

Abandoned Hopes: Reef Mining on the Albert Goldfield, north-western NSW

By KEN MCQUEEN
University of Canberra

As previously detailed in this journal, the Albert Goldfield in far north-western New South Wales was initially developed as an alluvial field exploiting scattered occurrences of near-surface, nuggetty and coarse-grained gold.¹ After miners on the early rushes located and extracted most of this gold it was realised that for the field to become 'permanent', attention would need to be directed to discovery and mining of more substantial deep-lead alluvial and quartz-reef gold deposits. Quartz pebbles containing gold were observed during the early alluvial mining and gold-bearing quartz reefs were soon found in outcrop. Experienced miners noted that the reefs and their slaty host rocks greatly resembled those at Bendigo in central Victoria, giving great hope that the field might prove to be a rich reef-mining district.² This was not to be.

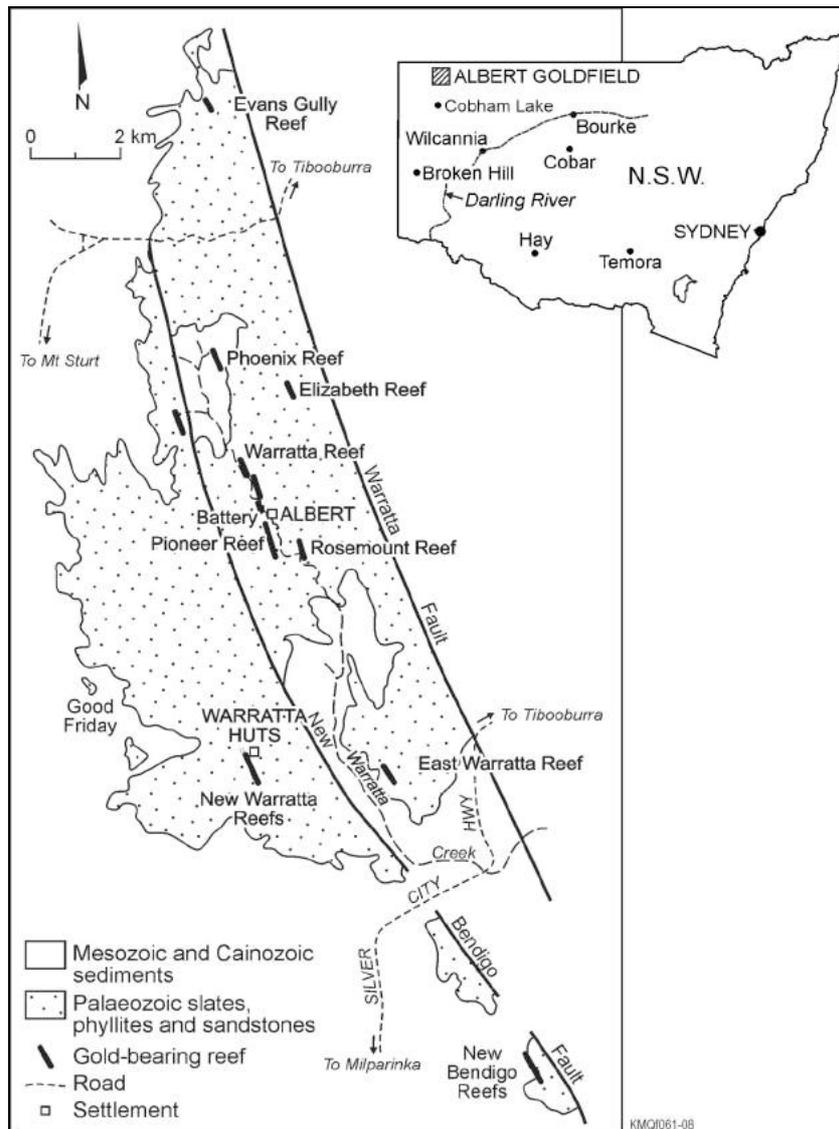
Development of the reefs was plagued by the same problems facing the alluvial miners, notably lack of water and difficulty of supply to such an arid and isolated region. Companies were floated locally, in Melbourne and in Adelaide to raise capital to purchase the required machinery for hard rock mining and gold extraction, but getting large items of equipment to the remote field proved a Herculean task. One plant was eventually erected and the reefs tested by crushing and processing but the equipment proved inadequate, resulting in low recovery of gold from the ore. Capital was wasted by poor management and piecemeal mining of the small reef systems. Even in more recent times the difficulties have deterred most exploration and until very recently the reefs had never been tested by drilling. Consequently, gold production from the Albert reefs at about 1.5 thousand ounces has been miniscule compared to that from the alluvial mining, and particularly compared to that from other reef mining districts in similar rocks such as Ballarat, Bendigo and Hill End.

Discovery of reef gold

Gold was first discovered in the Albert district near Mount Poole in October 1880. The first indication of a payable alluvial field came in February 1881 with the discovery of

gold near Mount Browne.³ The early prospectors noted numerous north-west trending quartz reefs in the slaty rocks of the Mount Browne Range and also observed gold with adhering quartz in the alluvial wash.⁴ By mid March, gold had been found in some of the quartz reefs.⁵ Small shafts were sunk into these reefs and the quartz hand crushed and washed to extract the gold. However, the reefs did not appear to be sufficiently payable, particularly with such primitive mining and processing.

Figure 1: Location of the Albert goldfield and the main gold reefs in the Warratta Creek area.

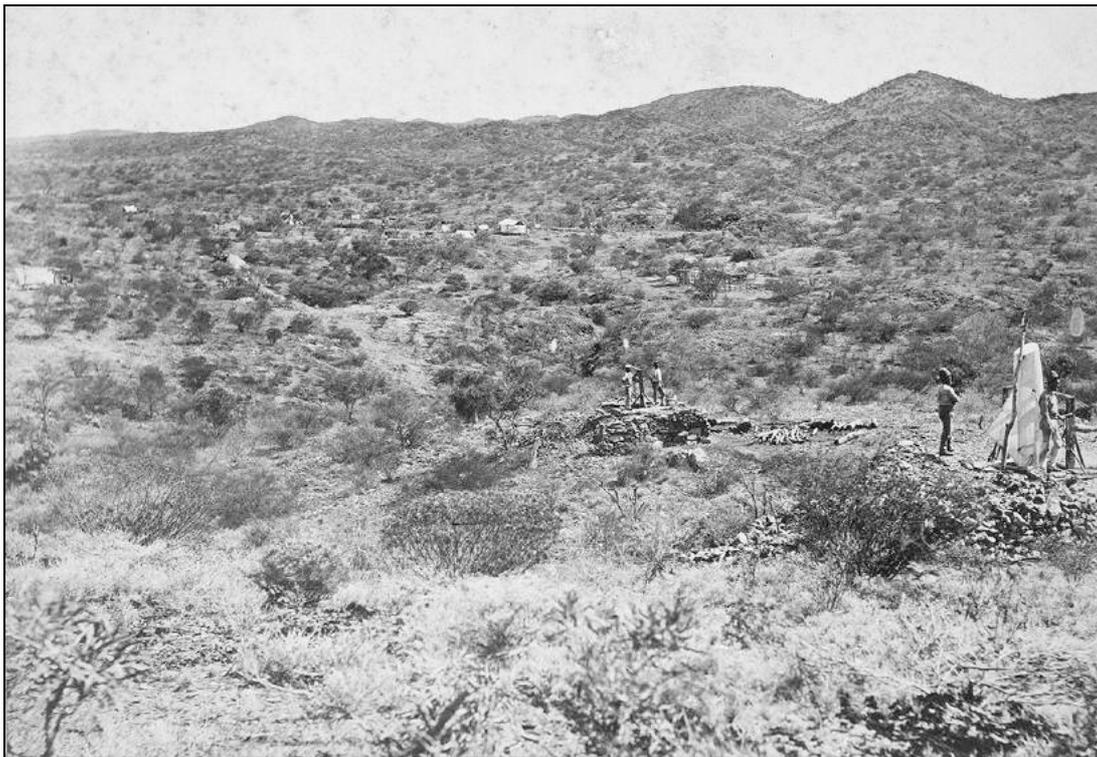


Source: Map collated from historic reports and 1:25 000 Provisional Geology, Warratta Inlier, Geological Survey of New South Wales.

