# MINING HISTORY OF THE ILLAWARRA

**G.MOULD**[1]

**R.A.CAIRNS**[2]

## INTRODUCTION

There is little doubt that the aborigines had long burnt coal before the white men arrived in this country but the first recorded discovery of coal in New South Wales was near Newcastle by William Bryant an escaped convict accompanied by his wife Mary and others in March 1791.A French landing party had burned coal on the south east coast of Tasmania in February 1793.

The first discovery of coal in the Illawarra was in May 1797 by a group of shipwrecked sailors who had been driven ashore in the Bass Strait and were making their way to Port Jackson on foot along the east coast. They found coal and made a fire near Austinmer and were later picked up by a fishing boat near Wattamola and returned to Port Jackson**.** Governor Hunter sent Dr. George Bass to the area in August of that year and he reported the presence of coal seams from Coalcliff to Austinmer**.**

The mining of coal commenced soon after its discovery in Newcastle near the mouth of the Hunter River using convict labour and mining continued for around twenty-eight years producing the modest quantities of coal needed to support the Colony.

In 1828 the British Government granted the Newcastle based private enterprise Australian Agricultural Company [AAC] a thirty-year monopoly on all coal mining in the Colony.

Despite the fact that coal had been discovered in this area in 1797,the inaccessibility of the Illawarra from the north and west and the AAC monopoly delayed the development of coal mining for some sixty years.

When mining did begin in 1849 the fact that the coal seams outcropped to the south of Coalcliff high above sea level on the sloping face of the escarpment presented problems that were unique to this area in delivering the coal from the mine to the coastal plain and seaboard. The first mine was in the Mt Keira area.

By the turn of the nineteenth century a number of mines had been established along the coastline between Coal cliff and the immediate Wollongong area.

## THE FIRST SETTLERS

In 1815 Dr. Charles Throsby who had cattle grazing in the Liverpool area was told by friendly natives that there was plentiful grazing land and water on the coast in the area they new as the Five Islands.Throsby visited the area in the company of these natives and confirmed what he had been told earlier. He later returned with a mob of cattle and drove them down a track he had made near Bulli on the earlier trip erected a stockyard and began grazing his cattle near the area we now know as Belmore Basin. This was the first entry by land into the Illawarra and as other cattlemen followed a thriving agricultural and cedar getting timber industry developed.

---

[1] Retired former Inspector of Coal Mines N.S.W

[2] Retired former Manager Engineering BHP Steel Division Collieries.

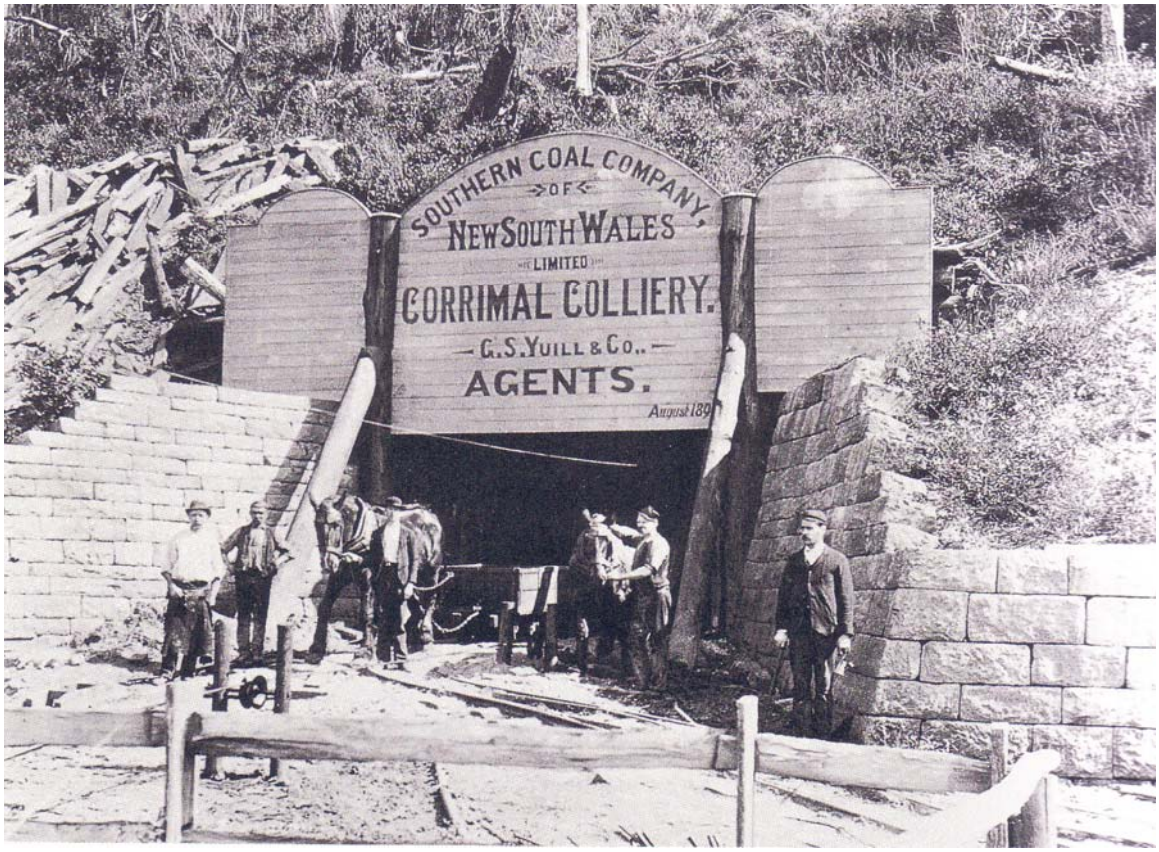
By 1826 the small settlement known as Wollongong had been established complete with a modest harbour that provided the only reliable means of access to the area for travelers and supplies to and product from the area.
In 1834 the site and layout of the town of Wollongong was gazetted and this layout included a harbour at what is now known as Belmore Basin.
Whilst several primitive bush tracks provided access to the area from the west they were easily rendered impassable in bad weather. This lack of access by land impeded the development of the area for many years and made access by sea the only option available.
Routes for a more reliable roads system on the coastal plain and over the escarpment were laid out in 1834 and the Mt Keira Road constructed in 1835/6 by convict labour provided the first reliable road to and from the area over the mountain range.

**A BACKGROUND TO MINING IN THE ILLAWARRA DISTRICT**

In 1839 the Reverend W.B. Clark who was a local Parson turned Geologist commenced his examination of the coal seams on the escarpment and the results of his efforts provided an insight into the available coal seams and the potential for coal mining.
By the 1840's most of the available cedar had been removed and with the land cleared the agricultural products of the area whilst of continuing importance began to give way to a growing and what has proved to be a long term dairying industry.
There was however a real need to develop another primary industry to support the continued development of the area and coal was to provide the answer to that need.
The monopoly on coal mining held by the AAC was still in force at that time and an attempt by Captain R.M. Westmacott to open a mine at Bulli in 1839 was contested by the AAC and it was not until 1847 that the monopoly was voluntarily relinquished by the AAC. This opened the door to the development of coalmines by others in this area and Mr. James Schoobert was to open the very first mine in the area in 1849 at Mt.Keira. The mine initially worked the Wongawilli or No3 seam and later the Balgownie or No2 seam.[3]
The mine was a crude affair with a tunnel into the seam, a lone miner filling one skip at a time then pushing the skip to the surface on a tramline of wooden rails. The coal was dumped in a pile at the entrance and then loaded into horse drawn slides and carts for transport to the harbour to be loaded on to a ship in bags.
The mine passed into new hands in1857 and work began in the Bulli or No1 seam lying above the Wongawilli seam and the mine became known as the Osborne- Wallsend mine.
In the period spanning 1847 to 1900 no less than fifteen mines were opened along the escarpment with others in the course of development, coal production reached 1.26 million tons and 2300 men were employed in the industry.
Most operators chose to mine the Bulli seam which was by far the most favoured as this coal became recognised as being ideally suited as a fuel for steam engines and for the production of coking coal. Some Balgownie or No2 seam was mixed with Bulli seam coal to meet the needs of some customers.
The mines opened in this phase of the industries development in this area were the Mt Keira mine 1849,Thomas Hale's Wonoona mine 1857, Taylor and Walker's Russell Vale mine 1861, Bulli mine 1861, and the Mount Pleasant mine at Balgownie 1862. All of

[3] See Appendix 1 for details of the main coal seam sequence in the Illawarra

these mines were located in the area bounded by Mt Keira to the south and Thirroul to the north.
At Coal Cliff where coal had been first discovered in 1797 a mine known as the Jetty mine was not opened until 1878 and was to be followed by the Bellambi, South Clifton and Mt Kembla mines in 1883, the North Illawarra, Corrimal and North Bulli mines in 1884 and South Bulli in 1887.
The Mt Kembla mine was the first mine to be opened in the Bulli seam to the south of Mt Keira. In 1888 the Southern Coal Company commenced the development of a mine in the Bulli seam on the southeastern slopes of Mt Kembla but were forced to abandon the project due to the poor quality of coal encountered in the seam. The Tongarra mine opened in the Tongarra or No6 seam in 1893.



