1947

STOCKTON OPEN CUT: COLLIE COALFIELD

Report of the

DEPARTMENT OF MINES

WESTERN AUSTRALIA

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND

1949

—

WESTERN AUSTRALIA

REPORT

of the

Department of Mines

FOR THE YEAR

1947

PERTH:

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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1946.

TABLE OF CONTENTS.

DIVISION I.

DIVISION II.

DIVISION III.

DIVISION IV.

DIVISION V.

DIVISION VI.

DIVISION VII.

DIVISION VIII.

DIVISION IX.

STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines of the State of Western Australia for the Year 1947.

To the Hon. Minister for Mines.

Sir,—I have the honour to submit the Annual Report of the Department for the year 1947, together with reports from the officers controlling Sub-Departments, and comparative tables furnishing statistics relative to the Mining Industry.

Department of Mines,
Perth, 31st May, 1948.

A. H. TELFER,
Under Secretary for Mines.

Division I.

The Honourable Minister for Mines,—

I have the honour to submit, for your information, a report on the Mining Industry for the year 1947.

The estimated value of the mineral output of the State for the year was £4,276,620 (calculating gold at £4 4s. 11.45d. per fine ounce); an increase in value of £602,045 compared with the preceding twelve months. The estimated value of the premium paid to gold producers amounted to £A4,585,657, bringing the gross value of all minerals up to £A8,862,277, an increase of £A1,168,326 compared with the 1946 production.

There were increases in quantities and values of arsenic, asbestos, beryl, clays, coal, diatomaceous earth, gypsum, glass sand, jarosite, kaolin, kyanite, magnesite, pyrites, red ochre, scheelite, silver, and cupreous ore for fertilising purposes, whilst a goodly quantity of lead ore and concentrates shipped abroad during the year awaits realisation. Decreases in quantities and values were shown in alunite, antimony, bentonite, dolomite, felspar, glauconite, talc, tin and vermiculite.

The estimated value of gold received at the Perth Branch of the Royal Mint and exported in gold-bearing material was £A7,575,574 (and equalled 85.48% of all minerals). (See footnote to Table 1 (a), Part II.)

Other minerals realised:—Coal, £840,249; pyrites, £187,621; silver, £47,814; alunite, £41,212; asbestos, £37,393; gypsum, £28,774; arsenic, £28,738; kyanite, £14,597; red ochre, £10,856; antimony, £9,731; glauconite, £8,762; cupreous ore, £6,071; clays, £6,074; tin, £5,565; felspar, £4,291; scheelite, £3,840; beryl, £1,525; lead, £936; talc, £813; vermiculite, £492; glass sand, £469; kaolin, £310; dolomite, £285; bentonite, £134; magnesite, £73; diatomaceous earth, £50, and jarosite, £37.

Dividends paid by mining companies amounted to £894,085, an increase of £180,159 when compared with the previous year. (See Table 6, Part II.)

To the end of 1947, the total amount distributed by gold mining companies was £43,351,154. To the same date, the value of the mineral production amounted to £241,773,921, of which gold accounted for £218,922,420 based on normal values; but premiums on sale of gold during years 1920-1924, plus payments under the Gold Bounty Act, 1930, and further premiums since that time, increase the total value of gold and mineral productions by £71,751,346.

GOLD.

The quantity of gold reported as being received at the Perth Branch of the Royal Mint (698,666.29 fine oz.) together with that contained in bullion, concentrates, and other gold-bearing materials exported for treatment £5,220 99 fine ounces) totalled 703,886.38 fine ounces, and exceeded that of 1946 by 86,922.72 fine ounces (*vide* Table 1 (a) of Part II).

On the other hand, the total gold yield for the year reported directly to the Department by the producers was 701,752.51 fine ounces, which was an increase of 83,145.20 fine ounces in comparison with the previous year's figures. (*Vide* Table 3 of Part II.)

The non-collation of the two totals mentioned above is principally due to the fact that the gold reported as being received at the Mint and exported for treatment is not all necessarily produced during the calendar year under review, a certain quantity being in the transitory stage or near transitory stage from the producer at the end of the year. For this reason, the former total is accepted as the official production of the State, whilst the latter is utilised mainly in tracing the gold back to its source, etc. The calculated average value per ton of ore treated in the State as a whole decreased from 23.948 shillings per ton in 1946 to 23.777 shillings per ton in 1947, calculating gold at the rate of £4 4s. 11.45d. per fine ounce, but the premium rate which remained unchanged throughout the year (153.37 per cent.) would more than double this estimate. For East Coolgardie Goldfield (which produced approximately 64.10% of the State's yield of gold), the calculated average value of the ore treated decreased from 23.992 shillings to 23.558 shillings per ton. The estimates for Murchison (Big Bell Mines Ltd., Hill 50 G.M., N.L., and Triton G.Ms. N.L.), Mt. Margaret (Sons of Gwalia), and Dundas (Central Norseman Gold Corporation), were 16.389s. (17.902s.); 32.220s. (30.610s.); and 27.189s. (24.850s.) respectively. Figures for 1946 are shown in parenthesis.

The tonnage of ore reported to have been treated in 1947, viz. 2,507,306 tons, was 312,829 tons more than the previous year and formed 58.4% of the State record tonnage established in 1940.

Increased tonnages were reported from various goldfields as follows:—Kimberley, 136; Ashburton, 301; Peak Hill, 1,294; Murchison, 268,631; Yalgoo, 209; North Coolgardie, 3,840; Broad Arrow, 12,347; East Coolgardie, 176,914; Coolgardie, 1,878; Yilgarn, 45.339; Philips River, 58; and Outside Proclaimed Goldfields, 522; whilst the goldfields showing decreased tonnages were: Pilbara, 14,129; East Murchison, 145,200; Mt. Margaret, 5,304; North-East Coolgardie, 102; and Dundas, 33,905.

All but one of the nine large producing companies on the Golden Mile exceeded their 1946 tonnage by a fair margin; the Murchison increase was due to the resumption of the Triton G.Ms. and the vastly increased production of the Big Bell G.Ms., and Broad Arrow's extra tonnage was reflected in the output of the Ora Banda Amalgamated Coy., whilst the credit for the Yilgarn rise was shared by the Evanston G.M., Burbidge G.Ms., and the Edna May (W.A.) Amalgamated.

The closing of the Wiluna G.M. at the beginning of the year was responsible for the East Murchison decrease and the cessation of crushing operations by the Norseman G.Ms. N.L. caused the Dundas decline; whilst Pilbara was affected by the closure of the Comet G.Ms. and a slight drop in the Blue Spec G.Ms. output. In the Mt. Margaret Goldfield the Sons of Gwalia failed to equal the previous year's production.

While the gold output has shown a steady upward trend since the war, the gold mining industry is beset with many difficulties at the present time. In common with production costs in all industries and trades, mining costs have risen sharply, but unfortunately the gold mining industry, unlike others, has to absorb these rises, as the price of gold has been static for a considerable time. In addition, labour is very scarce, and there is a gradual drift to the city which is very perturbing to the industry. This scarcity of labour also applies to the firewood industry which in the goldfields is so closely allied to the mining industry, as it supplies the fuel utilised in the production of power.

Another drawback is the difficulty in obtaining machinery and plant. This is also common to industry generally today, but mining suffers particularly because it is so highly mechanised.

As a result of these accumulated difficulties, a number of the mines are finding it hard to make ends meet, and an approach has been made by the State Government and the Chamber of Mines to the Commonwealth Government for some assistance which will enable the employing mines to carry on over the present difficult period, and until either costs can be reduced, or a rise in the price of gold occurs.

At the time of writing the industry is awaiting a decision from the Commonwealth Government.

As far as the development and exploratory side of the industry is concerned, the position is bright. There is in prospect the establishment of a number of mines of considerable size, amongst them the Mt. Charlotte at Kalgoorlie, the Porphyry at Edjudina, the Bullfinch near Southern Cross, the Western Mining Company's property near Coolgardie, the Mount View at Day Dawn, and the Nevoria G.M. at Nevoria. This is a formidable list, and if present-day costs and labour permit of the opening up of these mines on the scale projected, a considerable expansion in gold output will result.

GOLD TAX.

During the year the Commonwealth Government announced the repeal of the Gold Tax Act. Since this Act's inception in 1939, taxation totalling £4,569,494 8s. 11d. has been collected. Over the same period refunds of tax to prospectors and low-grade producers amounted to £1,206,163 6s. 1d.

MINERALS.

As forecasted in my previous report, considerable activity has been shown in regard to the production of minerals generally. The World demand is actually increasing and there is opportunity at the present time for the exploitation of many of our deposits. Some of the outstanding mineral projects now in hand are:—

(a) At Cockatoo Island in Yampi Sound, where a major iron ore deposit is being developed on modern lines.

(b) At Hamersley Ranges, where blue asbestos is being produced, and an up-to-date township is being established.

(c) In the Northampton mineral field where several lead deposits have been opened up and good quality lead already produced.

(d) At Greenbushes, where intensified operations are in hand to develop the tin deposits.

(e) At Yanmah, near Manjimup, where an interesting deposit of kyanite, a refractory is being thoroughly investigated.

(f) At Norseman, where the Norseman Gold Mines N.L. continues to produce regular quantities of pyrite for sale to the superphosphate manufacturers.

There are also other deposits being worked and investigated, and it is hoped that a number of reasonably permanent projects will result from this activity.

COAL.

The 1946 record output was exceeded in 1947, the tonnage produced being 730,506.

It is now necessary that each succeeding year should show a substantial increase, as the demand for coal is an ever-expanding one. New industries are being established, and more power is required for them, while increasing population and additional houses mean a greater call on electricity.

To meet this demand new seams need to be developed.

The geological and geophysical examinations conducted by the State Government with the help of the Commonwealth Geophysical Branch were completed during the year, and as a result the boundaries of the Collie coal basin were established. This work is to be followed by deep diamond drilling immediately a suitable boring plant now on order from Canada is obtained.

MINING DEVELOPMENT ACT, 1902-1924.

The expenditure incurred in rendering assistance to mine owners and the industry generally under the provisions of this Act totalled £21,544 1s. 10d., and, in the preceding year £12,488 13s. 11d.

PART II.—MINERALS.

TABLE 1.—*Quantity and Value of Minerals, other than Gold and Silver, produced and/or exported during Years* 1946 *and* 1947.

Description of Minerals.	1946.		1947.		Increase or Decrease for Year compared with 1946.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£A.	Tons.	£A.	Tons.	
Alunite (Crude Potash)	1,735·80	41,658	1,724·70	41,212	— 11·10	
Antimony	462·01	23,458	119·82	9,731	— 342·19	
Arsenic	1,624·50	33,935	1,191·13	28,738	— 433·37	
Asbestos (Anthophyllite)	8·50	121	75·00	988	+ 66·50	
Asbestos (Chrysotile)	Nil	Nil	88·50	6,179	+ 88·50	
Asbestos (Crocidolite)	365·56	13,404	888·99	30,226	+ 523·43	
Barytes	10·00	50	Nil	Nil	— 10·00	
Bentonite	62·00	186	44·75	134	— 17·25	
Beryl Ore	15·49	581	44·89	1,525	+ 29·40	
Clays	2,682·00	1,341	6,277·50	6,064	+ 3,595·50	
Coal	642,286·70	730,104	730,506·32	840,249	+ 88,219·62	
Copper Fertiliser	Nil	Nil	*917·00	6,071	+ 917·00	
Copper Ore	74·00	105	Nil	Nil	— 74·00	
Diatomaceous Earth	Nil	Nil	5·00	50	+ 5·00	
Dolomite	98·09	491	56·85	285	— 41·24	
Felspar	1,793·00	6,282	1,226·00	4,291	— 567·00	
Glass Sand	180·50	227	364·40	469	+ 183·90	
Glauconite	366·50	9,162	350·50	8,762	— 16·00	
Gypsum	15,350·16	21,154	20,281·50	28,774	+ 4,931·34	
Jarosite	Nil	Nil	9·54	37	+ 9·54	
Kaolin	Nil	Nil	581·00	310	+ 581·00	
Kyanite	139·74	568	2,931·00	14,597	+ 2,791·26	
Lead Ore and Concentrates	36·21	1,068	22·36	937	— 13·85	
Magnesite	10·50	26	73·00	73	+ 62·50	
Pyrites	77,784·00	107,250	86,952·00	187,621	+ 9,168·00	
Red Ochre	859·90	9,531	1,027·10	10,856	+ 167·20	
Talc	389·41	1,499	213·00	813	— 176·41	
Tantalite	·36	281	Nil	Nil	— ·36	
Tin	28·52	5,838	23·63	5,565	— 4·89	
	Units.		Units.		Units.	
Tungsten Ores (Scheelite)	285·00	1,552	642·54	3,840	+ 357·54	
	Tons.		Tons.		tons.	
Vermiculite	203·50	1,218	82·00	492	— 121·50	
		1,011,090		1,238,889		

TABLE 1 (a).—*Quantity and Value of Gold and Silver exported and minted during Years* 1946 *and* 1947.

	Fine ozs.	£A.	Fine ozs.	£A.	Fine ozs.	£A.
Gold (exported and minted)	616,963·66	‡6,640,069	703,886·38	‡7,575,574	+ 86,922·72	+ 935,50—
Silver (exported and minted)	171,452·22	42,792	199,301·57	47,814	+ 27,849·35	+ 5,0257
Total	...	6,682,861	...	7,623,388	...	+ 940,5722

*Includes 409 tons valued at £2,968, late reported for 1944, 1945, 1946.

‡Included in the value of Gold shown are the following estimated premiums :—1946, £A4,019,376 ; 1947, £A4,585,657

TABLE 2.—*Value and Percentage of Mineral Exports in relation to the Value of Total Exports from Western Australia.*

Year.	Total Exports. †	Mineral Exports (exclusive of Coal).	Percentage.
	£	£	
1902	9,051,358	7,530,319	83·20
1903	10,324,732	8,727,060	84·53
1904	10,271,489	8,625,676	83·98
1905	9,871,019	7,731,954	78·33
1906	9,832,679	7,570,305	76·99
1907	9,904,860	7,544,992	76·17
1908	9,518,020	7,151,317	75·13
1909	8,860,494	5,906,673	66·66
1910	8,299,781	4,795,654	57·78
1911	10,606,863	7,171,638	67·61
1912	8,941,008	5,462,499	61·09
1913	9,128,607	4,608,188	50·48
1914	8,406,182	3,970,182	47·23
1915	6,291,934	2,969,502	47·19
1916	10,878,153	6,842,621	62·92
1917	9,323,229	5,022,694	53·87
1918	6,931,834	2,102,923	30·34
1919	14,279,240	6,236,585	43·67
1920	15,149,323	3,096,849	20·44
1921	10,331,405	1,373,810	13·30
1922	11,848,025	2,875,402	24·27
1923	11,999,500	3,259,476	27·16
1924	13,808,910	1,424,319	13·24
1925	13,642,852	173,126	1·27
1926	14,668,184	1,597,698	10·89
1927	15,805,120	472,041	2·99
1928	16,911,932	996,099	5·88
1929	16,660,742	1,802,709	10·82
1930	19,016,639	6,370,396	33·49
1931	14,266,650	4,333,421	30·37
1932	16,771,465	5,657,870	33·74
1933	18,098,214	5,328,869	29·44
1934	16,784,705	5,759,324	34·31
1935	17,611,547	5,698,721	32·36
1936	19,564,716	7,130,381	36·45
1937	21,594,942	9,026,313	41·80
1938	24,220,864	10,417,458	43·01
1939	23,244,509	11,969,562	51·49
1940	25,800,562	12,480,721	48·37
1941	24,536,777	12,411,316	50·58
1942	20,681,284	8,476,622	40·99
1943	18,014,340	6,539,295	36·30
1944	19,453,001	(a) 1,282,867	6·59
1945	20,170,624	(b) 205,587	...
1946	26,342,125	(b) 211,890	...
1947	42,147,241	(c) 4,163,991	9·98
Totals since 1902 ...	699,867,680	244,506,915	34·94

Exclusive of Arsenic prior to 1935. † Including Ship's Stores. (a) Approximately 25 per cent. of gold production for year exported. (b) No gold bullion exported. (c) Approximately 51 per cent. of gold production for year exported.

COMPARATIVE STATISTICAL DIAGRAMS
SHOWING
OUTPUT AND VALUE OF GOLD AND OTHER MINERALS
LANDS LEASED FOR GOLD MINING IN WESTERN AUSTRALIA
AND THE GOLD PRODUCTION OF AUSTRALASIA FOR THE YEAR 1947

FIG.1 Output of Gold from various Goldfields as reported to Mines Dept.

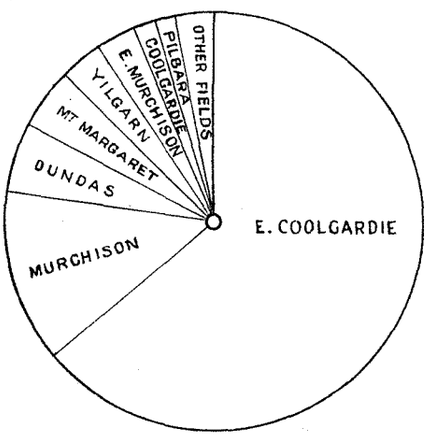


FIG.2 Gold produced from various Goldfields as given by the Export and Mint Returns.

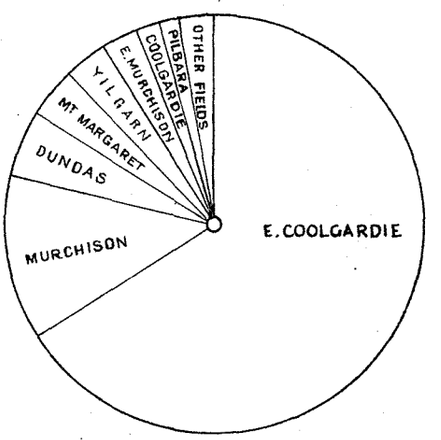


FIG.3 Value of Gold and other Minerals.

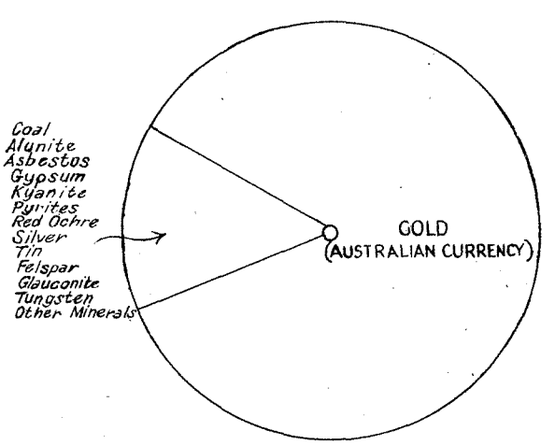


FIG.4 Value of Minerals other than Gold.

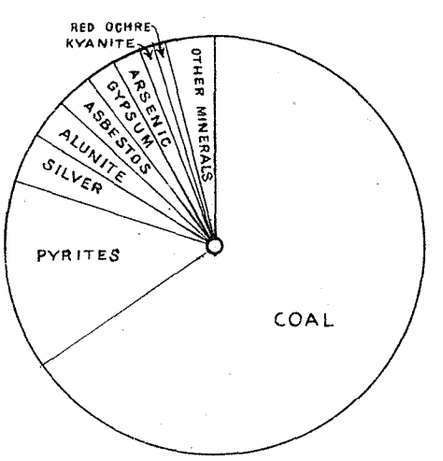


FIG.5 Areas of land leased for Goldmining on various Goldfields.

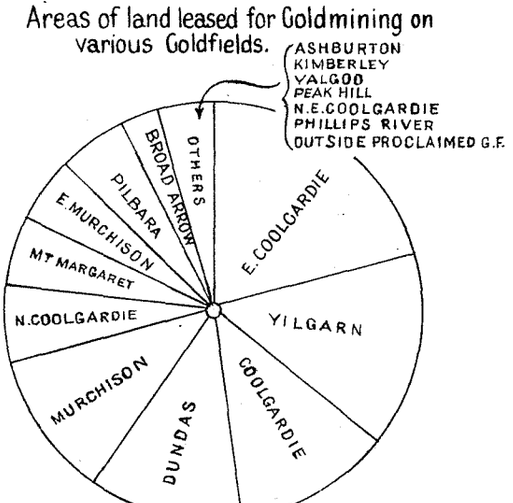


FIG.6 Output of Gold in the States of Australia and the Dominion of New Zealand.

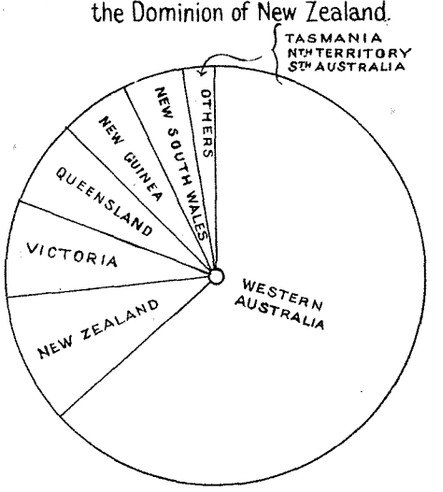


DIAGRAM OF GOLD OUTPUT

Showing Tonnage Treated (as reported to Mines Dept.); the Total Output of Gold Bullion, Concentrates etc., entered for export and received at the Perth Mint, and the Estimated Value thereof, in Australian Currency.

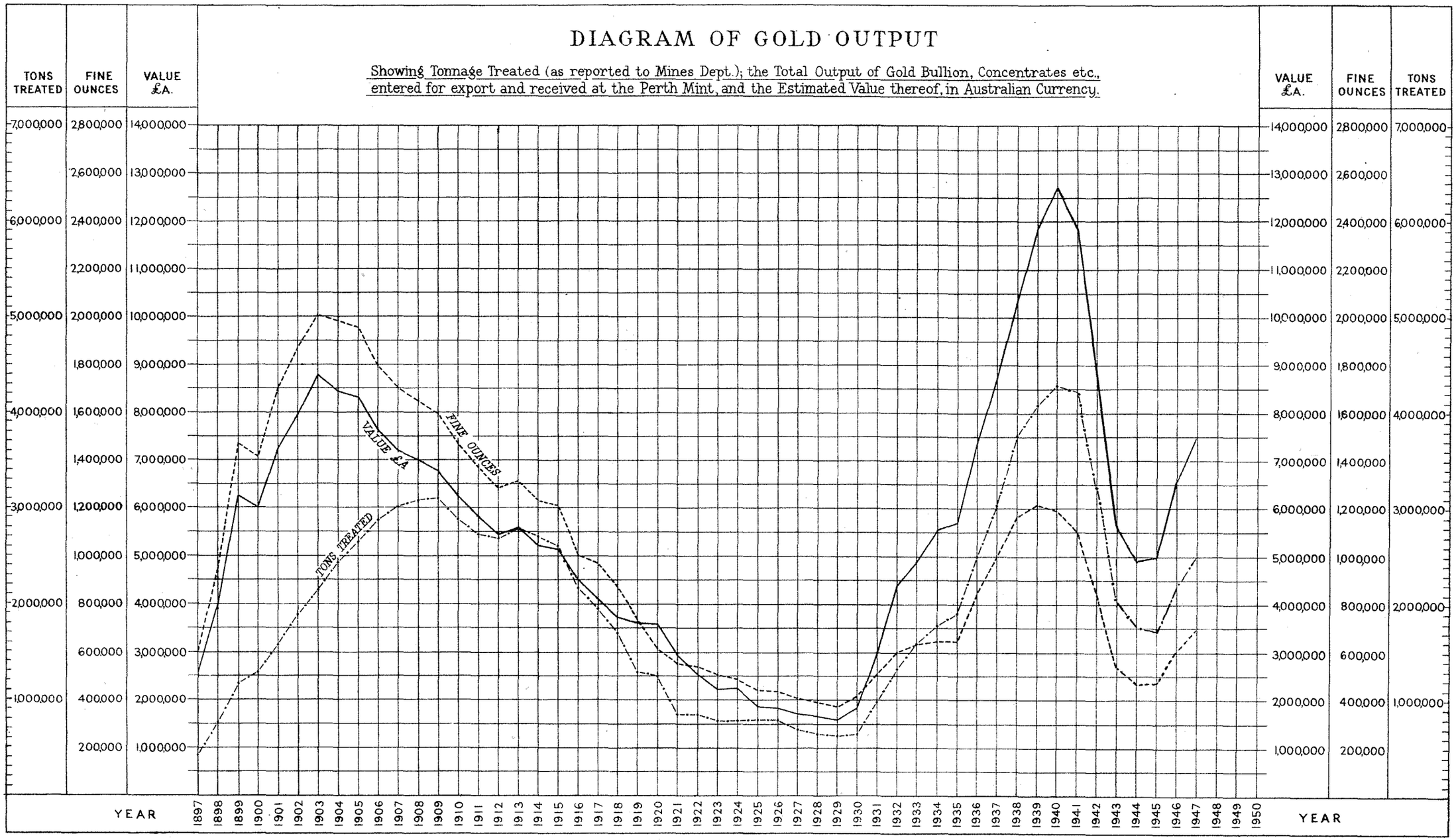


TABLE 3.

Showing for every Goldfield the amount of Gold reported to the Mines Department as required by the Regulations; also the percentage for the several Goldfields of the total reported, and the average value of the yield of Gold per ton of ore treated.

Goldfield.	Reported Yield.		Percentage for each Goldfield.		Average Value per ton of Ore Treated. (Gold at £4 4s. 11·45d. per fine oz.).	
	1946.	1947.	1946.	1947.	1946.	1947.
	Fine ozs.	Fine ozs.	%	%	shillings	shillings
1. Kimberley	233*	427*	·038	·061	....	*266·530
2. Pilbara	12,491	11,026	2·019	1·571	43·402	90·756
3. Ashburton	53*	143	·009	·020	....	40·326
4. Gascoyne	16*	....	·003	....	....	....
5. Peak Hill	1,160	1,632	·188	·233	37·506	35·344
6. East Murchison	37,148	21,487	6·005	3·062	17·244	48·285
7. Murchison	44,304	92,378	7·162	13·164	17·902	16·389
8. Yalgoo	653	1,175	·106	·167	36·872	58·333
9. Mt. Margaret	34,634	34,442	5·599	4·908	30·610	32·220
10. North Coolgardie	5,906	8,144	·955	1·160	66·436	60·736
11. Broad Arrow	4,084	8,253	·660	1·176	58·934	38·451
12. North-East Coolgardie	610	911	·099	·130	52·560	87·629
13. East Coolgardie	408,170	449,816	65·980	64·099	23·992	23·558
14. Coolgardie	13,986	11,966	2·261	1·705	29·144	23·836
15. Yilgarn	10,709	22,056	1·731	3·143	37·178	26·842
16. Dundas	44,327	37,648	7·166	5·365	24·850	27·189
17. Phillips River	34	32	·005	·005	25·334	16·206
18. Outside Proclaimed Goldfield	89*	216	·014	·031	....	35·042
Totals and Averages	618,607	701,752	100·000	100·000	23·948	23·777

* Principally Alluvial and Dollied.

The total yield of the State is as shown in Table 1 (a), being the amount of gold received at the Royal Mint, gold exported in bullion and concentrates, and alluvial and other gold not reported to the Mines Department.

When comparisons are made as to the yield from any particular Field with the preceding year, the figures reported to the Department are used.

TABLE 4.

Average Quantities of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during 1946 *and* 1947.

Goldfield.	1946.				1947.			
	Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.		Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.	
	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.
	Tons.	Tons.	Fine ozs.	Fine ozs.	Tons.	Tons.	Fine ozs.	Fine ozs.
1. Kimberley	....	....	77·82	25·94	22·71	7·57	71·24	23·75
2. Pilbara	317·53	116·43	162·23	59·48	141·38	58·98	151·04	63·00
3. Ashburton	....	....	....	26·61	150·50	75·25	71·44	28·58
4. Gascoyne	....	....	....	....	....	....	....	....
5. Peak Hill	202·19	101·10	89·27	44·63	206·46	122·59	85·90	51·00
6. East Murchison	978·64	394·41	198·65	80·06	420·06	120·78	238·73	68·65
7. Murchison	546·06	270·57	115·07	57·02	773·61	436·12	149·24	84·13
8. Yalgoo	83·47	42·93	36·27	18·65	90·09	42·79	61·86	29·38
9. Mt. Margaret	410·76	175·40	148·01	63·20	410·93	183·83	155·85	69·72
10. North Coolgardie	82·99	33·71	64·90	25·24	83·76	37·11	59·88	25·37
11. Broad Arrow	84·09	39·77	58·34	26·52	161·36	81·04	73·03	35·57
12. North-East Coolgardie	46·95	20·12	29·05	11·09	38·41	16·36	39·62	15·45
13. East Coolgardie	784·60	441·29	221·59	123·80	805·43	450·84	223·34	124·26
14. Coolgardie	463·28	202·83	158·93	69·58	352·45	167·24	98·89	46·92
15. Yilgarn	128·79	66·14	56·36	28·94	290·87	148·53	91·90	46·93
16. Dundas	470·61	267·73	137·66	78·32	355·39	239·09	113·74	76·52
17. Phillips River	112·50	28·13	33·55	8·39	56·67	21·12	10·81	4·05
18. Outside Proclaimed Goldfields	....	....	29·72	9·91	74·64	30·74	30·79	12·68
Total Averages	619·03	317·26	174·50	88·87	621·08	329·91	173·83	91·74

TABLE 5.

Output of Gold from the several States of Australia, the Northern Territory, Papua, the Mandated Territory of New Guinea, and the Dominion of New Zealand, during 1947.

State.	Output of Gold.	*Value.	Percentage of Total.	
			Output of Commonwealth.	Output of Australasia.
	Fine ozs.	£	%	%
1. Western Australia	703,886	2,989,917	70.610	63.464
2. Victoria	84,709	359,821	8.498	7.637
3. New South Wales	50,082	212,736	5.024	4.515
4. Queensland	72,281	307,030	7.251	6.517
5. Tasmania	15,051	63,933	1.510	1.357
6. South Australia	629	2,672	.063	.057
7. Papua‡	....	....	....	....
8. Northern Territory	11,016	46,793	1.105	.993
9. Mandated Territory of New Guinea	59,202	251,474	5.939	5.338
10. New Zealand	112,260	476,850	....	10.122
	1,109,116	4,711,226	100.000	100.000

* Exclusive of Premium. ‡ Not available.

