

Chapter four - Smelting operations

Introduction

Once the ore had been extracted it then had to be treated to such an extent that it could readily be sold on the open market. There were a number of associated difficulties in the smelting process. First, there was the variable nature of the ores. Not only were there different types of ores that required differing methods of treatment, but there were also varying degrees of richness of silver/lead which meant decisions had to be made regarding the "mix" of high and low grade ores to be smelted. By using a mixture of high and low grade ores the life of the mine could be extended. Second was the problem of extracting the highest possible percentage of silver/lead from the ore, with as little as possible being lost in the tailings. Third, the silver/lead ore often combined with other minerals (such as zinc) and ways had to be found to separate economically the minerals into their constituent parts, for silver was, for the most part, an associated metal.¹

These were all structural factors which impacted upon managerial decision making. Choices were always available regarding a particular course of action, but such choices were not determined either by the nature of the ore or the smelting technology available. Certainly, the structure of the ore bodies did provide constraints, but it also enabled choices. As mentioned above the nature of the ore was such that it could be "mixed" in various proportions depending upon what outcomes were required. For

¹ Davies, D.C., (1880), A treatise on metalliferous minerals and mining, London, p. 289.

example, for immediate short term gain or with a longer view in mind. This was a conscious decision taken by the board of directors. Why they chose one alternative over another is not clear. Such a choice may have been as simple as wanting to continue “working” rather than want to live the life of a monied gentleman. Unfortunately, extant records do not reveal the reasons why the directors chose the course they did. What is clear is that they did have a number of alternatives from which to choose. The alternative they chose was one that did not enrich them to the extent they might have been, at least initially. This chapter also demonstrates another step in the process of transforming the silver and lead ore into a marketable product. Unless the output of the mine could be converted into an economically viable product, then any further or future development of the Company was very questionable.

As was the case with mining, there was only a limited amount of expertise available in Australia to smelt the silver/lead/zinc ore into a marketable product. Smelting experts were imported from America due to the earlier discovery and development of the Comstock silver lode. Initial smelting was, however, undertaken by Australian smelters with no direct experience of developments in America. The first commercial batch of ore (a total of 49 tons 6 cwt) from the mine of the Company was smelted in Melbourne in 1885 by the Intercolonial Smelting and Reducing Company.² The general manager at this time, Jamieson, writing later in 1898, was convinced that this first smelting was highly inefficient, with up to a third of the silver being lost in the smelting process.³ However, prior to discussing in detail the smelting operations of the Company, it is first necessary to discuss briefly the nature of the ores to be

² Reports and Statements of Account, figure from Mining Working Account, 1/12/1885-31/5/1885, half year ending 15/12/1885, BHPA/PE30/ , p. 12.

smelted, and the various processes adopted in rendering the ore into a marketable product. This is necessary as already mentioned above the smelting of ores was a complex process which involved a range of choices. Once this has been done, then there will be a more detailed discussion of the progress made by the Company in smelting and refining the ore from the mine. Another factor which needs to be kept in mind is the discussion of the history of mining and smelting, as outlined in Chapter three. As with mining techniques, smelting techniques also came with a history, and this history was expressed through the actions and experience of those in charge of the mining and smelting operations of the Company. The silver mining area with the most recent history embedded in experience was the United States of America. For mining techniques, the source of such experience was the Comstock lode in Nevada; for smelting techniques it was the state of Colorado.

The nature of the ore⁴

As early as 1886 there were indications that the nature of the ore in the mine would change as the mine was developed to greater depths.⁵ It was also known early in the life of the mine that certain types of ore were more expensive to treat than others. For example, kaolin ore required a great deal of fluxing and was therefore more expensive to treat than other ores.⁶ There was never any degree of certainty in terms of the

³ Jamieson to Dickenson, 15/3/1898, BHPA A18/6, p. 4.

⁴ For a fuller (and more technical) discussion of the nature of the ore in the Broken Hill mine, see Jamieson, M.B., and Howell J., (1892/1893), *Mining and ore treatment at Broken Hill, New South Wales*, Minutes of proceedings of the Institute of Civil Engineers, pp. 116-182. and Jaquet, J.B., (1894), Geology of the Broken Hill Lode and Barrier Ranges Mineral Field, New South Wales, Sydney.

⁵ Reports and Statements of Account, Half year ending 30/11/1886, BHPA/PE30/1, p. 25.

⁶ Reports and Statements of Account, Half year ending 31/5/1887, BHPA/PE30/1, p. 22.

quantity or quality of the ore available for smelting. Decisions had to be made based on what was likely to be found, rather than what was being found. The main reason for this uncertainty was a variable amount of silver per ton of ore. For example, iron ore could contain between 22 to 160 ounces per ton; carbonate of lead from 7 to 100 ounces per ton; kaolin 12 to 700 ounces per ton; garnet rock 8 to 70 ounces per ton and sulphide ore 7 to 80 ounces per ton.⁷ There was then the question of what ratios of the various ores would be used to produce bullion. Choices had to be made, as there were a number of different options available, but these choices were constrained and enabled, by the physical structures of the ores, and the types of technology available to treat the ores, as will become apparent during the following discussion.

Jaquet⁸ classed the ore of the lode into two great divisions - sulphide ores and oxidised ores - and noted that each division could further be subdivided. The classification system that Jaquet used was:

sulphide ores which consisted of primary (or ordinary) sulphide ore; secondary sulphide ore, argenteriferous garnet-quartz rock impregnated with silver ore.

oxidised ores which consisted of mangiferous iron ore; carbonate of lead ore; dry high grade ore; dry low grade ore.

⁷ Jamieson, M.B., and Howell, J., (1892/3), Mining and ore treatment at Broken Hill, New South Wales, Minutes of proceedings of the Institution of Civil Engineers, p. 149.

⁸ Jaquet, J.B., (1894), The geology of the Broken Hill Lode and Barrier Ranges Mineral Field, New South Wales, Sydney.

The oxidised ores could be treated simply by the addition of the appropriate fluxes of ironstone and limestone with coke to make a fusible mixture in the smelting furnaces. Sulphide ore, on the other hand, could not be directly smelted in the furnaces as it combined with the iron in the flux and carried away a substantial quantity of lead and silver.⁹ Thus it was much easier to turn the oxidised ore into a marketable product than the sulphide ore. Such was the extent of the oxidised ore that it was not until the late 1880's that the Company had to turn its attention to solving what became known as the "sulphide problem". The solving of this problem produced another difficulty for the Company. As will be discussed below, a solution to the "sulphide problem" was the separation of zinc from the ore. However, in separating the zinc from the sulphide ore, it "took" with it a quantity of silver. This resulted in large dumps of zinc tailings with its locked up silver which, while theoretically an asset, was virtually worthless until some means was discovered to release the silver from the zinc. The basic method used in solving the "sulphide problem", the result of experiments developed and refined by the Company (and other mining companies), was a method of gravity concentration with water, which allowed sufficient lead and silver to be recovered and thus the sulphide ore could be profitably worked.¹⁰

⁹ Horwood, E.J. (1928), Mining and treatment of ore at the Broken Hill Proprietary Mine, The BHP Recreation Review, 5/5, 25 April, BHPA/PE32/4, pp. 8-9. Horwood had been a member of the managerial staff of the Company since 1888.

¹⁰ Horwood, E.J., (1925), Notes descriptive of the Broken Hill Mine and its operations past and present, The BHP Recreation Review, 2/9, 22 October, BHPA/PE32/3, p. 8. For more technical descriptions of the various ores and treatment see Clark, D., (1904), Australian mining and metallurgy, Melbourne, pp. 369-416; Elprat, G.D., (1906), Ore treatment at the Broken Hill Proprietary mine, Proceedings of Australian Institute of Mining and Metallurgy, XII, pp. 1-29; Henderson, E.T., (1928), The history of ore treatment processes in Broken Hill, Proceedings of Australian Institute of Mining and Metallurgy, 72, pp. 99-112; Low, V.F.S., (1905), Concentration of silver-lead ores, Proceedings of Australian Institute of Mining and Metallurgy, X, pp. 197-212; Members of the Broken Hill Branch of the Australasian Institute of Mining and Metallurgy (1930), The development of processes for the treatment of crude ore, accumulated dumps of tailings and slimes at Broken Hill, New South Wales, Proceedings of Australian Institute of Mining and Metallurgy, 80, pp. 379-443; Sewell, F.W., (1907), The mining and metallurgy of copper, silver, lead and zinc, Proceedings of the Australian Institute of Mining and Metallurgy, XII, pp. 105-130.

Treatment of the ore

By the time some indication of the possibilities of the Broken Hill ore deposit was realised, the treatment of ore had already been carried out in nearby Silverton, the site of significant silver discoveries in 1883. The Barrier Ranges Silver Mining Association (who owned a number of mines at Silverton) had carried out successful smelting trials of silver ore in Melbourne.¹¹ The first smelting of ore on the field was at the Pinnacles mine at Silverton.¹² The patentee of the water jacket smelter, Mr. La Monte, had also addressed a large crowd at a public meeting held in Silverton on 8 July, 1885 regarding the smelting of silver ores.¹³ This meant that when the Company finally discovered payable ore, there already existed on the silver fields some knowledge of the smelting of silver ore upon which the Company could draw. This did not mean there were still no problems to be overcome.

Some idea of the scope of the problems facing the board of directors and senior managers was revealed in the Report of the Mining Warden at Silverton. Reporting in 1885 on developments in 1884, he stated that: "Until quite recently silver ores were unknown to the great bulk of our miners, and the treatment of silver ores in bulk was regarded as an insurmountable difficulty."¹⁴ In the same report, fuel, for smelting purposes, was also raised as a problem.¹⁵ By the time ore from the mine was of sufficient quantity and quality to be smelted these "insurmountable difficulties" appeared to have been overcome, with the first batch of ore having been treated in

¹¹ Silver Age, 20/12/1884.

¹² Silver Age, 4/7/1885.

¹³ Silver Age, 11/7/1885.

¹⁴ 1884 Annual Report of the Department of Mines Sydney, 1885, p. 35.

Melbourne. Until the Company had its own smelters operating, ore was smelted at the Day Dream Smelter at Silverton.¹⁶ When the smelting of silver commenced, treatment processes were aimed mainly at recovering silver from the ore. Lead was simply regarded as a by product and "...its recovery, except in so far as it effected silver recovery, was of minor importance."¹⁷ By the mid 1890s, this position was reversed and the production of lead produced more revenue for the Company than that produced from silver.

The board of the Company was obviously concerned about turning the ore into a marketable product as two directors were authorised to make overseas trips to investigate different facets of smelting. Jamieson (an ex-government surveyor and the first general manager of an antecedent organisation) was authorised on 1 March, 1886 to visit America and Europe to make enquiries about smelting operations.¹⁸ Jamieson must have first travelled to Europe as in June the board approved of W.R. Wilson (who was also a director of other mining companies based at Silverton) visiting America to obtain the proper appliances to reduce dry ores.¹⁹ Jamieson wrote to Knox (the secretary) in July, 1886 pointing out "...we don't [sic] yet know much about extracting the silver."²⁰

¹⁵ 1884 Annual Report of the Department of Mines, Sydney, 1885, p. 35.

¹⁶ Jamieson to Dickenson, 15/3/1898, BHPA/A18/6, p. 4.

¹⁷ Henderson, E.T., (1928), The history of ore treatment processes in Broken Hill, Proceedings of the Australian Institute of Mining and Metallurgy, 72, p. 99.

¹⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 1/3/1886, BHPA/S1/1, p. 102.

¹⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 7/6/1886, BHPA/S1/1, p. 149.

²⁰ Jamieson to Knox, 23/7/1886, BHPA/A18/6.

When Wilson, the only director with any practical mining experience, went to the United States of America in 1886 he was accompanied by 45 bags of silver/lead ore.²¹ The purpose of taking the ore with him was, in light of the inexperience within Australia with the smelting of silver/lead ores, that the Company wished to consult experts in America regarding the best way of treating the ore. These tests carried out in America proved successful as the board received a telegram from Wilson, dated 15 November, 1886, advising that he would reach Sydney on Thursday. Included in the telegram was also advice that the ore tests had been completed and 98% saved with a simple process.²² Two significant outcomes of Wilson's trip²³ were, first, the recommendation of the employment of H. H. Schlapp as metallurgist to the Company (which was later accepted by the board) and second, meeting W. R. Patton, who would later be offered the position of general manager.²⁴ An additional outcome was that "[a] very great amount of information has also been acquired with regard to the best processes of silver reduction other than smelting..."²⁵

Smelting operations of the Company

The Company commenced its own smelting operations at the mine site at Broken Hill on 28 May, 1886.²⁶ By 7 June, 1887 five (5) furnaces were operating with an overall

²¹ Union Steamship Company of New Zealand Ltd. waybill dated 9/9/1886, BHPA/A18/1.

²² Minutes of board meeting, 15/11/1886, BHPA/S1/1, p. 237; Statements of Account, half year ending 30/11/1886, where the following entry appears: Mr. Wilson's Expenses to America, including Cost of Ore Tests, Experiments, and Charges £552 14 2. BHPA/PE30/1, p. 52.