In early April 1881, Richard Eades and Edward Heffernan discovered gold-bearing quartz reefs along Warratta Creek in the Wambarriga Range about seven miles

north-east of Mount Poole. The two prospectors were granted a prospecting claim on the 17th April and by July had sunk three trial shafts varying from 6 to 20 ft deep. Further sinking was retarded by lack of explosives and drills. The main quartz reef, which became known as the Pioneer (Figs. 1 and 2), was about two feet wide with clearly visible gold. Dollying of selected stone indicated 3-4 oz of gold to the ton.⁶ Two additional claims (No. 1, Huggens and party and No. 2, Ronalson and Byrne) were soon being worked south of the prospecting claim. By July there were six different parties prospecting this line of reef, which extended about 800 yards.⁷ Other reefs were soon discovered including the Phoenix and Warratta (Old Warratta) reefs, followed in early November by discovery of the Rosemount Reef and later in 1883 the Elizabeth (Fig. 1).

Figure 2: *The reef mining area on Warratta Creek, Albert Goldfield c. September 1882. View looking north from the southern end of the Pioneer Reef. Note the embryonic settlement of Albert (middle distance) opposite the site of the Wittabrinna Gold Mining Company mine. Shafts at the right foreground are on the Pioneer Reef (possibly Wittabrinna South Company), note wind sail for ventilation.*



Source: Courtesy State Library of New South Wales, photograph by Herbert Brasnell, 1882.

First attempts to develop the quartz reefs

It was obvious that capital would be required to develop the reefs, particularly for a quartz crushing plant, and several meetings were called in Wilcannia aimed at setting up

a public quartz mining and crushing company. A large meeting was held at the Crown Hotel on Saturday 9th of July 1881, chaired by Walterus Brown, a leading light of Wilcannia. This meeting considered forming a company to purchase machinery to toll mill ore from the various claims but it was pointed out that the quartz already mined would only occupy a crusher for about half a day. A second-hand, six-head stamp battery owned by John E. Kelly had already been offered for sale at £950, delivered to the goldfield from Louth.⁸ One member of the meeting was clearly not impressed with this plant, commenting that if there was any one present who had anything to do with a ‘rattletrap of a chaff-cutter sought to be palmed on the public as a crusher’, he would have nothing to do with the company. The meeting concluded that it would be better to form a mining company to take over and develop four of the existing claims, and it was decided to approach the owners with a proposal.⁹ This local company was launched in August as the Mount Browne Quartz Crushing Company (Ltd), the promoters being Alfred Kirkpatrick, Thomas Ottaway, Edward O’Donnell and Arthur Woodfall, all prominent local businessmen.¹⁰ Five thousand £1 shares, paid to 10s, were offered to the public and by the 11th August one thousand had been taken up.¹¹ A little later there was a call to set up a separate company to purchase and work leases on the Pioneer Reef.¹²

In the meantime a syndicate of Melbourne stock-brokers and other investors, reportedly including the largest shareholder in the Long Tunnel Mine at Walhalla in Victoria, had taken an interest in the quartz reefs.¹³ In late August this group sent J.C. Hutton up from Melbourne to inspect the area. He reported favourably on the prospects for the field if a dependable water supply could be provided.¹⁴ The syndicate bought into the original company, which became the Mount Browne Gold Mining and Crushing Company, with Hutton as the mine manager. The company purchased the No. 3 and No. 4 North claims on the Pioneer Reef and ordered a crushing plant. Part of this machinery had reached Mena Mertie just north of Wilcannia by February 1882 but could be taken no further because of severe drought. By the end of 1882 the company had spent £4,000 developing their claim, including the cost of plant and equipment.¹⁵

In October 1881 a second reefing company called the Wittabrinna (sometimes spelt Whittabreena or Whittabrinnah) Gold Mining Company (NL) was formed in Adelaide with capital of £15,000 in 30,000 shares of 10s each. This company took over Eades and Heffernan’s original Prospectors Claim on the Pioneer Reef, for which the prospectors received 4,000 fully paid shares and £1,500 in cash. An additional 5,000

shares paid up to 5s went to the promoters.¹⁶ The directors of this company were J. Bagot, J. Cowan, R.T. Reid, H.D. O'Halloran and W.A. Horn; T.S. Horn was appointed manager.¹⁷ On the 22nd of November Richard Eades, who had been made mine manager, reported that the No. 1 shaft had struck a heavy inflow of water at 75 feet. The No. 2 and No. 3 shafts were at depths of 8 feet and 12 feet respectively. He planned to continue the No. 3 shaft to the water table and then put in levels north and south to expose a large section of the reef. He also proposed to call for tenders to sink the Engine shaft 20 feet west of the steeply west-dipping reef, to cut it at depth.¹⁸

By February 1882 another three companies, the Wittabrinna South Quartz Mining Company, the Phoenix Quartz Mining Company and the Wizard Peak Gold Mining Company, had been formed in Adelaide to work various other claims on the reefs. Walter Sully, who had first inspected the goldfield the previous April for a group of Port Augusta capitalists, became the agent and mine manager for the three new companies.¹⁹ The capital of these companies varied from £15,000 to £32,000 with at least half the funds available for machinery and development. However, as with the Mount Browne Gold Mining and Crushing Company, getting machinery to such a remote site was a major difficulty, particularly as the Darling River was now unnavigable due to the drought. Without crushing equipment, work at the mines consisted of shaft sinking, underground development and stockpiling of mined quartz. Even this work was almost suspended in March 1882 due to lack of water and explosives. However, in April a fresh supply of explosives arrived at the reefs and development resumed.²⁰ Mining activity was largely restricted to depths above the water table (generally at 70-85 feet) as at this stage there was no efficient means to pump out the water.

The Wittabrinna Gold Mining Company held its first ordinary general meeting on the 28th of April 1882 at the company's office in Adelaide.²¹ A report from the mine manager indicated that the No. 1 shaft had reached 80 feet where the reef was 18 inches wide with both fine and coarse visible gold. A drive had been extended north for 15 feet and 20 tons of quartz grading about 5 ozs of gold to the ton taken out. The Engine shaft had reached 35 feet and was predicted to cut the reef at 150 feet below the surface. The No. 3 shaft was down 85 feet with a level driven 46 feet north along the reef, which in this section was 20 to 30 inches wide. This had been stoped to the face of the drive and 90-100 tons of quartz removed. It was estimated that 1,300 tons of quartz running about 3 ozs per ton could be mined between the No. 1 and No. 3 shafts to this depth. A

second-hand crushing plant had been purchased at Taradale in Victoria and stamper boxes and gold saving devices ordered from Messrs Martin and Co. of Gawler, South Australia. By the end of April the plant was still stranded *en route*, 140 miles from the reefs due to the continuing drought.²² The directors reported that an adjacent claim had been purchased for £750. They also recommended that the company consider amalgamating with the adjoining Wittabrinna South Quartz Mining Company in order to reduce management expenses and allow the reef to be more advantageously worked.

In early May 1882 about half a ton of quartz from four claims on the Pioneer Reef was sent by J.C. Hutton for trial crushing and treatment at Maldon in Victoria. This produced just over 3 oz of gold, equivalent to 7¼ oz to the ton, with most of the gold very fine and invisible to the naked eye.²³ In July a more plentiful supply of explosives arrived at the goldfield and hard-rock mining resumed in earnest.²⁴ There were now 15 separate groups and companies' holding claims on the various reefs with shafts down between 30 and 120 feet and drives extending up to 100 feet. A group of miners (Nolan and party) working on the southern end of the Pioneer Reef had dug a cutting and tunnel 220 feet in from Warratta Creek to intersect the reef below the ridge where it cropped out. There was about 550 tons of quartz on the surface ready for crushing, but still no machinery on the ground.²⁵

With all this activity a small settlement gradually developed at the reefs near Warratta Creek, comprising a licensed hotel operated by Mr and Mrs Delandre, a blacksmith's shop, butcher, two bakers and several eating houses, which also served as shanties.²⁶ In September 1882 Mining Warden C. McA King laid out a new township called Albert, with two main streets named Poole and Sturt streets (Fig. 2). An extensive store was opened by Bignell and Young of South Australia and a post office established under the management of Carl Heuzenroeder, a local storekeeper.²⁷

The crushing plants for the Wittabrinna Gold Mining Company and the Mount Browne Gold Mining and Crushing Company arrived at the reefs in October. Parts of the plant for the Wittabrinna Company were found to be worn or faulty and were sent back. The manager of the Mount Browne Company refused to erect the machinery for his company on the grounds that there was no water to operate it. The site for this plant was at a dam on Warratta Creek about three miles from the mine, but there had been no rain to fill the dam. This problem could have been avoided had the site been fixed near the reefs, where water had now been struck in five or six shafts.²⁸ At the end of November there was suddenly sufficient rain to fill the dam plus another dam at the

Pioneer Reef, but neither plant had yet been erected and the water gradually evaporated.²⁹