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1947, *and the Total to date.*

Mainly compiled from information supplied to the Government Statistician's Office by the Chamber of Mines of Western Australia.

Goldfield.	Name of Company.	Dividends Paid.	
		1947.	Grand Total to end of 1947.
		£	£
Pilbara	Various Companies	....	26,513
Peak Hill	do. do.	....	199,305
East Murchison	do. do.	....	1,914,053
Murchison	Hill 50 Gold Mine, N.L.	28,125	203,126
	Various Companies	....	2,714,945
Mt. Margaret	Sons of Gwalia, Limited	30,469	1,988,723
	Various Companies	....	958,286
North Coolgardie	do. do.	....	712,551
Broad Arrow	do. do.	....	92,500
North-East Coolgardie	do. do.	....	129,493
East Coolgardie	Boulder Perseverance, Ltd.	21,076	(*a*) 2,495,065
	Golden Horseshoe (New), Ltd.	11,459	(*b,d*)4,032,918
	Gold Mines of Kalgoorlie, Ltd.	38,422	433,204
	Great Boulder Proprietary, Ltd.	78,125	7,004,713
	Kalgoorlie Enterprise Mines, Ltd.	11,000	265,375
	Lake View & Star, Ltd.	332,500	(*c*) 4,092,000
	North Kalgurli (1912), Ltd.	103,125	1,057,812
	Paringa Mining and Exploration Co., Ltd.	42,256	270,979
	South Kalgurli Consolidated, Ltd.	17,528	1,144,251
	Various Companies	....	10,754,854
Coolgardie	do. do.	....	388,770
Yilgarn	do. do.	....	1,205,556
Dundas	Central Norseman Gold Corporation	180,000	480,000
	Various Companies	....	786,162
	Totals	894,085	43,351,154

(*a*) Also £45,091 in bonuses and profit-sharing notes in years 1935–36. (*b*) Also £42,000 in bonuses and profit-sharing notes in year 1934. (*c*) Also £75,000 in bonuses and profit-sharing notes and £93,750 Capital returned in years 1932–35. (*d*) Also £55,000 Capital returned in year 1932 by Golden Horseshoe (New), Ltd.

TABLE 7.

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1947.

Goldfield, District or Mineral Field.	1947.		Increase or Decrease as compared with 1946.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£A.	tons.	£A.
ALUNITE (Crude Potash)—				
Yilgarn	1,724·70	41,212	— 11·10	— 446
ANTIMONY—				
Pilbara (Nullagine)	117·82	9,622	— 38·12	+ 145
East Murchison (Wiluna)	....	....	— 306·07	— 13,981
Outside Proclaimed Goldfield	2·00	109	+ 2·00	+ 109
ARSENIC—				
East Murchison (Wiluna)	1,190·00	28,714	— 434·50	— 5,221
Yilgarn	1·13	24	+ 1·13	+ 24
ASBESTOS (Anthophyllite)—				
East Coolgardie (Bulong)	....	....	— 3·50	— 21
Outside Proclaimed Goldfield	75·00	988	+ 70·00	+ 888
ASBESTOS (Chrysotile)—				
Pilbara	·50	7	+ ·50	+ 7
Outside Proclaimed Goldfield	88·00	6,172	+ 88·00	+ 6,172
ASBESTOS (Crocidolite)—				
Outside Proclaimed Goldfield	888·99	30,226	+ 523·43	+ 16,822
BARYTES—				
North-East Coolgardie (Kurnalpi)	....	....	— 10·00	— 50
BENTONITE—				
Outside Proclaimed Goldfield	44·75	134	— 17·25	— 52
BERYL ORE—				
Pilbara (Marble Bar)	16·04	513	+ ·55	— 68
Coolgardie	28·85	1,012	+ 28·85	+ 1,012
CLAYS—				
Outside Proclaimed Goldfield	6,277·50	6,064	+ 3,595·50	+ 4,723
COAL—				
Collie	730,506·32	840,249	+ 88,219·62	+ 110,145
COPPER FERTILISER—				
Peak Hill	*917·00	6,071	+ 917·00	+ 6,071
COPPER ORE—				
Phillips River	....	....	— 74·00	— 105
DIATOMACEOUS EARTH—				
Outside Proclaimed Goldfield	5·00	50	+ 5·00	+ 50
DOLOMITE—				
Murchison (Mt. Magnet)	56·85	285	— 41·24	— 206
FELSPAR—				
Coolgardie	1,226·00	4,291	— 567·00	— 1,991
GLASS SAND—				
Outside Proclaimed Goldfield	364·40	469	+ 183·90	+ 242
GLAUCONITE—				
Outside Proclaimed Goldfield	350·50	8,762	— 16·00	— 400
GYPSUM—				
Yilgarn	8,953·50	13,430	+ 4,941·50	+ 7,412
Dundas	376·00	564	+ 164·00	+ 247
Outside Proclaimed Goldfield	10,952·00	14,780	— 174·16	— 39
JAROSITE—				
Phillips River	9·54	37	+ 9·54	+ 37
KAOLIN—				
Outside Proclaimed Goldfield	581·00	310	+ 581·00	+ 310
KYANITE—				
Outside Proclaimed Goldfield	2,931·00	14,597	+ 2,791·26	+ 14,029

* Includes 409 tons valued at £2,968, late reported for 1944, 1945 and 1946.

TABLE 7—*continued.*

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1947—*continued.*

Goldfield, District or Mineral Field.	1947.		Increase of Decrease as compared with 1946.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£A.	tons.	£A.
LEAD ORE AND CONCENTRATES—				
Pilbara (Marble Bar)	16·47	611	+ 16·47	+ 611
Northampton	5·89	326	— 30·32	— 742
MAGNESITE—				
East Coolgardie (Bulong)	73·00	73	+ 62·50	+ 47
PYRITES—				
Dundas	86,952·00	187,621	+ 9,168·00	+ 80,371
RED OCHRE—				
Pilbara	2·10	15	+ 2·10	+ 15
Murchison (Cue)	823·40	8,123	+ 317·55	+ 3,725
North-East Coolgardie (Kurnalpi)	10·40	83	+ 10·40	+ 83
Outside Proclaimed Goldfield	191·20	2,635	— 162·85	— 2,498
TALC—				
East Coolgardie	213·00	813	— 176·41	— 686
TANTALITE—				
Pilbara (Marble Bar)	...	...	— ·36	— 281
TIN—				
Pilbara	17·90	4,109	+ 3·91	+ 1,359
Greenbushes	5·73	1,456	— 8·80	— 1,632
TUNGSTEN ORES (Scheelite)—	Units.		Units.	
Coolgardie	30·58	130	+ 3·58	— 20
Yilgarn	611·96	3,710	+ 353·96	+ 2,308
VERMICULITE—	tons.		tons.	
East Coolgardie (Bulong)	...	...	— 2·50	— 12
Outside Proclaimed Goldfield	82·00	492	— 119·00	— 714

* Includes 409 tons valued at £2,968 late reported for 1944, 1945, and 1946.

TABLE 8.

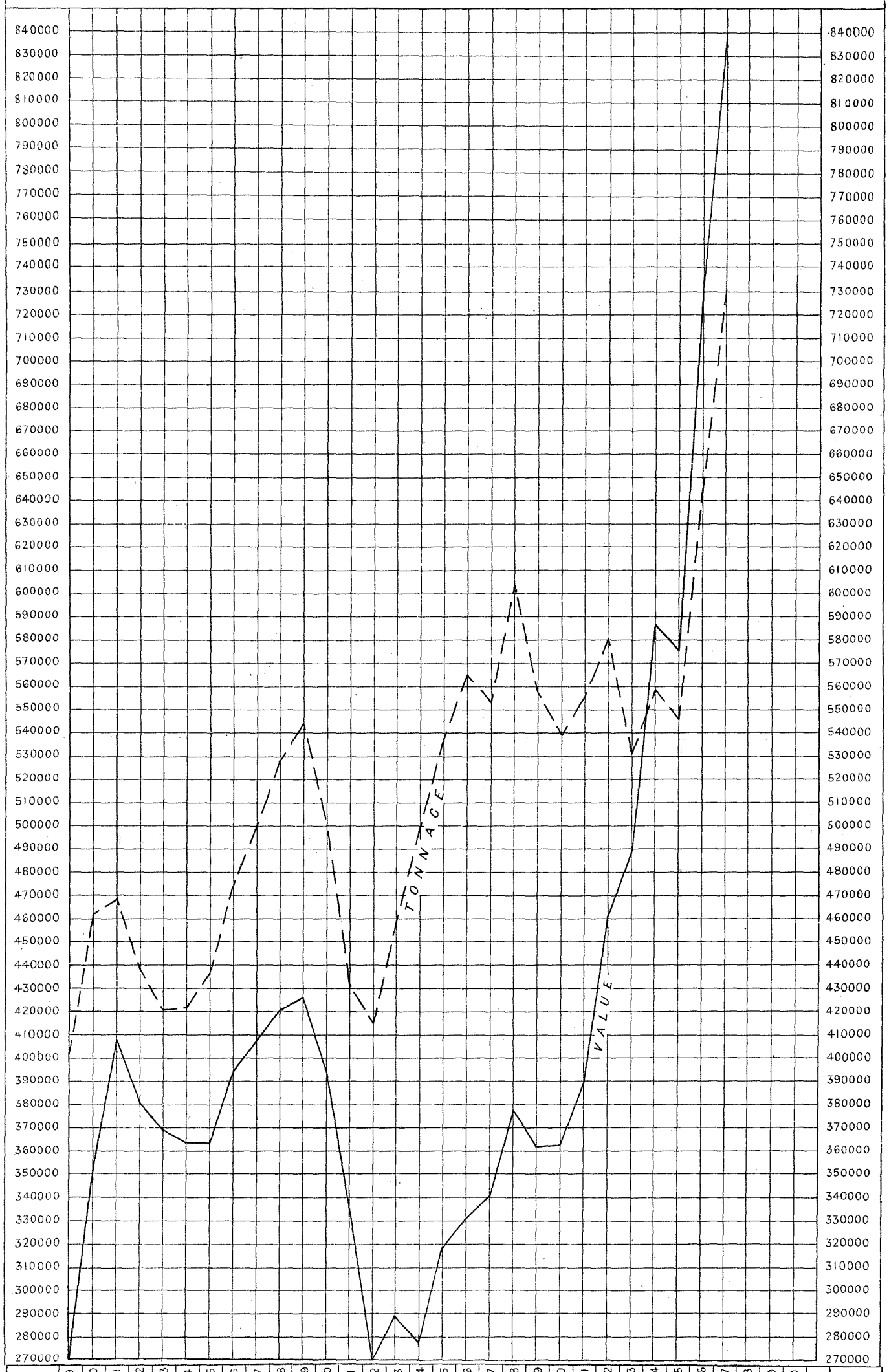
Quantity of Coal raised during 1946 *and* 1947, *estimated Value thereof, Number of Men employed, and Output per Man.*

Coalfield.	Year.	Quantity raised.	Estimated Value.	Men Employed.		Quantity Raised.	
				Above ground.	Under ground.	Per Man employed under ground.	Per Man employed above and under ground.
		tons.	£			tons.	tons.
Collie	1946	642,287	730,104	262	693	927	673
	1947	**730,506**	**840,249**	**287**	**745**	**980**	**708**

The quantity and value of coal raised during the year 1947 showed an increase amounting to 88,219 tons and £110,145 respectively. The average number of men employed during the year increased by 77, and the number of tons raised per man employed increased by 35 tons when compared with figures for 1946.

DIAGRAM OF COAL OUTPUT

Showing Quantities and Values as reported to Mines Dept. from 1919 onwards



YEAR	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	YEAR
£ VALUE	270355	350346	407117	381555	368949	363255	363203	394400	407967	420145	426706	394758	336178	270630	289806	278704	318013	331565	340444	375083	362811	364500	389278	461495	489721	583075	572896	730104	840249					£ VALUE
TONS	401713	462021	468817	438443	420714	421864	437461	474819	501505	528420	544719	501425	432400	415719	458399	500343	537188	565075	553510	604793	557535	539427	556574	581176	531546	558322	543363	642287	730506					TONS

PART III.—LEASES AND OTHER HOLDINGS UNDER THE VARIOUS ACTS RELATING TO MINING

TABLE 9.

Total Number and Acreage of Leases, Mineral Claims, and Prospecting Areas held for Mining on 31st December, 1946 and 1947.

Leases and Other Holdings.	1946.		1947.	
	No.	Acreage.	No.	Acreage.
Gold Mining Leases on Crown Lands	1,455	24,966	1,444	24,612
Gold Mining Leases on Private Property	9	226	13	336
Mineral Leases on Crown Lands	176	38,496	163	32,854
Mineral Claims	148	9,341	182	11,151
Prospecting Areas	*913	19,056	†809	17,219
Totals	2,701	92,085	2,611	86,172

* Includes 5 Prospecting Areas for Minerals of a total of 3,088 acres.

† Includes 47 Prospecting Areas for Minerals of a total of 1,172 acres.

PART IV.—MEN EMPLOYED.

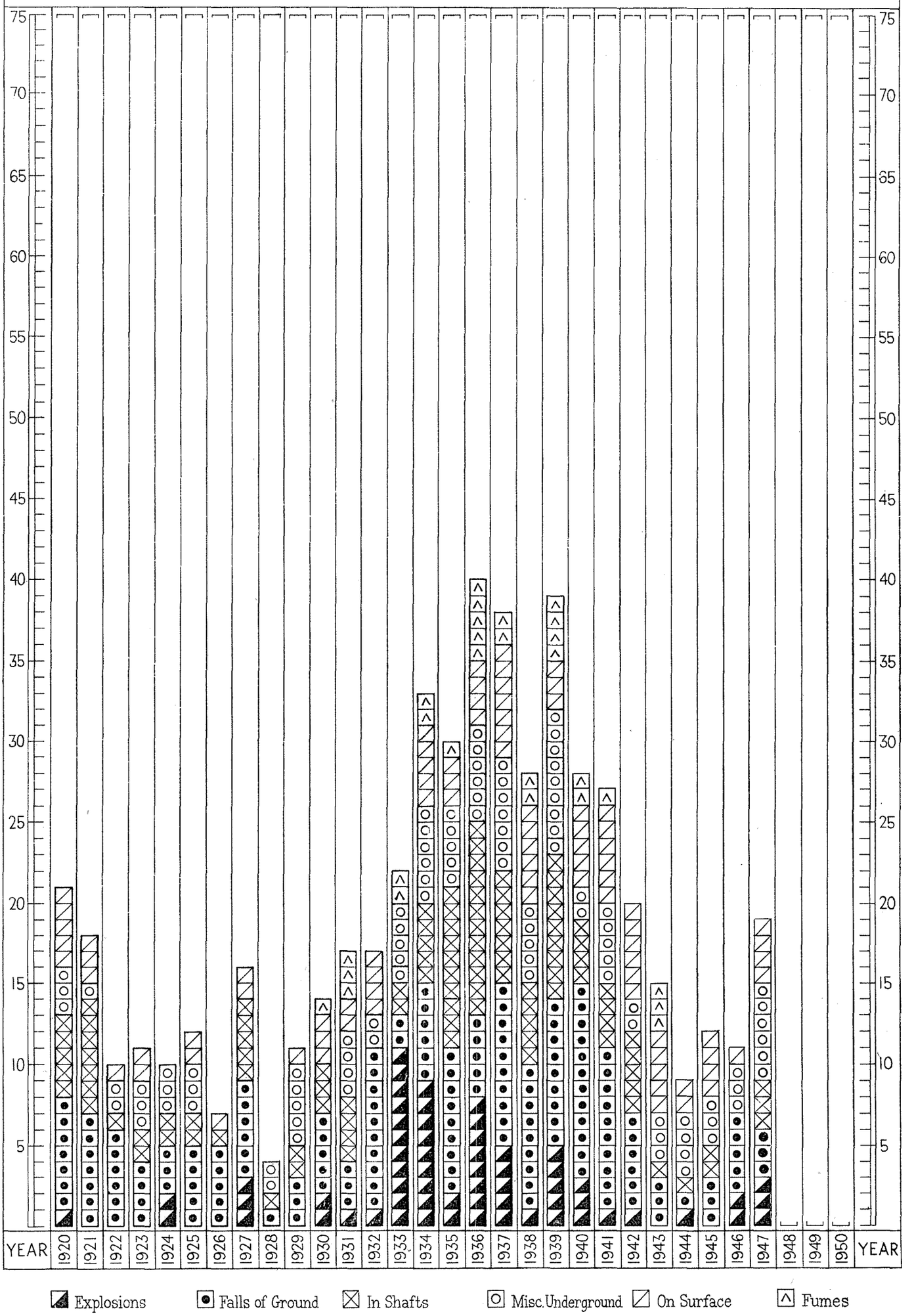
TABLE 10.

Average number of Men reported as engaged in Mining during 1946 *and* 1947.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1946.	1947.	1946.	1947.	1946.	1947.
Kimberley	...	9	18	...	...	9	18
Pilbara	Marble Bar	126	80	...	...	126	80
	Nullagine	84	95	...	...	84	95
Ashburton	...	2	4	...	1	2	5
Gascoyne	...	...	...	...	...	...	...
Peak Hill	...	26	32	...	...	26	32
East Murchison	Lawlers	111	103	...	...	111	103
	Wiluna	329	173	...	...	329	173
	Black Range	24	37	...	...	24	37
Murchison	Cue	487	769	...	...	487	769
	Meekatharra	103	124	...	...	103	124
	Day Dawn	39	52	...	...	39	52
	Mt. Magnet	148	153	...	...	148	153
Yalgoo	...	35	40	...	...	35	40
Mt. Margaret	Mt. Morgans	112	101	....	....	112	101
	Mt. Malcolm	332	293	....	....	332	293
	Mt. Margaret	104	100	....	....	104	100
North Coolgardie	Menzies	100	131	5	6	105	137
	Ularring	48	71	2	4	50	75
	Niagara	24	29	....	....	24	29
	Yerilla	52	76	3	4	55	80
Broad Arrow	....	148	225	6	7	154	232
North-East Coolgardie	Kanowna	33	41	4	3	37	44
	Kurnalpi	16	13	2	2	18	15
East Coolgardie	East Coolgardie	3,250	3,565	19	17	3,269	3,582
	Bulong	25	33	3	5	28	38
Coolgardie	Coolgardie	185	236	....	....	185	236
	Kunanalling	16	19	....	....	16	19
Yilgarn	....	370	470	....	....	370	470
Dundas	....	566	492	....	....	566	492
Phillips River	....	4	8	....	....	4	8
State Generally	....	9	17	....	....	9	17
Total—Gold Mining	....	6,917	7,600	44	49	6,961	7,649
MINERALS OTHER THAN GOLD.							
Alunite	....	120	127	....	....	120	127
Arsenic	....	18	14	....	....	18	14
Asbestos	....	436	193	....	....	436	193
Bentonite	....	1	....	....	....	1	....
Beryl	....	1	2	....	....	1	2
Clays	....	3	5	....	....	3	5
Coal	....	955	1,032	....	....	955	1,032
Copper Ore	....	1	2	....	....	1	2
Dolomite	....	2	1	....	....	2	1
Felspar	....	7	3	....	....	7	3
Glass Sand	....	1	1	....	....	1	1
Glauconite	....	8	8	....	....	8	8
Gypsum	....	25	29	....	....	25	29
Kyanite	....	1	13	....	....	1	13
Lead	....	5	18	....	....	5	18
Pyrites	....	57	134	....	....	57	134
Red Ochre	....	4	6	....	....	4	6
Talc	....	2	2	....	....	2	2
Tantalite	....	2	....	....	....	2	....
Tin	....	10	9	....	....	10	9
Tungsten Ore (Scheelite)	....	3	6	....	....	3	6
Vermiculite	....	1	1	....	....	1	1
Total—Other Minerals	....	1,663	1,606	....	....	1,663	1,606
GRAND TOTAL	....	8,580	9,206	44	49	8,624	9,255

DIAGRAM OF ACCIDENTS

Showing the number of Deaths, arranged in Six Classes, in the Mines of Western Australia, from 1920 onwards



PART V.—ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1946 AND 1947.

A.—*According to Locality of Accident.*

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1946.	1947.	1946.	1947.	1946.	1947.
1. Kimberley	....	1	....	....	....	1
2. West Kimberley	....	....	....	....	....	....
3. Pilbara	....	3	14	14	14	17
4. West Pilbara	....	....	....	....	....	....
5. Ashburton	....	....	....	....	....	....
6. Gascoyne	....	....	....	....	....	....
7. Peak Hill	....	....	....	....	....	....
8. East Murchison	1	....	45	32	46	32
9. Murchison	3	4	65	86	68	90
10. Yalgoo	....	....	....	....	....	....
11. Mount Margaret	1	2	31	33	32	35
12. North Coolgardie	....	....	4	5	4	5
13. North-East Coolgardie	....	....	....	....	....	....
14. Broad Arrow	2	....	2	3	4	3
15. East Coolgardie	3	7	556	521	559	528
16. Coolgardie	....	....	25	22	25	22
17. Yilgarn	....	....	6	2	6	2
18. Dundas	....	1	78	57	78	58
19. Phillips River	....	....	....	....	....	....
Mining Districts—						
Northampton	....	....	....	....	....	....
Greenbushes	....	....	....	....	....	....
Collie	1	....	286	281	287	281
South-West	....	1	10	14	10	15
Totals	11	19	1,122	1,070	1,133	1,089

From the above table, it will be seen that the number of fatal accidents for the year 1947 was 19, as against 11 in 1946. The number injured showed a decrease of 44. In the report of the State Mining Engineer, published as Division 11 of this Report, these accidents are classified according to their causes.

B.—*According to Causes of Accidents.*

Cause.	1946.		1947.		Comparison with 1946.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	2	7	3	5	+ 1	— 2
2. Falls of Ground	5	62	3	97	— 2	+ 35
3. In Shafts	....	16	3	21	+ 3	+ 5
4. Miscellaneous Underground	3	787	6	745	+ 3	— 42
5. Surface	1	250*	4†	202‡	+ 3	— 48
6. Fumes	....	....	....	....	....	....
Totals	11	1,122	19	1,070	— 8	— 52

* Includes 10 serious accidents in Quarries. † Includes 1 fatal accident in Quarries. ‡ Includes 14 serious accidents in Quarries.

PART VI.—STATE AID TO MINING.

(*A*) *State Batteries.*

The number of State Batteries existing at the end of the year was 21 with three leased. From inception to the end of 1947 gold and tin to the value of £13,269,304.510, including gold premium estimated at £3,579,803.055 have been received from the State Batteries. 2,745,415.94 tons of auriferous ore have been treated and have produced £9,595,046.295 plus estimated premium of £3,579,803.055 and 81,810.5 tons of tin ore produced tin to the value of £93,882.96 and residues to the value of £572.2.

During the year 49,168.25 tons of ore were crushed for 39,134.80 ounces of bullion esimated to contain 33,146.60 fine ounces of gold equal to 13 dwt. 11.6 gr. per ton. The average value of tailings produced was 4 dwt. 7.1 grs., making the average head value of 17 dwt. 18.7 grs. The estimated value of gold produced was 33,146.60 ounces by amalgamation and 7,450.46 ounces from tailings treatment a total of 40,597.06 ounces valued at £A411,080.

The working expenditure for all plants for the year was £77,461 3s. 7d. and the revenue was £59,563 8s. 2d., which shows a loss of £17,897 15s. 5d. on the year's operations.

The capital expenditure since inception of the scheme has been £550,485 19s. 2d.; £411,322 2s. 4d. from the General Loan Fund, £96,755 15s. 5d. from Consolidated Revenue, £28,621 13s. 5d. from assistance to gold mining industry and £13,786 8s. from Commonwealth assistance to metalliferous mining.

Head office expenditure including insurance under the Workers' Compensation Act and payroll tax was £6,053 17s. 3d. as against £5,243 1s. 10d. for 1946.

The working expenditure from inception to the end of the year exceeds revenue by £156,584 7s. 6d.

(*B*) *Geological Survey of Western Australia.*

The principal work of the geological survey for the year 1947 is covered by the following reports published in Division IV of this report.—

- The Yanmah Kyanite Deposit, Mineral Claim 287H.
- Progress Report on the Re-Survey of the Coolgardie District, Coolgardie Goldfield.
- Cheyne Bay Beach Sands, Examination of Dredging Claim 9.
- Note on the Occurrence of Monazite in Pegmatites at Cape Riche.
- Collie Coal Field, Geological and Geophysical Survey, Summary of Economic Results.
- Necessity for Deep Bores at Collie, W.A.
- Estimate of Shale Available North of State Brickworks at Byford.
- Geological Investigation of a Portion of Location 521 at Byford for Brick-making Materials.
- Notes on Some Mining Groups in the Coolgardie District:—
  - (i) Three Mile Hill Group;
  - (ii) Londonderry Group;
  - (iii) Londonderry Felspar Group;
  - (iv) Further Notes on Bonnievale Group;
  - (v) Lord Bobs Group;
  - (vi) "Sydenham" Group of Gold Mining Leases.
- Report on Hill 50 Gold Mine, Boogardie, Murchison Goldfield.
- Progress Report on the Geology of Portion of the North-West Division.

During the year the following publications were issued:—

- Bulletin No. 101, "The Mining Groups of the Yilgarn Goldfield, North of the Great Eastern Railway," by R. S. Matheson, B.Sc., Geological Survey of Western Australia.

The following publications are still in the Press:—

- Annual Progress Report of the Geological Survey of Western Australia for the year 1945.
- Annual Progress Report of the Geological Survey of Western Australia for the year 1946.
- Mineral Resources Bulletin No. 4, "The Dandaragan Phosphate Deposits," by R. S. Matheson, B.Sc., Geological Survey of Western Australia.
- Geological Survey of Western Australia Bulletin No. 102, "The Greenbushes Mineral Field," by R. A. Hobson, B.Sc. (Hons.) and R. S. Matheson, B.Sc., Geological Survey of Western Australia.

The following reports have been compiled for some time and are awaiting publication:—

- Geological Survey of Western Australia Bulletin on the Geology of Portion of the Mt. Margaret Goldfield, by R. A. Hobson, B.Sc. (Hons.), Geological Survey of Western Australia.
- Geological Survey of Western Australia Bulletin on Some Economic Aspects of the Principal Tantalum Bearing Deposits of the Pilbara Goldfield, North-West Division, by H. A. Ellis, B.Sc., A.O.S.M., Geological Survey of Western Australia.
- Mineral Resources of Western Australia Bulletin, Moulding Sands, by K. R. Miles, D.Sc., F.G.S., Geological Survey of Western Australia, and H. A. Stephens, B.Sc., Council for Scientific and Industrial Research.
- Mineral Resources of Western Australia Bulletin, Silver, Lead and Zinc, by W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.
- Mineral Resources of Western Australia Bulletin, Vermiculite, Talc and Soapstone, Fullers Earth, Bentonite and Diatomite, by W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.

Enquiries are being made frequently for these reports, and it is hoped that some of the lag in printing will be overcome in the near future.

Officers of the survey have rendered varied types of practical assistance to individuals, companies and syndicates, as well as Government Departments who have been concerned with the exploitation of mineral and water resources in all parts of the State.

(*C*) *Assistance under the Mining Development Act*, 1902-1924.

The following statement shows the sums advanced during the year 1947 under this Act:—

		£	s.	d.
1.	Advanced in aid of mining work, and equipment of mines with machinery	8,695	8	7
2.	Subsidies on stone crushed for public, being amounts paid to owners of plants crushing at fixed rates	829	4	6
3.	Providing means of transport, equipment and sustenance for prospectors	8,070	5	3
4.	Compressor and mobile drilling plants	2,242	13	4
5.	Other assistance granted from Vote during the year on various matters totalled	1,706	10	2
		£21,544	1	10

The receipts under this Act, exclusive of interest payments, amounted to:—

		£	s.	d.
1.	Refund of advances	3,542	14	7
2.	Prospecting refunds	1,913	16	9
3.	Miscellaneous refunds	681	11	4
		£6,138	2	8

PART VII.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 5,675 against 5,482 total for the preceding year, showing an increase after all adjustments of 193 boilers.

Of the total 5,675 useful boilers, 3,259 were out of use at the end of the year, 2,439 thorough and 399 working inspections were made and 2,416 certificates were issued.

Permanent condemnations totalled 28 and temporary condemnations 12. There was one reinstatement. Six boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 21,152 against 20,017 for the previous year, showing an increase of 1,135.

Inspections made total 11,805 and 3,359 certificates were granted.

The total miles travelled for the year were 67,762 against 67,029 miles for the previous year, showing increase of 733 miles. The average miles travelled per inspection were 4.62 as against 4.68 miles per inspection for the previous year.

389 applications for engine-drivers' and boiler attendants' certificates were received and dealt with, and 339 certificates, all classes, were granted as follows:—

Winding Competency (including certificates issued under Regulation 40 and Section 60)	9
First-class Competency (including certificates issued under Regulations 40 and 45, and Sections 60 and 63) ..	22
Second-class Competency (including Certificates issued under Regulation 40 and Section 60)	33
Third-class Competency (including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act) ..	41
Locomotive Competency (including Certificates issued under Regulation 40 and Section 60)	19
Traction Competency (including certificates issued under Regulation 40 and Section 60)	2
Internal Combustion Competency (including certificates issued under Regulation 40 and Section 60)	59
Crane and Hoist Competency (including certificates issued under Regulation 40 and Section 60)	27
Boiler Attendants' Competency (including certificates issued under Regulation 40 and Section 60	120
Interim	1
Copies	6
Transfers	—
Total	339

The total revenue from all sources during the year was £8,890 12s. 10d., as against £8,320 8s. 7d. for the previous year, showing an increase of £570 4s. 3d.

The total expenditure for the year was £11,238 6s. 1d. as against £10,271 12s. 9d. for the previous year, showing an increase of £966 13s. 4d.

PART VIII.—CHEMICAL AND MINERALOGICAL LABORATORIES.

Mr. H. Bowley retired from the position of Director of the Laboratories on the 30th June, 1947, and was succeeded by Mr. H. P. Rowledge.

Earlier in the year Mr. A. Reid arrived from India and took up his appointment as Chief Industrial Chemist in charge of the newly created Industrial Chemistry Division. He was shortly followed by Mr. R. P. Donnelly who came from England to fill the position of Fuel Technologist in charge of the Fuel Technology Division.

A number of other appointments was made completing the re-organisation of the laboratories.

