AUSTRALIAN MINING HISTORY ASSOCIATION

ANNUAL CONFERENCE

Kadina, South Australia

5–10 July 2006

Cornish miners at Elders Shaft, Wallaroo Mine, c.1900.

AUSTRALIAN
MINING
HISTORY
ASSOCIATION

PRESIDENT'S FOREWORD

The AMHA organising committee thank you for joining us at the 2006 conference in South Australia's Copper Triangle of Moonta, Kadina and Wallaroo. This is another of our stand-alone conferences in a major historic mining centre. Our previous conferences have been held in Townsville, Melbourne, Newcastle (twice), Sydney, Hobart, Adelaide, Kalgoorlie, Brisbane, Broken Hill and Bendigo. Our early conferences were held under the auspices of the Australian Historical Association, and few of those were held in mining districts. In the past four years we have ventured out alone, and organised our own conferences incorporating visits to places of historic interest, and greater interaction with mining industry and with mining communities. These appeal to many of our members' interests, but there is also a significant element of our membership who would like to see our links with other historical organisations retained. It is clearly possible to do both these things, and our association must resolve the best ways to do this.

A hundred years ago the Copper Triangle was one of the world's great base metal mining centres, famous for the value of its mineral production, as a centre of technological innovation, and for the spirit of its Cornish community. While the district's mining heyday is long past, it has left us a fascinating industrial landscape. Appropriately, a large part of our conference will be spent in telling aspects of the stories of the mines and mining communities of Moonta, Kadina and Wallaroo. Hopefully, as usually happens at our conferences, these papers will bring new insights to a story which some people might think is already well known.

Three themes in particular dominate the conference program: the distinctive character of the local area, the copper and other base metal mining industries in many other places, and the role of the Cornish in making Australia. Historians from around Australia and several overseas countries have contributed papers relating to the Copper Triangle and its place in the wider world; where the technology, the capital and the communities came from, and in turn how the profits created here, the skills and the community traditions developed here went on to transform the mining industry in other places and to shape Australian society.

The conference could not have happened without the enthusiastic support of Copper Triangle organisations and community members. I thank the District Council of the Copper Coast and the Kadina Dryland Farming Centre, the Department of Primary Industries and Resources, the National Trust and the Wallaroo Football Club, all of whom have helped to make the conference possible. I thank our sponsors in the mining industry for their generosity: Avoca Resources Ltd, Red Metal Ltd, Hillgrove Resources Ltd and Adelaide Resources Ltd. I also thank my fellow-members of the organising committee in Adelaide, Greg Drew, Ross Both and in particular Graham Hancock, and our Secretary/Treasurer, Mel Davies in Perth for his superb organising and record-keeping skills.

Dr Peter Bell
President, AMHA

INTRODUCTION

The Moonta – Wallaroo Mining District covers an area of about 130 square kilometres on the northern Yorke Peninsula. The area is flat-lying with a thin veneer of calcrete and soil overlying older crystalline basement rocks containing copper vein mineralisation. There was no surface expression of these veins. In 1859 and 1861, shepherds discovered brightly coloured copper ore which had been brought to the surface by the burrowing of native animals. W.W. Hughes, the owner of the pastoral leases covering the discoveries secured mining leases and formed two separate companies to work them – the Wallaroo Mining Company and the Moonta Mining Company.

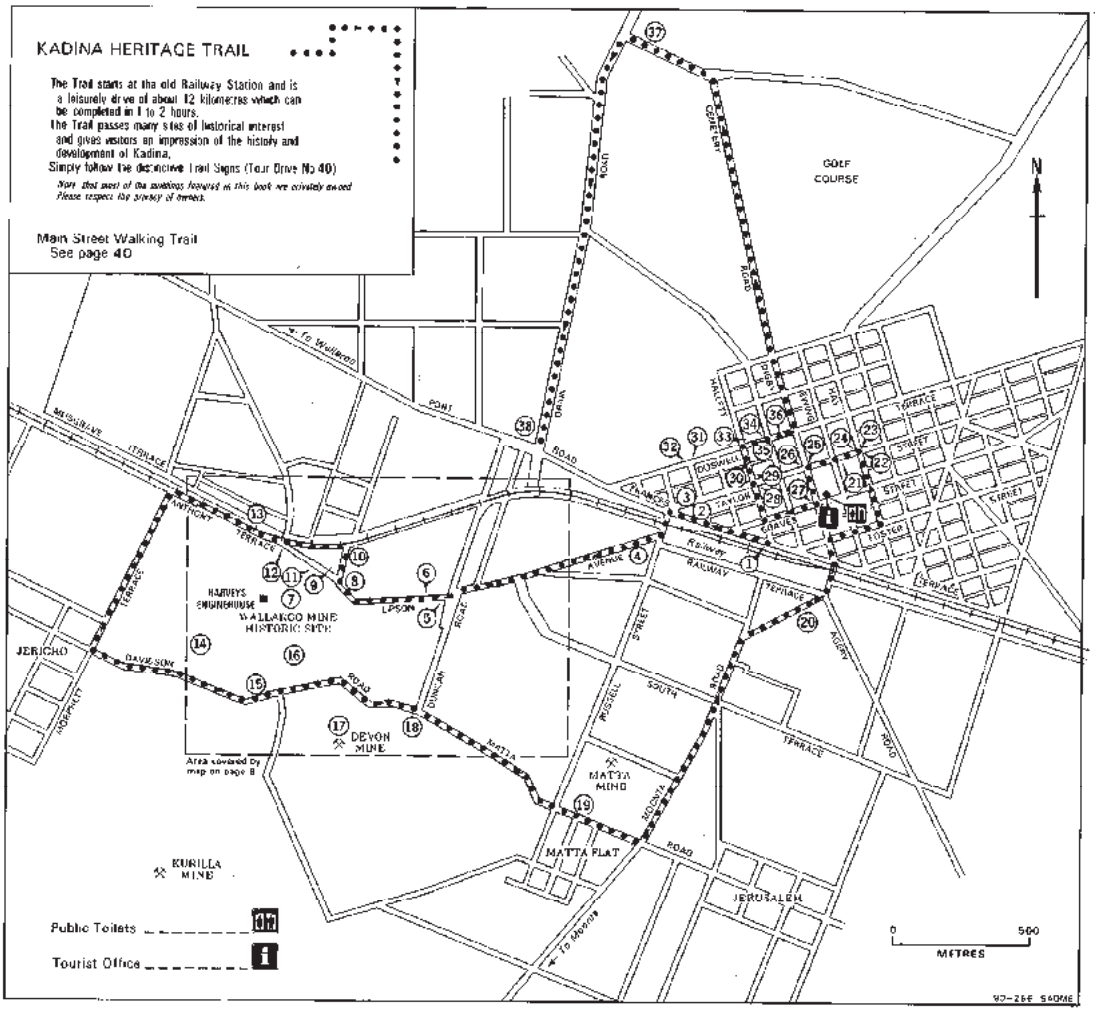
These discoveries which subsequently became the Wallaroo and Moonta mines, were made at a time when the earlier rich copper carbonate ores at Kapunda and Burra were declining and ensured the continuity of production and employment in the South Australian mining industry. They caused a rush for leases in the vicinity of the two mines and numerous companies were formed to work extensions of the Moonta and Wallaroo lodes or prospect new ground. However none of the mines was as rich or successful and many were later incorporated into the Moonta and Wallaroo operations.

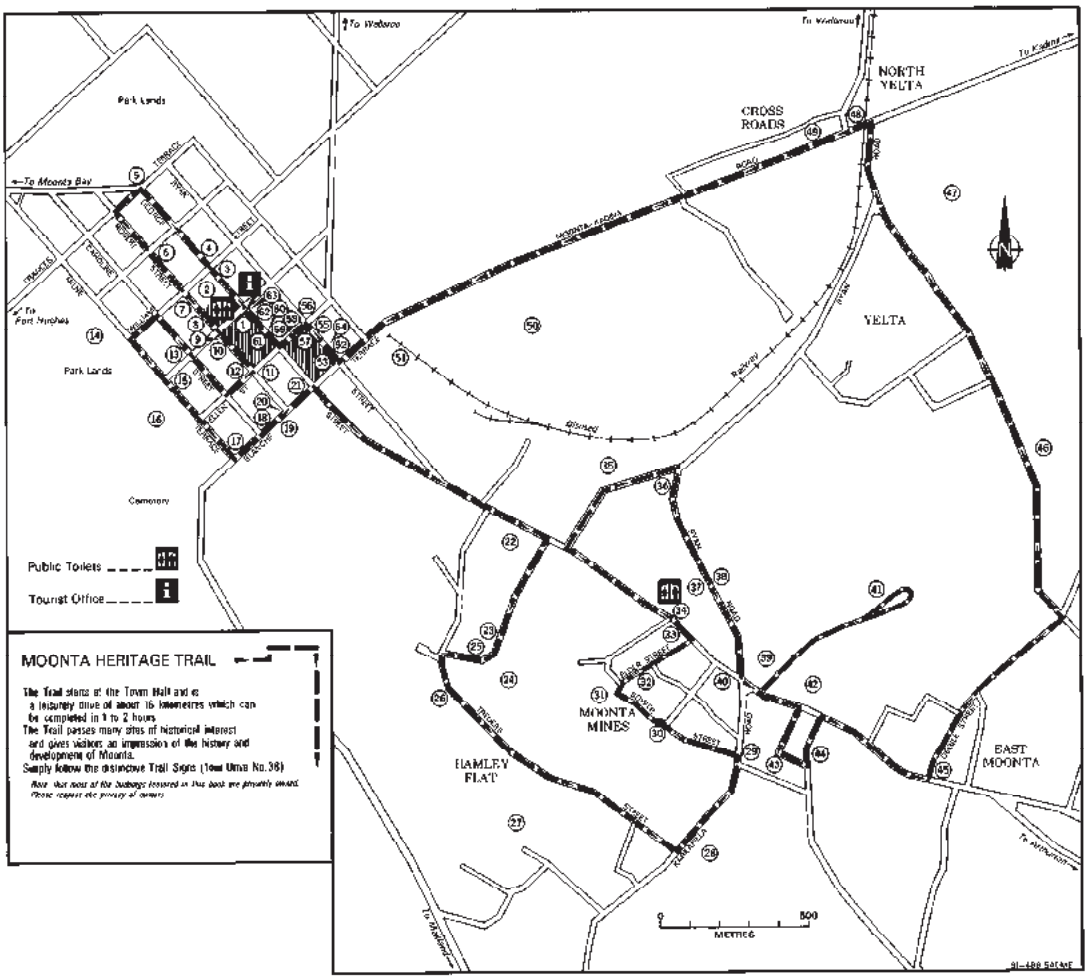
The Moonta and Wallaroo mines remained in almost continuous production for more than 60 years during which time their combined production was about 335,000 t of copper metal from 7 mt of ore. They were worked as private ventures until 1889 when they amalgamated to form the Wallaroo and Moonta Mining and Smelting Co. Up to that time Moonta outshone the Wallaroo Mine in terms of production and richness of ore and in 1876 the Moonta Mining Co. became the first mining company in Australia to pay £1 million in dividends. However the years after the amalgamation saw widespread modernisation at Wallaroo which was accelerated by a disastrous fire at Taylors Shaft in 1904. This included electrification of the works and the addition of new headframes and power plants, and the flotation process to ore treatment.

Large smelting works which were erected at Wallaroo on the coast, treated ore from the mines from 1861 until 1923. The Welsh smelting process using small reverberatory furnaces remained virtually unchanged during the first 30 years of operation when it was for a time the largest smelting works in the world outside Swansea in Wales. The amalgamation of the two companies resulted in the application of new technology and diversification including the Bessemer smelting process, copper sulphate plant and sulphuric acid works.

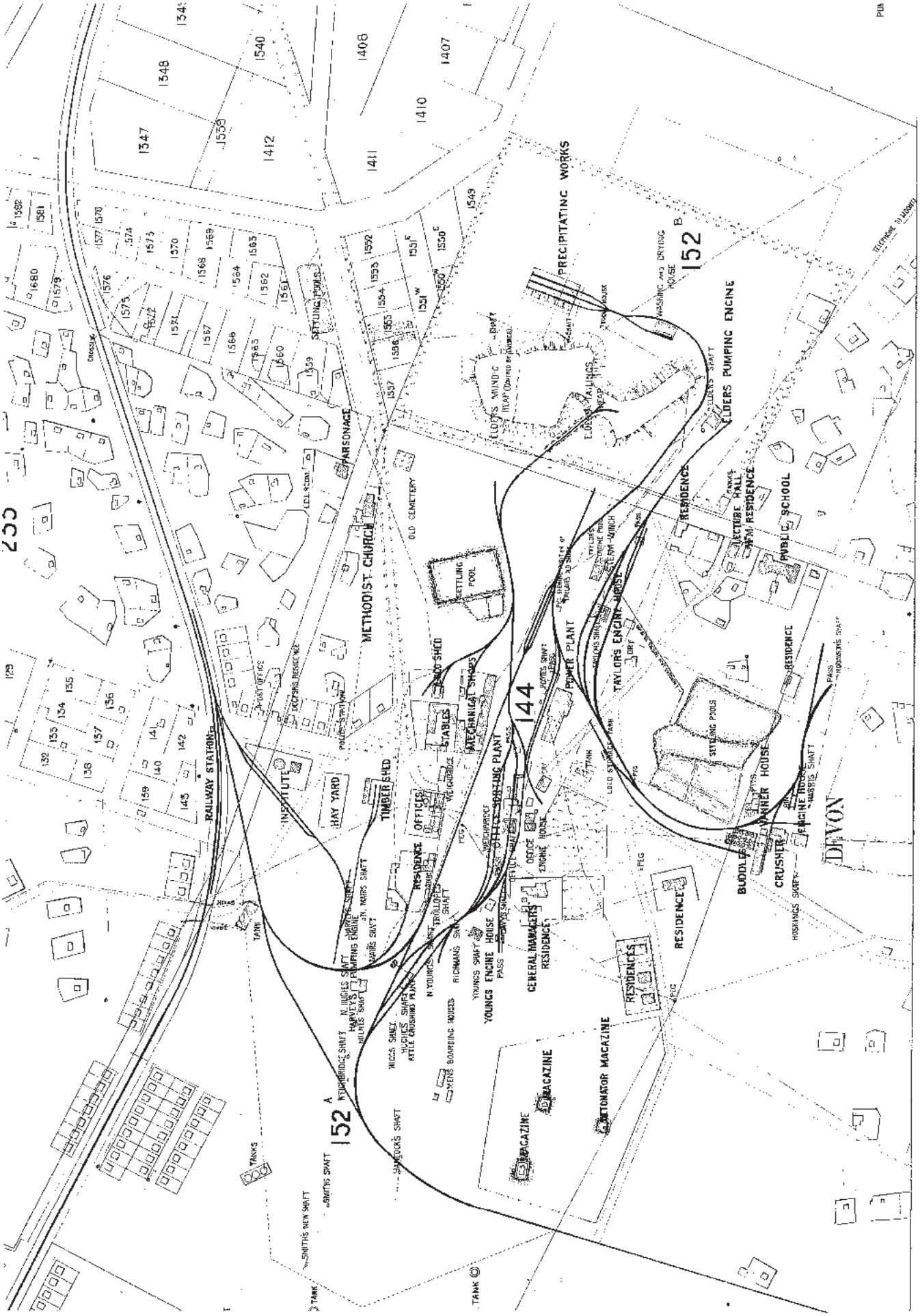
The mining and smelting of copper had a great influence on economic activity in the district. At the peak of mining activity in the mid 1870s, the mines employed more than 3000 and the district had a population of about 20,000 - predominantly Cornish immigrants and their descendants. In particular, it resulted in the establishment of three significant towns - Kadina, Moonta and Wallaroo.

View of Elders Lode from Richmans Tailings Dump, Moonta Mine, c.1900

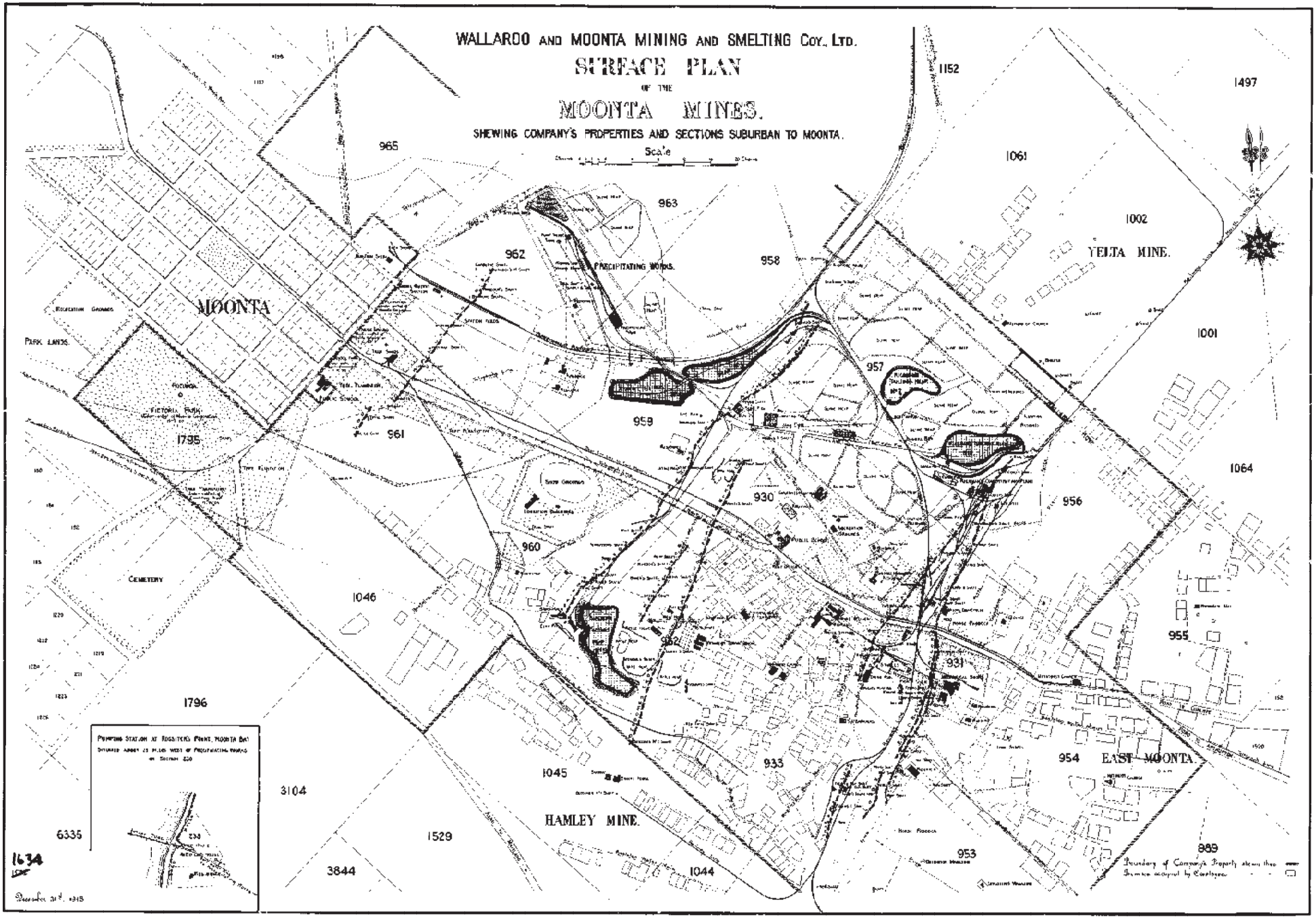




Location maps



Plan of the Wallaroo Mine, 1906



Plan of Moonta Mines, 1913

PROGRAM

Wednesday 5 July

12.30-2.00 pm	BBQ lunch – Kadina Visitor Centre
2.00-5.00 pm	Registration – Kadina Visitor Centre
	Open House – Farm Shed Museum
	Includes Wallaroo Mine tour at 2.00-4.00 pm
4.00-6.00 pm	AHMA Board Meeting
6.00-8.00 pm	Welcoming Reception hosted by Copper Coast Council – Kadina Town Hall

Thursday 6 July

8.00-9.00 am	Registration - Kadina Visitor Centre	
9.00-9.10 am	President's Welcome	
9.10-10.30 am	***First Session of Talks*** – *Chair:* Peter Bell	
	Keynote speaker	
	Greg Drew	*The Moonta-Wallaroo Mining District 1859-1923*
	Anne Both	*The Struggle for Water Supply in the Copper Triangle*
10.30-11.00 am	Morning Tea	
11.00-12.30 pm	***Second Session of Talks*** – *Chair:* Mel Davies	
	Ross Both	*Exploration and Mining in the the Moonta-Wallaroo Field after the 1923 Closure*
	Peter Bell	*The Forgotten Twenty Years: Leaching the Moonta Waste Dumps 1901-1943*
	Ruth Kerr	*South Australian Investment in the North Queensland Base Metal Industry*
12.30-1.30 pm	Lunch – Kadina Visitor Centre	
1.30-3.00 pm	***Third Session of Talks*** – *Chair:* Jeremy Mouat	
	Ken McQueen	*Hidden copper: the early history of the Cornish, Scottish and Australian (C.S.A.) Mine, Cobar, NSW*
	Jim Enever	*Copper Mining in Victoria in the Nineteenth Century*
	Roger Kellaway	*'Not enough to make a kettle': Copper mining at Badger Head 1877-1880*
3.00-3.30 pm	Afternoon Tea	
3.30-5.30 pm	Wallaroo Museum and smelter site	
7.00-9.30 pm	Social evening – Wallaroo Town Hall	