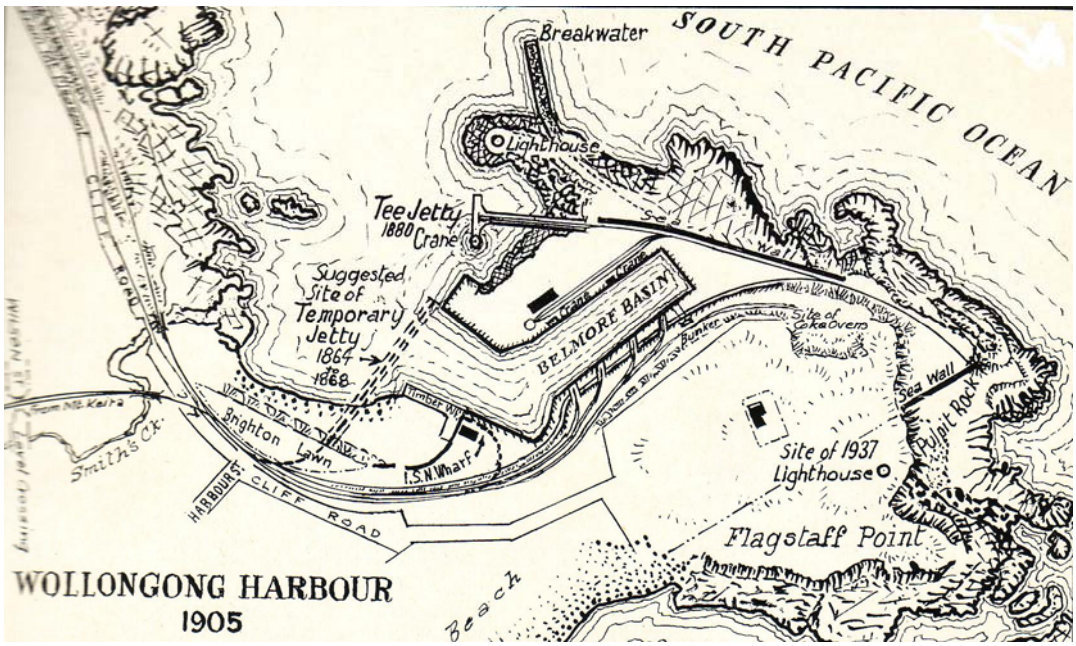

**CORRIMAL COLLIERY circa 1899**

The Metropolitan Colliery opened in 1888 and was unique in that it was located in a valley near Helensburgh and required the sinking of a 335 metre deep shaft to reach the Bulli seam.
In 1910 the Jetty mine became known as the Coal Cliff colliery when a shaft was sunk to establish the mine surface plant and provided access to the underground workings a short distance inland from the sea.
In the first half of the 20th century more than a dozen mines were opened along the escarpment and whilst several new mines were established in the period 1940 to 1970 with few exceptions all of these mines have closed and in one case two mines have been amalgamated to create one mine [Elouera]. The closure of these mines was mainly as a result of the exhaustion of reserves, changes in mining practices and the costs associated

with operating and maintaining very old mines with extensive workings. Several new shaft and inclined drift access mines were developed on Greenfield sites behind the escarpment to mine the Bulli seam and some of these mines remain in operation today.

**WOLLONGONG HARBOUR**

The need to have a means of exporting the coal mined from an area that had no other reliable means of access other than by sea made the harbour a critical item in the coal handling chain from the mines to the ships holds and warrants some discussion at this point in the presentation of this paper. In 1837 plans for a basin and pier were adopted for the harbour site and later in that year 300 convicts and a guard of soldiers arrived to undertake this work. The harbour opened for service in 1844 after some changes had been made during the construction period to increase its size to match the increase in trade through the harbour during the seven-year construction period.



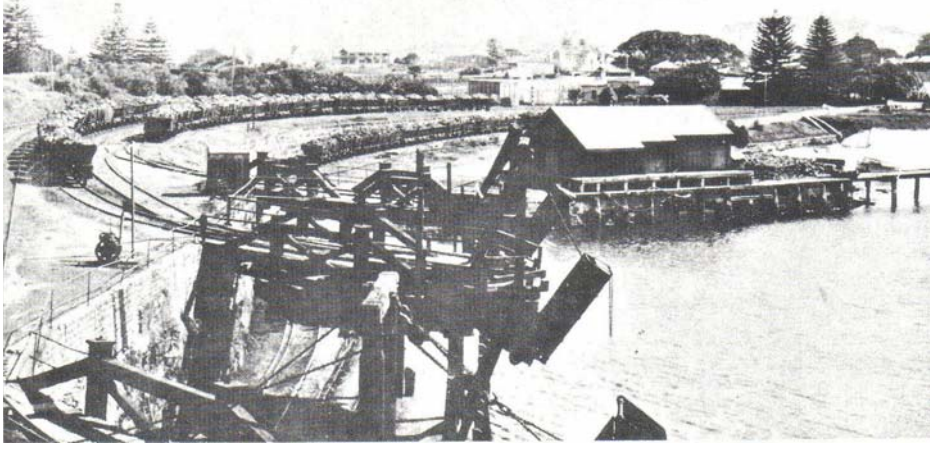

Further additions were made to the harbour in 1861 with changes required during construction to increase the handling capacity. This work was finally completed in 1868 with an official opening ceremony and naming of the harbour as Belmore Basin.
The harbour was now provided with three coal staiths capable of loading 3000 tons of coal per day and provided a wharf frontage able to accommodate about 15 vessels. A later modification to the harbour included the installation of a fourth loading staiths.

Two developments that directly contributed to the ongoing need to upgrade the handling capacity of the harbour were the construction in 1859 of a tramway from the Osborne Wallsend mine to the western side of the Wollongong to Bulli road, (currently the site of Bunning's Warehouse) where the coal was dumped and then hauled by horse and dray to the harbour.
In 1861 the tramline was extended to Cliff Road and the harbour with the wagons being hauled along the rail line initially by horse and in 1879 by a steam locomotive.

In 1862 the Mount Pleasant Colliery owners developed a similar proposal. This rail line was routed in a southwestern direction from the mine located on the mountainside behind Balgownie to the Wollongong Bulli Road (currently the grounds of the Keira High School). The rail line was extended from that point to cross Fairy Creek and Stuart Park and then followed the path of what is now the walking and cycle track leading from the North Beach Kiosk building to the harbour. Horses initially hauled the **waggons** to be replaced in 1884 by a steam locomotive.
When the Belmore Basin opened in 1866 coal exports amounted to 31,450 tons and an average of 68 vessels were being cleared each month.
In 1878, the coal passing through the harbour had increased to 92,500 tons.

**COLLIERY JETTIES**
As the number of mines increased along the coast and in the absence of any government railway or an all weather road system leading to the Wollongong harbour the mines to the north and south of Wollongong looked to providing their own facilities for loading coal onto ships by building jetties that were linked to their tram lines from the mine.
The history of these coal-loading jetties is with two exceptions one of relatively fragile structures located in positions that could provide only minimum protection from high winds and heavy seas and as a result led to their frequent destruction and in some instances the attending ship was washed on to nearby shores and reefs.
The building of these structures first began at Bellambi Point in the period 1858 to 1863. Jetties were constructed at Sandon Point for the Bulli Colliery about 1863, for the Coal Cliff Colliery at Coal Cliff in 1878, the Mount Kembla Colliery near Red Point (later to be known as Port Kembla) and the North Illawarra Coal Company at Austinmer in 1884. Following the earlier attempts noted above a new jetty was built at Bellambi Point in 1887 to be followed by second jetty in 1889 only to be abandoned in 1889.The Southern Coal Company built a jetty at Port Kembla in 1890 and whilst the mine it was to service did not eventuate it was used by that Company and others and remained in service until 1916.

COAL LOADING STAITHS AT BELMORE BASIN
IN BACKGROUND
OSBORNE WALLSEND & MT PLEASANT WAGGONS




**THE COAL CLIFF COLLIERY JETTY - 1905**

The Mt Kembla and Southern Coal Company jetties at Port Kembla proved capable of withstanding the sea and weather conditions without regular repair and serious damage as a result of them being located in more sheltered positions.
The Bellambi Point jetty remained in service until 1954, the Coal Cliff jetty until 1912 and the Sandon Point and Mt Kembla Red Point jetties until the 1940's.
The maintenance of these jetties imposed a heavy burden on the mine operators and they did not return the financial benefits originally planned by the mine owners.

**THE GOVERNMENT RAILWAY AND HARBOUR DEVELOPMENTS**

The Government Railway system reached the Illawarra in 1886 but it did not provided a continuous single line connection from Wollongong to Sydney until 1888 when the Waterfall to Clifton section was completed.
With the arrival of the railway the Government was keen to see all the export coal handled through Belmore Basin and in pursuing that policy, resumed in 1890, that section of the Osborne Wallsend rail line from its intersection with the Government line to the harbour and created a connection between the two rail line systems at their intersection. Similar connections were made at other mines both north and south of Wollongong where the mine and the Government lines crossed.
At this same time the handling capacity of the harbour was being stretched to its limits and the Governments single track rail line to Sydney was simply not capable of handling the increased capacity needed to support the districts export needs.
This state of affairs led after much agitation and consideration of several other alternative port sites that included Lake Illawarra and Tom Thumb Lagoon to a Government

decision in 1897 to develop Port Kembla as the future port for the district and work began on this project in 1900.

**THE PIONEER KEROSENE WORKS**

Although this was not a coalmine it was part of history of the area. The shale for the process was extracted from the No 4 or American Creek seam and the coal used to fire the retorts was mined from either the Balgownie or Wongawilli seams.