A wide variety of work was undertaken during the year under the headings of Food, Drugs, Toxicology, Agriculture, Forestry, Water, Minerals, Mineral Technology, Geo-Chemistry, Industrial Chemistry, and Fuel Technology.

PART IX.—SCHOOL OF MINES.

(a) Kalgoorlie.—The individual enrolments for 1947 totalled 572.

Included in this figure were 142 full time and 91 part time students, under the Commonwealth Rehabilitation Training Scheme.

Further additions to the staff were required to cope with the increased activity at the school.

The Metallurgical Research Laboratory received 33 samples of ore from various parts of the State for investigation in regard to suitable methods of treatment. The laboratory also continued its general advisory service to the public, and the assay of prospectors' samples.

(b) Norseman.—The total number of students enrolled during the year was 62.

The department appointed a full-time instructor in Mr. Dowson, to this school at the beginning of 1947, and this innovation proved very successful. Mr. Dowson was aided by a number of part-time lecturers, and a full-time cadet.

(c) Wiluna.—With the closure of the Wiluna Mine and the departure of the great bulk of the mining population, the warrant for the Wiluna School vanished, and it was closed down in March, 1947.

Part X.—MINERS' PHTHISIS ACT AND MINE WORKERS' RELIEF ACT.

In 1947 the goldfields were visited with the exception of Ashburton, Gascoyne, Kimberley and Phillips River.

The number of examinations conducted was 6,450 compared with 5,606 for the previous year.

STAFF.

During the year, Mr. H. Bowley, F.A.C.I., Director of the Department's Laboratories, retired after a very lengthy and meritorious service with the department. It was greatly as a result of Mr. Bowley's capacity and able direction that our modern laboratory in Adelaide Terrace reached its present high state of efficiency.

Mr. Bowley was succeeded by Mr. H. Rowledge, A.W.A.S.M., A.A.C.I., who is also an officer of considerable experience in laboratory technique.

Throughout a busy year, the head office and outstation staffs loyally and efficiently carried out their duties, and I greatly appreciate their efforts.

In dealing with the various activities I have commented only on the principal items. Divisions II to IX of this publication contain the detailed reports of the responsible officers.

A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 31st May, 1948.

Division II.

Report of the State Mining Engineer for the Year 1947.

The Under Secretary for Mines:

Sir,

I have the honour to submit for the information of the Hon. Minister for Mines, my Annual Report on this Branch of the Mines Department for the year 1947.

A report on the mining activities in the State during the year under review, compiled by the Assistant State Mining Engineer and based on information supplied by the Statistical Clerk and reports from the Inspectors of Mines, is submitted in its entirety as portion of such Annual Report.

ACCIDENTS.

The average number of fatal and serious accidents per 1,000 men employed on gold mines was a little lower than in the previous year, although the fatal accident rate was unfortunately somewhat higher.

Table B, which in the past has shown the number of fatal accidents recorded year by year, during the previous five years, and death rate per 1,000 men employed has been altered and re-arranged. It now shows the number of men employed, and the number of fatal accidents year by year since 1929, when the mining revival began, together with the current and progressive accident rates since that date. In this tabulation the mining employment has been classified in three classes, viz.: Gold mining, coal mining and other minerals. The progress figures in this arrangement give a better general idea of the incidence of mining fatalities.

ADMINISTRATION.

The Coal Mines Regulation Act, 1946, and regulations came into operation on October 1st. The increasing urgency of stepping up coal production to meet the demands of industry and to replace the somewhat vicarious supplies from New South Wales called for the exercise of greater Governmental control of coal mining and the new legislation is somewhat more stringent in this regard. Provision is made for improved amenities for the workers and an important innovation in this State is the certification of deputies. The whole Act and Regulations have been consolidated, simplified and re-arranged.

The Mines Regulation Act, 1946, was passed in the final session of 1946, and the new regulations were drafted in 1947. Copies of the draft regulations were submitted to the interested parties for comment. Numerous amendments were proffered and a conference to discuss such amendments was arranged to take place early after the end of the year.

Figuring largely in the proposed new Act and regulations is legislation to provide for certification of mine managers, for the introduction of aluminium therapy to combat silicosis and a general overhaul of existing legislation with reference to silicosis and occupational diseases. Regulations have also been framed for the control of underground haulage, including provision for the use of diesel locomotives underground.

VENTILATION.

Increased attention has been given to ventilation problems and three officers are now continually employed in this important branch of the Department's operations. The work of these officers has been hampered by the difficulty experienced in obtaining the necessary new instruments for an increased staff and in replacing occasional breakages of existing instruments.

This problem becomes increasingly important each year with the increase in depth of the larger and older mines. At the time when many of these mines were opened and for a number of years afterwards, good ventilation was not considered of great importance and the mine workings were, therefore, not laid out with this end in view. To bring such mines into line with modern ventilation practice involves much labour and expense in such work as stripping old shafts, sinking new ones, provision of fans, increasing the area of airways, etc. It seems possible that in places where a number of such mines are working, such as Kalgoorlie, two or more mines might pool resources to provide a common return air shaft, with great mutual advantage.

GOLD MINING.

Gold mining generally throughout the State, although showing a substantial increase in production on the previous year's figures, was somewhat disappointing. The excess over the 1946 gold production amounted to 83,000 ounces. Four mines, viz.: Lake View and Star (29,000 ozs.), Big Bell (22,000 ozs.), Triton (14,000 ozs.) and Mountain View (8,000 ozs.), together with State Batteries (10,000 ozs.) exceeded the previous year's output by 85,000 ounces, indicating that the remaining mines barely kept producing at their old rate.

This position is entirely due to shortage of manpower and materials and rising costs and a sense of impotence is being felt amongst mining men, together with a pessimistic view of the immediate future of the mining industry unless some assistance is forthcoming either in the form of an increase in the price of gold or a bounty on its production.

At the time of writing, a reduced output is anticipated during the current year.

Ore reserves of the principal mines are in a healthy state and prospecting and small mine activities are increasing.

A pleasing feature is the revival of mining at Coolgardie and on the Yilgarn, due largely to the progressive policy pursued by the Western Mining Corporation. Whether such policy results in the location of further large producing mines or not, the introduction of courageous, modern and scientific methods of exploration must eventually be vastly advantageous to the mineral industry of the State generally.

On the Murchison Goldfield, the return to full scale production of the Big Bell and Triton mines has had a marked effect, and the continued production of rich ore from the Mountain View at Day Dawn, which produced 12,975 fine ounces from 1,922 tons, has captured the public interest. This mine was being developed under option at the end of the year, and it is understood that the bonanza shoot still exists at a depth of 100 feet below the level from which the last crushing was taken.

At Hill 50, it would appear that successful development and diamond drilling results will shortly warrant a much increased output.

On the Pilbara Goldfield, the closing of the Comet Mine early in the year was a severe blow to the district. A tribute was let on this mine, but future operations will only be on a small scale.

At Nullagine, the Blue Spec Mine, had its best year, with a production of 4,645 fine ounces of gold and 280 tons of antimonial concentrate. Messrs. Bewick Moreing and Co. have now taken over the management. This is now the only gold mine in the North West which may be said to be producing a substantial output.

Gold mining at present, owing to the reasons outlined above, is passing through a difficult period but it may, I think, be stated with confidence that, with sufficient assistance at least to guarantee companies or persons working marginal ore against loss over such period, the industry will be able to rehabilitate itself and return to its pre-war pre-eminence.

COAL MINING.

Increasing industrial, railway and power requirements, together with a short and vicarious supply of New South Wales coal have for some time made it apparent that considerable extra supplies of native coal are essential for the natural growth of this State.

The average annual production from Collie for the three years 1943-5 was 543,000 tons. A drive for increased production resulted in a total of 642,356 tons in 1946 and 730,506 tons in 1947.

It has been claimed that the open-cut coal is responsible for such increased production and that the output of the underground mines is decreasing and will continue to decrease year by year.

The following is a tabulation of outputs of the underground mines for the years 1945 and 1947.

	Tons. 1945	Tons. 1947
Co-operative	62,113	103,984
Proprietary	127,229	156,242
Cardiff	60,034	87,020
Stockton	90,029	100,239
Griffin	77,699	91,641
Wyvern	—	43,035

No further comment is required on this point.

It is fully realised that the stepping up of production must continue and even be expedited to meet future requirements and plans are in course of formulation for this purpose. Such plans will involve full mechanisation of mines where practicable and full co-operation from all parties concerned and it is hoped and confidently anticipated that the State will in a few years be self-supporting so far as coal requirements are concerned.

Investigations undertaken during the past two years indicate the possibility of economically obtaining domestic and industrial gas from Collie coal and further investigations into this angle are proceeding.

Plans were in hand at the close of the year for a deep boring programme, commencing on the Collie Burn leases, in connection with the geological survey of the field. It is proposed to sink at least three holes to bedrock in this area with the object of proving whether the Co-operative-Proprietary-Stockton series extends to this portion of the field.

Investigation of the 22ft. seam of coal at Eradu was practically completed at the end of the year. Samples of coal extracted showed it to be of a much inferior quality to that of Collie coal and unsuitable for railway and most industrial purposes in the State at present.

The Assistant State Mining Engineer, who was in charge of the investigation has submitted a report on this and the Irwin River coal, which is attached as an appendix to his report.

MINERALS OTHER THAN GOLD AND COAL.

The production of minerals other than gold and coal has maintained a rapid rate of increase over the past few years.

In 1935, the value of such mineral production reported was £99,269 from eight different minerals. In 1947, the reported value was £446,453 from twenty-seven minerals. This total does not include lead ores and concentrates of an estimated value of some £35,000 in transit to market at the close of the year.

Of these minerals, the most important so far as present value of production is concerned is pyrite. The Iron King Mine worked by Norseman Gold Mines, N.L., produced concentrates and crushed ore to the value of £187,000 in 1947, and has large reserves of ore for future production.

The present high price of lead has given considerable impetus to lead mining in this State. The reported value of production for the year was £937, but, as pointed out above, considerable quantities in transit were not included in this total. Further mines will come into production during 1948 and a very substantial output is anticipated for the coming year.

The output of blue asbestos from Australian Blue Asbestos, Ltd., was more than double that of the previous year, but is still far from the company's objective. The provision of a township at Wittenoom, now in the course of construction, should provide amenities which should assist in solving labour problems in that rather isolated area.

The Nunyerri chrysotile asbestos deposits were successfully worked by Mr. L. G. Hancock and party who, during the latter half of the year, produced 88 tons of fibre valued at £6,173. Mr. Hancock is largely responsible for the start of the blue asbestos industry and it is pleasing to record his success in this other field. It is hoped that his successful operations will be an encouragement to other potential operators in the production of this valuable and somewhat widespread mineral in the Roebourne-Nullagine area.

Anthophyllite asbestos production by the Midland Mining Company from their Bindi Bindi deposits was small but they were waiting for treatment plant from overseas. It is understood that this is now installed and a regular and increased output is anticipated in future.

The production of nearly 3,000 tons of kyanite by Midland Mining Company, from the Yanmah deposits is of great interest. This is by far the highest production of this mineral from the State in any single year. As a matter of fact the total previous production has been almost negligible. There is apparently a world shortage of this material which, in pre-war years, was supplied almost exclusively by India. The Yanmah deposits are situated in heavy jarrah and karri forest country, which makes exploration difficult and costly. The extent of the deposits is therefore unknown, but there are some indications which suggest that they may be extensive. Government assistance is being sought to prove the potential value of this occurrence.

The expansion of the gypsum industry is of interest; the last two years' production, stimulated by building requirements, averaging £25,000, almost doubled that of any previous year.

The value of potash, produced from the Chandler Alunite deposits, amounted to £41,000 for each of the past two years. This is a satisfactory figure, considering that the plant has been in operation only four years.

The Wundowie charcoal iron furnace, like the Chandler Alunite Works operated by the Department of Industrial Development, was almost ready to start smelting at the end of the year. The value of production of pig iron from this plant should reach appreciable proportions by the end of the current year.

It is also anticipated that the production of iron ore from Cockatoo Island by Australian Iron and Steel Ltd., will commence during 1948. This ore will be shipped direct to Newcastle in ships built by Broken Hill Pty., Ltd., for the purpose.

The production of antimony received a severe setback by the closure of the Wiluna Mines. The production of 281 tons of concentrate, however, by Blue Spec Gold Mine at Nullagine, indicates that appreciable amounts of this mineral will still be forthcoming.

Tantalite production has been rather at a standstill since 1944, the only recorded production being in the form of low grade material separated magnetically from tin concentrates at Greenbushes.

There is, however, a proposal afoot to establish a refinery in the State for the production of tantalum and beryllium from their ores produced in the State. All previous output of tantalite and beryl has been shipped overseas for the extraction of the oxides and metals and the establishment of these metallurgical processes in this State should give a great impetus to the industry.

The present high price of tin has been the cause of considerable activity in the investigation of the State's deposits, but no appreciable increase in production has yet been noted.

Recent trends suggest that increased output of vermiculite and talc is likely, while there is also some likelihood of graphite and barite production commencing.

Speaking generally, the outlook for mineral production appears bright and its value to the State is rapidly increasing annually.

TRANSPORT FOR INSPECTORS OF MINES.

The condition of the cars allotted to some of the inspectors of mines is the cause of grave concern. Replacements of two Government cars, one for the Kalgoorlie office and one for Cue are long overdue, while the failure to obtain the release of a car for the workmen's inspector in the North West has kept that officer almost grounded since his appointment in that district.

Much disappointment to the officers concerned is caused by the fact that numerous new cars and utilities are seen on the road and it is not understood why their urgent requirements should be neglected when new cars are being allocated. This is the personal side of the matter and it must have a psychological effect on officers who are giving their best efforts in the interests of the department. The economic aspect is evidenced in the prices charged for the overhaul of old cars. The cost of overhaul of one particular car from the Kalgoorlie office recently amounted to approximately £270, and the time taken for this work was two months. This was not the result of an accident, nor of careless driving. The car had had many years on bad roads and was due for replacement. Inspectors of mines are highly paid technical officers and cannot be expected to perform their duties efficiently on their long journeys over rough roads if their means of transport constantly require the services of a mechanic.

GENERAL.

Much time has been devoted by the staff of this branch to investigations of applications for assistance, both financial and in an advisory capacity, and in maintaining liaison with the mining public and with other State and Commonwealth Departments, more especially with the Department of Supply and Shipping.

Efforts to rehabilitate the gold mining industry and to commence mining operations for other valuable minerals have received continuous attention throughout the year and financial assistance has been granted in many cases where it appeared, after investigation, to be warranted. It is felt that good work has been carried out by all officers in this connection.

Finally I wish again to express my appreciation of the loyal and valuable support received from the Assistant State Mining Engineer and all Inspectors of Mines, and also for the assistance and friendly co-operation offered by all officers of other branches of the Department with whom I have had official dealings during the year.

JOHN S. FOXALL,
State Mining Engineer.

ANNUAL REPORT FOR 1947.

STATE MINING ENGINEER.

Mining activities in the State during the year 1947 are described in this report. It is based on information supplied by the Statistician and Inspectors of Mines.

STAFF.

There has not been any change in the staff during the year. The Wiluna District of the East Murchison Goldfield has been worked from Leonora by Inspector Boyland and Workmen's Inspector Culley since 19th August. On the same date Workmen's Inspector Gillespie was transferred to Cue, while Workmen's Inspector Hunter was transferred to Port Hedland with jurisdiction in the Pilbara, Kimberley, West Kimberley and Ashburton Goldfields and Blue Asbestos Mines in the Hammersley Ranges.

ACCIDENTS.

Fatal and serious accidents in mines and quarries reported to the Department are shown below. Corresponding figures for 1946 are shown in brackets.

There were 19 (11) fatal and 1070 (1122) serious accidents including 1 (1) fatal and 295 (196) serious in coal mines and quarries.

Of the fatal accidents 16 occurred in gold mines, 1 in a quarry, 1 in an asbestos mine and 1 in an iron mine.

The total number of serious accidents reported from the gold mines was 775 (826). The average number of men employed on such mines was 7,649 (6,961). The average accident rate per 1,000 men employed was thus: 2.09 (1.43) for fatal and 101.38 (118.68) for serious accidents.

On the coal mines the number of serious accidents was 281 (286) while the average number of men employed was 1,032 (955). The average accident rate per 1,000 men employed was thus 272.28 (319.76) for serious accidents. There were no fatal accidents in coal mines.

A classification of the serious accidents showing the nature of the injuries is given in Table A.

Table B. shows the fatal accidents, the number of men employed and the death rate per 1,000 men employed for each year since 1929, classified according to employment in gold mines, in coal mines and other mines and quarries. The progressive figures are also given for each year.

WINDING MACHINERY ACCIDENTS.

There were four accidents involving winding machinery which are briefly described.

Overwinds:

(1) The driver of a winder handling a skip in an internal vertical shaft started the electric winder with the reversing lever in the wrong position. Two men were in the skip which went up into the tip. One was thrown into the bin and received severe injury. The other was thrown into the shaft and received fatal injuries.

(2) A skip was overwound owing to ore remaining in the descending skip. Only minor damage was caused.

Derailment.

(1) The skip in an underlay shaft was derailed by a stone which lodged between the rail and a leg.

Miscellaneous (underground):

(1) The copper rivet in a safety hook sheared and allowed the cage to escape. It fell to the bottom of the shaft and was abandoned. It is thought that a twist in the attaching chains caused the rivet to shear.

TABLE A.

SERIOUS ACCIDENTS FOR 1947.

Goldfields.	Major Injuries—Exclusive of Fatal.																						
	Fractures.											Amputations.						Loss of Eye.	Serious Internal.	Hernia.	Dislocations.	Other Major.	Total Major.
	Head.	Shoulder.	Arm.	Hand.	Spine.	Rib.	Pelvis.	Thigh.	Leg.	Ankle.	Foot.	Arm.	Hand.	Finger.	Leg.	Foot.	Toe.						
East Coolgardie	2	1	1	6	....	5	....	1	2	....	6	....	....	4	....	....	....	1	2	5	....	7	43
Yilgarn	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Coolgardie	....	....	1	....	....	....	....	1	1	....	1	....	....	....	....	....	....	....	....	....	....	1	5
Dundas	....	....	....	2	....	2	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	6
Broad Arrow	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Margaret	....	....	....	....	....	3	....	....	1	1	....	....	....	1	....	....	....	....	....	....	....	....	6
North Coolgardie	....	1	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	1	....	....	4
East Murchison	....	1	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	1	1	1	6
Murchison	1	1	1	3	....	3	....	....	4	3	1	....	....	2	....	....	....	....	....	1	1	2	23
Pilbara	....	....	1	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	3
South-West	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Collie	....	....	12	5	2	14	....	....	3	....	2	....	....	5	....	....	....	....	....	3	1	5	52
Total	4	4	16	17	2	27	....	2	14	4	11	....	....	14	....	....	....	1	2	12	3	16	149

Goldfields.	Minor Injuries.												
	Fractures.		Head.	Eyes.	Shoulder.	Arm.	Hand.	Back.	Rib.	Leg.	Foot.	Other Minor.	Total Minor.
	Finger.	Toe.											
East Coolgardie	11	6	17	20	13	29	135	81	13	73	58	22	478
Yilgarn	....	....	....	....	....	....	1	....	....	....	....	....	1
Coolgardie	....	....	1	....	....	1	7	2	1	3	2	....	17
Dundas	....	....	....	2	2	1	25	6	1	5	7	2	51
Broad Arrow	....	....	....	....	....	1	1	....	....	1	....		3
Mt. Margaret	2	....	2	....	2	1	6	4	1	6	2	1	27
North Coolgardie	....	....	....	....	....	....	1	....	....	....	....	....	1
East Murchison	4	1	....	....	1	....	6	5	....	5	....	4	26
Murchison	8	1	1	2	1	4	13	2	2	10	12	7	63
Pilbara	....	....	....	....	....	....	4	3	....	3	....	1	11
South-West	1	....	2	1	1	....	2	1	1	3	2	....	14
Collie	14	11	8	13	6	15	45	12	2	39	31	33	229
Total	40	19	31	38	26	52	246	116	21	148	114	70	921

TABLE B.

FATAL ACCIDENT RATE.

	Gold.						Coal.						Other Minerals.					
	Men Employed.		Fatal Accidents.		Death Rate per 1,000.		Men Employed.		Fatal Accidents.		Death Rate per 1,000.		Men Employed.		Fatal Accidents.		Death Rate per 1,000.	
	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.	Current.	Progress.
1929	4,108	4,108	7	7	1.70	1.70	858	858	4	4	4.66	4.66	193	193	....	....	....	....
1930	4,452	8,560	14	21	3.14	2.45	896	1,754	....	4	....	2.28	94	287	....	....	....	....
1931	6,344	14,904	16	37	2.52	2.49	752	2,506	1	5	1.33	2.00	51	338	....	....	....	....
1932	7,983	22,887	16	53	2.00	2.31	604	3,110	....	5	....	1.61	108	446	1	1	9.26	2.24
1933	9,900	32,787	21	74	2.12	2.26	626	3,736	1	6	1.59	1.61	164	610	....	1	....	1.64
1934	12,523	45,310	30	104	2.39	2.29	624	4,360	....	6	....	1.38	158	768	3	4	19.00	5.21
1935	14,708	60,018	28	132	1.90	2.20	689	5,049	2	8	2.90	1.58	160	928	....	4	....	4.31
1936	15,696	75,714	38	170	2.42	2.24	768	5,817	....	8	....	1.37	188	1,116	2	6	10.64	5.38
1937	16,174	91,888	36	206	2.22	2.24	723	6,540	....	8	....	1.22	239	1,355	2	8	8.37	5.90
1938	15,374	107,262	23	229	1.50	2.13	765	7,305	1	9	1.31	1.23	288	1,643	4	12	13.88	7.30
1939	15,216	122,478	38	267	2.49	2.18	752	8,057	1	10	1.33	1.24	231	1,874	....	12	....	6.40
1940	14,593	137,071	25	292	1.71	2.13	713	8,770	3	13	4.21	1.48	193	2,067	....	12	....	5.81
1941	13,106	150,177	25	317	1.91	2.11	781	9,551	2	15	2.56	1.57	134	2,201	....	12	....	5.45
1942	8,123	158,300	18	335	2.21	2.12	822	10,373	2	17	2.43	1.64	155	2,356	....	12	....	5.10
1943	5,079	163,379	12	347	2.36	2.12	838	11,211	1	18	1.19	1.60	310	2,666	2	14	6.45	5.25
1944	4,614	167,993	7	354	1.52	2.11	880	12,091	1	19	1.13	1.57	436	3,102	1	15	2.29	4.83
1945	4,818	172,811	10	364	2.08	2.11	860	12,951	1	20	1.16	1.54	393	3,495	1	16	2.55	4.58
1946	6,961	179,772	10	374	1.44	2.08	955	13,906	1	21	1.05	1.51	708	4,203	....	16	....	3.80
1947	7,649	187,421	16	390	2.09	2.08	1,032	14,938	....	21	....	1.40	574	4,777	3	19	5.22	4.00

FATAL ACCIDENTS.

Following is a brief description of all fatal accidents that were reported during the year :—

Name and Occupation.	Date.	Mine.	Details and Remarks.
		Explosives.	
Veale, William Samuel (Miner)	21–4–47	Australian Blue Asbestos	This accident was caused by the miner boring into a butt containing unexploded fracture from a previous charge.
Clemesha, Arthur Gordon (Miner)	14–4–47	Barton	There were no witnesses to this accident which was due to an explosion which apparently occurred in explosives on the bench in the blacksmith's shop where deceased was working.
Lynch, James (Miner)	28–11–47	Horseshoe	Lynch's body was found about 20 feet from a face in which 21 holes had been fired a few minutes previously. He charged and lit the holes himself. The cause of the accident is unknown.
		Falls of Ground.	
Menato, Attilio (Miner)	24–2–47	Sons of Gwalia	This man was working as a bogger in a stope. A piece of stone fell without warning and killed him.
Kershaw, James William (Scaler)	17–9–47	Great Boulder	The deceased with another man was engaged in barring down in a stope. As he moved across the stope a large piece of rock fell and killed him.
Urlich, Augustin (Miner)	30–9–47	North Kalgurli	This man was killed by a fall of rock. There were no witnesses to the accident but it is thought that he was barring down when the fall occurred.
		In Shafts.	
Preston, Thomas James (Miner)	2–5–47	South Kalgurli Consolidated, Ltd.	This man and his mate were working in the bottom of the shaft when a timber which was being lowered below the cage, escaped. The Manager of the mine was prosecuted for not providing the penthouse required by the regulations.
Tinkler, Stephen Harold (Miner)	27–6–47	Lake View and Star, Ltd.	The driver of the winder handling the skip on the internal shaft by which two men were travelling, started the winder in the wrong direction. When the skip entered the tip, Tinkler was thrown into the shaft. The other man was thrown into the tip and was severely injured.
Smith, William Roy (Miner)	25–8–47	Triton Gold Mines	The trolley used for handling the kibble at the surface escaped down the shaft and fell upon Smith. The safety door had inadvertently been left open.
		Miscellaneous Underground.	
Mills, Arthur Leonard (Miner)	1–2–47	Great Boulder Proprietary Gold Mines, Ltd.	A piece of drill steel which was thrown down a manway struck this man on the head. He received severe injuries to which he succumbed in hospital. Steps have been taken to prevent the dangerous practice of dropping steel down manways.
Wood, Albert Thomas Charles (Loco. Driver)	11–2–47	Central Norseman Gold Mines, Ltd.	This man was employed driving an electric loco. underground. Part of his duty was to pick up steel from the level and load it into the trucks he was hauling. His body was found crushed between a chute and the loco. and it is surmised that he mistook the position of the loco. and stood up when he was in a dangerous position.
Crocetti, Gioarchino (Miner)	23–4–47	Big Bell Gold Mines, Ltd.	Some boards loaded into a kibble by deceased were being pulled by an air hoist in a winze. One of the boards caught in the footwall of the winze and the hook supporting the head sheave opened out. The kibble then fell away breaking the rope and continued down the winze striking Crocetti.
Liljegren, Charles Viggo (Miner)	1–7–47	Triton Gold Mines	While travelling in a filled stope, this man fell down a pass and was killed.
Savardi, Giacomo (Miner)	21–7–47	Triton Gold Mines	This man went down into a pass that was hung up. He was secured by a sisal rope. The ore ran, and rope broke, or was cut by stone.
Vukmanovich, Milo (Driver)	7–11–47	Sons of Gwalia, Ltd.	This man was caught between a horse drawn truck and a chute. He was familiar with the level, and it is thought that he made an error in judgment. An instruction forbidding riding on trucks has been issued.
		Surface.	
Ferrier, Robert (Rigger)	10–1–47	Great Boulder Proprietary, Ltd.	Riggers were engaged in shifting a steel chimney stack with a jinker. It slipped off a jack and rolled on Ferrier, killing him instantly.
Brown, Henry Heath (Foreman)	7–3–47	Blue Rock Quarries	While barring down a face this man fell about 60 feet to the floor of the quarry sustaining fatal injuries. It is thought that the piece of rock on which he stood came away. A rope wound round his arm was not sufficient to save him.
Hobson, Robert Alfred (Diamond Driller)	14–6–47	Pilgrim's Rest	Shortly after this man had filled an engine with petrol, he lit a cigarette and his clothes burst into flames. He died in hospital the following day.
Henderson, Peter Basil Dinham (Electrician)	30–12–47	Australian Iron & Steel, Ltd., Cockatoo Island	An electric shock received while making temporary connections to a live switchboard was the cause of this man's death.

TABLE C.

Fatal and Serious Accidents Showing the Causes and Districts in which they occurred.

	Explosives.		Falls of Ground.		In Shafts.		Fumes.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. East Coolgardie	1	2	2	46	2	13	....	....	1	371	1	89	7	521
2. Mt. Margaret	....	....	1	1	....	2	....	....	1	23	....	7	2	33
3. Coolgardie	....	1	....	2	....	....	....	....	....	14	....	5	....	22
4. North Coolgardie....	....	....	....	1	....	....	....	....	....	1	....	3	....	5
5. North-East Coolgardie	....	....	....	....	....	....	....	....	....	....	....	....	....	....
6. Broad Arrow	....	....	....	....	....	....	....	....	....	2	....	1	....	3
7. Dundas	....	....	....	3	....	3	....	....	1	43	....	8	1	57
8. Yilgarn	....	....	....	....	....	....	....	....	....	1	....	1	....	2
9. Murchison	....	....	....	8	1	3	....	....	3	62	....	13	4	86
10. East Murchison	....	1	....	2	....	....	....	....	....	18	....	11	....	32
11. Peak Hill	....	....	....	....	....	....	....	....	....	....	....	....	....	....
12. Yalgoo	....	....	....	....	....	....	....	....	....	....	....	....	....	....
13. Northampton	....	....	....	....	....	....	....	....	....	....	....	....	....	....
14. Greenbushes	....	....	....	....	....	....	....	....	....	....	....	....	....	....
15. South-West	....	....	....	....	....	....	....	....	....	....	1	14	1	14
16. Phillips River	....	....	....	....	....	....	....	....	....	....	....	....	....	....
17. Collie	....	....	....	33	....	....	....	....	....	203	....	45	....	281
18. Pilbara	2	1	....	1	....	....	....	....	....	7	1	5	3	14
19. West Pilbara	....	....	....	....	....	....	....	....	....	....	....	....	....	....
20. Ashburton	....	....	....	....	....	....	....	....	....	....	....	....	....	....
21. Kimberley	....	....	....	....	....	....	....	....	....	....	1	....	1	....
Totals for 1947	3	5	3	97	3	21	....	....	6	745	4	202	19	1,070
Totals for 1946	2	7	5	62	....	16	....	....	3	787	1	250	11	1,122

PROSECUTIONS.

Sixteen persons were prosecuted under the provisions of the Mines Regulation Act. In 14 cases the actions were successful and in two cases the prosecution failed. Eight prosecutions were for breaches of the regulations relating to the use of explosives, four were for breaches of regulations concerning ventilation and one was for breach of the regulations relating to the provision of a penthouse when sinking below working shafts.

The two cases dismissed were against managers of mines who were charged with not enforcing the provisions of the Mines Regulation Act.

Four prosecutions were made under the provisions of the Coal Mines Regulation Act. One failed as a result of a technicality in the presentation of the case.

Two miners were fined for breach of a rule relating to the use of explosives and an engine driver was fined for breach of the Special Rule relating to the operation of engines. He did not obey signals and an accident resulted.