²³ Where he had visited "...most of the large mines in America", Reports and Statements of Accounts, half year ending 30/11/1886, BHPA/PE30/1, p. 3.

²⁴ These appointments will be discussed in a later section.

²⁵ Reports and Statements of Account, half year ending 30/11/1886, BHPA/PE30/1, p. 8.

²⁶ There is some confusion surrounding the exact date smelting was started. In the Reports and Statements of Account, half year ending 31/5/1887, two dates differing from the above are to be found, the 28/4/1886 (p. 22) and the 6/5/1886 (p. 14). However, as these reports are prepared some weeks prior to the actual meeting of the shareholders, the above date is likely to be the most accurate, as this date was given to the shareholders at the actual meeting during the address by the chairman. See chairman's address to shareholders, 30/6/1886, BHPA/PE30/1, p. 7. The Silver Age reported on 8/5/1886 that the smelters were first fired on 6/5/1886. While this date would be accurate, it only refers to the first firing, not the actual start of smelting.

capacity of 5,000 tons of ore per month. Consideration was also being given to an additional further three (3) furnaces of 10,000 tons of ore per month capacity being installed at the mine.²⁷ As at the 31 May, 1888 the Company was operating three (3) by eighty ton and five (5) by thirty ton furnaces. The total running costs per ton of ore including labour, fuel, flux and repairs, was 32/2 per ton for the large furnaces; the smaller furnaces, 36/5 per ton.²⁸ The metallurgist also pointed out that the different types of ores required different treatment. For example, kaolin ore required a great deal of fluxing, and, as a consequence, was more expensive to treat than other types of ores.²⁹ The newly arrived general manager, W. H. Patton, recommended that a proper system of concentration be initiated without delay. Hand picking to remove low grade ore was initially successful, but as more and more furnaces were erected, the necessity for greater amounts of concentrated ore was required. This meant mechanical methods of concentration were required.³⁰ While such a system required water, the general manager considered that the water supply was "...satisfactory and ample." Due to the highly siliceous nature of the ore, it could not under present arrangements be properly treated and as a consequence operations were temporarily suspended until the completion of a suitable concentration plant.³¹ The concentration or ore dressing plant was reported to be operating satisfactorily in May, 1889.³²

The metallurgist advised the board on 7 June, 1888 that the new furnaces had commenced operations on 18 February, 22 February and 23 February of that year. He also noted that during July and August water supplies were limited. Due to constant

²⁷ Reports and Statements of Account, half year ending 31/5/1887, BHPA/PE30/1, p. 22.

²⁸ Reports and Statements of Account, half year ending 31/5/1888, BHPA/PE30/1, p. 25.

²⁹ Reports and Statements of Account, half year ending 31/5/1887, BHPA/PE30/1, p. 22.

³⁰ Henderson, E.T., (1928), The history of ore treatment processes in Broken Hill, Proceedings of the Australian Institute of Mining and Metallurgy, 72, pp. 100-101.

³¹ Reports and Statements of Account, half year ending 30/11/1887, BHPA/PE30/1, p. 8; p. 19. The change Patton recommended was to move from hand sorting of ore to remove rubbish rock to a mechanical system.

³² Reports and Statements of Account, half year ending 31/5/1889, BHPA/PE30/2, p. 8.

re-use in the furnaces the water became heavily mineralised which proved destructive to the furnace water jackets, culminating on the 15 August, when all but one furnace had to be shut down for a short time. With an increased supply of water from the mine in September, six of the furnaces were back in blast and by the 3 October all the furnaces were once again working.³³ This was not the only problem he encountered with the operation of the smelters. Another problem was the quality of coke supplied for use in smelting operations. It was noted in 1889 that colonial supplies were insufficient and the quality, generally, was not satisfactory for the requirements of the Company. This meant that coke had to be imported from England.³⁴

The board also decided that they would build their own desilvering works as it would enable the Company to produce fine silver and soft lead, ready for the most favourable market that was on offer. Such a decision would also render the Company independent of the European refineries where the bullion produced by the mine smelters was sent for final refining.³⁵ The board decided that Port Pirie would be the site selected for the erection of a refinery works and coke bins, as well as providing the port of shipment for timber to be used in the mine. Port Adelaide had been considered, but rejected mainly due to the break of gauge of the rail line at Terowie. An associated problem with Port Adelaide was that no space could be found on the existing wharves that did not involve considerable filling up, which would involve "...much loss of time and large outlay."³⁶ The first parcel of refined silver from the Port Pirie works was offered for sale on the 8 May, 1889.³⁷

³³ Reports and Statements of Account, half year ending 31/5/1888, BHPA/PE30/1, pp. 24-26.

³⁴ Reports and Statements of Account, half year ending 31/5/1889, BHPA/PE30/2, p. 9.

³⁵ Reports and Statements of Account, half year ending 31/5/1888, BHPA/PE30/1, p. 13.

³⁶ Reports and Statements of Account, half year ending 30/11/1888, BHPA/PE30/1, p. 8.

³⁷ Reports and Statements of Account, half year ending 31/5/1890, BHPA/PE30/2, p. 10.

But already problems were being anticipated in the treatment of the ores being mined. As the exploratory shafts were sunk deeper into the lode, the nature of the ore changed from oxidised ores, which, while not without problems, were simple enough to treat, to sulphide ores which presented a whole new set of problems. The general manager, reporting to the half yearly meeting of 31 May, 1887 pointed out that:

The question of treating sulphide ores from below water level is one that must soon engage attention...Extensive experiments in concentration should commence as early as possible, and carried on vigorously, as much of the future success of the mine depends upon this proposition.³⁸

While problems were being anticipated with the treatment of sulphide ores, new plant was being installed to deal with difficulties being experienced with the existing ore. It had been found necessary to "dress" the ore [that is. remove the waste rock] as portion of the ore of the mine was "...entirely unfit for smelting in its crude state, owing to the amount of silica (80%) which it contains."³⁹ A gravity concentrating mill was erected in July, 1889 in order to concentrate lower grade lead carbonate ores.⁴⁰

As the mine was developed so also were techniques being developed to treat the ores. The chairman advised the shareholders on 22 January, 1890 that a leaching plant had been established at the mine which meant that the silver and lead remaining in the

³⁸ Reports and Statements of Account, half year ending 31/5/1887, BHPA/PE30/1, p. 14.

³⁹ Supplementary report by general manager to shareholder's meeting, Reports and Statements of Account, 18/7/1889, BHPA/PE30/2, p. 3.

⁴⁰ Members of the Broken Hill Branch of the Australasian Institute of Mining and Metallurgy (1930), The development of processes for the treatment of crude ore, accumulated dumps of tailings and slimes at Broken Hill, New South Wales, Proceedings of the Australian Institute of Mining and Metallurgy, 80, p. 384.

tailings could now be extracted without going to the smelters.⁴¹ It also meant that low grade ferruginous kaolin ore which could not previously be profitably smelted could now be treated.⁴² The board, in 1890, had also commenced investigation of making their own coke for use in the smelting processes as 500 tons of coke per week was being used for this purpose.⁴³

The "sulphide problem", first raised in 1887, was again raised in 1890 with the directors advising shareholders:

The General Manager is now devoting much time and anxious thought to this subject [treating the sulphide ores] and is experimenting in various ways in order to determine the best mode of treatment.⁴⁴

Reports of the general manager and the metallurgist for the half year ending 31 May, 1890 provided details of the smelting plant currently being used and also of that being considered. There was now a total of ten furnaces operating, but the five original furnaces (of 30 ton capacity) were "...pretty well worn out...[and] not be needed much longer, and will be torn down, and eight new 80 ton capacity furnaces substituted; work on the latter is well advanced." An ore concentrating plant (used to dress the ore) had been erected but "[t]he results have not been altogether satisfactory, and changes in the machinery and treatment of the ores are under consideration." An amalgamation plant was being erected to treat low grade kaolin and siliceous iron ores

⁴¹ Chairman's address to shareholders, Minutes of meeting of shareholders, 22/1/1890, BHPA/S3/1.

⁴² Reports and Statements of Account, half year ending 30/11/1889, BHPA/PE30/2, p. 8.

⁴³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 5/5/1890, BHPA/S1/13, p. 500.

⁴⁴ Reports and Statements of Account, half year ending 31/5/1890, BHPA/PE30/2, p. 10.

that were currently "...valueless for smelting."⁴⁵ The leaching plant (also called a lixiviation works) results had "...so far, been somewhat variable, but it is expected that better results will be obtained shortly." The expectations were misplaced. The chairman reported to a meeting of shareholders on the 29 January, 1891 that the results were certainly varied, but that "...they have generally varied in the wrong direction." The machinery that was being used was being pulled out, and an alternative design was to be used. According to the chairman:

Leaching is always a metallurgical worry. If one thing is not the matter something else is. In our case we find that considerable silver value is enclosed in the small particles of quartz and ironstone, and that it is impossible for the solution, as it is called, to get at this silver.

Consequently, it passes through the vats in its original state and is lost...We have had endless trouble with this leaching plant, and I am afraid we cannot look for much from it at any time.⁴⁶

A plant to refine the bullion into silver/lead in order to enable the production of fine silver, fit for coinage and the production of pure soft lead had been completed during December, 1889 at Port Pirie which meant that the bullion no longer had to be sent overseas for refining.⁴⁷ Also, as a result of a series of experiments that had been conducted in the middle of 1889, a lixiviation plant (which would treat some of the low grade ores from the mine, as well as tailings from the concentrator plant) was

⁴⁵ Reports and Statements of Account, half year ending 30/11/1890, BHPA/PE30/3, p. 23.

⁴⁶ Chairman's address to shareholders, Minutes of meeting of shareholders, 29/1/1891, BHPA/S3/1.

⁴⁷ Reports and Statements of Account, half year ending 31/5/1890, BHPA/PE30/2, pp. 16-17; p. 34.

being erected.⁴⁸ In 1891 the Company was running twenty (20) furnaces, fifteen (15) at the mine and five (5) at Port Pirie.⁴⁹ Some idea of the extent of the mining and smelting operations can be gained by the amount of materials being used. The daily requirements, as at 13/11/1890 were ten trucks of coal (to provide fuel for all the steam engines), eleven trucks of timber (for use in the mine), twenty six trucks of coke (fuel for the smelters) and forty trucks of limestone (for use as a fluxing agent in smelting).⁵⁰

The question of the nature of the ore being smelted was raised on a number of occasions in 1890. The first time was at a half yearly meeting of shareholders on 24 July, 1890, when the chairman advised the shareholders that "...[i]t has been pretty freely stated that we have been 'gutting' the mine; that is to say, that we have been taking the best of the ore out and leaving that of inferior quality." He denied this and provided details of the average percentages of ore taken from the different shafts at the mine as follows: Rasp's shaft - 21%, Macgregor's shaft - 22%, Jamieson's shaft - 15%, McBryde's shaft - 21% while concentrates made up 15%.⁵¹ The matter was again raised in the Reports and Statements of Accounts for the half year ending 30 November, 1890 when it was again pointed out that at one end of the mining operations the ore was low in silver and high in lead, while at the other end it was high in silver and low in lead. By getting the mixture of ore in the appropriate proportions the cost of smelting was reduced as the various fluxing agents (lead ore,

⁴⁸ Reports and Statements of Account, half year ending 31 May, 1890, BHPA/PE30/2, p. 34.

⁴⁹ Chairman's address to shareholders, half yearly meeting held on 28/1/1892, BHPA/S3/1.

⁵⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 13/11/1890, BHPA/S1/5, p. 252.

⁵¹ Chairman's address to shareholders, half yearly meeting held on 24 July, 1890, BHPA/PE30/2, p. 5.

iron ore and limestone being the major ones) that were required were less than if only ore high in silver was smelted.⁵²

But the creep (or movements) of the ground in the underground workings could also disrupt smelting operations by restricting the production of ore. In January, 1892 the chairman reported that as a consequence of movements in the mine there had been a shortage of lead. According to the chairman "...when lead is scarce bad smelting follows, and slow smelting also..."⁵³ However, not only was it necessary to get the "mix" of ores right, but there were also considerable quantities of zinc in the ore of which "...not a ton is saved from those ores carrying it in important quantities."⁵⁴ This locked up zinc would later play a significant role in the fortunes of the Company.

Smelting and refining capacity was further increased in 1892 when the British Broken Hill Proprietary Company offered to sell to the Company its smelting establishment at Port Pirie for £26,000. After receiving reports from the general manager and the refinery superintendent the shareholders, at an extraordinary meeting on 30 June, 1892 authorised the purchase of the smelting works etc at Port Pirie for £26,000.⁵⁵

While this expansion of refining capacity was taking place, the problem of the sulphide ores had still not been solved. The general manager reported to a meeting of shareholders on 27 July, 1892 that:

⁵² Reports and Statements of Account, half year ending 30/11/1890, BHPA/PE30/3, pp. 21-22.

⁵³ Chairman's address to meeting of shareholders, 28/1/1892, Minutes of meetings of shareholders, BHPA/S3/1.

⁵⁴ Leibus, A. (1892), Anniversary address, Journal and Proceedings of the Royal Society of New South Wales, 25, pp. 44-45.