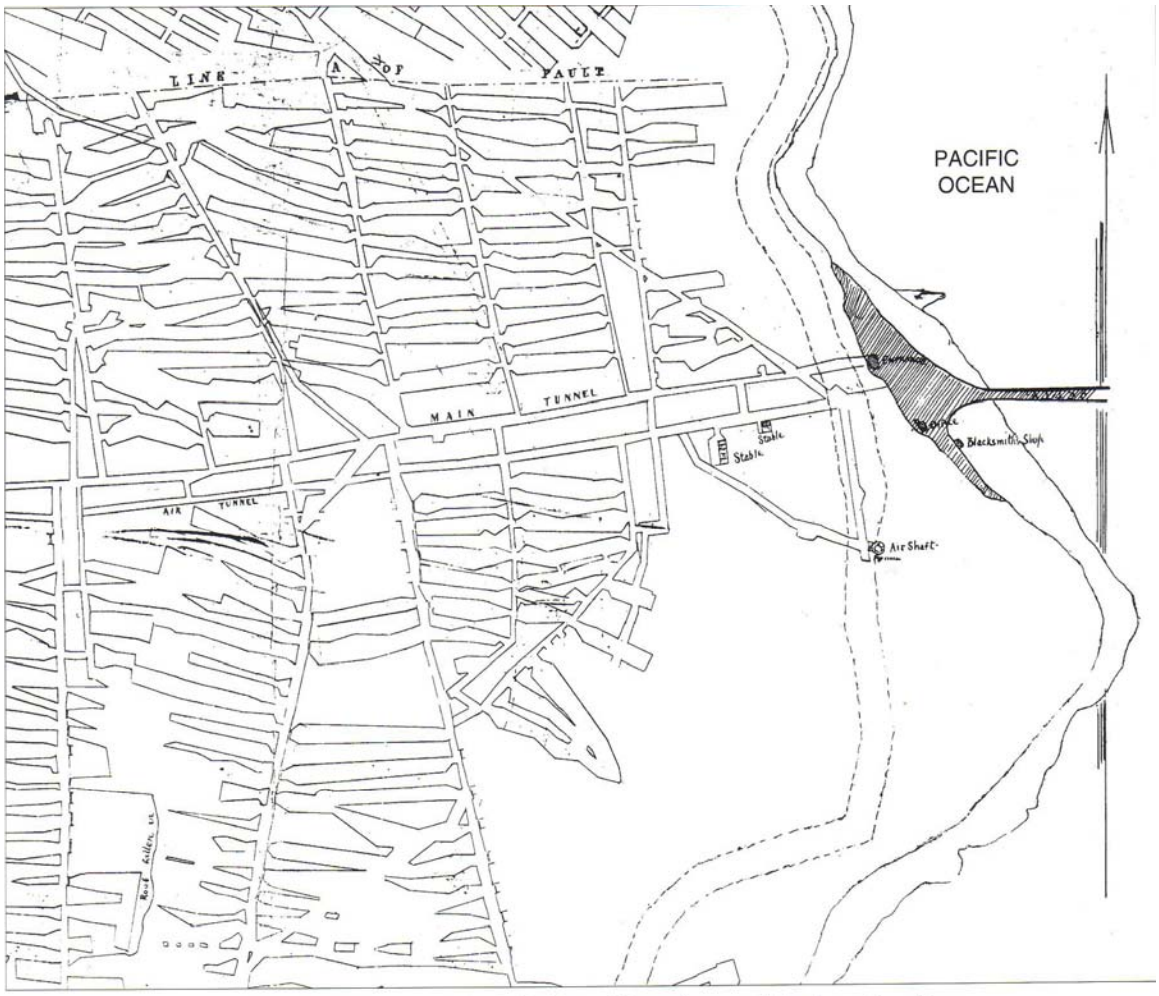
A shale bed found in the American Creek seam at Mt Kembla led to the production of sample quantities of kerosene shale being produced in 1865 to be followed by the establishment of a kerosene shale plant 1872.The plant operated until 1878 before closing mainly for economic reasons being unable not match the price of kerosene being produced elsewhere in the State and imported from overseas.

The plant was located near the entrance to the Dendrobium mine on Cordeaux Road at Mt Kembla Heights.

**MINING METHODS**

The earliest method of mining was the Welsh bord system where the coal was mined off “the point of the pick” and hand loaded into rail mounted skips of one ton or less capacity. Tunnels were driven in a pillar formed between two roadways with those tunnels being increased in width by robbing the coal from the sides or ribs and leaving narrow pillars between the “bords” to support the roof.

**COAL MINED “OFF THE POINT OF THE PICK” COAL CLIFF COLLIERY**




Partial plan of Coal Cliff workings from original sea headings

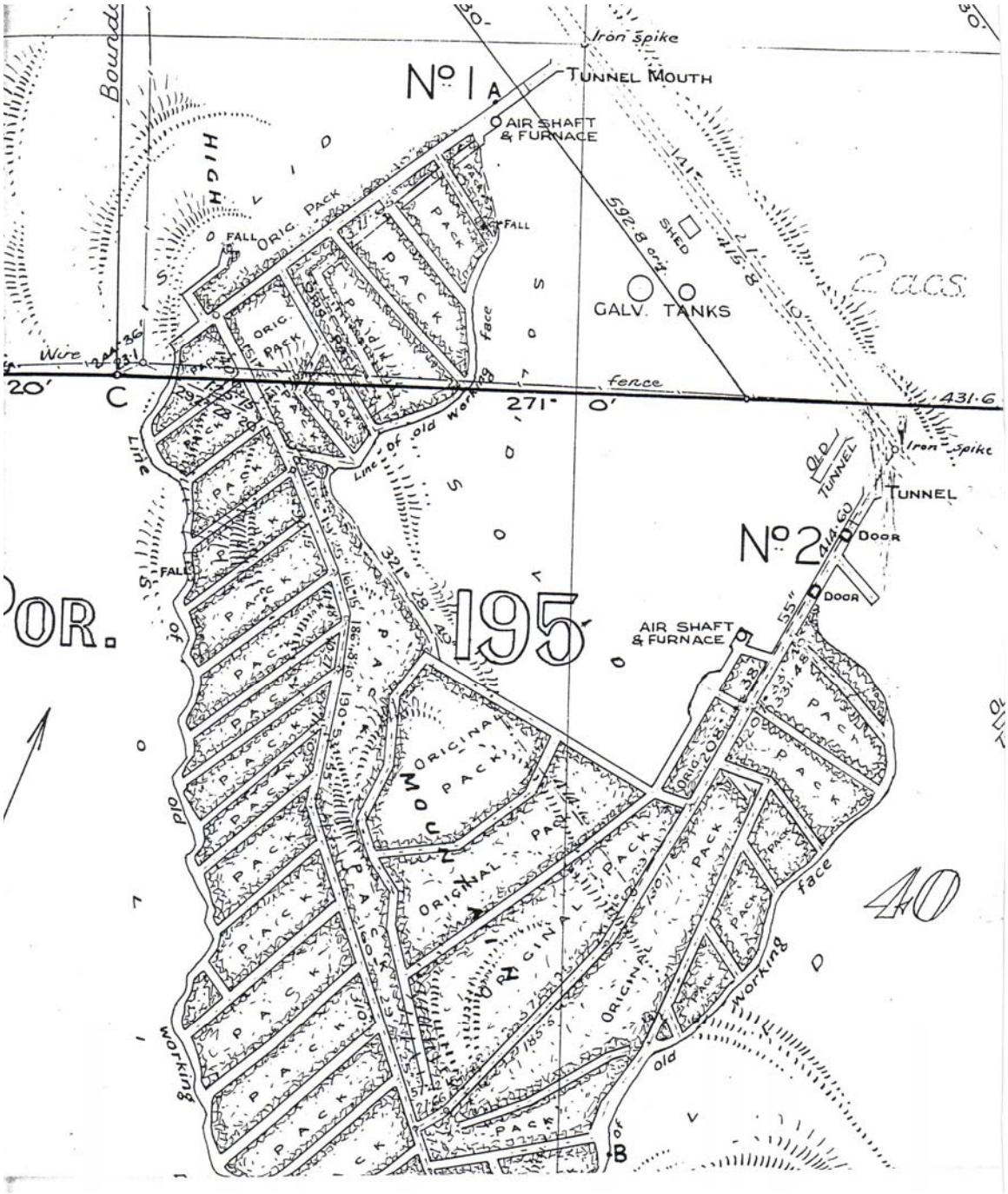
The skips were manually pushed or hauled by horse to the main roadways and on to the surface or in the case of a shaft mine to the shaft bottom.
Another and more enduring method has been the bord and pillar system .In this case multiple headings (bords) are driven with cut throughs between them to create a series of square or rectangular pillars. Part and preferably all of the coal in these pillars is removed when pillar extraction commences in that area of the mine.
When on track mechanical coal loaders were introduced in the 1930's to develop bord and pillar layouts the shape of the pillars had to be changed to a diamond pattern to accommodate the laying of track work.
Another system of mining used around the turn of the nineteen-century was longwall advancing. This system was practiced in the thinned out sections of the Bulli seam at Mt Kembla and South Clifton. The roadways were brushed by taking stone from the roof and floor with the loose stone packed on each side of the headings. The roadways were kept open as the face advanced using traditional roadway support and stone packs on both sides of the mined out side of the roadway.
The widespread introduction of off track mounted continuous miners and shuttle cars in the 1950's enabled the continuous miner to both drive the bords and cut throughs and go on to extract the pillars formed by the these workings. A now widely accepted method of

pillar extraction in this country was developed at the Wongawilli Colliery in the 1970's and has become known as "the Wongawilli system" and is used both here and overseas. The scope of this paper does not allow a full description here however the adoption of the Wongawilli system yields a substantial increase in the % of coal recovered in the extraction of pillars using continuous miners, improves the control of roof in the pillar lifts and reduces the overall cost of the development and extraction of pillar panels.
Longwall retreat mining was introduced in the 1960's.This system of mining requires the use of continuous miners or road headers to drive the development headings for each longwall panel leaving a wider dimensioned pillar [nominally 200 metres] between the intake and return headings that is extracted as the longwall face retreats using powered roof supports and a shearing machine loading on to a flexible chain face conveyor.