EXEMPTIONS.

In accordance with the provisions of Section 34, Subsection (4) of the Mines Regulation Act, 1906-38, 79 permits were issued exempting the holders from the operation of subsection (b) of the same section. In 1946, the number issued was 64.

SUNDAY LABOUR.

Permission for Sunday Labour was granted under the Mines Regulation Act on 17 Sundays for a total of 151 man-shifts. Twenty-two permits were issued under the provisions of the Coal Mines Regulation Act.

ADMINISTRATION.

(Amendments of Acts.)

Coal Mines Regulation Act, 1946.

The Coal Mines Regulation Act, 1902-1926, was repealed and a new Act received assent on 24th January, 1947, and the proclamation was gazetted on 19th September, 1947.

An amendment to Regulation 116 was gazetted on 9th December, 1947.

Mine Workers' Relief Act.

The provisions of this Act were extended to the South-West mining district by proclamation gazetted on 17th January and 7th March, 1947.

VENTILATION.

Supplies and equipment for ventilation work have been difficult to obtain, but interest has been maintained and some improvement effected. Several mines have purchased velometers and konimeters.

The Inspectors of the Department have made a survey of the ventilation arrangements in dead ends and have produced further evidence to show the value of large pipes.

Atomiser sprays are used for the suppression of dust caused by firing in one mine.

Dust counting has been continued by the Department's officers and a tabulation of the results is below.

Preliminary arrangements have been made for the introduction of aluminium therapy as a protection against silicosis.

The principal events of interest in the various mines are:—

Lake View and Star are stripping the Horseshoe No. 3 Shaft preparatory to installing a fan of 200,000 cubic feet per minute capacity. This arrangement will produce a downcast in all the working shafts on the western group and should improve conditions on the Ivanhoe. The development at the Chaffers is the deepest working on the fields but temperatures have been maintained at a satisfactory figure.

Dust thrown into the air at air passes has been a major problem, and has been met by running transfer passes before the commencement of the shift. Sixteen new fans for secondary development have been secured.

Great Boulder have had some trouble with their ventilation and moved the Edwards shaft fan from 1930 level to 2050 level. The result has not been satisfactory. This mine lacks a sound return airway. Hydraulic filling has introduced some problems as the wet conditions cause a rise in the humidity of the air. Ten new fans for secondary ventilation have been obtained.

Kalgoorlie Enterprise moved the fan from 1750 level down to the new 2050 level but trouble has been experienced in maintaining the circuit. The removal of the fan to the return side of the mine is proposed.

Central Norseman have installed an atomiser system to combat the dust in their large open stopes. The same system will be used in development ends.

Sons of Gwalia is having difficulty in maintaining a satisfactory temperature in the lower levels and alterations to the intake airways are proposed.

Big Bell has a separate fan on each of its three working levels. Each fan draws from the main shaft and the return is by the open stopes.

The employment of more men and the improvement of the output per man indicated an increased output from the larger mines.

Table E, which shows the gold output classified by districts according to the output of the individual mines, and Table F, which gives a comparison of the production for the past five years classified according to production indicate that the increase has been very largely in mines producing upwards of 3,000 ounces. The increase in the amount produced by sundry claims etc., is due to the inclusion of all cyanide gold under this heading.

State Batteries treated 49,168 tons of ore for a return of 33,147 fine ounces by amalgamation and cyanidation of tailings yielded 7,450 fine ounces. The total gold recovered was thus 40,597 fine ounces. During the previous year the ore treated was 45,476 tons and the gold production was 28,479 ounces. The quantity of ore treated, the value of the ore treated and the gold recovered from treatment of tailings are all greater than for the previous year.

DUST SAMPLING.

Summary of Samples taken during 1947.

Month.	Level.		Development.		Stoping.		Number of places showing count of 1,000 plus p.p.c.c.		
	No.	Average Count.	No.	Average Count.	No.	Average Count.	Level.	Development.	Stoping.
January	....	....	....	....	....	....	....	....	....
February	....	....	....	....	....	....	....	....	....
March	....	....	....	....	....	....	....	....	....
April	6	345	13	198	14	294	6	1	....
May	8	204	....	....	....	....	2	....	....
June	1	301	5	101	8	313	....	....	1
July	7	248	18	233	16	259	2	....	2
August	2	135	16	248	16	203	3	....	2
September	1	290	3	153	1	347	....	....	1
October	4	355	3	150	2	60	....	3	....
November	7	254	7	247	13	248	1	4	2
December	....	....	....	....	....	....	....	....	....
Totals	36	264	65	213	70	253	14	8	8
							Total 30		

GOLD MINING.

The ore produced during the year was 2,507,306 tons and the gold yield was 701,752 fine ounces. There is some increase over the corresponding figures 2,194,477 tons and 618,607 fine ounces for the preceding year but the return is below expectations. Factors which have had an adverse effect upon production are shortage of labour, particularly unskilled labour and rises in costs of production as a result of increased wages and shorter hours of work.

The average grade of 5.59 dwt. per ton is a little lower than last year's figure of 5.64 dwt. per ton.

The number of men employed in the industry is estimated on the basis of monthly averages at 7,649 as compared with 6,961 in the previous year.

The tonnage treated and gold won per man employed were 327.79 and 91.74 respectively and both are higher than the corresponding figures 315.2 tons and 88.87 fine ounces for the previous year.

The number of mines producing 5,000 ounces and over for the year was 20, which is one more than for last year. Comet Gold Mines and Norseman Gold Mines have fallen below the 5,000 ounces level and Edna May, Evanston and Triton have increased their production.

Triton has returned to production after being closed for the war years. Ora Banda Amalgamated, which resumed last year has had a poor year owing to a fire in the treatment plant.

Table G, shows the output for the principal mines of the State. Blue Spec and Burbidge did not produce 5,000 ounces as was anticipated but have been retained in the table as it is expected that they will both produce over 5,000 ounces in the coming year.

Wiluna Gold Mines has produced 7,450 fine ounces from the treatment of tailings and this is shown among the large retreatment plants.

Among the smaller mines, the most successful were:—

Mine.	Tons.	Fine ounces.	Dwt./ ton.
Boomerang	271	1,074	79·26
Carnation	944	789	16·72
Constance Una	215	642	59·72
Daisy	1,198	598	9·98
Democrat	953	1,997	41·91
Edward's Reward	3,844	1,539	8·01
Fenian	129	793	122·94
First Hit (Menzies)	1,163	951	16·35
Haoma	803	555	13·82
Lancefield	2,985	927	6·21
Lister's	1,119	891	15·92
New Brew	1,138	1,438	25·27
Prohibition	700	737	21·06

Table D, shows the production statistics for each year since 1929.

TABLE D.

Gold Production Statistics.

Year.	Tons Treated. (2,240 lbs.)	Total Gold Yield.	Estimated Value of Yield.	Value of Yield per ton.	Number of Men Employed.	Average Value of Gold per oz.	Average Yield per ton of ore.
	tons.	fine oz.	£A.	shillings A.		shillings A.	dwt.
1929 ...	628,400	372,064	1,580,426	50·30	4,108	84·96	11·84
1930 ...	645,344	419,767	1,874,484	58·09	4,284	89·33	13·01
1931 ...	982,163	518,045	3,042,019	61·94	5,961	117·44	10·55
1932 ...	1,327,021	599,421	4,358,989	65·70	8,695	145·44	9·03
1933 ...	1,588,979	636,928	4,884,112	61·48	9,900	153·36	8·01
1934 ...	1,772,931	639,871	5,461,004	61·60	12,523	170·69	7·22
1935 ...	1,909,832	646,150	5,676,679	59·45	14,708	175·71	6·77
1936 ...	2,492,034	852,422	7,427,687	59·61	15,698	174·27	6·84
1937 ...	3,039,608	1,007,289	8,797,662	57·99	16,174	174·68	6·64
1938 ...	3,759,720	1,172,950	10,409,928	55·38	15,374	177·50	6·24
1939 ...	4,095,257	1,188,286	11,594,221	56·62	15,216	195·14	5·80
1940 ...	4,291,709	1,154,843	12,306,816	57·35	14,594	213·15	5·38
1941 ...	4,210,774	1,105,477	11,811,989	56·10	13,105	213·70	5·25
1942 ...	3,225,704	845,772	8,840,642	54·81	8,123	209·04	5·24
1943 ...	2,051,011	531,747	5,556,756	54·185	5,079	209·00	5·185
1944 ...	1,777,128	472,588	4,966,451	55·89	4,614	210·18	5·32
1945 ...	1,736,952	469,906	5,025,039	57·86	4,818	213·87	5·41
1946 ...	2,194,477	618,607	6,657,762	60·70	6,961	215·25	5·64
1947 ...	2,507,306	701,752	7,552,611	60·25	7,649	215·25	5·59

TABLE E.

Classification of Gold Output for 1947 by Goldfields and Districts.

Goldfield or District.	Unclassified, Sundry Claims, Alluvial, etc. (fine ozs.)	Under 100 ozs.		100–500 ozs.		500–1,000 ozs.		1,000–2,000 ozs.		2,000–3,000 ozs.		3,000–4,000 ozs.		4,000–5,000 ozs.	
		No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).
Kimberley Goldfield	351	2	76	....	....	....	....	....	....	....	....	....	....	....	....
Ashburton Goldfield	3	1	140	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara Goldfield—															
Marble Bar	896	10	252	2	512	....	....	....	....	....	....	1	3,744	....	....
Nullagine	335	7	102	2	539	....	....	....	....	....	....	....	....	1	4,645
Peak Hill Goldfield	483	8	185	4	965	....	....	....	....	....	....	....	....	....	....
East Murchison Goldfield—															
Lawlers	344	5	139	....	....	....	....	....	....	....	....	....	....	....	....
Wiluna	751	7	200	3	555	....	....	....	....	....	....	....	....	....	....
Black Range	556	2	7	6	1,588	....	....	....	....	....	....	....	....	....	....
Murchison Goldfield—															
Cue	2,225	7	385	1	109	....	....	....	....	....	....	....	....	....	....
Meekatharra	1,179	13	332	8	1,327	2	1,529	1	1,438	....	....	....	....	....	....
Day Dawn	203	2	16	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Magnet	867	9	241	2	630	....	....	....	....	....	....	....	....	....	....
Yalgoo Goldfield	186	9	200	....	....	1	789	....	....	....	....	....	....	....	....
Mt. Margaret Goldfield—															
Mt. Morgans	1,157	6	82	2	458	1	702	1	1,997	....	....	....	....	....	....
Mt. Malcolm	433	6	114	3	671	....	....	....	....	....	....	....	....	....	....
Mt. Margaret	917	5	153	4	772	1	927	1	1,074	....	....	....	....	....	....
North Coolgardie Goldfield—															
Menzies	1,616	9	209	1	227	1	951	....	....	1	2,081	....	....	....	....
Ularring	401	9	328	5	1,185	....	....	....	....	....	....	....	....	....	....
Niagara	244	1	71	2	234	....	....	....	....	....	....	....	....	....	....
Yerilla	270	3	133	1	192	....	....	....	....	....	....	....	....	....	....
Broad Arrow Goldfield	2,651	23	819	7	1,079	....	....	....	....	....	....	1	3,704	....	....
North-East Coolgardie Goldfield—															
Kanowna	138	5	190	1	540	....	....	....	....	....	....	....	....	....	....
Kurnalpi	43	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie Goldfield—															
East Coolgardie	20,592	23	749	6	1,686	2	1,153	....	....	....	....	....	....	....	....
Bulong	121	2	35	1	116	....	....	....	....	....	....	....	....	....	....
Coolgardie Goldfield—															
Coolgardie	1,418	29	794	7	1,643	1	890	....	....	....	....	....	....	....	....
Kunanalling	342	5	94	....	....	....	....	....	....	....	....	....	....	....	....
Yilgarn Goldfield	1,864	39	1,418	6	1,307	1	642	2	2,753	1	2,278	....	....	....	....
Dundas Goldfield	415	9	309	1	175	1	845	1	1,492	....	....	....	....	....	....
Phillips River Goldfield	....	3	32	....	....	....	....	....	....	....	....	....	....	....	....
State Generally	216	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	41,217	259	7,805	75	16,510	11	8,428	6	8,754	2	4,359	2	7,448	1	4,645

Goldfield or District.	5,000–10,000 ozs.		10,000–20,000 ozs.		20,000–30,000 ozs.		30,000–40,000 ozs.		40,000–50,000 ozs.		50,000-100,000 ozs.		Over 100,000 ozs.	
	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).
Kimberley Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ashburton Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara Goldfield—														
Marble Bar	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Nullagine	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Murchison Goldfield—														
Lawlers	1	6,247	....	....	....	....	....	....	....	....	....	....	....	....
Wiluna	....	....	1	11,101	....	....	....	....	....	....	....	....	....	....
Black Range	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Murchison Goldfield—														
Cue	....	....	1	14,382	....	....	....	....	1	41,048	....	....	....	....
Meekatharra	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Day Dawn	....	....	1	12,795	....	....	....	....	....	....	....	....	....	....
Mt. Magnet	....	....	1	13,673	....	....	....	....	....	....	....	....	....	....
Yalgoo Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Margaret Goldfield—														
Mt. Morgans	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Malcolm	....	....	....	....	1	24,986	....	....	....	....	....	....	....	....
Mt. Margaret	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North Coolgardie Goldfield—														
Menzies	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ularring	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Niagara	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yerilla	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Broad Arrow Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North-East Coolgardie Goldfield—														
Kanowna	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Kurnalpi	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie Goldfield—														
East Coolgardie	....	....	3	51,203	1	21,429	2	72,636	1	44,609	1	94,051	1	141,436
Bulong	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Coolgardie Goldfield—														
Coolgardie	1	6,785	....	....	....	....	....	....	....	....	....	....	....	....
Kunanalling	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yilgarn Goldfield	2	11,794	....	....	....	....	....	....	....	....	....	....	....	....
Dundas Goldfield	....	....	....	....	....	....	1	34,411	....	....	....	....	....	....
Phillips River Goldfield	....	....	....	....	....	....	....	....	....	....	....	....	....	....
State Generally	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	4	24,826	7	103,154	2	46,415	3	107,047	2	85,657	1	94,051	1	141,436

TABLE F.

Classification of Gold Output, 1943-1947.

Range of Output.	1947.			1946.			1945.			1944.			1943.		
	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.
Fine ozs.		fine ozs.			fine ozs.			fine ozs.			fine ozs.			fine ozs.	
Over 100,000	1	141,436	20.1	1	119,992	....	....	....	....	....	....	....	....	....	....
50,000 to 100,000	1	94,051	13.4	1	87,343	33.5	2	159,901	34.1	2	155,870	33.0	3	202,875	38.1
40,000 to 50,000	2	85,657	12.2	....	....	....	....	....	....	....	....	....	....	....	....
30,000 to 40,000	3	107,047	15.3	3	110,878	18.0	2	66,080	14.0	1	39,030	8.3	....	....	....
20,000 to 30,000	2	46,415	6.6	5	123,100	19.9	5	115,034	24.5	5	123,141	26.0	5	121,408	22.8
10,000 to 20,000	7	103,154	14.7	5	73,179	11.9	2	30,389	6.5	4	56,193	12.0	8	115,886	21.8
5,000 to 10,000	4	24,826	3.5	5	36,670	5.9	8	57,364	12.2	5	43,313	9.1	4	24,407	4.6
4,000 to 5,000	1	4,645	0.7	2	9,496	1.5	....	....	....	3	13,125	2.8	2	8,329	1.6
3,000 to 4,000	2	7,448	1.1	....	....	....	1	3,779	0.8	....	....	....	3	9,629	1.8
2,000 to 3,000	2	4,359	0.6	2	5,234	0.8	1	2,739	0.6	2	4,990	1.0	1	2,276	0.4
1,000 to 2,000	6	8,754	1.2	7	7,929	1.3	4	5,331	1.1	3	4,435	0.9	4	5,250	1.0
500 to 1,000	11	8,428	1.2	13	8,847	1.4	8	5,736	1.2	11	7,614	1.6	14	9,635	1.8
100 to 500	75	16,510	2.4	83	18,528	3.0	57	12,771	2.7	72	15,598	3.3	87	21,345	4.0
Under 100	259	7,805	1.1	272	8,022	1.3	175	5,545	1.2	155	4,753	1.0	193	5,127	1.0
Sundry Claims, etc.	....	41,217	5.9	....	9,391	1.5	....	5,238	1.1	....	4,696	1.0	....	5,583	1.1
Total	376	701,752	100.0	399	618,607	100.0	214	469,907	100.0	263	472,588	100.0	324	531,747	100.0

TABLE G.

Mines Producing 5,000 ounces and Upwards for the Past Five Years.

Mine.	1947.			1946.			1945.			1944.			1943.		
	Tons treated.	Ounces Gold.	Dwts. per ton.	Tons treated.	Ounces Gold.	Dwts. per Ton.	Tons Treated.	Ounces Gold.	Dwts. per Ton.	Tons Treated.	Ounces Gold.	Dwts. per Ton.	Tons Treated.	Ounces Gold.	Dwts. per Ton.
1. Big Bell Mines, Limited	357,623	41,048	2.30	153,588	19,633	2.55	....	....	....	....	....	....	26,354	4,220	3.20
2. Blue Spec Gold Mines, N.L.	4,029	4,645	23.06	8,844	2,139	4.84	....	....	....	....	....	....	....	....	....
3. Boulder Perseverance, Ltd.	137,456	33,498	4.88	101,144	29,106	5.75	85,806	23,666	5.52	75,987	20,389	5.37	81,965	22,985	5.61
4. Burbidge Gold Mines, N.L.	27,787	2,278	1.64	3,850	149	....	....	....	....	....	....	....	4,350	411	1.89
5. Central Norseman Gold Corporation, N.L.	107,750	34,411	6.39	105,640	35,959	6.95	73,488	24,669	6.71	71,521	29,675	8.30	76,864	27,089	7.05
6. Comet Gold Mines, Ltd.	2,768	3,744	27.05	12,075	7,698	12.75	10,515	6,370	12.12	12,968	13,125	20.02	12,905	13,265	20.56
7. Consolidated Gold Mines of Coolgardie	....	....	....	....	....	....	890	145	3.26	20,745	2,267	2.18	32,983	5,127	3.11
8. Edna May Amalgamated Gold Mines, N.L.	17,498	6,774	7.74	11,464	4,613	8.05	10,861	3,779	6.96	12,409	4,271	6.88	8,681	3,332	7.68
9. Emu Gold Mines, Limited	26,720	6,247	4.68	28,929	6,976	4.82	27,511	7,017	5.09	18,816	4,539	4.82	28,567	7,049	4.93
10. Evanston Gold Mines, N.L.	11,585	5,019	8.66	748	245	6.55	....	....	....	....	1,335	....	3,120	796	5.10
11. Gold Mines of Kalgoorlie	158,337	39,138	4.94	151,871	36,758	4.84	109,334	25,357	4.64	98,554	22,969	4.66	87,928	21,610	4.92
12. Great Boulder Pty. Gold Mines, Ltd.	367,293	94,051	5.15	343,506	87,343	5.09	276,778	71,560	5.17	248,313	64,878	5.22	283,201	63,302	4.47
13. Hannans North (Broken Hill Pty., Ltd.)	44,307	13,893	6.27	36,504	13,047	7.15	....	....	....	....	....	....	695	441	12.69
14. Hill 50 Gold Mines, N.L.	50,659	13,673	5.39	44,842	12,819	5.72	31,108	8,430	5.42	32,082	9,571	5.98	36,459	10,054	5.52
15. Kalgoorlie Enterprise, Limited	57,277	17,807	6.22	51,112	16,530	6.46	40,889	11,861	5.80	37,349	9,490	5.08	54,027	16,110	5.96
16. Lake View and Star, Limited	518,431	148,766	5.74	453,317	119,992	5.29	279,579	75,602	5.41	278,171	76,502	5.50	260,720	76,583	5.87
17. Moonlight Wiluna, Limited	....	....	....	....	3,095	....	19,117	5,834	6.10	75,375	12,019	3.19	100,577	17,790	3.54
18. Mountain View	1,922	12,795	133.14	1,423	4,883	68.63	1,495	7,745	103.62	....	....	....	....	....	....
19. Norseman Gold Mines, Limited	5,858	845	2.88	42,099	5,601	2.66	40,580	5,626	2.74	38,980	6,837	3.52	58,215	11,734	4.03
20. North Kalgurli (1912), Limited	151,710	44,608	5.87	123,550	38,160	6.18	107,737	31,064	5.77	91,444	27,443	6.00	78,181	25,721	6.58
21. Ora Banda Amalgamated, N.L.	12,897	3,704	5.76	1,182	558	9.44	....	....	....	1,295	1,103	17.04	16,230	4,109	5.06
22. Paringa Mining and Exploration, Ltd.	99,702	21,429	4.39	99,568	22,529	4.52	81,378	20,550	5.05	67,295	15,446	4.59	74,108	17,104	4.62
23. Phoenix Gold Mines, Limited	28,085	6,785	4.83	29,520	7,586	5.14	29,431	8,263	5.61	28,507	8,061	5.66	24,719	6,695	5.42
24. South Kalgurli Consolidated, Limited	79,173	19,503	4.93	75,915	18,571	4.89	63,253	18,528	5.85	56,685	15,603	5.51	63,065	19,135	6.07
25. State Batteries	49,168	33,147	13.48	45,477	23,671	10.41	20,078	18,113	18.04	18,262	15,595	17.08	19,074	18,591	19.49
26. The Sons of Gwalia, Limited	81,510	24,986	6.13	87,683	27,056	6.17	67,871	20,792	6.13	72,653	22,657	6.24	75,774	24,003	6.34
27. Triton Gold Mines, N.L.	55,961	14,382	5.14	....	....	....	....	....	....	....	....	....	....	....	....
28. Wiluna Gold Mines, Ltd.	3,854	839	4.35	149,172	24,775	3.32	334,638	35,016	2.09	392,246	39,028	1.99	479,069	52,377	2.19
Total	2,459,630	648,015	5.27	2,163,023	569,492	5.27	1,712,367	429,987	5.02	1,749,647	422,803	4.83	1,987,831	469,633	4.72
Other Sources (excluding large retreatment plants)	47,676	18,047	7.57	31,464	23,285	14.81	24,225	16,823	13.81	27,481	26,114	19.00	63,180	40,807	12.92
Total (excluding large retreatment plants)	2,507,306	666,062	5.31	2,194,477	592,777	5.40	1,736,592	446,810	....	1,777,128	448,917	5.05	2,051,011	510,440	4.98
Golden Horseshoe Sands Retreatment	....	10,648	....	....	8,810	....	....	8,079	....	....	9,183	....	....	10,694	....
Lake View and Star Retreatment	....	7,330	....	....	12,212	....	....	12,738	....	....	14,488	....	....	10,613	....
Wiluna Gold Mines Retreatment	....	10,262	....	....	....	....	....	....	....	....	....	....	....	....	....
State Batteries Tailings Treatment	....	7,450	....	....	4,808	....	....	....	....	....	....	....	....	....	....
GRAND TOTAL	2,507,306	701,752	5.60	2,194,477	618,607	5.64	1,736,592	467,627	5.38	1,777,128	472,588	5.32	2,051,011	531,747	5.19

TABLE H.

Development Footages Reported by the Principal Mines for 1947.

Goldfield.	Mine.	Shaft Sinking.	Driving.	Cross-cutting.	Rising and Winzing.	Diamond Drilling.	Total.
		Feet.	Feet.	Feet.	Feet.	Feet.	Feet.
Pilbara	Blue Spec Gold Mines, N.L.	147	565	164	118	....	994
	Comet Gold Mines, Limited	....	41	9	43	....	93
East Murchison	Beth Heno Gold Mine	175	75	57	25	....	332
	Emu Gold Mines, Limited	....	773	149	77	1,099	2,098
	Mount Harris Gold Mine	50	190	....	20	....	260
Murchison	Big Bell Mines, Limited	133	3,938	2,305	2,304	2,090	10,770
	Hill 50 Gold Mines, N.L.	....	1,770	908	678	4,137	7,493
	Triton Gold Mines, N.L.	28	609	50	93	2,364	3,144
Mount Margaret	British King Gold Mine	50	80	100	40	....	270
	Democrat Gold Mine	....	163	73	138	....	374
	Dragon Gold Mine	100	170	....	50	....	320
	Morgood Gold Mine	80	80	100	40	....	300
	North Democrat Gold Mine	100	75	10	90	....	275
	Sons of Gwalia, Limited	241	377	507	428	2,628	4,181
North Coolgardie	First Hit (Menzies), Gold Mine	....	280	18	100	....	398
	First Hit (Morley's)....	25	54	60	60	....	199
	Golden Hill Gold Mine	140	6	6	....	....	152
	Porphyry Gold Mine	....	....	443	22	....	465
	Timoni Gold Mine	5	793	114	155	....	1,067
Broad Arrow	Ora Banda Amalgamated, N.L.	72	1,058	422	493	1,009	3,054
East Coolgardie	Boulder Perseverance, Limited	....	4,702	....	7,505	9,190	21,397
	Gold Mines of Kalgoorlie, Limited	....	4,778	2,011	1,209	12,742	20,740
	Great Boulder Proprietary Gold Mines, Ltd.	105	10,389	3,554	5,191	22,314	41,553
	Haoma Gold Mine	82	170	56	32	....	340
	Kalgoorlie Enterprise Mines, Limited	140	2,670	533	898	2,670	6,911
	Lake View and Star, Limited	....	15,772	2,822	8,099	5,923	32,616
	North Kalgurli (1912), Limited	....	5,613	1,930	1,990	6,559	16,092
	Paringa Mining and Exploration Co, Ltd.	....	3,608	2,779	1,117	10,034	17,538
	South Kalgurli Consolidated, Limited	51	3,427	1,145	512	2,470	7,605
Coolgardie	Barbara and Surprise	101	1,708	693	791	2,684	5,977
	Hampton Gold Mining Areas, Limited	620	1,162	982	345	3,002	6,111
	Fair Play Gold Mine	60	....	100	....	....	160
	Lister Gold Mine	50	150	125	....	....	325
	Phoenix Gold Mines, Ltd.	....	167	75	210	1,066	1,518
Yilgarn	Copperhead Mine	....	202	3,608	223	19,787	23,820
	Sunshine Reward Gold Mine	....	262	....	....	....	262
Dundas	Central Norseman Gold Corporation, N.L.	1,188	2,716	745	1,900	14,875	21,424
	Total	3,743	68,593	26,653	34,996	126,643	260,628

OPERATIONS OF THE PRINCIPAL MINES.

EAST COOLGARDIE GOLDFIELD.

The total ore treated in this district during 1947 was 1,622,141 tons and the yield was 449,816 fine ounces which is a return of 5.35 dwt. per ton. In the previous year 1,445,228 tons were treated for a recovery of 408,170 fine ounces which is 5.65 dwt. per ton.

The number of men employed was 3,620 in 1947 as against 3,297 in the previous year.

About 64 per cent. of the State's production was derived from this goldfield, the proportion being slightly less than for last year.

The principal mines are:—

East Coolgardie District.

The ore treated for the year by the *Lake View and Star Mine* was 518,431 tons and the gold recovered was 148,766 fine ounces which is an average of 5.74 dwt. per ton. Tailings retreatment yielded 7,330 fine ounces of gold.

The grade of ore treated is almost half a pennyweight better than for last year.

The Western Group contributed about 60 per cent. of the ore milled and about 40 per cent. was won from the Lake View and Associated Mines.

Payable ore has been developed at various levels between 1400 and 3000 feet and the reserve of ore is approximately 4,200,000 tons.

The Ivanhoe South Shaft is being stripped to provide for increased ventilation.

North Kalgurli milled 151,710 tons of ore for a return of 44,608 fine ounces, the average grade being 5.87 dwt. per ton. Both tonnage and yield are higher than for the previous year, but the grade is slightly lower.

Some high grade ore was developed and payable ore was opened on various levels between 200 and 1500 feet. At the 1600 level in the Kalgurli Shaft a haulage is being driven to connect with the North Kalgurli Shaft.

The Croesus treatment plant has operated throughout the year and a new poppet legs is being erected on the Croesus Shaft.

Paringa treated 99,702 tons for a return of 21,429 fine ounces, the average return being 4.39 dwt. per ton. Most of the ore was obtained from the Paringa lease, but North Kalgurli Central, Paringa Extended and Block 45 together contributed about 20 per cent. Development was carried out on all leases. High grade ore was encountered on Block 45 at the 400 level.

Gold Mines of Kalgoorlie treated 158,337 tons for a return of 39.138 fine ounces which is a slight increase in last year's figures. The average return of 4.94 dwt. per ton was also slightly higher than for last year. A considerable tonnage is obtained from opencuts. A patch of high grade ore was opened up on the 300 ft. level in the Iron Duke Lease.

Great Boulder improved slightly on last year's output the figures for this year being 367,293 tons milled for a return of 94,051 fine ounces, an average of 5.15 dwt. per ton.

Edwards Shaft was sunk to 3,100 ft. level and will be continued to 3,400 feet. A lode carrying high values was encountered at 3,100 feet much closer to the shaft than was expected.

Normal development and stoping has proceeded on all levels from 800 to 2,600.

Conroy's Lode is developing satisfactorily at 2,050 level and development of the same lode is in progress at 2,500 level.

Boulder Perseverance increased its output by about 40 per cent. on last year's figures. The ore treated was 137,456 tons and the recovery of 33,498 fine ounces represents a grade of 4.88 dwt. per ton, which is the lowest grade produced by this mine for several years.

A new steel head frame has been erected at the main shaft.

Stoping and development proceeded on all levels from 200 to 2,200 feet.

The returns from *Kalgoorlie Enterprise* were similar to the preceding year. This year's figures of 57,277 tons of ore treated for a return of 17,807 ounces of fine gold being about 12 per cent. higher than last year. The return of 6.22 dwt. per ton is slightly lower than last year's figure.

A 30-foot diameter pulp thickener placed near Victoria shaft to control the pulp density of the hydraulic fill has enabled the average pulp density to be raised to 72 per cent. solids and has improved the placing of the filling in the stopes.

Scraper haulage is used for handling the ore in cut and fill stopes.

Victoria shaft was sunk to 2,394 feet and development work was continued on the Greenhill shoot at 2,175 level.

The returns of 79,173 tons treated for a recovery of 19,503 fine ounces from *South Kalgurli* are very similar to those of last year. The recovered grade of 4.93 dwt. per ton is slightly above the figure for last year.

