The Harbour that Worked

©

INTRODUCTION

Aborigines fishing C. 1813

Sydney Harbour has been a valuable asset to its adjacent inhabitants since Aborigines first came to its shores. Primarily, it provided them and the much later European settlers with seafood. The Europeans also made lime from sea shells for constructing their dwellings, and the harbour provided the highway for emigrants, the transport of people, food, goods and the import and export of commodities.

It became a working harbour.

As the colony developed so did shipbuilding and industry around the harbour's foreshores. Its waters not only allowed the convenient delivery of coal for power generation and gas-making, but provided cooling for the machinery.

The export and import trade grew from the early days of the colony, developing from man-handled cargoes to bulk handled and containered goods, and to motor vehicles carried by huge vessels.

Bennelong Point & Fort Macquarie C.1875

Troopships took our soldiers off to war and brought them home, and before large passenger aircraft, ocean liners transported travellers across the seas and brought immigrants, especially after World War 2.

Sydney Cove 1994

Ferries became a valued and gracious way to commute, and tourist craft increased in numbers as more and more people came to visit from overseas; many of them arriving in huge cruise vessels which replaced the passenger liners.

The harbour became a significant venue for sailing, yachting and pleasure craft, and a major tourist attraction in its own right.

Now, the shipbuilding, the power stations, the gasworks and much of the industry have gone, and the remaining bulk cargo function is cited for relocation – the working harbour is under threat.

These notes explore many of the industrial sites and other places around the western harbour foreshores that contributed to the development and prosperity of Sydney.

DARLING HARBOUR

The head of Cockle Bay (renamed Darling Harbour about 1826) originally stretched to the south side of the Entertainment Centre. It was shallow with tidal mud flats and this prompted reclamation (which commenced in the 1850s) to facilitate industry. It accelerated in the 1920s with disposal of rock excavated for the city's underground railway.

The Darling Harbour area was the cradle of Sydney's industrialisation. It saw the development of new technologies and the adaptation of old ones to the needs of the growing colony.

Dickson's Mill. Australia's first steam engine was brought to the country by John Dickson, an enterprising engineer who arrived in Sydney in 1813. Governor Macquarie granted him waterfront land near the end of Liverpool Street and there, on 29 May 1815 the industrial revolution arrived in Australia.

Dickson's steam mill (near today's Chinese Garden) produced flour at the rate of 260 bushels per day, more than twenty times the output of the windmills at Millers Point!
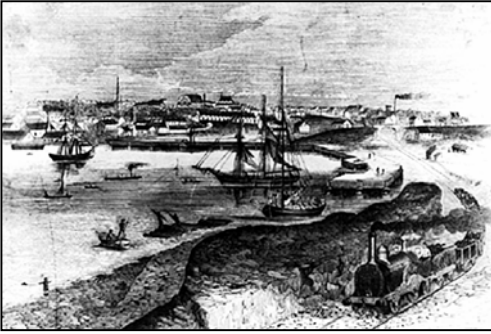
Darling Harbour C. late 1850s

Railway goods yard. As part of a line to provide a direct connection between the Sydney terminus yard and the Darling Harbour port, the first railway 'tunnel' was constructed under George Street (later widened to become Railway Square). The line commenced service in 1855. The Darling Harbour railway goods yards then developed for the receipt of commodities for export.

Export of commodities. In the 1870s and '80s the wool industry grew, the rail network expanded and the export of commodities from Darling Harbour – wool, wheat and frozen meat – created great wealth for the colony.

Wool stores. Many wool stores were built on the high ground to the west of the Harbour to receive and store wool prior to export. These fell into disuse with the construction of new wool stores at Yennora and the transfer of wool export to Botany Bay.

The huge Goldsborough Mort store on Harris Street has since been converted into apartments, with six extra floors added on top.

Wharves. Finger wharves at right angles to the shore (like at Walsh Bay) lined both sides of Darling Harbour for most of the twentieth century (from the air it resembled a giant toothcomb). These were progressively replaced by shore-parallel piers in the 1960s-70s for bulk cargo handling by container carriers and roll-on-roll-off vessels. A number of these berths are now used for tourist vessels and public entertainment.

Hydraulic Power. The steam-driven Number 1 hydraulic pumping station (later converted to electricity), was built at the southern end of Darling Harbour in 1890 by the Sydney and Suburban Hydraulic Power Company. It supplied the city with high-pressure water to drive many machines such as hoists, cranes and wool presses, as well as the lifts in the city's earliest high-rise buildings.

Separate pumping stations and hydraulic systems were at Walsh Bay (where the accumulator can still be seen) and Wooloomooloo finger wharf.

The system was quickly overtaken by the advent of electricity, but it continued to operate until 1975. Some of the hoists can still be found at Campbells Cove and the Argyle Stores, and the No. 1 pumping station still stands near the Sydney Entertainment Centre as part of the Pumphouse Hotel.