They [sulphide ores] cut a very important figure in the future of your Mine, and it is time something definite was decided upon with regard to working them.⁵⁶

This view was echoed by the mining warden at Broken Hill when reporting on developments in 1892. He pointed out that:

No effort is being spared to solve the problem how to treat profitably our sulphide ores, and upon the solution of that problem to a great extent depends the future of silver mining in this Colony.⁵⁷

At the same meeting the chairman reported that the metallurgist was currently overseas making enquiries into methods of treating sulphide ores in Europe and America and that "...your directors are very hopeful that he will bring back a process with which we will be able to treat these sulphide ores profitably."⁵⁸

The matter also of the increasing use of iron ore in smelting was brought to the attention of the board by the metallurgist on 28 September, 1894 and the general manager was asked to report on this matter.⁵⁹ Meanwhile, what had become known as

⁵⁵ Minutes of meetings of directors, 24/3/1892, pp. 486-487; 1/4/1892, pp. 503-504; 18/5/1892, p. 15, BHPA/S1/6; Minutes of extraordinary meeting of shareholders, 30/6/1892, BHPA/S3/1.

⁵⁶ Howell to a meeting of shareholders, minutes of meeting of shareholders, 27/7/1892, BHPA/S3/1.

⁵⁷ 1892 Annual Report of the Department of Mines, (1893), Sydney, p. 39.

⁵⁸ Chairman to a meeting of Shareholders, minutes of a meeting of shareholders, 27/7/1892, BHPA/S3/1.

⁵⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/9/1894, BHPA/S1/9, pp. 194-195. With the benefit of hindsight, this was one of the most significant decisions taken by the board, as will be subsequently discussed, this decision led to the discovery of the vast iron ore deposits which facilitated the move of the Company into the iron and steel industry in the early part of the twentieth century.

the "sulphide problem" had still not been solved by the end of 1895. The chairman reported to a meeting of shareholders on 31/1/1895 that "...we have been for some time endeavouring to treat the sulphides, but whether we shall be successful or not, I would not at the present time like to say."⁶⁰ Overseas experts were also engaged in an effort to solve the sulphide problem. Dr. Schnabel from Germany was recruited by all the established mining companies at Broken Hill in an effort to solve this problem.⁶¹ However, the method advocated by him (roasting the ore, and then subsequently treating it with chemicals) was not economically viable.⁶²

The question of the supply of iron ore was again returned to at the board meeting on 25 April, 1895 when the general manager was asked for a full report on the supplies of iron ore at both the mine and Port Pirie.⁶³ A report was received from the metallurgist at the board meeting of 23 May, 1895 about the iron deposits of the Iron Monarch Company, near False Bay in South Australia. Details of the leases held by that company were obtained by the chairman and it was arranged for a further report from the general manager, while the chairman would also make additional enquiries.⁶⁴ Problems were also being experienced with the limestone being used for fluxing purposes. Good stone had been combined with bad stone and, as a result, notice of

⁶⁰ Chairman's address to shareholders, minutes of a meeting of shareholders, 31/1/1895, BHPA/S3/2.

⁶¹ Hebbard, J., (1913), Evolution of mineral separation process on Central mine, Proceedings of Australian Institute of Mining and Metallurgy, 10, p. 76.

⁶² Horwood, E.J. (1925), Notes descriptive of the Broken Hill Mine and its operations past and present, The BHP Recreation Review, 2/9, 21 October, BHPA/PE32/3, p. 8.

⁶³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 25/4/1895, BHPA/S1/9, pp. 488-489.

⁶⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/5/1895, BHPA/S1/9, p. 530. The chairman at this time was John Darling, who resided in Adelaide and had good connections in both the business and political worlds of that city.

the contract being terminated was given while exploration for an alternative source of limestone was carried out.⁶⁵

The chairman was able to advise the shareholders that since the 4 July, 1894 all bullion had been treated at the refinery at Port Pirie and there was no longer any bullion being sent to London for refining.⁶⁶

The general manager also advised the secretary on the 3 October, 1895 that he was purchasing large amounts of iron ore to use as flux and, six months later he sought, and obtained, the permission of the board to send out prospectors to take up any iron ore claims available in South Australia as great supplies were immediately required at the Port Pirie refining plant.⁶⁷ The chairman (Darling) reported what actions he had taken in connection with securing the lease of the Iron Monarch property - actions which the board approved.⁶⁸

By 1896 the smelting operation had been specialised to the extent that the bullion was first smelted at the mine site at Broken Hill and then sent to Port Pirie to be separated into more "...marketable material."⁶⁹ It was also during this year that the question was first raised about all the smelting of the products of the Company being performed at the one location. For example, one of the processes that would be carried out at Port Pirie was the roasting of concentrate. This process was necessary to remove the

⁶⁵ Acting general manager to secretary, 17/7/1895, pp. 354-356; 9/9/1895, p. 563a, Letterbook, BHPA/M3/4.

⁶⁶ Chairman's address to shareholders, minutes of meeting of shareholders, 30/1/1896, BHPA/S3/2.

⁶⁷ General manager to secretary, Letterbook 3/10/1895, BHPA/M3/4, p. 691; Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 24/4/1896, BHPA/S1/10, pp. 446-447.

sulphur from the ore. As this process used a great deal of coal, it was cheaper to send concentrates to Port Pirie than to take coal to Broken Hill.⁷⁰ At a board meeting held at Broken Hill on 28 September, 1895 the costs of treating ore at Port Waratah (Newcastle, New South Wales), Broken Hill and Port Pirie was considered. A decision was deferred until the board met at Port Pirie, but it was decided that the Port Waratah site would be used for the production of zinc spelter.⁷¹ At the board meeting held at Port Pirie:

It was ultimately resolved that the scheme [the transfer of the whole of the companies smelting operations to Port Pirie] be approved, but before finally deciding, the general Manager was to submit full particulars showing the estimated saving over treatment at Broken Hill and elsewhere.

The general manager was also asked to provide an estimate of costs for the transfer and how much of the existing plant at Broken Hill could be utilised at the new site.⁷² At a board meeting on the 22 October, 1896 statements were considered that gave the comparative costs of treating sulphide concentrates at the mine at Broken Hill, Port Pirie and Newcastle and in view of these details and the recommendation of the general manager it was decided:

⁶⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 18/6/1896, BHPA/S1/10, p. 525. The Minutes do not specify exactly what these actions were.

⁶⁹ Chairman's address to shareholders, minutes of a meeting of shareholders, 30/7/1896. BHPA/S3/2.

⁷⁰ Horwood, E. J., (1925), Notes descriptive of the Broken Hill Mine and its operations past and present, The BHP Recreation Review, 2/9, 22/10/1925, BHPA/PE32/3, p. 7.

⁷¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/9/1896. BHPA/S1/11, pp. 73-74.

⁷² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 29/9/1896. BHPA/S1/11, p. 89.

"...that the smelting operations of the Company should be carried on at Port Pirie.⁷³

The sulphide problem had been solved in 1896.⁷⁴ Essentially this was achieved by concentrating the ore, which produced lead with large amounts of silver and a zinc product, also containing silver. The lead product was either smelted in the furnaces or roasted, and the zinc product had a ready market.⁷⁵ It was recognised that while this was not the most effective way of recovering the silver, it was the most economic.⁷⁶ The matter of the iron ore deposits for use in fluxing had still not been resolved. The general manager sent a telegram dated 31 March, 1897 to the board in the following terms:

Understand Adelaide Syndicate is being formed to secure all South Australian Iron ore claims - in my opinion no more time should be lost securing Iron Monarch - next best Tasmanian.⁷⁷

The matter was referred to Darling (a director from Adelaide) and at a meeting of the 8 April, 1897 it was "[d]ecided that the General Manager's recommendations that the

⁷³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 22/10/1896, BHPA/S1/11, pp. 106-107.

⁷⁴ 1896 Annual Report of the Department of Mines, (1897), Sydney, p. 45.

⁷⁵ Chairman's address to shareholders, Minutes of meetings of shareholders, 30/7/1897, BHPA/S3/2, p. 32. For a more detailed description of this process, see Horwood, E.J. (1928), Mining and treatment of ore at the Broken Hill Proprietary Mine, The BHP Recreation Review, 5/5, BHPA/PE32/4, 25 April, p. 8.

⁷⁶ Chairman's address to Shareholders, Minutes of meetings of shareholders, 28/1/1898, BHPA/S3/2, p. 37.

⁷⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 1/4/1897, BHPA/S1/11, p. 282.

leases known as the 'Iron Monarch' property should be pegged out and that arrangements in regard to this should be left in his hands."⁷⁸

While the sulphide problem appeared to be solved, another problem was being considered by the Company in relation to treatment of ores. This was the zinc problem first raised publicly in 1897. The chairman, when addressing the half yearly meeting of shareholders on 30 July 1897, noted:

Still more important is the zinc, of which we have illimitable quantities in the mine, and which was a drug and a loss to us will become profitable.⁷⁹

The chairman was referring to the tailings (or waste) left after the ore had been smelted. A significant part of the tailings consisted of zinc and silver in combination and, at that time, there was no satisfactory way of separating the silver from the zinc. Thus there were two potentially valuable sources of income locked together in such a way as for all intents and purposes to render them valueless.

The Company was also diversifying into other areas of smelting and in the latter part of 1897 smelted a shipment of 150 tons of gold ore from Western Australia.⁸⁰ The

⁷⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/4/1897, BHPA/S1/11, pp. 287-288.

⁷⁹ Chairman's address to shareholders, Minutes of a meeting of shareholders, 30/7/1897, BHPA/S3/2.

⁸⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 3/9/1897, BHPA/S1/11, p. 479.

general manager was able to report in August, 1898 that a profit of £2/5/3 per ton was being made on gold ore purchased to date.⁸¹

In January, 1898 the chairman referred again to the zinc problem and noted that "[p]ossibly science may come to our assistance, and render some of our products and by products especially the zinc ones, more profitable than they now are."⁸²

By this time the new smelters were working at Port Pirie, but the results were not as anticipated.

The new furnaces have been running satisfactorily during the half-year, though, unfortunately, owing to the increased fineness of a portion of the Oxidised Ore, and the larger concentrates now being treated in the furnaces, the process of smelting has been a slower one, thus decreasing the total quantity of material the plant has been capable of treating, and with a less satisfactory recovery of the metals contained.⁸³

The only treatment plant remaining at the mine at the end of 1898 was the concentrating plant, used for the preliminary treatment of sulphide ores, and the chloridising and leaching plant, which was being used to extract silver and lead from ores that were too poor to send to Port Pirie for smelting.⁸⁴ In June, 1899, the general manager submitted a scheme, which the board approved, for the next five years which

⁸¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 5/8/1898, BHPA/S1/12, p. 362.

⁸² Chairman's address to shareholders, 28/1/1898, BHPA/S3/2.

⁸³ Reports and Statements of Account, half year ending 30/11/1898, BHPA/PE30/6, p. 8.

outlined how oxidised and sulphide ore would be combined in the one production process.⁸⁵

The matter of the Iron Monarch leases had still not been settled early in 1899. It was decided at a board meeting that, even though the Company had to buy from other suppliers, and that it was desirable to control the iron ore supplies, the leases would not be applied for until after the South Australian Parliament was dissolved.⁸⁶ In June, 1899 the general manager advised that the total cost to the Company of using the iron ore from Iron Monarch was 3/6 per ton, while the present price was 12/6 per ton for "...not as good a quality ore." The estimated cost of developing the site was £50,000.⁸⁷ When it was considered that the daily consumption of iron ore was 200 tons,⁸⁸ there were ample reasons to secure the leases. The leases were eventually secured, but not without some dispute from the former owner of the leases.⁸⁹

The only problem not solved at the turn of the century was the discovery of an economic process to release the zinc from the mountain of tailings that had been built up over the years. This problem was eventually solved in 1903 with the discovery, and patenting, of what became known as the Delprat-Potter flotation process.⁹⁰

⁸⁴ Chairman's address to shareholders, 27/1/ 899, BHPA/S3/2.

⁸⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 16/6/1899, BHPA/S1/13, pp. 163-164.

⁸⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 13/1/1899, BHPA/S1/12, p. 542. The reason(s) for this decision is not recorded in the minutes.

⁸⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 16/6/1899, BHPA/S1/13, p. 167.

⁸⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 25/8/1899, BHPA/S1/13, p. 244.

⁸⁹ For a full discussion of this issue, see Hughes, H., (1964), The Australian iron and steel industry 1848-1962, London.

⁹⁰ For a fuller description of this process, see Clark, D.. (1904), Australian mining and metallurgy, Melbourne, pp. 397-405.