Friday 7 July

9.00-10.30 am	***Fourth Session of Talks*** – *Chair:* Graham Hancock	
	Keynote speaker	
	Dr. Phillip Payton	*Making Moonta: the Invention of Australia's Little Cornwall*
	Nic Haygarth	*Catch'em, hold'em, shave'em, shear'em: Cornish "practical mining" and Tasmanian tin*
10.30-11.00 am	Morning Tea	
11.00-12.30 pm	***Fifth Session of Talks*** – *Chair:* Phillip Payton	
	Jay Fell	*From Swansea to Black Hawk to Butte: the Transfer of Copper Smelting Technology from Wales to the American West*
	Gil Ralph	*An Illustrated History of WMC*
	Ian Schomburgk	*The Role of Mining in Pioneering a New Society*
12.30-1.30 pm	Lunch – Kadina Visitor Centre	

1.30-3.00 pm	***Sixth Session of Talks*** – *Chair:* Jay Fell	
	Barry McGowan	*Class, hegemony and localism: the Welsh mining communities of Currawang and Frogmore*
	Vic Taylor	*The Woolgar's Lost World: A framework of theory and method in an attempt to establish its provenance*
	Janice Wegner	*Gardening under difficulties: gardens on inland mining fields, North Queensland*
3.00-3.30 pm	Afternoon Tea	
4.00-6.00 pm	Wheal Hughes Mine Tour or Moonta Cemetery Tour	
7.00-10.30 pm	Conference Dinner – Moonta Town Hall	

Saturday 8 July

8.30-10.30 am	Moonta Walking Tour	
10.30-11.00 am	Morning Tea	
11.00-12.30 pm	***Seventh Session of Talks*** – *Chair:* Ruth Kerr	
	David Branagan	*From Russia via USA (With Love): Australian Geochemical Mineral Exploration: it all began at Moonta*
	Jeremy Mouat	*"Just Now the 'Merican expert is the Prominent Man": American mining engineers and the Australian mining industry*
	Mike Williams	*A Man we know and trust: Thompsons of Castlemaine*
12.30-1.30 pm	Lunch – Kadina Visitor Centre	
1.30-3.00 pm	***Eighth Session of Talks*** – *Chair:* Ross Both	
	Bill O'Neil	*The Federated Engine Drivers and Firemens Association in Broken Hill*
	Philip Hart	*Michael Dineen O'Keeffe: Union Leader*
	Sandra Kippen & James Lerk	*Suicide on the Bendigo goldfields*
3.00-3.30 pm	Afternoon Tea	
3.30-5.00 pm	***Ninth Session of Talks*** – *Chair:* Greg Drew	
	Brian Hill	*A reinterpretation of the history of the acquisition of the Blackwater gold mine*
	Pauline Payne	*Researching the Adelaide Assay Office – some triumphs and some pitfalls for researchers*
	Keith Johns	*The Cornish in Burra*
5.00-6.00 pm	Closing and AGM	

Sunday 9 July

9.00-12.00 pm	Moonta Mines State Heritage Area National Trust sites including the Moonta Mines Museum, Tourist Railway, Miners Cottage and Moonta Mines Uniting Church. Includes coffee break in the Museum
12.00-1.30 pm	Lunch – Moonta Mines Church
1.30-4.00 pm	Moonta Mines Elders Line of Lode walk

POST-CONFERENCE TOUR

Monday 10 July

9.00–4.00 pm	Moonta Mine (Treuers, McDonnells, Fergussons, Greens and Beddomes lodes), Hamley Mine, Yelta Mine, Wheal Hughes, Poona Mine and Paramatta Mine.

ABSTRACTS

The Forgotten Twenty Years: Leaching the Waste Dumps at Moonta Mines 1901-1943

Peter Bell
Historical Research Pty Ltd Adelaide

Copper ore was mined at Moonta from 1862 until 1923, but copper metal was produced there for another twenty years after the mines closed. Copper was being extracted from the waste dumps by acid leaching from 1901 onward, and when mining ceased, the process continued for another generation. While the quantities of copper produced were never large, the process was capable of operating at virtually no cost, utilising principally seawater, by-product sulphuric acid and scrap metal, and consuming minimal labour and fuel.

The process was designed by Antonio Delgado of the Rio Tinto mines of Spain, an instance of the Wallaroo and Moonta Mining and Smelting Company's responsiveness to trends in international mining technology. Its principal significance to us today is that the relic industrial landscape we see at Moonta Mines was created to a great extent not by the first sixty years of mining operations, but by the final twenty years of leaching.

"Nor any Drop to Drink": The struggle for water supply in the Copper Triangle

Anne L Both
Burnside Historical Society

Lack of water was a major problem for the mining communities of the Copper Triangle for approximately thirty years after mining began. Low rainfall, mainly in the winter months, no natural watercourses of any note and poor catchment areas meant that settlers were dependent on sporadic rains for replenishment of their water supply. Prior to the commencement of mining in 1861 the area was sparsely settled by farmers and fishermen whose water supply came largely from known native wells for stock watering and the small tanks constructed to catch rain for domestic use.

Mining activity brought rapid population growth within a relatively short time span. This rapid growth meant that the necessary infrastructure to support such influx was totally inadequate or non-existent. The water from native wells and sparse rainfall rapidly proved insufficient for domestic and other needs and settlers suffered severe water shortages and zymotic disease for almost thirty years. State and Local Government strove to meet the water needs of the population, constructing water tanks to collect rainfall and introducing health regulations to combat the frequent episodes of infection. Local Boards of Health acting under the direction of District Councils and the Central Board of Health worked to improve poor drainage, inferior methods of refuse disposal and poor animal husbandry. In spite of the health measures precious water often became readily contaminated from domestic and industrial activity.

In 1890, the Copper Triangle saw the first reticulation of water from a Government reservoir and since that time has enjoyed water comparable to that of any modern township. This paper traces the struggle to obtain adequate uncontaminated water through the construction of reservoirs, and considers the roles of the mining community, the District Councils and the South Australian Government in provision of safe water.

Exploration and mining in the Moonta and Wallaroo fields following the 1923 mine closures

Ross A. Both
School of Earth and Environmental Sciences, University of Adelaide

The Moonta and Wallaroo mining fields are located in the easternmost part of the Gawler Craton. The ore bodies are veins hosted by metamorphosed volcanic and sedimentary rocks of Proterozoic age. An investigation of ore-controlling structures in both fields by S. B. Dickinson in 1942 (Bulletin 20, Geological Survey of South Australia) provided a geological basis for mineral exploration but, because of a complete lack of outcrop in the area, exploration has relied heavily on geophysical and geochemical methods, with follow-up diamond drilling to test anomalies. Geophysical investigations were first used in the Moonta-Wallaroo area in 1928-1929 by the Imperial Geophysical Experimental Survey and the first application of

geochemical reconnaissance was that carried out by V. P. Sokoloff of the U.S. Geological Survey on behalf of Zinc Corporation Limited during their 1947-1948 exploration program. A major exploration project by Western Mining Corporation Limited and North Broken Hill Limited from 1959-1988 found further deposits at Poona and Wheal Hughes, near Yelta, but failed to make any major discoveries. The project was sold to Moonta Mining NL who between 1988 and 1994 produced 187,843 t of ore averaging 4.76% copper and 1.45 g/t gold from Poona and 287,871 t of ore averaging 3.51% copper and 0.67 g/t gold from Wheal Hughes. Further exploration is currently being conducted by a joint venture between Adelaide Resources Limited and Phelps Dodge Australasia Inc/Red Metal Limited.

From Russia via USA (With Love): Australian Geochemical Mineral Exploration: it all began At Moonta

David Branagan
School of Geosciences, University of Sydney

Tradition has it that the Moonta – Wallaroo field began when Cornish men spotted 'green stuff' in soil dug from a wombat's hole, and noticed that burning local bushes produced a green flame, all indicative of copper. Some people were sceptical. In the late 1940s, V.P. Sokoloff undertook the first systematic geochemical exploration in Australia at Moonta, apparently on behalf of the Zinc Corporation. The idea was that traces of copper could be held at varying levels in the soil profile above a mineralised zone in the bedrock. At Moonta the soil mantle varied from 2 m to more than 6 m. Sampling was carried out over a total length of 13 km, 326 soil profiles were examined and about 2000 samples were tested chemically. Three geochemical anomalies were located. The subsequent drilling revealed mineralisation in the bedrock, but not of economic grade. Thus the method proved technically sound, but un-commercial. The method was taken up elsewhere in Australia, with varying success. Sokoloff is virtually forgotten in South Australia. Where was he from, where did he go?

The Moonta-Wallaroo Mining District, 1859-1923: an Overview

Greg Drew
Senior Geologist, Mineral Resource Group, Primary Industries and Resources SA

The Moonta-Wallaroo Mining District covers an area of about 130 square kilometres on the northern Yorke Peninsula. The area is flat lying with a thin veneer of calcrete and soil overlying older crystalline basement rocks containing copper vein mineralisation. There was no surface expression of these veins. In 1859 and 1861, shepherds discovered brightly coloured copper ore which had been brought to the surface by the burrowing of native animals. W.W. Hughes, the owner of the pastoral leases covering the discoveries secured mining leases and formed two separate companies to work them – the Wallaroo Mining Co. and the Moonta Mining Co.

These discoveries which subsequently became the Wallaroo and Moonta mines, were made at a time when the earlier rich copper carbonate ores at Kapunda and Burra were declining and ensured the continuity of production and employment in the South Australian mining industry. While numerous leases were taken up in the vicinity of the two mines, none of the outlying lodes proved as rich or successful, and many were later incorporated into the Moonta and Wallaroo operations.

The Moonta and Wallaroo mines remained in almost continuous production for more than 60 years during which time their combined production was about 335,000 t of copper metal from 7 mt of ore. They were worked as separate ventures until 1889 when they amalgamated to form the Wallaroo and Moonta Mining and Smelting Co. Large smelting works were erected at Wallaroo on the coast, treating ore from the mines from 1861 until 1923. The amalgamation of the two companies resulted in the application of new technology and diversification including the Bessemer smelting process, copper sulphate plant and sulphuric acid works.

The mining and smelting of copper had a great influence on economic activity in the district. At the peak of mining activity in the mid 1870s, the mines employed more than 3000 and the district had a population of about 20,000, predominantly Cornish immigrants and their descendants. In particular, it resulted in the establishment of three significant towns - Kadina, Moonta and Wallaroo - which form the Copper Triangle.

This paper will provide an overview of the mining history, geology, mining methods and settlement patterns in the Moonta–Wallaroo District and provide some comparisons with the Olympic Dam Mine which will eventually replace it as the longest continuously operating mine in South Australia.

Copper Mining in Victoria in the Nineteenth Century

Jim Enever

Although never of the significance of the copper industries in other Australian States, some copper mining and smelting was undertaken in Victoria during the second half of the nineteenth century and early twentieth century. Copper mineralisation was relatively widespread throughout the Victorian goldfields, but was not of commercial significance except at Berthanga, where early gold mining activities led eventually to the extraction of copper from the complex refractory ore of the area, and at the Coopers Creek (or Thompson River) Mine in the Wallhala District, where a relatively simpler copper ore body separate to the gold occurrences of the area formed the basis of an intermittently successful mining operation. Away from the goldfields, stand alone copper mining on a limited scale was undertaken during the latter part of the nineteenth century in far east Victoria at Accomodation Creek in the Mt Dedick Mineral Field, better known for its silver/lead mineralisation. Copper was also recovered from small deposits of mineralisation found in limestone of the Buchan district of east Gippsalnd from the 1870s on.

The histories of the three most significant Victorian copper mining sites of the period vary much in terms of the problems that had to be overcome in their development. At Berthanga, the issues were essentially metallurgical, while at Coopers Creek, difficulties in delineation of the ore reserves made for a stop-start history. In the case of Accommodation Creek, it was the relatively small size of the resource and its remoteness, by Victorian standards, that put the break on development. Taken together, Berthanga, Coopers Creek and Accomodation Creek provide an interesting insight into a relatively little known corner of the Victorian mineral industry of the nineteenth century and early twentieth century.

From Swansea to Black Hawk to Butte: The transfer of Copper Smelting Technology from Wales to Colorado, Montana, and other American States in the 1860s, 1870s, and after

James E. Fell, Jr.
University of Colorado at Denver and Health Sciences Center

The Pike's Peak Gold Rush of 1859 prompted the rise of mining in what quickly became first the Territory and then the State of Colorado. By the mid-to-late 1860s, however, the industry collapsed largely because of the inability to extract gold from deep ores containing small amounts of copper, iron, and other substances. In the crisis, Nathanial P. Hill, a resourceful former college professor as well as mine owner, came to believe that the technology used to reduce copper ores at Swansea, Wales, was the solution to Colorado's technological impasse. After two trips to Britain and the Continent to study technology, he hired Welsh, Cornish, and German-trained metallurgists and workers, obtained the capital he needed, and founded the Boston and Colorado Smelting Company. In 1868, this enterprise opened a plant that used the Welsh technology so successfully that by the mid-1870s, it was reducing more than half of Colorado's total metallic output in terms of silver and gold.

Meanwhile, analogous technological problems in the small gold mining town of Butte, Montana, prompted a major mine owner there, William Andrews Clark, to visit Hill's plant to discuss the situation. Eventually, these talks led Hill, Clark, and others to create the Colorado and Montana Smelting Company, which established a plant at Butte in the late 1870s. This resolved the technological problem that Clark and others faced. But the long-term results were different. While the Boston and Colorado Company remained focused on using the Welsh technology to recover gold and silver, the continued development of Butte revealed the presence of massive copper deposits which became the focus of production as the gold and silver content of the ores there declined. As a result, Butte emerged as one of the world's greatest copper producing centres in the late 19th and early to mid-20th century. The technology brought to Black Hawk and Butte evolved dramatically in the western United States, and metallurgists from there transferred the technology elsewhere as well.

Michael Dineen O'Keeffe: Union Leader

Philip Hart
University of Waikato

O'Keeffe was an exception to the general rule that the first leaders of the Thames Miners' Union were respectable and cautious mine managers. Although also a mine manager, of very small mines, he was a notable 'character' with an 'Irish' sense of humour.

Like many other miners, in his first years in New Zealand he had attempted to be a part-time farmer as well; unlike most other people, after becoming bankrupt he repaid all his debts, even though not required to do so. As president of the union, he was a strong advocate of its members' interests. When the Arbitration ruled against the union's application for increased wages and improved conditions, his trenchant criticism of the judge offended the respectable. Despite retaining the confidence of the members, he retired soon after this conflict, and returning to managing small mines on several fields.

O'Keeffe was an example of a genuinely popular union leaders whose efforts, although largely unsuccessful, were greatly appreciated by the rank and file.

Catch 'em, hold 'em, shave 'em, shear 'em: Cornish 'practical mining' and Tasmanian tin

Nic Haygarth

It is appropriate that Tasmania's 19th and early 20th-century mining 'capital' was called Launceston, on the Tamar River, in County Cornwall, since Cornish and Devon 'practical miners' were often prized in Tasmania as mining managers and tin dressers. Under their guidance the Anchor tin mine developed, plus the Tasmania gold mine at Beaconsfield and the Zeehan-Montana silver-lead mine flourished. Yet in a colony in which German mining academy graduates such as Gustav Thureau, George Ulrich, Ferd Kayser, WH Twelvetrees and Robert Sticht were very influential, the methods and economy of Cornish miners were questioned. The Mount Bischoff tin field was a battleground between German and Cornish mining traditions. Expectations of tin lodes 'living down', as they did in Cornwall, were also disappointed. This paper examines the trials, tribulations and successes of Cornish and Devon mining managers WH Wesley, Richard Mitchell, James Hancock and William White in Tasmania.

A reinterpretation of the history of the acquisition of the Blackwater gold mine

Brian R. Hill

The story of prospectors receiving only a pittance for a mine they have found which goes on to generate great wealth evokes sympathy, and it is a not uncommon tale in mining. The historiography of the acquisition of the Blackwater gold mine in the Reefton Gold Field of the South Island of New Zealand follows a similar *leitmotiv*. The extensive literature concerning the history of this mine, which was the second biggest gold producer in New Zealand, is in agreement that the discoverers sold the mine for next to nothing to a speculator because they had no other choice; he then made a huge and unjustified profit in selling it to the biggest mining company on that gold field; and this company's vendor profit in floating a new company to operate the mine is considered so unremarkable that it is not even commented upon. However, a more critical and rigorous analysis involving the calculation of a DCF Present Value of the mine at each transaction and comparing these values with the considerations paid, leads to a reinterpretation which indicates the opposite conclusion to these generally held views.

The Cornish at Burra

R. Keith Johns

Production of copper from the Burra Burra Mines during the period 1845-1877 was of great importance to the colony of South Australia in its early history, impacting on economic development, migration, roads, railways, ports, foundries, growth of townships which served the mining and related communities, and provision of capital for investment in other enterprises. The most important aspect was the employment afforded to numerous persons of many ranks and skills, since mining, smelting and the associated transport activities were highly labour intensive.

Mining practice was translated directly from Cornwall, and Cornish miners were recruited in large numbers specifically for work at Burra, since development there coincided with the decline of the tin and copper

mines at home. This paper briefly describes discovery and acquisition of the property, the mines, the townships and our Cornish cousins, at home, at work and at play.

'Not enough to make a kettle': copper mining at Badger Head 1877-1880

Roger Kellaway
University of Tasmania

Two local prospectors discovered an apparently rich deposit of copper ore in December 1877 near Badger Head on the north coast of Tasmania. In January 1880, work was abandoned and the Tasmanian Copper Company dissolved: its only assets being some office furniture and shafts from which no copper had ever been removed. This insignificant operation gains historical importance from two factors, viz: its ability to retain the enthusiasm of investors for almost two years despite the failure to establish a producing mine and through its contribution to the historical landscape of the Asbestos Range/Narawntapu National Park.

South Australian Investment in the North Queensland Base Metal Industry

Ruth S. Kerr
Queensland Department of Natural Resources and Mines

It is not well known that the North Queensland mining magnate, John Moffat, at the peak of his wealth but in a growing economic depression in 1891, sought to attract South Australian financial investment to his recently discovered Chillagoe copper field. The dabble by the Wallaroo and Moonta Mining and Smelting Company stimulated other southern companies.

Of greater impact on the north was the role of the Stannary Hills Tramway and Tin Mines Company Limited and the John Darling company in the Stannary Hills tramway opened in 1902 to serve an extensive tin field seven miles north of Irvineban. Likewise South Australian investment fostered mining interest in Arnhem Land. This paper examines the South Australian company formation, the role of directors and determination of investment opportunities in the North.

Suicide on the Bendigo Goldfields

Sandra Kippen and James Lerk

As a leading nineteenth century mining community, Bendigo was a scene of great wealth, but not all who came to this thriving town were able to avail themselves of the opportunities it seemed to be offering. Side by side with riches, mining activity helped to create for some a life of sickness, poverty and uncertainty about the future. In doing so, it inadvertently fostered conditions in which the taking of one's own life became a viable option. This paper explores suicides on the Bendigo goldfields as recorded through coronial inquests which were often reported in detail in the newspapers of the day.

Class, hegemony and localism: the Welsh mining communities of Currawang and Frogmore

Barry McGowan

The copper mining towns of Currawang and Frogmore in southern NSW were at their hey day in the 1870s. Though nowhere near the scale of the South Australian copper towns they were regionally very significant, and Currawang for a time was the largest producer of copper in the NSW.

One of the unique aspects, at least for NSW, of both mine communities was the close relationship between management and workers. Labour disputes were all but nonexistent, and management took a close interest in the welfare and well being of the work force and the communities generally. The common thread in both instances was the over arching presence of the Deer family, who were of Welsh extraction. In the case of Currawang there was also a very large proportion of Welsh people in the mine and town.

My paper seeks to look at the relationship between mine management and town from the viewpoint of localism (the elevation of local interest above all others, for instance, class), hegemony (the cultural supremacy of the dominant class) and agency (the exertion of power by the subordinate class). I also discuss the social mores of the communities and how these appeared to change over time and reflect the changing fortunes of the mines.

Hidden copper: The early history of the Cornish, Scottish and Australian (C.S.A.) mine, Cobar NSW

Ken McQueen

The Cornish, Scottish and Australian Mine near Cobar in western NSW had an inauspicious beginning. Thomas O'Brien discovered the gossan in January 1872 and a mineral conditional purchase was taken out by George Gibb (co-discoverer of the Cobar deposit), John Connolly and Bourke businessmen Henry and Richard Nancarrow. A company was floated but despite finding rich specimens, the early miners were unable to locate a payable deposit. Other groups attempted to develop the mine but it was not until 1905 that commercial mineralisation was located by the C.S.A. Development Syndicate under the direction of George Blakemore. This was rich secondary lead ore, and its discovery sparked an exploration boom in the region. C.S.A. Mines Limited was floated in 1906 to develop this discovery. Signs of economic copper were not found until 1910 by which time the various ventures had expended more than £100,000 on exploration and development with no return to shareholders. The early miners had been beaten by the strong near surface leaching and nature of the outcropping lodes.