1. Pyrmont Bridge. The first Pyrmont Bridge designed by the colonial engineer E O Moriarty opened in 1857. It provided quick access for meat from the Glebe Island abattoir to the Victoria Markets, where the Queen Victoria Building is now. It was of timber, with an opening span for the passage of ships.

It was replaced by the existing Pyrmont Bridge, which opened in 1902. Its swing span was one of the largest in the world and one of the first to be operated by electricity, with the power coming from the Ultimo Powerhouse. It was designed by engineer Percy Allan of the Department of Public Works, assisted by the young John Bradfield (of Sydney Harbour Bridge fame) and Gordon Edgell who later established a vegetable canning business.
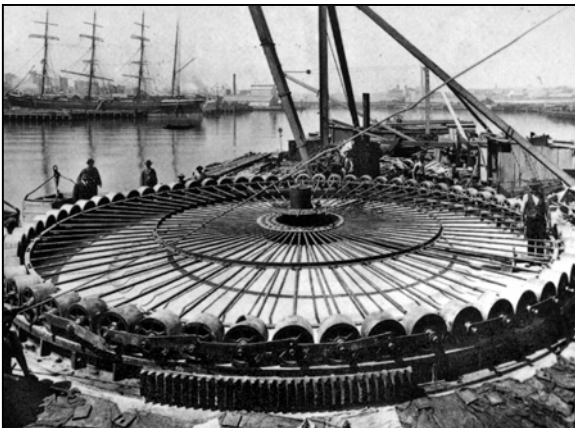
Swing span rollers, Pyrmont Bridge

When the bridge became redundant with construction of the Western Distributor fly-overs, it was saved from demolition by the efforts of the heritage community, including the Sydney Engineering Heritage Committee.

Pyrmont Bridge's timber truss approach spans represent the peak of achievement in timber bridge truss design in Australia. The bridge was proclaimed a National Engineering Landmark in 1992 by Engineers Australia. This is the highest honour that can be bestowed upon a heritage engineering structure in Australia, an honour shared by such major undertakings as the Sydney Harbour Bridge and the Snowy Mountains Scheme.

Leisure and entertainment. The advent of containerisation and bulk shipping (much of which became located at Port Botany) saw the demise of cargo handling at Darling Harbour, except for the eastern shore north of King Street. The railway goods yard thus became obsolete and was redeveloped for the nation's bicentenary in 1988, as a landscaped leisure and entertainment area.

ULTIMO POWERHOUSE (POWERHOUSE MUSEUM)

The Ultimo Powerhouse was built in 1899 to supply power for Sydney's electric tram network and was enlarged as the network expanded. It was the first publicly-owned power generator in the State. It closed in 1963 and was adapted to become the Powerhouse Museum, which opened in 1988.

PYRMONT

2. Pyrmont Power Station. Pyrmont Power Station was on the site of today's Star City casino. It opened in 1904 and supplied power for industrial and domestic customers and street lighting, including Sydney's first street lights. These were switched on by the Lady Mayoress on 8 July 1904.

3. Shipbuilding and repair. The Hunter River Steam Navigation Company established a shipbuilding and repair works on Darling Island in the 1840s. It was absorbed by the Australasian Steam Navigation Company in 1851, which expanded the works into a huge enterprise

3. Royal Edward Victualing Yard. Darling Island later became the site of the Royal Edward Victualing Yard, where ships of the British Navy were serviced and supplied for voyages in the southern oceans during the early years of the 20th century. It is marked by the two tall brick buildings near Pier 13. They were designed in about 1910 by the first Government Architect, Walter Liberty Vernon.

In later years the site was used by the Australian Navy. The buildings were re-furbished in about 1996 as office accommodation, with strict heritage principles being observed. The refurbishment received an Institute of Architects' award, and the structural engineering work received an Engineers Australia 'Highly Commended' Heritage Excellence Award.

Quarrying. John Macarthur an early Pyrmont landowner, quarried stone in the 1820s for a house that was never built. However by the 1850s quarrying was big business. Pyrmont 'yellow block' sandstone had become valued for its quality and was specified for much of the building in Victorian Sydney, including Sydney University and the General Post Office. The cliffs of some quarries are still visible.

By 1930 Saunders Pyrmont quarries had closed and supplies of 'yellow block' were limited, as quarry sites gave way to development.

Colonial Sugar Refining Company (CSR). From 1878 the Colonial Sugar Refining Company occupied the entire northern section of the Pyrmont peninsular, where it had a large processing plant and refinery. Apart from the basic activity of refining raw sugar which had been shipped down from northern NSW and Queensland, the site included a distillery and a plant for the manufacture of wall-board.

Deep-water shipping berths enabled the works to directly unload and load materials and products. There were even huge stables for the horses and carts that transported the manufactured products all over Sydney.

After the site became inoperative, much of it was cleared for residential re-development during the 1990s.