Briefly, in 1903 Delprat, the general manager, assisted by Carmichael, a chemist employed by the Company, discovered a process of freeing the silver from the zinc. Delprat immediately sought to patent the discovery, but he was sued by a Melbourne chemist, C. V. Potter, who claimed Delprat was using his process and thus breached a patent that he had taken out some years ago. The case dragged on through the courts for a number of years, going all the way to the Privy Council in London. Agreement between Potter, Delprat, and the Company was finally reached on 28 August, 1907 when the various parties agreed to (i) discontinuance of current court actions; (ii) the Company be granted free use of the patent; and (iii) the Company pay Potter £10,000.⁹¹ The total cost to the Company of the various legal actions involving this patent was £19,438/8/9.⁹² The significance of this discovery can be appreciated when it was estimated in 1904 that ore dumps contained 6,582,000 tons of slimes and tailings from nine mines. Of this figure, the Company owned 2,500,000 tons; the next highest total was for the Central mine with 1,600,000 tons.⁹³

In May, 1907 the general manager wrote to the secretary regarding the advisability of erecting additional coke ovens at Bellambi. This would enable the Company to manufacture an extra 250 tons of coke per week and would eventually make the Company independent of outside sources. His letter provided details of the costs

⁹¹ Agreement between C.V. Potter, Potter's Sulphide Ore Treatment Ltd., and BHP, BHPA/M8/52.

⁹² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 25/10/1907, BHPA/S1/17, p. 428.

⁹³ Members of the Broken Hill Branch of the Australasian Institute of Mining and Metallurgy, (1930), The development of processes for the treatment of crude ore, accumulated dumps of tailings and slimes at Broken Hill, New South Wales, Proceedings of the Australian Institute of Mining and Metallurgy, 80, p. 385. For a more recent discussion of developments at other mines at Broken Hill (and other processes), see Mouat, I. (1996). The development of the flotation process: technological change and the genesis of modern mining 1898-1911, Australian Economic History Review, XXXVI/1, pp. 3-31.

necessary to implement this suggestion.⁹⁴ Significant quantities of sulphuric acid were also produced during 1907. The total for the year was 3,428 tons.⁹⁵ By 1908, although the mine was only working on one shift a day, the Company was smelting the majority of the ore concentrates produced by the Sulphide Corporation, Block 10, Junction North, South Blocks, Zinc Corporation and De Bavay Corporation mines. By 1913 the Company was purchasing more leady concentrates from other mines than it was producing itself. For example in March, 1913, leady concentrates were being purchased from the Junction Company (200 tons per week), Junction North Company (500 tons per week), South Blocks Company (600 tons per week), Zinc Corporation (300 tons per week), De Bavay's Limited (50 tons per week) while their own production was only 1100 to 1200 tons per week.⁹⁶

Advantage was also taken of the process that had unlocked the silver from the zinc. In 1908 the board commissioned a plant to produce zinc spelter at the rate of 8,000 tons per annum, at an estimated cost of £100,000.⁹⁷ The general manager had estimated that with the Company smelting its own zinc concentrates there was sufficient for thirty eight (38) years. An overseas expert from Germany would be engaged to supervise the operation of the first plant. While the plant was being built, the expert would spend the first six (6) months making enquiries in Europe and America concerning the production of zinc spelter.⁹⁸ The first zinc spelter distillation plant

⁹⁴ General manager to secretary, 24/5/1907, Letterbook, BHPA/M3/7, pp. 386-387.

⁹⁵ Half yearly accounts of the Broken Hill Proprietary Company Ltd. 28/2/1908, BHPA/PE30/9, p. 3.

⁹⁶ Manager, Broken Hill to Manager, Port Pirie, 27/3/1913, Letterbook, BHPA/M4/2, p. 231.

⁹⁷ Reports and Statements of Account, half year ending 31/5/1908, BHPA/PE30/9, pp. 6-7.

⁹⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 30/7/1908, BHPA/S1/18, pp. 178-180.

was started up on 12 April, 1910.⁹⁹ In 1911 the board decided that a refinery furnace would be erected at Port Pirie so that the Asian markets could be exploited. This decision was reached following consideration of a report prepared by the secretary after he had visited Asia.¹⁰⁰

Once the spelter plant was operating successfully the board and senior management turned their attention to the production of iron and steel - a question which had been raised as far back as 1895 when the iron rich leases in South Australia had been first brought to the attention of the Company. This move by the Company into iron and steel manufacturing is discussed in a later section.

The Company ended its direct involvement in the smelting operations at Port Pirie after the outbreak of the First World War. In February, 1915 the chairman advised shareholders that a "...basis has been found for the sale and future operations of the Port Pirie Smelting Works."¹⁰¹ The Company sold the works to Broken Hill Associated Smelters Proprietary Limited for £450,000. Shares in the new company were held by the Company, Broken Hill South and North Broken Hill, with the Agreement being effective from 2 June, 1915.¹⁰² Under the terms of the sale, the Company received £300,000 in cash, and 200,000 shares in the new company.¹⁰³

⁹⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 15/4/1910, BHPA/S1/19, p. 277.

¹⁰⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 30/6/1911, BHPA/S1/20, pp. 102-103.

¹⁰¹ Half yearly accounts of the Broken Hill Proprietary Company Ltd. 26/2/1915, BHPA/PE30/10, p. 2.

¹⁰² Agreement to sell Port Pirie Smelting Works, BHPA/M8/100.

¹⁰³ Reports and Statements of Account, half year ending 31/5/1915, BHPA/PE30/10, p. 10.

Production details

Some idea of the scope and development of the mine and associated operations can be gained from a brief examination of the production figures in terms of the quantity of ore treated, the quality of the ore treated, the various methods of treating the ore, and the products that were obtained from the ore.¹⁰⁴

In 1885, the first year of the operation of the Company, 48 tons of ore were treated, producing 35,605 ounces of silver, which averaged 741.77 ounces of silver per ton, for which the Company received £7,442. By the 30 November, 1886, the first full year of operation, this total had increased to 11,500 tons of ore being treated, which produced 1,016,269 ounces of silver, which averaged 107.47 ounces of silver per ton, for which the Company received £194,269. Figures 2 and 3 provides details of the production of silver and lead from 1885 (the first year of operation of the Company) up until the 30 November 1915.

¹⁰⁴ This section is, unless indicated otherwise, based on Working Summary, 1885-1908, showing gross quantities of ore treated and values of produce, with net cost...BHPA/A18/8(1) and Grand Totals of silver, lead ...from commencement of the Company to the 30 November, 1898, Reports and Statements of Account, half year ending 30/11/1898, BHPA/PE30/6, pp. 26-27

Figure 2 Broken Hill Proprietary Company Limited - Silver production 1885-1914¹⁰⁵

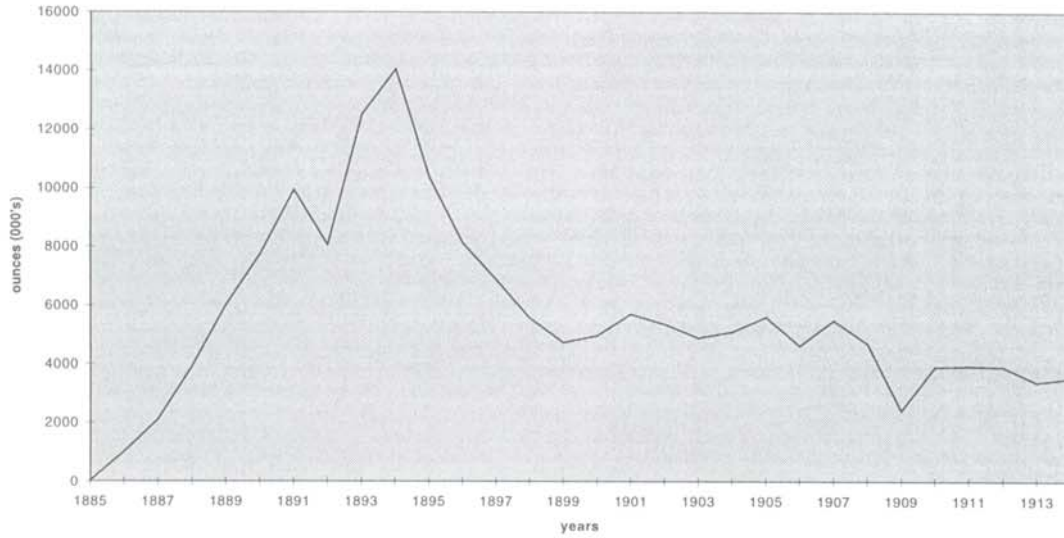
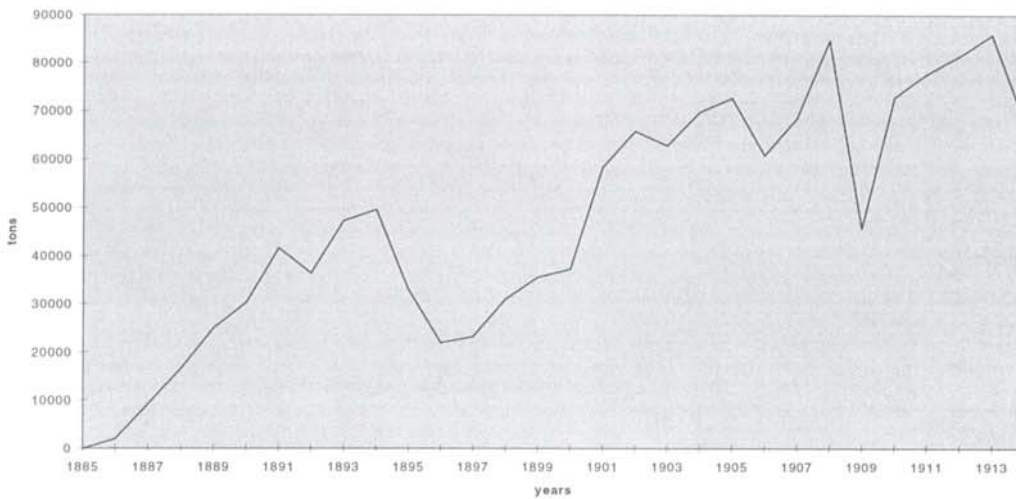


Figure 3 Broken Hill Proprietary Company Limited - Lead production 1885-1914¹⁰⁶



¹⁰⁵ Broken Hill Proprietary Company Limited working summary, 1885-1908, BHPA/A18/8(i) and Half yearly reports and statements of accounts 1909-1914 inclusive, BHPA/PE30/series.

Figures 2 and 3 reveal a number of interesting aspects of the operations of the Company. First, silver production fell as the quality of silver ore decreased, while the production of lead increased. The industrial disputes of 1892 and 1908 both had an impact on production. However, it would seem that the biggest single impact upon production was the appointment of a new general manager in December, 1894. Production of lead and silver both declined sharply in 1894-1895. This was also the same time as the general manager and assistant general manager were in dispute in relation to the life of the mine. The general manager initially took leave of absence and subsequently resigned. The new general manager (who had been the assistant general manager) initially reduced production of both lead and silver in an endeavour to prolong the life of the mine.¹⁰⁷

As mentioned above one of the concerns of the board and general managers was the life of the mine. At various stages the question of how much longer the mine would continue to produce was raised on an irregular basis by both directors and shareholders, but it was not until the early years of the twentieth century that concern about the productive capacity of the mine started occurring on a regular basis. For example, at a meeting of shareholders on 28 January, 1908, the chairman advised that it was estimated that two years full output of 10,000 to 12,000 tons per week remained in the mine. He reminded shareholders that a similar situation had arisen in 1904, but new discoveries had been made that extended the life of the mine and that it was "...quite probable that in this history will repeat itself."¹⁰⁸ This is another indication of

¹⁰⁶ Broken Hill Proprietary Company Limited working summary, 1885-1908, BHPA/A18/(i) and half yearly reports and statements of account 1909-1914, BHPA/PE30/series.

¹⁰⁷ Chapter 11 discusses this issue in greater depth.

¹⁰⁸ Report of half yearly meeting of shareholders. 28/2/1908, BHPA/PE30/9, p. 2.

how decision making had to be based on what the future might hold, as there were no guarantees regarding the presence or otherwise of ore bodies.

Concern was, however, being shown by the general manager when he advised a board meeting of 8 May, 1908 that "...he had in consequence of deliveries of Carbonates from the Block 14 Co., suspended operations in our own mine as he would be able to mine this cheaper at a later date."¹⁰⁹ A week later the general manager dismissed three hundred and sixteen men, in order to reduce unremunerative work for the present.¹¹⁰ As from the 1 January, 1909 the mine was closed, due to industrial action and was not re opened until the 25 June, 1909. Prior to closing, the mine had employed 4427 men; after it re opened it employed less than 2,000 men.¹¹¹ It is worthwhile pointing out that mining operations were suspended for over two years. Until then work was confined to treatment of the surface dumps for zinc.¹¹² The Company was also smelting most of the concentrates produced on the Barrier prior to the mine closing down.¹¹³ This situation was maintained while the mine was closed down. Figure 4 illustrates the average cost per ton of ore treated from 1885 to May, 1908. The initial sharp drop in the costs can be attributed to the connection of Broken Hill to the South Australian railway system, which significantly reduced the costs of transporting goods to and from the mine. There was another sharp fall in 1892 as a result of the introduction of mining by contract.

¹⁰⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/5/1908, BHPA/S1/18, p. 94.