By 1912, development extended to four levels and good bodies of copper ore had been located east of the old workings. The nearby Cobar Tinto mine was acquired in 1913 and a copper smelter constructed. Copper production steadily increased and in 1916 the estimated resource was 200,000 tons of 5.5% copper. A dramatic rise in copper prices during World War I led to major production and construction of a second larger smelter. Output peaked in 1918 before the collapse of the copper price in 1919. Production continued until 1920 when an underground fire closed the mine. In 1961, the newly established Cobar Mines Pty Ltd decided to reopen the C.S.A. Exploration and deep drilling by Enterprise Exploration in collaboration with the Bureau of Mineral Resources and the NSW Geological Survey had confirmed deeper extension of the mined lodes and located a new copper system. Persistent near mine exploration from the 1960s through to the present has discovered further major blind ore bodies. The C.S.A. is now recognised as the largest copper deposit in the Cobar Basin, containing an estimated 1.6 mt of copper metal. Between 1965 and 1996, the C.S.A. mine contributed more than 50% of the total copper production of NSW.

"Just Now the 'Merican expert is the Prominent Man": American mining engineers and the Australian mining industry, 1880s-1910s

Jeremy Mouat
Chair of Social Sciences & Professor of History, Augustana Campus, University of Alberta, Alberta, Canada

This paper will examine the role of American mining engineers in New South Wales, Western Australia and Victoria in the late nineteenth and early twentieth centuries. Their presence in Australia was less random than that of Americans during the earlier gold rush era, for in most cases these engineers had been recruited to carry out specific duties. The paper will argue that the presence of these individuals in Australia forms part of a broader shift in the mining industry, one that saw larger mines relying to a far greater extent on professional engineers. At the same time, mining engineers began to imagine themselves as members of an epistemic community with a global reach. Most engineers were trained in similar ways, shared a common approach to geological and technological challenges, participated in national engineering societies, and read the same technical journals. The presence of American engineers in Australia was less a reflection of American dominance per se than it was an indication of the mining industry's growing internationalization.

The Federated Engine Drivers' and Firemen's Association in Broken Hill

Bill O'Neil
Former Secretary, Barrier Branch of FEDFA

The Barrier Ranges Engine Drivers and Firemen's Association was registered as a trade union in New South Wales in 1889. When Federation came, the Barrier Engine Drivers were among the founding branches of FEDFA which was formed in Melbourne in 1907, and the seven members of the inaugural executive included three Broken Hill representatives. The move to Commonwealth jurisdiction followed the Harvester case earlier that year, which had established the basic wage. FEDFA initiated a further landmark case against BHP in 1911, in which Justice Higgins upheld the right of a union to take legal action against an employer, thereby establishing an important principle of the arbitration system which dominated Australian industrial relations for the next century.

The paper will describe the role that FEDFA has played in industrial relations at Broken Hill, where two generations of the O'Neil family dominated industrial relations for decades. The timing is appropriate, because FEDFA ceased to exist in January 2006 when its last branch amalgamated with the Construction, Forestry, Mining and Energy Union.

Researching the Adelaide Assay Office – some triumphs and some pitfalls for researchers

Dr Pauline Payne
Professional Historian and Visiting Research Fellow in the School of History and Politics, University of Adelaide

In 1852, the South Australian Government passed the Bullion Act. This act provided for a Gold Escort service and an Assay Office that operated in the basement of Adelaide's Treasury Building, services designed to encourage miners on the Victorian goldfields to send gold back to Adelaide where it could be assayed and sold. Research on the work of Benjamin Babbage and Edward Davy, who worked in the Assay Office, revealed large discrepancies in figures quoted for the amount of gold processed. The answer seemed to be to check the Parliamentary records. Now, parliamentary records contain a treasure trove of information but they are not always easy to use!

While this paper will discuss the challenges facing the researcher, it will also tell the brief but colourful story of the Gold Escort and the Assay Office, and outline the details that are to be found in the Parliamentary records and other sources.

Making Moonta: the Invention of "Australia's Little Cornwall"

Philip Payton
Professor of Cornish and Australian Studies and Director, Institute of Cornish Studies, University of Exeter

This paper is about Moonta and its special place in the Cornish transnational identity. Today Moonta is a small town on South Australia's northern Yorke Peninsula. Along with the neighbouring townships of Wallaroo and Kadina, it is an agricultural and heritage tourism centre for the surrounding hinterland. In the second half of the nineteenth century, however, Moonta was the centre of a major copper mining industry. Many hundreds of Cornish miners and their families settled there, making the district arguably 'the largest Cornish community beyond Land's End'. There were plenty of other 'Cornish' settlements on the nineteenth-century mining frontier – elsewhere in Australia and overseas in places such as America and South Africa – but from the beginning Moonta cast itself as unique. As this paper seeks to demonstrate, although Moonta had much in common with these other Cornish settlements, it sought early on to distinguish itself as 'Australia's Little Cornwall', founding a myth perpetuated by later writers – popular and academic alike – that remains vibrant today.

Philip Payton obtained his first doctorate from the University of Adelaide for his thesis 'The Cornish in South Australia', and has written widely on Cornish emigration. Recent books include *The Cornish Overseas: A History of Cornwall's Great Emigration* (2nd ed. Cornwall Editions, 2005) and *A.L. Rowse and Cornwall: A Paradoxical Patriot* (University of Exeter Press, 2005).

Pictorial History of WMC

Gilbert Ralph

This brief history of the Western Mining Corporation (WMC) Group from its beginnings in the early 1930s to its demise in 2005 is illustrated with over 100 fast moving photographs and diagrams of its diverse world-wide operations and the people of vision and enterprise who led this once insignificant gold exploration company into a major Australian diversified exploration, mining and mineral processing company.

High-Tech Society

Ian Schomburgk

There is a popular misconception, on which many of us were brought up, believing that the new Province of South Australia was founded as an agricultural society. Most of us at this conference know that mining soon became important. Many know that both industries depended on a very large innovative metal working industry. In turn it provided a platform on which many new industries grew. The net result of these three industries was that within 20 years South Australia can be seen to have become the first integrated high tech society outside Europe.

If one considers the proportion of our population working directly in or directly for these industries one is fairly safe in contending that within the period say 1850-1875 it may well have been THE most highly integrated high tech society. During the following 20 years, three communications-based industries became significant - Randell's paddle steamer and the Murray Darling basin, Todd's international telegraph and education.

These early developments were enhanced by the appointment of some outstanding people to head up government departments and provision of the infrastructure. The claims and the factors underlying these developments will be examined and illustrated with particular reference to the contribution of the mining industry.

The Woolgar's Lost World: A framework of theory and method in an attempt to establish its provenance

Victor J Taylor
School of Archaeology & Anthropology, Australian National University

The remote Woolgar goldfield, first discovered in 1879 covers some 128 square kilometres along the southern edge of the Gregory Ranges, northwest Queensland. Following the 'rush' of 1880, three settlements were established along the banks of the Woolgar River. Two of these settlements became known as Middle Camp and Lower Woolgar and were the main processing centres for the goldfield. Approximately 10 km to the northeast of Lower Woolgar through some difficult country is a hilly area with alluvial workings not featured in the historical record. The area is known today as Lost World and in spite of what seems in places a clear archaeological record, its provenance is confused by conflicting oral histories. This paper is an account of the attempts to establish who worked the slopes of Lost World.

Gardening under difficulties: gardens on inland mining fields, North Queensland

Jan Wegner

As gardening could be considered the art of growing plants that don't belong, most parts of Australia can present difficulties to the gardener. However the mining fields of inland North Queensland were particularly challenging, and most residents simply didn't bother. This paper investigates the reasons why some did, and how they overcame problems such as poor or scarce water supplies, rocky soils, marauding animals, termites, extreme temperatures, and wet season humidity. They were motivated by the need for fresh food, modifying the effects of climate, aesthetics, nostalgia, class expectations and the "civilising" impulse.

A man we know and trust: Thompsons of Castlemaine

Mike Williams

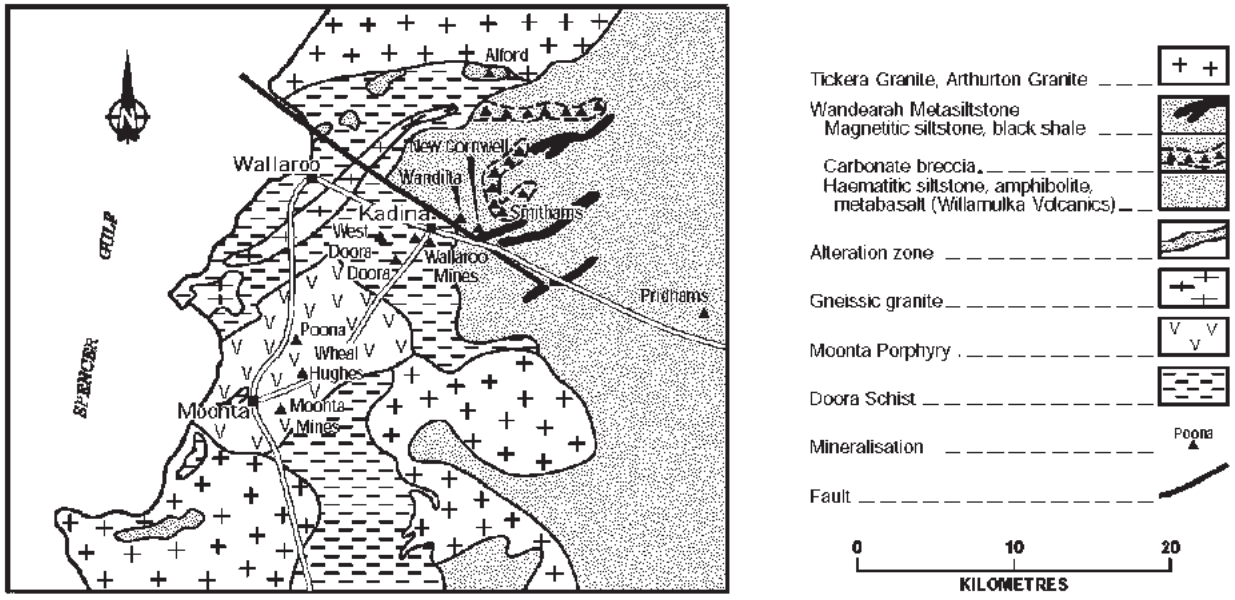
For two generations the Thompson family owned and operated the engineering company of Thompson & Co. Castlemaine in Victoria. Their Australian fortunes were founded on successful gold mining on the Mount Alexander gold field, but the family successfully pursued flour milling before engaging in engineering work until a disastrous excursion into tin dredging equipment in the 1920s terminated their involvement in the company. This paper covers the Thompson family history from first arrival in Victoria in 1851, to 1925 when their association with the company ended. It describes the development of Thompson Co.; how it evolved what were its triumphs and disasters, and how the enterprise formed the basis of the only survivor on its original site of over eighty engineering companies established on the Victorian central goldfields during the nineteenth century.

GEOLOGY OF THE MOONTA- WALLAROO MINING DISTRICT

Geological Setting

The Moonta-Wallaroo Mining District is located in the eastern part of the Archaean-Proterozoic Gawler Craton. The Moonta and Wallaroo ore deposits are hosted by the Proterozoic Moonta Porphyry and Doora Schist, respectively, both of which are concealed beneath a thin cover of younger Proterozoic, Cambrian and Cainozoic sediments. The Moonta Porphyry is a fine-grained, metamorphosed volcanic rock which has been dated at 1740 million years old (porphyritic rhyolite-rhyodacite interpreted to be either a series of ignimbrites or subaerial flows with adjacent epiclastic sediments and/or waterlain tuffs or, at least in part, subaqueous lava flows). The Doora Schist is in contact with the Moonta Porphyry in the Wallaroo field and consists of metamorphosed sedimentary rocks.

The Arthurton and Tickera Granites were emplaced following the 1850 to 1700 Ma Kimban Orogeny. These granites are equivalents of the Hiltaba Suite granites that are widespread in the Gawler Craton, and have ages in the range 1600-1585 million years old. Feldspar--quartz pegmatites are common throughout the Moonta-Wallaroo district, including within the ore zones. They represent late stage fractionation of both the Tickera and Arthurton Granites. Granite emplacement was followed by deposition of Proterozoic and Cambrian sediments.



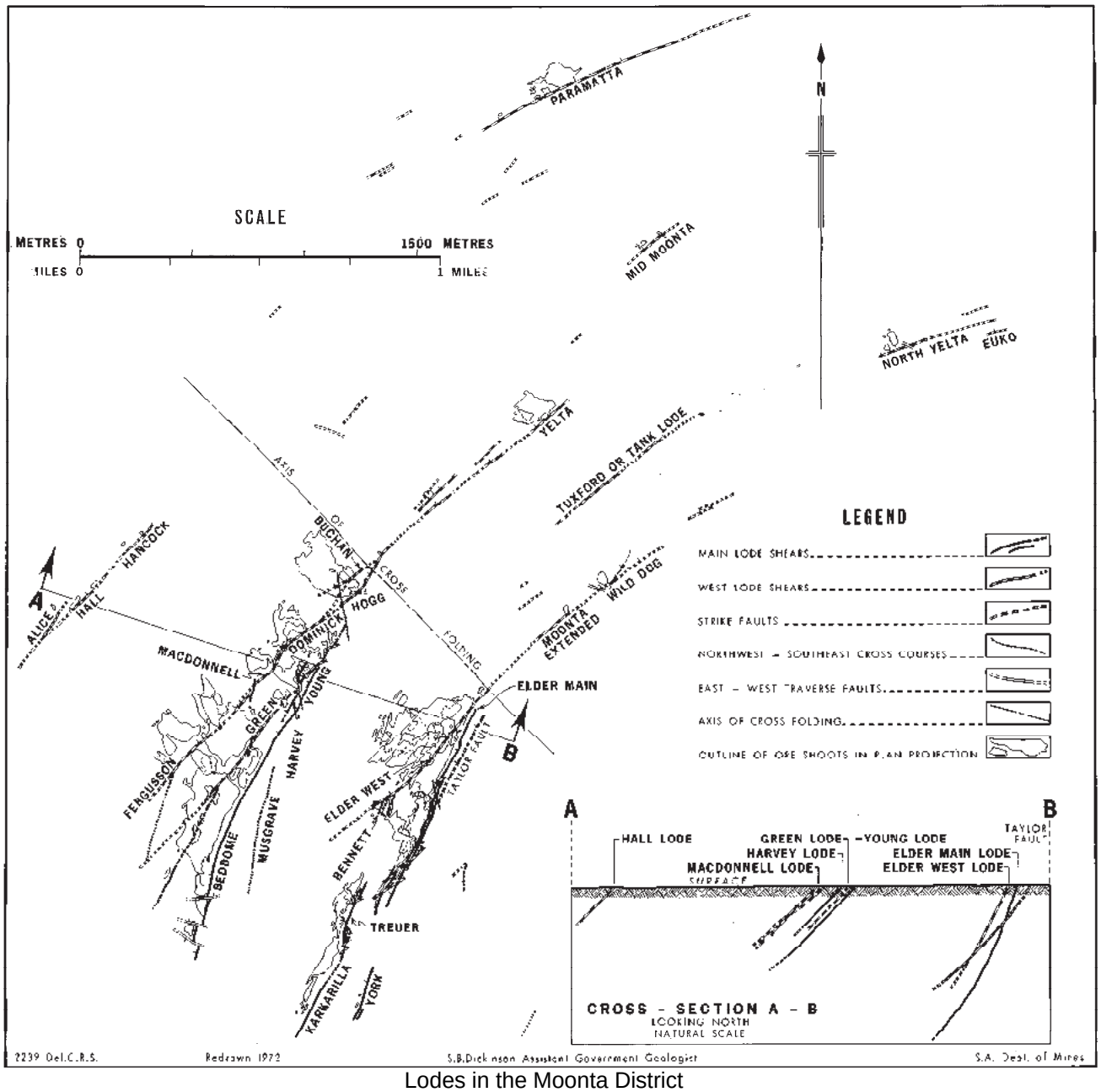
General Geology of the Moonta-Wallaroo Mining District

Ore Deposits

Moonta District

Ore bodies or lodes in the Moonta district typically have the form of tabular veins within fractures and shear zones in the Moonta Porphyry. Veins up to 10 m wide and up to 1500 m long were mined to depths of almost 700 m. The majority of the veins are located in a series of concentric arcs trending from NNE to ENE. The largest veins (e.g.Taylor or Elder) are hosted by structures known as Main Lode Shears that dip 40º to 65º NW. West Lode Shears dip approximately 60º NW, but diverge in strike by about 15º from Main Lode shears, and do not host major ore bodies, although high-grade ore shoots are located at the intersections with Main Lode Shears.

The dominant primary minerals of the Moonta ores are chalcopyrite, bornite, pyrite, hematite, magnetite, quartz, tourmaline and chlorite.



Lodes in the Moonta District

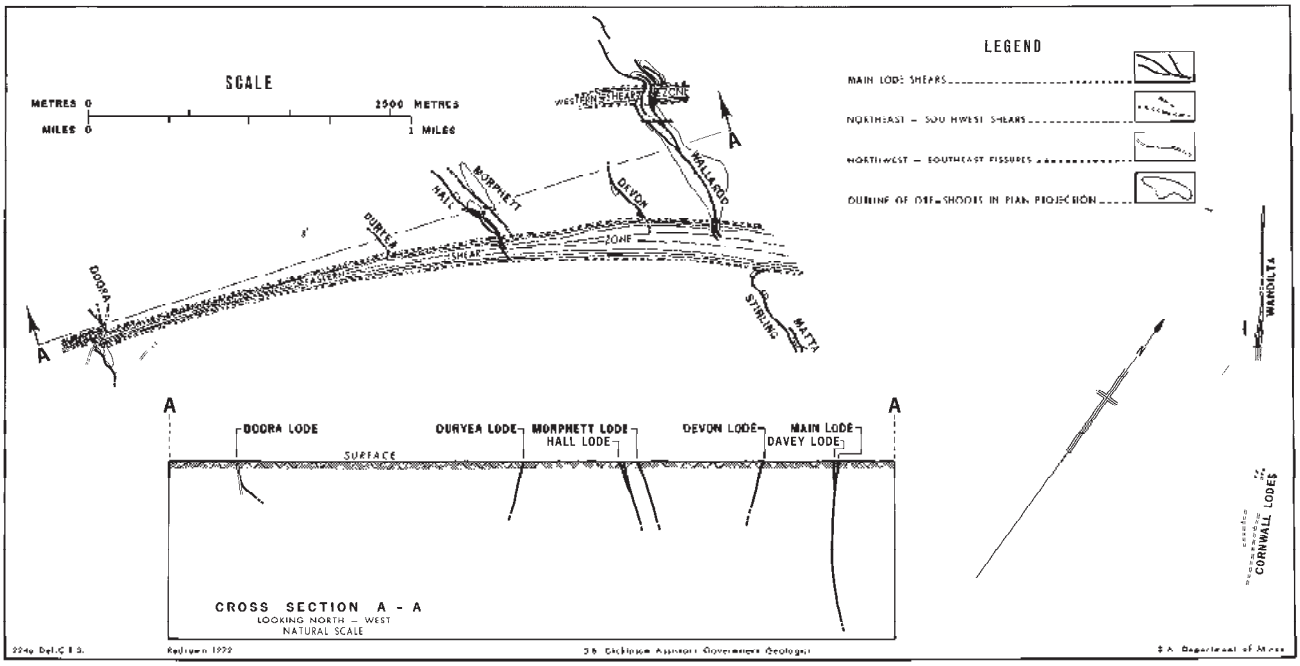
Wallaroo District

The Wallaroo ore bodies were fewer in number compared to the Moonta district and occur within the Doora Schist. Most ore bodies are located in Main Lode shears which run approximately E-W and contain large and continous ore bodies. The largest of these, the Wallaroo Main Lode, dipped steeply, varied in width from less than one metre to more than 20 m and was mined over a distance of about 1000 m and to a depth of 850 m. It contained two productive shoots - Taylors and Youngs. Two major NE-SW shears have disrupted the Main Lode shears – the Western and Eastern shear zones.

The main minerals in the Wallaroo ores were chalcopyrite, pyrite, pyrrhotite, magnetite and minor galena and sphalerite in a matrix of quartz and carbonate minerals (calcite, dolomite, siderite and rhodocrocite; bornite and hematite were much less abundant than in the Moonta ores.

Production

The total production for the Moonta-Wallaroo Mining District is estimated at 383,000 t of copper of which about 87% (335,000 t) was the combined production from the Moonta and Wallaroo mines. Of the remainder approximately 10,000 t were produced from the Hamley Mine and a combined 8,700 t from the Paramatta and Yelta mines. A total of 19,055 t were produced from the modern Wheal Hughes and Poona mines.