4. GLEBE ISLAND BRIDGE

1861 Glebe Island Bridge

The first Glebe Island Bridge opened in 1861 and was a timber structure designed by the Public Works engineer E O Moriarty. It was built so that meat from the Glebe Island abattoir could be transported quickly into the city, because there was no refrigeration.

The bridge contributed significantly to the opening up of suburbs such as Balmain, Rozelle and beyond. Balmain which had few residents before, mushroomed to a population of 3500 in 1864.

The first bridge was replaced in 1903 by another designed by Percy Allan. Its swing span is a sister to the one in Pyrmont Bridge opened one year earlier. The bridge also carried trams through Rozelle and Drummoyne, over the old Gladesville Bridge and on to Top Ryde.

In turn it was superseded by the ANZAC Bridge; its future is still being determined.

ANZAC BRIDGE

Anzac Bridge was completed in 1996 to replace the old Glebe Island Bridge. It comprises three main spans - the end two at 140 metres and the centre one at 345 metres. They are of prestressed concrete and are cable-stayed and continuous. The A-shaped concrete towers are 119 metres high above the pile caps and are visible from many parts of Sydney.

The bridge provides a distinctive 'gateway' to the city from the west, just as the Harbour Bridge does from the north.

5. GLEBE ISLAND ABATTOIR

**Pigs to the abattoir,
Glebe Island Bridge 1906**

The Glebe Island abattoir was on the hill just to the south of the western end of the ANZAC bridge. It was designed by the Colonial Architect Edmund Blackett in 1850, but modelled on the one at Montmartre.

All the waste from the abattoir was deposited in the adjacent Rozelle Bay, attracting sharks and creating a tremendous stench. Naturally this gave rise to complaints from nearby residents and even seamen on boats. As well, suburban residents took exception to the nuisance caused by the droving of animals to the abattoir through their streets

Finally, an inquiry in 1903 - which heard about 'a disgusting state of affairs' - recommended relocation of the abattoir. This led to the opening of the Homebush Abattoir in 1917. In turn it closed in 1988 and became the site of Olympic Park.

6. PYRMONT INCINERATOR

Pyrmont Incinerator

Some incineration of garbage took place at a number of locations from the early 1900s. Then in 1930 the Reverberatory Incinerator and Engineering Company was contracted to build a number of large garbage incinerators around Sydney. The buildings were designed by the architectural firm of Walter Burley and Marion Mahony Griffin (designers of Canberra).

The most significant of the incinerators was the one built in 1934 at Pyrmont (near the end of the ANZAC bridge) which operated until 1971. It was demolished in 1990 and replaced by an apartment building.

Most of the incinerators have now been demolished. The one still standing at Willoughby was for a time a fashionable restaurant.

7. GARBAGE PUNTS (SYDNEY FISH MARKETS)

The disposal of Sydney's garbage was always a problem. So in 1899 the Council built a wharf on the site of the present Fish Markets, where punts were moored for the loading of garbage before being towed to sea for dumping. However, as punts were left there until they were full (which could take a week or longer), the stench became unbearable and the operation eventually ceased.

RECLAMATION OF BAYS

All around the Harbour and along the Parramatta River, creeks and drains fed into the shallow bays. Before Sydney was properly sewered, the drains virtually became obnoxious open sewers and caused extensive silting.

This and other demands led to the reclamation of the headwaters of most of the bays, much of it for parks and playing fields. Major reclaimed areas to be seen on this tour are the heads of Darling Harbour, Blackwattle Bay (now Wentworth Park), and Bicentennial, Federal and Jubilee Parks at Glebe.

8. GRAIN SILOS

The Grain Silos on Glebe Island were built between 1918 and 1922 as a cooperative venture for the storage and export of grain, by the Railways Department and the Department of Agriculture.

9. WHITE BAY POWER STATION

The first electric power stations in the world were built in London and New York in 1882, and by the 1890s there were a number of small private companies supplying power to local areas of Sydney.

Ultimo, the first major power station in Sydney was commissioned in 1899 to supply the George Street electric tramway. Expansion of the tramway system led to construction of the second major power station at White Bay during 1912-13. The station also supplied bulk power to local government authorities and powered the suburban railway system when it was electrified in the mid 1920s.

To meet demand, the White Bay station was progressively expanded up till 1956. It was taken over by the Electricity Commission of NSW when it was established in 1950, and was decommissioned in 1983.

It still contains machinery that is of historic interest. A conservation management plan has been prepared for the site and options are presently being considered for its adaptive re-use.

The buildings of the White Bay station together with Ultimo (now the Powerhouse Museum) are the last two major ones remaining in Sydney. The others – Bunnerong, Pyrmont and Balmain have been demolished.