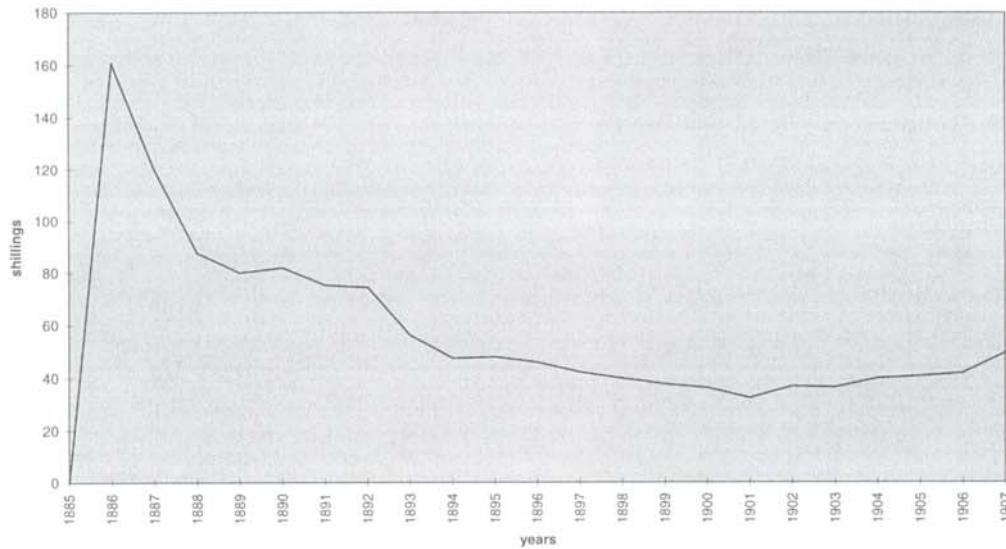
¹¹⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 15/5/1908, BHPA/S1/18, p. 110.

¹¹¹ Minutes of a meeting of shareholders, 27/3/1909, BHPA/S3/2, p. 144.

¹¹² Horwood, E. J. (1925), Notes descriptive of the Broken Hill mine and its operations past and present, BHP Recreation Review, 21 October, p. 7.

¹¹³ Delprat, G. D., Opening Address, Report of Conference between the Broken Hill Mining Managers' Association and Combined Trades Unions' Delegates, 11/11/1908.

Figure 4 Broken Hill Proprietary Company Limited - Average cost per ton of ore treated 1885-1908¹¹⁴



In March, 1909, the chairman publicly admitted that as no new reserves of ore had been discovered, the immediate prospects for the mine "...are somewhat disappointing..."¹¹⁵ In July of that year, the board also decided that when the mine was re opened, it would be operated at half the pre strike output, that is 5,000 tons of ore per week. Overall production levels of silver and lead could be maintained by buying silver and lead concentrates from other companies operating at Broken Hill. In order for the Company to produce 5,000 tons per week only one shift per day was necessary.¹¹⁶ It was also a strategy for prolonging the life of the mine.

¹¹⁴ Broken Hill Proprietary Company Limited working summary 1885-1908, BHPA/A18/8(i)

¹¹⁵ Half yearly accounts of the Broken Hill Proprietary Company Ltd. 26/3/1909, BHPA/PE30/9, p. 4.

¹¹⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 16/7/1909, BHPA/S1/19, p. 25.

Mining did not resume until September, 1911, and it was another twelve months before two shifts were being worked.¹¹⁷ It was at this point that the focus shifted from mining operations at Broken Hill to the establishment of the iron and steel works at Newcastle.

Reporting of silver yields

One of the more interesting problems with the accuracy of the production figures is the way in which the various general managers, with and without the acquiescence of the board, varied the silver yield of the mine either by reporting a higher yield of silver than had been produced, or reporting a lower yield of silver than actually produced. For shareholders, this was an important piece of information and yield information would be forwarded to the various offices of the Company, stock exchanges, and newspapers for publication.

The first mention of the silver yield of the Company being manipulated seems to have been in the latter part of 1889. The general manager advised the board that his bullion reserve was not lying at the mine,¹¹⁸ but rather the specifications of the bullion containing the silver had been undervalued by 15-20 per cent. While the general manager gave no reason for holding a reserve in the first place, he did advise the board that the reserve was not lying at the mine as he was concerned about the

¹¹⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/9/1911, pp. 163-164; 6/9/1912, p. 500, BHPA/S1/20.

¹¹⁸ A common practice in those days was for various quantities of bullion to be stored at the mine, awaiting treatment. This was referred to as 'lying at the mine'. An alternative, earlier phase was 'ore at grass'. Both terms meant essentially the same thing - each represented an unreported reserve.

possibility of a strike by miners.¹¹⁹ In April, 1890, the silver surplus at the mine was 42,569 ounces¹²⁰ During the 1890 strike at Port Pirie the general manager was advised by the board to report the output of silver as 212,000 ounces when the actual output was nearly 260,000 ounces. The balance between the actual and the reported was to go into the reserve.¹²¹ By November, 1890, the general manager reported to the board that the surplus of silver was 400,000 ounces in excess of what had been officially reported.¹²²

Early in 1891, the general manager asked the board what he should do about the yield telegram to be sent to the Adelaide agent and the Sydney stock exchange. The actual output had been 163,250 ounces of silver. He was directed by the board that "...the reported output must not exceed 178,000 ounces. In the telegram to Adelaide this office would add an assuring footnote attributing cause of low output to mineralised water and say ore is keeping of an average grade and mine is looking well." A similar procedure was adopted at a meeting on 5 March, 1891, when the actual output was 156,912 ounces and the general manager was told to report 175,000 ounces. A board meeting was called on the 26 March, to decide on the yield to be reported. On the 7 May, it was advised that the output for the week would be "...about 200,000 ounces" and the general manager was to make the customary announcement of 177,000

¹¹⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 3/9/1889, BHPA/S1/4, p. 64.

¹²⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 15/4/1890, BHPA/S1/4, p. 287.

¹²¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 4/9/1890, BHPA/S1/5, p. 42.

¹²² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 13/11/1890, BHPA/S1/5, p. 238.

ounces, with the reserve of silver in hand being about 200,000 ounces.¹²³ Yet the above actions seemed somewhat contradictory to what a meeting of shareholders, held on 29 January, 1891 had agreed. At this meeting, the chairman advised that after an informal meeting of shareholders in Adelaide, several influential shareholders had held discussions with the directors in Melbourne, pointing out the directors "...were more or less mystifying the shareholders in our method of dealing with the output of the mine." The chairman requested that a shareholder move "...the publication of weekly returns, as averaged at present, and the publication on the last Friday of every month of the actual surplus carried forward, would afford ample information." The reason given for adopting an averaging policy was that the output of the mine could vary substantially from week to week and it was thought these variations would "...cause a complete see-saw in the market values of the shares." Later in his report, he advised that the value of the actual surplus at the end of the half year just ended was £53,000, but, due to the wishes of the shareholders this had been reduced to 159,289 ounces.¹²⁴

However, in June, 1892 this policy of manipulating the silver yield of the mine was changed, when the board resolved that "...in future the actual output from all sources should be reported each week, " a course of action that was agreed with by the general manager.¹²⁵ This information was relayed to the next half yearly meeting of shareholders, held on 27 July, 1892. The shareholders were not given any reason, nor

¹²³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 20/2/1891, p. 464; 5/3/1891, p. 482; 26/3/1891, p. 493; 7/4/1891, p. 558, BHPA/S1/5.

¹²⁴ Minutes of a meeting of shareholders, 29/1/1891, BHPA/S3/1.

¹²⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/6/1892, BHPA/S1/7, p. 65.

did they seek an explanation.¹²⁶ This policy appears to have been maintained only for a short time, as the general manager advised a board meeting in April, 1894 that there was an unreported output of 1,500 tons of bullion (unrefined silver) and 300,000 ounces of silver. The board decided, again, "...that the actual yields must in each case be reported to the board...", which seemed to suggest that the general manager had not been doing this.¹²⁷ At a board meeting on 17 May, 1894 the board decided "...that the whole of this [surplus] should be cleaned up by 31 May, the end of the financial year."¹²⁸

But the practice of manipulating the reported yield of the mine continued. In March, 1895, the general manager advised the board that "...at the present time the actual yield was greater than the amount reported" and the general manager was convinced that the mine was being worked beyond its capacity. As a result, the board agreed to reduce gradually reported output to not exceed 225,000 ounces of silver so the actual yield could be reduced to 200,000 ounces, drawing on the unreported reserves to make up the difference.¹²⁹

Drawing to the end of the half year (30 November), the general manager wrote to the secretary on 26 November, 1895 advising him that the present silver surplus was 225,000 ounces and the amount brought forward from previous half year was 238,000 ounces. This meant that the Company had reported 13,000 ounces more than had

¹²⁶ Minutes of a meeting of shareholders, 27/7/1892, EHPA/S3/1.

¹²⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 20/4/1894, BHPA/S1/8, p. 526.

¹²⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 17/5/1894, BHPA/S1/9, p. 23.

been produced during the current half year. The general manager sought direction as to what he should do. This matter was raised at a board meeting on 28 November, 1895, when the board resolved to carry forward to the next half year the unreported surplus of silver on hand.¹³⁰ The practice was still continuing in 1896 when at a board meeting of 2 April it was advised that the approximate yield was 165,000 ounces, with the reserve standing at 116,000 ounces. The board instructed the general manager to publish the yield as 145,000 ounces.¹³¹

That the practice of manipulating yields was still continuing into 1896 is significant for a number of reasons. First, it was a mechanism for controlling share prices. Second, it formed a buffer against possible union activity. If there was industrial activity at the mine, the cash flow of the Company could be maintained. Third, the reserve formed a buffer should production at the mine be interrupted due to fires, creep, and other similar accidents. Finally, the presence of a reserve even when the board had specifically instructed that one not be kept is indicative of the relationship between the board and the general manager. The whole practice of maintaining a reserve seems to have been introduced by the general manager recruited in America, where such appeared to be standard practice. However, the individual who had the most significant impact on the 'manufacturing' of the production figures was J. Howell, general manager from February 1890 until December 1894. This was the period when yields of the mine were manipulated as an almost regular occurrence.

¹²⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/3/1895, BHPA/S1/9, p. 438.

¹³⁰ General manager to secretary, Letterbook 26/11/1895, BHPA/M3/5, p. 158; Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/11/1895, BHPA/S1/10, p. 202.

¹³¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 2/4/1896, BHPA/S1/10, p. 408.

Howell was achieving these surpluses by working the mine beyond its long term sustainability. Once Howell was replaced, production of silver and lead fell relatively sharply (see figures 2 and 3). Silver production did not reach 1895 levels during the remainder of this study, while lead production, after an initial drop, gradually increased for the remainder of the period.

The above is a good example how information was manipulated to suit the directors and managers of the Company. While there may have been good reasons for doing so (at least in the minds of the directors and managers), such a practice demonstrates how agents can socially construct a specific reality. The choice to construct such a reality was the outcome of actions taken by agents, who could have taken other choices (for example, to report the actual output). The structure of the mining industry was such that shareholders would want to know what the output of any mine was in order that they could judge the worth of their investment, either in terms of potential dividends, or whether or not to sell (or buy) shares. But as the above demonstrates, the actual choice regarding the output levels could be socially constructed by those in the position to do so, which, in this case was the directors and senior managers of the Company.

Conclusion

As both chapters three and four demonstrate, finding the silver and lead ore deposit was not an immediate passport to wealth. The ore had first to be mined and then treated in such a way that marketable product was produced. As the material in both chapters indicates, human agency was a significant factor in the choices that were made. But such choices were not unlettered, being effected by a number of physical structures. For example, the physical structure of the ore body had to be taken into account when mining the ore and the nature of the silver and lead ore influenced the smelting processes which could be used. Economic considerations had also to be taken into account, as some methods of mining and smelting were more economical than others. The choice of which method was more economical was a matter of judgement of the individuals involved. Judgement, in this case was based on the experience of the individuals involved. The experience of the individuals was also derived from the historical development of silver and lead mining and smelting. As was demonstrated in chapter three, silver and lead mining and smelting techniques used at the site of mining and smelting operations at Broken Hill had been developed at other times and places. In terms of the mining and smelting operations at Broken Hill, the most recent developments had taken place in the United States of America and it was to this country that the Company turned for its senior managerial staff. However, the directors were not compelled to seek managerial staff from America, they could simply have persevered with 'local' managerial staff. But as the historical development in silver and lead mining in Australia was relatively recent, directors and shareholders wanted those managerial staff with the latest expertise in, initially smelting techniques, and then mining techniques, to operate the mining and smelting operations.

A common element in all the above factors were human agents making choices, but under various structural conditions. For example, the silver and lead ore had to be mined and choices could be made as to how this was done. The very structure of the orebody also imposed constraints, both in terms of the size of the orebody, and the composition of the ore.

None of the processes associated with turning the ore discovery into a marketable product was free from choices being made by agents. Certainly, various physical structures and historical circumstances impacted upon those choices, but at no time were choices determined. Agents could always have acted in ways other than they did, even allowing for the physical structures within which agents had to choose.