All underground work at the Wittabrinna Company mine on the Pioneer Reef was suspended from September 1882 until early 1883, while the company waited for its plant to be installed. The other Adelaide companies had also applied for suspension of work requirements on the grounds of drought and lack of machinery to test their ore. It was realised that more experienced management was required so in January 1883 the Wittabrinna Company, in conjunction with the Wittabrinna South, Phoenix and Wizard Peak companies, appointed Richard Parker, previous manager of the Garibaldi Mine at Sandhurst (Bendigo), to oversee their operations on the reefs. His annual salary of £700 was to be proportionally paid by the four Adelaide companies.³⁰ In February 1883 the balance of the machinery arrived and fourteen men were engaged in erecting the plant and associated infrastructure. To this point the Wittabrinna Gold Mining Company had expended a total of £12,960.8s.5d, including £5,500 to purchase the mine, £1,927.6s.6d for machinery and £5,463 for working expenses.³¹

By October 1882, the Wittabrinna South Gold Mining Company had extended its No. 1 underlay shaft to 131 feet and commenced two levels (Nos 1 and 2) above this depth with a total of 120 feet of drives along the reef. A strong flow of water was struck at 118 feet (inclined depth) and could not be kept down with the existing appliances. The reef in the shaft above the water level was partly disrupted, but at 130 feet was well defined. Walter Sully (mine manager) reported:

Gold is visible in the stone, which is also heavily charged with iron pyrites. The average width of the reef above water to No. 1 Level is about 18 inches. The stone throughout looks well, gold was occasionally seen, and good prospects obtained by mortar-tests where the reef was broken up.³²

Drives were extended from near the bottom of the shaft for 13 feet along the reef to the north and 4 feet to the south. In the north drive the reef averaged two feet in width and had a honeycomb appearance, similar to that of a rich shoot of gold encountered higher up in the No. 1 Level.

The Wizard Peak Gold Mining Company had struck water in their workings north of the Wittabrinna Company at about 80 feet and had suspended operations to conserve funds until crushing equipment was available.³³ Special meetings of the Wittabrinna and Wittabrinna South companies were held on the 18th October 1882 to

consider amalgamating their interests.³⁴ A formal merger does not appear to have gone ahead, but the companies agreed to collaborate on their mining activities. Some collaboration also occurred with the other companies, including the Mount Browne Gold Mining and Crushing Company.

In January 1883 the new manager of the Mount Browne Gold Mining and Crushing Company, Mr Bull, transferred the components of that company's crushing plant from the dam on Warratta Creek to a new site at their claim on the northern end of the Pioneer Reef. This plant included a 10-stamp battery, steam boiler and engine, but by the end of July only the boiler had been set up.³⁵

Table 1: *Results of quartz crushings from the reefs during July (1-21) 1883.*

Company	Tons	Gold Yield	Average grade ozs/ton
Wittabrinna G.M. Co.	45	26 oz 12 dwt	0.591
Wittabrinna South G.M. Co.	45	27 oz	0.600
Wizard Peak	25	11 oz 15 dwt	0.470
Phoenix	19	17 oz	0.895
MacLeans	12	10 oz 2 dwt	0.842
Warratta	10	1 oz 17 dwt	0.185
Total	156	94 oz 3 dwt	0.604

Source of data: *The Adelaide Observer*: 29 October 1881, p. 35; 7 January 1882, p. 30; 21 January 1882, p. 16; 11 Feb 1882, p. 29; 29 April 1882, p 21; 24 June 1882, p. 17.

The Wittabrinna Gold Mining Company finally got its machinery working on the 15th of May 1883 and four days latter two of the directors, W.R. Wilson and J. Bagot, arrived to inspect the operations.³⁶ This plant was capable of crushing 150 tons per week and consisted of 12 heads of stamps with accompanying stamper boxes, gold-saving tables, amalgam plates and pumping gear, all driven by a 15 horsepower horizontal steam engine (Figs. 3 and 4). It was erected under the supervision of engineer H.J. Mathers with assistance from Mr Bull of the Mount Browne Gold Mining and Crushing Company. There was great optimism on the reefs and a total of 100 men were soon working on the various claims.³⁷ Crushing continued through June into July at a slow pace due to the limited supply of water, which was pumped from the workings at night and used for processing during the day. Trial crushings totalling 369.5 tons were made for a number of claims at a charge of £2 per ton. This yielded a total of 230 ozs of gold (details for July 1883 are shown in Table 1). The results were generally disappointing and most of the parcels barely covered the cost of crushing. It was

realised that the plant was not up to the task, with such low gold recoveries from some obviously rich ore. Some of the gold was so fine-grained that it floated on water. Other than blanketing tables, there were no appliances for recovering this fine floury gold or that associated with pyrite.³⁸ During the year Mr Bull, formerly with the Mount Browne Company, took over management of the Wittabrinna Company operations. Richard Parker, the previous manager applied for 8 acres of leases over the reefs, possibly on the grounds that they hadn't been sufficiently worked, but his application was refused.³⁹

Figure 3: *Stamp battery and plant at the Pioneer Reef c. 1900. This plant was erected by the Wittabrinna Gold Mining Company in 1883. The cyaniding component (front right) was added in 1898. Headframe behind crusher is the Main or Engine shaft.*



Source: Courtesy John Gerritsen, photograph taken by Victor C.W. Nicholls, Tibooburra.

At the fifth general meeting of the Wittabrinna Gold Mining Company in Adelaide on the 30th of April 1884 the mining manager reported some progress in further developing the mine, however funds were almost exhausted. Work completed between September 1883 and April 1884 included deepening the main Engine shaft 65 feet and making a cross cut to the reef at the 160 foot level. At this point the reef was 22 inches thick and testing of a 20 pound sample suggested a grade of 3 oz 14 dwts of gold per ton. This work was completed using initially two shifts a day, and from January three shifts of miners brought in from Victoria. Progress was slow due to illness and

‘disturbances’ with the Victorian miners and also because of the need to use horses to haul mullock and ore from the mine. In March the manager, after ‘immense difficulties’, was able to make the steam engine reversible and use it to operate winding gear that he had constructed on site. He also made numerous other improvements including building truck ways and some box-trucks to do away with the labour intensive and inefficient barrows used to this point. The supply of water in the main shaft was about 85 gallons per hour, insufficient for full plant operation, prompting the manager to investigate the possibility of also pumping from the Wizard Peak shaft.⁴⁰ To the end of April 1884 the Wittabrinna Gold Mining Company had expended a total of £16,202 and had cash in hand of £65.5s.5d. The Company had produced gold worth £355.17s and generated £524.16s.2d of income from toll crushing for other groups. Clearly the capital was running short, so a special meeting was held after the ordinary general meeting to consider the financial position and decide whether the company should be wound up. The directors pointed out that they were now personally liable for £200-300 and that the shareholders could not expect them to continue incurring a liability. It was suggested that the company could increase its capital by either issuing 15,000 preference shares of 10s each or by increasing the existing shares from 10s to £1. The opinion of the meeting was that the company should not be wound up and a motion was passed that the capital be increased to an amount that the directors saw fit.⁴¹ Work was suspended until at least June while new capital was sought. It was then reported that activity on the reefs would be recommencing.⁴² There was now a good supply of water in the various shafts that also needed to be pumped out for mining to resume. News of a restart to mining led to a slight rise in the Wittabrinna Company shares.⁴³

On the 2nd of September the Milparinka correspondent for *The Adelaide Observer* reported:

Things are progressing at the Albert reefs but very slowly, principally owing to the Manager (Mr Bull) having his hands tied in regard to funds. He is now using a lot of labour-saving machinery of his own construction, and I think a little more latitude might be allowed him. I believe he is now driving on a 164 level, with one shift of men for each drive. The water has increased in the north drive. The stone has much improved in appearance, and now shows gold freely.⁴⁴

The Wizard Peak Gold Mining Company had also exhausted its capital and was unable to continue the work requirements for maintaining a claim. The Warden of Goldfields had granted a six-month suspension of work conditions at the beginning of

1884 but by June the situation had not improved. The general economic conditions meant that it was not a good time to make a further call on shareholders. On 6 June a meeting of the company resolved to apply for an extension of the work suspension and if this was not successful, to wind up the company. Shortly afterwards, the company appears to have been wound up.⁴⁵ Near the end of 1884 it was decided to wind up the Wittabrinna and Wittabrinna South companies and their claims, plant and other equipment were put up for auction in Adelaide on 21st November.⁴⁶ The sale appears to have been unsuccessful, as the crushing plant continued to operate intermittently through 1885 with results of about ½ oz to the ton.⁴⁷

Figure 4: *Remains of the stamp battery and plant at the Pioneer Reef on Warratta Creek. Over the years various modifications were made, including conversion from 12 to 8 stamps. Note the gear-drive mechanism.*



Photograph taken by the author in May 2007.