**THE RIBS AT THE ENTRANCE TO A WELSH BORD**

**THE TRANSPORT OF COAL**

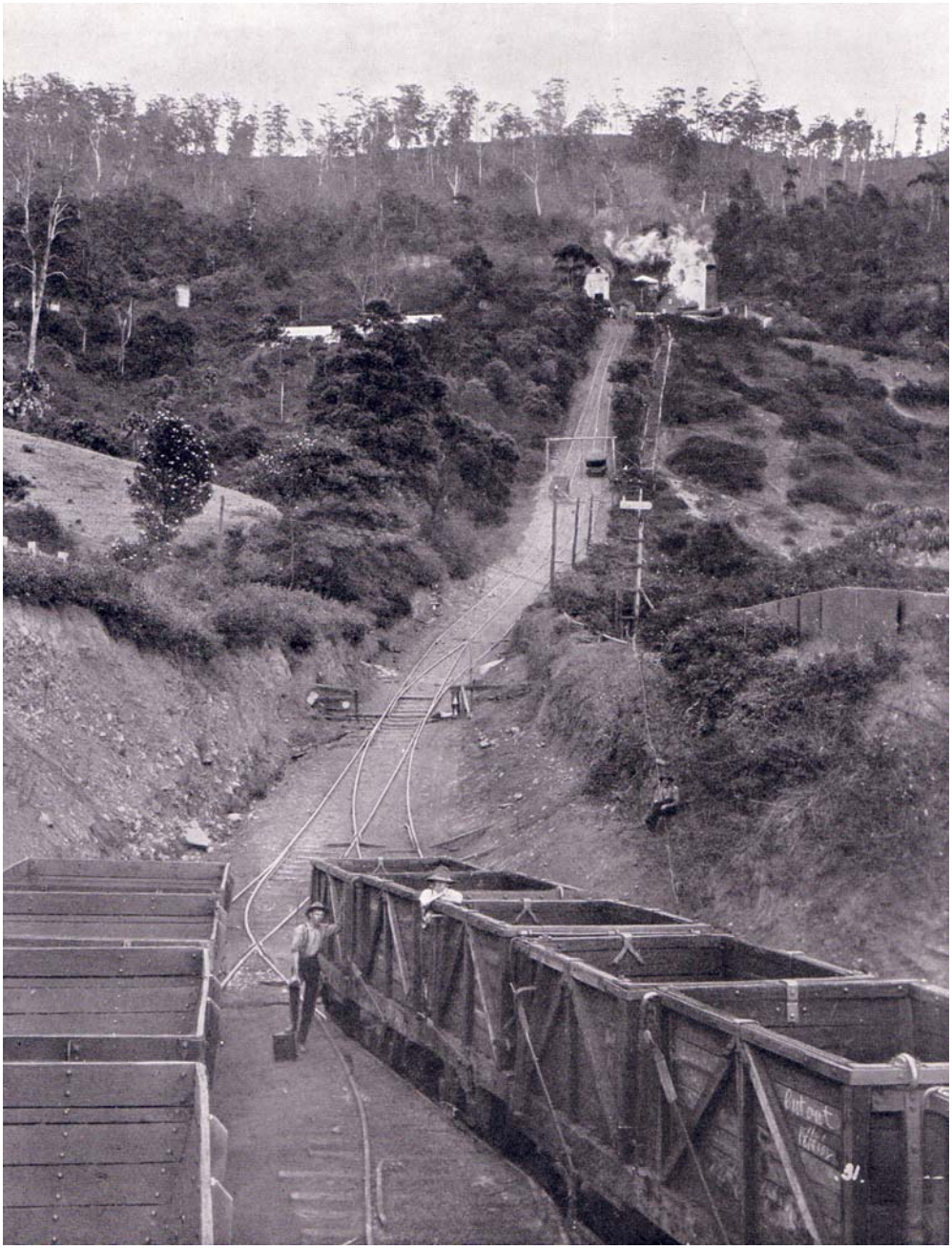
The mine opened by Schoobert at Mt Keira and those that followed at that time were small operations using very primitive means of underground transport provided by man horse or wheelbarrow with the miners using naked flame lamps for lighting.
As the mine workings advanced underground the haulage of coal to the surface by horse was replaced by a direct or main and tail rope haulage system using a single rail track and later as the extent of the mine workings and the production capacity of the mine increased by an endless rope haulage that required two tracks These rope haulage systems were initially powered by gravity or steam engine and later by electric motor.




**A LONGWALL ADVANCING SYSTEM**

As most of the mines were located on the escarpment and the coal was required to be lowered to the coastal plain the initial system of using horse and bullock drawn sleds and carts soon gave way to gravity powered incline rope haulage systems and some very ingenious but simple systems were designed to harness the forces of gravity for this purpose.

There were several variations of the incline endless rope haulage system.
The first was to haul the skips from within the mine to the surface and down the incline with the gravitational force generated by the full skips hauling the empty skips back up the incline. The skip dumping and screening plant was located at the bottom of the incline. In this system no external power source was used.



**SOUTH BULLI COLLIERY SELF ACTING INCLINE**

The second option was to have the underground to surface system powered by steam or electric motor, the full skips being dumped and screened at the tunnel mouth and the

empty skips returned underground. The incline haulage system in this case was quite separate from the underground to surface system and employed waggons up to railway gauge size that were loaded at the screens located at the pit top and as the full was lowered down the incline it generated the motive power needed to haul an empty up the incline to the screens. There were many variations on these themes.


**MT KEIRA INCLINE HAULAGE – note 3 Rail System**

The speed at which the haulage operated was manually controlled by a brake on the rope drums. At one mine the braking operation was automated with a preset governor controlling the braking mechanism and at this same mine the motive forces generated by the incline haulage system were used to power the screening plant located at the bottom of the incline.
At another mine where the underground and incline haulage roping systems were separate from one another the motive forces generated by the incline haulage were used to provide the power needed to operate the underground haulage system by linking the two together through a system of manually controlled mechanical clutches.

The mechanization of the mines in the 1940 –50's required a rethink of the existing equipments capacity to support the increased level of production and led to the replacement of the limited capacity endless rope haulage systems used during the hand mining era and the "brushing" of roadways previously used for the transport of men to provide a road with the height and width dimensions needed to install wide gauge track work and rolling stock capable of transporting men materials and mining machinery to

and from the surface. Some mines continued to use their existing endless rope haulage and man transport systems until conveyor belt systems became available to replace them in the 1950's. In the case of AIS that company commenced the driveage of long cross


**THE MT KEIRA COLLIERY ENDLESS ROPE INCLINE HAULAGE**

measure drifts at their Bulli [1944] and Mt Keira Collieries [1948] to access the coal seam from the surface near the base of the original incline at Bulli and in the Kemira Valley near Mt Kembla in the case of Mt Keira. These cross measure drifts were arranged to intersect the Bulli seam in the area chosen to complete the mechanization of the mine with the dimensions of the drifts and track work chosen to accommodate the use of large carrying capacity trains of mine cars and diesel powered locomotives.

**MEN AND MATERIAL TRANSPORT**

In early days of working each mine the miners working places were close to the surface and the men would walk to and from the face. As the workings developed the walking distances increased and legislation was enacted in the 1940's that required the provision of man transport where the working faces exceeded a distance of 1 mile from the surface. This need was satisfied using rope haulage or battery hauled man transport trains capable of transporting the complete shift of men at one time.

As the mechanization of mines increased provision had to be made to handle both men and materials in much larger quantities and in the case of face mining equipment larger dimensions. The first systems adopted in conveying men to and from the mine was to transport them in large numbers in trains to be replaced later by high speed self contained diesel powered personnel cars with the capacity to convey individual mining crews to and from their respective mining panels.

**VENTILATION**

The initial ventilation of the mine workings depended on the natural flow of air and the disturbances created in the workings as a result of the movement of men and skips in and

out of the mine and at the face. This system could only be used for the ventilation of workings very close to the surface.
The next stage in providing ventilation was to either drive a heading or series of headings to “daylight” near the working face or to install a furnace ventilation system. The introduction of a furnace-induced system was the first step in providing an established system of ventilation of the mine workings. These furnaces were located either at the surface with an accompanying brick chimney or underground at the base of a shaft with the draft required to produce a flow of air in the chimney or shaft induced by either a jet of steam if available nearby but in most cases an open fire at the base of the chimney.

**REMAINS OF VENTILATION FURNACE COAL CLIFF COLLIERY**

As the mine workings became more extensive, deeper and gassier the risk of underground fires and explosions increased and this required the installation of mechanical fans powered by steam engines or electric motors.
Early in the 1900’s the mines on the escarpment commenced the sinking of ventilation shafts behind the escarpment. These shafts were used as downcast shafts for intake air and later converted to or set up from the beginning as upcast shafts with steam or electrically driven mechanical fans exhausting the air from the workings. A number of these shafts were sunk and it is interesting to note in researching their history that obtaining the access required to sink and maintain them on property that was and still is under the management and care of the Water Catchment Authority appears to have been as begrudgingly resisted then as it is to this day.
Brattice cloth was used to direct the air to the working faces in the hand mining system and this material continued to be used in mines using cutters and loaders. The

introduction of the continuous miner soon exposed the inadequacies of brattice cloth in meeting the statutory requirements for face ventilation and led to the introduction of the auxiliary fan and vent tube systems for face ventilation. The use of auxiliary fans was approached with some concern as some earlier installations had resulted in the recirculation of air. Properly designed auxiliary fan installations were proved not to give rise to these problems and many installations were operated and continue to be operated successfully in this district to this day.