Chapter five - The iron and steel industry

Introduction

At an extraordinary meeting of shareholders on 27 September, 1912 the board of directors was authorised to undertake the manufacture of iron and steel.¹ That such a choice was made to diversify the activities of the Company was not surprising given the perception of the directors and senior managers that the economic life of mining operations at Broken Hill was limited. The directors could simply have chosen to either sell the mine or close it down. While these were alternatives open to them, this was not the course of action chosen. Exactly why the directors decided to find an alternative to simply closing or selling the mine is unclear. Certainly, from a managerial perspective, self interest would have been an important factor. Managerial positions of the type available in the Company were extremely limited, not only in terms of income and responsibilities, but also in terms of status. Members of the board could well have had similar reasons while shareholders would not have welcomed the cessation of regular dividends. The choice to enter into iron and steel production was not necessarily determined by any pre-existing environmental conditions as would be claimed by structural determinists (such as Donaldson). As the following chapter demonstrates, the actions of directors and senior managers were the result of a long process.² This process had started in 1898 and culminated with the

¹ Minutes of meeting of shareholders, 27/9/1912, BHPA/S3/2, pp. 176-179.

² To claim this was a process is probably too grand a term. The issue had been considered on a regular basis for a number of years. The actual process did not gain impetus until 1909.

opening of an iron and steel works at Newcastle in June, 1915. Certainly, structural features were important but not in any determining way.

Rational models of managerial decision making assume that problem or opportunity recognition is self evident to those with the necessary power (in this case, authority) to commence the decision making process. As the material following demonstrates, the move into iron and steel by the Company was not due to any specifically identified problem, and, although it could be argued such a move was an opportunity being taken, such an argument could not explain why it took the Company so long to take advantage of the opportunity.

Satisficing models of decision making also fail to account for the role of history, and the place of individuals within historically derived structures. Both elements were important facets of the choice to enter the iron and steel industry. Important also was the lack of satisficing behaviour of those involved in the choice. As the following material demonstrates, individuals went to a great deal of trouble and expense in order to accumulate as much information as they could. At no stage was there any suggestion that the directors or senior managers satisficed.

Contemporary models of managerial decision making also fail explicitly to account for the impact of time, space, and physical structures on the choice process. Again, as the following account demonstrates, a theory of managerial decision making based on structivist theory and concepts is better able to map the various elements, both structural and human, in accounting for and explaining the decision of directors of the Company to enter the iron and steel industry.

Rather, the choice seemed to be based on taking advantage of existing resources and expertise and the potential consequences on individuals (loss of income, status, work) if the mine did close or was sold. As the following chapter demonstrates, certain structural factors enabled such a choice to be made, while there were also a number of structural factors that had to be overcome. As a consequence of this authorisation, an iron and steel works was officially opened on 2 June, 1915,³ the implications of which were to marginalise the mining operations previously carried out by the Company. There were a number of differing structural features which impacted upon the choices of directors and senior managers to establish an iron and steel manufacturing plant. For example, as members of the Company, directors and senior managers had access to social structures (business, political and social) and the attendant benefits that flowed from such positions. As representatives of a large and successful company, the directors and senior managers were part of an economic and social elite which, if not for their position within the Company, may not have been the case. The structure of the Company was also a factor. The main business of the Company had become smelting both the ore produced from the Company's mine and the mines of other companies located at Broken Hill. The physical and social structures that had been developed for this purpose favoured diversification based on these structures. Physical structures were also important in the choice to locate the steelworks at Newcastle, New South Wales. The Company already owned land Newcastle; one of the sites of major coalfields of New South Wales was located at a relatively short distance from, and connected to the potential site, with well developed transport links. With the benefit of hindsight it might be tempting to argue that the choice was inevitable to establish an iron and steel industry. The following account demonstrates that this was not the case. At almost any point in the process, directors and senior

³ Reports and Statements of Account, half year ending 31/5/1915, BHPA/PE30/10, p. 10. (The meeting was held on 27/8/1915).

managers could have acted in ways other than they did. This section examines briefly the events leading up to the opening of the iron and steel works at Newcastle in New South Wales.⁴

Background to entering the iron and steel industry

The earliest indication that the Company was contemplating involvement with an Australian iron and steel industry was when the general manager wrote to the secretary on 13 December, 1898 as follows:

I enclose for your perusal a newspaper cutting referring to the establishment of an Iron and Steel Industry near Newcastle, New South Wales. I have not compared the figures quoted in any way, but if approximately correct, you will note that lower costs would be obtainable by an establishment somewhere on the South Australian coast with direct communication to Ironstone of a grade equal to the Iron Monarch stone.⁵

The general manager again raised the issue early in the new year, advising the secretary that "...if any Iron Works are to be established in the Colonies, it might be well to bear in mind the fact that we can supply a superior grade of Ironstone to any other obtainable in the Colonies and it would be a pity if any opportunity of

⁴ For a much more detailed account see Hughes, H., (1964), The Australian iron and steel industry 1848-1962, London. Her account of how the finance for the venture was initially arranged is a good example also of how agents were free to act, but within structural constraints.

⁵ General manager to secretary, Letterbook, 13/12/1898, BHPA/M3/6, p. 38.

advantageously disposing of a portion of the "Iron Monarch" stone were lost."⁶ It is interesting to note that in the first letter the general manager was suggesting the establishment of an iron and steel industry in South Australia, while the second letter suggests the possibility of supplying an iron and steel industry. However, nothing came of either suggestion at the time and it was not for another twelve months that the issue was again raised. Darling (a director) was giving evidence to a South Australian Parliamentary Committee of Enquiry that had been formed to enquire into a Private Members Bill which would allow the Company to construct a private tramline from the iron ore deposits to Hummocky Hill. He advised the Committee that the Company had no intention of using the ironstone in connection with a steelworks in an eastern colony.⁷ Given that the Company had an extensive refinery establishment at Port Pirie, if a steelworks were to be established this would have been, at the time, the logical site. The next time the issue was raised was at a half yearly meeting of the Company in early 1901 when shareholders were advised by the chairman that he saw "...no reason why it [the Company] should not supply a portion of the present requirements of the world for the manufacture of iron as well as flux for our smelters."⁸ Again, there was no indication of the Company establishing an iron and steel manufacturing plant. The chairman was still thinking only in terms of supplying other plants with iron ore.

Again, no action seems to have been taken as the next time the issue of iron and steel was raised was at a meeting early in 1902 when the chairman drew attention to the fact that the Federal government was paying a 20/- a ton bounty for all iron

⁶ General manager to secretary, Letterbook, 12/1/1899, BHPA/M3/6, pp. 246-247.

⁷ Trengove, A., (1975), Whats good for Australia: The story of BHP, Sydney, p. 60.

manufactured in the States.⁹ Two years later, in August, 1904, the use of the ore from Iron Knob was again raised by the chairman at a meeting of shareholders.¹⁰ As a result of this meeting, a Mr. T. H. Horton wrote to the board "Enquiring whether the Company was prepared to consider the question of the manufacturer of iron and steel in New South Wales" and offering coal areas to the Company. The board decided that it was "Not prepared to negotiate."¹¹

Some indication of the reasons for the apparent reluctance of the board to get involved in the manufacturing of iron and steel around this time can be gleaned from a decision which had to be made in relation to the establishment of a plant to produce zinc spelter. The board was considering establishing a spelter works at Port Waratah¹² but it was eventually decided that the new plant would be erected at Port Pirie in South Australia, as this would provide closer supervision and would save the initial expenses of starting a new industry in a new centre.¹³

Although no definite decision had been taken regarding the establishment of an iron and steel industry, experiments were still being carried out in this direction. For example, at a board meeting on 23 November, 1905

⁸ Minutes of meeting of shareholders, 25/1/1901, BHPA/S3/2, p. 66.

⁹ Minutes of meeting of shareholders, 31/1/1902, BHPA/S3/2, p. 74.

¹⁰ Minutes of meeting of shareholders, 26/8/1904, BHPA/S3/2, p. 95.

¹¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/9/1904, BHPA/S1/16, p. 145.

¹² The Company had purchased land at Port Waratah (Newcastle, New South Wales) on 30/6/1896. Ownership of this land was to be important in establishing an iron and steel works and details of the way in which the land was purchased, and the reasons for such purpose, form a separate discussion.

¹³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 9/6/1905, p. 320; 7/7/1905, p. 343; 21/7/1905, p. 353, BHPA/S1/16.

The General Manager reported the experiment carried out in the smelting furnace erected for the treatment of ironstone, and stated that a parcel of about 3 to 5 tons had been treated and sold at £5/5/0 per ton at Port Pirie. Further experiments were still being carried on, and he was obtaining full reports and information from Europe in connection with the electric smelting of this material.¹⁴

The general manager was also assisted in his investigations by one of the directors, Mr. John Darling Jnr., who in July, 1906, supplied information regarding the Moore Heskett Steel and Wrought Iron Process. However, the general manager advised the board that this process had not as yet proved a success.¹⁵ The general manager also advised this meeting of the board that he had sold 3,000 tons of ironstone to Elder Smith and Co. and the London Office of the Company was asked to trace the destination of this shipment.¹⁶ The board was advised on 11 October that apparently 2,000 tons had been shipped to Glasgow (a centre of iron and steel manufacture) and 400 tons to London.¹⁷ Tests were still being carried out with the iron furnace, as time permitted.¹⁸ The Company was conducting its own experiments with a furnace for the production of pig iron, with preparations being made to blow in an iron furnace at Port

¹⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/11/1905, BHPA/S1/16, p. 441.

¹⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 10/8/1906, BHPA/S1/17, p. 50.

¹⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 10/8/1906, BHPA/S1/17, p. 50.

¹⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 12/10/1906, BHPA/S1/17, p. 86.

¹⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/2/1907, BHPA/S1/17, p. 170.

Pirie early in March, 1907.¹⁹ In June the acting general manager advised the secretary that "we require a specially soft Pig Iron to mix with our very hard scrap to obtain good results from castings..."²⁰ Later that month, the general manager writing from London, advised that Messrs Scott Anderson made a speciality of electric production of iron. He thought this could possibly lead to something.²¹ The London office also forwarded comments made by a Mr. Joseph Langer regarding ironstone and the manufacture of iron.²²

After a hiatus of nearly four years, the attention of the Company once more turned to the production of iron when it was noted in the board Minutes that:

The General Manager reported that in as much as the Spelter plant was now on its way to a successful issue, and nearly all the difficulties in connection therewith had been surmounted he proposed directing his attention towards the question of erecting works for the production of pig iron from ironstone from Iron Knob.

The board instructed both the general manager and the secretary to obtain full details as privately as possible so that the intentions of the Company did not become public.²³ Further impetus for entering into the iron industry was given by William Jamieson, a director, when he sent a cable from London dated 15 May, 1911 to the board that he

¹⁹ Minutes of meeting of shareholders, 22/2/1907, BHPA/S3/2, p. 121-122; 1/3/1907, p. 184, BHPA/S1/17.

²⁰ Acting general manager to secretary, 2/6/1907, Letterbook, BHPA/M3/7, p. 482.

²¹ Delprat to Dickenson, 21/6/1907, BHPA/A40/15.

²² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 25/10/1907, BHPA/S1/17, p. 429.

considered no time should be lost in starting an iron industry (although no reason is recorded in the Minutes). He also suggested that arrangements be made with the owners of the Blythe River iron ore deposits in Tasmania so that the Company would have a monopoly of iron deposits. The board decided to seek further information regarding the iron ore deposit at Iron Knob but that no advantage would accrue to the Company from any such amalgamation with the Blythe River company.²⁴ On 2 June, 1911, the board granted the general manager six (6) months leave to investigate the iron industry in Europe and America. According to the general manager a director, was very much against the idea, but the chairman helped the general manager by having a "...chat..." with the director concerned prior to the board meeting.²⁵ At the same board meeting approving of the general manager's leave, the general manager advised the board that he had been in touch with a large German firm which had erected sixty big plants for iron smelting and this firm would be prepared to supply plans for \$US2,500. The board instructed the general manager to investigate this matter during his leave.²⁶ The emphasis had now shifted from supplying iron ore to other companies to establishing the Company's own plant. The issue was now also receiving the attention of the general manager, especially as the zinc spelter plant was now operating successfully and the general manager needed another project with which to occupy his time and skills.

²³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 10/2/1911, BHPA/S1/19, p. 552.

²⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 19/5/1911, pp. 65-66; 30/6/1911, p. 104, BHPA/S1/20.

²⁵ G. D. Delprat, *Diary*, 2/6/1911.

²⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 2/6/1911, BHPA/S1/20, p. 82.

The general manager departed the South Australia on 21 July, 1911 and arrived back in Port Adelaide on 27 April, 1912,²⁷ reporting by letter and cable on a regular basis to the board. All told, he visited twelve works in Great Britain, seven in America, three in Germany and one in Sweden.²⁸ Following consideration of a number of letters and cables from the general manager, the board directed that the secretary investigate the position of the Lithgow works in New South Wales and to approach the New South Wales Government with respect to guarantees.²⁹ The Company could well have been influenced by the setting up in New South Wales, in August, 1911, of a Royal Commission into the Iron and Steel Industry in that State, of which the terms of reference were essentially to report on how the current iron and steel works of Hoskins at Lithgow was serving the State. One outcome that may have been potentially favourable to the Company was the cancellation, by the New South Wales Government, of its contracts with Hoskins. However, by 1914 Hoskins was again undertaking large contracts.³⁰ While the Report of the Royal Commission was not favourable to Hoskins, this did not stop the Sydney agent for the Company discussing the issue of iron and steel works with C. N. Hoskins, who was only too pleased to give the Company the benefit of his experience. The Company appears not to have officially availed itself of Hoskins' advice, as his initial offer was deferred to a full meeting of the board, but then there is no further mention of the matter.³¹

²⁷ G. D. Delprat, *Diary*, 21/7/1911, 27/4/1912.