10. TRAM 'DOLLY', DARLING STREET WHARF, BALMAIN

Before Sydney changed to busses, trams used to travel down the hill to the Darling Street wharf. However, because the hill was steep there was concern that if their brakes failed, the trams could plunge into the harbour. To prevent this a wagon (the 'dolly') was positioned on the tramline at the top of the hill connected by a cable running down the hill over a pulley, to a heavy counterweight that ran on rails underground below the tramline. Another cable was attached to the uphill end of the counterweight and ran over a pulley at the top of the hill to be connected to the uphill end of the dolly.

When a tram arrived, it pushed against the dolly and its descent was slowed by it having to pull the counterweight up the slope. When the tram departed, the driver released the brake and as the counterweight descended, it helped pull the tram up the hill.

GOAT ISLAND

Goat Island was possibly named after the three goats that arrived with the First Fleet in 1788. During the 1830s the island served as a gaol and a quarry, with a gunpowder magazine complex being constructed by convicts between 1833 and 1839. The Colonial Magazine was later constructed in the 1850s. Much of this work was supervised by Colonial Engineer George Barney.

The first building for Sydney Water Police was designed by the Colonial Architect Mortimer Lewis in the 1830s and was located at the eastern side of the island. More recently it was used for filming the TV series *Water Rats*.

Details of Goat Island powder magazine

The island was the storage depot for army munitions, explosives and other ordnance until 1900. Many of these buildings still remain, notably a fine arsenal on the western side of the island, with two-metre thick walls and a vaulted stone roof.

In 1900 when the Bubonic Plague reached Sydney, Goat Island was declared a quarantine zone and a

bacteriological station was established to investigate the disease. The plague gave rise to the creation of the Sydney Harbour Trust, to clean up the waterfront and to reconstruct and manage the port.

The Trust, which later became the Maritime Services Board (MSB), established its main engineering depot on Goat Island, building large workshops and shipyards as well as administrative buildings and dwellings. It eventually had a workforce of around 500 men.

With the departure of the MSB, the island was transferred to the National Parks and Wildlife Service in 1994 and is now part of Sydney Harbour National Park.

MORT BAY

Mort Bay was named after Thomas Sutcliffe Mort. Mort was an entrepreneur, a merchant, a leading auctioneer, a major financier, a wool merchant, a shipbuilder and repairer, a founder of the Australian Mutual Provident Society (AMP) and a pioneer of refrigerated exports of meat and other produce.

11. Colgate-Palmolive factory. For more than half a century, the "soap factory" (as it was sometimes disparagingly called) made its presence strongly felt in the air of Balmain, as it converted pungent raw materials into bathroom and laundry products. Like so many of the other industrial and manufacturing enterprises, it was a major employer in the area and contributed significantly to the local economy.

It has now been converted into residential apartments.

Sydney ferry depot. Near the ferry wharf is the Sydney Ferry Depot, where ferries are serviced between runs. Mort Bay traditionally has strong links with Harbour transport; the ocean-going tugs operated from here for many years.

12. MORT'S DOCK

Mort's Dock was constructed in 1854 to service the mail-steamers that commenced the Europe-Sydney runs in 1852. This graving dock was designed by the noted colonial consulting engineer E O Moriarty, and was dug from solid sandstone. It was enlarged several times – in 1878 (the year Mort died) and again in

Morts Dock 1905

1897 when it became 194 metres long – twice its original size. Many ships were built and launched from the works.

Mort's Dock and Engineering Co. Ltd. was established in 1872 and became the largest industrial establishment in the nation, with a workforce of 1500 in 1917 in its Balmain and subsidiary enterprises around the harbour. By 1917 Mort's Dock had built 39 steamships including seven Manly ferries.

Under the guidance of engineer J P Franki, the company was involved in a wide range of general engineering throughout this time, including the building of railway locomotives.

As the dock was too small for large ships, in July 1896 Franki announced the building of a new dry dock at Woolwich and this opened in 1901.

The creation of other (mainly Government-owned) shipyards in the 1940s led to the decline of Mort's Dock and Engineering Co. which went into liquidation in 1959. The dockyard in Mort Bay has now been demolished and replaced with public housing, but the outline of the original dock is marked in the small park at the head of the Bay.

13. CALTEX OIL DEPOT

The old Caltex Oil Depot occupied Ballast Point on the northern headland of Mort Bay. This site is now unused, and after much public protest at the possibility of it becoming a high-density residential site, it was purchased in 2002 by the NSW government for public open space. Its management has been added to the portfolio of the Sydney Harbour Foreshore Authority.

"DOLPHIN" BERTHS

The "Dolphin" berths in Snails Bay are where cargo ships carrying timber in logs and flitches were unloaded onto lighters, before being carried to the sawmills and timber-yards that lined the shallow bays around Balmain until fairly recent times.

14. BALMAIN COAL MINE

The Balmain Coal Mine which commenced in 1897 was operated by Sydney Harbour Collieries Co. Ltd, from two shafts. The main shaft (which was located in the vicinity of the present Balmain Sailing Club and Birchgrove Public School) was nearly 3000 feet (900m) deep and the area mined extended from Mort Bay under Goat Island and across to Balls Head.

