. (H A Moriarty, the nephew of E O Moriarty [the designer of the works] was the PWD's District Engineer, Goulburn).
The Public Works Department also had a hand in the design and building of the much larger Botany Pumping Station that contained three larger beam pumping engines commissioned in 1858. The Harbours & Rivers Branch of the Public Works headed up by Mr E.O Moriarty as Engineer in Chief, supervised the construction of the £67,000 plant and initially operated it up to 1887

How the Goulburn pumping station was saved at the end of its operational life is a mystery. The other three engines in the Appleby order were scrapped without trace as were the engines from the Botany plant.

The Appleby Beam Engine

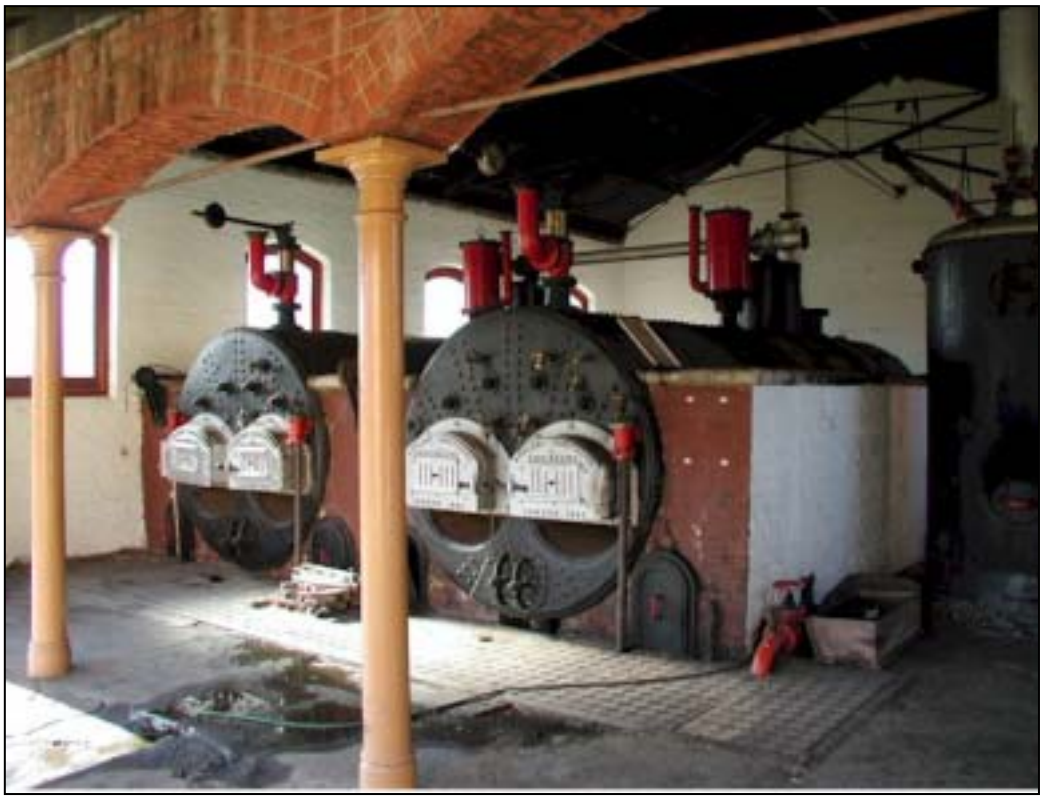
Physical Condition

Virtually all of the fabric of the original installation is intact and in excellent condition. The original building is brick with timber roof trusses and corrugated iron roof. The building also includes the later extensions to the plant which were to house the second pumping engine installed in 1897, and the electric pumps that were installed in 1918. The original brick boiler chimney is still standing and in fair condition.

The Goulburn City Council has renovated the main building and engineer's residence, which is a separate building on the site.

The original Appleby compound beam pumping engine appears to be "fully" intact and is operational. The two Lancashire boilers are intact and still standing in their original locations but are visual only. An additional vertical boiler, located in the boiler house adjacent to the original boilers, supplies steam to the beam engine and the horizontal mill engine.

The weir is intact and appears to be in fair condition. The associated grounds are currently being developed by the Goulburn City Council.



Boiler House
2 off Lancashire Boilers & Vertical Boiler

Associated Engineers

The construction and development of the Goulburn Waterworks was managed by the NSW Public Works Department, Harbours & Rivers Branch. This Branch was headed up from 1858 to 1889 by its first Engineer in Chief, **Edward Orpen Moriarty,** well known for his work in water supply and coastal development in NSW.

Moriarty's achievements include the design of Morts Dock at Balmain, Sutherland Dock on Cockatoo Island, the first Pyrmont Bridge, the Upper Nepean Water Supply Scheme, Lake Parramatta Dam and Newcastle Harbour. The last two have been proclaimed National Engineering Landmarks.

The specifications and design were developed by E O Moriarty and the work on site appears to have been directed by his nephew **Henry Allaster Moriarty** (1864-1928), who was the Public Works Department's District Engineer for Goulburn.

The design and supply of plant was most likely done by the in house engineers of **Appleby Brothers of London** who would have also supplied erection supervisors for their equipment, especially considering that there were four of these plants being constructed over a five year period. (This would need to be confirmed.)

The plant consisting of engine and boilers was installed by **Ball & Stubbs** of Goulburn.

The pump house was designed by the **Colonial Architects Office** and was built by **H.G. Evans and Son** of Wagga. The renowned architect James Barnet, was the Acting Colonial Architect from 1862 to 1865 and Colonial Architect from 1865 to 1890.

After commissioning the Goulburn Council took over the operation of the waterworks in 1887 and appointed its first engineer, **Edward Woodhart** who managed the plant for 27 years until his death on site at work.

Edward Woodhart

Modifications and Dates

- Original construction - 1883
- Plant commissioned - 1886
- Supplementary pumps & steam engine installed in annex to original building - 1897
- New dam constructed upstream at Rossiville - 1915
- First electric pumps installed and modifications to building annex - 1918
- More electric pumps installed and modifications to building annex - 1932
- Beam engine decommissioned - 1932
- Steam Museum commenced and beam engine restored - 1957
- Waterworks ceased operation - 1977
- Steam Museum ceased operation and site cleared of excess steam memorabilia - 2001

Electric Pumps in well – East Annex

Heritage Listings

Name : Australian Heritage Places Inventory
Title: Marsden Steam Museum

Number : 1807

Date :

Location : Crookwell Rd, Goulburn

Local Government : Goulburn City

State : NSW

Statement of Significance: Dating from the 1880s, the former pumping station provided water to the city over a long period; consequently it has an important association with Goulburn's history and the development of local services which in turn improved the quality of life of Goulburn's inhabitants. (Criterion A.4) The station still has its original beam steam engine, the only surviving beam engine in New South Wales still in working order on its original site. Of additional importance is the way in which the place reflects forms of technology, which are now obsolete. (Criterion B.2) Standing on a pleasant bend of the Wollondilly River, the place with its historic character has considerable amenity value. (Criterion E.1)