²⁸ General manager's report on European and American trip, 21/7/1911 - 27/4/1912, BHPA/A40/15, pp. 1-2.

²⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 20/10/1911, BHPA/S1/20, p. 196.

³⁰ Hughes, H. (1964), *The Australian iron and steel industry 1848-1962*, London, p. 62.

³¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 10/11/1911, BHPA/S1/20, pp. 214-215.

At a board meeting on the 1 December, 1911, the "...whole question [of iron and steel production] was fully discussed...[it was] decided the matter should be deferred, pending receipt of the General Manager's further letters and information."³² While the matter may have been deferred, this did not prevent enquiries being continued. For example, the secretary reported to the board that the Hon. Josiah Thomas (Minister for External Affairs) had asked to see him with Mr. O'Malley (Minister for Home Affairs) after the holiday regarding the iron industry.³³

The general manager was still overseas in January, 1912 when the secretary submitted a cable from the general manager to the board, that, subject to the approval of the board, he had secured the services of an American expert to advise in connection with the manufacture of iron and steel. The board deferred making a decision on this issue, instead asking the general manager if the expert could arrive in Australia at the same time the general manager arrived back. The general manager advised that they could both arrive at the same time and the board resolved to approve of the engagement of an expert at the cost of \$US10,000 plus expenses to prepare a report for the Company on establishing an iron industry in Australia. The expert recommended by the general manager was D. Baker. Baker met with the board for the first time on 1 March, 1912.³⁴ Shareholders were informed by the chairman at the half yearly meeting held on 23 February, 1912 that the general manager was in Europe and America collecting information about the manufacture of iron and steel and associated industries.³⁵

³² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 1/12/1911, BHPA/S1/20, p. 235.

³³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 22/12/1911, BHPA/S1/20, p. 256.

³⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 26/1/1912, pp. 278-279; 2/2/1912, p. 290; 1/3/1912, p. 311; 20/5/1912, p. 383, BHPA/S1/20.

³⁵ Minutes of meeting of shareholders, 23/2/1912, BHPA/S3/2, p. 171.

Once the general manager returned to Australia he, accompanied by the secretary, visited the Treasurer of New South Wales (Cann) and as a result of such visit sent a letter, setting out the position of the Company to the New South Wales Cabinet. The general manager recorded in his Diary "Called on Cann (Treasurer) and discussed steel question - Cann against State Steel works - in favour of our works."³⁶ They also visited Josiah Thomas (Minister of External Affairs) and wrote to King O'Malley (Minister of Home Affairs). Possible sites for an iron and steel works in New South Wales at Port Kembla and Newcastle were also inspected. Following these visits and inspections, the general manager, in company with the American consultant, Baker, went to inspect Iron Knob and Port Pirie.³⁷ The general manager was also authorised by the board to discuss the matter of iron production with financiers, but "...without commitment."³⁸

The general manager submitted a report to the board after his various visits referred to above and in his conclusion stated that "...if ever there was a time for us to go in for Steel making, I think that time has arrived now. We are making more money than we require to pay a good dividend..." He also argued that, essentially, the decision to go into steel was a "...life or death..." situation.³⁹

The various visits referred to above proved beneficial to the Company. A letter dated 23 May, 1912 from the Minister for Home Affairs was submitted to the board

³⁶ Delprat, G. D., *Diary*, 13/5/1912.

³⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 20/5/1912, BHPA/S1/20, pp. 383-384.

³⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 9/2/1912, BHPA/S1/20, p. 295.

³⁹ Report on the production of iron and steel 29/4/1912, BHPA/M8/92, pp. 6-8.

advising that the erection of a steelworks in Australia by the Company would receive consideration while a letter from the Premier of New South Wales was somewhat more encouraging. The Premier advised that the establishment of an iron and steel works would receive encouragement and consideration, and that it was not a policy of his government to nationalise the iron and steel industry.⁴⁰ This removed a possible obstacle to the venture, as in 1909 the New South Wales Political Labor League had formally adopted a policy of nationalising the iron and steel industry. With the coming to power of a Labor government in 1910 there was always the possibility that nationalisation could take place.⁴¹

The Company was moving closer to the establishment of an iron and steel industry, with the general manager recommending that, after thorough discussions with the consultant, the works be built at Port Waratah.⁴²

The board finally reached a decision about entering the iron and steel industry at a meeting held on 7 June, 1912 when it was resolved that:

The board favoured the policy of undertaking the project of the manufacture of iron and steel provided satisfactory financial arrangements could be arranged upon the position being legally approved.

⁴⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 31/5/1912, p. 391; 24/5/1912, p. 386, BHPA/S1/20.

⁴¹ Trengove, A., (1975), Whats good for Australia: The story of BHP, Sydney, p. 91.

⁴² General manager to chairman, 7/6/1912, BHPA/M8/92.

At the same meeting it was decided to offer the American consultant, Baker, the position of works superintendent, at a salary of £5,000 per annum. However, the general manager recommended that this salary should be \$US25,000⁴³ per annum, to which the board agreed, subject to financial arrangements being carried out.⁴⁴ This same meeting was advised that the Minister for Home Affairs had intimated that the Company "...might be perfectly assured of the good-will of the Commonwealth Government and that it was the policy of the Ministry to give decided preference to Australian manufacturers if of equal quality, and price not excessive..." The secretary was also authorised to discuss with brokers the most expedient way of raising the necessary capital and to submit a scheme to the board.⁴⁵

While the board had agreed in principle to establish an iron and steel works, it was still gathering information to assist in the final decision. According to the American consultant the Iron Knob deposit was so large and of such high grade that it would be suitable for making steel. In terms of costs, he estimated that pig iron, using coke supplied by independent companies would cost 34/- per ton, while using coke manufactured by the Company, at a cost of 24/8 per ton, there would be no place in the world where iron and steel could be made so cheaply.⁴⁶

⁴³ For some reason, currency transactions were expressed either in pound sterling or US dollars. No reasons are ever given for the switch from one to another. Obviously the 'swap' from one currency to another presented no problem to the Company.

⁴⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 7/6/1912, pp. 399-400; 14/6/1912, p. 406; 1/7/1912, p. 429, BHPA/S1/20.

⁴⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 7/6/1912, BHPA/S1/20, p. 406, p. 416.

⁴⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/6/1912, BHPA/S1/20, p. 424.

The board also again reaffirmed their intention to manufacture iron and steel at a board meeting held on 28 June, 1912:

directors feel strongly Iron and Steel Works will ultimately be started here by someone and as this Company has [its] own immense iron deposits, tramway, jetty, also large organisation already formed, it is particularly adapted to embark on operations and present time most opportune to take advantage of position to forestall opposition.⁴⁷

The London board of the Company was also kept informed of developments and the Australian board sought from this board their opinion of the method of financing the new venture. However, while the London board agreed with the venture, it did not agree with the proposed method of financing. It should also be pointed out that individual directors also disagreed regarding finance.⁴⁸

The New South Wales Government was actively supporting the project, with the Premier advising the board by letter that the Government would not place any obstacles in the way of the construction of the iron and steel works; the Government would sell the botanical gardens at Newcastle to the Company for a sum of approximately £4,000; a portion of the private railway over the adjoining road would be resumed; the river would be dredged and a wharf erected. The Government would

⁴⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/6/1912, BHPA/S1/20, p. 425

⁴⁸ See, for examples, Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/7/1912, p. 439; 9/7/1912, pp. 440-441; 10/7/1912, p. 442; 12/7/1912, pp. 443-446, 16/7/1912, pp. 452-453; 19/7/1912, p. 457, BHPA/S1/20.

also consider any proposal for preferential contracts.⁴⁹ The Federal Government also had not been ignored in the negotiations in establishing the Steelworks. The general manager, in August, "[c]alled on King O'Malley - said he would have to give out small orders to keep going but you need not be afraid, I will give you a chance when you are ready - I promised you this."⁵⁰ Thus, prior to the building of the works at Newcastle, guarantees (of a kind) had been obtained from both the Federal and State Governments that they would support the project both politically and with orders for products.

Once operations commenced at Newcastle, a number of staffing changes were also mooted - among them it was decided that the general manager would make his headquarters in Melbourne, moving from there to the different centres of the Company's operations from time to time. The chief accountant from Broken Hill would also move from Broken Hill to Newcastle when operations started, while the chief engineer from Broken Hill would move, initially to Port Pirie and then ultimately to Newcastle.⁵¹ The American consultant, Baker, was also appointed iron and steel works manager for five (5) years from the 29 August, 1912.⁵²

⁴⁹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 16/7/1912, BHPA/S1/20, p. 452.

⁵⁰ Delprat, G.D., *Diary*, 20/8/1912. The promise referred to was presumably contained in the letter read to the board meeting of 7 June, 1912.

⁵¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 27/9/1912, BHPA/S1/20, p. 521. This was another indication of the shift of importance from mining operations at Broken Hill to the iron and steel operations at Newcastle.

⁵² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 4/10/1912, BHPA/S1/20, p. 530.

But the construction of the works at Newcastle was not without various problems. For example, the secretary and the general manager both reported that there were difficulties in getting the relevant iron and steel legislation through Parliament.⁵³ However, the "difficulties" were apparently only short lived. The general manager wrote to the board on 30 December, 1912 advising that "...he was having the foundations of the blast furnaces and stones set out, also dock line, and advising generally regarding the work in hand"⁵⁴ When completed, the plant at Newcastle was expected to produce, on a per annum basis, 25,000 tons of wire, 25,000 sheets of iron and 50,000 tons of rails.⁵⁵ The formal arrangements for financing the iron and steel works had by now also been decided. Two hundred and forty thousand shares of 8/- fully paid would be issued to both the public and to shareholders at 40/- each.⁵⁶ The share buying public must have had a high degree of confidence in the Company; at 31 January, 1913, 737 shares had been applied for; one week later, by the 7 February, 29,000 applications had been received from Australian shareholders, and 68,000 from the London register. By 14 February, 1913, 217,636 shares had been allotted. This number was increased to 221,056 shares (93,911 Australian, 127,145 British) by 21 February.⁵⁷

⁵³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 22/11/1912, BHPA/S1/20, pp. 567-568.

⁵⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 3/1/1913, BHPA/S1/21, p. 24.

⁵⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 28/3/1913, BHPA/S1/21, p. 99.

⁵⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 17/1/1913, BHPA/S1/21, pp. 29-30.

⁵⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 31/1/1913, p. 37; 7/2/1913, p. 46 and p. 48; 14/2/1913, p. 59; 21/2/1913, p. 68, BHPA/S1/21.

The outbreak of World War I resulted in only a slight set back to the construction of the works at Newcastle. A German steamer carrying material for the works was detained at Melbourne, but after the secretary wrote to the Commonwealth Government the steamer was permitted to sail, under guard, to discharge the cargo at Newcastle.⁵⁸ Some shipments from Belgium had failed to arrive, and it was arranged that the missing material be manufactured locally.⁵⁹

One of the factors which facilitated the decision to manufacture iron and steel was the ownership of suitable land at Port Waratah, Newcastle, New South Wales. It was found to be cheaper to bring the iron ore to the coal, rather than vice versa. This next section examines the purchase of the original land at Port Waratah, which formed the basis for the iron and steel industry.

Port Waratah land purchase⁶⁰

The land was first offered to the Company in 1895 as a possible site for the erection of a works to treat the sulphide ores of the Broken Hill mine. On 11 May, 1895 the secretary of the Waratah Coal Company Limited wrote offering the land to the Company. As well as the land, there was also some plant on the land. On 31 May the secretary again wrote to the Company, this time forwarding plans and providing a description of the works. This had been done as at a meeting of the Company board on 23 May, further details had been requested.⁶¹

⁵⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 21/8/1914, p. 10, and 11/9/1914, p. 33, BHPA/S1/22.

⁵⁹ Reports and Statements of Accounts, half year ending 30/11/1914, BHPA/PE30/10, p. 19.

⁶⁰ Unless indicated otherwise, the source of the data is BHPA/A21/1 - Copies of letters relating to the purchase of land at Port Waratah, New South Wales.

The question of whether or not to buy the land and its associated works was referred to the general manager. He advised that he did "...not think it advisable for the present to take any steps towards securing a site." The matter was again raised on 5 August, 1895 by a James R. M. Robertson, of Sydney, who raised the issue of leasing the land. On 9 August, Robertson urged the directors to visit the site, adding "...you should not lose this place if at all possible." A further letter dated 17 August was received from him, still urging the Company to obtain the site as "...it is the best site in the Colony..." with access to rail, water, frontage, no houses would be built, and good workmen's accommodation at two towns. "If you can come to inspect Waratah let me know and I will run you through the Works unknown to anyone as I presume you would be averse to avow your identity until the critical moment is past."