**ELECTRIC POWER**

The invention of the electric motor in the 1880's provided an opportunity to use these machines to power mine haulages but this would of course required the installation of steam powered generators at the mine sites.

In 1893 electrical equipment began to be introduced into the mines and this along with the availability of compressed air as a motive force lead to the introduction of floor mounted coal cutters to ease the manual burden of mining coal. By the early 1900's electrically powered as opposed to pneumatically powered coal cutters were in the ascendancy as were underground rope haulages driven by electric motors.

A number of the mines in the Illawarra installed coal fired generating plants at the mine to power both the surface and underground plant and at South Bulli and Helensburgh Collieries these power generating plants were used as the source of power for domestic use in the surrounding townships for a number of years before being replaced by the state power grid.

**MECHANISATION**

The mechanization of coal mines began in the latter part of the 1930's with the introduction of rail mounted electric coal cutters to support the loading of coal mined in the first working of bords and pillars by the miners working on the contract system.

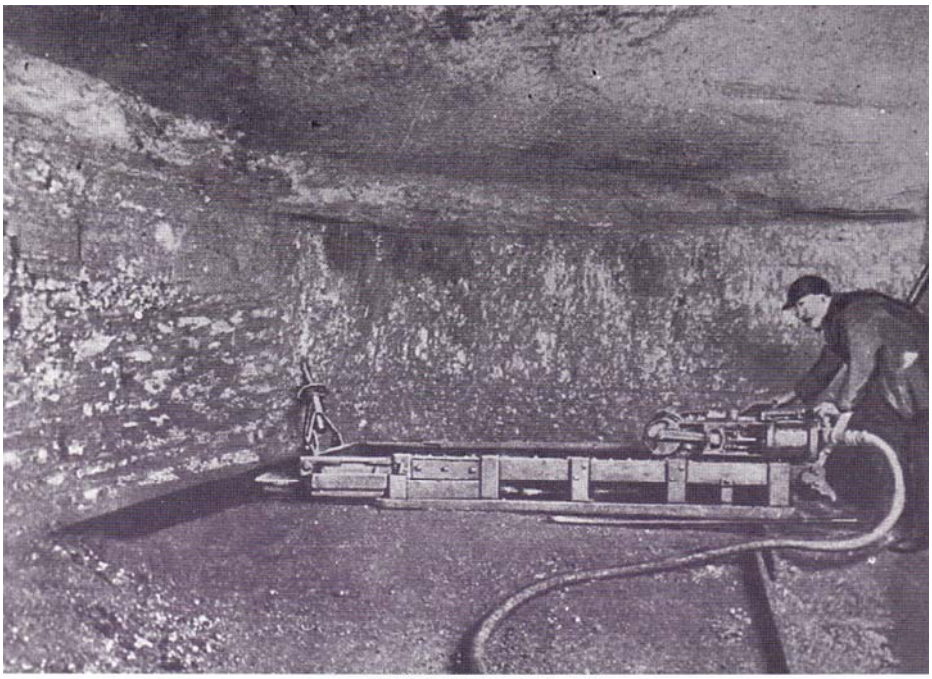
A further step in the process was the introduction in the early 1940's of power boring machines to replace the manually operated units used by the miners to drill their shot holes.

Whilst the Contract system was only one of many it was the major factor in the never-ending industrial disputation and days lost to strikes that plagued the industry. This prevented the mines from reaching the levels of coal production required to make them economically viable and capable of reliably producing the coal required to support the nation during the 1939-45 war.

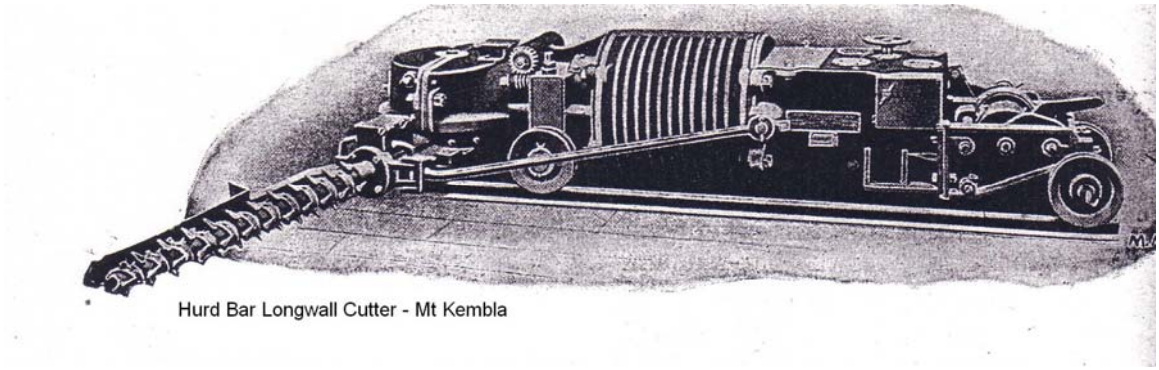
In the late 1930's two of the four mines owned by the Australian Iron and Steel Company [AIS] installed coal cutters, loaders, battery powered locomotives and mine cars as a first step toward the complete mechanization of their mines and other mines in the area followed.

The state of the industry at that time was such that the abandonment of the contract system and the adoption of the mechanized system were required as a matter of urgency as the industry was tottering on the brink of total collapse. Many mine owners were reluctant to outlay the large capital sums required to mechanize given the hostile behavior of the miners union because of the fear of job losses and the ban placed by the union in 1938 and embraced in mining regulations 1941 on the mechanical extraction of coal in pillars. Despite these concerns in the period 1938 to 1949, the introduction of mechanised

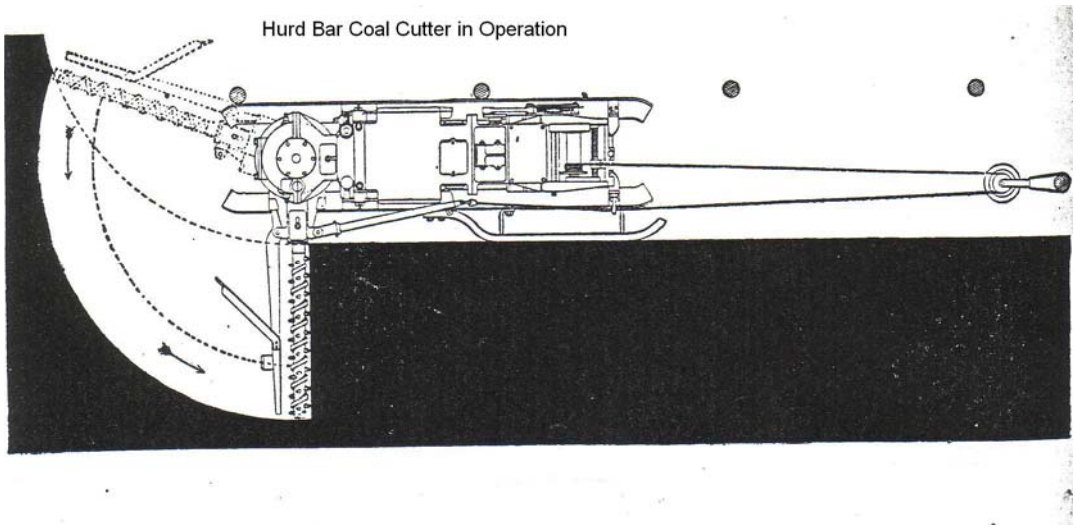
mining made progress but slowly showing some improvement in 1950 following award variations that gave conditional approval for the use of machines in pillars and then accelerated rapidly with the arrival of the continuous miner in 1952.The introduction of mechanised mining continued to increase at an accelerated rate with the regulations relating to the mechanical extraction of pillars being finally repealed in 1972.



BREASTING COAL CUTTER - 1904



Hurd Bar Longwall Cutter - Mt Kembla




In contrast to Australia scene mechanized mining was well underway in the UAS prior to the beginning of the 1939 –1945 conflict. As the seam conditions, and mining methods used in Australia were similar to those in the USA the mining machinery best suited for this country could, with few exceptions, be sourced from manufacturers based in the USA.

**COAL CUTTERS AND LOADERS**

The coal cutters and loaders used in the mechanization of mines in the Illawarra were track-mounted machines manufactured in either the USA or the United Kingdom. Whilst a small number of these machines had been purchased and placed in service by the late 1930's the outbreak of war in 1939 prevented the shipment of more of these machines from overseas.

To enable their planned mechanization programme to proceed AIS as part of the Broken Hill Proprietary Company [BHP] commenced the manufacture of cutters, loaders and battery locomotives in their Newcastle and Port Kembla Steel Plants under license to the Jeffrey Company of the USA.

This machine manufacturing programme began in 1944 and enable AIS to complete the mechanization of their Bulli, Mt Keira, Wongawilli and Nebo Collieries in 1948.