Although a plentiful supply of coal was available, there were problems with water seepage, and extraction was expensive when compared with the shallower coal-mines to the north and south of Sydney. By 1930, the mine had ceased to trade profitably, although later attempts were made at various times to produce natural gas.

Increasing gas leakage led to the mine being flooded and the shafts sealed; this was completed in 1957.

COCKATOO ISLAND

Cockatoo Island was for many years the premier shipyard of Sydney Harbour. As with many other harbour islands, Cockatoo's initial role was as a gaol, and remnants of the original 1841 convict-built stone buildings still exist at the western end of the main ridge. Their construction was supervised by Colonial Engineer George Barney,

At the eastern end not visible from the water, Barney's convicts also built a set of silos (which still exist) excavated 6 metres deep into the solid sandstone, for the storage of the colony's grain.

The large **Fitzroy Graving Dock (15)** at the eastern end and named after the then Governor, was designed by civil engineer Captain Gother Mann for servicing naval vessels. It was constructed by convicts between 1851 and 1857.

The **Sutherland Dock (16)** in the south-western corner of the island was designed under E O Moriarty of the Public Works Department and was completed in 1890. At the time it was the largest dock in the world.

Following transfer of ownership to the Commonwealth Government in 1913, facilities for ship construction increased rapidly, and warships and government-owned cargo and passenger vessels were built and launched. In 1933 the facilities were leased by the British shipbuilders, Vickers Ltd, and in subsequent years extensive workshops with very heavy machinery were set up, with the workforce reaching 3,600 men, many coming from nearby Balmain. However, as with the operations at Morts Dock, Cockatoo was unable to compete with shipbuilders elsewhere, and the works were wound down in the 1960s.

Titan floating crane

Cockatoo Island is one of the former defence properties now under the control of the Sydney Harbour Federation Trust. Its future is still under consideration.

17. BALMAIN POWER STATION

The Pumphouse (1934) on the water's edge is almost all that remains of the old Balmain Power Station, established in 1909 by the Electric Light and Power Supply Corporation. This highly innovative piece of engineering involved the construction of a large incinerator for the combustion of the city's garbage, coupled to a power station which used the heat from the burning garbage (supplemented by coal unloaded from a deepwater port) to generate electricity. Engineer Thomas Kenway was the original proponent of the garbage power station concept. The Company was efficient and profitable and supplied power to local areas until the 1940s.

 A new reinforced concrete power station, with greatly increased capacity, was constructed in 1947. The site was finally closed in 1976, and was re-developed for residential use in the 1990s.

IRON COVE BRIDGE

The present-day Iron Cove Bridge was built in 1956 to replace the 1882 iron lattice bridge which formerly carried traffic including trams, to the first bridge built across the Parramatta River in 1884 at Gladesville.

18. ROZELLE HOSPITAL (CALLAN PARK)

The Callan Park estate was bought by the Government in 1873 for a model mental hospital. It was later combined with the neighbouring Broughton Hall estate to form Rozelle Hospital.

The 62-hectare site, which extends from Balmain Road to Iron Cove, is of major heritage significance. The beautiful sandstone buildings of Callan Park hospital were designed by James Barnet, the last Colonial Architect and were built between 1878 and 1883.

The site was landscaped by Charles Moore, the then Director of the Botanic Gardens.

The NSW Government planned to sell off 2 ha of the site for private development, but faced with strong public opposition, withdrew the proposal in 2002.

Today there are still about 200 hospital patients; Callan Park House is now the NSW Writers' Centre; Sydney College of the Arts occupies 'Kirkbride'- the original asylum buildings; and the park-like grounds are open to the public.

RODD ISLAND

During the last half of the nineteenth century Rodd Island was both a public recreation reserve and a biological research station (functioning under the instruction of Dr Louis Pasteur). A large colonial-style hall was built in 1889 and picnic shelters and summer-houses were added during the 1920s. The island is now part of Sydney Harbour National Park.

19. DUNLOP RUBBER FACTORY, BIRKENHEAD POINT

John Boyd Dunlop invented the pneumatic tyre in Belfast in 1888, and factories were quickly established around the world to produce tyres for cycles and motor-cars. Whilst the Australian company was formed in 1899, its original factory was not on this site.

The factory at Birkenhead Point (now a shopping centre) was started in the late 1890's by Henry Perdriau to mould India-rubber goods. He moved progressively into making rubber products for cars including shock absorbers, springs and radiator hoses and started the manufacture of rubber tyres around 1914.

In 1928 the factory was one of Sydney's largest employers with a payroll of 2300. The following year the company merged with Dunlop to form the Dunlop Perdriau Rubber Company Limited and after another merger in 1941, it became Dunlop Rubber Australia Limited.