Name : NSW State Heritage Register

Title: Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine

Name of Item : Goulburn Pumping Station, Marsden Weir & Appleby Steam Engine

Other Name/s : Goulburn Steam Museum Pump House
Type of Item : Built
Group/Collection : Utilities - Water
Category : Water Pump House/Pumping Station
Primary Address : Wollondilly River, Goulburn, NSW 2580
Local Govt. Area : Goulburn City

Property Description :

Lot/Volume Code	Lot/Volume Number	Section Number	Plan/Folio Code	Plan/Folio Number
LOT	21	-	DP	750015
LOT	22	-	DP	750015
LOT	1	-	DP	951293

All Addresses :

Street Address	Suburb/Town	LGA	Parish	County	Type
Wollondilly River	Goulburn	Goulburn City	Goulburn	Cumberland	Primary
off Fitzroy Street	Goulburn	Goulburn City	Goulburn	Argyle	Alternate
off River Street	Goulburn	Goulburn City			Alternate

Owner/s :

Organisation Name : Goulburn City Council
Owner Category : Local Government
Date Ownership Updated : 19 Mar 99

Listings :

Heritage Listing : Heritage Act - State Heritage Register
Listing Number : 00356
Gazette Date : 02 Apr 99
Gazette Number : 27
Gazette Page : 1546

Heritage Listing : Heritage Act - Permanent Conservation Order - former
Listing Number : 00356
Gazette Date 29 Jun 87
Gazette Number : 109
Gazette Page : 3639

ASSESSMENT OF SIGNIFICANCE

Historic Phase :

The Goulburn water works were constructed during the early period of utilities improvement around the state (mid 1880s) and is representative of the technology and work for that period in this industry.

The original Waterworks was the first water utility in Goulburn and as subsequently modified provided water to Goulburn from 1886 to 1977; consequently it has an important association with Goulburn's history and development.

Historic Individuals or Association:

E.O. Moriarty (1825-96) was the first Engineer-in-Chief of the Harbours & Rivers Branchof the NSW Public Works Department, holding the position from 1858 to 1889. He is renowned for his work in water supply and coastal development in NSW. Moriarty's achievements include the design of Morts Dock at Balmain, Sutherland Dock on Cockatoo Island, the first Pyrmont Bridge, the Upper Nepean Water Supply Scheme, Lake Parramatta Dam and Newcastle Harbour. The last two have been proclaimed National Engineering Landmarks.

James Barnet (1827-1904) was appointed Acting Colonial Architect in 1862 and Colonial Architect in 1865. Barnet's works include 169 post and telegraph offices, 130 courthouses, 155 police stations,110 lock-ups and 20 lighthouses. His major works include the General Post Office, Sydney, Callan Park Asylum, the Australian Museum, the Chief Secretary's Building, the Lands Department Building, the Garden Palace and the Anderson Building at Sydney University. Barnet, who was the last Colonial Architect, resigned in 1890.

Creative or Technical Achievement :

The Beam engine as displayed at the Waterworks demonstrates the culmination of a drive power technology, which started with Thomas Newcomen and James Watt and their development of steam engines of the same beam format. The steam engine was initially developed with a beam and a steam cylinder for driving mine pumps and James Watt incorporated the fly wheel to this pattern. The engine at Goulburn is about at the height of this technology and before steam engines took completely different formats capable of higher speeds.

The site also demonstrates the development of water supply systems through the changing technologies over the past 120 years.

Research Potential:

The specific details of history of the Goulburn Waterworks and its three (3) sister plants has numerous gaps in the delivery of the projects. The part played

by Appleby in the supply of the engines is unclear since this firm was not known for this kind of work.

Information on the Goulburn works and sister projects is scattered, and dedicated time would be required to search for numerous facts from numerous sources.

Social:

The Waterworks has a strong association with Goulburn and its development ; Goulburn being the first inland city in NSW. The technology as demonstrated here took water supply for such towns away from the water cart era to one of "on tap" supply. This plant is typical of some of the first installations in NSW to supply water to country towns. .

Rarity:

The Goulburn Waterworks' beam engine is one of a handful of beam engines still in existence in Australia. More importantly, it is the only one still in its original location and setting.

Representativeness:

The 'Appleby' beam pumping engine and its associated Lancashire boilers at the Goulburn Waterworks, is the last remaining of four very similar sets of pumping equipment purchased at the same time and installed in large regional towns in NSW,.. They are representative and typical of the technology and style of works that were built for many other town water supplies such as the Maitland Walka Water Works (commissioned 1887) and the Botany Pumping Station (commissioned 1859) for the Sydney supply.

Integrity/ Intactness:

The Goulburn Waterworks including the building housing all the plant and the wells, is substantially intact, and the original beam engine is still in operable condition.

The engineer's residence on the site is also intact, as is the weir that supplied the water to the pumping station.

Other Points of Significance

- Goulburn was the first inland city in NSW and the Waterworks is one of Goulburn's most significant historic sites.
- The site demonstrates the development of the supply of water to a city over the past 120 years.
- The site demonstrates the development of past steam technologies.

- In 1918 Goulburn Waterworks was one of the first reticulated systems to install electric pumps.
- The site is listed on the Register of the National Estate as a significant site.
- The pump house is listed as a significant Industrial Archaeology Site
- The National Trust has classified the site as significant.
- The site is presently covered by a permanent conservation order under the Heritage Act 1977

Statement of Significance

The Goulburn Waterworks is of high social, technical and representative significance for an engineered work from the steam era. It is an extremely rare example in Australia of a beam engine in operable condition that demonstrates the culmination of this form of steam engine as originally developed by Thomas Newcomen and James Watt. It is the remaining example of a series of water pumping stations that were installed through out NSW to supply water to the growing populous. This technology in water supply took town utilities away from the water cart era and into 'on tap' supply state. The water works has a strong association with Goulburn as a growing inland city. Its possession in good order, of all the equipment installed during its upgradings to keep pace with the city's demands and growth up to 1977, provides evidence of the development of water supply technology from steam driven beam engine pumps to electrically driven centrifugal pumps. It is an excellent example of steam era technology and is a significant landmark in industrial archaeological and historical terms. The Goulburn Waterworks has associations with two major public servants of the Colonial era: Edward Orpen Moriarty, the first Engineer-in-Chief Harbours and Rivers of the Public Works Department, and James Barnet, Colonial Architect.

Assessed Significance : **STATE**

Plaque Wording

Historic Engineering Marker
Goulburn Waterworks

E O Moriarty, Engineer-in-Chief, Harbours & Rivers of the NSW Public Works Department, directed the design and construction of the original water works, comprising Marsden Weir and the pumping station, between 1883 and 1886. District Engineer H A Moriarty supervised construction and Goulburn City Council engineer E J Woodhart managed the works from 1887 to 1922. The Appleby beam engine operated until 1932 and is the last of its type in its original setting in Australia: the upgraded waterworks operated until 1977.