The general manager on 18 August advised the secretary that nothing had changed since his original advice; however, the situation might change in two years. He recommended that the Company "...secure the refusal of it for two years...at no more than £800 expenditure." This decision was made after a discussion with Robertson as the general manager thought the site might be useful for a reduction works.⁶²

Robertson was still pushing the Company to secure the site, writing on 2 October that he "...would not like to see this site slip past you."

⁶¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/5/1895, BHPA/S1/9, p. 525.

⁶² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/8/1895, BHPA/S1/10, pp. 82-83.

However, it was not only the urgings of Robertson that induced the Company to act. Rather, it seemed also to have been the interest in the land by a rival syndicate, which included a former general manager of the Company, John Howell. The secretary wrote to the chairman on 10 October recommending that action be taken, if any, without delay in view of the interest in the land by another syndicate. He sent a further telegram to the board on 11 October, outlining three schemes to secure the land. On 14 October, the secretary sent another telegram to the board following a site inspection and suggested action as "...John Howell arrives shortly." This telegram was followed up with a telegram of 14 October to the chairman of the Company, advising that a visit had been made to the site and that the site was satisfactory. The secretary included a report on the site (buildings etc.) and noted "...he [Robertson] is not activated by any self interest in the matter." He concluded his letter with the suggestion that the offer made by the Company be revised.

On 15 October, 1895 the board sent a telegram to the secretary that he was to stop all negotiations until the matter had been fully considered by the board. On 17 October, the board sent a telegram to the secretary instructing him to make an offer of £750 for a lease. This was done on 1 November, but not by the secretary. Instead the offer to chairman of the Waratah Coal Company was made by Robertson. This offer was for a £750 deposit for an option to purchase within two years for £11,000. If the option was exercised, the deposit was to form part of the purchase price. If the option was not exercised, then the deposit would be forfeited.⁶³

⁶³ This offer was formally agreed to at a meeting of the board on 24/10/1895, Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, BHPA/S1/10, p. 153.

The Sydney agent, by telegram of 7 November, advised that the offer had been declined and a counter offer of £15,000 with a three month option was on offer. The Sydney agent advised the secretary by telegram on 11 November that a counter proposal on behalf of the Company had been made for £13,000. This was after the board had sent a telegram to one of the directors, who was in Sydney assisting with the purchase, advising him that the board had authorised Dr. Robertson to secure the property with the option to purchase for £15,000 in three months, but hoped to secure in six months. The board had agreed with Robertson that it was "...most desirable to purchase immediately". Schlapp (formerly an assistant general manager and now acting in a consultant role) was leaving for Sydney immediately in order to complete the purchase.⁶⁴ The director in Sydney on 13 November advised by telegram that the Doctor had been successful. The Doctor referred to was Robertson, who was still acting the part of the potential purchaser. The Sydney agent, on the same day, forwarded a telegram advising that the condition of the sale was a four month option to purchase for £14,000 with a £750 deposit. The purchase of the land by the Company was not to be made public. Obviously, the Company had increased its offer by £1,000 over the offer made on 11 November, but even this offer was less than had been authorised by the board.

The Sydney agent, also on 14 November, advised that £750 had been deposited in Robertson's account and Robertson would hand his own cheque to the Waratah Company. The Sydney agent also advised, on 16 November, that he had obtained from Robertson a letter to the effect that the option on the land was held in trust for

⁶⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 11/11/1895, BHPA/S1/10, p. 166.

the Company. The Sydney agent also considered it desirable that surrounding land be purchased by the Company as speculators would buy land to erect workmen's cottages. If speculators did buy land too close to the works the owners of the cottages could cause problems for the Company for a variety of reasons. This claim was based on his experience with Newcastle miners and collieries. In the meantime, Robertson's letter had been referred to the solicitors, who had advised that the letter "...fully protected the Company's interest."⁶⁵

However, the Sydney agent advised the secretary on 27 November that the agreement had still not been executed and, the following day Allen Allen and Hemsley, solicitors, wrote to Robertson suggesting that he meet with the chairman of Waratah Company in order to solve some minor difficulties. Robertson was not to mention that the idea had come from Allen Allen and Hemsley. As Allen Allen and Hemsley was acting for the vendors, this suggestion, while perhaps unethical, was at least understandable. The meeting must have been successful, as the Sydney agent advised the secretary on 29 November that the Agreement would be completed soon. The agent advised, again on 29 November, that the agreement would be executed on Monday. This did not happen. The Sydney agent sent a telegram on 2 December advising the agreement was not yet signed and added "that these continued delays should take place is most extraordinary, as also are the reasons causing the delays." The Sydney agent did not specify the reasons.

⁶⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 21/11/1895, BHPA/S1/10, p. 184.

Allen Allen and Hemsley wrote to Robertson on 4 December advising that the agreement had been settled and outlining the implications of a number of changes that had been made to the agreement. On 5 December, Robertson wrote to Allen Allen and Hemsley approving the agreement and authorising the deposit be paid. The Sydney agent advised the secretary of the Company on 5 December that the agreement had been executed and on 9 December he forwarded the executed agreement.

The purchase had still not been completed by 14 April, 1896 and the opinion of leading counsel was being obtained as to the Company's position.⁶⁶ At one stage, the Premier of New South Wales became involved in the purchase as there was a problem with the water frontage rights.⁶⁷ The Sydney agent advised the board meeting of 30 June that the purchase of the Waratah land had been completed on 29 June, 1896.⁶⁸ In the chairman's address to a meeting of shareholders on 30 July, 1896 he noted that the Waratah site had been purchased as a site to smelt sulphide ores as it was cheaper to take the ore to the coal than vice versa.⁶⁹

It was still intended to erect a works on the land, as the general manager, reporting on staffing changes to a board meeting on 23 July, 1896 noted that one of the employees of the Port Pirie works would "...take charge of the works to be erected at Waratah."⁷⁰

⁶⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 14/4/1896, BHPA/S1/10, p. 424.

⁶⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 4/5/1896, BHPA/S1/10, pp. 461-462.

⁶⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 30/6/1896, BHPA/S1/10, p. 537. It should also be noted that an adjoining block had been purchased in December, 1895, for an amount of £750. See Newcastle land, BHPA/M8/30.

⁶⁹ Minutes of meeting of shareholders, 30/7/1896, BHPA/S3/2.

The erection of a plant on the Waratah land did not proceed and nothing more was done with the land until an offer was received to rent the property for ten years with an option to purchase. The board decided that it would lease the works for £750 per annum for ten years, without an option to purchase, or to sell the land outright for £15,000 cash.⁷¹ These terms were rejected by the potential purchasers, as at the board meeting on 8 September, 1905 an enquiry was received for the sale of all, or part of the Waratah property. The board indicated that the whole block would sell for £16,000, or £10,000 for half the block.⁷² This sale also was not completed as another inquiry was received at the board meeting of 31 August, 1906. The board advised that the price was £16,000.⁷³

Over twelve months later, the land had still not been sold and, in September, 1907 "...it was decided that enquiries should be made in Sydney as to the possibility of disposing of this property to the New South Wales Government or otherwise."⁷⁴ In November of the same year, the board approved of the secretary approaching the Mount Morgan Company about their purchasing the Waratah land.⁷⁵ The Mount Morgan Company did make an offer of £1,000 per acre but "...it was thought the Company might still require the land for some of its operations, and that, meanwhile the indication might

⁷⁰ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 23/7/1896, BHPA/S1/11, p. 16.

⁷¹ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 17/10/1902, BHPA/S1/15, p. 196.

⁷² Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 8/9/1905, BHPA/S1/16, pp. 387-388.

⁷³ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 31/8/1906, BHPA/S1/17, p. 62.

⁷⁴ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 13/9/1907, BHPA/S1/17, p. 380.

⁷⁵ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 15/11/1907, BHPA/S1/17, p. 457.

stand pending further consideration during the board's visit to Broken Hill.⁷⁶ At the meeting of the board at Broken Hill the general manager advised the board that it was "...highly improbable that this property would be required for any of the Company's operations..." He recommended that the land should be disposed of. The board agreed with the recommendation and set a price of £15,000.⁷⁷ The land had still not been sold by June, 1910 and the board authorised the Sydney agent to negotiate for the sale of the property at any time.⁷⁸

The land was still unsold at the time the decision was taken by the Company to commence the manufacture of iron and steel and thus the land, originally purchased in 1896 now served as basis for the site of the Company's iron and steel works.

As the foregoing clearly demonstrates there were a number of opportunities for the board to either not buy the land in the first place (in fact the general manager had initially recommended against the purchase) and there were significant difficulties (although these difficulties were not specified) to be overcome prior to the purchase being satisfactorily completed. The fact that the land was purchased in the first place can be seen as the result of the actions of two individuals. The first, Robertson, brought the land to the notice of the board. The second individual was an ex-general manager of the Company, who had left the Company under somewhat clouded circumstances, and had now formed a syndicate to smelt ores and the Port Waratah

⁷⁶ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 22/11/1907, BHPA/S1/17, pp. 463-464.

⁷⁷ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 30/11/1907, BHPA/S1/17, p. 478.

⁷⁸ Minutes of Meetings of Directors, Broken Hill Proprietary Company Limited, 3/6/1910, BHPA/S1/19, p. 324.

land was being considered. It was as a result of a combination of the actions of these two individuals that prompted the board to consider buying the land in the first place. But of course the board did not have to act. There was no compulsion to purchase the property.

Once the transaction had been completed the Company tried, unsuccessfully, to re-sell the property. While an economic imperative was being followed regarding the price being asked for the land by the Company, this did not mean the Company had to sell the land at a certain price. The board of directors could have, if they had so wished, offered to sell the land at a reduced price, which would have increased the possibility of a sale, given the expressions of interest that had been received for the purchase of the land. The whole managerial decision making process demonstrates the extent to which social agents acted, but within various constraints. For example, the name of the Company was a constraint in terms of the price of the property. If the purchaser of the property had been known, the price would have been higher, such was the financial standing of the Company in the business community. The location of the land also served as a constraint as it was located a long way from the existing administrative and operational sites of the Company in Melbourne, Port Pirie and Broken Hill. That a potential competitor was also interested in the site added another factor to be considered in whether or not to purchase the property.

The purchase of the property was also enabled by a number of factors, such as the use of personal networks. Robertson drew the attention of the Company to the land; the solicitors acting for the vendors, the Port Waratah Coal Company, gave advice to the Company on how to overcome some difficulties in completing the sale; the New

South Wales Government provided assistance in facilitating the sale of the land to the Company. Finally, the financial strength of the Company meant that the cost of the property was not necessarily an issue to be considered.

Clearly it was individuals acting as social actors who were responsible for the purchase of the land. Certainly, these actions were constrained or enabled by a variety of factors, but at no stage was it possible to state the actions of these individuals were determined. There were always choices available to the social actors, at all stages of the overall decision making process from the time the decision was taken to purchase the property up until the time the property was used as the foundation for the iron and steel works.

Conclusion

As the above discussion clearly indicates the directors and senior managers had available to them a number of alternatives should the mine at Broken Hill prove to be no longer economically viable. It is also important to note that the choices made when the iron and steel issue was first raised were choices not to take any action. Despite there being periodic references to an iron and steel industry since the mid 1890's choices were made not to make choices as the perception of directors and senior managers was such that there was no necessity to diversify into iron and steel manufacturing. Not until the general manager raised the whole question again in 1911 was the choice made to take any action towards establishing an iron and steel plant. While the actual decision was formally taken by shareholders in September, 1912, the choice was based upon investigation and information obtained by directors and senior managers since the 1890's. Structural factors impacted at all stages of this process. For example, the structure of the organisation was such that relationships developed between directors and senior managers that facilitated the choice process. This meant that when the general manager proposed the Company enter the iron and steel industry, he was able to draw upon relationships which had been established and developed over a considerable period of time. The relationships between directors and senior managers (especially the general manager) were facilitated by the geographic locations of the various operations of the Company, and the amount of time directors and senior managers had to share the same physical spaces. This sharing occurred due to the amount of train travel undertaken by directors and senior managers in the normal course of inspecting the various operations of the Company,

located at Broken Hill, Port Pirie, Adelaide, Melbourne. These structural features facilitated the relationships between directors and senior managers. These factors could just have easily have caused problems between and among directors and senior managers, especially if relationships were not amicable. In the case of the Company, the personal relationships between and among directors and senior managers were, with one or two exceptions, apparently good.

Historical factors also had a part to play in the choice by directors to establish an iron and steel industry. The availability of land at Port Waratah (Newcastle) was the result of choices made in the past which served to provide, potentially at least, a physical site for such a plant. But while the availability of the land might have provided a potential site, that was all it was. The Port Waratah site was chosen for a number of structural reasons. First was the nature of the process of manufacturing iron and steel. The two basic components of the process was large quantities of coal and iron ore. The land owned by the Company at Port Waratah was in reasonably close proximity, with well developed transport structures, to major coal fields in the Hunter Valley. There were also well established land and sea transport structures which could be drawn upon in transporting material and personnel to and from the Port Waratah site. Second, the development of the Company since the mineral leases were first pegged in 1883 also facilitated the choice to locate the plant at Port Waratah. Directors and senior managers had experience in managing the physical component of the operations of the Company from a point geographically distant from the administrative headquarters. Finally there was also a number of individuals in key institutional structures (for example, Federal and State politicians) who provided active support to the establishment by the Company of an iron and steel works.