During 1884 a very rich, but narrow leader was discovered in a claim on the Elizabeth Reef, to the northeast of the Pioneer. The gold here was very fine-grained and the owners attempted, apparently unsuccessfully, to float a company that was to send their stone to England for processing. The total recorded gold production from the reefs for 1884 was just over 89 ozs, comprising 66 ozs from 71 tons of quartz from the Wittabrinna Company, 21 ozs 10 dwt from 57 tons for the Wittabrinna South Company and 1 oz 13 dwt from 3.5 tons of quartz for the Elizabeth Prospecting Claim.⁴⁸

More attempts to work the reefs and fading hopes

Near the end of 1885 a group of local business people formed the Milparinka Gold Mining Company and purchased the plant and claims of the Wittabrinna Company on the Pioneer Reef at a low price. Part of their motivation was to prevent the plant, which had required so much effort to get to the field, from being removed from the district.⁴⁹ They let the mine out to tributers, who over a four-month period in 1886 crushed about 40 tons of quartz for 30 ozs of gold.⁵⁰ By this stage the main workings on the Pioneer Reef were down to 220 feet, still in gold-bearing quartz. The mine and crusher were then idle while an engineer was engaged to remodel and improve the plant. He recommended that the tailings be reduced and sent to Sydney for treatment and suggested that the poor gold recovery may have been due to loss of amalgam by thickening from the high mineral and sulphate content of the water used in the plant.⁵¹

In January 1886 Joseph Nolan, who had been working at the reefs on Warratta Creek, found a rich patch of alluvial gold in a nearby gully, including three nuggets totalling just over 27 ozs.⁵² This discovery attracted about 30 diggers to the area and stimulated renewed prospecting across this part of the goldfield. In June, Tom House discovered alluvial gold at Little Bendigo or New Bendigo, about five miles north east of Milparinka, and in September some minor reef gold was also discovered in this area (Fig. 1).⁵³ At the end of the year the same prospector struck a new zone of rich ore on the Elizabeth line of reef. With his partner Laws, he took up an extended claim and attracted some promoters. Several other groups also took up claims on this reef.⁵⁴

During April 1888 operations at the Pioneer Reef were floated into the Milparinka Quartz Mining Company, with nominal capital of £12,000, paid up to £8,000, including investment by 'influential local Barrier and Adelaide speculators'. A limited number of shares were placed on the market and sold off rapidly at 5s each. The company immediately spent £150 improving the machinery and appointed Alexander Bagnell from Bendigo as mining manager, raising hopes that the battery would soon be up and running again.⁵⁵ The promoters of the Elizabeth claim took up a lease on the Pioneer Reef adjoining the Milparinka Company.⁵⁶ Three samples from the Elizabeth Reef sent to Wilcannia for assay averaged just over 15 oz 10 dwt of gold and 1 oz silver per ton, prompting a burst of activity to open up this reef.⁵⁷ In July a 1.5 ton bulk sample was sent to the School of Mines in Sandhurst (Bendigo) for testing and a group

of Queensland pastoralists, who made a flying visit to the reefs, were induced to invest.⁵⁸

The new manager for the Milparinka Quartz Mining Company, who had been appointed on a 'handsome salary', proved unsuitable. Local mining warden, Charles de Boos, reported that the manager was not up to the task of 'setting the mine at work on a proper basis' and that 'after pottering about aimlessly, making a hopeless attempt to reset the tables of the machine, and wasting no small amount of the Company's funds, his services had to be dispensed with'.⁵⁹ In the meantime a new investor inspected and took an interest, purchasing the Company's lease and two adjoining areas. In July, John Nicholas, also from Bendigo, was appointed mine manager and work resumed pumping out the shaft and relaying the tables. Towards the end of 1888 there were 60 miners working on the reefs. However, the problem was still a lack of operating machinery to process the quartz they mined. There was also some activity at a reef called the Gladstone, in the Tibooburra mining division. This reef, held by George Kissley and party, was 3-4 feet wide with good assays, but again there was no available plant for extracting the gold.⁶⁰

Finally in September, the Milparinka Quartz-mining Company commenced crushing operations.⁶¹ The results were most disappointing. Parcels of stone with clearly visible gold commonly assayed 3 ozs and up to 7 ozs of gold per ton, but the plant could not achieve better than ½-1 oz per ton. Clearly the gold saving system attached to the crusher was losing much of the gold. The following year, crushing and most mining operations stopped, although the apparently indomitable Tom House mined 100 tons of quartz from the Warratta line of reef, some miners persisted on the Elizabeth and Kissley and party at the Gladstone mine continued to sink their shaft to 100 feet.⁶²

During 1890 there were plans to float a new company on the Pioneer and Warratta reefs and purchase a better gold treatment plant.⁶³ In February, Walter Meriton, an experienced quartz miner, inspected the workings at Nolan's Tunnel on the Pioneer Reef for John Bowring and Charles Fartiere of Melbourne.⁶⁴ Little work had been done on this lease, also known as the Tunnel Quartz Lease, since the initial development by Nolan and party in 1882. Meriton reported favourably on the grade of the quartz he observed still at grass and in some of the accessible exposures, stating 'I believe that, under proper treatment, it would yield from 3 oz to 3½ oz to the ton'. He suggested that additional lodes could be cut if the existing tunnel was driven another 100 feet and also noted that a large, untested quartz blow south of Nolan's Shaft could

be of considerable value.⁶⁵ In September it was reported that the mine and machinery on the Wittabrinna claim were back in working order with crushing about to commence in a few days. There were 45 tons of rich stone at grass from Nolan's Tunnel, but attempts to attract significant new capital failed.⁶⁶ Work continued at the Gladstone Mine, where a dam was constructed for proposed future operations. A number of shares in this mine changed hands during the year at prices up to £15.⁶⁷

Over the period 1891 to 1893 activity on the reefs of the Albert Goldfield effectively ceased and alluvial mining also went into serious decline. This was due to a combination of continuing severe drought and the collapse in November 1891 of the Mount Browne Prospecting Company, which had been working the alluvial deep lead system at Billygoat Hill near Mount Browne. The demise of the main gold mining enterprise on the field had a depressing effect across the district and made it almost impossible to raise capital for any sort of mining. In any case, venture capital was hard to come by as most of the colonial economies were entering a serious depression. Early in 1891 stockpiled ore with rich visible gold was put through the battery at the Pioneer Reef for a very discouraging yield of only 8 dwt per ton. The mine was again let out on tribute and a small crushing of quartz taken from the 220 foot level returned 18 dwt of gold per ton. The tributers considered this satisfactory, deepened the shaft and started driving to intersect the reef at a lower level. However, by early 1892 the work was stopped. Most of the reef claims had already been cancelled for not meeting the labour requirements. Mining Warden E.L. Maitland concluded that 'if the quartz reefs at Warratta are to prove a success improved gold saving appliances are indispensable'.⁶⁸

New discoveries and hopes revived.

Interest in reef mining on the Albert Goldfield had a dramatic revival in February 1895 with the discovery of new reefs at New Bendigo and at a locality known as Warratta West (or New Warratta, Fig. 1), about three miles south of the Pioneer and Old Warratta reefs. Rich specimens of gold-bearing quartz had been found the previous November in a flat area of thin transported cover and there had been very active prospecting to find the source of this gold. Ground was soon pegged out in all directions. The first lease was taken out by Roberts and Downs, who formed a syndicate of Melbourne investors to test the ground with shafts and shallow costeans. During this work a number of rich but narrow leaders from half to nine inches wide were found, all showing visible free gold.⁶⁹

At New Bendigo an outcrop of gold-bearing quartz 3-5 feet wide was found on the 21st of February. Testing by dollying showed the quartz contained a large amount of fine-grained as well as coarse visible gold. Twenty-four claims were registered and about 100 miners were attracted to the site, but a drastic shortage of water hampered development.⁷⁰ By May about 40 tons of quartz had been mined at the initial Prospectors Claim (House and party) and a number of other discoveries made. These included a separate reef, several feet wide, on the claim of Chambers and party to the west of House's claim, and good indications on claims held by Kershaw, Lindberg, Bamess and Sullivan.⁷¹ In a special report on the new discoveries the Chief Inspector of Mines, W.H.J. Slee, concluded:

I beg to reiterate my opinion, expressed in my annual report of 1893 and former reports, that Mount Browne, Mount Poole, the reefs on Wamberriga Range, Good Friday, Nuggety, Easter Monday, The Granite (Tibooburra) and Tipperary Gully (Two-mile), which are situated in a tract of country 50 miles in length by 10 miles in width, will sooner or later be closer related by leads or other gold workings and that rich but narrow quartz-veins will be discovered. In fact, prospecting for payable auriferous quartz-veins has been greatly neglected on the whole Albert Gold-field.⁷²