The Institution of Engineers Australia
and Goulburn City Council, 2003

References:

1. Conservation Management Plan - Goulburn Steam Museum
   By Gary Dutaillis & Associates
2. Museum Public material
   From Goulburn City Council
3. Public Works Department Archives
   State Archives
4. Conservation Management Plan for Albury Water Pumping & Electricity Generating House
   By Kenneth Young – Architect
5. Notes on Appleby Beam Engine
   By Owen Peake of International Stationary Steam Engine Society - ISSES.

Source Material & Research

The research on the Goulburn Waterworks subject has been fragmented and difficult, as most of the information is scattered and found in many sources. Even to date the Goulburn City Council and the nominator are communicating with relevant people in England to determine further the history of Appleby Bros. The nomination proposal is mostly based on previous research by those undertaking heritage works on the Goulburn Waterworks and the other associated waterworks constructed at the same time. Detail such as exact dates is difficult to determine without further prolonged research in archives, newspaper library's and other sources. Very little material is cross-referenced especially at the Government level where much of this information and detail was stored at the government archives prior to current recording procedures.

The subject has great potential for further research both in terms of the Public Works involvement and that of the overseas supplier, Appleby, but this would require a serious amount of time and research.

Plaquing of this Work needs to be based on the merit of the subject and not upon the detail within the nomination.

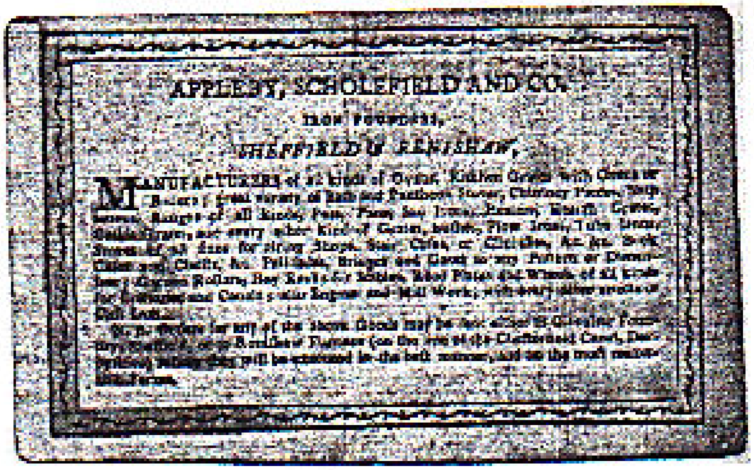
Appendix D Appleby Family History

APPLEBY ENGINEERS

Thomas Appleby was the first of four generations of his family to be Engineers. He was born in Barningham, North Yorkshire in 1757, the third son of Francis Appleby and Ann Rooksby. Sheffield records show that he was originally a carpenter and joiner. Around 1780 he teamed up with one Edward Scholefield of Bridgehouses, in Sheffield, a schoolmaster, and on 14th Nov 1786 they acquired an iron foundry in Gibraltar Street, Sheffield, and the initial company of "**Appleby Scholefield and Co**" was formed. It is from this initial partnership that all the subsequent Appleby family companies and engineers originate.

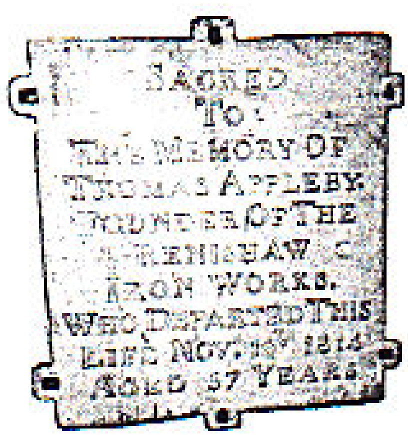
On 15th Oct 1789 Thomas Appleby married Alethea Wilde at what was to become the Cathedral Church of St Peter's in Sheffield. Alethea Wilde was the daughter of Robert Wilde of Ecclesall and sister of Thomas Wilde who joined the partnership on 30th Jan 1794. They had 12 children. Thomas Wilde was already in partnership with one John Walker (Walker Wilde and Co) and consequently John Walker also became one of Thomas Appleby's partners.

On 22nd June 1793, the partnership purchased some farmland at Renishaw in Derbyshire from Cornelius Brown, and there they built a new iron foundry. The signatories to the purchase of the Renishaw farmland were Thomas Appleby Edward Scholefield and John Harrison. (See note 1) A deed of copartnership for the Gibralter Street works and the works at Renishaw was signed on 28th Nov 1797 by Thomas Appleby, of Sheffield, Edward Scholefield of Brightside Bierlow, Sheffield, John Harrison of Eckington, John Walker of the Wicker, Sheffield, Thomas Wilde of Sheffield, John Scholefield of Brightside Bierlow, Sheffield and Jonathan Roddis of Middlewood, Sheffield. The total Stock Capital of the partnership was £9000. Thomas Appleby and Edward Scholefield each held twice the share of the other individuals in the partnership.



The partnership of **Appleby Scholefield and Co** was dissolved in Dec 1801. Edward and John Scolefield retained the Gibralter Street works, in Sheffield, while the other partners, Thomas Appleby, John Harrison, John Walker, Thomas Wilde and Jonathan Roddis, retained the Renishaw Iron foundry. The Renishaw Iron foundry was then operated under the name of **Appleby Walker and Co.**

The ownership of **Appleby Walker and Co** changed with the withdrawal or deaths of the original copartners in the Renishaw Works. John Harrison withdrew from the partnership on 30 June 1802, selling his share to Thomas Appleby and John Walker. Jonathan Roddis died. Thomas Appleby died on 15th Nov 1814. As his original partner, Edward Scholefield, had withdrawn from the Renishaw partnership Thomas was the major stock holder and his memorial plaque, (shown right) states that he was the "Founder of the Renishaw Iron Works." Under his Will, his interests in the Renishaw Iron Works were passed to his