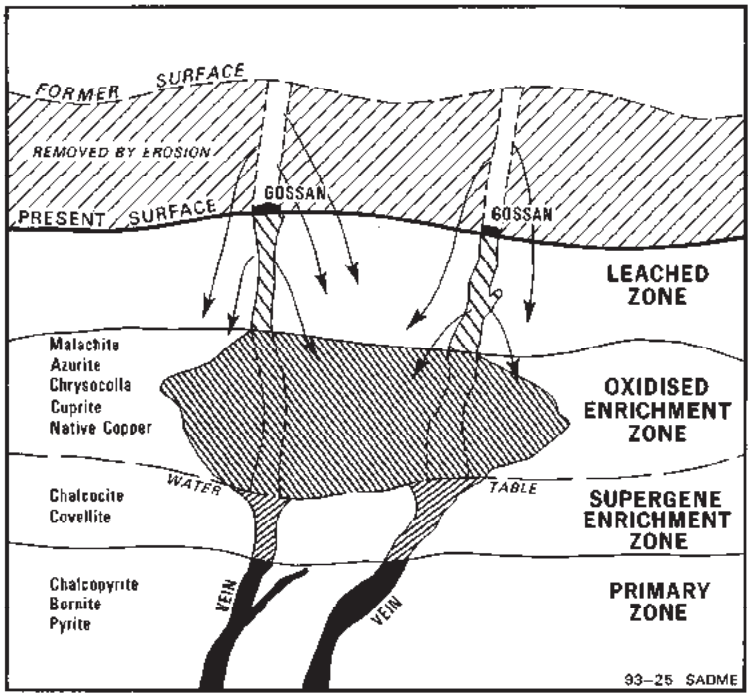


Lodes in the Wallaroo District

Weathering of the Lodes

Below the surface layers of calcrete and clay in the Moonta-Wallaroo districts, weathering of the underlying primary ore formed an oxidised and enriched zone which extended to depths of 30-50 m. In the upper portions of this zone green copper carbonates, mainly atacamite with minor malachite, extended to a depth of about 20 m. Below this, an enriched zone containing mainly cuprite and chalcocite overlay the primary sulphide ore.

The common occurrence of atacamite was very efficient used in prospecting for concealed copper lodes. Auger holes were bored to 10 m in the clay layer to detect atacamite and the existence of the lodes from which they were derived.



Typical oxidation and enrichment of copper lodes. The oxidised zone at Moonta- Wallaroo is covered up to 5 m of calcrete and clay with no surface expression of the lodes

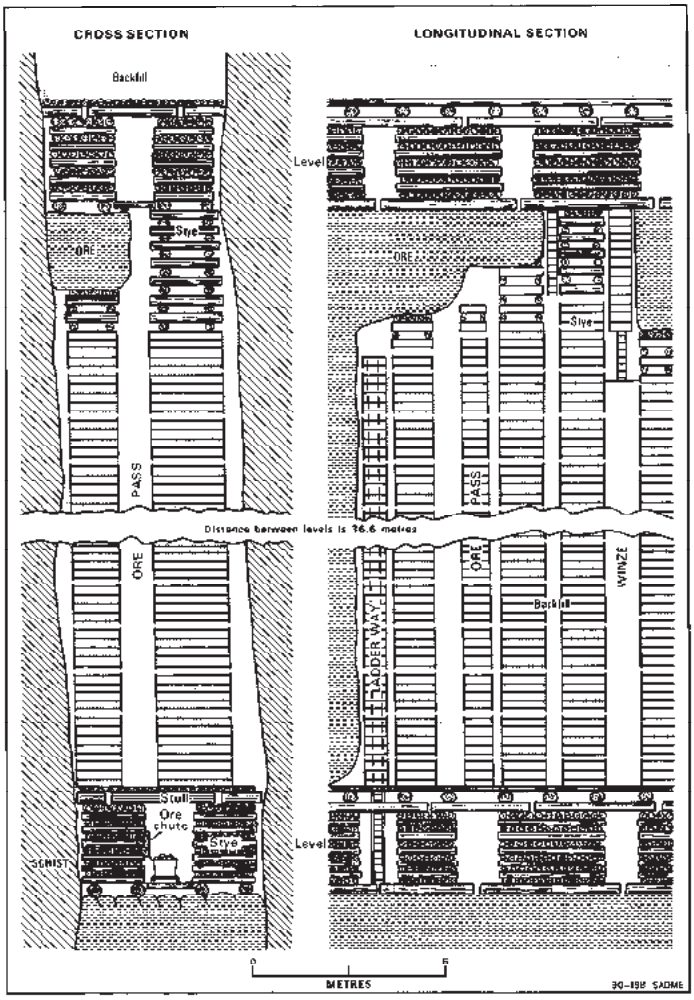
MINING METHODS

Shafts were sunk on the incline following the lodes, the deepest being Taylors Shaft, Wallaroo Mine at more than 900 m. The Cornish system was used to drive horizontal tunnels or levels at regular intervals connecting shafts. These levels were initially at intervals of 10 fathoms (1 fathom = 1.83 metres) but were increased by Captain Hancock to 15 fathoms after 1870 and later to intervals of 20 fathoms (36.6 m). Hence the lodes were explored and ore reserves proven by development of levels and connecting shafts or winzes.

In removing ore, miners worked upward from the upper part or back of one level towards the bottom of another. The resulting excavation or stope was therefore arranged so that broken ore fell to the level below and was trammed to a hauling shaft. This method of mining was known as overhand stoping. As stoping progressed, timbers were hitched into the sides of the stope, forming a platform or stull which gave a protective cover to the level and a platform for landing ore, which was passed through chutes to the level below. Basic hand-picking of ore was carried out in the stopes.

A stope was worked by taking about one metre off the roof of the stope at one end, continuing to work towards the opposite end. Where the lode was wide and the ground weak, timber pillars known as styes, were erected to support the roof. As the roof was removed, the styes were increased in height and filled with crushed rock or attle which was conveyed by attle passes to the worked-out sections of the mine.

Gunpowder was used to break the rock and was placed in shot-holes drilled by hand, using a technique known as hammer and tap in which one man held a steel borer while two others alternatively hit it with sledge hammers. After 1880, gunpowder was replaced by dynamite and, later, small rock drills worked by compressed air supplied from a central power plant were introduced. When the Wallaroo mine closed, the underground workings extended for more than 70 km.

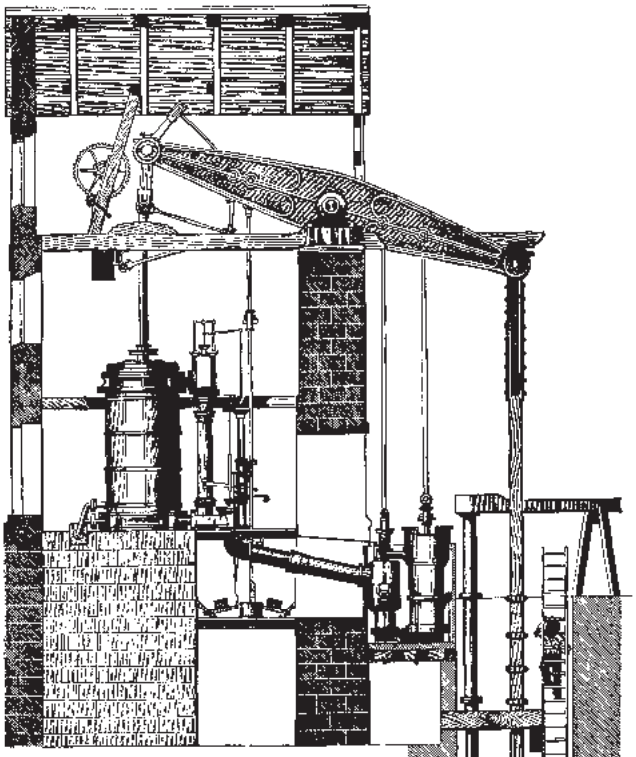


Method of working a wide stope

THE

Cornish Pumping Engine,

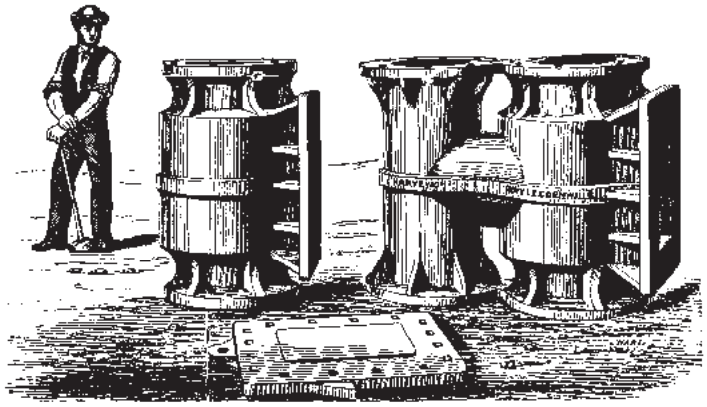
AS USED FOR DRAINING MINES.



THIS illustration shows the usual method adopted for the unwatering of deep mines. The pumps are arranged in lifts placed one above the other at distances varying from 30 to 50 fathoms or more. At the bottom is placed the drawing lift, by which the water is lifted a height of about 10 fathoms to the first plunger lift, from which point it is forced by a plunger up the rising main to the second lift, and so on, until it reaches the surface.

The accompanying Illustrations show some of the principal parts of the pump work, &c.

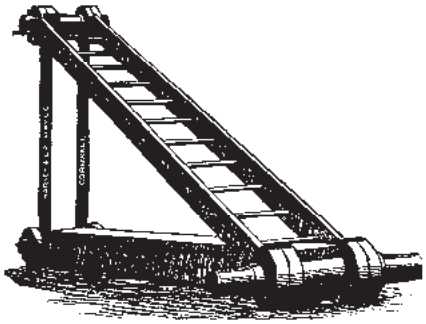
H Piece and Door Piece.



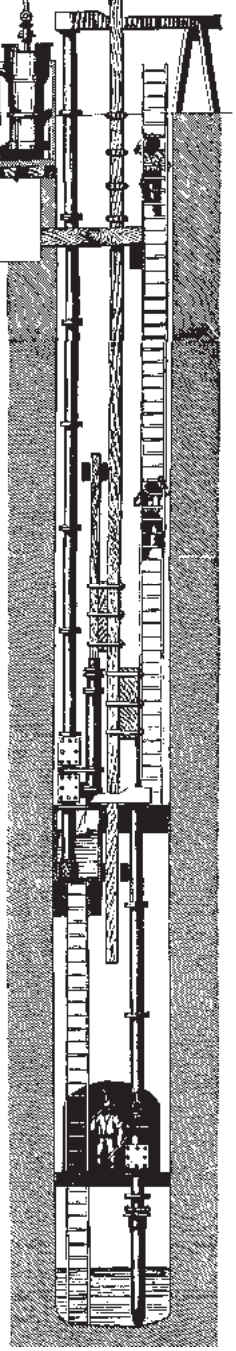
Wrought Iron Main Caps, with Saddle, Brass, and Bolts.

Outer connection from pump end of the Engine Beam to the top of the Main Connecting Rod.

V Bobs for Flat Rods and Underlay Shafts.



These V Bobs are used in places where it is necessary to change the direction or underlie of the Main Rod or Flat Rods. In sinking on metalliferous lodes, the underlie frequently changes; under such circumstances fend off, or holdback Bobs, are required to enable a new direction to be given to the Main Rod.



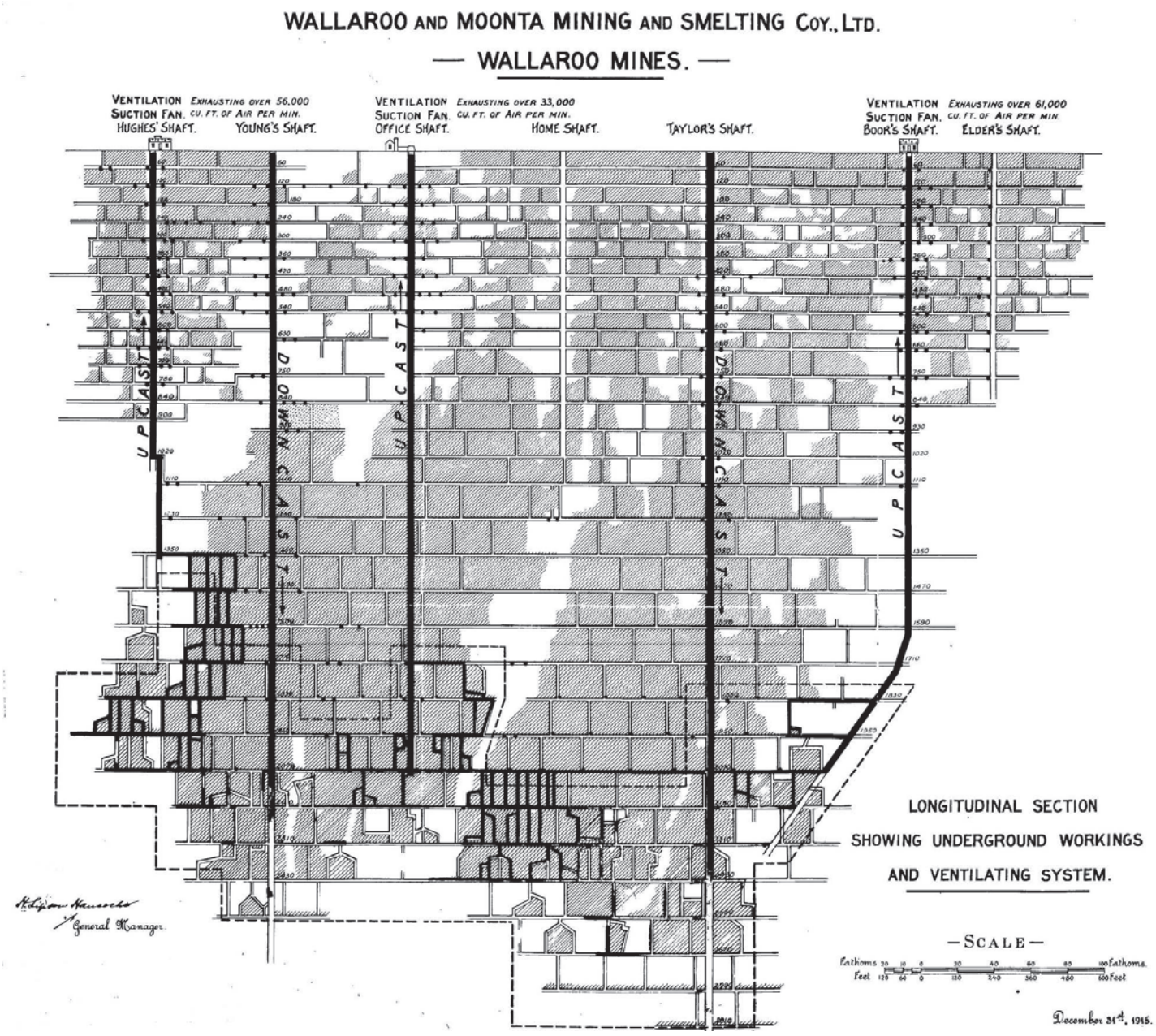
From the 1884 Catalogue of Harvey and Co.

TOURS

Wallaroo Mines Walk

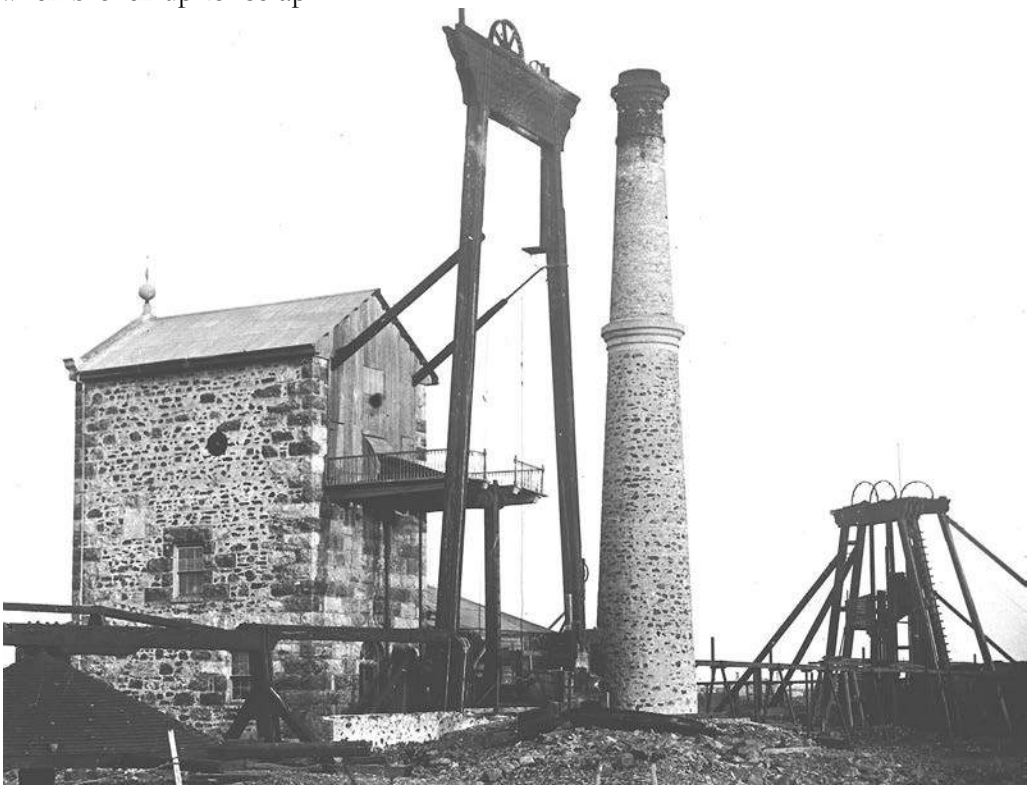
Wednesday July 5, 2.00-4.00 pm Guides: Greg Drew and Keith Bailey

This walk commences from the car park near Harveys Enginehouse at the western end of the mine and follows the main lode to Taylors Shaft. Alternatively it can start at the cairn near Home Shaft.



1. Harvey Enginehouse

Harveys 60-inch Cornish beam engine was erected at North Hughes Shaft on Milnes Lode in 1876, replacing Hughes engine at the western end of the mine. It raised about 0.5 million gallons per day with three 10-inch plunger pumps. It ceased pumping in 1906 when the mine was electrified but remained intact until 1924 when broken up for scrap.

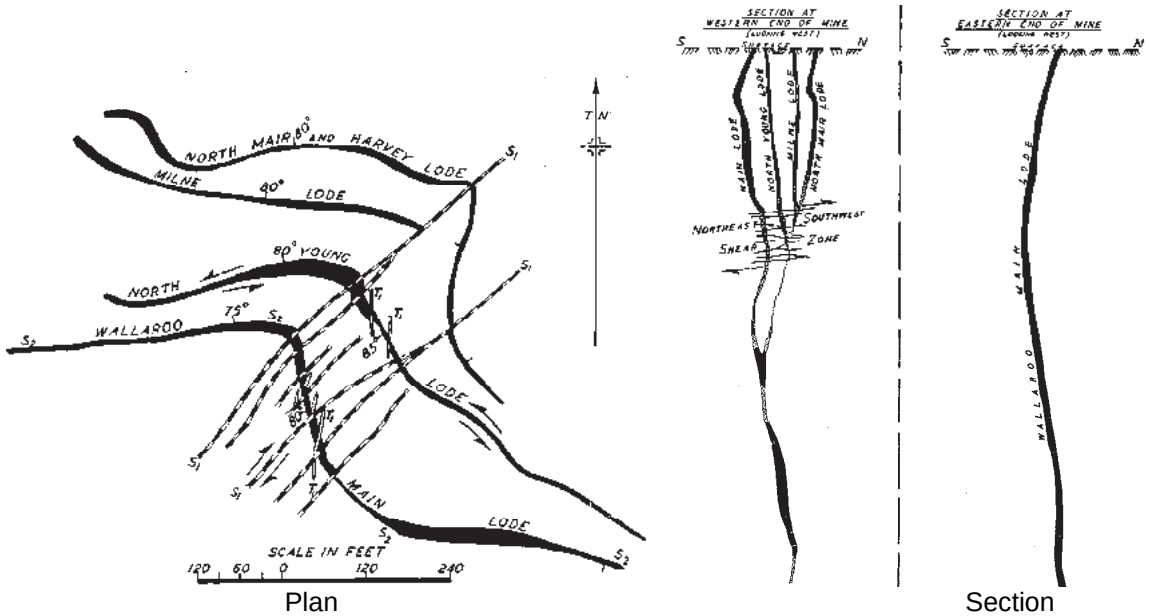


Harveys Enginehouse at North Hughes Shaft, c.1915

2. Hughes Shaft

Hughes shaft was the principal shaft for some years and, in 1867, a second hand 48-inch Cornish Bull engine was erected to dewater the western and of the mine. The engine pumped until 1876 when replaced by Harveys Engine to the north. Hughes engine operated as a man engine until 1880 when wire rope and man skips were introduced. In 1912, it was converted to an updraught ventilation shaft with an exhaust fan erected in a concrete housing.

Near Hughes Shaft the Wallaroo main lode has been offset into four lodes by a NE-SW shear zone - the Western Shear Zone. These lodes are from north to south, North Mairs, Milnes, North Youngs and Main Lode.



Plan Section

Wallaroo Mine showing Main Lode split into four lodes at western end of mine

3. Attle Crushing Plant

Erected in 1901 to crush waste rock (attle) from Office Sorting Plant which was then re-trucked to large bins at various parts of the mine to fill stoped out areas. A steam engine (replaced by an electric motor in 1906) powered an underground shaft which drove the crusher in an adjacent building.

Attle Crushing Plant with Youngs Shaft in background, 1915

4. Youngs Shaft

A major hauling shaft which reached a depth of 814 m. Youngs 30-inch Cornish winding engine was erected in 1876 and was the main winding engine until 1905 when replaced by a modern horizontal steam winder. In 1910, the engine was turned by 90° around the shaft. Youngs shaft was a downcast shaft in the mine ventilation system

5. Manager Residence and Office

Housed the underground mine survey plans.

6. Office Shaft

This was one of the principal hauling shafts reaching a depth of 631 m. It was converted to an updraught ventilation shaft in 1915 with the erection of a large capacity fan housed in a concrete structure.