In response to the new discoveries, as well as some renewed activity at the Old Warratta reefs, the abandoned crushing plant at the Pioneer Reef was again refurbished and pressed into service. It processed small parcels of quartz from Tom House's claim at New Bendigo and from Manix's lease on the Evans Gully, producing 167 ozs of gold. There were unsuccessful attempts to float some of the new leases into companies.⁷³

Severe drought the following year and into 1897 forced the miners to abandon the new reefs even though some were going 4 oz of gold to the ton.⁷⁴ The crushing plant was shut down when it was no longer possible to get firewood for the steam engine or cart quartz to the battery due to lack of feed for the horses. Eventually the water supply was insufficient for domestic purposes, let alone the boiler.⁷⁵ Most of the claims were held by small syndicates without funds to maintain the labour conditions, so their claims were cancelled. By the end of 1898 all the leases at Warratta West were abandoned, one lease remained in force at New Bendigo and there was only minor activity in other areas.⁷⁶

During 1899 a new syndicate repaired yet again the engine and crusher at the Pioneer Reef and added a cyanide plant (Figs 3 & 4). Several months were also spent repairing the water storage system. The syndicate ordered a second boiler, as the

existing one could not generate sufficient steam to operate the battery and the cyanide plant at the same time. In addition to new ore, they treated about 100 tons of tailings and recovered 54 ozs of gold, clearly indicating that significant gold had been lost by earlier treatment. Stone from some of the reefs was also sent to Broken Hill for processing.⁷⁷

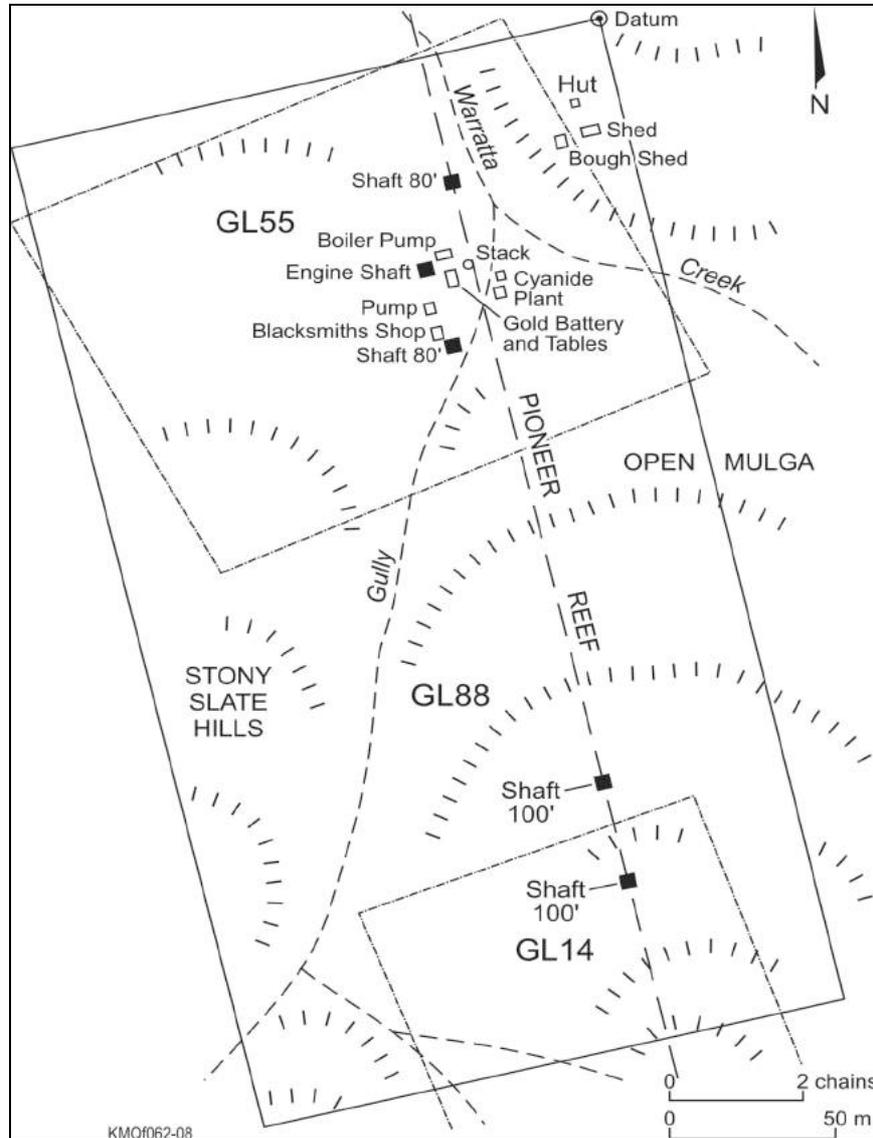
The improved gold recovery from using the cyanide process raised hopes that it would now be possible to efficiently treat the ore and economically work the reefs. The manager of the new syndicate announced plans to employ a large number of men. However, work appears to have stalled yet again due to continuing drought, causing many of the miners to leave the field with their families. There was some limited reef mining and stockpiling of quartz at Warratta and New Bendigo through 1900, aided by grants from the Government Prospecting Vote. In November, McNulty and party found promising new outcrops on a previously worked line of reef. In 1901 it was reported that a Mr Reid had done further work to get the battery and cyanide plant operating and to clear out the main shaft at the Pioneer mine.⁷⁸ It was hoped that the next year would see the plant operating efficiently and significant gold being produced.

All hopes abandoned

Early in 1902 the restored battery at the Pioneer reefs processed some parcels of ore from Jeffers lease at Warratta West and from the Black Prince mine at New Bendigo. The results, although an improvement on previous crushings, were still disappointing with only 29 ozs of gold produced. The battery was shut down. It was concluded that successful working of the reefs would require a very large injection of capital to build a much better plant and to systematically mine the reefs on a large scale.⁷⁹ The remoteness of the field and the multitude of other difficulties seemed insurmountable obstacles to any further investment. However, the following year a new company was formed, but on a scale and arrangement doomed to failure (Fig. 5). It was reported that ‘operations have so far been directed towards putting the shaft and machinery in order. A small trial crushing of quartz gave satisfactory results and the general prospects are decidedly encouraging’.⁸⁰ Nothing more was heard and this appears to have been the last optimistic attempt to use the machinery at the Pioneer Mine. In 1907 the annual report of the Department of Mines noted that ‘the reefs at Warratta have not been worked for some years past, and under present conditions there seems little prospect of operations being resumed thereon’.⁸¹ In 1910 a party headed by a Mr Connell

commenced a shaft to retest a reef at New Bendigo, but the inevitable scarcity of water soon compelled them to relinquish operations.⁸²

Figure 5: Plan of the Pioneer Mine area in July 1904. This plan refers to the *Tiboo Proprietary* and application for the lease in June 1903 by Charles Sydney Williams.



Source: Redrafted from original survey plan (21/7/04) supplied by John Gerritsen.

Over the following years the reefs were largely forgotten by all but the local residents. In 1952, two geologists from the Zinc Corporation Ltd, Haddon King and B.P. Thomson, inspected the old goldfield during a reconnaissance trip to the region. They concluded that the reefs were of only minor importance as prospects.⁸³ Barry Jackaman and L. Koncek of International Geological Consultants Australia NL, made a more detailed investigation in 1974, including geological mapping and sampling of

some of the reefs (35 samples). They recommended further investigation and drilling but this was not carried out.⁸⁴ In the early 1980s the Carpentaria Exploration Company Pty Ltd conducted an extensive chip-sampling program across the exposed sections of the reefs. Results were positive but apparently not enough to warrant further work.⁸⁵ In December 2006, Proto Resources and Investments Ltd undertook the first ever drilling program on the reefs, completing two reverse circulation percussion holes at the Phoenix Reef and 20 holes along the Pioneer Reef. This drilling indicated continuation of the reefs below the historic workings but the size and grade of the intersected mineralisation were not sufficient to encourage mining, at least not without further investigation.⁸⁶

Features of the reefs and relationship to the alluvial diggings

The miners on the Albert Goldfield were perplexed by the relatively large amount of alluvial gold in rich but scattered deposits compared to the seemingly small amount of gold in the exposed narrow reefs, considered to be the source of the gold. Much of the alluvial gold was well-rounded, suggesting abrasion during significant transport and reworking. However some gold, particularly close to the reef mining areas, was angular, with adhering quartz and slate, indicating that it had been subjected to little abrasion and derived locally from erosion of the exposed reefs. The other puzzling feature was that much of the alluvial gold was coarse or nuggety with nuggets up to 65 ozs. The gold observed in the reefs, although commonly visible, was rarely so coarse or nuggety. Clearly the alluvial gold was concentrated from a much larger volume and area of eroded reef-bearing country than that currently exposed. Some of this source area was subsequently buried under younger sediments and no longer crops out. The large mass of material that was weathered and eroded probably contained a very small proportion of lumpy gold, rarely seen during the limited reef mining. Efficient concentration of this coarser primary gold during erosion could account for the abundance of coarse alluvial gold. Much of the finer gold in the reefs was probably lost or abraded away during the extensive denudation. The concentration process was also multi-stage, involving erosion and deposition in Mesozoic gravels and then further reworking into younger gravels after uplift and erosion of the gold-bearing Mesozoic sediments. Additional gold was eroded from the outcropping reefs and deposited directly into the younger gravels.