**CONTINUOUS MINERS AND FULL FACE BORING MACHINES**

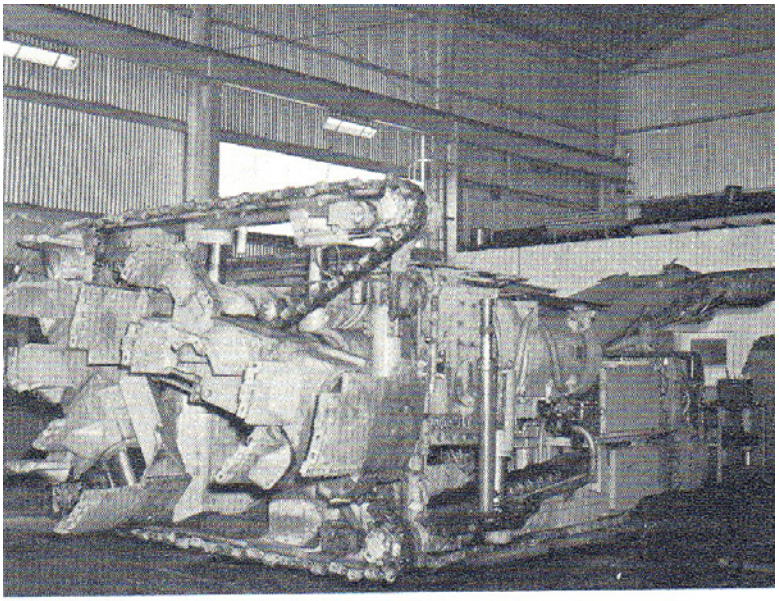
In 1950 the first of what was to be many Joy Continuous Miners arrived in the Illawarra.The machine was one of five machines shipped to Australia from the USA with two coming to the Illawarra.The first machine commenced work at Huntley Colliery and the second a short time later at Nebo Colliery before being transferred to Wongawilli Colliery.


The development of this machine was a “defining moment” in the mining of coal by mechanized means in that the machine combined the cutting and loading operation into one caterpillar mounted machine that was extremely maneuverable and eliminated the inflexibilities of the on track system.

The rapid replacement of conventional cutter loader units followed, as did the developments in continuous miner designs. A number of manufacturers entered the field with each new design seeking to reduce the number of moving parts on the machine and provide features that include integral roof and rib bolting rigs, radio remote control, on board dust suppression systems and so on. Whilst the current versions of the continuous miner have given way to the longwall system as the primary source of coal production at the mine they have been refined to becoming along with purpose built road heading machines the means of rapidly developing and supporting panels in preparation for longwall mining.

Continuous boring machines were to follow the continuous miner in the late 1960’s and some relatively short trials of these machines were carried out in the Illawarra and elsewhere. These machines appeared to offer the possibility of improved roof control under poor roof conditions because of their ability to cut a regular face profile that included a curved intersection of the vertical rib and horizontal roofline.

These machines were not successful in that they did not improve roof conditions as expected and created problems in providing immediate roof support, adequate face ventilation and control of dust make and created a width of place that did not in all cases match the dimensions of the supporting face equipment.



**GOODMAN FULL FACE BORING MACHINE**

**SHUTTLE CARS**

The shuttle car came commercially available in the USA in 1938.This machine provided the perfect fit as the face coal haulage vehicle for caterpillar mounted loaders and continuous miners

These cars were initially supplied from an onboard battery with later models supplied by a reeling trailing cable using direct current and later an alternating current supply. Literally hundreds of these cars found their way into service in the Illawarra alone and despite the major changes in face equipment used in bord and pillar mining and the dominance of longwall mining the shuttle car remains to this day the principal means of carrying coal from the face to the conveyor boot end in continuous miner and road header machine panels.

**CONVEYORS**

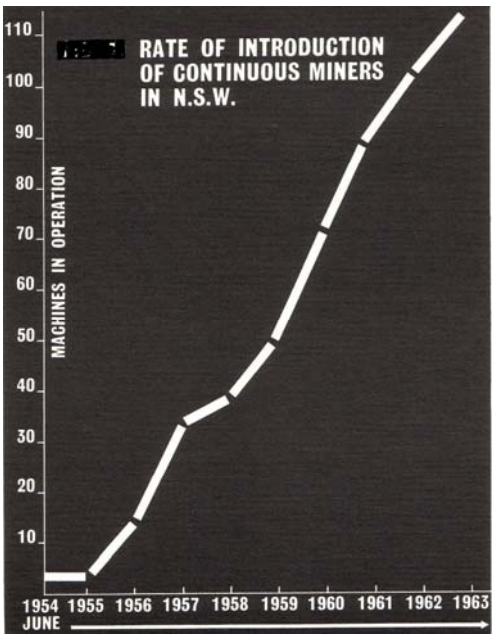
Face conveyors were developed in the United Kingdom around the 1900's to support the use of coal cutters. In the longwall advancing system the coal cutter made it possible to straighten and increase the length of the face. In the hand worked system the face was made up of a series of hand worked stalls, strung out along the face with each stall worked by individual pairs of miners loading the coal into skips for haulage from the face to the mine haulage system by a wheeler and his horse.

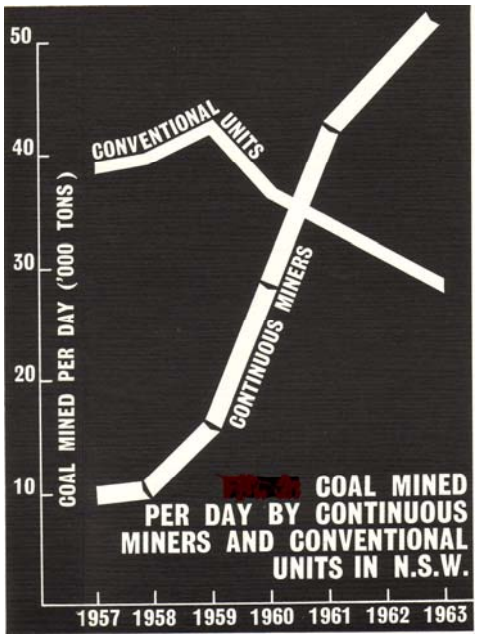
With the arrival of the coal cutter the individual stalls could be joined together to create a straight line of face for under cutting, drilling and shooting the face and loading the coal directly onto the conveyor.

The longwall advancing system was particularly suitable for thin seam mining with the miner carrying out all the face operations including the removal or brushing of the floor or roof or both and packing the debris on each side to support the advancing headings.

Whilst the longwall advancing system was used in the low height section of the Bulli seam at Mt Kembla Colliery Hurd bar coal cutters were used possibly with a Blackett scraper chain conveyor.
Chain conveyers were used in the surface plant on stone picking tables along with bucket elevating conveyors in screening plants and the very early coal washing plants.
As a first step towards mechanization at some mines in the Illawarra coal cutters and scraper loaders that delivered the cut and shot coal to a bridge ramp with an elevating scraper chain conveyor for discharge into skips were introduced. These installations were used in the extraction of pillars whilst duckbill shaker loaders were used to load the shot coal in the solid first workings of these panels. These latter loaders were well suited for conditions where the product was in favour of the load.
Whilst the chain conveyor was to be completely replaced by the flexible continuous belt conveyor it came into prominence again in the 1960' in this district as the armored face conveyor, developed in Germany during World War 2 in a bigger and better form as an integral part of the retreat longwall systems equipment packages.

In the 1950's flexible endless belt panel conveyors began to replace rope and locomotive haulage systems with the shuttle cars loaded by the continuous miner discharging in to the boot end loading point of the panel conveyor. The panel conveyor then delivered the coal initially to an underground bin for loading on to the rope haulage or main line diesel haulage system.
These latter haulage systems were soon to be replaced at most mines by an underground to surface trunk conveyor belt system that provided a delivery point underground for each panel belt and conveyed the coal all the way to the surface.
Some particularly interesting installations were undertaken and included the 42-inch. Main underground to surface trunk Cable Belt Conveyor at Coal Cliff Colliery that was 2.5 miles in length and operated at a speed of 466 ft. per. minute.
The 36-inch. Main underground to surface trunk conveyor at Wongawilli Colliery that was 1.75 miles in length and the accompanying 36 inch wide decline conveyor that was 0.85 miles in length and lowered the coal 600 ft down the mountainside. Each of these installations were claimed to be the only conveyors in the world at that time with these centre to centre lengths and vertical lift in the case of the Coal Cliff conveyor and vertical lowering in the case of the Wongawilli decline conveyor.
At South Bulli Colliery a series of in line conveyors were installed to provide an underground to surface trunk system of approximately 4 miles in length to deliver the coal to the surface. Each conveyor was 36 inches in width operating at 600 ft per. Minute with a total vertical lift from underground to the surface portal of 350 ft.
The cable belt conveyor was of particular interest in that it was unlike the conventional endless conveyor in that the tension normally imposed on the belting to drive the conveyor were taken by two flexible wire ropes one on either side of the belt with the load carrying conveyor belt material being support at each side by the wire ropes.




**ROOF BOLTING**

The use of roof bolts as a complimentary means of support to the conventional wooden props and bars began in the Illawarra in the early 1950's.The earliest split and wedge designs used wooden broom handle like bolts and wooden wedges followed soon after by steel bolts and wedges. The bolt holes were drilled and the wedge and nut set and tightened using stand alone pneumatic jack hammers with stoper legs. This was a dirty, noisy, wet operation and was soon replaced by a purpose built mobile roof bolting machine capable of rotary drilling the bolt hole, collecting the "dry" cuttings and setting the expansion shell anchor by rotating and tightening the nut to the roof plate.

The use of roof bolts created a great deal of interest and research and over the intervening period has led to the development of the full column chemical anchor bolt in its various designs that are now used in many mines as the principal means of roof support.

In the same period of time lightweight pneumatic roof bolting drill rigs have been developed that enable one man to rapidly set roof and rib bolts as part of the normal mining cycle and highly flexible purpose built mobile multi drill rigs have been developed and form part of the face equipment package required to support the place changing system of mining.