Dunlop progressively closed down its operations at Birkenhead from 1975 and moved its tyre manufacturing to Melbourne.

After the final closedown, the Birkenhead site was adapted for use as a retail shopping precinct in 1979. It is one of the first examples in Sydney of the recycling (adaptive re-use) of industrial buildings for commercial purposes.

SNAPPER ISLAND

In 1932 Snapper Island was granted by the Government for the use and training of sea cadets. A museum was developed there in 1940s.

SPECTACLE ISLAND

The first building on Spectacle Island was the powder magazine, erected in 1863-64. The island was officially declared a Naval Armament Depot in 1883 and continued as a magazine until the 1960s, when a new depot was established at Newington further up the Parramatta River. It is now a Naval Museum.

GLADESVILLE BRIDGE

1884 Gladesville Bridge with trams

The present Gladesville Bridge, which opened in October 1964, replaced the first bridge, which was a multi span lattice girder structure completed in 1884. That bridge later carried trams right from Circular Quay, through Rozelle and Drummoyne and then on to Top Ryde.

The new bridge was designed by the consulting engineers Maunsells. It carries six lanes of traffic across the Parramatta River in a single arch spanning 304.8 metres (1000 feet). For a period it was the world's longest concrete arch bridge.

The bridge consists of precast hollow box units 6.2 m wide and 4.3 to 6.9 m deep. They were erected on falsework (with four units placed side by side) as a complete arch span. Prestressing using flat jacks raised the arch clear of the falsework, which was then removed. The deck consists of precast prestressed concrete T-beams, spanning 30.5 m between slender spandrel columns.

ATLAS ENGINEERING COMPANY

Atlas Engineering Company purchased land on the point where the Lane Cove River joins the Parramatta River in 1884. Here they constructed a large engineering works, with several large workshops and slipways for shipbuilding, but the enterprise did not prosper and was sold to the Mort's Dock and Engineering Co. Ltd. in 1898.

20. WOOLWICH DOCK

When Woolwich Dock opened in 1901 it was one of the largest graving docks in the world. Excavated into solid sandstone, it was extended several times, eventually becoming 30.5 metres wide and 259 metres long, with a draft of nearly 8 metres.

The Company ceased operations in 1958 and the site was purchased in 1963 by the Australian army to house a Water Transport Division.

Woolwich Dock is one of the former defence properties now under the control of the Sydney Harbour Federation Trust; its future is still undetermined.

LANE COVE RIVER

Between Woolwich and Greenwich is the mouth of the Lane Cove River, which winds its way many kilometers upstream into the hills to the north. This was the scene of one of the earliest foreshore-based industries - forestry. In about 1805 Governor King established a "sawing establishment" some 12km up this river, where bands of convicts were set to work cutting timber for the infant settlement.

The sawn timber was too heavy to be floated downstream, and was brought down in rowing boats. Joseph Fidden was a boatman who would bring down a full load of timber on the falling tide, and then row back on the incoming tide – a round trip of about 32 km! His name is commemorated in Fiddens Wharf Road, Killara.

21. SHELL OIL TERMINAL

The Shell Oil terminal on the east side of the Greenwich peninsular 'Kerosene Bay' marks the site of an early oil refinery built by a Scottish engineer, J W Fell whose company also mined oil shale at Newnes and Hartley, west of Sydney. The refinery operated for about 27 years from the turn of the century.

BERRY ISLAND

Berry Island on the west side of Balls Head Bay was a rocky outcrop connected to the mainland by a narrow sandy isthmus standing only about half a metre above high tide. The island's great significance to the Aborigines was recognised by its listing on the Register of the National Estate in 1984.

The Gadyan walking track around the island is named after the Aboriginal name for the Sydney Cockle shell found in the middens there. The track passes several rock engravings.

22. NORTH SHORE GASWORKS
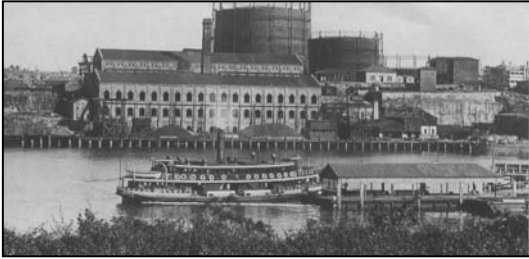
Neutral Bay gasworks 1927

The North Shore Gasworks was constructed from about 1914 to 1917 at the head of Wollstonecraft Bay (originally Oyster Cove). There, coal was heated in huge retorts to make town gas.

The works closed in 1969 and from about 1998 to 2002 the site was redeveloped for residential purposes. The powerhouse chimney and one of the gas-making buildings have been conserved as part of the new development.

Other gasworks were located near the water in Darling Harbour (site 29), Neutral Bay (see photo) and at Mortlake, some distance up the Parramatta River.