eldest son Francis Rookby Appleby,(See Note 2) and in trust to his executor John Bingham (who was the clerk at Renishaw) until Thomas' youngest child had attained the age of twenty one. At that stage Thomas' other children opted to sell their share to their brothers Francis, Charles and Edwin Appleby. John Walker died on 7th March 1818 and his interests passed to his sons William Walker and John Walker. Thomas Wilde died on 18th July 1827, and his interests passed to his nephews Francis Rokeby Appleby, Charles Appleby and Samuel Gardner. Being a nephew of Thomas Wilde, Samuel Gardner was descended from Robert Wilde, and hence he was related to the Applebys. Edwin Appleby withdrew from the partnership on 13th June 1828. John Walker also withdrew, (deed dated 26th Feb 1833). The business was then carried out by Francis Rokeby Appleby, Charles Appleby, Samuel Gardner and William Walker, still continuing under the stile of "**Appleby Walker and Co".** The deed shows how much the business had grown. It refers to the "divers Freehold and Copyhold Messuages Mills Furnaces Iron Mines Coal Mines Land Hereditaments and premises at and near Renishaw aforesaid and in the several parishes of Eckington and Balborough in the said County of Derby". As well as being described as Ironmasters all the signituries were by then described as Coalmasters. The 1833 deed is also of interest as it states that Charles Appleby (Iron and Coal master) was residing in the Empire of Russia. William Walker died on 27th Dec 1848, and Charles Appleby died on 19th April 1849. After the death William Walker and Charles Appleby the firm changed its name to "**Appleby and Company,**" the remaining partners being Francis Rokeby Appleby and Samuel Gardner. On 19th April 1860 Charles Appleby's son Charles Edward Appleby received his fathers interest in the company and became a partner. Samuel Gardner died on 24th Dec 1857 and his children Samuel and Elizabeth Gardner inherited their father's interests. They subsequently decided to withdraw and sold their share to the two remaining partners, Francis Rokeby Appleby and Charles Edward Appleby on 30th June 1861. Charles Edward Appleby gave control of his share of the company to his uncle Francis Rokeby Appleby on 25th March 1868 in anticipation of the sale of the company. Francis agreed to pay Charles his share of the proceeds, with interest from 30th June 1867 until the date of the sale. When Francis finally sold the business access to the new owners, Messrs Thomas Morrison, William Hunter, William John Hutchinson, Hilton Philipson and Alfred Allot was granted in 1870. The deeds finally transferring the business were signed by Francis Rokeby Appleby, by then described as "of Broomhill House Sheffield," on 17th May 1872.

James Appleby of Eckington and Renishaw Iron Works, Derbyshire. (shown left) was the eighth of Thomas and Alethea's twelve children. He was born 15th Aug 1800 and died 11th May 1878. He married Emma Hodgson on 24th April 1825 They had two children, Thomas Hodgson Appleby and Charles James Appleby. Renishaw and Barlborough trade directories show that in 1849 James Appleby who was not an equity partner, having sold his share as described above, had become Iron and Coal Master at Renishaw. By then James Appleby's eldest brother Francis Appleby would have been 59 and may have retired. Charles was in Russia, and Edwin withdrawn from the partnership. The directories show James continued as Iron and coal Master until 1862 when he would have been 62, and also likely to have retired. There is no reference to James in

any of the Renishaw deeds, but then he was not an equity holder in the company. His signature appears as a witness to a deed in 1830. In 1842 he contributed to the Royal Commission Report on the Employment of Children and Young Persons in the Mines and Collieries of Derbyshire and Nottinghamshire. This report shows that he was working at the Renishaw Iron works (Messrs **Appleby and Co).**

Thomas Hodgson Appleby was born on 7th Mar 1826 and on died 23rd Nov 1899. He married Fredrica Hughes Wilkinson on 9th Sept 1867. There were no children.

Charles James Appleby was born 23rd Feb 1828 and died 26th April 1908. He married Lucinda Tallis on 8th June 1858. They had 9 children.

Pictured (left) are James Appleby with his sons Thomas (standing) and Charles (right).

Charles James Appleby obtained his initial engineering training at: the Renishaw Iron Works of Appleby and Co. His subsequent training was obtained at the works of Messrs Sharp Roberts and Company, Messrs Whitworth, Messrs James Nasmyth and Company and various others.

In 1849 Charles James Appleby returned to Sheffield and took a position at uncle's steelworks, but he then returned to Manchester to supervise completion and delivery of the first Nasmyth Steam Hammer that was sent to Russia. In 1850 he went to Russia to superintend the erection of the steam hammer. Whilst in Russia he then supervised trestle works on the St Petersburg and Moscow Railway. It was during this period that he realized the need for efficient machinery for the lifting and handling of building materials. He spent about 3 years in Russia, and then travelled extensively for work and pleasure before returning home.

In 1858 after CJA had married Lucinda Tallis they set up home in London, and CJA started producing the engineering machinery for which he made his name. The following year (1859) he was joined by his brother Thomas Hodgson Appleby and they practised under style of **Appleby Brothers.** Lucinda Tallis was the only child of the publisher and cartographer John Tallis. (There is a Blue Plaque to John Tallis at No 233 New Cross Road S E 14). Their 9 children included Edmund Gardner Appleby (born 31 Jan 1864) and Percy Vavasseur Appleby who were to become involved in **Appleby Brothers** and its successor companies. Other children, who are mentioned in the text below, include Charles Tallis Appleby, who was later to be involved in his brother's company, and Florence Mary Appleby.

Company note paper tells us that as early as 1862 Appleby Brothers started to receive the "Highest Awards" for cranes at International Exhibitions. Exhibitions listed on the notepaper are London, Paris, Philadelphia, Vienna, Amsterdam, Adelaide and Melbourne. In that year it is also of interest that Appleby Brothers installed a lift at the London Printing and Publishing Company, the works of Charles' father in law, John Tallis.

On 2nd Feb 1864 Charles James Appleby was admitted as an Associate of the Institution of Civil Engineers. Also in 1864, his son Percy Vavasseur Appleby (See note 3) was born on 26 January. Percy Vavasseur Appleby was educated at Eastbourne College, and at University

College London. He was awarded the Miller prize for his paper intituled "In Iron and Steel in Tension, Compression, Bending, Tension and Shear" by the Institution of Civil Engineers, in July 1883. He was admitted as an Associate member of the Institution of Civil Engineers on 1st April 1890.

At this time **Appleby Brother** products were manufactured by **Appleby Brothers** at the Reinshaw Iron Works of **Appleby and Co**. An **Appleby and Co** brochure and letter survive from May 1867 which contains a list of products and associated costs. Manufacture by **Appleby Brothers** at Renishaw is likely to have started at a time when Charles and Thomas Appleby's father James was the Ironmaster at Renishaw. The Appleby and Co brochure directed customers of **Appleby Brothers** to their London office which Appleby Brothers had established in Emerson Street in Southwark. These offices remained until (at least) 1879. Around 1868 when manufacture by Appleby Brothers at the Renishaw Iron works would have been coming to an end, following the decision to dispose of Appleby and Co, Appleby Brothers established a new works in Leicester known as the "London Steam Crane and Engine Works".

In 1869 Charles James Appleby published the first comprehensive edition of "Appleby's Handbook of Machinery" (published by Messrs E and FN Spon). There had been a previous and much shorter edition published in 1863, however the new 1869 work was probably prompted by the sale of the Renishaw works, previous sales data having been in the Appleby andco catalogue. This 1869 work, which was both a handbook and a catalogue of Appleby products, was in eight separate sections covering an enormous range of engineering equipment and machinery. The volumes were completely revised and reprinted many times with the last printing being in about 1906. One writer has described CJ Appleby and Appleby Brothers as "a veritable emporium of Victorian machinery" and added that "they became one of the pillars on which the British Empire has depended for supplies of equipment of every kind". They were principally known for their expertise in cranes, as they were one of the first significant producers of cancs in the world. However the range of equipment which they produced was simply enormous and this is exemplified by the vast range of items covered in eight volumes of "Appleby's Handbook of Machinery" The titles of the eight volumes is long enough without providing a detailed index of their of their contents. These volumes were:-

Section 1 – PRIME MOVERS
Steam, Gas and Air Engines, Boilers, Turbines, etc.

