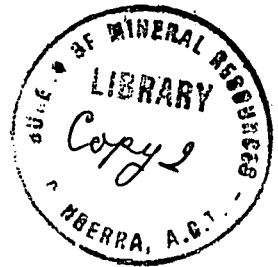


COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.
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GEOLOGY AND GEOPHYSICS.

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NOTES ON PRODUCTION, EFFICIENCY FACTORS AND
COSTS ON TWELVE WEST AUSTRALIAN GOLD MINES FOR 1947.

by

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TABLE OF CONTENTS.

| | <u>Page.</u> |
|---|--------------|
| Lake View & Star, Ltd. | 1 |
| Great Boulder | 1 |
| Big Bell | 1 |
| North Kalgurli (1912) Ltd. | 2 |
| Gold Mines of Kalgoorlie, Ltd. .. | 2 |
| Boulder Perseverance Ltd. | 2 |
| Central Norseman Gold Corp. Ltd.. | 2 |
| Parlaga Mining and Exploration Co. Ltd. | 3 |
| Sons of Gwalia Ltd., Leonora. .. | 3 |
| South Kalgurli Consolidated. ... | 3 |
| Kalgoorlie Enterprise Ltd. | 4 |
| Hill 50 Mine, Mount Magnet | 4 |

TABLE. Mining and cost statistics of
twelve Western Australian Gold Mines.

NOTES ON PRODUCTION, EFFICIENCY FACTORS AND
COSTS ON TWELVE WEST AUSTRALIAN GOLD MINES FOR 1947.

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1. Lake View and Star, Ltd.

This mine has a very high production (50,000 tons per month). Ore reserves amount to 5½ to 6 years' supply. It is very efficiently managed, which is reflected in the very high production of 3.66 tons per man shift and in the low costs which total 35.87/- per ton. This is in spite of the fact that nearly all the stopes are filled. The filling used is oxidised material obtained from surface open cuts and carried underground through a network of passes.

At the present time, due to lack of manpower, the Company is unable to carry out the development and exploration which it would like to undertake. This is the deepest mine on the average at Kalgoorlie, and miners prefer to work in the shallow mines. A most important factor in the favourable operating result is the low cost of generating power - 0.97d. per unit. The company has its own 15,000 h.p. generating plant, and its total power cost per ounce is only 13/7 as against 25/- to 37/- per ounce for a number of other mines which purchase power from the Kalgoorlie Power Corporation at a cost ranging from 1.6d. to 1.9d. per unit.

2. Great Boulder.

An interesting feature of this mine is the bold development and exploration policy. Normally, 16,000 to 20,000 feet of development are carried out each year, and of this only about 25 per cent is on payable ore. Any shear or lode which appears to have a chance of producing payable ore is explored, usually by driving. If a grade of 2.0 to 2.5 dwt. is obtained in the drive, it is usual to take off a leading stope at least, in the hope that the grade will improve. In average years, each foot of development adds 20 to 30 tons of ore to the reserve. The maintenance of the present reserve (5½ years' supply) also involves about 80,000 feet of diamond drilling per year.

3. Big Bell.

This orebody is about 1,500 feet in length and has an average width of 60 feet ranging from a minimum of 30 feet to a maximum of 115 feet. At present the head value ranges from 2.8 to 2.9 dwt. and the recovery is 83 per cent. It is possible to mine ore of this grade only because of the length and width of the orebody, which has enabled the company to adopt sub-level stoping by diamond drill blast holes. There is no exploration as understood at Kalgoorlie, that is, in the sense of exploring new lodes. The main levels are driven in the footwall of the lode, but all other development is carried out in ore and is really stope preparation. Development costs per foot are close to £10 as against about £6 at Kalgoorlie. The Kalgoorlie drives at normally 7' x 5', as against drives up to 11' x 11' at Big Bell. The ground at Big Bell - an albite muscovite schist - is "woody", and involves a high expenditure per foot on drilling and explosives. For a number of years, the ore obtained per foot of development averaged about 45 which is high as against Kalgoorlie mines. This was based on a stope length of 107 feet with pillars 23 feet in length. It is thought that it may now be necessary to reduce the stope length to 65 feet with pillars 35 feet in length. This is expected to reduce the tons per foot of development to 32.7.

Although Big Bell orebody totals about 3,500 tons

per foot, it is possible to extract only about 2,800 tons per foot because of the method of mining; about 20 per cent of the ore must be left as permanent pillars to support workings.