7. Office Sorting Plant

Up to 1900, ore was broken by hand and sorted on ore floors at the major shaft. In 1902, a central sorting plant was erected at the centre of the mine. Large ore bins were erected at the three main shafts and ore conveyed by belt to the plant where it was crushed and sorted by hand. High-grade ore was railed to the smelter, second grade transferred to the Devon concentration plant and mullock to Harveys attle crusher.

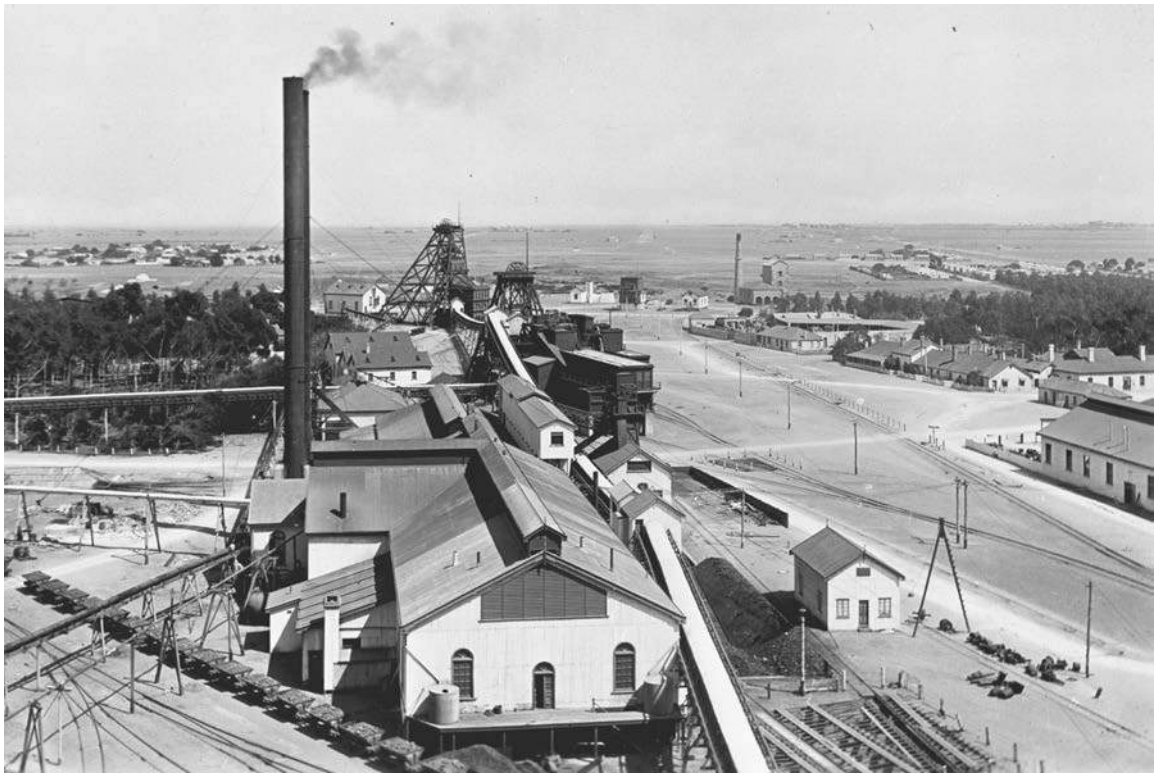
8. Powerhouse

Erected in 1904 to supply electricity and compressed air to the mine. The power plant contained turbines, generators and compressors which were mounted on large concrete blocks. The adjacent boilerhouse contained ten Babcock and Wilcox boilers connected to two large steel chimneys. An inclined conveyer belt took coal from an underground bin to an overhead crusher.

9. Taylors Shaft

This was the principal shaft on the mine and was 908 m deep. Taylors 60-inch Cornish pumping engine operated from 1863 until the fire of 1904 which destroyed the upper part of the shaft. A new shaft collar was sunk to the south to intersect the shaft at 245 m. The new collar was equipped with a modern

headframe and winding engine, and electric pumps replaced the Cornish engine. Taylors Shaft was a downcast shaft in the mine ventilation system. Near by is Taylors pool which held water pumped to the surface by Taylors Engine.



Wallaroo Mine looking west from Taylors Shaft, 1915. In the foreground is the powerhouse with Office sorting plant behind and Office and Youngs shafts

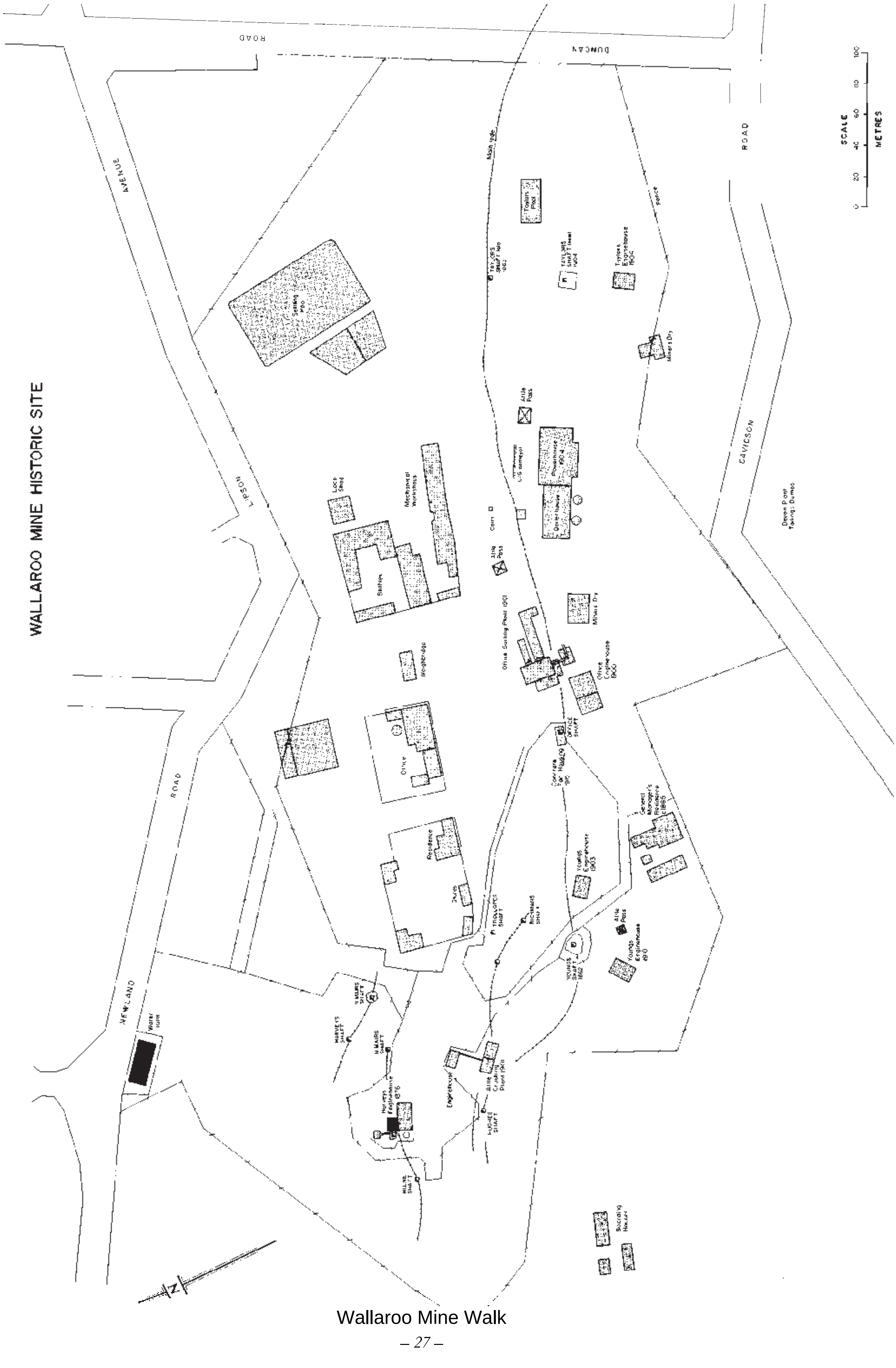
10. Company Housing

Three large houses built for the company's doctor, surface manager and last general manager.

11. Wallaroo Mines Settlement

Stirling Terrace was the hub of civic and leisure activities for the mines settlement. It was located at the main entrance to the mine and contained the Post Office, doctor's rooms and residence, Police Station and Mines Institute all erected about 1900. Other houses were occupied by mine staff.

Wallaroo Mine offices looking north to Stirling Tce, c.1910


WALLAROO MINE HISTORIC SITE
SCALE
METRES
0 20 40 60 80 100
DUNCAN
ROAD
AVENUE
LIPSON
ROAD
NEWLAND
DAVISON
ROAD
Fence
Main lode
Loco Shed
Mechanical Workshops
Stables
Weighbridge
Office
Residence
Miners Dry
Office Enginehouse 1900
OFFICE SHAFT
Youngs Enginehouse 1903
General Manager's Residence c1885
HUGHES SHAFT
MILNE SHAFT
Enginehouse
Devon Point Tailings Dumps

Farm Shed Museum

Wednesday July 5, 2.00-5.00 pm Guides: National Trust

This museum was established by the local National Trust in 1966 and is located at the rear of the Kadina Visitor Centre. It includes:

- **Matta Matta House** which was erected in 1863 for the manager of the adjacent Matta Matta Mine has be furnished in the style of the late 1800s
- Other buildings contain a range of displays including The Kadina Story, Life on the Farm, The Printworks and Farm Displays
- **Matta Matta Mine Site**
  Near the northern boundary of the museum is the main shaft of the Matta Matta Mne. A 60-inch Cornish beam pumping engine was erected at this shaft in 1864. Operation ceased in 1967 after the shaft reached a depth of 73m. The remains of the enginehouse including the engine bedstones and balance-weight pit can be seen.

Wallaroo (see *Discovering Historic Wallaroo)*

Thursday July 6, 3.30-5.30 pm

Wallaroo Heritage and Nautical Museum Guide: Colin Boase

Located in Wallaroo's first Post Office (1865), this museum provides an insight into the early history of Wallaroo. It houses extensive displays of the copper smelting era, maritime, transport and communications history.

Wallaroo Smelting Works Guides: Greg Drew and Peter Bell

Smelting operations were carried out on this site continuously from 1861 until 1923 and it was for a time the largest smelting works in the world outside Swansea, Wales. The site has two levels – the furnaces were erected on the lower level and an upper level allowed the loading of processed ore into the tops of furnaces. This walk along the lower level will outline the history and development of the smelting operations which can be dived into three main phases. Little remains of the early phase of Welsh smelting in reverberatory furnaces but remains of the second and third phases can be examined at the northern end of the site.

Moonta Cemetery

Friday July 7, 4.00-5.00 pm Guide: National Trust

This walk highlights the hardships of life during the early years of settlement in the Moonta district. The Cemetery Trust was formed in 1866 and more than 300 children and many pioneer settlers including Sarah Hancock, wife of Moonta Mines superintendent Captain H.R. Hancock, have graves in the heritage listed section. Other graves of interest include the allegedly poisoned husband of Elizabeth Woolcock, the only woman hanged in Adelaide Gaol, and John Verran, a former Labor premier.

Wheal Hughes Tourist Mine

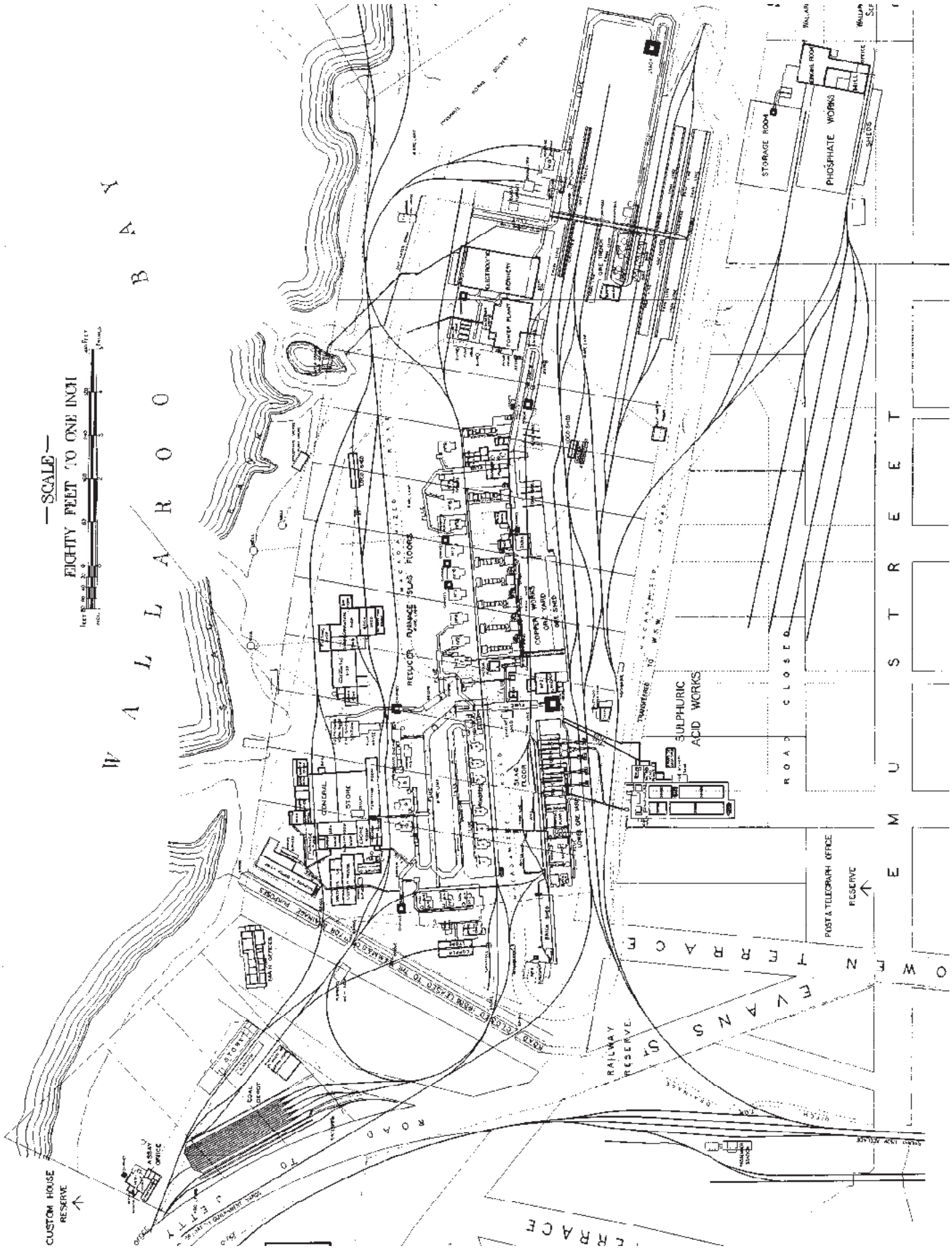
Friday July 7, 4.00-6.00 pm Guides: Alwyn and Enid Johns

Wheal Hughes was worked on a small scale in the late 1860s. An extension of the orebody was worked by an open cut and underground section between 1990 and 1994. The mine was acquired by the District Council of the Copper Coast and opened as a tourist mine in 1997. The tour decends 65 m down to the bottom of the opeb cut and then a further 55 m underground via a circular tunnel.

Moonta Walk (see *Discovering Historic Moonta)*

Saturday July 8, 8.30-10.00 am Guide: Barbara Schilling

The Moonta *Up Street* Walk commences from the Rotunda in Queens Square in the centre of Moonta and gives an insight into the history and development of Moonta. It includes Moonta Uniting Church (1873), Moonta School of Mines (1866), All Saints Anglican Church (1873), Masonic Lodge (1875), Post Office (1866), and historic buildings in the main commercial area of George Street.



Plan of the Wallaroo Smelting Works, 1906

Moonta Mines

Sunday July 9, 9.00-12.00 noon Guides: National Trust

A. Moonta Mines School

The school was constructed in 1877 on the mining company's lease. It commenced with 800 pupils and operated as a school until closure in 1968. It is now owned by the National Trust and houses a museum which interprets the social and industrial history of the mines area. The Moonta Public School just one kilometre to the west also commenced in 1878.

B. Precipitation Works

The Tourist Railway adjacent to the Moonta Mines Museum conveys visitors to the Precipitation Works via a tunnel in Ryans Tailings Heap. The works were erected in 1901 as part of the process to extract copper from tailings heaps. A mixture of sea water and a little sulphuric acid was allowed to percolate through the tailings into channels which flowed to the precipitation works. Remains of the channels, precipitation tanks, wash and dry house will be viewed from the railway.

C. Miner's Cottage

This typical early miner's cottage was built about 1870 by Mr Wood who operated a small brickworks nearby. The cottage is now a National Trust museum and depicts the typical home of a Cornish miner.

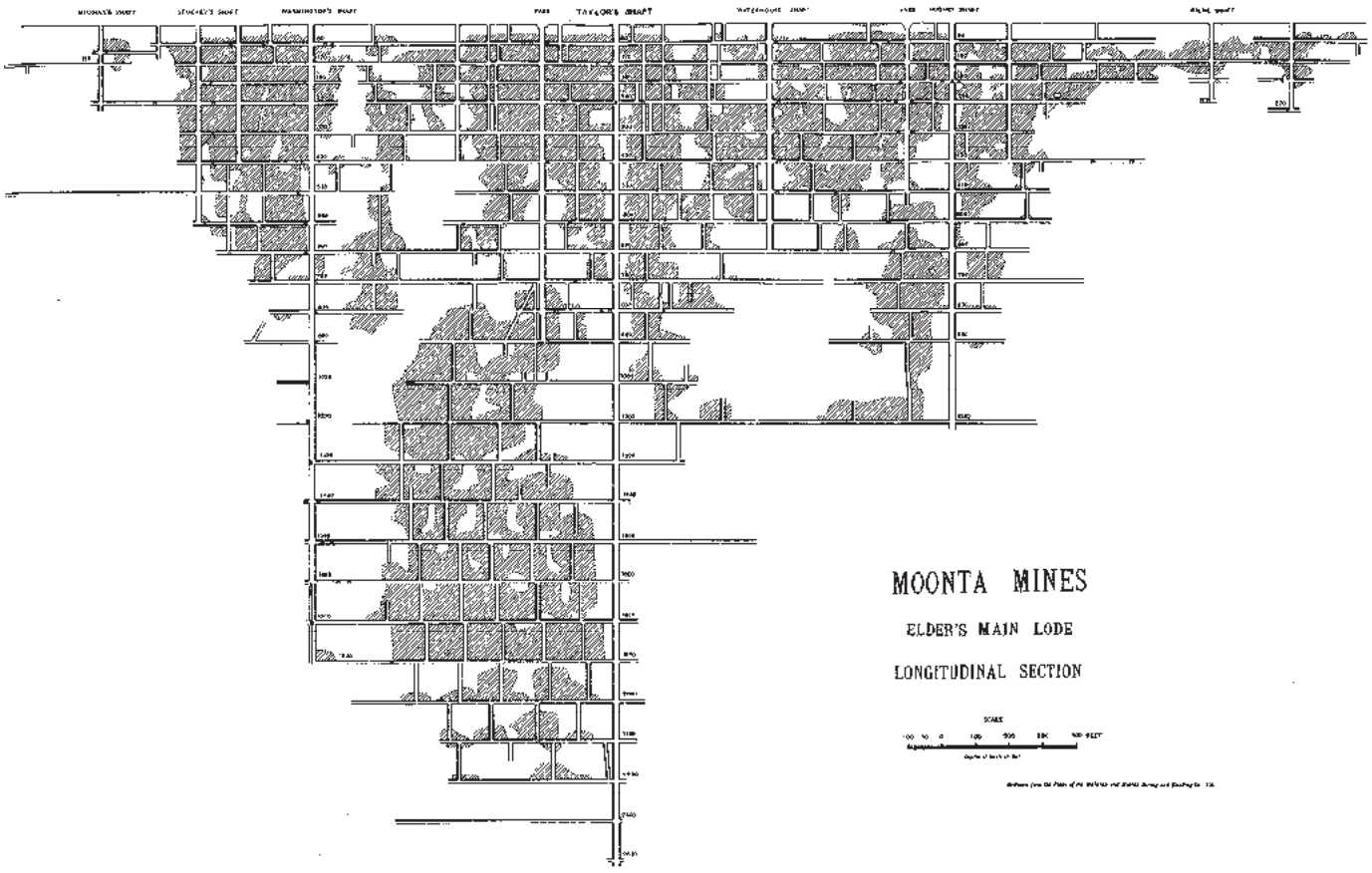
D. Moonta Mines Methodist Church

Erected by the Wesleyan Methodists in 1865 with a gallery added in 1872 to give a seating capacity of 1250. The adjacent hall housed a Sunday School. The Primitive Methodists and Bible Christians erected churches nearby in 1865 but these have been demolished.

Elders Line of Lode

Sunday July 9, 2.00-4.00 pm Guide: Greg Drew

Elders Lode was the most persistent at Moonta, worked for a length of about 1000 m and extending to a depth of more than 700 m.