Section 2 – HOISTING MACHINERY
Winding Engines, Hydraulic, Steam and Hand Cranes, Winches and Jacks

Section 3 – PUMPING MACHINERY
Pumping Engines, Centrifugal, Steam and Hand Pumps

Section 4 – MACHINE TOOLS
For Working Metal, Wood etc.

Section 5 – CONTRACTORS' PLANT AND RAILWAY MACHINERY
Including the Machinery and Materials required for the Construction and Equipment of Railways and other Public Works

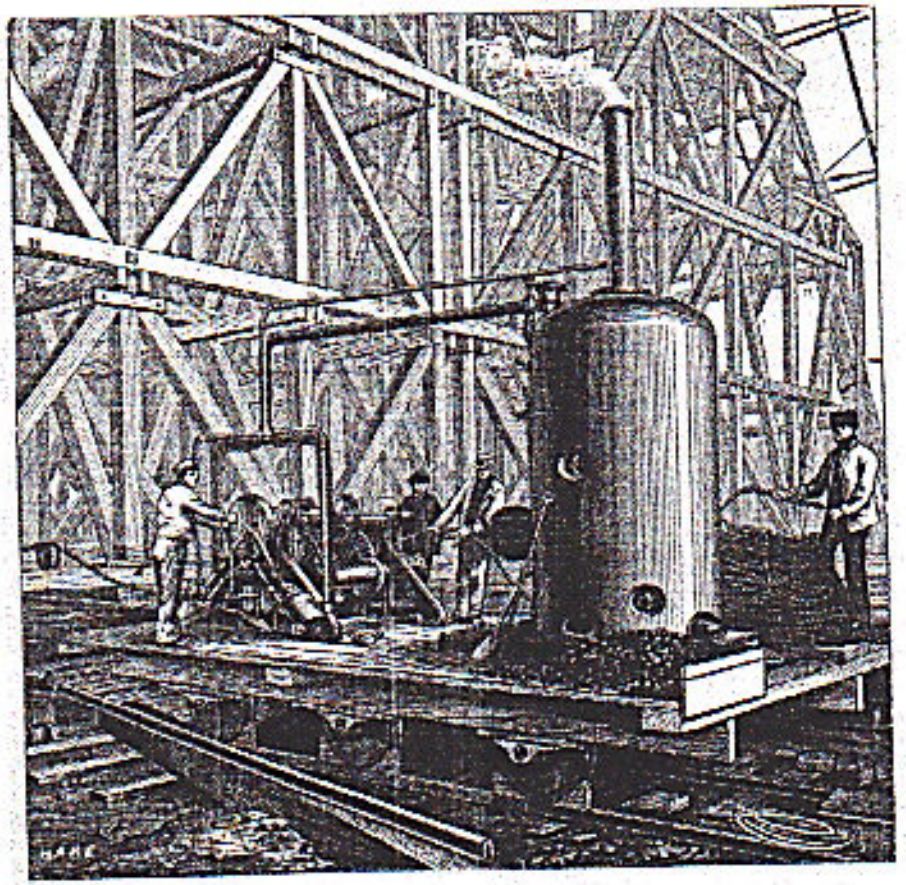
Section 6 – COLONIAL AND MANUFACTURING MACHINERY
For treating corn, coffee, rice, sugar, cotton and other products, oil mills, gas works etc.

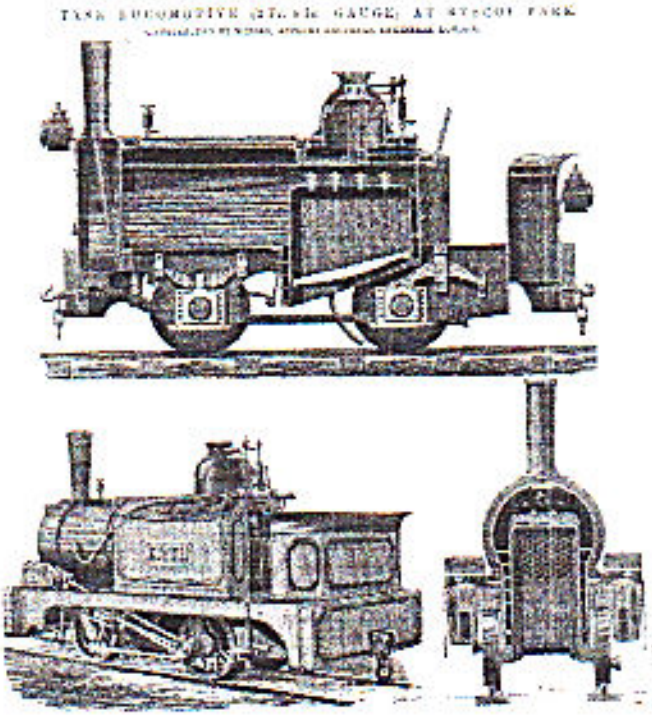
Section 7 – MISCELLANEOUS IRON WORK
Brass fittings, Engineer's Tools, and General Stores

Section 8 – USEFUL TABLES AND MEMORANDA
For Engineers, Merchants and Manufacturers, with Prices, Weights, Measurements, Working Results, Cost of Working etc.

These sections were completely revised and rewritten a number of times, with the contents being extended to include, in particular, electrical equipment: dynamos, motors, electric canes etc. and Mining Equipment. Inspection of just 14 pages of the 158 pages in the 1877 edition of Section 2 –Hoisting Machinery, gives an idea of the numbers of contracts and clients that there must have been. The 14 pages identify a derrick for the Mount Sorrel Granite Co in Leicestershire, Cranes of the East and West India Docks in London, Derricks for the Calcutta Waterworks, Harbour Works in Fiume, Cranes for the International Exhibitions described below, locomotive cranes for the Midland Railway Company, Cranes for the Finland State Railways etc. etc.

Now, at a time when major Civil Engineering news is on subjects like the new high speed Channel Tunnel Rail Line, and the consequential modifications to St Pancras Station in London, it is worth remembering that Appleby Brothers designed the temporary works and provided the craneage for the erection of the original arch roof of the station. It was then the largest single span arch in the world.