The richest reef gold was in very narrow veins and irregular shoots, rather than the larger, more prominent quartz veins. These gold-bearing veins were a later

generation, introduced separately from the more common, barren white-quartz reefs. The reefs also appear to have been disrupted and offset by cross-cutting faults; at New Bendigo this produced lenticular blocks or pinching reefs.⁸⁷ There may also have been significant fine-grained gold in zones of hydrothermally altered slate and disseminated through alteration zones within some of the granite intrusions (e.g. the Tibooburra Granite). The different character of the alluvial gold on the Tibooburra diggings (i.e. finer grained, scaly and lighter yellow gold), suggests a different source for this gold, possibly related to the granite or associated igneous dykes and alteration zones.

Although the numerous attempts to test and develop the reefs of the Albert Goldfield all failed, they were tantalisingly inconclusive, largely due to the problems with the plant. More recent exploration has found the average gold grade to be significantly lower than that reported by the early miners. For example, chip sampling of several reefs in 1982 by Carpentaria Exploration Company Pty Ltd indicated a maximum grade of 6 grams per tonne (3.6 dwt/ton).⁸⁸ The best drill intersection obtained by Proto Resources in 2006 was 4 m of 4.39 grams/tonne (2.78 dwt/ton) for one hole into the Pioneer Reef.⁸⁹ It appears that the parcels of ore tested by the early miners were selectively mined and probably also hand picked from the narrow reef material. Thus the style of reef-gold mineralisation worked in the Warratta area (i.e. narrow and patchy veins) would probably not be amenable to large-scale exploitation, by modern mechanised mining. However, there may still be potential for larger but lower grade styles of disseminated and lode gold mineralisation in the up-faulted and exposed basement rocks as well as in areas of basement now covered by Mesozoic and Cainozoic sediments.

A curious aspect of the historic reef mining was the very limited near-surface working of the exposed reefs by trenching or open-pitting, with the emphasis instead on deep shaft sinking. There were probably two reasons for this. One was related to the need to obtain a supply of water by sinking the shafts to the water table at around 80-90 feet. The other was a belief that better grade ore would be found at depth, below the weathered zone. This belief may have arisen from comments by H.Y.L. Brown, who as NSW Government Geologist visited and described the field in 1881 and subsequently inspected the reef workings in May 1883 after he had moved to South Australia. During his later visit Brown stated that he had a high opinion of the gold-bearing reefs, further noting 'but nothing has yet been done to test them. Go down into the settled country below the water level and I expect some very rich patches will be found'.⁹⁰

The South Australian connection

The location of the Albert Goldfield in far north-western New South Wales, close to the South Australian border, meant that from the earliest discoveries South Australian prospectors, miners, businessmen and capital were important in developing the field. This link to South Australia was also important in the later development of mining at Broken Hill. At a time when the cheapest form of transport was by ship, the nearest sea port to the Albert Goldfield was Port Augusta. The river port of Wilcannia was closer but subject to the vagaries of the water level in the Darling River. The New South Wales Government, based in Sydney, was a long way from the goldfield and there were many complaints by the miners that government officials were totally out of touch and disinterested in the 'Albert'. Supplies and interest came from South Australia but this colony had no jurisdiction over the goldfield. A frustrated correspondent to *The Adelaide Observer* wrote from Albert in April 1883:

We live in a sort of 'no man's land,' owing allegiance to New South Wales, dependant upon South Australia, obtaining law from Sydney, and goods from Adelaide. At the junction of three colonies, upon the great highway of traffic, we look in vain for assistance, and begin to despair of the long promised road being opened by the South Australian Government, while that from Wilcannia can never be depended on inasmuch as Wilcannia itself is often short of supplies. Will the day ever arrive when our statesmen shall outgrow the old parish vestryman.⁹¹

When the Albert Goldfield was discovered, South Australia still lacked a significant goldfield. A close source of gold was an additional reason for South Australians to take a keen interest in the new field on their north-eastern border. In early March 1881 the Port Augusta Dispatch Party was organised by S.J. Mitchell to proceed to the Mount Browne diggings. This group of 12 men, six horses and a wagon planned to travel by rail to Hookina and then via Craddock, Mattawarungla, Bimbowrie, Boolcoomatta and the Barrier Ranges. The residents of Port Augusta believed that this would prove the best route to the goldfield from Melbourne or South Australia and they were active in promoting this view to the South Australian government.⁹² The following month Walter Sully was appointed by a group of Port Augusta capitalists, who had formed the Enterprise Gold Mining Company, to visit Mount Browne to 'speculate in the purchase of alluvial or quartz reefing claims, or for erection of machinery'. This was to be the vehicle by which a significant amount of South Australian capital was invested in the reefs.⁹³ Prominent South Australian investors involved in speculation on the

Albert Goldfield included William R. Wilson who failed to make a fortune in these mines but went on to further speculation in silver mining at Silverton and finally great success in the Broken Hill Proprietary Company.⁹⁴

Some of the Wilcannia storekeepers who had rushed to supply the goldfield were initially suspicious of South Australian involvement and the effect it might have on their business. In June 1881 a large consignment (52 tons) of flour, tea and sugar was dispatched by Messrs Bath and Pearce of Koorunga (Burra), South Australia, for the Kidman Brothers on the Mount Browne diggings, with another 20 tons to follow in a few days.⁹⁵ In the same month the *Wilcannia Times* reported that a South Australian dealer was purchasing gold in Milparinka:

On a late Sunday he was seen standing in the middle of the road with a small pair of scales in his hand, weighing and paying for his purchases. This person may be a very honourable gentleman, and know [sic] doubt he is so, but the circumstances illustrate how easy the diggers might be fleeced by light weights or other sharp practices.⁹⁶

In July, the *Burra Record* reported, 'large quantities of goods still go up from here to the Albert Gold-fields, and it is clearly demonstrated that while the river is low South Australia can hold the trade'.⁹⁷ Ultimately a large proportion of the supplies to the goldfield came from South Australia, particularly during the frequent periods of severe drought when only camel teams could reach the field or when the Darling River was unnavigable to Wilcannia.

There were early proposals to extend the railway from Hawker in South Australia to the Albert Goldfield. On the 1st of May 1882 a 'monster meeting' in Hawker considered urging the Government to continue surveying such a line, but when it was pointed out that many teamsters were making a good living carting by road it was decided instead to suggest a practicable road be surveyed via Parallina.⁹⁸ The discovery and development of the mines at Silverton and Broken Hill meant that a railway line was built by the South Australians in 1886 to the border at Cockburn. In 1888 the Milparinka Progress Committee lobbied the South Australian Government to extend their railway system from Cockburn along the South Australian border to a point adjacent to the Albert Goldfield. This would have put the goldfield within 45 miles of a railway, but by this stage it was clear that the gold would not provide sufficient revenue to justify the expense. At the same time the businessmen of Wilcannia were lobbying the New South Wales Government for a railway connection to Sydney.

Conclusions

Although the reefs of the Albert Goldfield showed early promise their proper testing and development were hindered by a host of difficulties. These included water problems (both lack of sufficient water for processing and problems with pumping out water in the deeper workings), shortages and high cost of explosives and other supplies, drought-related shortages of feed for the horses, difficulties in obtaining firewood for the steam engine, ongoing inadequacies with the primitive crushing and processing equipment, lack of sufficient capital for development, as well as other challenges related to the remoteness of the area. Total recorded gold production from all the reefs to 1906 was 1,456 ozs, valued at around £6,000 for that period.⁹⁹ Total expenditure by the various companies formed to work the reefs exceeded £35,000. This suggests that the main mining was of shareholders funds, with a large part of this consumed by the difficulties inherent in the field and some probably wasted through mismanagement. The miners on the ground were persistent in their faith that the 'Albert' would prove to be a valuable reefing goldfield. Their faith may have been misplaced and certainly the dice were loaded against them. Importantly they were unable to attract the capital needed to conclusively test or properly develop the reefs. In 1902 the mining warden for Milparinka summed up the situation concluding:

After years of bitter experience in contending against the effects of the trying climate, the scarcity of water, the hardships and privations caused by the remoteness from populous centres, and the desert country between, practical miners are still working on undeterred, and firm in the opinion that gold is plentiful in reefs and alluvial in this District, and that capital judiciously expended would justify their faith. For years past no capital has found its way to these parts and the want of it is probably the strongest factor in retarding the progress of the field.¹⁰⁰

The field had been abandoned by the capitalists and eventually the miners gave up hope.