1. Richmans Enginehouse and Tailings Dump

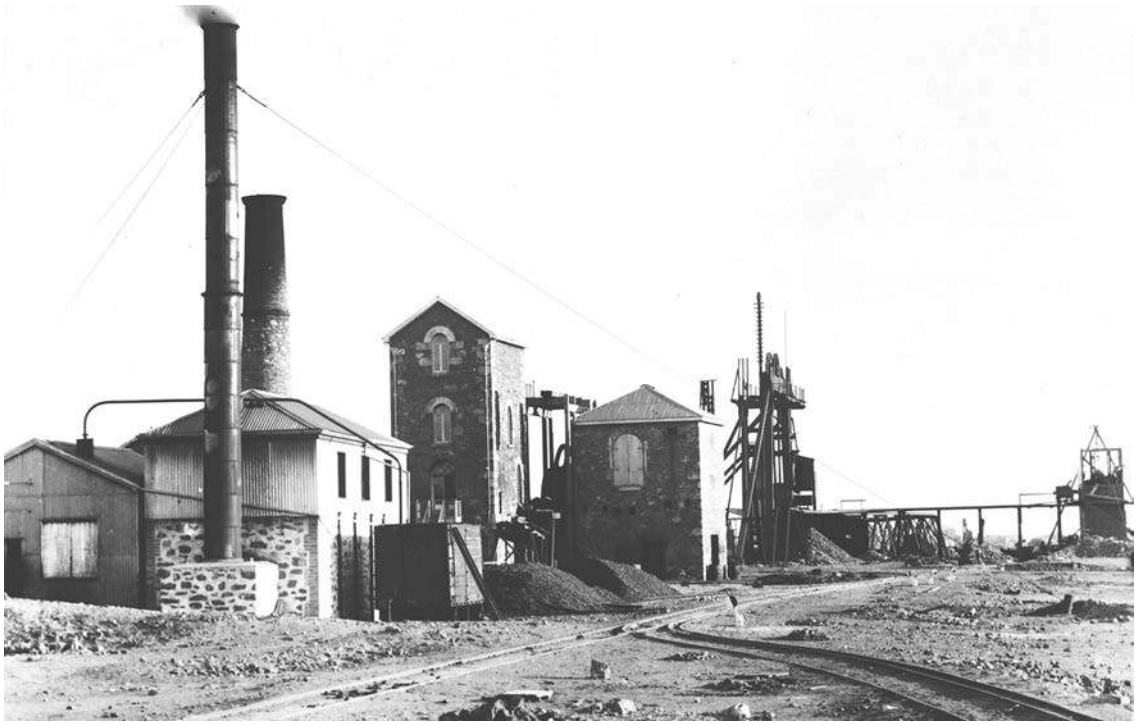
Richmans 32 inch Cornish beam rotative engine was erected in 1860 to power crushing and concentrating machinery for treatment of low-grade ore. The coarse tailings were placed on the adjacent tailings heap. Buddles were added in 1875 to concentrate the fines from the process and the resultant slimes placed on large flat areas to the north and west.

2. Warmingtons Shaft

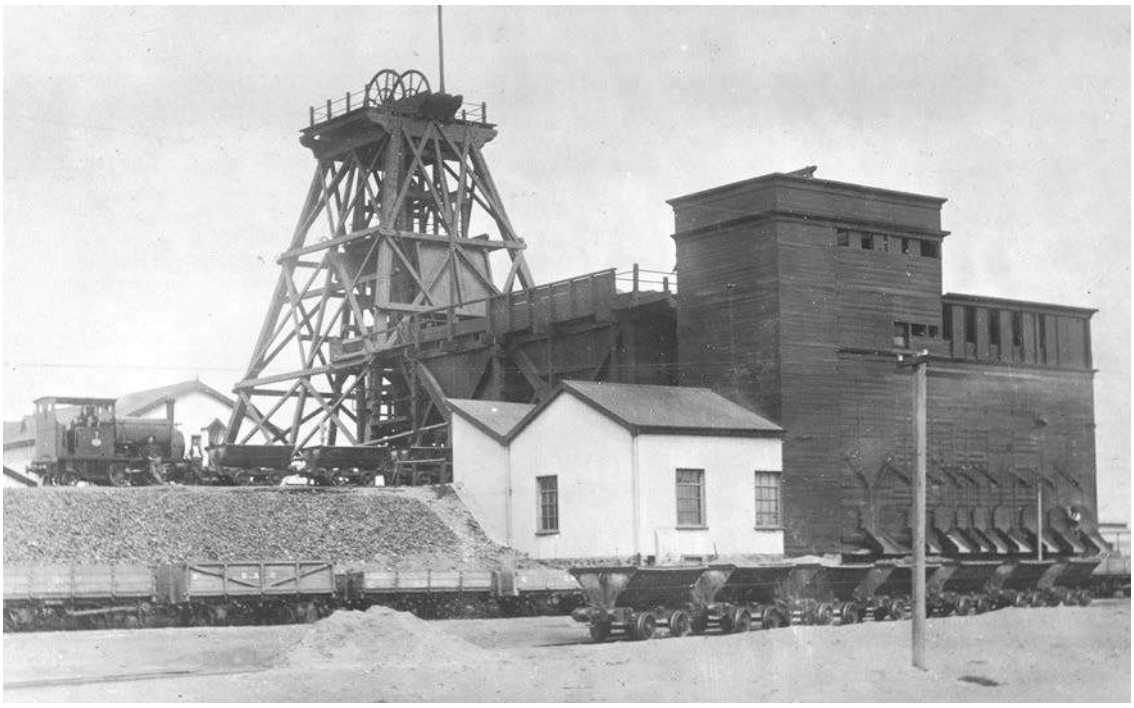
This was one of the principal shafts from 1862 until 1900 reaching a depth of 585 m. Ore was hauled by Prankards Cornish Winding Engine from 1867 until 1901 when replaced by Taylors Horizontal Engine.

3. Prankerds Enginehouse

Prankherds 22 inch-Cornish beam winding engine was erected in 1867 to haul from Taylors, Taylors North and Stirlings shafts, and power crushing and concentrating equipment. After 1874, it was used mainly for hauling, and operated until 1901.



Prankerds Enginehouse c.1900



Taylors Shaft and sorting plant, c.1915

4. Taylors Shaft and Enginehouse

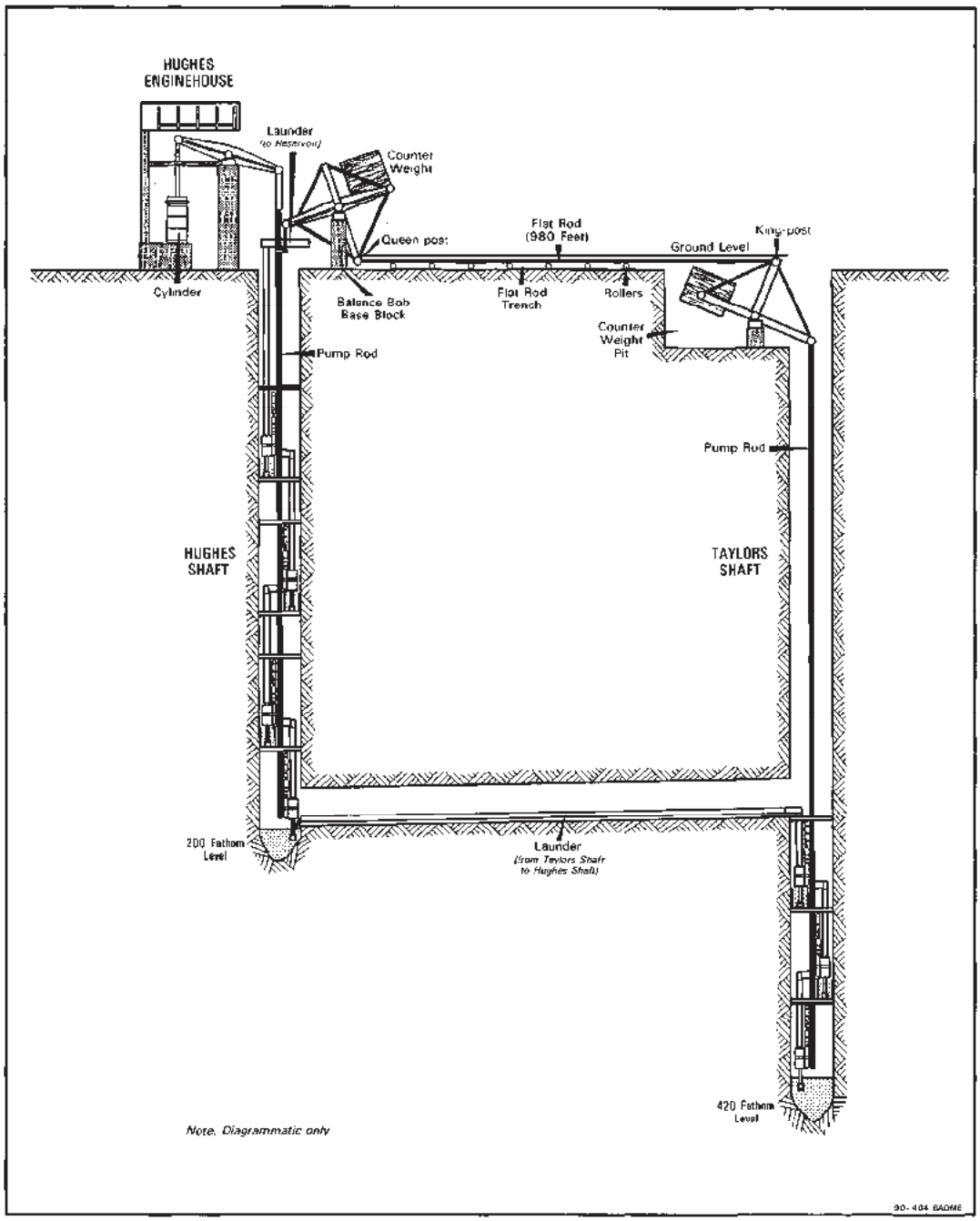
Taylors Shaft was the principal shaft on Elders Lode reaching a depth of 768 m. Hauling was originally undertaken by Prankerds Engine which was replaced in 1901 by Taylors horizontal winding engine. In 1868, pumps in Taylors Shaft were connected by flat rods to Hughes Engine 300 m to the south. Hughes Engine continued to operate those pumps until the mine closed in 1923.

5. Flatrod Channel

Flat rods, which ran from Hughes Engine to operate pumps in Taylors Shaft, were located just below the ground on rollers in this open channel.

6. Hughes Shaft

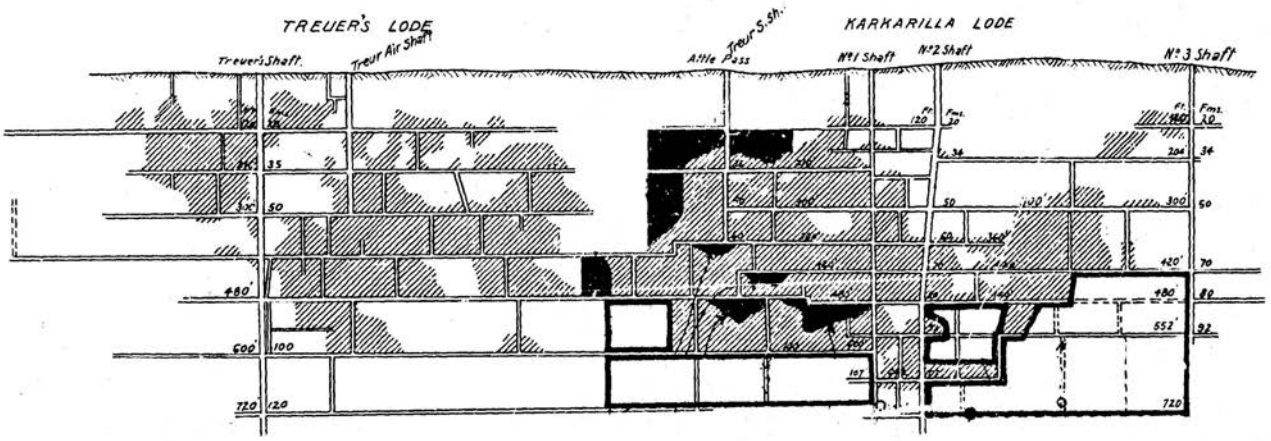
Hughes 60-inch Cornish pumping engine was erected in 1865 at Hughes Shaft, the principal pump shaft on Elders Lode. The shaft was sunk vertically to 128 m where it intersected Elders Lode which it followed on the underlay to the 365 m level. Flat rods connected to balance bob operated pumps in Taylors Shaft. In the vicinity are the remains of Elders Winding house (1863), Hughes engine pool, mine stables and the1930s Moonta Mining Scheme concentration plant. The shaft collar was reconstructed in 1992 using precast concrete panels and bearers to allow stabilisation and conservation of the condenser pit and balance bob supports.



Hughes Enginehouse pumping arrangement

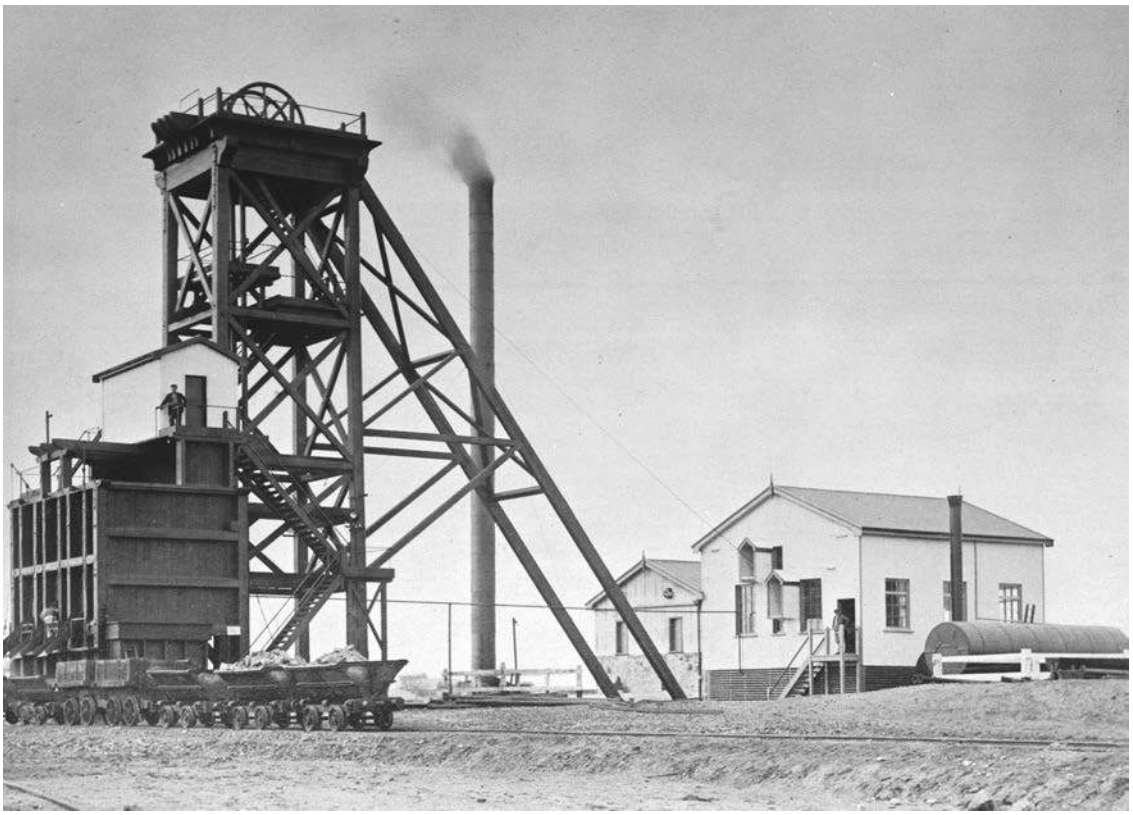
Treuers Lode

Treuers Lode is located about 100 m west of Elders Lode. It was worked principally after 1900 in conjunction with the Karkarilla Lode of the Hamley Mine to a depth of 180 m.

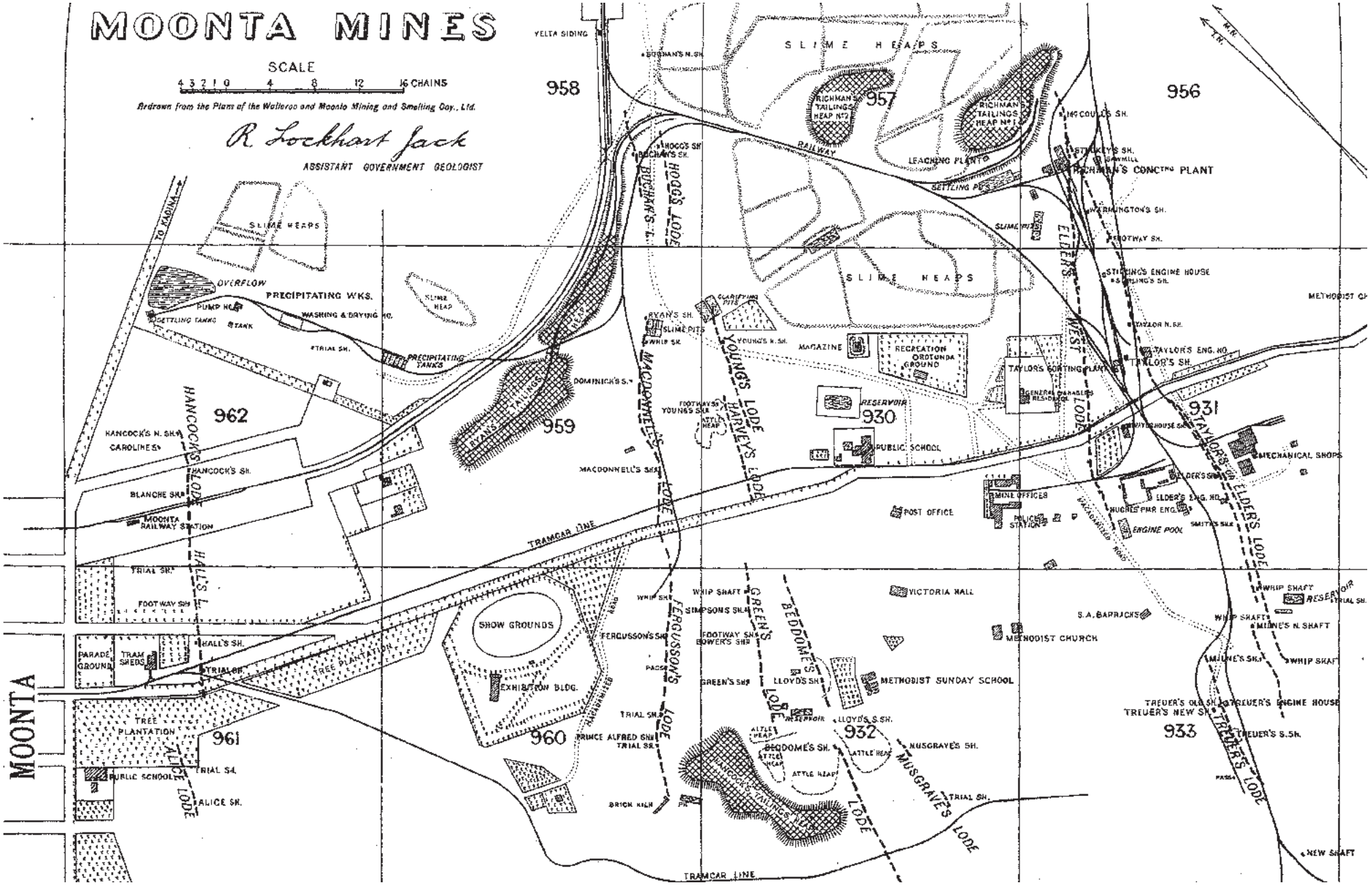


7. Treuers Shaft

Treuers Shaft was the main shaft on Treuers Lode which was worked over a length of 400m and to a depth of 220 m. It was a major producing area after 1900. A new headframe and horizontal winding engine were erected in 1906.