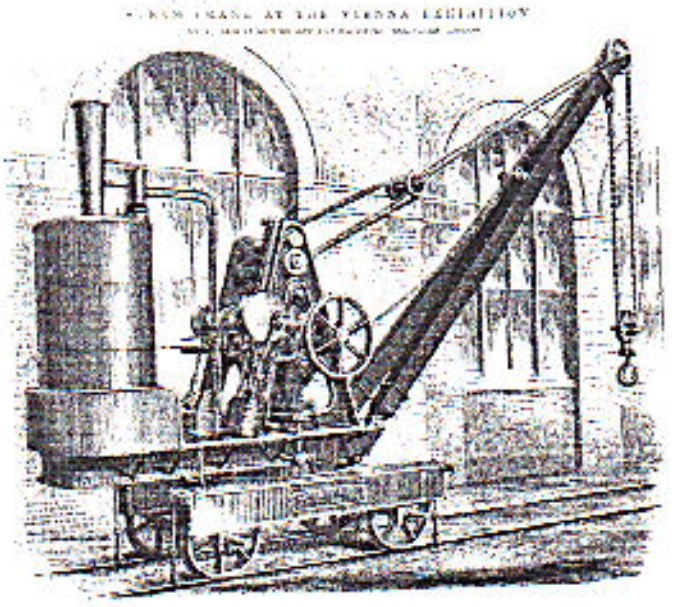




Applebys Brothers provided all sorts of railway equipment, details of which appear in Section 5 of the Handbook. A good example of is the manufacture of a narrow gauge locomotive named "Edith" which appeared in the 20th Jan 1871 edition of "Engineering".

Charles James Appleby had other involvements as well as being involved in Appleby Brothers. Articles in The Times newspaper show that when, in 1871, the Buenos Ayres National Tramways Company was issuing shares Charles James Appleby was one of its 6 Directors. Another article the following year when the South Cleveland Iron Works (Limited) were issuing shares also shows that he was a director.

Appleby Brothers were requested by the British and Austrian Commissioners of the 1873 Vienna Exhibition to supply three cranes for service at the Exhibition. Cranes of the same type had been previously made available to the British Commissioners in Paris and London. An article in the Times on 10th July 1873 describing the English machinery at Vienna said.... "and there were the three cranes of Appleby Brothers which have proved of immense service in playing with the ponderous weights that had to be moved and arranged in their places". CJ Appleby had the distinction of being made a Ritter of the Order of Franz Joseph of Austria. This award was made on 27 Oct 1873.

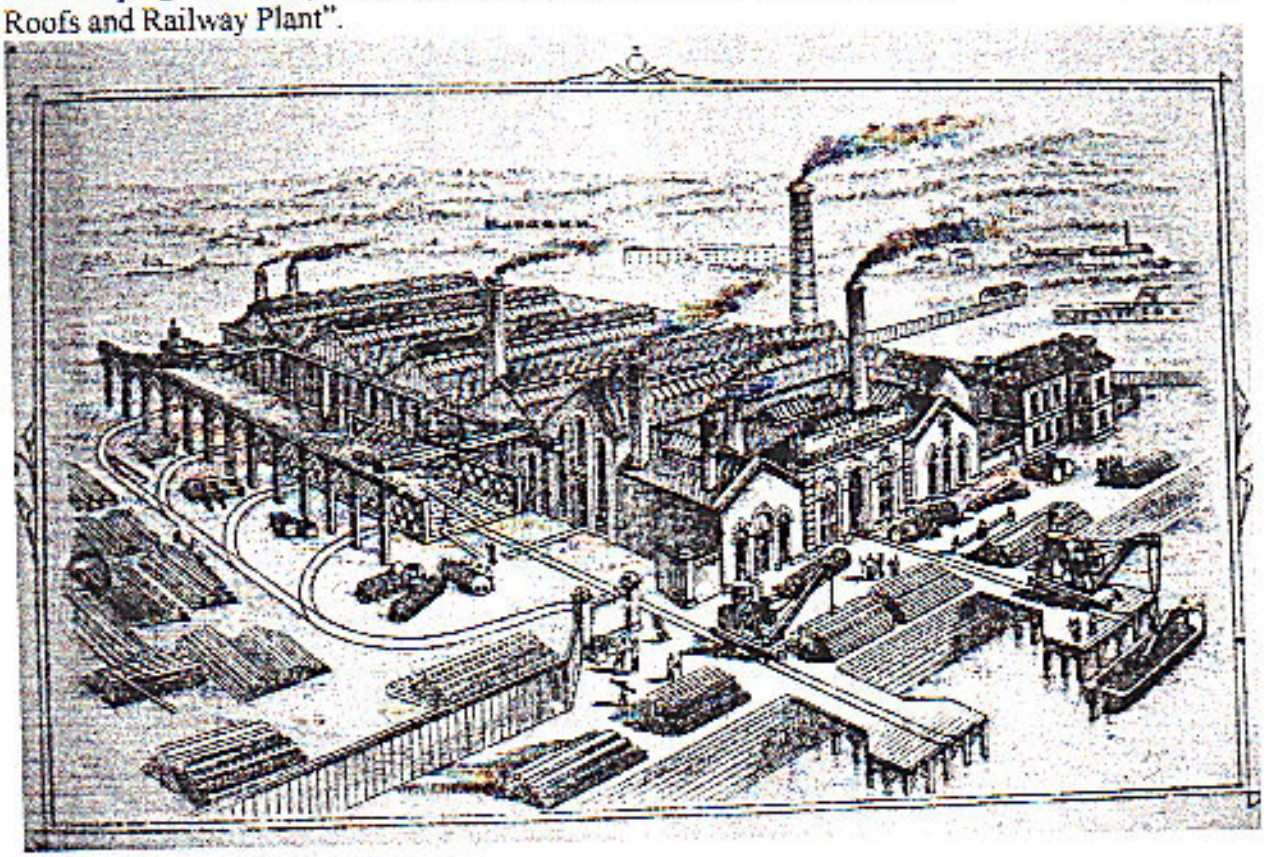


In 1874 Charles James Appleby entered into a contract with the Egyptian Government to supply rails, rolling stock and material for the first Sudan Railway. Unfortunately the Egyptian Government decided to abandon the line before it was complete, which resulted in substantial compensation payments.

On 29th May 1877 Charles James Appleby became a member if the Institution of Civil Engineers, and the following year, on 15 Nov 1878, he was awarded the Order National de La Legion D'Honneur for the Appleby Brothers exhibit at the 1878 Paris Exhibition. Similar cranes to the ones used in Vienna were again provided for the Paris Exhibition.

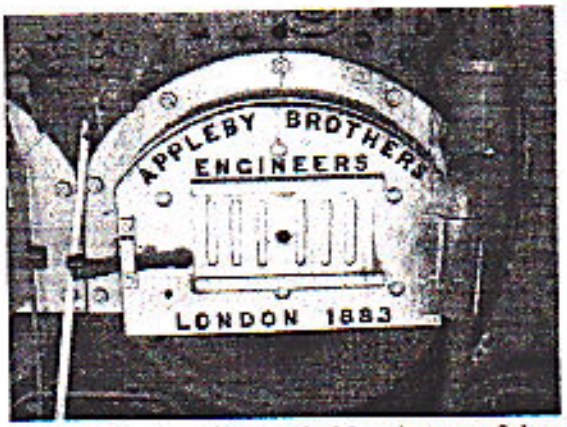
It is unknown, at present, when Thomas Hodgson Appleby ceased working, but his occupation is shown as "Retired Engineer" in the 1881 census. (See note 4).