23. COAL TERMINAL & LOADER

For many years the coal loader on the eastern side of Balls Head Bay received coal transported by bulk carriers from the north and south of Sydney, which was stored in huge bunkers for the re-fuelling of steam-driven, ocean-going vessels.

In the later years of its working life the loader supplied barges and boats involved in harbour and coastal trade. It is now derelict.

24. BP TERMINAL

The BP Australia terminal on the western side of Berrys Bay is the third oil terminal seen on this tour.

BP virtually started in Australia in 1920 when Prime Minister Billy Hughes signed an agreement which founded the Commonwealth Oil Refineries (COR).

Then in 1952 the Anglo-Iranian Oil Company purchased COR and later changed the name to BP Australia.

LAVENDER BAY

25. Blues Point ferry terminal. At the end of Blues Point Road is the ramp that was used by horse-drawn vehicles and later early motor cars, to embark on the steam ferry running from Blues Point to Dawes Point. That ferry and another that went from Milsons Point to Bennelong Point, were the only direct means of vehicular transport between the North Shore and the City until the Harbour Bridge opened in 1932.

Neptune Engineering Works operated at the head of Lavender Bay, for many years.

Old railway terminus. Also at the head of the bay can be seen a rail line and train marshalling yards. When the North Shore railway line was extended to Milsons Point in 1891, the terminus near Luna Park was where passengers changed to a steam ferry for the journey across the water to the city.

26. Luna Park. The pleasure grounds of Luna Park with its famous face, and the art deco North Sydney Olympic Pool, mark the site that was originally levelled for the workshops for construction of the Sydney Harbour Bridge.

There, the steel pieces were cut, planed, drilled and fabricated into components by riveting, before being taken out by barge and lifted by cranes into position in the bridge. The workshops contained many pieces of heavy machinery, some of it specially manufactured for building the bridge. For example there was a guillotine that could shear – like a pair of scissors – 2¼" thick silicon steel plate.

SYDNEY HARBOUR BRIDGE

The Sydney Harbour Bridge, together with the design and supervision of the City Railway was the crowning achievement of engineer Dr J J C Bradfield.

The contractor for the bridge and steel approach spans was the English firm of Dorman Long & Co. Ltd; the detailed design was done by their consultant Ralph Freeman; and the concrete approaches were constructed by the Public Works Department. After taking 8 years to build, the bridge was opened on 19 March 1932.
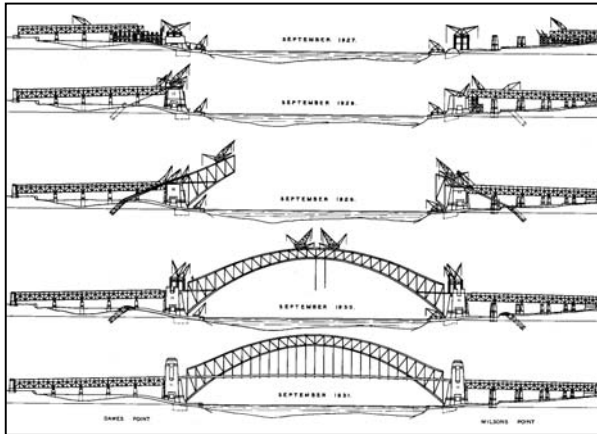
Erection of Sydney Harbour Bridge

The basic construction process involved building cantilever trusses out from each shore that were tied back by steel cables in tunnels through the sandstone bedrock.

Barges brought prefabricated members from the workshops and huge cranes on the cantilevers lifted them into position, where they were riveted into place.

When the cantilevers joined forming a self-supporting arch, the cables were removed, the hangers were installed, deck structure was constructed and the pylons completed.

The total length of the Bridge including steel approach spans is 1149m; the arch spans 503m; from the crown of the arch to mean sea level is 123m; and the shipping clearance at mean sea level is 52.3m.

In 1988 the bridge was declared an International Historic Civil Engineering Landmark by the American Society of Civil Engineers and a National Engineering Landmark by Engineers Australia.

DAWES POINT – TARRA

The Aboriginal name for the place was Tarra, but Lieutenant Dawes called it Point Maskelyne, in honour of the Astronomer Royal who sent the first astronomical instruments to the new colony. It was later named Dawes Point, and in 2001 became the first place in NSW with dual European and Aboriginal names, when the name of Tarra was added. It is now Dawes Point – Tarra.

Dawes Observatory. Lieutenant William Dawes who arrived with the First Fleet established a makeshift observatory on Dawes Point in 1788.

Dawes Battery was built in stages from 1791 to guard Sydney Cove. There was an upgrading by the convict architect Francis Greenway in 1819 at the same time as he was constructing Fort Macquarie on the opposite headland (where the Opera House now stands). Then in 1857 the battery was enlarged by Colonial Engineer George Barney at the same time as he was upgrading Fort Denison. Like all our colonial fortifications, Dawes Battery never fired a shot in anger.