Acknowledgments

My thanks to John Gerritsen, for supplying the historic photograph of the battery at the Pioneer Reef and a survey plan of this site. Also thanks to Kingsley Mills, John Greenfield and Phil Gilmore of the NSW Department of Primary Industries, Broken Hill and Maitland, for discussions on the history and geological aspects of the Warratta area. Staff of the National Library of Australia, Canberra, the State Library of New South Wales, Sydney and the State Library of Victoria, Melbourne assisted with access to information for this article and permission to reproduce some photographs. Also thanks to some of the residents of Milparinka and Tibooburra, particularly George Williams, Ray and Debbie Hotchin for information and site access.

Glossary of some terms used in the text

Costean = trench through soil or overburden to expose the underlying bedrock, reef or lode.

Cross cut = a horizontal underground opening from a shaft to the reef or orebody (hence to cross cut).

Dollying = hand grinding in a dolly pot, a type of steel mortar and pestle.

Drive = a horizontal underground opening, in some cases along the reef or orebody.

Dyke = an intrusive body of igneous rock that cross-cuts the intruded strata or other host rocks.

Hydrothermal = natural hot water commonly at 150-350° C.

Igneous = formed from solidification of molten or partly molten rock (magma below the surface, lava on the surface).

Leader = a mineralised structure, either a narrow vein or fracture with gold, that might lead to more substantial mineralisation.

Lode = a generally tabular mineral deposit in solid rock, commonly related to alteration of the parent rock, rather than in a vein or reef.

Stope = underground opening where the ore is removed (hence stoped or mined from a stope).

Underlay shaft = a sloping or angled shaft, commonly following a reef along its dip (or underlay).

Units

1 troy oz (the standard measure of gold) = 20 dwt = 31.10348 g; 1 dwt = 1.555 g; 1 (long) ton = 1.01605 tonnes; 1 pound = 0.454 kg; 1 inch = 25.4 mm; 1 foot = 0.3048 m; 1 yard = 0.914 m; 1 mile = 1.609 km; 1 (imperial) gallon = 4.5461 litres

Pre-decimal currency

£1 (pound) = 20s (shillings) and 1s = 12d (pennies).

Endnotes

¹ For details on the discovery and historical context see K.G. McQueen, 'A thirsty and confusing diggings: The Albert Goldfield, Milparinka-Tibooburra, north-western NSW', *Journal of Australasian Mining History*, vol. 5, 2007, pp. 67-96.

² 'The Albert Gold District – Report by H.Y.L. Brown', *Town and Country Journal*, 27 August 1881, p. 406; Annual Report of the New South Wales Department of Mines, [hereafter *ARNSWDM*] for 1881, pp. 9, 107-108.

³ *Ibid.*; 'Another Gold Discovery', *Wilcannia Times*, 10 February 1881.

⁴ 'Mines and Mining – The Albert Gold District, report by H.Y.L. Brown', *Town and Country Journal*, 27 August 1881, p. 406.

⁵ 'Mount Browne Diggings', 'Another Gold Discovery', *Wilcannia Times*, 3 March 1881; 'Latest News from Mount Brown Diggings'. *ibid.*, 10 March, 1881; 'The Mount Poole Gold-Fields', *The Adelaide Observer*, 12 March 1881, p. 440; 'Mines and Mining - The Albert Gold District, report of H.Y.L. Brown', *Town and Country Journal*, 27 August 1881, p. 406.

⁶ 'Latest Mining Intelligence', *Wilcannia Times*, 28 April 1881; 'A Tour through the Albert Goldfields by the Raven', *Town and Country Journal*, 6 August 1881, p. 262; 'Mount Browne' *ibid.*, 13 August 1881, p. 310.

⁷ 'The Albert Gold Field District – Extract of report by H.Y.L. Brown', *Wilcannia Times*, 1 September 1881.

⁸ This plant had been made for the Fort Bourke Gold-mining Company Cobar to test their ore. 'Water for Mount Poole', *ibid.*, 21 April 1881, 'A quartz crushing machine', *ibid.*, 23 June 1881.

⁹ 'Public meeting to form a quartz mining company', *ibid.*, 14 July 1881.

¹⁰ 'Preliminary Advertisement – The Mount Browne Quartz Crushing Company Limited', *ibid.*, 11 August 1881.

¹¹ 'The Albert Gold-field', *Ibid.*, 11 August 1881; 'Mount Browne Diggings', *The Argus*, 22 August 1881, p. 6.

¹² 'Advertisement - call for meeting', *ibid.*, 11 August 1881.

¹³ This investor would probably have been William Pearson, who in 1877 was the largest shareholder in the Long Tunnel Mine and who had investments in a number of other mining ventures including the Long Tunnel Extended Mine; R. Paoletti, *The Long Tunnel Extended Gold Mine*, Paoletti's Maps and Videos, Langwarrin, Vic., 2001, p. 5; Adams, J., *Mountain Gold: a history of the Baw Baw and Walhalla counties of the Narracan Shire*, 1980.

¹⁴ 'The Albert Goldfield', *Wilcannia Times*, 18 August 1881; 'The Albert Goldfield' *ibid.*, 1 September 1881; 'The Albert Goldfield', *ibid.*, 8 September 1881.

¹⁵ *ARNSWDM* for 1882, p. 100.

¹⁶ 'Wittabrinna Gold-Mining Company', *Adelaide Observer*, 8 October 1881, p. 14.