Treuers Shaft and enginehouse, c.1907



Location of sites on Moonta tours

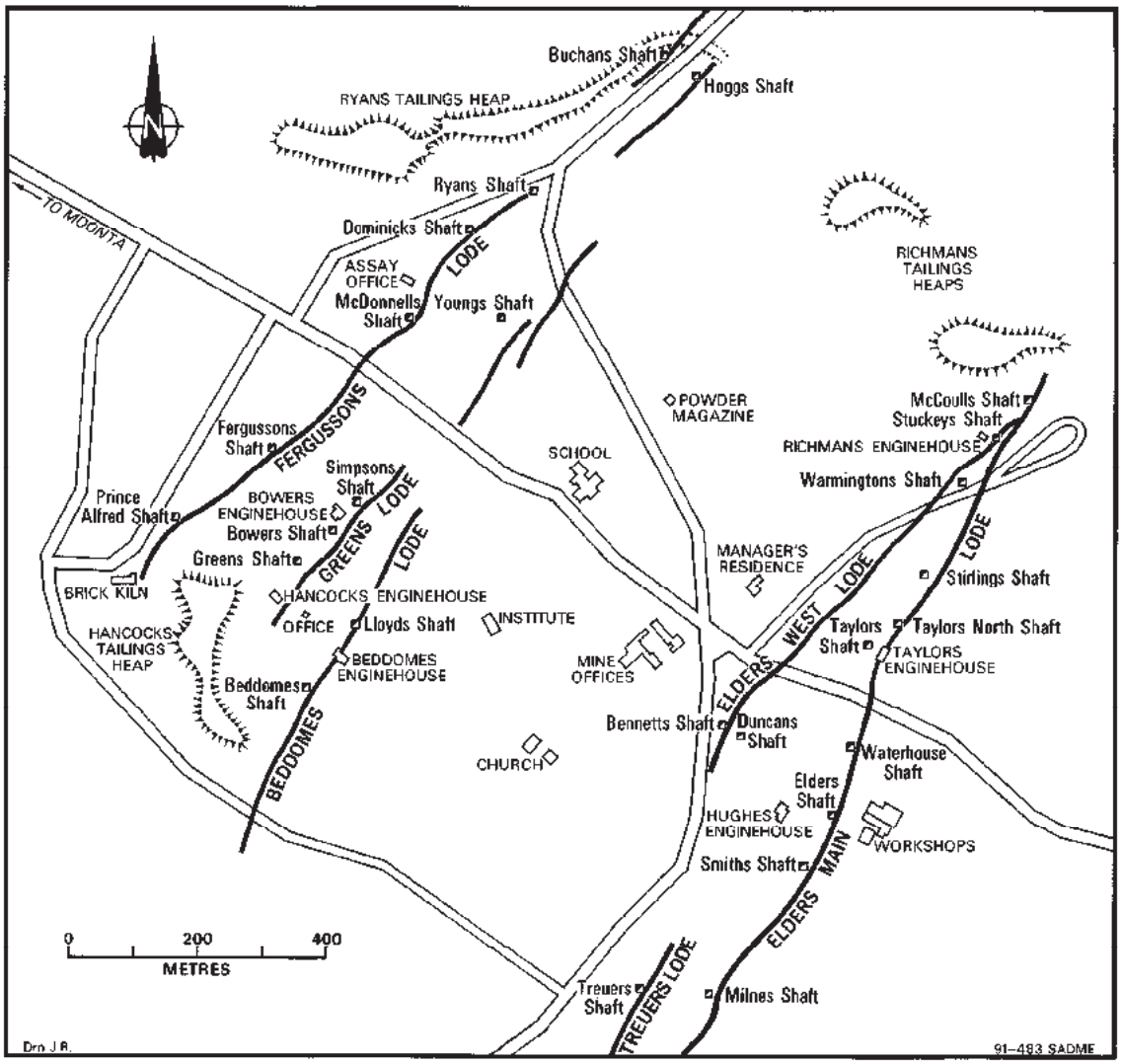
POST CONFERENCE TOUR

Monday July 10, 9.00- 4.00 pm Guide: Greg Drew

Moonta Mine

Central Belt of Fracturing

The lodes of the central belt were largely worked out by 1900 and included McDonnells (Fergussons), Greens and Beddomes lodes.



Major ore lodes, Moonta Mines

8. Ryans Tailings Heap

This dump contains tailings from Ryans concentration plant which operated from 1864 until 1906

McDonnells Lode was worked to a depth of 340 m over a length of 800 m.

9. Ryans Shaft

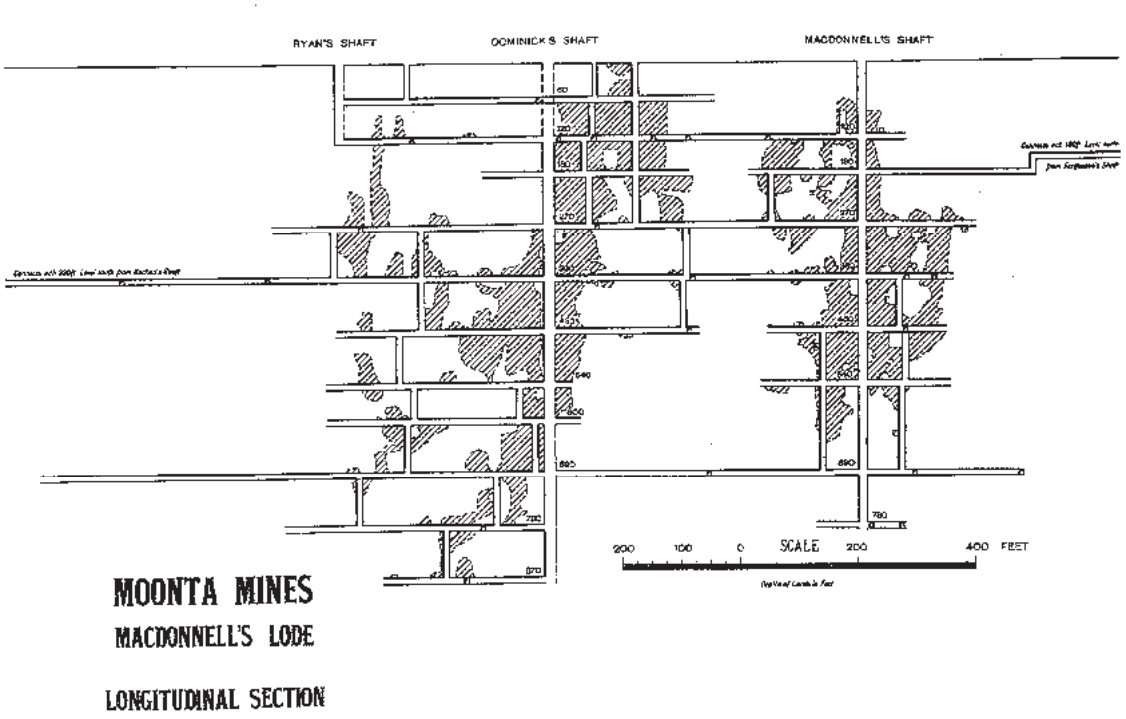
Ryans Shaft which marks the northern end of McDonnells Lode, commenced in 1861 on the site where Patrick Ryan first discovered copper ore. Ryans Enginehouse was erected nearby in 1865 and worked until 1906. It contained a 32-inch horizontal engine which powered pumps and a crushing and concentrating plant.

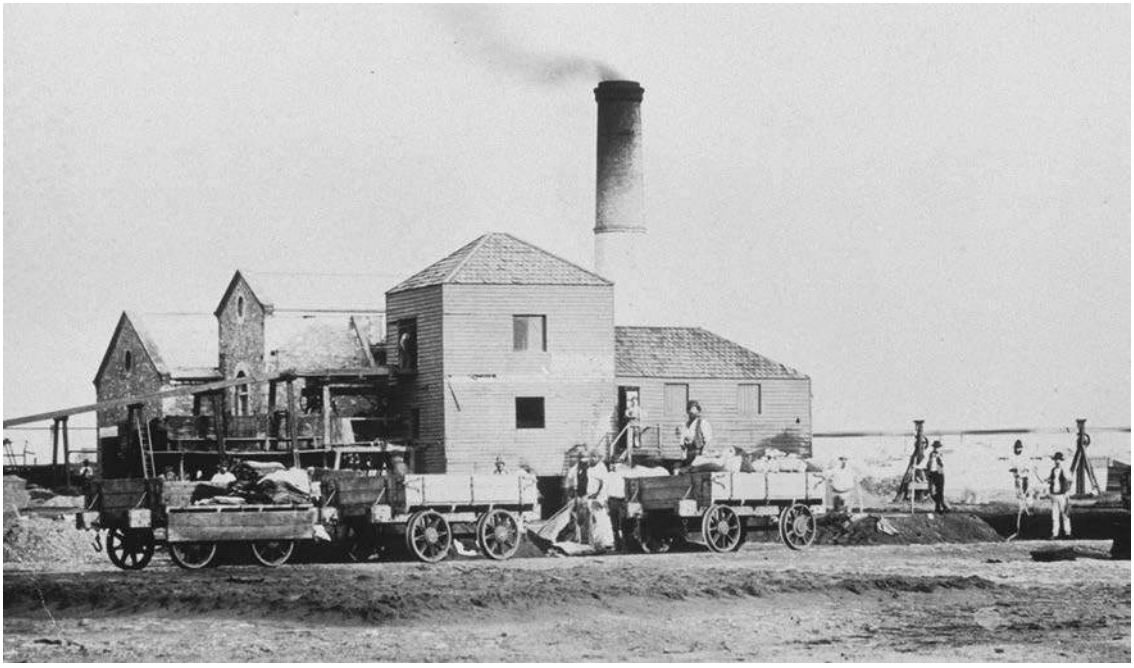
10. Dominicks Shaft

Ryans Engine operated Cornish pumps in Dominicks Shaft which was 265 m deep

11. McDonnells Shaft

This shaft marks the southern end of McDonnells Lode and was connected to Fergussons Lode to the south at the 55 m level.





Ryans Enginehouse and processing plant, c.1880

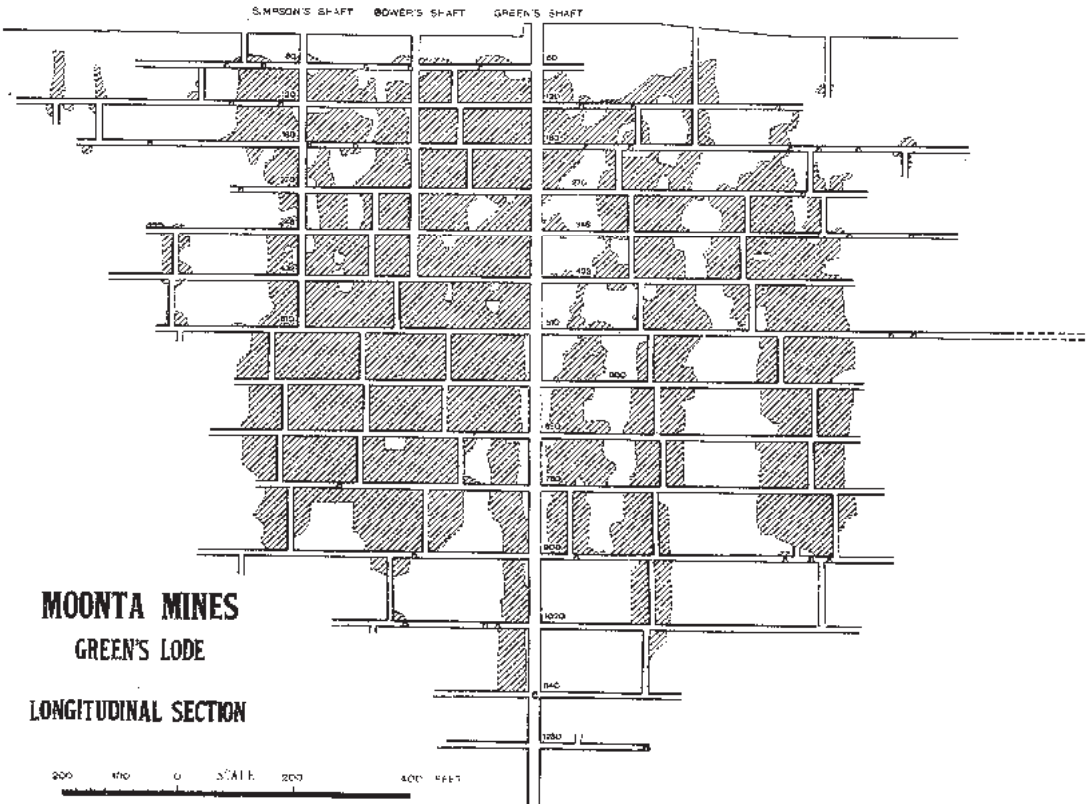
12. Hancocks Tailings Heap

This dump contained the waste from Hancocks concentration plant which operated from 1874 until 1900. The dump was leached after 1901 as part of the Cementation Process. Pipelines which conveyed the copper solution to the Precipitation Works can be seen in the vicinity. Nearby is Prince Alfred Shaft on the southern end of **Fergussons Lode**.

13. Fergussons Shaft

Fergussons Shaft marks the northern end of Fergussons Lode and was 373 m deep. Nearby are extensive ore floors with rail beds

Greens Lode was worked over a length of about 500 m.



Moonta Mine looking south to Greens Lode from near Fergussons Shaft, c.1900. From left are Bowers Enginehouse, Greens Shaft and Hancocks Enginehouse and processing plant.

14. Bowers Shaft

Nearby was Bowers Enginehouse which hauled and pumped from several shafts in the area. It was erected in 1866 and housed an 18-inch beam engine which was replaced by a 22 inch horizontal engine in 1877

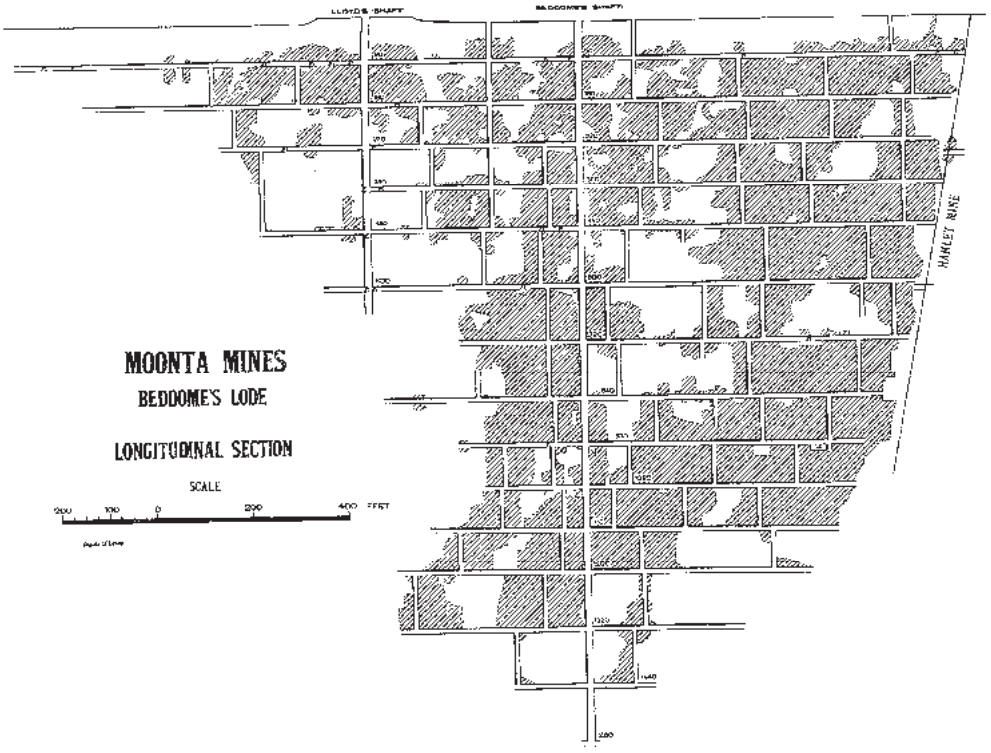
15. Greens Shaft

This shaft was the principal shaft on Greens Lode and was 375 m deep

16. Hancocks Enginehouse

Hancocks 35-inch Cornish beam rotative engine was erected in 1874 to increase the mine's crushing and concentrating capacity. The plant comprised the tall enginehouse and adjacent stone crusherhouse and timber jiggerhouse. Hancocks Engine also powered pumps by flatrods in Greens, Prince Alfred and Beddomes Shafts. The complex was demolished in 1904 but foundations and mounting bolts survive.

Beddomes Lode was worked to a depth of 440 m and extended into the Hamley Mine property to the south.



17. Lloyds South Shaft

Lloyds South Shaft near the centre of Beddomes Lode was worked to 183 m. Nearby was Beddomes Engine which was erected in 1875 to haul from Beddomes and Lloyds Shafts.

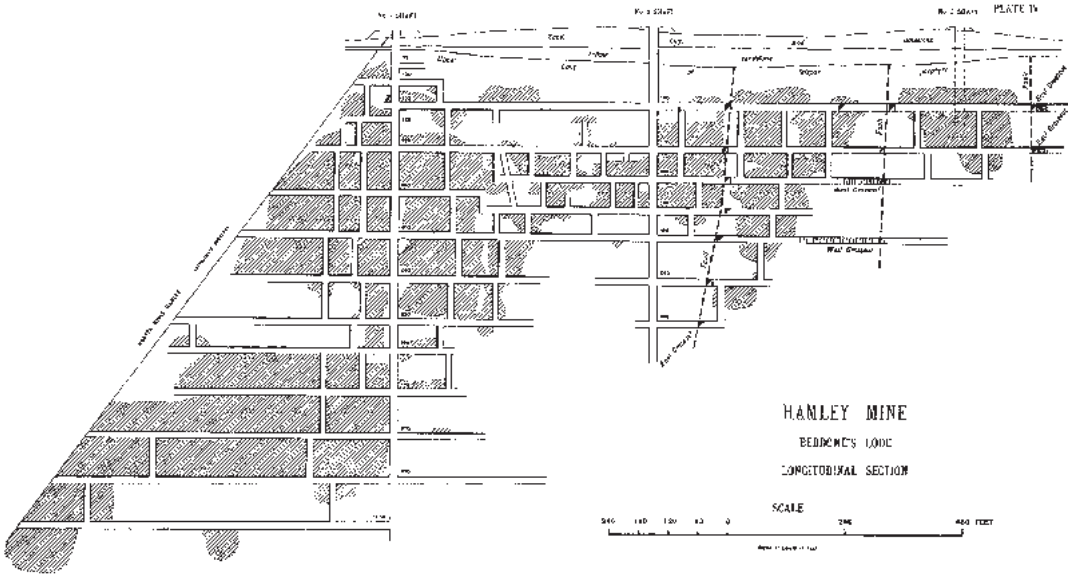
18. Beddomes Shaft

Beddomes Shaft was the principal shaft on Beddomes Lode at a depth of 476 m.

19. Hamley Mine (Karkarilla)

Ore was discovered in 1861 on leases south of the Moonta Mine. Operations commenced in 1862 on an extension of Treuers Lode and the mine named Karkarilla. In 1868, the company was reformed as the Hamley Mining Co. and worked an extension of Beddomes Lode.

A 24-inch horizontal engine was erected in 1874 to power winding, crushing and concentrating machinery. At peak production in the mid 1870s up to 200 men and boys were employed but the mine closed in 1888. It was reworked by tributors in the early 1900s and sold to the WMMS Co. in 1916. Total production is estimated of 10,000 t of copper