The main shaft was sunk a further 51 feet to a total depth of 2,179 feet. Some nice ore was developed on the No. 2 Cross Lode at 2,050 ft. level.

The *Daisy* and *Haoma* leases at Mount Monger both produced over 500 ounces, and the *Caledonian* produced 263 fine ounces while the *Dry Mount* recovered 357 ounces. *New Milano* obtained 484 ounces from 141 tons.

Bulong District returned only 272 fine ounces.

COOLGARDIE GOLDFIELD.

The production for the year was 42,646 tons of ore which yielded 11,966 fine ounces, which is an average return of 5.61 dwt. per ton. The figures for the previous year were 40,769 tons of ore for 13,968 fine ounces at an average of 6.86 dwt. per ton. While there is some increase in the tonnage treated, the grade of ore is lower by a little over 1 dwt. per ton.

The average number of men employed was 255 as compared with 201 last year. This increase is due to the development work in progress on the Hampton Areas.

Coolgardie District was responsible for most of the production, the principal mine being the *Phoenix* with a return of 6,785 fine ounces from 28,085 tons of ore, at an average of 4.83 dwt. per ton. Tonnage treated is practically as for last year with a decline in grade of 0.3 dwt. and a corresponding decrease in gold returned. The ore has been obtained mainly from the shrink stope above 1,300 level.

The flotation of the *New Coolgardie Mines* to take over the *Surprise* and *Barbara* leases has aroused considerable interest. Development of the leases is proceeding. This company is also investigating the Burbanks group of leases.

Hampton Areas are prospecting in the vicinity of the Surprise and Barbara and have developed some ore. Four leases have been sold to New Coolgardie.

Among the smaller mines the *Moya* which produced 353 ounces and Lister's at Widgiemooltha which produced 745 ounces were the most successful.

Kunanalling District produced only 436 ounces.

DUNDAS GOLDFIELD.

During 1947, the ore mined in this goldfield amounted to 117,633 tons which yielded 37,648 fine ounces of gold at an average of 6.41dwt. per ton. Comparison with the corresponding figures 157,538 tons for 44,327 fine ounces at an average grade of 5.85 dwt. per ton shows a decline.

This is due to the reduced output from Norseman Gold Mines.

This goldfield ranks third and produced 5.4 per cent. of the State's output for this year. The average number of men employed was 492 as compared with 566 in the previous year.

Central Norseman, the principal producer, milled 107,750 tons for a return of 34,411 fine ounces which is an average of 6.39 dwt. per ton. This is a slight increase on last year's production figures of 105,640 tons treated for 35,959 fine ounces at an average of 6.95 dwt. per ton. The grade for the current year shows a decline of 0.56 dwt. per ton. This is the lowest grade of ore treated by this mine for some time.

A new shaft, approximately one mile north of the Phoenix shaft is being sunk to intersect the new shoot discovered in this area.

This company is also developing the *Princess Royal* mine where the principal work has been at 700 and 900 levels, and the *Lady Miller* where a shaft has been sunk to 500 feet underlay depth and development is proceeding at 300 and 500 levels.

Norseman Gold Mines has abandoned gold mining operations, but continued to produce pyrite for the superphosphate industry.

Dundas Gold Mines operating on the Empress lease treated 2,223 tons for a return of 1,492 fine ounces but other small mines have had an unsuccessful year.

YILGARN GOLDFIELD.

This goldfield has shown a marked increase over the output for the previous year. Its production is slightly greater than the East Murchison field and it is fifth in order of gold production. During this year 69,809 tons were treated for a return of 22,056 fine ounces at an average of 6.32 dwt. per ton, while for the previous year the figures were 24,470 tons for 10,709 fine ounces at an average of 8.75 dwt. per ton.

This increase is mainly due to the re-opening of the Evanston Mine and of several small mines. The number of men employed was 410 as compared with 370 in the previous year.

The *Edna May Amalgamated* mine at Westonia although in the salvage stage had its best year for some time. The ore treated was 17,498 tons and the gold recovered was 6,774 fine ounces, which is an average of 7.74 dwt. per ton. Treatment of sands for the recovery of scheelite and wolfram was continued and 674 units of tungstic oxide were obtained.

Burbidge Gold Mines although not yet back into full production has done well to treat 27,787 tons of laterite ore for a return of 2,278 fine ounces at the very low average of 1.64 dwt. per ton. The ore is mined by diesel shovel and carted by motor trucks to the mill.

Edwards Reward treated 3,855 tons of ore for a return of 1,539 fine ounces of which 612 fine ounces were obtained by cyanidation of battery tailings. Satisfactory development was carried out during the year and the mine is in a good position as regards reserves.

The *Evanston* Mine treated 11,585 tons of ore for a return of 5,019 fine ounces which is an average of 8.66 dwt. per ton. Operations ceased in December owing to the exhaustion of the available ore.

A good shoot of ore was found on the *Constance Una* Mine by exploration beyond a fault. The ore crushed amounted to 215 tons and yielded 642 fine ounces by amalgamation.

The *Frances Furness* treated 1,838 tons for a return of 474 fine ounces. All ore was mined above the 250 level and widths up to 20 feet were encountered.

The *Christmas Gift* returned 132 fine ounces by amalgamation from 40 tons of ore.

The *Radio* treated 1,026 tons of ore for a return of 1214 fine ounces. Both tonnage and grade are slightly higher than last year.

Radio Deeps struck trouble in their shaft sinking operations due to heavy flows of water. These were dealt with by cementation and the shaft is now down 284 feet, approximately 70 feet from the ore channel.

After considerable expenditure on unwatering and reconditioning *Clamps Central* has commenced production. Ore from shaft sinking amounting to 151 tons was crushed for a return of 105 fine ounces by amalgamation.

Another rich mine is the *Diehardy Range* which crushed 60 tons for 64 fine ounces by amalgamation. This mine recently changed hands and is now being equipped with a small plant.

Several other small mines had rather poor returns but have done a lot of development work.

Western Mining Corporation has been active in the district and is operating on the *Three Boys, Pilot, Corinthian* and *Copperhead* mines. These properties are under option to the company.

BROAD ARROW GOLDFIELD.

The total ore treated in this goldfield was 18,233 tons and the yield was 8,252 fine ounces or 9.05 dwt. per ton. The gain over last year's figures of 5,887 tons treated for a return of 4,084 fine ounces, at an average of 13.87 dwt. per ton is due to the return of Ora Banda Amalgamated to the list of producers.

The average number of men employed was 232 and the figure for the previous year was 154.

Production was suspended at *Ora Banda* Amalgamated in October when a fire destroyed the ten head mill. From 12,897 tons of ore treated, the return was 3,704 fine ounces which is an average of 5.76dwts. per ton. Developments were satisfactory.

Bellevue, Grace Darling and *Zoroastrian* were the most important of the other mines.

NORTH COOLGARDIE GOLDFIELD.

In this Goldfield, 11,392 tons of ore were treated for a return of 8,144 fine ounces, an average return of 14.30dwts. per ton. During the previous year, 7,552 tons were treated for a return of 5,906 fine ounces, which is an average of 15.64dwts. per ton.

The number of men employed was 321 while the corresponding figure for the previous year was 234.

Menzies District was responsible for 4,993 fine ounces which was obtained from the treatment of 6,726 tons of ore.

The principal mine is the *Timoni* at Mount Ida which is operated by Goldfields Australian Development. The power plant was burnt out but the mine was able to continue operations and the plant has been rebuilt. The ore treated was 3,876 tons and the yield of 2,081 fine ounces is an average return of 10.8dwts. per ton. Satisfactory development was done during the year and the mine is in a strong position.

The *First Hit* produced 1,163 tons which yielded 951 fine ounces.

Ularring District returned 1,914 fine ounces from the treatment of 2,577 tons. Good returns were obtained from the *First Hit* at Morley's Find which treated 135 tons for 275 fine ounces, and the *Oakley* at Mulwarrie which treated 240 tons for 305 fine ounces.

Niagara district produced 550 fine ounces from 899 tons of ore.

In the *Yerilla District* the *Porphyry* and the *Yilgangie Queen* are being prepared. The total ore treated in the district was 1,190 tons which yielded 595 fine ounces.

NORTH EAST COOLGARDIE GOLDFIELD.

The ore treated in this goldfield amounted to 883 tons and the return of 911 fine ounces included 370 fine ounces of dollied and specimen gold.

MOUNT MARGARET GOLDFIELD.

The tonnage treated during this year, 90,814 tons, is less than the figure 96,119 for last year. The average grade was improved to 7.59dwts. per ton from 7.21dwts. per ton, and the return of 34,442 fine ounces for this year is almost equal to the 34,635 fine ounces produced during last year.

This is the fourth in order of production of the Goldfields.

The number of men employed during the year was 494 as compared with 548 in 1946.

There are several small mines in this goldfield producing ore of 1 ounce or better per ton.

Mount Malcolm District produced 26,204 ounces from 83,006 tons of ore. *The Sons of Gwalia* which is the principal mine in the goldfield is a consistent producer. The figures of 81,510 tons treated for a return of 24,986 fine ounces, at an average of 6.13dwts. per ton are slightly below the figures for last year in tonnage and grade. Development work was limited by shortage of labour but results were satisfactory. A new 500 horsepower gas engine was installed to meet increased demand.

The re-opening of the *Reefer Battery* has stimulated prospecting.

Among the small mines, the best were: The *Puzzle* at Diorite with 246 fine ounces from 240 tons, the *British King West* with 223 fine ounces from 115 tons and the *Dragon* with 202 ounces from 282 tons, both at Lake Darlot.

In the *Mount Margaret District* 5,075 tons of ore were treated for a return of 3,842 fine ounces. The rich *Boomerang* at Burtville which treated 271 tons for a return of 1,074 fine ounces was the principal producer. Improvements to plant have been made during the year.

Opencut operations at the *Lancefield* produced 2,985 tons which yielded 927 ounces. Treatment is by battery and leaching. The return of gold by amalgamation is too small to be economical.

Two small mines at Burtville, the *Happy King* and *Nil Desperandum* treated small parcels of ore worth over 1oz. per ton.

Mount Morgans District produced 1,396 fine ounces from the treatment of 2,734 tons of ore. The *Democrat* at Linden contributed 1,997 fine ounces obtained from the treatment of 953 tons of ore and the *North Democrat* 266 fine ounces from 150 tons of ore while the *Local Lady* treated 585 tons for a return of 701 fine ounces.

EAST MURCHISON GOLDFIELD.

Production for the year was 37,806 tons yielding 21,487 fine ounces at an average of 11.37 dwt. per ton and is much below the previous year's production of 183,005 tons for 37,148 fine ounces at an average of 4.05 dwt. per ton. This is due to the cessation of mining on the Wiluna. The inclusion of gold from tailings retreatment also increases the average return.

The number of men employed was 313 as compared with 464 in the previous year.

The gold produced in the *Lawlers District* amounted to 6,730 fine ounces won from 27,516 tons of ore which is an average of 8.20 dwt. per ton.

Emu Gold Mines mined 26,720 tons of ore for a return of 6,247 fine ounces, the average return being 4.68 dwt. per ton. Both tonnage and grade are slightly below the figures for the previous year. An electric hoist for the serving of the 990 level was installed at the 900 level and a ventilation fan and pump were also installed on this level. The supply of available ore is low and the future of this mine is doubtful.

In the *Wiluna District*, the production of 12,607 ounces from 7,249 tons is due mainly to the inclusion of 10,262 fine ounces from tailings retreatment at the *Wiluna* Mine.

The *Black Range District* produced 2,150 fine ounces from the treatment of 3,040 tons of ore, the principal producers being *Scheelite Leases* at Barrambie with 169 ounces from 181 tons, the *Apples* at Hancocks with 317 ounces from 72 tons, *Doolette South* with 330 ounces from 360 tons and *Lady Mary* with 487 ounces from 303 tons at Sandstone.

MURCHISON GOLDFIELD.

This Goldfield with an output of 478,862 tons of ore yielding 92,378 fine ounces of gold at an average of 11.37 dwt. per ton is now the second producer in the State and responsible for 13 per cent. of the total.

Last year's figures were 210,232 tons for 44,304 fine ounces. The very considerable increase is due to increased output from the Big Bell mine and the resumption of the operations at the Triton.

The number of men employed was 1,098 as against 777 for the previous year.

The Cue District produced 416,843 tons which yielded 58,149 fine ounces of gold and is thus responsible for over half the yield of the Murchison Goldfield.

The principal producer, *Big Bell* mined 357,623 tons of ore for a return of 41,048 fine ounces which is an average of 2.30 dwt. per ton. Preparations for the installation of another diesel alternator unit in the power house are in hand. Developments have been satisfactory and the mine is in a secure position as regards ore reserves. Insufficient labour has been available and the tonnage mined has not been sufficient to keep the mill at full capacity. Recent rises in costs have had an adverse effect on this mine because of its small margin of profit per ton.

Triton has resumed operations but owing to labour shortage has not been able to operate at full capacity. The production for the year was 55,961 tons of ore yielding 14,382 fine ounces of gold which is an average of 5.14 dwt. per ton. Reserves of ore are limited and failing some fortunate development, the life of this mine is limited.

The Meekatharra District yielded 4,740 fine ounces obtained from the treatment of 5,990 tons of ore. The principal producers were *New Brew* at Gabanintha, 1,138 tons for 1,438 ounces, and *Fenian* with 129 tons for 793 ounces and *Prohibition* with 700 tons for 737 fine ounces, both at Meekatharra.

In the *Day Dawn* District where 2,192 tons of ore were treated for a return of 12,965 fine ounces, the rich *Mountain View* Mine produced 1,922 tons for 12,795 fine ounces, an average of 6 ounces 13 dwt. per ton. This mine has recently been taken over by a company.

The return from the *Mount Magnet District* was 52,275 tons of ore treated for a return of 15,410 fine ounces. The principal producer was *Hill 50* which treated 50,659 tons for a return of 13,673 fine ounces. Extensive diamond drilling has been carried out in search of lateral extensions.

PILBARA GOLDFIELD.

In this goldfield, 10,321 tons of ore were treated for a return of 11,026 fine ounces, an average of 21.32 dwt. per ton. This is less than half the previous year's production due to the failure of the Comet and reduced output at Blue Spec.

The number of men employed was 175 as compared with 210 in the previous year.

The *Marble Bar District* recorded a production of 4,642 tons which yielded 5,405 fine ounces. The *Comet* Mine produced only 2,768 tons of ore which yielded 3,744 fine ounces. Among the small mines, the *Federation* at Bamboo Creek with 125 tons for 266 ounces and the *Homeward Bound* at Marble Bar with 348 tons for 246 ounces were the best.

In the *Nullagine District* 5,679 tons of ore was treated for a return of 5,621 fine ounces. The principal producer was the *Blue Spec* which treated 4,029 tons for a return of 4,645 ounces, equal to 23.06 dwt. per ton. No. 3 Level was developed during the year and the water supply was improved by the sinking of another well and three additional bores.

PEAK HILL GOLDFIELD.

The return from this field was 3,923 tons of ore treated for a yield of 1,632 ounces, averaging 8.32 dwt. per ton. The good return of 402 ounces from 89 tons was obtained by the *Pegasus* at Egerton. *Horseshoe Lights* and Labouchere *Main Lode* at Horseshoe mined low grade ore.

Kimberley, Ashburton, Gascoyne, Phillips River and places outside proclaimed goldfields produced 818 ounces of gold in which is included 345 ounces of alluvial, dollied and specimen gold from the Kimberley Goldfield.

COAL MINING.

The output of the Collie Coalfield during 1947 is compared with the 1946 output in the following table:—

Mine.	1947.		1946.	
	Tons.	Value £A.	Tons.	Value £A.
Proprietary	156,242	178,816	128,963	148,665
Co-operative	103,984	123,471	87,651	102,698
Cardiff	87,020	102,093	69,739	79,174
Stockton	100,239	118,760	100,101	117,101
Stockton Open Cut	96,461	114,543	122,960	142,477
Wallsend Open Cut	51,884	61,446	31,432	37,325
Total, Amalgamated Collieries	595,830	699,129	540,846	627,440
Griffin	91,641	95,623	81,289	81,894
Wyvern	43,035	45,857	20,152	20,770
Total, Griffin Co.	134,676	141,120	101,441	102,664
Grand Total	730,506	840,249	642,287	730,104

The total output for the year is a record being greater than last year's record by 88,219 tons. The output from underground mines increased by 94,266 tons, while the total open-cut coal decreased by 6,047 tons. The Griffin Companies increased their output by 33,235 tons while the Amalgamated Collieries increased the output from underground mines by 61,031 tons.

Supplies of imported coal have been short during the year and sufficient Collie coal has been produced to meet the needs of power and railway services. There has been a strong demand for coal for industrial purposes. Lack of sufficient railway waggons has caused some reduction of output.

The average number of men employed during the year was 1,032 of whom 287, including 73 in open-cuts, were employed on the surface, while 745 were employed underground. In the previous year, 955 men were employed of whom 262, including 62 in open-cuts, were surface workers while 693 were employed underground.

The increase of 77 men is made up of 25 surface workers, including 11 in open-cuts, while 52 additional men were employed underground.

The operations of the principal mines were as follows:—

Proprietary Mine:

At the end of the year 98 working places were available as against 109 at the end of the previous year. The loss of working places is due to the fault encountered in the Main Dip in 10 Section and to places stopped on the barrier below the Old Proprietary workings. The seam beyond the fault in Main Dip has not yet been located. Two bords are being driven into the Old Proprietary above the level of the water standing in them.

The headings in Section 11 have been driven 200 yards bringing them into line with old 18 level. Reduced levels indicate a displacement between present workings and the old level.

In Section 21 there are 21 places ready for work and these will become available when the new ventilation shaft is completed and equipped with its fan. The production for the year was 156,242 tons as compared with 128,963 tons in the previous year.

This mine has maintained its position as the largest producer in the field.

Co-operative Mine:

The number of available working places in this mine at the end of the year was 45 as compared with 72 at the end of 1946. A fault was encountered in the dip heading. A bore hole put up from the stone drive beyond the fault encountered a heavy flow of water. The hole was plugged and no further exploration has been done.

The "Siderite" section on the eastern side of the mine is being unwatered and prepared for work.

This will bring some places stopped on the protective barrier into production.

The year's output was 103,984 tons, second to the Proprietary, and greater than last year's output of 90,029 tons.

Stockton Mine:

In this mine 74 places were available at the end of the year as against 67 at the end of the preceding year. The top seam has opened up well and there are now 33 places available.

The two headings to connect Stone Drive Section and No. 2 Heading Section struck the fault but the connection has not yet been made.

The coal won for the year was 100,239 tons, only slightly less than the Co-operative output and practically the same as last year's output of 100,101 tons.

Cardiff Mine:

During the year, an area of about seven acres caved in over the pillar extraction section. A creek on the surface was directly over the area and it appears that water from this creek found its way down into the broken ground above the roof which had been caved during pillar extraction. Accumulations of water softened the inundated strata and a rush of water and "slurry" occurred. No damage apart from the filling up of a section of the mine resulted.

The work of extracting the top coal in the existing bords with scraper loaders proceeds but no further pillar extraction has been done.

Griffin Mine:

The number of places available in this mine at the end of the year was 45 the same as at the end of 1946.

Four scraper units are employed in this mine and "grunching" is employed to some extent.

The output of 91,641 tons shows a substantial increase above the 81,289 tons produced in 1946.

Wyvern Mine:

In this mine six scraper loaders and two scrapers are used and the mine doubled last year's output, producing 43,035 tons as compared with 20,152 tons. Further increase should result when more conveyor belt is available.

Phoenix Mine:

A tunnel to open up the third seam in the Griffin horizon was commenced on 13th November.

Open Cut Areas:

The Stockton Open Cut has extended over the old mine and has taken a considerable amount of pillar coal as well as the top seam. The overburden is getting heavier as progress continues in this direction and the end of open cutting is in sight.

An area on the western side of the line is being cleared and stripped ready for work in that area. The production of 96,461 tons shows a considerable decline from last year's figure of 122,960 tons.

Wallsend Open Cut produced 51,884 tons, which together with 31,432 tons produced in the previous year makes a total of 83,316 which is approaching 100,000 tons estimated to be available.

The Black Diamond area was drilled but no other work has been undertaken.

Eradu Coal:

Both shafts were put down to the bottom of the coal seam and some 150 tons of coal obtained. The coal proved to be unsatisfactory for use in boilers without special equipment. A flow of water also entered the mine through a break in the roof and the project was closed down. A full account of the operations is published as an appendix to this report.

MINERALS OTHER THAN GOLD OR COAL.

The value of minerals other than gold or coal produced during the year was £446,453. A considerable increase on last year's figure of £323,777. Products in transit valued at £37,700 are not included in the return.

The principal causes of this improvement were increases in the production of Crocidolite Asbestos, Clays, Gypsum, Pyrites and Silver.

Notes on the various minerals are given below:—

Alunite:

During the year 34,331 tons of Alunite were treated for the return of 1,725 tons of 30 per cent. K_2O potash containing 958 tons of pure potassium sulphate valued at £41,212. Production has proceeded steadily throughout the year.

Antimony:

The Blue Spec Mine shipped 282 tons of concentrate estimated to contain 118 tons of Antimony valued at £9,622. This is considerably less than last year's production as the mine ceased production for part of the year for re-organisation and development. Two other small parcels amounted to 65 tons and contained 2 tons of antimony.

Arsenic:

Wiluna Gold Mines produced 1,190 tons of arsenic valued at £28,714 from stocks of crude. It is expected that production will cease in the near future.

Asbestos:

Midland Mining Company increased their production of Anthophyllite and marketed 75 tons valued at £988.

Chrysotile mining was resumed at Nunyerri and the production amounted to 88 tons valued at £6,173.

Australian Blue Asbestos shipped 889 tons valued at £30,226 from the mine at Wittenoom Gorge. Last year's production was 366 tons. A township has been surveyed in the vicinity of the mine and buildings are in course of erection.

Beryl:

There has been some response to the satisfactory prices now offering for Beryl. Most of the known patches have been exploited. This year's production of 45 tons valued at £1,525 is greater than last year. This is principally due to 24 tons from the felspar quarry at Londonderry. The Port Hedland area produced 21 tons as compared with 15½ tons in the previous year. Ore in transit amounting to 26 tons is not included in the return.

Bentonite: The Marchagee leases produced 45 tons of Bentonite valued at £134 which is similar to last year's production. Some inquiries have been made for supplies of this material.

Clays:

Clays used in the manufacture of ceramics refractories and cement amounted to 6,277 tons valued at £6,064. The amount used is more than double that for last year.

Copper:

The only copper mined was in the form of carbonate ores used for fertiliser and 917 tons valued at £6,071 were used for this purpose.

Diatomaceous Earth:

The Lake Gnangarra deposits yielded 5 tons for local use.

Felspar:

The only producer was Australian Glass Manufacturers operating at their Londonderry Quarry. The production of 1,226 tons valued at £4,291 was less than 1,793 tons produced in the previous year.

Glauconite:

Glauconite recovered from Greensand mined in the Gingin area amounted to 351 tons, valued at £8,762. The greensand treated at the Midland Junction Works was 1,753 tons.

Gypsum:

There has again been a considerable increase in the production of gypsum, most of which is manufactured locally into plaster board. The raw material obtained from several localities in the inland areas amounted to 20,282 tons valued at £28,774. Last year's production was 15,350 tons.

Glass Sand:

Is obtained in the Wanneroo area and is manufactured locally. This year 364 tons valued at £469 was used.

Iron:

The Wundowie blast furnace commenced smelting towards the end of the year and will be in full production in the coming year. Australian iron and steel are nearing completion of the plant at Cockatoo Island for the mining, crushing and loading of the ore from the deposits there.

Jarosite:

A parcel of 9½ tons was obtained from the deposit at Ravensthorpe.

Kaolin:

Local manufacturers obtained 581 tons from a deposit at Mount Kokeby.

Kyanite:

Development of the deposits at Yanmah has yielded 2,931 tons valued at £14,597. Information has also been obtained regarding the origin and nature of the deposit. Last year's production was 140 tons.

Lead:

The high price now offering for lead has stimulated mining. The return of 22 tons of lead ore containing 17 tons of metallic lead valued at £937 does not include 987 tons of ore and concentrate in transit.

The Protheroe Mine operated by Heinsen Bros. at Nabawa has had a successful year and has developed a nice lens of high grade ore.

Galena Lead Mines are erecting a plant on the old Surprise Mine at Galena and the Baddera Mine close to Northampton is also being equipped. Prospectors have also produced fair quantities of lead ore of fair grade. Some from the Derby area contains a fair amount of silver.

Magnesite:

The Broken Hill Pty. Co., Ltd., obtained 73 tons from the deposit at Bulong.

Pyrites:

Norseman Gold Mines produced 86,952 tons of ore and concentrates estimated to contain 19,009 tons of sulphur and valued at £187,621 as compared with 77,784 tons in the previous year. The deposit has been developed and equipment has been improved.

Ochre:

Deposits of red ochre from the Pilbara Goldfield and the North-East Coolgardie Goldfield have yielded small parcels. The Opthalmia Range deposit produced 191 tons while Wilgie Mia yielded 823 tons. The total production for the year was 1,027 tons as compared with 650 tons for the previous year.

Scheelite:

Scheelite was produced at Higginsville where Urlich obtained 1,054lbs. of concentrate containing 30.58 units, while the treatment of accumulated tailings at Edna May yielded 21,968lbs. of concentrate containing 612 units. The value of the total production of 23,022 tons of concentrate was £3,840.

Talc:

The production from Leases at Mount Monger was 213 tons valued at £813.

Tin:

The total production for the year was 24 tons valued at £5,565. Pilbara produced 18 tons and 6 tons was obtained from Greenbushes.

Vermiculite:

Perth Modelling Works obtained 82 tons from their Leases at Young River.

E. E. BRISBANE,
Assistant State Mining Engineer.

APPENDIX No. 1.

COAL IN THE IRWIN RIVER AND GREENOUGH RIVER AREAS.

The first discovery of coal in Western Australia was in 1846. In that year A. C. and F. T. Gregory left T. N. Yule's station in the Toodyay district on 7th August. The following entry from their journal on 9th September is transcribed from Bulletin 38 of the Geological Survey:—

> "At 1 p.m. entered a deep valley by an abrupt descent and found ourselves once more on the banks of the brackish stream, which was much enlarged, and running through a narrow grassy flat backed by high sandstone cliffs from 80 to 100 feet high. Continuing our course along the river West till 1.55 p.m., when it turned North, and at 2 p.m. North-West; at 3 p.m. the banks of the stream became very high and stratified in a remarkable manner, the lower rocks in thin beds dipping to the East, whilst the superincumbent rocks of red sandstone were horizontal. We therefore entered the bed of the river to examine it and found two seams of coal, one five feet thick and the other about six feet thick, between beds of sandstone and shale. Having pitched the tent and tethered the horses, we commenced to collect specimens of the various strata and succeeded in cutting out five or six hundredweight of the coal with the tomahawk, and in a short time had the satisfaction of seeing the first fire of Western Australian coal burning cheerfully in front of the camp, this being the first discovery of coal in the Western part of the continent."

This was 37 years before coal was found at Collie by Arthur Perrin in 1883.

The Government followed up this discovery by sending Lieutenant Helpman with a volunteer party in the Colonial schooner "Champion" to Champion Bay. The party travelled overland to the coal seam on the Irwin River a distance of 90 miles and brought about 3 cwt. of coal back to the vessel.

In the year 1847, the Government Geologist, Dr. Von Sommer, made an examination and continued the discovery reporting two seams six feet and eight feet thick.

The Government declared a reserve of 10,000 acres and for over 30 years no further investigation was made.

The Midland Railway Company put down a bore to a depth of 500 feet in 1890. It passed through clays and sandstone and struck black shale just as the hole was abandoned.

In 1893, the Government relinquished the greater part of the reserve.

The sum of £100 was made available in the year 1897 by the Legislative Council with the object of sinking a shaft to cut the coal. A shaft was sunk to 50 feet and although no coal was cut, indications were considered favourable.

The Rev. C. J. Nicolay also visited the area and reported that on account of the great quantity of water met with and the poor quality of the coal the discovery was of no value.

In 1888, Messrs. Bell and Elliot found fragments of coal in the bed of the North branch of the Irwin River which proved to be of fair quality. They did some work on various seams but did not find coal sufficient to justify exploitation. During these operations coal was obtained which was used by the vessel "Rob Roy" on a passage from Geraldton to Fremantle.

A bore was put down at Dongara by the Government in the year 1900. It was stopped at a depth of 2111 feet when the limit of the plant was reached without passing out of the Jurassic strata. The log of the bore shows sandstone with coal seams from 260 to 305 feet, carbonaceous shale 305 to 309 feet, sandstone with bands of carbonaceous shale 477 to 490 feet.

Analysis of a 4-inch seam occurring at 265 feet gave moisture 13.13 per cent., volatile hydrocarbons 29.47 per cent., fixed carbon 49 per cent., ash 8 per cent.

As the bore went down sub-artesian and artesian flows were tapped. Fresh water at the rate of 3,600 gallons per hour was obtained at 1384 feet and salt water at the rate of 9,000 gallons per hour and a temperature of 104 degrees F. at 1478 feet.

Another bore was put down at Yardarino in the following year (1901). The log of this bore shows sandstone and soft coal 345 feet to 348 feet 6 inches, and black shale 348 feet 6 inches to 365 feet 5 inches. There are some inconsistencies in the report of water from the bore as in Geological Survey Bulletin No. 38 at page 71 the flow is given as 2,400 gallons per hour. It is also stated that after a few years it ceased to flow. The log of the bore has a footnote that when boring ceased the water stood at 25 feet below the surface and at this depth 2,000 gallons per hour could be pumped without lowering the level of the water. At the present time, the bore is discharging a liberal supply of warm water.

This bore was stopped at 1607 feet owing to the tools being lost in the hole.

The fact that carbonaceous material and hot artesian water have been found in these two holes some eight miles apart at comparable depths suggests the existence of a considerable area of sedimentary rocks in a horizontal attitude.

The carbonaceous beds are down about 250 to 350 feet and boring to investigate these beds should disclose some information about the broad structure of the area and may find some workable coal.