Dawes Battery

Some of the buildings at Dawes Battery were demolished in the 1920s to make way for the Sydney Harbour Bridge and others were used as offices by the bridge contractors. The remainder were demolished when the Bridge was completed.

In 1995 archaeological work by the Sydney Cove Authority uncovered much of the remains of the battery and buildings. The reconstruction and interpretation of the battery by the Sydney Harbour Foreshore Authority was opened on 24 November 2001. During the work one of the large concrete blocks that contain the guide tubes for the bridge erection cables was exposed and it is now interpreted on the site.

27. WALSH BAY FINGER WHARVES

The five wharves were constructed between 1906 and 1922 to facilitate the export of wool in bales; these were moved by hydraulically operated machinery. Because this part of the Harbour has deep water very close to the shore with high ground immediately adjacent, it was possible to construct two storey wharves with vehicular access from the urban road network directly onto both upper and lower levels.

Moreover, by arranging the wharves perpendicular to the shoreline (so they project as "fingers" into the bay) it was possible to load two vessels simultaneously, using both levels and both sides of the wharf. This innovative concept was developed by Henry Dean Walsh, who was Chief Engineer of the Sydney Harbour Trust from 1901 to 1919.

The wharves became redundant after the change to bulk cargo handling and have been converted for residential and other purposes.

WINDMILL (FLAGSTAFF or OBSERVATORY) HILL

Windmills. The first windmill was built on Windmill Hill in c.1796 and other mills were later built on the cliff tops of Millers Point to catch the prevailing breezes. The maize and wheat were unloaded from boats that were able to tie up at a rock-ledge at the foot of the cliff.

Fort Phillip citadel. Fort Phillip Citadel was commenced in 1804 by Governor King, who feared an insurrection by Irish political prisoners at Parramatta and interference from the French. It enclosed the site of the first windmill and was built of sandstone in the shape of a hexagon with sides one hundred feet (30.5m) long, but it was never completed.

Fort Phillip, Signal Station and Observatory
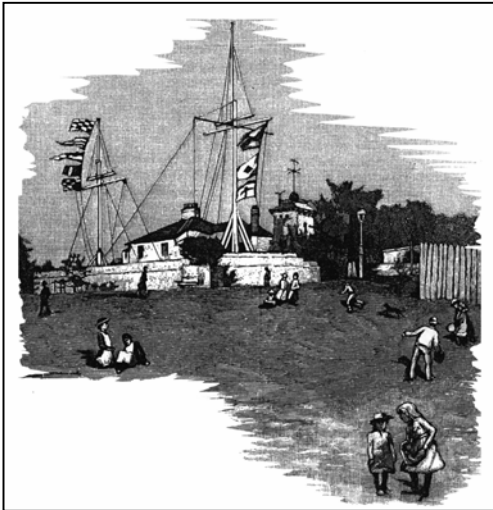
A gunpowder magazine designed by Francis Greenway was built there about 1815, but by 1822 the fort had been replaced by Dawes Battery. However, three sides of the fort remain as the wall surrounding Sydney Observatory.

Fort Phillip gave its name to the road to the east, now Upper Fort Street.

Signal Station. In about 1825 the eastern wall of Fort Phillip was converted into a signal station, from which flags sent messages to ships in the Harbour and the signal station on South Head. A new signal station designed by Colonial Architect Mortimer Lewis was built in 1848.

The signal station ceased operation in 1939.

Sydney Observatory. Sydney Observatory which includes a time-ball tower, was designed by Colonial Architect Alexander Dawson and opened in 1858.

Daily, first at noon and soon after at 1 pm, the ball would drop to signal the correct time to the city and the harbour, and to enable ships to accurately rate their chronometers. On the drop of the ball a cannon was fired as a time signal, initially at Fort Macquarie, then Dawes Battery and later at Fort Denison.

Technological change and other factors including the adverse effect of ambient light from the city forced its closure in 1982 as an operating observatory. It is now part of the Powerhouse Museum and an educational and tourist facility.

28. CUTHBERTS SHIPYARD

Cuthberts shipyard .

John Cuthbert took over Corcoran's shipyard in the 1850s and the yard became very highly regarded for both new construction and for the repair and maintenance of overseas vessels. (The yard was just to the south of the present Port Operations and Communications Centre – the round concrete tower).

The *Spitfire*, the first colonial warship, was built there in 1855 and five schooners were also built for the Royal Navy before the yard closed in the 1870s

29. AUSTRALIAN GAS LIGHT COMPANY

The Australian Gas Light Company (AGL) was formed in 1836, and built a gasworks on the waterfront at the end of the present Gas Lane off Kent Street. It used coal brought by sailing ships from the Hunter River and unloaded directly at the works. Under the Chairmanship of Major George Barney the noted Colonial Engineer of that time, the company built gas retorts and two large gasholders.

Gas lighting of Sydney's streets commenced in 1841.

AGL still exists as one of the oldest public companies in Australia.