The continuing search for and development of reliable roof support systems has been driven by the behavior of the roof overlaying the seams being worked in this area, the increased rate of extraction and depth of cover over these seams and the costs involved in supporting the roof.

**LONGWALL MINING**

Whilst longwall advancing has been practiced at Mt Kembla and other mines in the area around the 1900's mining conditions being encountered by continuous miners working

under deeper cover in most mines in this area led to the introduction of a longwall retreating face in the Bulli seam at Coal Cliff Colliery in the early 1960's.This installation was withdrawn soon after as a result of its inability to control the roof and problems arising from dust make. A second face was installed in 1964 and withdrawn in 1965 with the same problems experienced by the earlier face remaining unsolved.
A retreating longwall face was installed in the Bulli seam at the Kemira Colliery in 1965. This installation has been claimed to be the first successful retreat longwall face to operate in Australia. After many modifications this face was taken out of service in 1968. Despite the success of this installation the hydraulic roof supports that had been manufactured and operated so successfully in the United Kingdom [UK] proved to be incapable of maintaining control of the strong sandstone roof overlying the Bulli seam when compared to the more plastic like nature of the roof overlying the seams encountered in the UK.
Subsequent longwall packages were supplied with hydraulic roof supports of more robust construction and increased roof carrying capacity with early support features and improvements in the design of the shearing and face conveyor equipment.
The road to success with longwall in this district is littered with equipment design failures and operating problems most of which have now been overcome in some cases after many attempts with inadequacies in the roof carrying capacity of the hydraulic roof supports being the most persistent and difficult problem to resolve. It is generally recognised that it was not until the late 1970's that the longwall retreat system equipment package had been developed to the point where it could be considered as a practical and economically viable proposition.
The Longwall retreat systems were initially introduced to deal with roof conditions that severely hampered production when using continuous miners under deepening roof cover. In a relatively short time longwall was and continues to be used irrespective of roof conditions because of the marked increase in production that can be realized by that system.

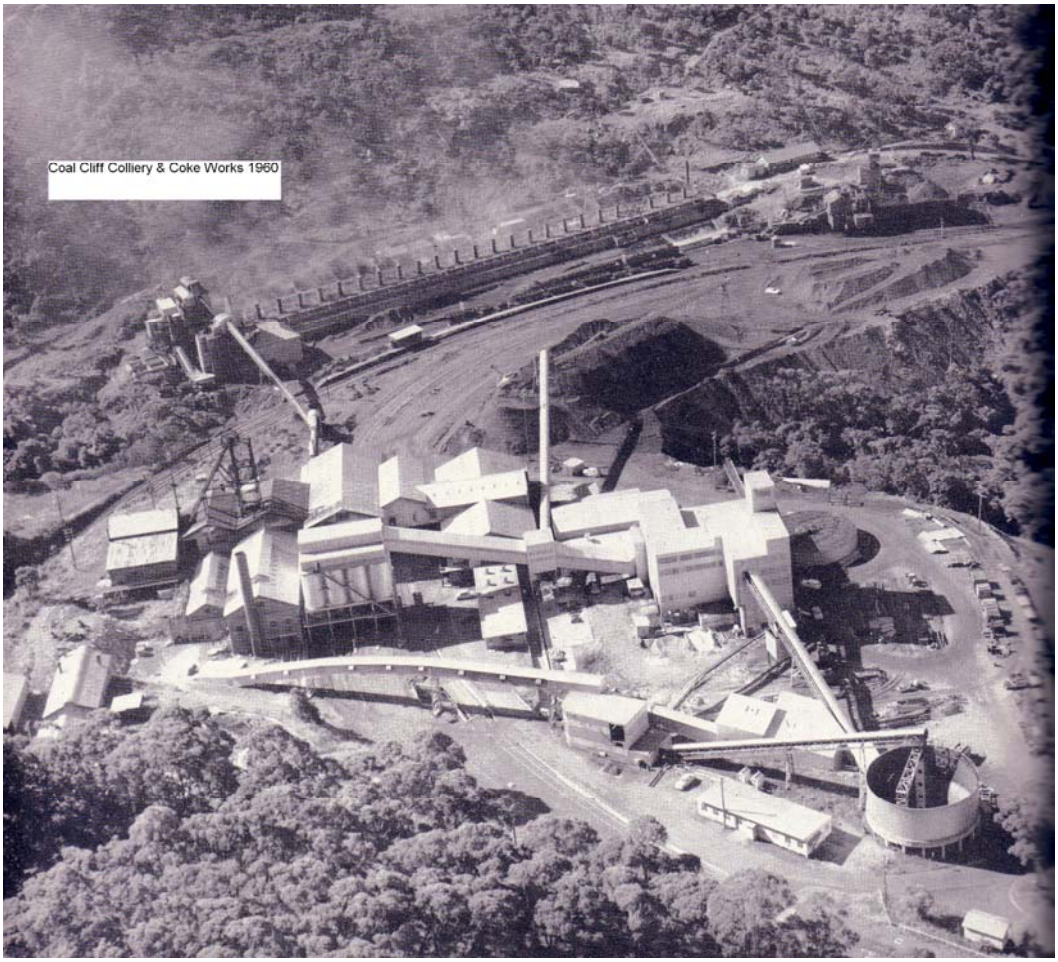
**SHORTWALL MINING**

The use of longwall type powered roof supports with an existing continuous miner and shuttle cars was seen as an opportunity to increase the % of coal recovered from purpose developed panels dimensioned to suit the use of this equipment combination.
Two short wall mining units were installed the first at Corrimal Colliery in 1972 and a second installation soon after at Nebo Colliery. Both of these units were judged as being only of partial success and no further installations followed.

**COKE OVENS**

When mining commenced in the Illawarra the market for coal did not include a demand for small coal so that the coal mined was loaded by the miners into a skip at the face using a fork with the undersize [¾"] being tossed back into the rib or cut through. When the coal reached the surface it was screened and the undersize dumped on to the surface "slack heap".
Patrick Lahiff who was the manager of the Mount Pleasant mine noted that a good quality coke was being created by the spontaneous combustion of coal in the "slack heap" at his mine.

Lahiff was to follow this up in 1857 by erecting two beehive ovens near the harbour and producing small quantities of coke for export. Lahiff later sold this venture and the new owner/s increased the number of ovens to six and continued to operate until the operation was shutdown in 1890.
Other mines were to follow Lahiff and by 1907 there were ten coke works in operation along the coast exporting a total of 35,000 tons of coke per annum the bulk of which was being used in South Australia in Smelters processing the ores mined at Broken Hill.
The Hoskins Brothers decision to move from Lithgow to establish a steel plant at Port Kembla in 1928 provided a considerable boost to the coalmines in this area. Coke was not only required for the local steel industry but was in much demand for similar purposes especially in Japan. The rapid expansion of the local steel plant led to an increased requirement for coke and coal suitable for coking. The Bulli seam provided the main source for coal for this purpose but it was found that the Wongawilli seam coal, when cleaned of impurities could be blended very successfully with the Bulli seam coal to make an excellent coke for the steel plant blast furnaces.




**COAL CLIFF COLLIERY AND ILLAWARRA COKE WORKS - 1960**

**INDUSTRIAL ISSUES**

The mining of coal that began in Newcastle around 1797 was carried out using convict labour working in leg irons under military control. Following the abolition of convict labour, free labour was imported from Great Britain. With these men came the old prejudices that were soon to be added to an already troubled industry and created an enduring and troublesome industrial legacy that has had a profound effect on the industry to this day albeit in a more enlightened manner in which the industrial affairs of the industry are now conducted.

The early miners in the Illawarra worked as elsewhere in the state in a master and servant relationship with the work being hard and dangerous and the continuity of employment determined by the owner of the mine on a day-to-day basis. The mine owners contributed to the problem by acting alone and engaging in cutthroat pricing tactics that led to loss of profits, markets and jobs for miners. These factors along with the contract system provided a fertile source for grievances and strikes.

In 1887 an underground explosion at Bulli Colliery was to claim the life of 81 men. This incident did little to cool the anger of the miners not to mention the terrible effect it was to have on the families of those who lost their life.