Big Bell costs were 27.46/- in 1947, while revenue was close to 25/- per ton; costs should have been higher as insufficient development was carried out to maintain the mine in a healthy state. It may be noted that Big Bell would probably produce about 34,000 tons per month with 1,000 feet of development and stope preparation per month, as against Great Boulder's requirements of approximately 1,500 feet of development per month with a similar production.

4. North Kalgurli (1912) Ltd.

This mine is in a most healthy position regarding ore supplies, and at present has about 10 years' reserves. Its present output of 12,500 tons per month is to be increased to 20,000 tons per month when milling facilities are made available. There are probably sufficient ore reserves on the mine to increase production ultimately to 30,000 or more tons per month, even at the present price of gold. Most of the ore is being obtained above the thousand foot level which is quite shallow for Kalgoorlie. The past production shown in Table I is that by the present Company only; the lease has produced very large quantities of gold prior to the formation of the present Company, but these production figures have not been assembled.

5. Gold Mines of Kalgoorlie.

This mine is at present obtaining a quarter of its ore from open cutting, that is, approximately 50,000 tons per year. This is reflected in the high figure, 7.03, for the tons per man shift. The mine may be in difficulties at the end of approximately 4 years when the open cut ore is expected to be exhausted. The cost of mining the open cut ore is 8/- as compared with the 25/- underground. The company is heavily capitalised compared with other mines at Kalgoorlie and has £68,000 more capital than Lake View and Star, Ltd. The mine has its own power plant. Ore is obtained from a large number of smallish scattered shoots, many of them related to the contact between the quartz-dolerite-greenstone and the calc schist. Exploration is intensive and is under geological direction. The cost of development is really relatively high, the figure shown on Table I being an arbitrary charge allocated by the Head Office.

6. Boulder Perseverance Ltd.

This is a mine in late maturity, and the shaft has not been deepened since 1912. Production is maintained from lateral exploration of branch lodes, spur lodes, counter lodes, etc. Development and mining costs are about normal for a mine of this size. Milling is carried out at the Kalgoorlie Ore Treatment Plant which also treats ore from the Enterprise Mine and from North Kalgurli (1912) Ltd. This mill treats about 28,000 tons of ore per four-weekly period, and is jointly owned by Boulder Perseverance and North Kalgurli.

7. Central Norseman Gold Corp. Ltd.

A feature of this mine is the large number of men employed for the output of 107,000 tons per year, and the low tonnage per man shift (1.223). This is partly due to the fact that the ore shoots at Norseman do not outcrop, but occur in a north-pitching bed of greenstone where it is crossed by a shear dipping at 45 degrees to the east. Shoots have been

found over a total length of 10,000 feet, but they are separated by long blank areas. Prospecting costs are high, and, at present, workings are 2,000 feet or more to the north of the main shaft. A new shaft is being sunk; this fact is reflected in the high development cost of 16.0/- per ton. Overall costs at 58.09/- per ton are the second highest of the twelve mines examined. There is no labour shortage, probably because Horseman is a relatively pleasant town.

8. Paringa Mining and Exploration Co. Ltd.

From 7,500 feet of development carried out in 1947, only 11 tons of ore per foot were found, which is the lowest factor for any mine at Kalgoorlie. The major orebodies which formerly provided a very large proportion of the production have now dipped into North Kalgurli ground, and output has to be maintained from a number of small, scattered shoots. Overall costs are kept at the reasonable figure of 47.03/- by the Management by the use of all possible economies. Power is purchased from the Kalgoorlie Power Corporation at approximately 1.8d. per unit, and the total cost of power per ounce at £1.17.6 is the highest for the Kalgoorlie field. At present, the Company's output is about 6,600 tons per four-weeks as against a scheduled output of 8,000 tons per four weeks. In the northern section of the Kalgoorlie field, in which this mine is located, the ore was formerly regarded as being very poor, and the present Company has done well to repay most of its capital and to build up a reserve of approximately £200,000. At present the company is finding it difficult to maintain adequate development and pay expenses out of income.