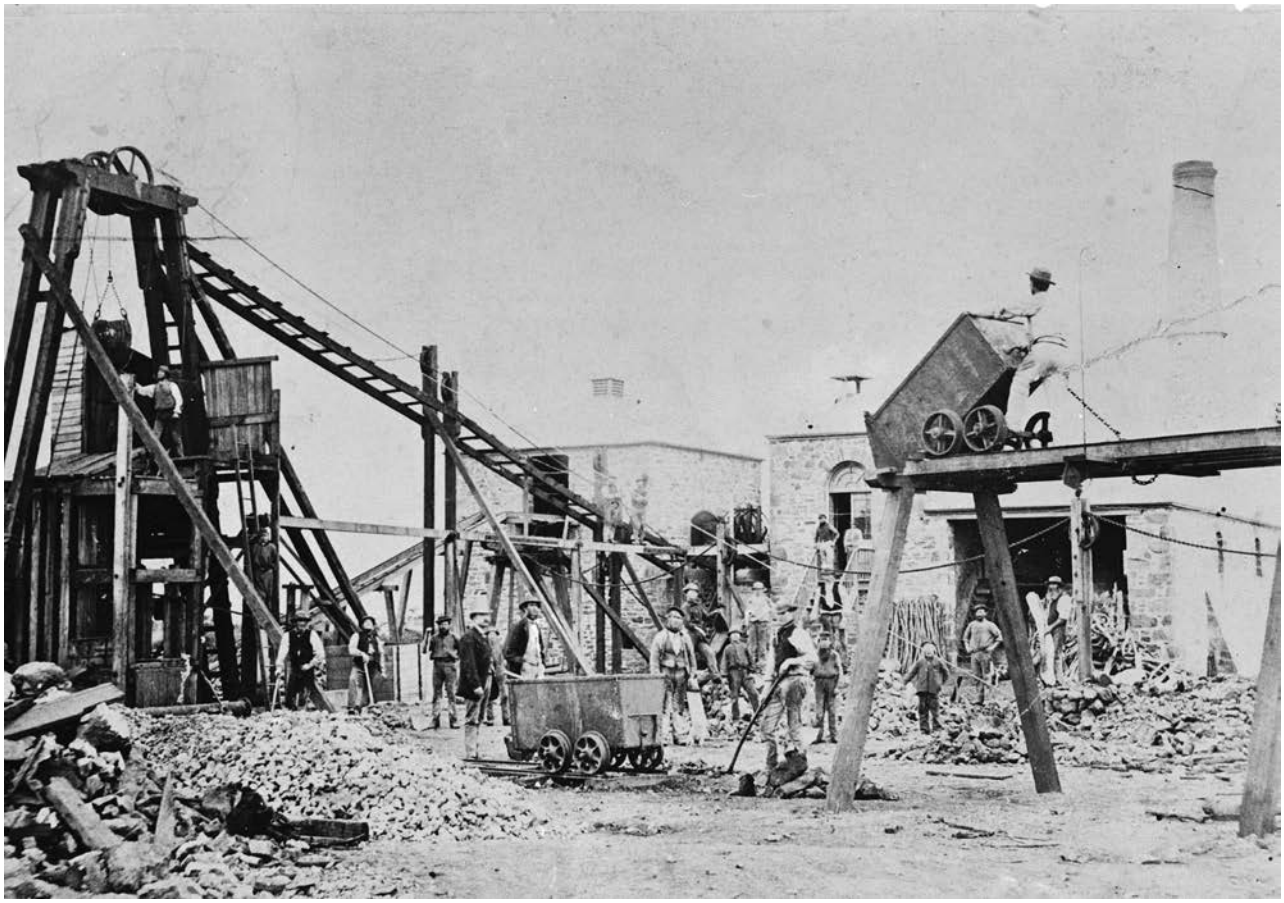


Yelta Mine

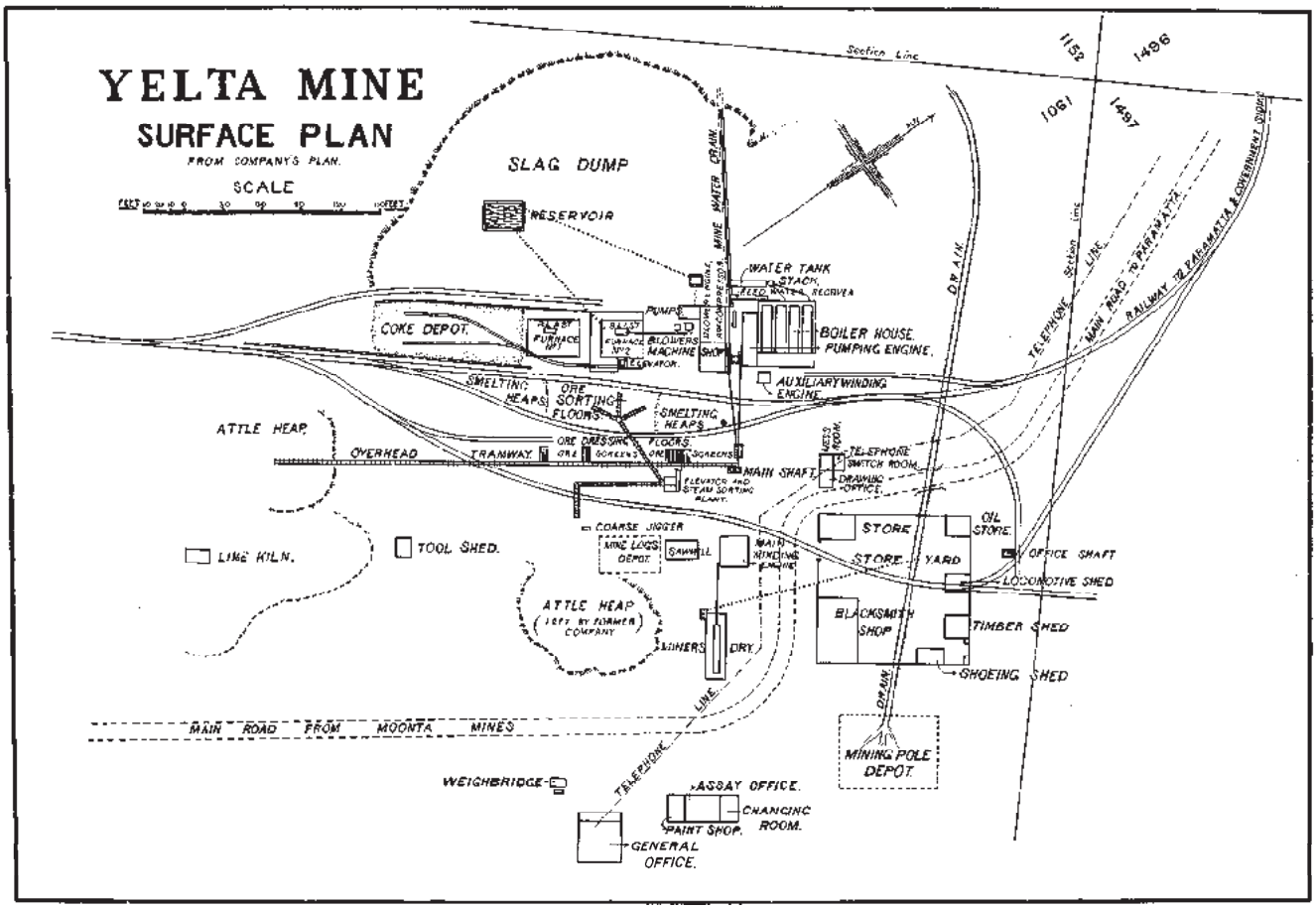
Ore was discovered in 1861 on leases north of the Moonta Mine. Operations commenced on a small scale in 1663 under the management of Captain H.R. Hancock near the southwest corner of the leases. The main lode was discovered in 1868 and up to 100 were employed over the next few years. A 22-inch horizontal engine (the Yelta) was erected in 1871 to power pumping, winding, crushing and dressing machinery. The mine closed in 1877 due to falling copper prices after producing 1700 t of copper.

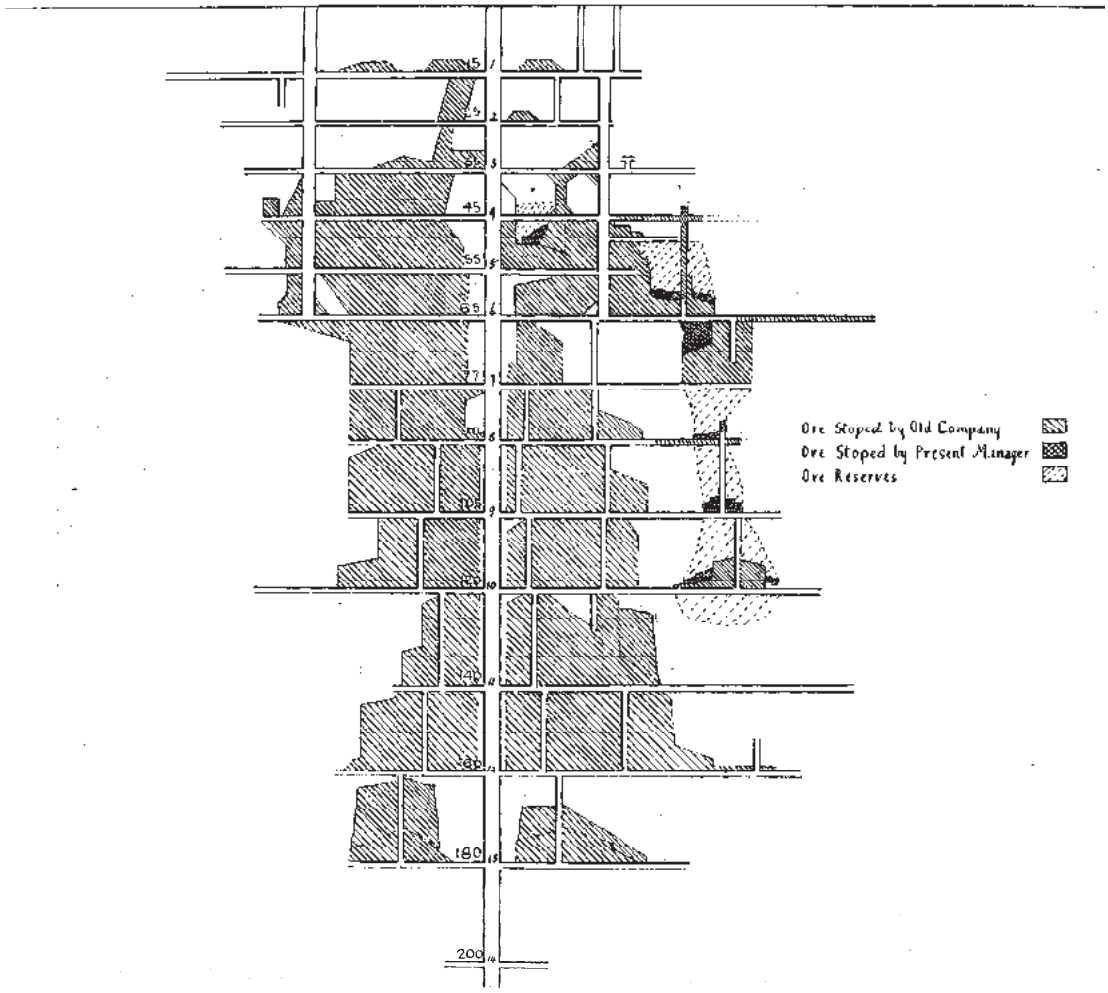
In 1903, the mine was acquired by a French company in conjunction with the Paramatta Mine. Two blast furnaces were erected and the mine operated until 1907. In 1910, the SA government purchased the mine and a remaining shoot of ore mined until closure in 1913. During this period about 7000 t of ore were smelted producing 270 t of copper with a loss of £36,000. About 330 kg of molybdenite was handpicked from the ore and sold. Total production from the Yelta Mine is estimated at 4300 t of copper.

Between 1906 and 1916, the SA government worked a lode along the eastern boundary of the Yelta leases as part of the Yelta Mine. It was reworked by tribute parties as the Wild Dog Mine from 1924-1929 and by the Moonta Mining Scheme as part of the Subsidised Mining Program from 1929-1938. Total production was 1920 t of copper.



Yelta Mine and enginehouse, c.1875





NE-SW longitudinal section of the Yelta Mine

Wheal Hughes

The discovery of copper ore during the cutting of the Moonta-Wallaroo tramway in 1865 led to the Paramatta group of mines – Paramatta, Poona, Wheal James and Wheal Hughes. Wheal Hughes commenced operations in 1866 and produced a small amount of ore from three shallow shafts until it was abandoned in the late 1870s. A small steam engine was erected in 1875.

Exploration in the district found a new deposit at Wheal Hughes which was worked by open cut and underground mines between 1990 and 1994. This produced 288,000 t of ore averaging 3.5% copper and 0.67 g/t gold. Following closure Wheal Hughes has been developed as a tourist mine and is now South Australia's leading underground mine experience.

Poona Mine

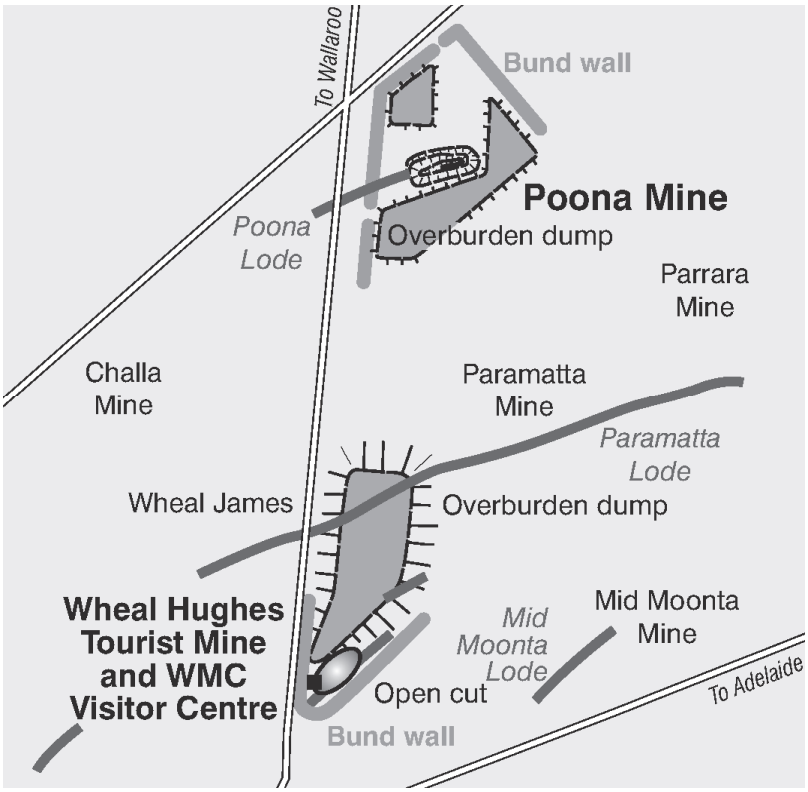
The Poona Mine was first worked for several years in the late 1860s. A small amount of ore was extracted from several shafts sunk along the Poona Lode which was exposed in a cutting of the Moonta-Wallaroo tramway.

Exploration discovered an extension of the Poona Lode which was worked by open cut and underground operations between 1988 and 1992. This produced 188,000 t of ore averaging 4.76% copper and 1.45 g/t gold.

Paramatta Mine

The Paramatta Mine commenced operations in 1866 on a small scale with up to 130 employed. In 1869, a 24-inch horizontal engine was installed to operate pumping, winding and dressing machinery. Other improvements included blacksmiths and carpenters shops, assay office and manager's residence. The mine closed in 1878 after producing 1374 t of ore valued at £187,000 and paying £40,000 in dividends.

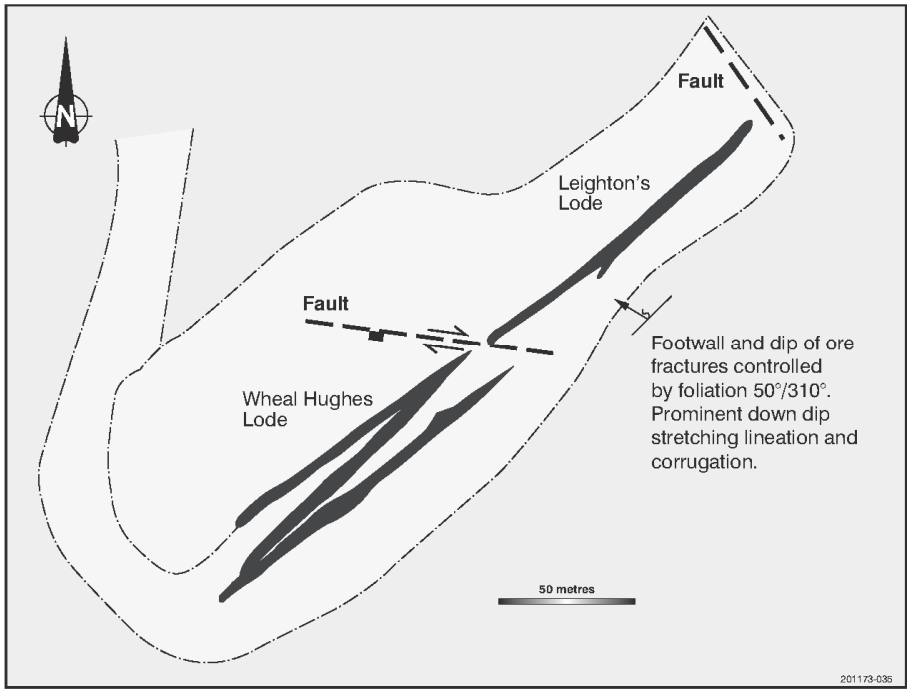
The mine was reopened by a French company in 1899 and worked in conjunction with the adjoining Wheal Hughes and Wheal James. In 1904, it was amalgamated with the Yelta Mine. New concentrating machinery was erected and the Main Shaft extended from 133 m to 247 m by 1907 when operations were suspended due to falling grades and copper prices. Total production of the Paramatta Mine is estimated at 4400 t of copper.



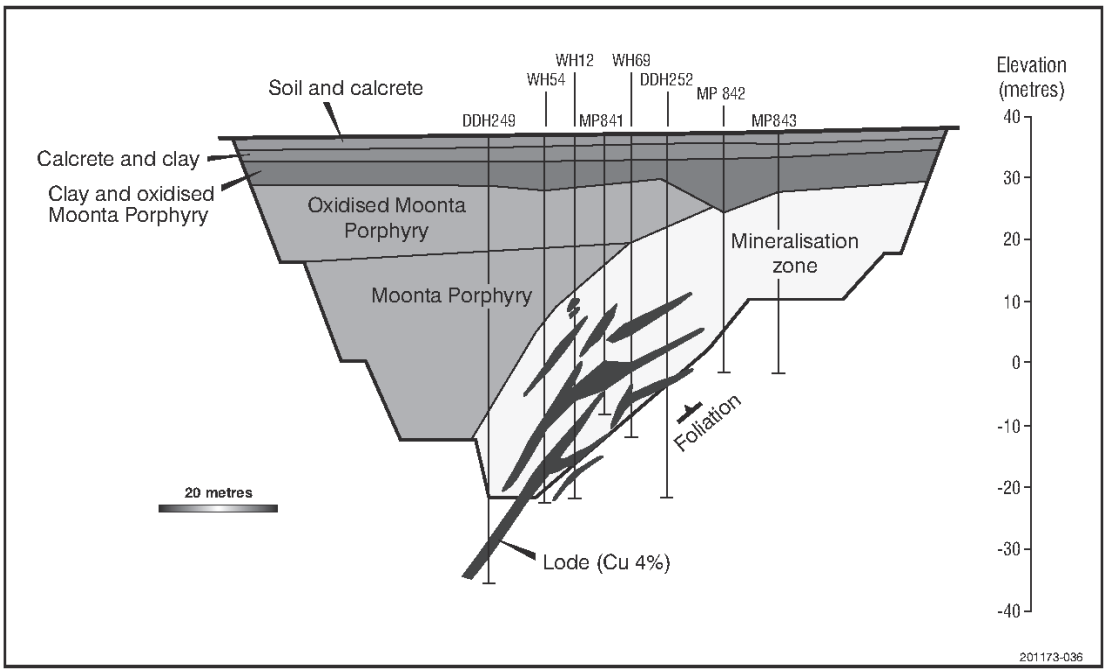
Geology of Wheal Hughes and Poona Mine

The Poona and Wheal Hughes deposits are typical of the Moonta district. The Poona vein strikes ENE and dips approximately 45º NNW, within a shear zone, and is offset into three segments by faults perpendicular to the shear plane. The Wheal Hughes deposit is unusual for the Moonta field, in that the main part consists of a multiple vein system. The veins strike NE and dip 45º NW, and are hosted by a 25 m wide shear zone. The NE part of the Wheal Hughes deposit, known as Leighton's Lode, consists of a single vein separated from the main deposit by a cross-cutting fault.

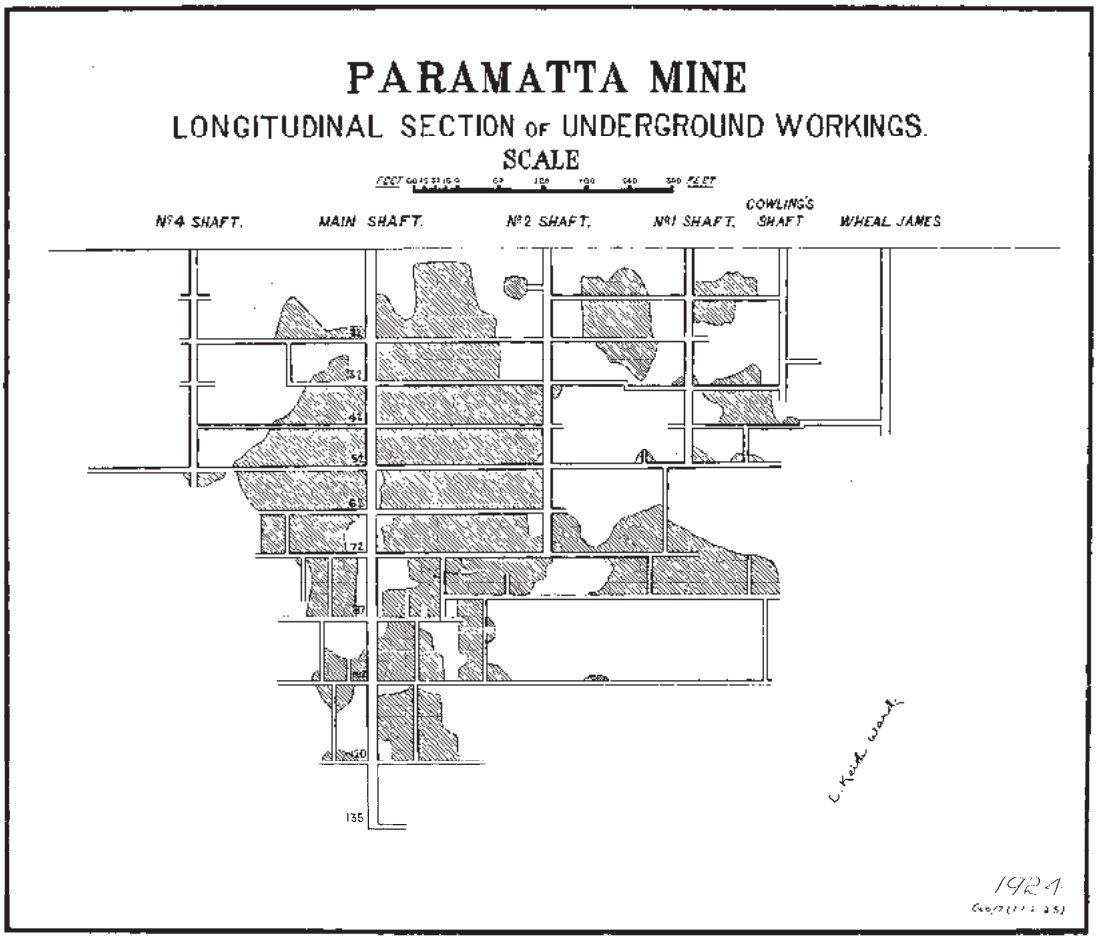
Adjacent to the Poona and Wheal Hughes orebodies, the host porphyry has been altered to chlorite, tourmaline and sericite. Tourmaline is more abundant in the alteration zone associated with the main part of the Wheal Hughes orebody, where the zone is up to several metres in thickness. Leighton's Lode segment and Poona have narrower alteration zones. The oxidized porphyry above both deposits is extensively kaolinized and the upper sections of the Wheal Hughes veins are also partly surrounded by a zone of supergene kaolinite.



Plan of Wheal Hughes



Wheal Hughes cross section



Paramatta Mine Main Shaft and concentration plant, c.1900

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Williams	Nick	16 View Mount Road, Glen Waverley, Vic 3150	n.williams@sci.monash.edu.au