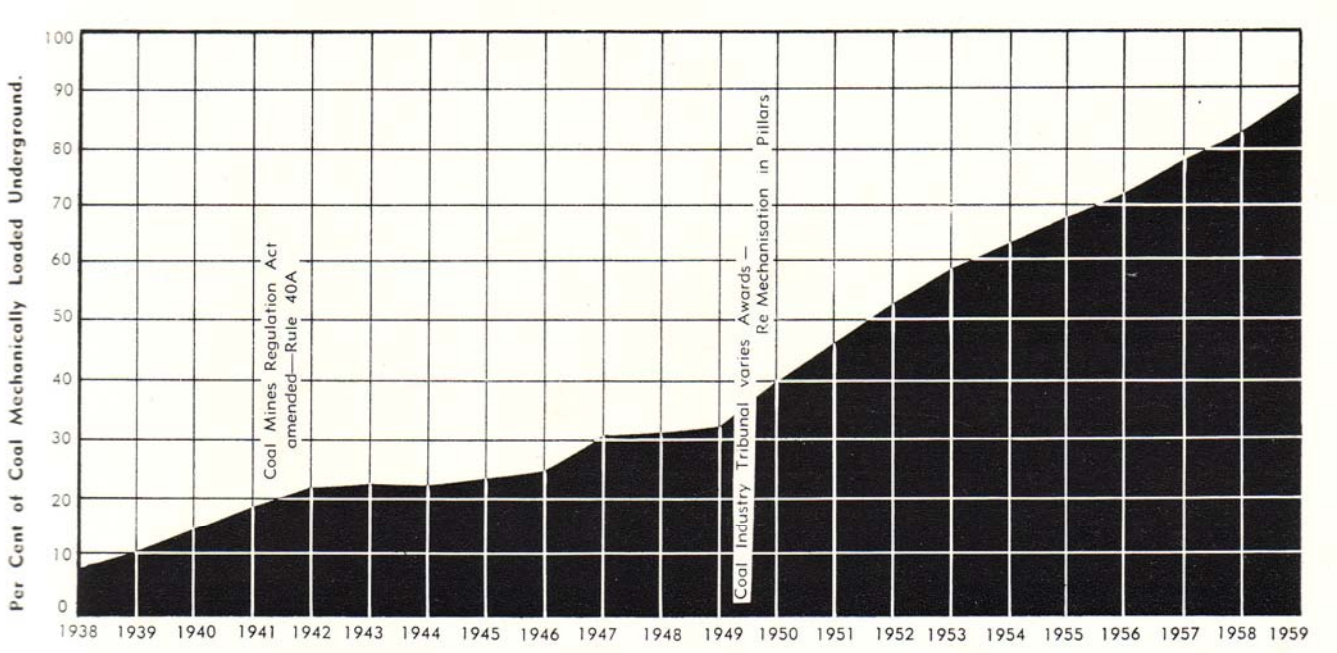
Whilst there were too many and frequent strikes one of the more noteable was the 1890 Maritime Strike. This strike was joined by the miners and led to the owners withholding the miners wages and hiring blacklegs or scabs as they have become known in more recent times to work the mines. Meetings and marching on the colliery offices demanding payment of wages occurred every few days and miners and in some cases women were arrested and jailed for molesting the black legs. Armed police were sent to Mt Kembla and Helensburgh to protect the black legs and to prevent further damage to colliery property.

In 1902 an underground explosion at the Mt Kembla Colliery rocked the area with 95 men and boys losing their life. This incident has unenviable record of having caused the greatest loss of life of any one accident that has occurred to this day on the Australian mainland.

Unrest in the industry continued up to and during the 1914-18 war with the major issues being wages and a demand for an eight-hour working day. The eight-hour working day was granted in 1916.

The mines in this area declined, as elsewhere during the Great Depression of the 1930’s, the cost to produce coal was unacceptably high and was accompanied by high levels of unemployment. When the 1939-45 war began many mines were in a state of obsolescence as no capital investment had taken place at the mines during and following the Depression.

The level of industrial disputation did not abate during the war with strikes in 1945 leading to significant losses of coal production that impeded the country’s war effort and a general strike in 1946 evoked strong action by the Federal Labor Government that included the goaling of some miners and waterfront union leaders. This action was to spell the end of the Communist control of these two unions and the first signs of industrial peace in the industry began to emerge from that time onwards.




*Graph shows the stalemate in mechanisation imposed in 1941 by Rule 40A. The column of figures at left indicates percentage of N.S.W. underground output mechanically loaded. Variation of awards in 1950 made possible mechanical mining of pillar coal, led to rapid rise in mechanised output. Underground loading operations were 88.2% mechanised in 1959.*

**MINE REHABILITATION**

Apart from the greater attention we pay to the environment there is a willingness by owners and a requirement imposed by Statutory requirement to the manner in which the "footprints" of abandoned coal mines are treated in respect to their historic and heritage value and their restoration as far as is practical to an as before state so that no unsightly and damaging legacies are left for those who follow.

Whilst a number of mines along the escarpment have or are in the process of being rehabilitated it is worth relating the work that is nearing completion on the site of what was the first mine in the area at Mt Keira later named Kemira.

The mine closed in 1995 and after 138 years of operation a considerable amount of rock; coal and assorted rubbish had accumulated "over the bank" as it was called at the pit top. Several washaways had occurred in the past during heavy rain and quantities of this material had found its way down the mountainside and into the residential areas below.

In developing plans for the rehabilitating the site the owners sought input from a Community Consultative Committee and a number of Government agencies and community input following the public display and comment. The rehabilitation of the site is now is now substantially complete and is visible from the coastal plain. From the Authors observations the work-undertaken has blended in well and will leave behind a record of this historic site and with the assistance of nature and regrowth return the site with some enhancements to what might have been the view from the coastal plain so many years ago.

**REHABILITATION WORK UNDER CONSTRUCTION**
**KEMIRA COLLIERY**

## CONCLUSIONS

This then is a brief history of coal mining in the Illawarra where coal was first found to exist in 1797 but was not mined until 1849.The mining that did take place at that time had primitive beginnings with landowners on discovering coal on their land set about finding a use for their own purpose or opportunities to exploit their find commercially.

Over the course of time fifty mines commenced operations in this district with some both large and small falling by the wayside whilst others were highly successful and went on to make a substantial contribution to the advancement of technology in mining systems and equipment, the prosperity of the country and the creation of a thriving overseas export trade.

With two exceptions all of the mines along the coastal strip have now closed due to changes in industry practices, the exhaustion of reserves and the loss of economic viability but the tradition is continuing inland behind the escarpment where there are still a small number of collieries producing large quantities of coal from the Bulli seam.

If it were not for coal mining in the Illawarra in conjunction with the steel and associated industries that followed Wollongong and the Illawarra district in general would have remained a small country town and district and not the thriving metropolis and vibrant area it is today.

## REFERENCES.

History of Coal Mining in Australia Monograph 21 – 1993 Australasian Institute of Mining & Metallurgy [Aus.I.M.M.]– C. H. Martin, A. J. Hargraves, R. J. Kinninmonth, S.M.C. Saywell.

Proceedings Aus.I.M.M. No 258 Presidential Address 1976 - C. H. Martin.

A History of Wollongong 1997 – Hagen & Wells.

A Railway History of the Illawarra – J. L. N. Southern 1978.

The Illawarra Coalfield – A Brief History to 1905 – Gordon Sellers Aus.I.M.M Conference Illawarra May 1976.

Port of Wollongong – C.W. Gardiner ~ Garden. Illawarra Historical Society 1975.

Transporting the Black Diamond – Gifford Eardley 1968.

Modern Mining Practice – C. M. Bailes Volume 4 – [no date]

Wollongong City Council – Illawarra Images Library.

BHP Billiton – Kemira Rehabilitation data and Photograph.

Joint Coal Board Annual Reports 1971-72, 1972-73.

The NSW Department of Mineral Resources.

## ACKNOWLEDGEMENTS

The Authors wish to record their thanks to all those organizations and persons who have assisted in gathering the information required to prepare this paper and who provide both financial support and encouragement in gathering and recording the history and heritage of coal mining.

## Appendix 1

### Coal Seams

There are seven major coal seams outcropping in the Illawarra. They are numbered from one to seven from the uppermost to the lowest levels of what is known as the Illawarra Coal measures.
The main coal seams are:
No1 – Bulli seam
No2 – Balgownie seam also known as the 4ft seam
No3 – Wongawilli seam also known as the Dirty seam
No4 – American Creek seam (noted for its oil shale qualities)
No5 – Tongarra seam
No6 – Wonoona seam also known as the Figtree seam

Other thin intermittent seams exist between the No2 & 3 seams and several identified but uneconomical seams occur below the main sequence.
All of the main seams in the above coal measures have been prospected at one time or another and in some cases mined to a limited extent and then abandoned.

# MINING HISTORY OF THE ILLAWARRA

**TABLE OF CONTENTS** **Page Number**

**TABLE OF CONTENTS (Continued)** **Page Number**

## Biographies

### Ron Cairns

Ron commenced work as an Apprentice at Wongawilli Colliery and after obtaining Statutory and Engineering qualifications moved through the AIS Collieries organization to the positions of Electrical Engineer at Mt Kembla and Kemira and in 1959 as Engineer and Under Manager during the sinking of the shafts and drifts at Appin Colliery.
In 1964 he was appointed Chief Electrical Engineer and in 1975 Chief Engineer of the AIS Collieries Group and in 1979 Manager Engineering BHP Illawarra and Newcastle Steel Division Collieries
He has witnessed the change from hand mining to longwall mining and was directly involved with others in the development of engineering practices associated with those changes. His engineering responsibilities included the development of Cordeaux and Tower Collieries from greenfield sites, the methane drainage and power generation plant at Appin Colliery and the Stockton Borehole Coal Preparation Plant in Newcastle.
He spent some time on secondment to BHP Engineering on mining prospects in New Zealand, China ant the Philippines and was privileged to present technical papers on AIS Collieries and Australian mine electrical engineering practices in London and the USA.
Ron is a member of the Aus. I. M. M. Minerals Heritage Sub-Committee and is keen to contribute to the recording of the history and heritage of mining in the Illawarra.

### Geoff Mould

Geoff was “called up” into the coal mining industry near the end of World War 2. He worked as a fitter and coal face worker entering University in 1947.By the end of 1950 he had obtained his Mining Degree and Colliery Managers Certificate and held a number of junior official positions at UK coal mines as an employee of the National Coal Board [NCB].
In 1953 he joined a firm of machinery manufacturers as a Mining Engineer and in 1956 returned to the NCB to take up the position of Assistant to the Chief Mechanization Engineer.
In 1960 he moved to South Wales as Area Mechanization Engineer and later to the position of Senior Project Engineer at the NCB Central Engineering establishment.
The downturn in the UK coal mining industry and the lack of any promotion prospects saw Geoff emigrate to Australia in 1970 to take up a position as a Mines Inspector with the Department of Mines based in Wollongong.
Geoff retired in 1984, working as a part time consultant up until 1994.He is keen Historian and a very active member of the Aus. I. M.M. Minerals Heritage Sub-Committee.