9. Sons of Gwalia Ltd., Leonora.

This has been a remarkable lode which has been followed down the dip for approximately 5,000 feet representing a vertical depth of 3,000 feet. The mine normally employs about 360 men, and maintains an output of about 120,000 tons per year. A large number of miners were Yugoslavs, many of whom have now returned to their own country and the present labour force of 249 is sufficient to maintain output at about 85,000 tons per year only. The Company depends on an adequate supply of firewood for its steam power units and this commodity is becoming increasingly expensive to obtain. Nevertheless, after more than 50 years operation the mine would still be a highly profitable producer if it could obtain an adequate labour force. At present, attempts are being made to obtain miners from northern Italy where the parent company, Bewick Moreing Ltd., controls other mines.

10. South Kalgurli Consolidated.

This mine is having difficulty in maintaining output at a payable grade; this is reflected in the figure of 14.5 tons per foot of development. The mine has produced over 2½ million tons of ore and the lease is not in the heart of the Kalgoorlie mineralisation. It is limited to a depth of approximately 2,200 feet by the encroachment of the unfavourable calc schist track. As a result of a recent geological examination, some 14,000 feet of driving, cross-cutting and winzing, and 15,000 feet of diamond drilling have been recommended. The Company has not yet decided on the implementation of this programme. The mine may well be nearing exhaustion (possible life, 4 to 8 years), but at Kalgoorlie, mineralisation is so intensive that there is always a good chance of a major discovery which will change the outlook of any mine. South Kalgurli overall costs at 50/- per ton are about normal for a Kalgoorlie mine producing 6,000 tons per month.

11. Kalgoorlie Enterprise Ltd.

This mine has the highest cost of the twelve shown on Table I, namely, 66.41/- per ton. This is partly due to the low output of about 5,000 tons per month and to the necessity for hydraulic filling. In 1939, prior to the introduction of filling, total ore production costs were 13/7.8 per ton as against 28/10.74 per ton in 1945 after the introduction of filling. The filling is necessary on account of the flat dip of the orebody, the bad hangingwall and the broken nature of the ore itself. The ore is intersected by a considerable number of joints and faults and filling has to be kept close to the back. Power costs are high.

12. Hill 50 Mine. Mount Magnet.

This mine is a good example of a small producer with fairly low costs (42/- per ton). The low costs are possible because the orebody is wide and can be benched. No filling is required. Treatment costs compare favourably with those of much larger mines. Geological mapping, followed by diamond drilling has recently revealed possible ore widths up to 50 feet, and it is proposed to increase the capital and to approximately double the output.

30th June, 1948.
CANBERRA. A.C.T.