Carbonaceous material described as lignite with the analysis: Moisture 27.45 per cent., volatile 41.65 per cent., fixed carbon 27.46 per cent., ash 3.44 per cent., was found in a seam one foot thick in a shaft at Depot Hill. The samples were taken by Campbell in 1906 and had previously been analysed by Simpson in 1901, giving a similar result except that the moisture was only 9.90 per cent.

A bore in the vicinity of Mingenew was commenced in 1903 by the Irwin River Coal Prospecting Syndicate. Coal was reported from this bore but the actual occurrence of coal is open to doubt. No coal was recovered from holes put down as checks in close proximity.

Some boring was done on the South branch of the Irwin River by a syndicate in 1917 and 1918, and two bores were put down by the Government in this locality in 1919 and 1920. This proved the existence of a considerable area of coal with a general Easterly dip of about 5 degrees or 6 degrees. The coal is of poor quality but seams of workable thickness exist. These seams are not continuous and big variation in thickness may occur in short distances.

Indications of coal have also been found in the Lockier River and Woolagar Creek so that the series extends Southwards for 20 miles from the Irwin River.

In 1945 further work on the coal at Irwin River was undertaken by the Government. An old shaft from which coal of high calorific value had been obtained was cleaned out and it was found that this coal was from seams 14 inches and six inches thick.

Three seams outcropping in the bank of the North branch were investigated. A tunnel 180 feet long was driven into the coal on a level grade from the

outcrop in the top seam which is the thickest of them. Representative samples were taken at 14 places. The results show a seam about six feet thick containing a high ash band a foot thick about 12 inches from the top of the seam.

Typical analyses give moisture 10 to 13 per cent., volatile 21 to 30 per cent., fixed carbon 30 to 43 per cent., ash 15 to 40 per cent. The calorific value of the coal from the seam ranges from 5,500 to 9,000 B.T.U.'s per lb. The high ash portion giving 5,500 and the remainder 8,000 to 9,000 B.T.U.'s per lb.

In 1906 when no valuable coal had been found in the Irwin River district, officers of the Geological Survey expressed favourable opinions of the country along the Geraldton-Nannine railway. These were apparently based on the occurrence of rocks of carboniferous age in the vicinity of Eradu.

A company was formed in Geraldton in that year to bore at Depot Hill but Eradu was recommended to the directors by H. P. Woodward as a more suitable site.

A bore in the river bed about three-quarters of a mile north-east of the railway station had already proved the existence of coal measures.

This company transferred its activities to Eradu and put down a series of hand bores.

A deep bore known as Hindley's Bore was commenced in 1907. Owing to financial and working difficulties this bore was not completed until 1909 when it was stopped at a depth of 670 feet. It did not find any coal.

In 1910 a second bore was put down by a man named Musk to a depth of 1006 feet but this bore also failed to intersect coal.

The Government resumed boring with a calyx drill in 1926 and nine holes were put down. This work was completed in 1929 and the results are summarised in the annual report of the Mines Department for that year.

A company known as Eradu Coal Limited was formed in 1939 and put down some further bores. In 1941, they started a shaft near the site of No. 5 Calyx bore but it was abandoned on account of excessive water, and the Government undertook to complete the shaft engaging Mr. C. A. Morrow as contractor in March 1943.

In May 1944, after attempts to seal off the water by concrete walls in the shaft and a concrete plug in the bottom this shaft was abandoned. Work was concentrated on a second shaft which had been started as a spare time job some time before.

Attempts were made to grout the ground through which the shaft was to be sunk, but grouting proved unsuccessful. Only a limited amount of cement was available and grouting was necessarily restricted to small efforts. The general indications are that the rock is too soft, and too unstable when wet to be satisfactorily grouted. Some of the grout was later recovered 150 feet from the point of injection, but there was no noticeable effect on the flow of water.

The shaft was sunk to 112 feet when a heavy flow of water was encountered. Concrete walls were constructed from water level at 75 feet to 105 feet and a concrete plug cast in the bottom of the shaft. This rendered the shaft practically dry.

At this stage the work was suspended and the party transferred to Irwin River in November 1944, to do the work which has been described above.

Work was resumed at Eradu in March 1945, where drives were put in from an outcrop of shale in the bank of the Greenough River, three miles north of Eradu. The seam which outcrops is a shale of no commercial value. Short bores below the seam failed to discover any coal.

In August 1945, work was resumed in the shaft with grouting of the shale as the main line of attack.

By December, preliminary arrangements involving installation of plant, timbering of shaft and erection of camps were complete, but at this stage no cement was available.

Small quantities were later available and cement in lots of two or three tons was pumped into 16 holes bored just to water. This made no impression on the flow of water.

It was then decided to bore a row of 6-inch diameter holes round the shaft and to fill them with cement. The shaft was stripped out just above water level for two feet and a row of holes at 2-foot centres was placed right around the shaft. Boring was done with a diamond drilling machine.

Drills faced with Haystellite, tungsten, carbide and various electrode deposits were tried, and finally cast set diamond drills were used. Previous grouting caused some trouble as masses of cement deflected the drill. Sand running into the holes also caused trouble but this decreased as the number of filled holes increased.

In August 1946, it was decided to try sinking inside a cylinder and Mr. T. S. Higgins commenced a shaft about 150 feet from Morrow's.

The steel cylinder was 72 feet long, 4 ft. 6 in. outside diameter and made of mild steel 7/16th in. thick. It was fabricated in 18 foot lengths and lowered into the shaft in these sections, the joints being welded after the cylinder was in place.

In September sinking was resumed in Morrow's shaft after the row of holes had been completed. The columns of cement in the ground proved to be of considerable importance in supporting the soft ground although some of them broke when the ground fretted away and exposed them.

Pomona pumps were used in both shafts. That in Higgins' shafts was equipped with a sliding suction and a by-pass valve for sinking. The level of the suction and the water delivered by the pump could be controlled from the bottom of the shaft. It had a rated capacity of 10,000 gallons per hour but was driven considerably above the rated speed.

Two pumps were used in Morrow's shaft and they were assembled from various available sections. Together they were capable of delivering about 30,000 gallons per hour.

During the sinking one of these pumps was set in a bore hole close to the shaft, the other being lowered in the shaft as required.

Both shafts reached the coal in August 1947. A concrete wall was built up inside Morrow's shaft and the water flow reduced to about 6,000 gallons per hour.

A drive was put in at the bottom of the seam in a southerly direction for a distance of 61 feet. Samples tested by burning in a Cornish boiler and at the East Perth power house gave disappointing results and it was decided to cease operations.

In order to sample the seam over the full width, a drive was put in at right angles facing west at 55 feet from the shaft on a rising grade, to reach the top of the seam.

Seams of grout were encountered and sandstone was found at a lower level than expected and Morrow reported the presence of a fault.

The exposed coal was sampled giving a record of 16 feet of the total thickness of the seam which is about 22 feet thick. An auger hole was bored from the back of the drive to the top of the seam and cuttings taken as a sample.

The water was then allowed to rise. The water was pumped out some days later for a final inspection and it was found that the laths were broken and the drive filled to the top with broken coal. The sandstone roof could be seen above the fallen coal and a flow of 2,000 to 3,000 gallons per hour was emerging from the heap of fallen coal.

At this stage the workings were abandoned.

The coal was tested in small boilers for the heating of hot water systems in the Freemasons' Hotel and Victoria Hotel in Geraldton both of which reported satisfactory results. It was also used satisfactorily mixed with wood as a fuel for burning bricks in the local brickworks. Trials in the Cornish boiler at the Geraldton Brewery were completely unsuccessful.

Two trial parcels were burned at the East Perth power house and the general manager's report is quoted below.

"The first test was made for burning quality only, and a boiler fitted with a chain grate stoker and induced draft was used.

The result was disappointing as only a very thin fire could be used and the boiler furnace arches cooled down rapidly. Had the boiler not been taken off, the fire would have gone out completely.

The next test was made with a boiler having a forced draft stepped grate stoker, when better results were obtained than with the chain grate boiler.

The maximum steam flow we were able to obtain was 10,000 lb. from a boiler capable, without effort, of evaporating 20,000 lb. of water into steam per hour.

The results obtained with the forced draft stoker only giving half the boiler's capacity decided that it was not worth while carrying out efficiency tests, it being conclusive that Eradu coal was very inferior to Collie.

In making these notes I would like it to be understood that if this coal had to be used, very careful thought and testing of the most suitable manner would have to be gone into.

We cannot at the moment try using this coal in powdered form as we have not the plant to lay off for the purpose, but if the coal was dried in a suitable mill this may offer some solution.

There is one very significant point however, and this is—unless pulverised (powdered) a very strong forced draft type of stoker must be used."

Samples taken were analysed at the Government Chemical Laboratories and a tabulation of the results is attached.

It should be borne in mind that the coal was subjected to repeated immersion in water and as the coal contains a good deal of ash of a clayey nature, it could probably be mined, under the best conditions, to produce a better fuel than the sampling indicates.

The rock above the coal consists of bands of a mixture of clay and sand ranging from fairly hard sandstone to nearly pure clay. When dry it stands well, but if it becomes wet has no strength. Under the action of running water, it frets away rapidly.

The coal has somewhat similar characteristics. When dry it is tough and fairly strong but when wet it becomes weak and tends to fall away from a vertical face.

Shaft sinking by the open caisson method proved satisfactory but pumps capable of handling a heavy flow of water carrying sand in suspension are necessary.

It should be possible to mine a portion of the coal near the bottom of the seam under dry conditions provided faults can be avoided.

Total extraction would not be feasible as any break in the roof will allow a heavy flow of water to come in.

The present demand of some 4,000 tons per annum in the Geraldton area does not permit of mining on an economical scale even if boilers were designed to use this coal.

E. E. BRISBANE,
Assistant State Mining Engineer.
25th May, 1948.

Lab. No.	Moisture.			Ash.	Volatile matter.	Fixed Carbon.	Calorific Value.	
	Ash Dry.	Over dry.	Total.					
4057	12.4	17.0	29.4	23.87	20.4	26.33	5,510	Morrow's Shaft Top 4 feet south face.
4058	15.15	23.3	38.45	15.42	19.3	27.83	5,170	,, ,, 4 feet to 8 feet east face.
4059	6.12	29.7	35.82	12.42	20.2	31.56	5,720	,, ,, 8 feet to 12 feet east face.
4060	18.5	22.3	40.8	13.73	16.6	28.87	5,630	,, ,, 12 feet to 16 feet east face.
4061	7.46	27.2	34.66	11.75	21.1	32.49	....	Spot sample for moisture content.
4062	9.8	23.4	33.2	13.30	22.4	31.1	....	Higgins Shaft Grab from dump.
5740	....	....	31.7	18.3	19.9	30.1	5,995	In drive 15 feet from south wall of shaft—bottom to 3 feet.
5741	....	....	34.0	12.6	25.2	28.2	6,620	In drive 15 feet from south wall of shaft— 3 ft. to 6 ft. above floor.
5742	....	....	36.2	10.7	21.9	31.2	6,460	In drive 15 feet from south wall of shaft—6 ft. to 9 ft. above floor.
6065	....	....	32.3	15.5	22.6	29.6	6,130	In west drive (rising 9 ft. to 12 ft. above floor).
6066	....	....	35.1	14.4	18.3	32.2	5,580	In west drive (rising 12 ft. to 16 ft.above floor).
6067	....	....	48.75	9.72	16.10	25.43	4,530	From auger hole from back of drive to top of seam.

APPENDIX No. 2.

Coal Mines Regulation Act, 1902-1926.

ANNUAL REPORT OF THE BOARD OF EXAMINERS FOR MINE MANAGERS, UNDER-MANAGERS AND OVERMEN.

Office of the State Mining Engineer,
Mines Department,
Perth, 14th June, 1948.

The Under Secretary for Mines.

We submit herewith, for the information of the Hon. Minister for Mines, the Annual Report of the Board of Examiners for the year 1946.

Examinations for Certificates.

April Examination.—There were no candidates for First Class Certificates of Competency.

Four candidates presented themselves for the Second Class examination. At the meeting of the Board on the 28th April, it was decided to issue Second Class Certificates of Competency to all four candidates.

October Examinations.—There was one candidate for the First Class examination, and one candidate for the Second Class examination. At the meeting of the Board on the 31st October, it was decided to issue Certificates of Competency to both the candidates.

Copies of the papers set for the examinations during the year are attached to this report. These papers were exchanged with kindred boards in England and the Eastern States.

We have the honour, etc.,

JOHN S. FOXALL,
State Mining Engineer,
(Chairman).

H. A. ELLIS,
Government Geologist,
(Member).

JAMES GILLESPIE,
Senior Inspector of Mines, Collie,
(Member).

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: Arithmetic.

Wednesday, 16th April, 1947: 9 a.m. to 11 a.m.

Possible Marks.		
15	(1)	Simplify $\frac{3\frac{1}{7} \times (4\frac{1}{5} - 2\frac{3}{4}) \times (5\frac{1}{2} + 2\frac{6}{11}) \div (6\frac{2}{7} + 3\frac{1}{5})}{4\frac{3}{4} + \frac{5}{16} - 3\frac{1}{10}}$
15	(2)	Boring on a coal lease 248 acres in area has proved the existence of a seam averaging 12 feet thick over the whole area. What tonnage of coal is available in the first working assuming that it will be taken out 7 feet high and 60% of the area will be left as pillars? The weight of one cubic yard of coal may be taken as 19 cwt.
14	(3)	The velocity of the air passing through a doorway 8 feet by 5 feet is measured at 300 feet per minute. Five-twelfths of this air is taken away by a branch airway. What is the velocity of the remaining air in the main airway if its dimensions are 10 feet by 7 feet?
14	(4)	A vertical shaft is to be sunk to cut a seam of coal which dips at an even grade of 1 in 8. The position of the shaft is half a mile from the outcrop in the direction of the dip. There is an upthrow fault of 35 feet known to exist between the outcrop and the shaft. The collar of the shaft is 75 feet higher than the outcrop. At what depth would you expect to cut the seam?
14	(5)	A certain coal contains 15% of dirt which can be separated from it by a cleaning process. The selling price of the uncleaned coal is 12s. per ton, and of the cleaned coal, 14s. per ton. The cost of cleaning is 4d. per ton of uncleaned coal. Calculate whether it pays to clean it.
14	(6)	How many rails 16.34 feet long, allowing ½ inch between consecutive rails, would be required for a double line (4 rails) a mile long?
14	(7)	A rectangular lease has one side 46 chains long and the diagonal measures 57.5 chains. What is its area in acres?
100		

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: Coal Mines Regulation Act, 1902-1926.

Wednesday, 16th April, 1947: 11 a.m. to 1 p.m.

Possible Marks.		
17	(1)	What is laid down in the Coal Mines Regulation Act with regard to the provision of second shafts, tunnels or outlets in mines?

16 (2) Provision is made in the Coal Mines Regulation Act for the erection of protective fences under certain circumstances. State these circumstances.

16 (3) Explain the requirements of the Coal Mines Regulation Act with regard to Special Rules for every mine.

17 (4) What are the requirements of the Act with regard to plans of
(a) Working collieries.
(b) Abandoned workings.

17 (5) What provisions are made in the Regulations dealing with the use of electricity in coal mines regarding
(a) Automatic circuit breakers.
(b) Protection of motors.
(c) Inspection of trailing cables.

17 (6) State the requirements of the General Rules dealing with Signalling and Manholes.

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: Roadways.

Wednesday, 16th April, 1947: 2 p.m. to 5 p.m.

Possible Marks.

17 (1) A cage load of 10 tons is carried by four chains attached to cage which make an angle of 60° to the top of the cage. Calculate the tension in each chain.

17 (2) Accidents often happen through chains and couplings breaking. What do you understand by annealing? Explain how you would anneal chains and couplings used for haulage purposes.

17 (3) State what you know about the construction, use and care of wire ropes in use for mining purposes. What is the smallest advisable diameter of drum or sheave wheel for a rope ¾ inches in diameter.

17 (4) Draw a section of a loose drum 2 feet 6 inches in diameter on tread 1 foot 6 inches between cheeks with cheeks 9 inches deep. Show particularly the boss with a bush and the brake path.

16 (5) Describe the different arrangement of laying rails in self-acting inclines. Show by sketches how the rails are laid at top and bottom of the inclines and also at the passing places and state where fast and loose points are used.

16 (6) Show by sketches how you would arrange a self-acting door, worked by skips, in an endless rope haulage road.

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: Mining of Coal.

Thursday, 17th April, 1947: 10 a.m. to 1 p.m.

Possible Marks.

16 (1) It is intended to introduce mechanical loaders into a mine. Give a description of one type of loader and say what the sequences are for its efficient working. Show by means of sketches the position of loader and how the rails are laid for quick and efficient loading.

16 (2) In a gaseous mine shot firing and explosives cannot be used. Describe some other mechanical means of breaking down the coal after being under-cut?

17 (3) It is intended to commence extracting pillars, but it is found that the roof is much broken in the bords. Would you clear up the old bords or drive new roads through the pillars? Give your reasons for your answer.

17 (4) It is proposed to get an output of 700 tons per shift from a coal seam 7 feet thick dipping 1 in 8 by mechanisation. Set out the workings to supply this quantity and show the haulage roads, stating approximately the quantity of coal coming along each road, and the system of haulage you would adopt.

17 (5) Sketch and describe one mechanical arrangement for loading coal at face of bord. State the sequence for such loader also what advantages or disadvantages it has in comparison with loading by hand.

17 (6) What are the advantages and disadvantages of the panel system of working?

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

Subject: Ventilation and Dangerous Gases.

Thursday, 17th April, 1947: 2 p.m. to 5 p.m.

Possible Marks.

14 (1) How does the oxygen content of a mine atmosphere become reduced? What are the effects of oxygen reduction on (i) men; (ii) the flame of an oil safety lamp; and (iii) the flame of an acetylene lamp?

14 (2) What are the advantages of "splitting" the volume of air circulated through a mine? What factors limit "splitting"?

14 (3) Give the physical, chemical, and physiological properties of carbon monoxide, and explain how this gas is produced in mines.

14 (4) The temperature of air changes as it passes down tunnel through roadways and working places. Enumerate the factors that are responsible for the changes in temperature.

15 (5) A fan circulates 90,000 cubic feet of air per minute through a mine with a 2½ inch water gauge. Calculate the indicated H.P. of the motor required to drive the fan if the combined efficiency of the fan and motor is 60%.

15 (6) What do you understand by natural ventilation? Explain how natural ventilation is created in inclined workings and vertical shafts.

14 (7) Distinguish between a "percentage of CH_4 in the air of a mine" and "an accumulation of gas." Explain how you would test for the presence of firedamp at the face of a bord and in a hole in the road. If in making the above test, gas was seen burning inside the lamp gauze, how would you proceed?

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Arithmetic.

Wednesday, 15th October, 1947: 9 a.m. to 11 a.m.

Possible Marks.

16 (1) It is observed that water rises 21 feet in 15 hours in a shaft 21 feet in diameter. What is the feeder in gallons per minute?

16 (2) Two shafts are 300 yards and 350 yards deep respectively. The distance between them is 26¾ chains. The surface level is irregular, making the former shaft 20 yards higher than the latter. In driving a drift from the bottom of the deeper shaft to the bottom of the shallow shaft what is the inclination of the drive and its length?

17 (3) Two drums winding cages, A and B from different levels work independently but make the same number of revolutions per minute. A has a diameter of 6 feet and pulls the cage a distance of 396 feet. B has a diameter of 8 ft. 6 in. and pulls the cage a distance of 561 feet. If the drums start winding simultaneously, which cage reaches the emptying point first?

17 (4) The area of a coal field is 1,000 square miles and the average thickness of workable coal is 60 feet. If a cubic yard of coal weighs one ton and the average annual consumption of coal is 70,000,000 tons for the whole country, find the number of years for which this field alone would supply the whole of the country, assuming that all the coal can be extracted.

17 (5) The contract price for driving a stone drive is £5 15s. per yard. What would be the sum due to the contractor if you found he had cut 85 feet since last payment? If the drift measures 10 ft. by 7 ft. 6in., what is the cost per cubic yard?

17 (6) A stream of water 9 inches deep flows along a rectangular channel 16 inches wide. The average velocity is 3½ feet per second. What is the flow of water in gallons per minute and in cubic feet per hour?

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Geology.

Wednesday, 15th October, 1947: 11 a.m. to 1 p.m.

Possible Marks.

20 (1) In your opinion, what was the sequence of events which gave rise to the formation of the Collie coal basin.

20 (2) Illustrate by sketches the various types of irregularities in thickness which are known to occur in coal seams in any coal field. State how you think these irregularities may have been caused.

20 (3) Briefly describe the various rock types which are generally associated with coal measures. Do not confine your attention to Collie only.

20 (4) Describe the various types of faults likely to be encountered in coal mining, illustrating by sketches where possible. Do you know of any characteristics of coal being mined which could lead to the conclusion that a fault was being approached?

20 (5) What evidence could be used in any attempt to correlate the various known coal occurrences in a coal basin?

100

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Machinery.

Wednesday, 15th October, 1947: 3 p.m. to 5 p.m.

Possible Marks.	
17	(1) What is the indicated horsepower of an engine having two 32 inch cylinders, a 5 foot stroke and making 40 revolutions per minute; steam pressure being 75 lb. per square inch.
17	(2) A pump is designed to pass 200 gallons of water per minute. What size of suction and delivery pipes would you use if the maximum speed of the water in the suction pipe is 3 feet per second, and in the delivery 4 feet per second.
17	(3) Explain the difference between— (a) Direct current and alternating current. (b) A volt-meter and an ammeter, and state how they are constructed.
17	(4) Give a descriptive resumé of a coal washing plant.
16	(5) Describe the advantages and disadvantages of hand held electric boring machines. Say how they differ from post or stand borers.
16	(6) What machinery would you install in open-cut mining (1) where the overburden is soft; (2) where the overburden is hard. The thickness of overburden in each case is 30 feet and the coal seam 9 feet thick.
100	

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Mining of Coal.

Thursday, 16th October, 1947: 10 a.m. to 1 p.m.

Possible Marks.	
28	(1) Give your opinion of extracting pillars— (a) By hand; (b) by mechanical method.
28	(2) Lay out a mine to produce 1,000 tons in seven hours in a seam 10 feet thick with soft shale roof and dipping 1 in 8 by loaders, cutters, etc.
28	(3) Describe a method of winding coal in a shaft to give the maximum output for the least power expended. State your reasons.
28	(4) Sketch and describe one method of deep boring such as would reveal the strata passed through in the Collie Coal Field.
28	(5) Describe the different machines you would use in Question No. 2.
30	(6) If your dip headings were being driven parallel, and they struck an up-throw fault, in which heading would you do the proving? Give your reasons, showing the advantages, etc.
30	(7) Show the pit-top arrangements (1) where sets of skips are landed on gantry, (2) where a belt conveyor delivers the coal, (3) where an automatic skip is used (i.e., alligator).
200	

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Surveying.

Thursday, 16th October, 1947, 2 p.m. to 5 p.m.

Possible Marks.	
25	(1) You have taken over a transit theodolite with which to make an important underground survey. Accurate levels are also required and a modern levelling instrument is available. Give a list of the adjustments you would consider necessary to be made to these two instruments before starting the work and describe any one of them.
25	(2) A, B, and C are three bore-sites, the R.Ls. of the collars of which are 270, 290, and 250 feet above mean sea level. The depth to the surface of a coal seam measured from the collar of the bore holes to 750 feet at Bore A, 600 feet at Bore B, and 500 feet at Bore C. Assuming that the same seam has been encountered in each bore, determine graphically or by calculation the direction of dip of the seam and the amount of dip of the seam.

Possible Marks.

The sites have been fixed by the following true bearings and distances:

A-B; 52°, 400 feet.

A-C; 112°, 490 feet.

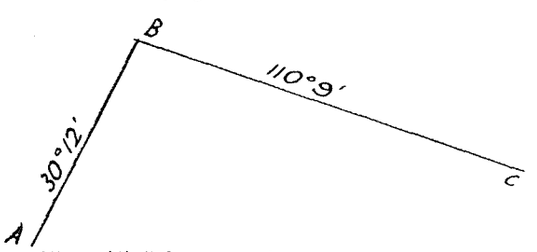
Use a scale suitable to a reasonable degree of accuracy if solving the problem graphically.

25 (3) In the sketch below it is desired to join the lines A B and B C by a curve of 15 chains radius. Compute—

(a) the distance of the tangent point from the point of intersection B;

(b) the deflection angle.

Briefly describe the actual procedure of laying out a curve.



25 (4) What type of plans are usually compiled and kept up to date in a well conducted colliery? For what purposes are these plans required?

25 (5) Show by illustration a specimen field book page of what you consider to be a sound method of recording data obtained in a six station traverse (inclusive of starting station) of some underground workings.

Calculate the bearing and distance of the closing line E-A in the following traverse:

A - B 45° 10′, 210 feet.
B - C 350° 11′, 190 feet.
C - D 50° 27′, 300 feet.
D - E 160° 18′, 270 feet.

25 (6) Describe a method you would adopt to estimate cubic yardage content of a large irregular shaped open cut. Illustrate by sketches.

150

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Ventilation and Dangerous Gases.

Friday, 18th October, 1947, 10 a.m. to 1 p.m.

Possible Marks.

25 (1) Why are auxiliary fans underground objectionable?

25 (2) Fill in the blank spaces on the chart below:—

	Methane.	Carbon Monoxide.	Hydrogen Sulphide.	Carbon Dioxide.	Nitrogen.
Chemical Symbol					
Specific Gravity					
Is it combustible?					
Does it support combustion?					
Is it poisonous?					
How is it detected?					
Explosive range percentage in air Origin					
What is its effect on life?					

25 (3) How do gases vary in their rates of diffusion?

25 (4) What is meant by the term "Vena Contracta"? Illustrate your answer by sketches.

25 (5) Describe an instrument other than a flame safety lamp for determining the presence of methane in the workings of a mine.

25 (6) Describe what system of ventilation and general management you would adopt in a gassy mine to minimise explosions and to keep the mine in a safe and healthy condition.

25 (7) Would you consider a mine efficiently ventilated when a large volume of air is found entering and leaving the mine? Explain.

25 (8) Indicate how you would ventilate the workings shown on the accompanying plan (page 41). Show defects in laying out the workings if gas (Methane) is given off freely.

200

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

Subject: Coal Mines Regulation Act, 1902-1926.

Friday, 17th October, 1947, 2 p.m. to 4 p.m.

Possible Marks.

22 (1) Section 4 gives the interpretation of terms. Enumerate those terms.

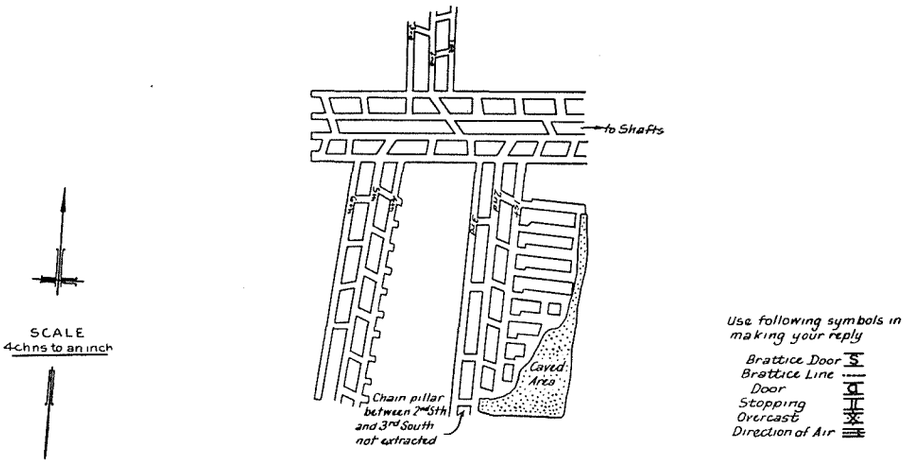
COAL MINES REGULATION ACT 1902-26

EXAMINATION FOR FIRST & SECOND CLASS CERTIFICATE OF COMPETENCY

October 15th, 16th and 17th

Sketch of workings to be ventilated

Reference Question N°8



Possible Marks.		Possible Marks.	
22	(2) What do the regulations say in regard to electric cables?	21	(6) The Regulations refer to penalties. State what penalty would be put on a manager for interference with a check-weigher and what is the rule number?
22	(3) What does the Act say in regard to opening and abandonment of a mine?	21	(7) What plans of the mine workings are required under the Act and Regulations?
21	(4) Section 66 refers to change houses. Write in your own way what it says.		
21	(5) Where shaft winding gear is in operation, what do the Regulations say in regard to overwinding?	150	

Appendix No. 3.

Mines Department,
Kalgoorlie,
17th February, 1948.

REPORT OF ACTIVITIES OF BOARD OF EXAMINERS FOR UNDERGROUND SUPERVISORS FOR THE YEAR 1947.

I hereby submit the report of the activities of the Board of Examiners for Underground Supervisors for the year 1947.

The examinations were held in March, May and October. The first one being held especially for eight Big Bell candidates, seven gaining certificates. Mr. R. Horseman was examined in July—being the only candidate of Yampi Sound, and was granted a certificate.

The May examination resulted in 22 applications being received and 16 being successful, and the October results being eight successful applicants out of 13, making a total of 32 out of 44 gaining a Certificate of Competency during the year.

The Board of Examiners consisted of Mr. J. S. Foxall, Mr. H. Verran and Mr. H. Fletcher, Director, School of Mines, until the latter's death, when Mr. Hobson was appointed in his stead.

One duplicate Certificate of Competency was issued.

No Certificates of Service or Duplicate Certificates of Service were issued.

Following are the names of persons to whom Certificates were granted:—

631 Hernesniemi, T. J., Big Bell.
632 James, R. S., Cue.
633 Johnson, W., Big Bell.
634 Glen, G. A., Big Bell.
635 Aston, N. B. U., Big Bell.
636 Watkins, E. D., Big Bell.
637 Kelly, W., Big Bell.
638 Cant, H., Kalgoorlie.
639 Renton, R. L., Kalgoorlie.
640 Downey, M. J., Kalgoorlie.
641 McGillivray, R., Southern Cross.
642 Hamilton, F. G., Kalgoorlie.
643 Crowe, I. F., Kalgoorlie.
644 Tomich, S. A., Kalgoorlie.
645 McLernon, C. B., Kalgoorlie.
646 Harn, H. P., Kalgoorlie.
647 McKerlie, R. T., Kalgoorlie.
648 Vaughan, H., Norseman.
649 Tregaskis, F. N., Reedy.
650 Jones, J. R., Reedy.
651 Elphick, W. H. J., Reedy.
652 Shields, N. S., Reedy.
653 Hadaway, J. W., Cue.
655 Horseman, R. G., Yampi.
656 Edwards, H. E., Norseman.
657 Hennig, E. E., Kalgoorlie.
658 Keegan, N. S., Kalgoorlie.
659 Pollard, W. M., Kalgoorlie.
660 Roberts, T. A., Cue.
661 Summers, W. A., Kalgoorlie.
662 Temme, E. A., Cue.
663 Wreford, P. M., Kalgoorlie.