-
- ¹⁷ 'The Albert Goldfield', *Wilcannia Times*, 13 October 1881; 'Wittabrinna Gold-Mining Company', *The Adelaide Observer*, 29 October 1881, p. 35.
- ¹⁸ 'Wittabrinna Gold-Mining Company', *ibid.*, 10 December 1881, p. 37.
- ¹⁹ 'Local Intelligence', *Wilcannia Times*, 7 April 1881; 'Phoenix Quartz Mining Company', *The Adelaide Observer*, 24 June 1882, p. 17; 'Wittabrinna South G.M. Co.', *ibid.*, 3 February 1883, p. 29.
- ²⁰ ARNSWDM for 1881, pp. 106-107; 'Deplorable Accounts from Mount Browne', *Town and Country Journal* 25 March 1882, p. 540; 'News from the Colonial fields – Mount Poole', *ibid.*, 22 April 1882, p. 742.
- ²¹ 'Wittabrinna G.M. Co.', *Adelaide Observer*, 29 April 1882, p. 21.
- ²² *Ibid.*, where noted the contract for transporting the machinery to the goldfield had been let to W.R. Wilson at £20 per ton; 'The Wittabrinna Gold-Mining Company', *Adelaide Observer*, 12 November 1881, p. 19.
- ²³ 'Tests of Mount Browne Stone' *Town and Country Journal*, 20 May 1882, p. 934.
- ²⁴ Reports of the Colonial Goldfields – Albert Goldfield', *ibid.*, 12 August 1882, p. 310.
- ²⁵ 'The Miner – Reefing at Mount Browne', *ibid.*, 9 July 1882, p. 214; 'News from the Colonial Goldfields', *ibid.*, 12 August 1882, p. 310.
- ²⁶ 'The Miner – Reefing at Mount Browne', *ibid.*, 9 July 1882, p. 214.
- ²⁷ 'The Miner – Mount Browne', *ibid.*, 16 September 1882, p. 550; 'The Miner – Albert Goldfield', *ibid.*, 27 October 1882, p. 694.
- ²⁸ 'Albert Goldfield', *ibid.*, 27 October 1882, p. 694.
- ²⁹ 'The Albert Gold Fields', *Wilcannia Times*, 7 December 1882.
- ³⁰ 'Mining-Meetings, Wizard Peak G.M. Co.', *Adelaide Observer*, 3 February 1882, p. 29; 'Mining-Meetings, Wittabrinna G.M. Co.', *ibid.*, 5 May, 1883, p. 13.
- ³¹ *Ibid.*
- ³² 'Mining-Meetings, Wittabrinna South G.M. Co.', *Adelaide Observer*, 3 February 1883, p. 29.
- ³³ 'Mining-Meetings, Wizard Peak G.M. Co.', *ibid.*, 3 February 1883, p. 29.
- ³⁴ 'Advertisements' *Wilcannia Times*, 12 October 1882, p. 3.
- ³⁵ It appears that this plant was never completely erected, although it is not clear what happened to it. It may have been sold and moved to another site and some parts may have been used in the various modifications of the Wittabrinna Company plant. See, 'The Albert Gold Fields', *ibid.*, 18 January 1883; 'The Albert Goldfield', *ibid.*, 10 August 1882, p. 3; ARNSWDM for 1883, p. 115; *ibid.*, for 1884, p. 109.
- ³⁶ 'Mount Browne Reefs', *Wilcannia Times*, 24 May 1883; 'The Albert Gold-fields', *Adelaide Observer*, 9 June 1883, p. 34.
- ³⁷ 'Albert Gold-field', *ibid.*, 21 April 1883, p. 8; 'Mount Browne Reefs', *Wilcannia Times*, 24 May 1883.
- ³⁸ 'The Albert Goldfield – Report by W.H.J. Slee, Inspector of Mines', *ibid.*, 10 August 1883, p. 3.
- ³⁹ 'Mining', *ibid.*, 10 September 1883, p. 2.
- ⁴⁰ Mining, Wittabrinna gold-mining Company', *Adelaide Observer*, 3 May 1884, p. 13.
- ⁴¹ *Ibid.*
- ⁴² 'Albert Gold-Fields', *ibid.*, 28 June 1884, p. 37.
- ⁴³ 'The Albert Gold-Fields', *Wilcannia Times*, 18 June 1884, p. 2.
- ⁴⁴ 'Albert Goldfields', *Adelaide Observer*, 20 September 1884, p. 32.
- ⁴⁵ 'Company Meetings – Wizard Peak G.M. Co.', *ibid.*, 14 June 1884, p. 28.
- ⁴⁶ 'Advertisement of Auction', *Wilcannia Times*, 5 November 1884, p. 3.
- ⁴⁷ ARNSWDM for 1885, p. 108.
- ⁴⁸ *Ibid.*, for 1884, p. 108.
- ⁴⁹ *Ibid.*, for 1885, p. 103.
- ⁵⁰ *Ibid.*, for 1886, p. 103.
- ⁵¹ *Ibid.*, for 1887, p. 106.
- ⁵² 'The Albert Gold Fields', *Wilcannia Times*, 3 February 1886, p. 2; *Ibid.*, 15 February 1886 p. 2.
- ⁵³ 'Mount Browne', *Town and Country Journal*, 24 July 1886, p. 180; 'Milparinka', *ibid.*, 11 September 1886, p. 544.
- ⁵⁴ ARNSWDM for 1887, pp. 106-107; *ibid.*, for 1888, p. 120.
- ⁵⁵ 'The Reefs', *Wilcannia Times*, 20 April 1888, p. 5; 'Milparinka Quartz Mining Co.', *ibid.*, 27 April 1888, p. 3; 'Latest Mining News – Wilcannia', *Town and Country Journal*, 21 April 1888, p. 805; 'The Reefs', *Wilcannia Times*, 20 April 1888, p. 5.
- ⁵⁶ 'Intercolonial News – Mount Brown', *Town and Country Journal*, 28 April 1888, p. 857.
- ⁵⁷ 'Intercolonial News – Tibooburra', *ibid.*, 5 May 1888, p. 908; 'Intercolonial News – Mount Brown', *ibid.*, 26 May 1888, p. 1065.
- ⁵⁸ *Ibid.*, 17 July 1888, p. 24.

-
- ⁵⁹ ARNSWDM for 1888, p. 120.
- ⁶⁰ *Ibid.*, for 1889, p. 124.
- ⁶¹ ‘Milparinka Quartz Mining Co.’, *Wilcannia Times*, 27 July 1888, p. 3; ‘The Albert Gold Fields’, *ibid.*, 21 September 1888, p. 2; ‘Intercolonial News – Milparinka’, *Town and Country Journal*, 29 September 1888, p. 648.
- ⁶² ARNSWDM for 1889, p. 124.
- ⁶³ *Ibid.*, for 1887, p. 106; *ibid.*, for 1890, p. 137.
- ⁶⁴ In 1881 Charles Fartiere had owned a photography business in Wilcannia. See, ‘Photography’, *Wilcannia Times*, 30 June 1881.
- ⁶⁵ ‘Nolan’s Tunnel’, *Tibooburra Telegraph*, 10 June 1890, p. 2.
- ⁶⁶ ‘The Miner – Tibooburra’, *Town and Country Journal*, 27 September 1890, p. 24.
- ⁶⁷ ‘Reefs’, *Tibooburra Telegraph*, 13 May 1890; ‘Advertisement for sale of one-twentieth share’, *ibid.*, 1 July 1890.
- ⁶⁸ ARNSWDM for 1891, pp. 138-139; *ibid.*, for 1892, p. 21.
- ⁶⁹ *Ibid.*, for 1894, p. 94; *ibid.*, for 1895, p. 30.
- ⁷⁰ ‘Milparinka’, *Town and Country Journal*, 2 March 1895, p. 26; ‘Mining at Milparinka’, *ibid.*, 9 March 1895, p. 27.
- ⁷¹ ARNSWDM for 1895, pp. 82-83.
- ⁷² *Ibid.*
- ⁷³ *Ibid.*, p. 30.
- ⁷⁴ *Ibid.*, for 1896, p. 37.
- ⁷⁵ *Ibid.*, for 1897, p. 51.
- ⁷⁶ *Ibid.*, for 1898, p. 55.
- ⁷⁷ *Ibid.*, for 1899, p. 48.
- ⁷⁸ *Ibid.*, for 1901, p. 33.
- ⁷⁹ *Ibid.*, for 1902, p. 13.
- ⁸⁰ *Ibid.*, for 1903, p. 11.
- ⁸¹ *Ibid.*, for 1904, p. 11; *ibid.*, for 1905, p. 11; *ibid.*, for 1907, p. 13.
- ⁸² *Ibid.*, for 1910, p. 12.
- ⁸³ B.P. Thomson and H.F. King, *Geological Reconnaissance of Koonenberry and Tibooburra-Milparinka Districts*, Geological Survey of NSW Open File Report GS 1952/084, 1952, 15 pp.
- ⁸⁴ B. Jackaman and L. Koncek, *Assessment of the gold prospects in the Milparinka-Tibooburra district*, Geological Survey of New South Wales, Open File Report GS 1974/027, 1974, 17 pp.
- ⁸⁵ *Final exploration report to May 1982*, Geological Survey of NSW Open File Report GS 1982/386, 22 pp.
- ⁸⁶ Proto Resources and Investments Ltd, *Annual Report for 2007*, pp. 13-17.
- ⁸⁷ W.H.J. Slee, *Report of Chief Inspector of Mines*, ARNSWDM for 1895, p. 83; Jackaman and Koncek, *Assessment of the gold prospects*, 17 pp.; K. Mills, pers. comm., 2008.
- ⁸⁸ P. Owen, *Final exploration report to May 1982*, Geological Survey of NSW Open File Report GS 1982/386, 1982, pp. 10-11.
- ⁸⁹ Proto Resources and Investments Ltd Annual Report for 2007, pp. 13-17.
- ⁹⁰ ‘The Albert Gold-Fields’, *Adelaide Observer*, 9 June 1883, p. 34.
- ⁹¹ ‘The Albert Gold-Fields’, *ibid.*, 12 May 1883, p. 7.
- ⁹² ‘Mount Poole Gold-field’, *ibid.*, 5 March 1881, p. 412; ‘Miscellaneous’, *Wilcannia Times*, 17 March 1881; ‘Miscellaneous’, *ibid.*, 24 March 1881; ‘Mount Browne Goldfields’, *Town and Country Journal*, 23 April 1881, p. 790.
- ⁹³ ‘Local Intelligence’, *Wilcannia Times*, 7 April 1881. Walter Sully went on to become a well-known storekeeper at Silverton in 1883 and at Purnamoota in the Barrier Ranges.
- ⁹⁴ Geoffrey Blainey, *The Rise of Broken Hill*, McMillan, Melbourne, 1968, pp. 39-40.
- ⁹⁵ ‘Mount Browne Requirements’, *Adelaide Observer*, 25 June 1881, p. 1126.
- ⁹⁶ ‘The Albert Gold Fields’, *Wilcannia Times*, 23 June 1881.
- ⁹⁷ ‘Mount Browne Diggings’, *Adelaide Observer*, 9 July 1881, p. 40.
- ⁹⁸ ‘Public Meeting at Hawker’, *ibid.*, 6 May 1882, p. 32.
- ⁹⁹ ARNSWDM for 1883-1906.
- ¹⁰⁰ *Ibid.*, for 1901, p. 33.