C. J. Sullivan.
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REVISION OF WESTERN AUSTRALIAN GOLD MINES

| Mine | Total Production to 1947 | | Production 1947 | | Ore Reserves | | Average width of lode ft. | Drilling per foot ft. | Develop- ment 1947 ft. | Tons Per foot of development | Percent- age pay- ability of driving. | Men Em- ployed | Tons Per Man-Shift Underground | Cost. (shillings per long ton.) | | | | | Individual costs of interest | | | | | | Per cent profit on Cap. |
|-----------------------------------|--------------------------|-------------------|--------------------------------------|-------------------------|----------------------|---------------------------|------------------------------------|-----------------------------|---------------------------------|------------------------------------|--|-------------------------|--------------------------------------|------------------------------------|--|-----------|--------------------|---------------------|------------------------------|----------------------------------|------------------------------|-------------------------------------|--------------------|---------------------|-------------------------------|
| | Ore Tons (2.244lb) | Gold fine ozs. | Long Tons. | Head Value dwt. | Tons | Grade dwt. | | | | | | | | Develop- ment | Winning (Ore Handling) | Treatment | Roasting- furn. | Adminis- tration | Total | Drilling per foot | Power cost per unit | Power cost per oz. gold | Geology per ton | Cap- ital \$. | |
| Lake View & Star. | 23,533,645 | 11,730,441 | 517,045 | 5.7 (Recov.) | 3,550,000 | 5.5 | 7 | - | - | 307 | 33% | 920 | 3.66 | 4.48 | 19.46 (Out & fill, fill stopes) | 11.19 | 1.09 | 2.35 | 38.57 | - | (15,000 H.P.) 0.95d. | 13-7 | 0.60. | 700,000 | 51.59 |
| Great Boulder | 2,448,752 | 4,000,327 | 363,639 | 5.22(R) (91.5R) | 2,131,000 | 5.8 | 5.5 | 80,000 | 16,000 -20,000 | 20-30 | 25% | 795 | 2.60 | 7.44 | 24.76 (shrink, out and fill) | 13.05 | 1.32 | 1.94 | 49.31 | - | 1.558d. | 21-4-9 | 0.78. | 312,500 | 40.5 |
| Big Bell | - | - | 357,623 | 2.77(R) 2.5 (R) | 2,415,300 | 3.01 | 60 | - | 9,600 | 30-45 | Main devel. in ore | 359 Normal 400 | 6.8 | 4.68 | 9.12 (sub-level stopping & d. blast) | 6.74 | 1.66 | 5.06 | 27.46 | (900') (11' x 11') 198.2/- | .90238d. | 1-6-7 | - | 400,000 | -25.7 |
| North Kalbarli | 1,898,242 | 660,203 | 151,405 | 5.9 | 1,548,000 | 6.02 | 121 | - | - | - | - | 303 | 2.77 | 8.60 | 17.65 (shrink) | 16.09 | 0.46 | 2.80 | 45.6 | - | 1.557d. | 1-4-1 | - | 137,500 | 69.47 |
| Gold Mines Kalgoorlie | 1,307,008 | 300,496 | 157,813 | 4.9(R) | (548,000 203,000) | 5.2 (shrink) 4.2 (out) | 5 | - | 7,500 | 21 | - | 300 | 7.03 (0. out) | 1.54 | 22.79 (shrink) | 15.81 | 1.97 | 1.61 | 43.72 | - | 1.07d. | ? | - | 768,437 | 6.84 |
| Perse- ance | 5,205,000 | 2,707,000 | 130,301 | 5.166 (Recov. 4.9) | 301,500 | 5.3 | 9 | - | 7,436 | 22 | - | 332 | 2.82 | 6.97 | 22.29 (shrink stopes) | 15.02 | 0.71 | 2.09 | 47.88 | (700') Since Risen to 1.7 | 1.56d. | 1-6-8 | 0.58. | 281,025 | 18.60 |
| Central Norseman | - | - | 107,292 | 6.8 (Recov.) (96% R) | 223,000 | 7.0 | 6 | - | - | - | - | 411 | 1.223 | 16.00 (New shaft) | 29.63 (Breast stopping, no fill) | 8.65 | 2.31 | 1.50 | 58.09 | - | 1.0422d. | 16-8 | - | 400,000 | 19.39 |
| Parings | 830,624 | 201,514 | 102,074 | 4.5 (R) (87% Recov.) | 239,775 | 4.89 | 5 | - | 7,500 | 11 (1947) 12-16 (Avge.) | - | 234 | 2.32 | 7.85 | 23.25 (shrink) | 14.18 | 1.23 | 0.52 | 47.03 | - | 1.8d. | 1-17-6 | 0.28. | 270,439 | 9.88 |
| Sons of Guelia | - | - | (Normally 120,000) Present 82,900 | 5.9 (94% Recov.) | 548,100 | 6.4 | 10 | - | - | - | - | 249 (No real 360) | 2.6 | 9.09 | 26.26 (Out and fill) Internal shaft. | 12.40 | 2.51 | 7.65 | 53.91 | - | 1.112d. | 1-12-10.4 | 0.18. | 203,125 | 25.61 |
| South Kalbarli Consolidated | 2,563,276 | 1,000,303 | 79,321 | 5.0 (89% Recov.) | 307,000 | 5.50 | 6.5 | 2,434 | 5,039 | 14.5 | 25% | 211 | 2.23 | 7.62 | 23.93 (shrink) | 17.07 | 0.16 | 1.22 | 50.00 | - | 1.68d. | 1-16-10 (1 yr. only) | 1.0d. | 76,126 | 24.37 |
| Kalgoorlie Enterprise | 573,450 (6.615dwt) | - | 58,549 | 6.721 (93.3R) | 310,700 | 6.3 | 10 | - | - | 297 | - | 129 | 1.7 | 12.29 | 33.66 (Hydr. fill) | 15.01 | 1.45 | 4.00 | 66.41 | (900') £10 | 1.56d. | 1-3-3 | - | 275,000 | 8.28 |
| Hill 50 Mine Mount Magnet | - | - | 44,718 | 5.3(R) | 110,000 | 5.5 | - | - | - | - | - | 110 | 3.03 | 5.40 | 20.36 (Benching, open stopes) | 12.24 | 1.53 | 2.47 | 42.02 | - | - | - | - | 68,790 | 21.77 |