Duplicate Certificate of Competency:—

654 Birch, T. A., issued in lieu of Certificate No. 201.

(Sgd.) M. V. MORRIS,
Secretary,
Board of Examiners for Underground Supervisors.

Index to State Mining Engineer's Annual Report, 1947.

INDEX TO STATE MINING ENGINEER'S ANNUAL REPORT, 1947—*continued.*

Division III.

Report of the Superintendent of State Batteries.

THE UNDER SECRETARY FOR MINES:

For the information of the Honourable Minister I submit herewith my report on the operations at State Batteries for the year ending December 31st 1947. 49,168.25 tons were crushed as against 45,476.5 in the previous year. which was rather disappointing when viewed alongside the increase of 20,078 tons in 1946.

The grade of ore milled however was high at an estimated yield per ton of 17 dwts. 18.3 grs. against the 1946 figure of 14 dwts. 20.4 grs. The highest return for 40 years was that for 1945 when the average value of the ore treated was 23 dwts. 22.6 grs.

The value of the gold produced increased sharply as a result of the high grade of ore treated, and is estimated at £411,080 (A) excluding the amount of gold tax collected by the Commonwealth Treasury prior to September 21st. The 1946 figure was £281,345 (A).

Cue again treated the highest grade of ore viz: 5,113.75 tons for an estimated average yield of 59 dwts. 5 grs. per ton. Kalgoorlie crushed the highest tonnage viz: 11,026 tons.

After long delays due to scarcity of materials, the reconstruction of most of our tailings plants has been completed notwithstanding the difficulty in obtaining suitable labour, the tonnage of tailing handled increased to an almost normal figure, resulting in a considerable reduction in the working loss, despite considerable rises in wages and materials.

The working loss was reduced from £22,464 in 1946 to £17,897.

A comparison of the tonnage crushed and cyanided for the last three years is as follows:

	1945	1946	1947
Tons Milled ..	20,078	45,476	49,168
Tons Cyanided ..	12,216	22,390	41,401

ESTIMATED VALUE OF PRODUCTION SINCE INCEPTION EXCLUDING VALUE OF GOLD TAX PAID TO COMMONWEALTH.

	£
Production at Par:	
By Amalgamation	7,711,324.650
By Tailing Treatment ..	1,883,721.645
Gold Premium	
By Amalgamation	2,754,739.661
By Tailing	825,063.394
	13,174,849.350
Tin Production	
Ore	93,883.160
Residues	572.000
Total Value	13,269,304.510

DETAILS OF PRODUCTION.

Eight hundred and sixty five parcels were milled averaging 56.84 tons per parcel as against 731 parcels and a 62.24 average in the previous year.

The value of the yield with the 1946 figures in brackets is shown as follows:

By Amalgamation—39,134.8 ozs. (27,930.1) worth £335,039 (£234,079).

Tailing plants produced 7,450.46 ozs. worth £76,041 (£47,801) bringing the total to £411,080 (£281,880).

GRADE OF ORE PER TON TREATED.

49,168 tons crushed yielded 33,146 fine ounces by amalgamation equal to 13 dwts. 11.6 grs. per ton. The average value of tailing produced was 4 dwts. 7.1 grs. giving an overall value of 17 dwts. 18.7 grs.

The average head value in 1946 was 14 dwts. 20.4 grs.

ESTIMATED PERCENTAGE RECOVERY.

The whole of the tailing produced was not treated during the year and approximately 8% was cupriferous and untreatable, but applying the average extraction obtained in all tailing treatment plants, namely 78.78% to 4 dwts. 7.1 grs., the average tailing value, the estimated percentage extraction was as follows:

Head Value—17 dwts. 18·7 grs.

	dwts.	grs.		%
Recovery by Amalgamation	13	11·6	=	75·86
Recovery by Tailings Treatment 78·78% of 4 dwts 7·1 grs.	3	9·22	=	19·03
Total Extraction	16	20·82	=	94·89

RECEIPTS AND EXPENDITURE.

Receipts from all sources were £59,563 8s. 2d as against £39,154 5s. 8d. the previous year.

Expenditure amounted to £77,461 3s. 7d., the previous year's figure being £61,519.

A comparative statement given later in this report shows details under the respective headings for both years.

MILLING.

One 15-stamp, seven 10-stamp and eight 5-stamp mills crushed for the public, the 5-stamp mills at Warriedar and Yalgoo being idle. In addition the Linden, Sir Samuel and Darlot Batteries worked under Lessees.

The Weerianna Battery reverted to the Department and a small round of crushings was put through by our Marble Bar staff. To all intents and purposes this has become a State Battery.

The 20-Mile Sandy Battery was put in reasonable order under State Battery supervision and is now quite an efficient plant and capable of handling the district's ore.

The State operated plants milled 865 parcels for a total of 49,168.25 tons as against 731, agregating 45,476.5 tons in the previous year.

The average tonnage per parcel fell from 62.21 to 56.84 tons.

COST OF CRUSHING.

The gross working cost including Head Office Expenditure was 19s. 1.7d. per ton, a reduction of 3d. per ton on the 1946 cost.

The result is satisfactory when practically all the rehabilitation which is proceeding as supplies are available is charged to working.

Increased cost of labour and supplies has also to be considered.

MILLING REVENUE.

Receipts under milling were £23,530 equal to 9s. 7.2d. per ton, which was slightly higher than the 9s. 6.7d. per ton received in 1946.

TAILING TREATMENT.

Twelve plants treated tailing, an increase of three over 1946.

The tonnage handled showed a considerable increase over that of the preceding three years and was in a large measure due to the completion of the rebuilding of the Kalgoorlie plant which comprises 18 new or reinforced vats and which handled 12,840 tons. Ora Banda where 10 vats had to be reinforced or renewed, also contributed with 4,999 tons.

In all 41,401 tons were treated for a recovery of 7,450.46 fine ounces as compared with 4,807.56 ounces from 22,390 tons in 1946.

The average head value of tailing treated was 4.579 dwts. and the tail value 0.995 dwt., showing an average extraction of 78.2%.

The actual recovery was slightly better than the call and gave an extraction of 78.78%.

Ora Banda headed the list with a recovery of 83.8% from a head value of 7 dwts. 2.64 grs. As most of the tailing consisted of the very colloidal material from the oxidized zone of the Ora Banda Amalgamated, the result was very good.

The call at £4 4s. 11½d. per oz. was £31,540, and the recovery £31,749, a very close result.

CLEAN AND REFRACTORY TAILING.

Schedule 3 gives full details of the clean and refractory tailing produced at each plant. On a basis of 90% of the tonnage crushed, the segregated results are as follows:

Over 2 dwts. 8 grs. per ton ..	26,405	= 59.37%
Between 1 dwt. 18 grs. @ 2 dwt. 8 grs.	4,195	= 9.43%
1 dwt. 18 grs. and under ..	10,238	= 23.02%
Refractory	3,629	= 8.16%
Total tons	44,467	

The percentage of tailing over 2 dwt. 8 grs. per ton is a good deal higher than usual. It will be noticed that 31% is either below 1 dwt. 18 grs. in value or is refractory.

The percentage of refractory tailing is mainly made up of cupriferous material segregated at Marble Bar, Peak Hill and Meekatharra, and 446 tons of low-grade sulphide material resulting from a bulk sampling campaign made by the Porphyry Company at Yarri, who wished to remove their tailing.

COST OF TREATMENT.

Cost per ton dropped from 15s. 8.2d. in 1946 to 14s. 8.2d. despite the fairly steep increase in prices. Increased tonnage assisted materially towards the drop in cost of treatment but some plants, especially Coolgardie, were severely handicapped through want of labour.

As staff and equipment have to stand by whilst an effort is being made to get men, cost of treatment with intermittent running and poor tonnages is necessarily very high.

Expenditure under Repairs and Renewals was heavy equal to 1s. 5d. per ton and included the cost of practically new plants at Peak Hill and Wiluna and considerable expenditure at Ora Banda and Kalgoorlie for new vats and piping, the result of disuse during the war years.

RECEIPTS.

Total Revenue was £37,029 2s. from which is deducted £996 6s. 5d. Treasury Interest, leaving an amount of £36,032 15s. 7d. equal to 17s. 4.9d. per ton, as against 15s. 6.5d. in the previous year.

High grade tailing at Ora Banda and Laverton and the remission of the Federal Gold Tax since 21st September contributed materially to the all round increase in revenue.

——Comparative Synopsis of Results at State Batteries for twelve months ended 31st December, 1946 and 1947.

——	1946.			1947.		
	Tonnage.	Expenditure per ton.	Revenue per ton.	Tonnage.	Expenditure per ton.	Revenue per ton.
		s. d.	s. d.		s. d.	s. d.
Milling	45,476.5	19 4.5	9 6.7	49,168.25	19 1.7	9 7.2
Cyaniding	22,390.00	15 8.2	15 6.5	41,401.00	14 8.2	17 4.9

Receipts and Expenditure.

——	Tonnage.	Expenditure.	Revenue.	Profit or Loss
		£ s. d.	£ s. d.	£ s. d.
Milling	49,168.25	47,057 14 4	23,530 12 7	*23,527 1 9
Cyaniding	41,401.00	30,403 9 3	59,563 8 2	†5,629 6 4
	....	77,461 3 7	36,032 15 7	*17,897 15 5

* Loss. † Profit.

CARTAGE SUBSIDIES.

State Plants.

The expenditure under this heading rose sharply. Although the tonnage crushed only rose from 45,476 to 49,168, that claiming subsidy increased from 6,890 in 1946 to 18,204 in the year under review and subsidies paid amounted to £8,154 5s. 2d. as against £3, 169 9s. 4d. in 1946.

The large increase in ore crushed at Kalgoorlie, a great percentage of which qualifies for subsidies, and special subsidies at Peak Hill to Labourchere crushings were mainly responsible for the increases.

Private Batteries.

Cartage Subsidies and a special feeders allowance of 2s. per ton at the Marvel Loch Battery, granted to customers at private batteries, amounted to £1,257 5s. 10d. on 5,416.5 tons, as against £514 8s. 9d. on 1,406.5 tons in 1946.

Comparative figures for the last three years are as follows:

Year.	Tons Crushed.	State Batteries.			Private Batteries.		Total.
		Tons Claiming Subsidy.	Percentage of ore Crushed.	Amount Paid.	Tons Claiming Subsidy.	Amount Paid.	
				£ s. d.		£ s. d.	£ s. d.
1945	20,078.25	1,943	9.6	790 11 7	268	121 2 3	911 13 10
1946	45,476.50	6,890.75	15.1	3,169 9 4	1,406.5	514 8 9	3,683 18 1
1947	49,168.25	18,204.25	37.0	8,154 5 2	5,416.5	1,257 5 10	9,411 11 0

ERECTION AND RECONSTRUCTION.

£3,326 5s. 6d. was expended, £1,630 3s. 1d., from General Loan Fund and £1,696 2s. 5d. from Consolidated Revenue towards the following works:

	G.L.F. £ s. d.	C.R.F. £ s. d.
Portable Conveyor ..	367 15 6	
Buildings		
Marble Bar		69 16 8
Meekatharra		150 0 0
Paynes Find		15 0 0
Trucks and Utilities		390 11 9
Horses		657 17 8
Cyanide Plants		
Kalgoorlie	863 1 10	
Meekatharra	53 13 9	
Peak Hill	341 5 0	
Rotary Hoe (Kalgoorlie)		372 16 4
Electric Motor (Kalgoorlie)		40 0 0
Rock Breaker (Wiluna)	4 7 0	
	1,630 3 1	1,696 2 5

REPAIRS AND RENEWALS.

	£. s. d.
Milling	6,896 5 2
Tailing Plants	3,053 8 1
	9,949 13 3

The expenditure under this heading for the individual batteries is shown on Schedules 6 and 7. Contributing items to this heavy expenditure are heavy replacements of vats, tanks and pipelines, extremely large increases in foundry repairs and inefficient labour.

STAFF.

It was not considered necessary to fill the positions of Inspector or Erection Engineer vacant since the retirement of Mr. L. P. Bisset and Mr. A. S. McLean. Mr. McLean's services were available for several small jobs.

Assayer H. J. Simons was appointed Manager at Laverton and Mr. J. E. Sturman, Assistant Metallurgist at the Central Norseman Gold Mine, was appointed Manager at Norseman.

Assistant K. Mack was transferred from the North-west circuit to Peak Hill and R. G. Sanfead as Assistant to Manager Chegwidden has been in charge of tailing treatment at Sandstone and crushing at Paynes Find.

Acting Manager Clemesha put a round of crushings through at the Weerianna Battery.

ADMINISTRATION.

Expenditure under this heading was £6,053 17s. 3d. as against £5,243 in the previous year.

The expenditure is charged out in accordance with the tons crushed and cyanided at each battery, and amounted to 1s. 4d. per ton as against 1s. 6.4d. in 1946.

Comparative details are as follows:

	1947 £ s. d.	1946 £ s. d.
Salaries	3,818 3 3	3,419 8 9
Pay Roll Tax	1,069 3 10	860 19 10
Workers' Compensation ..	849 17 5	565 13 9
Postage	27 17 6	16 2 11
Travelling Expenses ..	270 3 3	373 12 5
Sundries	18 12 0	7 4 2
	6,053 17 3	5,243 1 10

No additional staff were employed, the increase shown being normal grade increases and basic wage adjustments.

LEASED PLANTS.

A good deal of my time has been taken up with the work of bringing the leased State Batteries at Darlot, Linden and Sir Samuel, and the Government-owned plants at 20-Mile, and Weerianna into reasonable condition to deal with the treatment of public ore.

The Linden lessee was provided with a complete producer gas plant and iron to replace his cyanide vats, and freedom from complaints suggests that the plant is giving satisfaction.

At Darlot, 5-head of this very old battery has been brought into reasonable condition, a new producer plant installed, sundry repairs to water supply effected, and a building ex Youanmi erected as an office store, bathroom and prospectors' room.

In addition, arrangements were made to install four new vats to enable the treatment of prospectors' tailing to be proceeded with.

It was not considered advisable to persevere with the old State Battery at Mt. Sir Samuel and arrangements were made with Mr. A. White to crush for the public at his Vanguard battery. He is permitted to charge customers 15/- per ton for crushing, the Department paying the customer a subsidy of 2/6 per ton.

Mr. McColl retired from his lease of the Weerianna battery and our Nor-west staff put a small round of crushings through for local owners but the results were generally disappointing.

At the 20-Mile Sandy battery, reconstruction of the 5-head mill was completed under the supervision of the lessee, Mr. S. Jaffrey, and a considerable number of crushings was put through.

Two buildings ex Corunna 'drome were dismantled and landed on the site but there was no labour to re-erect them as office quarters, etc. Material for three cyanide vats was provided and at the time of writing, both the building and vats are being erected.

GENERAL REMARKS.

The increase in tonnage crushed from 45,476 to 49,168 was considerably below the expected figure, especially as the season on the Goldfields was ideal for prospecting with surface water plentiful.

Increased activity was noticeable at Peak Hill, Ora Banda and Kalgoorlie, and two of the shows at Peak Hill are under option to the Big Bell.

Consistently good results came from the Day Dawn Options which was recently floated. Results such as these are ample justification for the expenditure on our batteries and in cartage subsidies, especially when the yield from gold cleaned up at our batteries totalling £411,080(A) is taken into consideration.

I regret to report that labour both in quantity and quality has not improved, although we should have a better chance of getting our quota of the better class now that we are paying the industry allowance.

Materials are in very short supply especially steel in sheets or bars, and galvanised iron.

Unless the price of gold is increased or subsidies granted to assist production, the prospects for 1948 are not particularly bright.

The payment of the industry allowance, the granting of the 40-hour week and basic wage increases will be felt.

As stated in the conclusion of my last year's report, the only factors which can keep costs within limits are increased output, and complete mechanisation, which only large tonnages warrant. Tonnage forthcoming to our State Batteries has not been up to expectations and with the exception of one or two plants, crushings are intermittent and crews have to be transferred at considerable expense from place to place, and unfortunately plants which have been put in order at considerable cost are experiencing again the deterioration which is inevitable when they are left idle for long periods.

Before concluding my report, I would like to place on record my appreciation of the assistance and co-operation extended by both the Goldfields and Head Office Staff.

D. F. BROWNE,
Superintendent of State Batteries.

21st May, 1948.

SCHEDULE 1.

Return showing Tons Crushed, Gold Yield by Amalgamation, Average per Ton in Shillings and Total Value without Premium for Year ended 31st December, 1947.

Battery.	Tons Crushed.	Gold Yield Bullion.	Value per Ton in Shillings and Pence.	Total Value without Premium.
		ounces.	s. d.	£ s. d.
Bamboo Creek	851	505.6	42 9.3	1,820 3 3
Boogardie	1,008.25	815.45	46 9.6	2,935 12 5
Coolgardie	6,851.25	2,498.04	26 8.04	8,992 18 10
Cue	5,113.75	16,799.15	234 2.8	60,476 18 10
Kalgoorlie	11,026	3,401.85	22 6.8	12,246 11 1
Laverton	1,505.25	1,512.75	47 5.3	5,445 18 0
Marble Bar	1,087	532.85	35 3.5	1,918 5 4
Meekatharra	5,731.50	4,730.44	59 10.4	17,029 11 7
Mount Ida	220	97.85	32 0.08	352 5 2
Norseman	1,233.50	535.3	31 2.7	1,927 1 7
Ora Banda	3,599.25	2,288.77	45 5.9	8,239 11 6
Paynes Find	1,337.50	1,223.1	61 4.4	4,403 3 3
Peak Hill	3,803.75	1,004.65	19 3.2	3,616 14 10
Sandstone	1,754.50	1,720.15	70 7.07	6,192 10 10
Warriedar	165.50	35.8	10 11.3	128 17 7
Wiluna	2,389.25	886.5	26 8.5	3,191 8 0
Yarri	1,364.50	471.15	24 10.3	1,696 2 10
	49,041.75	39,059.40	57 4.1	140,613 14 11
Weerianna	126.50	75.40	42 10.98	271 8 10
	49,168.25	39,134.80	....	140,885 3 9

SCHEDULE No 2.

Number of Parcels Treated, Tons Crushed and Head Value for the Year ended 31st December, 1947.

No. of Parcels Treated.	Battery.	Tons Crushed.	Yield by Amalgamation. (Bullion.)	Yield by Amalgamation. (Fine Gold.)	Gross Contents of Tailings on 100% (including refractory).	Total Contents of Ore. (Fine Gold.)	Average per ton. (Fine Gold.)	Gross Value per ton, at £4 4s. 11½d. per oz.
			ozs. dwts.	ozs. dwts.	ozs. dwts.	ozs. dwts.	dwts. grs.	£ s. d.
24	Bamboo Creek	851	505 12	428 5	181 15	610 0	14 8	3 0 11
34	Boogardie	1,008.25	815 9	690 14	238 6	929 0	14 19	3 2 10
114	Coolgardie	6,851.25	2,498 1	2,115 16	1,163 15	3,279 11	9 17	2 1 3
117	Cue	5,113.75	16,799 3	14,228 18	1,064 9	15,293 7	59 5	12 11 6
158	Kalgoorlie	11,026	3,401 17	2,881 7	1,802 8	4,683 15	8 15	1 16 6
33	Laverton	1,505.25	1,512 15	1,281 6	517 8	1,793 14	23 21	5 1 5
27	Marble Bar	1,087	532 17	451 6	310 0	761 6	14 0	2 19 6
83	Meekatharra	5,731.50	4,730 9	4,006 14	1,731 6	5,738 0	20 5	4 5 10
11	Mt. Ida	220	97 17	82 17	23 12	106 9	9 16	2 1 1
48	Norseman	1,233.50	535 6	453 8	463 16	917 4	14 20	3 3 0
69	Ora Banda	3,599.25	2,288 15	1,938 11	1,361 7	3,299 18	18 4	3 17 2
20	Paynes Find	1,337.50	1,223 2	1,035 19	125 0	1,160 19	16 5	3 8 10
31	Peak Hill	3,803.75	1,004 13	851 0	467 0	1,318 0	7 0	1 9 9
25	Sandstone	1,754.50	1,720 3	1,456 14	374 0	1,830 14	20 21	4 8 8
8	Warriedar	165.50	35 16	30 6	62 13	92 19	7 22	1 13 7
32	Wiluna	2,389.25	886 10	750 17	499 1	1,249 18	10 11	2 4 5
23	Yarri	1,364.50	471 3	399 0	153 0	552 0	8 2	1 14 4
857	Total	49,041.75	39,059 8	33,082 18	10,538 16	43,621 14	17 19	3 15 7
8	Weerianna	126.50	75 4	63 14	23 0	86 14	13 0	2 15 3
865	....	49,168.25	39,134 12	33,146 12	10,561 16	43.708 8	17 19	3 15 7

Average tons per parcel .... 56.84.
Average yield by amalgamation per ton (fine gold) .... 13 dwts. 11.6 grs.
Average value by amalgamation per ton .... £2 17s. 3d.—Australian. £6 16s. 2d.
Average head value of tailing per ton (fine gold) .... 4 dwts. 7.1 grs.
Average value of tailing per ton .... 18s. 3d.—Australian, £2 3s. 5d.

SCHEDULE NO. 3.

Segregation of Tailing Produced According to Value, Year ended 31st December, 1947.

Battery.	Over 2 dwts. 8 grs.			2 dwt. 8 grs. to 1 dwt. 18 grs.			1 dwt. 18 grs. and under.			Refractory.			Total.		
	Tons.	ozs.	dwts.	Tons.	ozs.	dwts.	Tons.	ozs.	dwts.	Tons.	ozs.	dwts.	Tons.	ozs.	dwts.
Bamboo Creek....	541	161	11	39.5	4	7	125.75	8	16	61.25	7	1	767.6	181	15
Boogardie	538	201	8	224.5	23	17	117.25	7	7	26	5	14	905.75	238	6
Coolgardie	4,450	1,038	....	185.25	20	13	1,530	105	2	....	....	....	6,165.25	1,163	15
Cue	3,485.25	952	7	479.75	54	19	566.25	34	17	73	22	6	4,604.25	1,064	9
Kalgoorlie	4,679.25	1,379	16	1,476	188	....	3,826	234	12	....	....	....	9,981.25	1,802	8
Laverton	1,695	505	1	44	4	14	83.5	7	13	....	....	....	1,822.5	517	8
Marble Bar	444.75	227	3	....	....	....	154.25	2	5	371	80	12	970	310	0
Meekatharra	2,575.25	1,001	15	717.75	87	5	797.5	44	15	1,069.75	597	11	5,160.25	1,731	6
Mt. Ida....	60.75	17	5	21	2	3	66.5	4	4	....	....	....	148.25	23	12
Norseman	285	74	13	9	....	17	815.5	40	9	....	....	....	1,109.5	115	19
Ora Banda	2,432.5	1,296	8	327.5	38	9	446.25	26	10	....	....	....	3,206.25	1,361	7
Paynes Find	229.5	38	19	303 5	35	7	637.5	40	0	34	10	14	1,204.5	125	0
Peak Hill	1,357.75	293	10	22.5	2	10	657.75	34	15	1,339.	136	5	3,377	467	0
Sandstone	1,189.5	346	9	105	11	4	196.5	13	11	50	2	16	1,541	374	0
Warriedar	22	3	18	....	....	...	23.5	1	6	159.25	57	9	204.75	62	13
Wiluna	2,014	487	10	34.25	3	19	102.5	7	12	....	....	....	2,150.75	499	1
Yarri	405.5	121	5	205.5	26	0	91.75	5	15	446	42	5	1,148.75	195	5
Overall Total*....	26,405	8,146	18	4,195	504	5	10,238.25	619	9	3,629.25	962	13	44,467.5	10,233	5

* Includes Tonnages not completed in December, 1946, and not taken into account in that Year.

SCHEDULE NO. 4.

Details of Extraction Tailing Treatment, 1947.

Battery.	Tons Treated.	Head Value.		Contents.	Tail Value.		Contents.	Recovery.	Call.	Recovery.	Shortage.	Surplus.
		dwts.	grs.	dwts.	dwts.	grs.	dwts.	%	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,712	4	20.2	8,287	1	7.7	2,265	79.16	1,279 0 11	1,307 15 2	....	28 14 3
Boogardie	1,585	2	20.3	4,517	....	14.1	941	79.16	765 11 9	726 5 5	39 6 4	....
Coolgardie	4,428	4	10.2	19,765	....	21.04	4,028	79.6	3,338 13 5	3,276 19 0	61 14 5	....
Cue	5,348	4	7.4	23,045	....	20	4,461	80.2	3,949 18 0	4,204 13 9	....	254 15 9
Kalgoorlie....	12,840	3	4	40,782	....	18.03	9,707	76.2	6,600 9 1	6,540 0 0	60 9 1	....
Laverton	2,560	6	5.8	15,986	1	7.92	3,404	78.6	2,671 13 8	2,661 14 2	9 19 6	....
Marble Bar	565	13	4	7,439	3	7	1,863	75.00	1,187 0 0	1,187 0 0	....	....
Meekatharra	2,144	4	19.2	10,292	1	4.5	2,553	75.1	1,648 13 3	1,493 3 1	155 10 2	....
Norseman	1,320	2	10.1	3,196	....	14	793	75.5	510 7 2	605 9 1	....	95 1 11
Ora Banda	4,999	7	2.64	39,844	1	12.43	7,590	83.8	6,847 15 0	7,109 15 0	....	262 0 0
Peak Hill	1,982	3	21	7,684	....	19.2	1,585	79.4	1,297 10 2	1,189 4 2	108 6 0	....
Sandstone	1,944	4	13	8,857	1	1	2,059	76.9	1,443 17 5	1,447 2 4	....	3 4 11
	41,427	4.579		189,694	0.995		41,249	78.2	31,540 9 10	31,749 1 2	435 5 6	643 16 10
Refractory— Marble Bar	34	23	15	....	11	19	Actual	78.78	85 11 10	85 11 10	....	....

SCHEDULE NO. 5.

Direct Purchase of Tailing, Year ended 31*st December,* 1947.

Battery.	Tons of Tailings Purchased.	Amount Paid at £4 4s. 11½d.	Amount Paid A/c. Premium.
		£ s. d.	£ s. d.
Bamboo Creek	629.00	320 14 9	867 9 6
Boogardie	813.75	507 7 7	365 13 9
Coolgardie	4,264.50	1,566 14 8	2,421 2 1
Cue	4,016.25	1,783 1 4	2,381 4 3
Kalgoorlie	4,273.00	2,422 9 4	3,429 6 2
Laverton	1,849.75	1,096 3 6	1,690 10 9
Marble Bar	660.75	1,109 5 2	2,572 10 6
Meekatharra	2,690.25	2,155 3 2	2,142 0 9
Mount Ida	30.75	7 13 0	4 19 0
Norseman	284.75	108 11 4	183 18 8
Ora Banda	3,007.50	3,197 2 0	5,474 11 11
Payne's Find	4.50	2 10 1	1 12 5
Peak Hill	1,228.25	319 1 5	685 15 9
Sandstone	1,186.75	549 17 5	878 19 2
Warriedar	77.50	4 15 6	3 2 0
Wiluna	2,014.00	650 0 6	420 12 9
Yarri	779.25	220 9 8	486 12 9
	27,810.50	16,021 0 5	23,830 2 2
20-Mile Sandy	944.50	455 5 9	294 19 4
Totals	28,755	16,476 6 2	24,125 1 6

SCHEDULE NO. 6.

Tailing Treatment for 1947.

Battery.	Tonnage.	Yield. Fine ounces.	Value. £	Premium. £	Total. £
Bamboo Creek	1,712	307.43	1,307.767	1,730.214	3,037.981
Boogardie	1,585	148.80	632.758	969.383	1,602.141
Coolgardie	4,428	779.52	3,307.547	4,726.448	8,033.995
Cue	5,288	990.55	4,204.679	5,770.760	9,975.439
Kalgoorlie	12,840	1,555.06	6,637.787	9,340.310	15,978.097
Laverton	2,560	626.58	2,661.870	3,528.678	6,190.548
Marble Bar	599	285.18	1,212.021	1,857.883	3,069.904
Meekatharra	2,144	360.90	1,532.991	2,222.551	3,755.542
Norseman	1,320	148.14	629.185	821.390	1,450.575
Ora Banda	4,999	1,634.24	6,941.132	9,633.583	16,574.715
Peak Hill	1,982	266.56	1,132.262	1,686.495	2,818.757
Sandstone	1,944	340.55	1,446.566	2,038.028	3,484.594
Wiluna	....	6.95	29.554	39.191	68.745
Totals	41,401	7,450.46	31,676.119	44,364.914	76,041.033

SCHEDULE NO. 7.

Statement of Receipts and Expenditure for Year ended 31st December, 1947.

MILLING.