In order to provide greater capacity Appleby Brothers Ltd set up a new works in East Greenwich, on the bank of the Thames. These works, whose address was simply "The Works, East Greenwich" had previously belonged to Henry Bessinger. The earliest advertisements associated with these new works (found to date) are from January 1881 These advertisements give a flavour or the types of equipment manufactured in Greenwich. They refer to "Mining and Pumping Machinery, Engines, Boilers and Dredging Plant, Cranes and Travellers, Bridges, Roofs and Railway Plant".



The Works – East Greenwich

Few items survive from the original firm of Appleby Brothers. One item of particular note is the Appleby Brothers Beam Pump at Goulburn in New South Wales, Australia. This pump was manufactured in 1883. It was one the only surviving one of four Beam Pumps which Appleby Brothers built in New South Wales, and is likely to be the only surviving example in the world. (The Appleby's Handbook only makes reference to four Beam Pumps). It pumped the town's water supply until 1932 when it was mothballed. Thanks to one Bruce MacDonald, who saved it from being scrapped in the 1950's, this magnificent machine, which is still in its original building, has been restored. It is believed to be the first beam bump in the world to have been put back into steam as part of a conservation project. It can be viewed in operation on open days. Being so large, it is impossible to take a suitable picture of the pump, so the above is of a boiler door!



In 1882 Percy Vavasseur Appleby signed an indenture to carry out his engineering training under his father Charles James Appleby. The following year he travelled to Australia, as a trainee engineer on the SS Anglo Indian. It is probable that he visited Goulburn whilst the Beam Pump was being constructed.

On 8th Feb 1886 **Appleby Brothers Limited** was formed. This new company had shareholders, and presumably therefore introduced needed capital into the company. The list of shareholders, dated 2nd July 1886 shows that there were 3000 shares issued, of which Charles James Appleby held 110, his brother Thomas Hodgson Appleby (who had retired) held 80 and his son Percy Vavasseur Appleby held 10. The deed of association named the first directors as: John Wallace (Iron Merchant - 250), Thomas Greenwood (Gentleman - 450), William Robert Green (Engineer - 100) and Charles James Appleby. The occupations and figures in brackets show the occupations and numbers of shares held by each as shown on the share register of 2nd July 1886 It is interesting that the document stated that "Charles James Appleby shall not act as a director until the company has executed an agreement to purchase the business of Messrs Appleby Brothers". The document was signed by parties listed above plus Percy Vavasseur Appleby (Engineer - 100), George Higgs (Coal Merchant - 100) and Thomas Greenwood (Younger) (Dissenting Minister - 100).

On 14 Feb 1888, an article in the Times describes Appleby Brothers work for the Greenwich Ferry in London: "The contract for the foreshore works, travelling pontoons and machine generally was undertaken by Messrs Appleby Brothers (Limited) and is now far advanced toward completion. Considerable engineering difficulties have arisen in the sinking of the cylinders for the balance weights but these have now been overcome."....

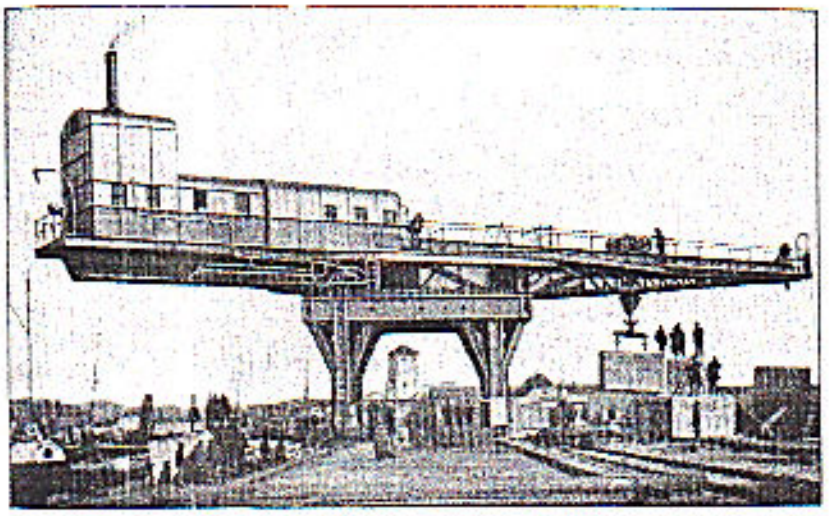
Appleby Brothers Limited appears to have run into financial difficulties and on Saturday 23 March 1889 a petition for the Voluntary winding up of the company was heard in the High Court of Justice in front of Mr Justice North. The petitioners were Farquhasson Brothers and Company, EP Trenchard and Sons, Edward Penny Trenchard (who held 10 shares in the company) and the Greenwich Ferry Company. The Court ordered the voluntary winding up to proceed, but excluded the Greenwich Ferry Company as creditors unless they could demonstrate that they were creditors. Notice of the petition was published in the London Gazette and the Times on 15th March 1889 and The Standard on 14th March 1889 The winding up took some time and the Final General Meeting of Appleby Brothers Limited took place on 8th May 1895. Details of the winding up are, as yet, unknown, but a new company **Jessop and Appleby (Leicester and London)** was incorporated and registered on 21st Feb 1896.(See Note 5)

The Directors of Jessop and Appleby were George Jessop, Charles James Appleby, Percy Vavasseur Appleby, Edmund Gardner Appleby and William Thomas Hough.

On 6th June 1889 Edmund Gardner Appleby married Kate Tozer. Kate Tozer was the sister of William Tozer, a director of the Sheffield Steel Company of Steel Peach and Tozer. William Tozer had previously married Edmund's elder sister Florance Mary Appleby. This family connection is of interest for two reasons. **Jessop and Appleby Brothers Ltd** manufactured several substantial cranes, overhead hoists and other pieces of equipment for Steel Peach and Tozer. Also, interestingly, in 1919 Steel Peach and Tozer purchased the unrelated Lincolnshire steel companies: the Appleby Iron Co Ltd and the Frodingham Iron Co Ltd, before merging them to form Appleby-Frodingham. Both the Appleby Iron Co Ltd and the Frodingham Iron Co Ltd derived their names from the Lincolnshire villages where they were located, now suburbs of Scunthorpe. Hence the often asked question of whether there is a connection

between the Appleby family companies of Appleby and Co with Appleby-Frodingham has an unexpected answer. Yes there is a connection, but it is not what might have been expected. It is via the marriage between the Appleby and Tozer families. As described below, Edmund Gardener Appleby, who had married Kate Tozer, was to become the managing director of Jessop and Appleby Brothers Ltd and the successor company of Appleby's Ltd

In 1892 Percy Vavasseur Appleby became a partner in Appleby Brothers Letters survive from the time which he wrote to his future wife, Hilda Margaret Hill ,in Libau, a sea-port in what is now Latvia, whilst travelling for the company. One letter dated 1892 is written from St Petersburg. Others written in 1894 mention his trips to Alexandrovsky near St Petersburg, to Teneriffe in the Canary Islands to Libau, to Mieres and Gijon (Spain). Shown right is an impressive Travelling Steam Crane provided of the harbour works in Libau, Latvia.



TRAVELLING STEAM TITAN CRANE.

Of 30 tons power : to lift, slew, jenny, and travel by power; maximum radius, 63 feet 6 inches. Supplied to Libau Harbour.

The letters are of interest because as well as mentioning the places visited in the course of work, they also tell us that Charles James Appleby was in poor health, and only rarely visited the office. They also mention the Jessop family who are clearly close friends. On 6th June 1895 Percy married Hilda Margaret Hill, the daughter of the Vice-Consul to Libau, in Libau.

In 1903 CJ Appleby had the distinction of having a biographical article written about him in the publication "Men of the Day."

On 19th Feb 1906 Percy resigned from Jessop and Appleby Brothers Ltd, and a new director was appointed: Arthur Bond Wykes, 24 Friar Lane Leicester (Accountant). Charles James Appleby bought back Percy's shares in the company, and this is described in a codicil to his Will. Percy's resignation came only a very short time before the announcement on 22nd Nov 1906 that Jessop and Appleby Brothers was to be wound up. Whether the two actions are related is unknown. His brother, Edmund Gardner Appleby, who had been the Jessop and Appleby Brothers Company Secretary became its Managing Director by the time the company was finally wound up, and he announced the amalgamation of the firm with the Glasgow Electric Crane and Hoist Company (Limited), under the style of **Appleby's (Limited)** with its head offices at 56 Victoria Street, S.W. Edmund Gardner Appleby followed on from being the managing director of Jessop and Appleby was the managing director of Applebys Limited. (Article in the Times dated 5th Dec 1906) The final winding up meeting of Jessop and Appleby Brothers was held on 12th July 1907. The following year Charles James Appleby died on 26th April 1908.

The new company of **Appleby's Limited** only survived a three years, before it went into liquidation. During that time however, it followed the example of the predecessor companies publishing catalogues showing their crane various products. The catalogues were published in five sections:

Section A - Steam and Electric Jib Cranes
Section B - Overhead Travelling Cranes and Goliaths etc
Section C - Hand Power Jib Cranes
Section D - Contractors' and Railway Equipment
Section E - General Machinery

Other commentators have made reference to other companies, parties and acquisitions at this stage which may have lifted control from the previous owners of Jessop and Appleby Brothers Ltd. Details evidence of this has yet to be found. However, when Appleby's Ltd went into liquidation, an agreement with the liquidator, on 9th May 1910, formed a new company named the **Appleby Crane and Transporter Co Ltd**. The agreement was between the liquidator, William Barclay, Sir Vincent Caillard trustee for the new company and Edmund Gardner Appleby, who had been the managing director of Appleby's Ltd. Applebys had certainly lost control after the signing of the agreement, which gave Vickers and Maxim Ltd in excess of 80% of the share capital. Sir Vincent Caillard is listed as one of the eight directors of the new company. There were no Appleby's or Jessops, although both families (including the executors of Charles James Appleby and George Jessop, both deceased) were allotted a very small number of shares.

Although Vickers and Maxim Ltd had taken control of the successor company to Appleby's Ltd, this was not the finale to the Appleby family association with the industry. Edmund Gardner Appleby, who had been the managing director of Applebys Ltd, set up his own company of **EG Appleby and Co Ltd**, with his brother, Charles Tallis Appleby, George Herbert Bentley and William Ernest Lee as fellow directors. This new company was registered on 1st January 1918. Initially it had offices at 12 Broadway Westminster, and then from April 1921 at 70 Victoria Street Westminster. They continued work in areas where the family had become specialised, and they published various pamphlets describing their expertise. These pamphlets included such topics as the Constructions and Application of "Phoenix" Electro-magnets for use with cranes, for which EG Appleby and Co had the sole licence, High Speed Friction Saws, which were used for the cutting of cold iron and steel sections of all kinds, and the Kerpely Gas Producer, the sale and manufacture of which, in this country, was controlled by the new company.

EG Appleby and Co Ltd was wound up on the death of Edmund Gardner Appleby, in 1927.

This brought to an end a line of Appleby Engineers which has lasted for nearly 150 years.

NOTES

1) In about 1990's a short history of Renishaw Foundry was written which suggested that "iron founding was probably carried out at Renishaw as early as the 11th century." Where this story comes from is unknown. The deeds appear to be are quite clear that Thomas Appleby, Edward Scholefield and John Harrison purchased farm land from Cornelius Brown, and built an iron foundry. It is possible that the 1990's document was written in order to give the works some antiquity that it did not have in an attempt to persuade the powers that be that the works should not be closed. Unfortunately the ploy did not work, and the Renishaw Works were finally closed in 1999. The site is now a housing estate.

2) In Thomas Appleby's Will, his eldest son Francis' second name is spelt Rookby. He was presumably named after Thomas Appleby's parents Francis Appleby and Ann Rooksby. In all of the Renishaw documents, Francis adopted the spelling Rokeby.

3) Why "Walter Appleby" should become "Percy Vavasseur Appleby" is unknown. The first name to appear on his birth certificate is "Walter". The names "Percy Vavasseur" were added as Baptismal Names after registration. The name Vavasseur keeps reappearing and whether the appearance of the name has anything to do with the Baptismal Names is unknown, although it seems to be more than a coincidence. Also whether the J Vavasseur who keeps reappearing is the same person is unknown. One of the Appleby Brothers Ltd shareholders was an engineer named Joshia Vavasseur. When Percy Vavasseur Appleby was admitted as a member of the Institution of Civil Engineers he required a number of sponsors. One of his sponsors was J Vavasseur. An article in the Times on 26 Feb 1872 shows that Charles James Appleby and J Vavasseur attended an engineering demonstration of some type. For most for his life after he resigned from Jessop and Appleby Brothers Ltd in 1906, Percy Vavasseur Appleby worked for J.H. Vavasseur Ltd, where he became a director. His company visiting card includes his qualifications: Assoc.M.I.C.E. M.I.M.E Details of JH Vavasseur Ltd are unknown. Were they in a similar branch of Engineering as that followed by Appleby Brothers?

4) On the date of the 1881 census Thomas H Appleby was at the home of Charles C Gardner at 53 Upper Bedford Place, London. Was Charles C Gardner related to the Samuel Gardner who was a partner in Appleby Walker and Co, at Renishaw?

5) When Jessop and Appleby Brothers was formed, George Jessop transferred the London Steam Crane and Engine Works in Leicester to the new company. These works had previously been belonged to Appleby Brothers, so how George Jessop came to own them is currently unknown.