Battery.	Tonnage Crushed.	Expenditure.									Receipts.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenses.	Cost per Ton.	Renewals and Repairs.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	851	121 14 9	538 17 9	164 2 1	824 14 7	19 4.6	121 1 11	130 1 1	1,075 17 7	25 3.4	456 5 6	10 8.7	....	619 12 1
Boogardie	1,008¼	212 7 2	564 7 10	294 7 8	1,071 2 8	21 2.9	283 16 7	245 2 3	1,600 1 6	31 8.9	680 12 8	13 6	....	919 8 10
Coolgardie	6,851¼	420 17 11	1,926 19 10	1,380 8 7	3,728 6 4	10 10.6	533 4 7	820 3 11	5,081 14 10	14 10	3,009 11 9	8 9.4	....	2,072 3 1
Cue	5,113¾	355 3 9	1,634 7 10	835 16 7	2,825 8 2	11 0.6	556 19 11	569 10 3	3,951 18 4	15 4.7	2,708 1 10	10 7.1	....	1,243 16 6
Kalgoorlie	11,026	782 6 8	2,438 15 7	2,298 7 6	5,519 9 9	10 0.1	832 14 7	1,565 5 3	7,917 9 7	14 4.3	4,283 9 2	7 9.1	....	3,634 0 5
Laverton	1,505¼	244 16 11	642 14 9	517 8 3	1,404 19 11	18 8.0	210 8 2	177 4 4	1,792 12 5	23 9.8	1,042 15 3	13 10.3	....	749 17 2
Lake Darlot....	....	....	....	160 12 4	160 12 4	....	125 8 1	102 0 8	388 1 1	....	....	....	....	388 1 1
Linden	....	....	....	1 4 9	1 4 9	....	137 16 7	....	139 1 4	....	119 9 9	....	....	19 11 7
Marble Bar	1,087	124 15 7	526 19 1	432 5 7	1,084 0 3	19 11.3	328 0 0	184 11 10	1,596 12 1	29 4.5	633 3 10	11 7.8	....	963 8 3
Meekatharra	5,731½	508 17 6	2,413 14 2	1,598 13 6	4,521 5 2	15 9.7	572 5 5	702 0 2	5,795 10 9	20 2.1	2,872 6 1	10 0.2	....	2,923 4 8
Mount Ida	220	231 16 7	257 6 7	118 13 10	607 17 0	55 3	346 17 8	90 7 10	1,045 2 6	95 0	132 13 3	12 0.8	....	912 9 3
Norseman	1,233½	305 19 6	795 18 10	467 12 5	1,569 10 9	25 5.3	266 14 0	171 5 0	2,007 9 9	32 6.5	619 18 1	10 0.6	....	1,387 11 8
Ora Banda	3,599¼	315 13 2	814 15 1	840 12 8	1,971 0 11	10 11.4	321 7 6	410 10 5	2,702 18 10	15 0.2	1,487 5 6	8 3.2	....	1,215 13 4
Payne's Find	1,337½	208 12 7	699 15 4	376 9 5	1,284 17 4	19 2.6	218 15 1	182 18 7	1,686 11 0	25 2.7	773 4 3	11 6.8	....	913 6 9
Peak Hill	3,803¾	242 2 10	1,581 17 2	664 9 2	2,488 9 2	13 1.1	924 0 2	420 9 9	3,832 19 1	20 1.9	1,652 9 10	8 8.2	....	2,180 9 3
Sandstone	1,754½	243 6 3	916 8 4	331 11 10	1,491 6 5	16 11.9	494 10 8	372 9 9	2,358 6 10	26 10.6	891 5 4	10 1.9	....	1,467 1 6
Warriedar	165½	41 18 4	192 18 1	32 15 1	267 11 6	32 4.2	28 6 0	56 17 8	352 15 2	42 7.8	134 2 8	16 2.5	....	218 12 6
Wiluna	2,389¼	142 1 4	759 11 6	220 2 4	1,121 15 2	9 4.3	182 2 8	344 15 4	1,648 13 2	13 10	1,209 3 3	10 1.5	....	439 9 11
Yalgoo	....	....	24 7 6	....	24 7 6	....	....	12 2 9	36 10 3	....	51 2 6	....	14 12 3	....
Yarri	1,364½	226 5 2	693 13 4	281 2 10	1,201 1 4	17 7.3	411 15 7	212 3 0	1,824 19 11	26 9	679 2 3	9 11.3	....	1,145 17 8
Head Office	....	....	....	....	....	....	....	....	....	....	3 1 9	....	3 1 9	....
Closed Batteries	....	....	....	....	....	....	....	....	....	....	22 19 6	....	22 19 6	....
	49,031¾	4,728 16 0	17,423 8 7	11,016 16 5	33,169 1 0	13 6.5	6,896 5 2	6,769 19 10	46,835 6 0	19 1.2	23,462 4 0	9 7.2	40 13 6	23,413 15 6
Weerianna	126½	64 3 6	63 18 0	38 0 5	166 1 11	26 4.4	41 16 0	14 10 5	222 8 4	34 6.1	68 8 7	10 10.3	....	153 19 9
Grand Total	49,168¼	4,792 19 6	17,487 6 7	11,054 16 10	33,335 2 11	13 6.9	6,938 1 2	6,784 10 3	47,057 14 4	19 1.7	23,530 12 7	9 7.2	40 13 6	23,567 15 3
														40 13 6
Total Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	£23,527 1 9

SCHEDULE NO. 8.

Statement of Receipts and Expenditure for Year ending 31st December, 1947.

TAILING TREATMENT.

Battery.	Tonnage Treated.	EXPENDITURE.									RECEIPTS.		PROFIT.	LOSS
		Management	Wages	Stores.	Total Working Expenditure.	Cost per Ton.	Renewals and Repairs.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,712	209 0 5	434 11 6	326 3 8	969 15 7	11 4	9 13 7	218 7 3	1,197 16 5	13 11.9	1,033 8 10	12 0.9	....	164 7 7
Boogardie	1,585	230 11 0	524 12 6	358 17 11	1,114 1 5	14 0.7	492 16 6	199 12 3	1,806 10 2	22 9.7	1,002 7 2	12 7.8	....	804 3 0
Coolgardie	4,428	278 16 11	1,550 8 10	928 19 7	2,758 5 4	12 5.3	435 9 2	449 8 6	3,643 3 0	16 5.4	3,493 1 5	15 9.3	....	150 1 7
Cue	5,288	91 8 11	1,568 19 9	827 13 0	2,488 1 8	9 4.9	16 7 0	498 9 3	3,002 17 11	11 4.2	6,006 2 2	22 8.5	3,003 4 3	....
Kalgoorlie	12,840	432 11 7	3,375 14 3	2,028 9 1	5,836 14 11	9 1.1	571 4 8	1,116 15 10	7,524 15 5	11 8.6	9,601 3 4	15 10.7	2,076 7 11	....
Laverton	2,560	196 12 10	510 10 9	437 4 8	1,144 8 3	8 11.3	66 10 3	195 14 0	1,406 12 6	10 11.9	2,830 5 8	22 1.3	1,423 13 2	....
Linden	....	....	....	....	....	....	102 2 6	....	102 2 6	....	....	....	....	102 2 6
Marble Bar	599	110 8 11	192 19 3	138 19 0	442 7 2	14 9.2	109 12 8	119 10 5	671 10 3	22 5.2	320 10 9	10 8.4	....	350 19 6
Meekatharra	2,144	102 14 5	1,030 3 3	812 3 8	1,945 1 4	18 1.6	156 19 3	372 8 1	2,474 8 8	23 0.9	1,406 5 6	13 1.4	....	1,068 3 2
Mount Ida	....	....	....	6 14 7	6 14 7	....	13 5 6	0 4 3	20 4 4	....	....	....	....	20 4 4
Norseman	1,320	7 6 7	350 10 2	375 7 7	733 4 4	11 1.3	112 2 7	110 5 11	955 12 10	14 5.7	1,267 1 0	19 2.3	311 8 2	....
Ora Banda	4,999	286 15 3	1,644 6 5	963 7 8	2,894 9 4	11 7	203 11 2	377 2 5	3,475 2 11	13 10.9	6,464 9 5	25 10.3	2,989 6 6	....
Payne's Find	....	....	....	3 0 0	3 0 0	....	....	291 15 0	294 15 0	....	....	....	....	294 15 0
Peak Hill	1,982	141 14 2	679 19 8	485 1 2	1,306 15 0	13 2.2	194 15 11	180 11 1	1,682 2 0	16 11.4	1,441 4 7	14 6.6	....	240 17 5
Sandstone	1,944	244 11 8	514 5 0	440 16 10	1,199 13 6	12 3.6	92 10 4	191 2 10	1,483 6 8	15 3.1	2,081 7 0	21 5	598 0 4	....
Warriedar	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wiluna	....	41 7 0	14 16 9	45 17 10	102 1 7	....	395 9 9	24 18 2	522 9 6	....	67 17 2	....	....	454 12 4
Yarri	....	10 0 0	17 12 6	19 1 0	46 13 6	....	80 17 3	12 8 5	139 19 2	....	13 18 0	....	....	126 1 2
	41,401	2,383 19 8	12,409 10 7	8,197 17 3	22,991 7 6	11 1.2	3,053 8 1	4,358 13 8	30,403 9 3	14 8.2	37,029 2 0	17 10 7	10,402 0 4	3,776 7 7
Interest Paid to Treasury	....	....	....	....	....	....	....	....	....	....	996 6 5	....	....	996 6 5
Net Receipts	....	....	....	....	....	....	....	....	....	....	36,032 15 7	17 4.9	....	4,772 14 0
Total Profit	....	....	....	....	....	....	....	....	....	....	....	....	£5 629 6 4	

GENERAL WORKING ACCOUNT FOR YEAR ENDED 31ST DECEMBER, 1947, COMPARED WITH 1946.

	1947. Milling.	Cyaniding.	Total.		1947. Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Wages	22,280 6 1	14,793 10 3	37,073 16 4	By Revenue	23,530 12 7	36,032 15 7	59,563 8 2
,, Stores	7,611 18 2	6,013 7 8	13,625 5 10	,, Loss Carried Down	20,256 4 0	....	20,256 4 0
,, Repairs and Renewals	6,938 1 2	3,053 8 1	9,991 9 3				
,, Battery Spares	1,130 7 2	....	1,130 7 2				
,, Water	3,442 18 8	2,184 9 7	5,627 8 3				
,, General Expenses	2,383 5 4	1,575 14 2	3,958 19 6				
,, Profit Carried Down	....	8,412 5 10	8,412 5 10				
	£43,786 16 7	£36,032 15 7	£79,819 12 2		£43,786 16 7	£36,032 15 7	£79,819 12 2

	1946. Milling.	Cyaniding.	Total.		1946. Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Wages	19,269 0 11	7,385 3 2	26,654 4 1	By Revenue	21,755 4 3	17,399 1 5	39,154 5 8
,, Stores	10,164 3 10	4,782 4 7	14,946 8 5	,, Loss Carried Down	18,833 7 0	....	18,833 7 0
,, Repairs and Renewals	6,922 17 6	2,085 17 2	9,008 14 8				
,, Battery Spares	973 0 8	....	973 0 8				
,, Water	2,259 7 0	1,133 17 2	3,393 4 2				
,, General Expenses	1,000 1 4	400 7 0	1,400 8 4				
,, Profit Carried Down	....	1,611 12 4	1,611 12 4				
	£40,588 11 3	£17,399 1 5	£57,987 12 8		£40,588 11 3	£17,399 1 5	£57,987 12 8

Profit and Loss Account.

	1947. Milling.	Cyaniding.	Total.		1947. Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Loss Brought Forward	20,256 4 0	....	20,256 4 0	By Profit Brought Down	....	8,412 5 10	8,412 5 10
,, Administration	3,270 17 9	2,782 19 6	6,053 17 3	,, Gross Loss Brought Down	23,527 1 9	....	23,527 1 9
,, Gross Profit Carried Down	....	5,629 6 4	5,629 6 4				
	£23,527 1 9	£8,412 5 10	£31,939 7 7		£23,527 1 9	£8,412 5 10	£31,939 7 7

	1946. Milling.	Cyaniding.	Total.		1946. Milling.	Cyaniding.	Total.
	£ s. d.	£ s. d.	£ s. d.		£ s. d.	£ s. d.	£ s. d.
To Loss Brought Forward	18,833 7 0	....	18,833 7 0	By Profit Brought Down	....	1,611 12 4	1,611 12 4
,, Administration	3,470 0 0	1,773 1 10	5,243 1 10	,, Gross Loss Brought Down	22,303 7 0	161 9 6	22,464 16 6
	£22,303 7 0	£1,773 1 10	£24,076 8 10		£22,303 7 0	£1,773 1 10	£24,076 8 10

General Profit and Loss Account.

	1947. £ s. d.	£ s. d.		1947. £ s. d.
To Gross Loss Milling	23,527 1 9		By Net Loss Carried Down	39,071 10 4
,, *Less* Gross Profit Cyaniding	5,629 6 4			
		17,897 15 5		
,, Interest	....	18,495 6 3		
,, Sinking Fund	....	1,406 0 0		
,, Depreciation	....	426 15 0		
,, Superannuation	....	845 13 8		
		39,071 10 4		39,071 10 4
,, Balance Brought Forward	....	1,451,743 5 5	,, Balance Carried Down	1,490,814 15 9
,, Loss for year	....	39,071 10 4		
		£1,490,814 15 9		£1,490,814 15 9

	1946. £ s. d.	£ s. d.		1946. £ s. d.
To Gross Loss Milling	22,303 7 0		By Net Loss Carried Down	44,775 5 8
,, Gross Loss Cyaniding	161 9 6			
		22,464 16 6		
,, Interest	....	20,390 0 0		
,, Sinking Fund	....	1,418 13 10		
,, Superannuation	....	501 15 4		
		£44,775 5 8		44,775 5 8
,, Balance Brought Forward		1,406,967 19 9	,,	
,, Loss for Year		44,775 5 8	Balance Carried Down	1,451,743 5 5
		£1,451,743 5 5		£1,451,743 5 5

BALANCE SHEET AS AT 31ST DECEMBER, 1947, COMPARED WITH 1946.

Liabilities—1946.

	£ s. d.	£ s. d.
Capital provided from :		
General Loan Fund	409,933 19 6	
Consolidated Revenue Fund	95,246 16 3	
Assistance Gold Mining Industry	28,621 13 5	
Commonwealth Assistance Metalliferous Mining	13,786 8 0	547.588 17 2
Tailings—		
Advanced by Treasury	23,500 0 0	
Amount in Suspense	18 16 7	
Sundry Creditors—		
For Tailings	2,636 6 3	
For Premiums	1,133 6 8	
Estimated Balance of premium due	2,362 18 9	29,651 8 3
Due to State Treasury—		
Excess of Expenditure over Revenue	158,470 3 2	
Superannuation—Employer's Contribution	1,857 6 3	
Interest on General Loan Fund Capital	697,018 0 0	
Sinking Fund on General Loan Capital	137,435 8 4	994,780 17 9
Sundry Creditors—		
Ordinary Accounts	3,443 19 7	
Cash Orders unpaid	1,073 12 0	4,517 11 7
		£1,576,538 14 9

Assets—1946.

	£ s. d.	£ s. d.
Plant and Buildings		73,833 18 0
Motors and Horses		1,167 17 10
Stores—		
Outstations	14,503 18 9	
Head Office	125 4 2	14,629 2 11
Sundry Debtors		4,556 19 3
Battery Spares		956 3 1
Tailings—		
Tailings (not treated)	22,447 13 11	
Estimated Gold Premium	2,362 18 9	....
Cash Balance of Advance	4,840 15 7	....
		29,651 8 3
Proffit and Loss Account	....	1,451 743 5 5
		£1,576,538 14 9

Liabilities—1947.

	£ s. d.	£ s. d.
Capital provided from—		
General Loan Fund	411,322 2 4	
Consolidated Revenue Fund	96,755 15 5	
Assistance Gold Mining Industry	28,621 13 5	
Commonwealth Assistance Metalliferous Mining	13,786 8 0	550,485 19 2
Tailings—		
Advanced by Treasury	22,500 0 0	
Sundry Creditors—		
For Tailings	665 17 1	
For Premiums	418 19 11	
Estimated Balance of premium due	602 4 6	24,187 1 6
Due to State Treasury—		
Excess of Expenditure over Revenue	179,281 3 6	
Superannuation—Employer's Contribution	2,702 19 11	
Interest on General Loan Fund Capital	715,513 6 3	
Sinking Fund on General Loan Capital	138,861 8 4	1,036,358 18 0
Sundry Creditors—		
Ordinary Accounts	3,177 2 2	
Cash Orders unpaid	2,490 18 7	5,668 0 9
		£1,616,699 19 5

Assets—1947.

	£ s. d.	£ s. d.
Plant and Buildings	....	75,713 14 1
Motors and Horses	2,185 3 9	
Less Depreciation	406 15 0	1,778 8 9
Stores—		
Outstations	17,700 2 4	
Head Office	136 5 10	17,836 8 2
Sundry Debtors	....	5,500 2 9
Battery Spares	....	869 8 5
Tailings—		
Tailings (not treated)	21,588 14 10	
Estimated Gold Premium	602 4 6	
Cash Balance of Advance	1,996 2 2	24,187 1 6
Profit and Loss Account	....	1,490,814 15 .)
		£1,616,699 19 5

ANNUAL PROGRESS REPORT OF THE GEOLOGICAL SURVEY BRANCH OF THE MINES DEPARTMENT FOR THE YEAR 1947.

Contents.

Plates

Division IV.

Annual Progress Report of the Geological Survey of Western Australia for the Year ended 31st December, 1947.

The Under Secretary for Mines.

I have the honour to submit for the information of the Honourable the Minister for Mines, my report on the progress of the Geological Survey for the year ended 31st December, 1947.

STAFF.

Strength as at 31st December:

			Total.
Professional.			
Ellis, H. A., B.Sc., A.O.S.M.	Government Geologist		
McMath, J. C., B.Sc. (Hons. Lond.) F.G.S.	Senior Geologist		
Lord, J. H., B.Sc., F.G.S.	Geologist, 1st Class		5
Ward, H. J., B.Sc.	Geologist, 2nd Class		
Johnson, W., B.Sc. (Hons.)	Geologist, 2nd Class		
Office.			
Outtrim, I. F.	Clerk		
Meredith, E. M.	Typiste (Temporary)		3
Carlin, J.	Messenger		
Laboratory.			
Fimmell, L. H.	Laboratory Assistant		1

Promotions, Resignations, Appointments.

Mr. R. A. Hobson, B.Sc. (Hons.), resigned from the Survey on 7th August to take up the appointment of Director of the Kalgoorlie School of Mines. He had been with the Survey since February, 1935, and was senior geologist from November, 1945. He takes with him a wide knowledge of the geology and mineral resources of the State.

Mr. R. S. Matheson, B.Sc., Geologist 1st Class, resigned from the Survey on the 14th March to take up an appointment with Zinc Corporation. He had been with the Survey since 1935 and made valuable contributions to our knowledge of the geology and mineral resources of the State during his period of employment with the Survey.

Mr. J. C. McMath, B.Sc. (Hons. Lond.), F.G.S., was promoted to Senior Geologist to fill the vacancy created by the resignation of Mr. R. A. Hobson.

Mr. J. H. Lord, B.Sc., F.G.S., was promoted to Geologist 1st Class to fill the vacancy created by the resignation of Mr. R. S. Matheson.

The authorised strength of the Survey during the year was:—

1 Government Geologist.
1 Senior Geologist.
2 Geologists, 1st Class.
4 Geologists, 2nd Class.

Owing to resignations during the year and to the insuperable difficulty of obtaining replacements, the staff was not up to this authorised strength at any period of the year.

It may be of interest to record the fact that for the positions of Senior Geologist and Geologist 1st Class, advertisements in the leading newspapers and technical journals throughout Australia and New Zealand failed to secure any applications. Similar difficulty was experienced in filling vacancies for 2nd Class Geologists.

The following tabulated statement shows the relation between the area of the State and the availability of geologists during the year:—

Period.	Number of Geologists available including Government Geologist.	Area of State.	Square Miles per Geologist.	Population.
		sq. miles.		
January-April	7	975,920	139,400	509,000
April-October	6	....	162,650	....
October-December	5	....	195,180	....

Early in 1948 with an effective strength of six geologists (including the Government Geologist), the area per geologist will be 162,650 square miles. This effective strength of six geologists enables only the most urgent requirements of geological investigation to be met, and it is not possible to undertake many types of geological investigation, which could be entered upon with ultimate advantage to the State's economy.

ACTIVITIES OF PROFESSIONAL STAFF.

H. A. Ellis, Government Geologist.

In addition to administrative duties, the following field work was undertaken:—

Places Visited.	*Purpose of Visit.*	*Period.*
Norseman	Inspection development work " Iron King " Pyrite Mine and Norseman Gold Mine	January.
Melbourne	Interstate conference, Atomic Minerals	do.
Brookton	Water Supply	February.
Hopetoun District	Beach Sands	do.
Collie	Inspection Geological and Geophysical Survey	do.
Bunbury	Inspection dredging claim	March.
Norseman	Development work " Iron King " Pyrite Mine and Norseman Gold Mine	do.
Young River	Inspection vermiculite deposits	do.
Hamersley River	Beach Sands	do.
Norseman	Underground development " Iron King " Pyrite Mine and Norseman Gold Mine	May.
Coolgardie	Inspection field work, Coolgardie Survey	do.
Mt. Magnet	Inspection field work " Hill 50 " Gold Mine (2 visits)	do.
Bunbury	Beach Sands	June
Greenbushes	Tin dredging claims	do.
Yanmah	Inspection kyanite deposits	do.
Adelaide	Conference, Atomic Minerals Investigation	do.
Norseman	Inspection Norseman Gold Mine and " Iron King " Pyrite Mine	July.
Do.	" Iron King " Pyrite Mine	do.
Do.	Development work, Norseman Gold Mine	August.
Coolgardie	Inspection field work, Coolgardie Re-Survey	do.
Murchison Goldfield	Inspection field work, Murchison Reconnaissance Geological Survey	do.
Cue	Inspection " Great Fingall " area and Wilgie Mia iron deposits (accompanied by Geologist H. J. Conolly)	September
Koolyanobbing	Inspection iron ore deposits, accompanied by Geologist H. J. Conolly	October.
Norseman	Inspection " Iron King " Pyrite Mine	do.
Margaret River, Denmark, and Manjimup	Water supply investigations	November
Norseman	Inspection " Iron King " Pyrite Mine	December

R. A. Hobson, Senior Geologist (Resigned August).

January-April: Office duties in connection with Murchison Survey, and underground examination of Spargo's Reward Gold Mine.

April-August: In charge of Reconnaissance Geological Survey of large portion of Murchison Goldfield.

Examination Hill 50 Gold Mine, Boogardie.

R. S. Matheson, Geologist 1st Class (Resigned March).

January-March: Office duties in connection with Coolgardie Goldfield Re-Survey.

J. C. McMath, Senior Geologist (Appointed December, 1946).

January-April: Geological field work, Collie Coalfield.

April-September: In charge of Re-Survey of Coolgardie Goldfield.

September-October: Investigation Cheyne Bay Beach Sands.

October-December: In charge of Coolgardie Re-Survey.

J. H. Lord, Geologist 1stClass.

January-April: Engaged on the Geological Survey of the Collie Coalfield in conjunction with the Commonwealth Bureau of Mineral Resources' Geophysical Survey.

June-July: Investigation of iron ore reserves in the vicinity of Wundowie for the Royal Commissioner inquiring into Wundowie Charcoal-Iron Project.

September: Geological Survey and laying out of drilling sites on the eastern portion of Cockburn Sound Location 521, at Byford, for the State Brick Works.

November-December: Providing geological supervision for drilling on the eastern portion of Cockburn Sound Location 521, at Byford, for the State Brick Works.

The intervening time was spent in the office preparing a bulletin on the Collie Coalfield, and in the compilation of numerous minor reports, such as "Necessity for Deep Bores at Collie," "Preliminary Shallow Boring Programme for P.A. 53, Collie," "Proposed Bores on Black Diamond Leases, Collie" (for State Electricity Commission), and "An Estimate of Shale Available North of State Brick Works at Byford."

H. J. Ward, Geologist 2nd Class.

January-April: Office duties in connection with Coolgardie Re-Survey.

April-December: Assistant Geologist, group mapping with Coolgardie Re-Survey.

W. Johnson, Geologist 2nd Class.

January-March: Preparing data for Annual Report. Preparing for 1947 field season.

April-May: Examination of Hill 50 Gold Mine, Boogardie, near Mt. Magnet, in association with Mr. R. A. Hobson.

June-November: Engaged in completion of Reconnaissance Survey of Murchison and Gascoyne Districts. In charge from August onwards.

December: Engaged in preparation of material for Annual Report, 1947.

FIELD WORK.

Field Work in Progress as at December 31st.

(1) Geological Reconnaissance of approximately 12,000 square miles in the Yalgoo, Murchison, and Gascoyne Goldfields—Messrs. Hobson and Johnson. Field work completed in December.

(2) Detailed Geological Examination of 900 square miles surrounding Coolgardie, Coolgardie Goldfield—Messrs. McMath and Ward.

(3) Geological Survey and miscellaneous economic investigations together with preparation of bulletin on Collie Coalfield—Mr. Lord.

(4) Beach Sands Reconnaissance Investigations on behalf of the Commowealth Bureau of Mineral Resources, Canberra. Two parties operating.

Field Work for 1948.

(1) Continuation of items 2, 3, and 4 above.

(2) Participation in an Oil Survey of the Fitzroy Basin, West Kimberley District, in conjunction with geologists from Commonwealth Bureau of Mineral Resources, Canberra, contingent upon availability of staff.

(3) Geological Survey of an area surrounding the old Great Fingall Mine, Day Dawn, with the object of providing a plan, at a scale of 100 feet equals 1 inch, on which to locate bore sites for a projected deep drilling campaign in search of a possible repetition of the Great Fingall quartz reef at depth.

(4) Supervision of boring programmes to be carried out in the Collie-Burn area, Collie Coalfield, and in the north-eastern portion of the field for the Government and private enterprise respectively.

(5) Geological reconnaissance surveys in various parts of the State for the Public Works Department in connection with the occurrence of underground water.

TRANSPORT.

Tabulated details of transport at present in use by the Geological Survey are as follows:—

No.	Type.	Capacity.	Speedo Reading 31st December, 1947.	Mileage for Year.	Purchased.
W.A.G. 474	Dodge Utility	15 cwt.	103,000*	7,842†	1935 (new).
W.A.G. 534	do.	do.	94,962	6,599	do.
W.A.G. 1053	Ford Utility	18 cwt.	48,665	7,401	1945 (second-hand).
W.A.G. 1060	International Utility....	15 cwt.	44,825	10,525	do.
W.A.G. 1175	Ford Utility	do.	21,549	11,945	1946 (new).
W.A.G. 1194	do.	do.	14,302	7,602	do.
W.A.G. 1307	Chevrolet Utility	do.	62,794	9,462†	7–2–47 (second-hand).
W.A.G. 1413	do.	do.	2,503	2,503†	13–10–47 (new).
W.A.G. 1421	do.	do.	1,740	1,740†	4–11–47 (new).

* Approximate reading when destroyed by fire 21–9–47. † Portion of year only.

With the exception of the two new vehicles added to the fleet during the year for use on work being done for the Commonwealth Bureau of Mineral Resources, the cost of maintaining these vehicles in a safe and efficient condition for the type of work they are called upon to perform, was high. This remark applies in particular to WAG 1053. An additional vehicle to replace

WAG 474 will be required for the 1948 field season. WAG 474 was accidentally destroyed by fire near the mouth of the Harvey River Diversion Drain on 21/9/47, while employed on Beach Sands Investigation work for the Commonwealth Bureau of Mineral Resources.

SERVICE TO THE GENERAL PUBLIC, MINING INTERESTS AND GOVERNMENT DEPARTMENTS.

The usual strong demand for geological information continued through the year. The requirements of personal callers and written applications were, in most cases, satisfactorily met by some members of the professional staff who happened not to be in the field, or by Mr. Outtrim, clerk to the Survey. when no professional officers were available.

Prospectors, mining companies, and syndicates engaged in prospecting, gold or coal mining, were assisted by the professional staff in the course of their extensive field activities.

Emphasis is again laid on the necessity for conveying to those vitally concerned the information collected by the field geologists in the course of their investigations. In the case of the Coolgardie Re-Survey, a further area was recommended for prospecting and the information was released in the usual manner, that is, simultaneously through the press in Perth and Kalgoorlie. The geological maps were open for inspection at the Geological Survey Camp at specified times.

The State Brick Works and the Public Works Department relied on the Geological Survey for basic information about shale deposits at Byford and underground water supply problems in various parts of the State.

The State Electricity Commission utilised our knowledge of the geology of the Collie Coalfield in carrying out an extensive shallow boring programme on the Black Diamond leases at Collie, in search of open-cut areas. I desire to record my appreciation of the cordial relations we have had with these departments.

The Hill 50 Gold Mining Company requested a geological survey of their leases and mine at Boogardie, near Mt. Magnet, for the purpose of setting out a diamond drilling exploratory programme. This work was done by Messrs. Hobson and Johnson, and the necessary data supplied to the company.

An examination of the underground workings of Spargo's Reward Gold Mine, Coolgardie District, was made by Mr. Hobson for the purpose of providing data for the Commonwealth Bureau of Mineral Resources to enable them to decide a question of financial assistance to this company. A development programme was outlined by Mr. Hobson and submitted for consideration.

Extensive underground development work on the Iron King Pyrite Mine and the Norseman Gold Mines, at Norseman, was set out and supervised by this branch.

Geological supervision was supplied for an extensive boring programme in the search for coal being carried out by the Goldfields Coal Syndicate operating in the north-eastern portion of the Collie Coal Basin. This work is still in progress (December, 1947).

Numerous requests for geological assistance in the way of field examinations could not be undertaken on account of the serious shortage of professional officers.

LIAISON WITH THE COMMONWEALTH BUREAU OF MINERAL RESOURCES.

Geophysical Survey, Collie Coalfield.

This work was completed in April and an interim report and plan was forwarded. The basic purpose of this work was to determine, in conjunction with the geological survey carried out at the same time, the boundaries of the coal basin and the approximate shape of the granite and gneiss floor underlying the basin. The detection of the presence of coal seams in the basin did not form part of the technique of the geophysical survey.

The final report is expected early in 1948 and will be published in the Annual Progress Report of the Geological Survey for that year.

The geophysical survey results, combined with the results of the geological survey, have added much to our knowledge of the shape and extent of the Collie Coal Basin, and when the deep-drilling programme, recommended in both the geophysical and geological reports, is carried out, our knowledge of the coal content of the Collie Coalfield will be elevated from the elementary status in which it is at present, to a stage in which reliable estimates of coal tonnage can be made.

Oil Survey, Fitzroy Basin, Kimberley District.

Owing to unforeseen circumstances, the Commonwealth geological parties did not take the field during 1947. The selected areas were aerially photographed by the R.A.A.F. early in the dry season of the year.

Geophysical Surveys, Loc. 59, Hampton Plains.

The trial surveys, using electrical methods, carried out towards the end of 1946 on selected areas in this locality, showed disappointing results due mainly to the high iron content of the soil and laterite covering the rocks, and to the particular characteristics of the rocks being investigated.

Beach Sands Investigations.

Arising from decisions made at a conference in Melbourne in January, 1947, at which the Mines Departments of all the States and the Commonwealth Bureau of Mineral Resources were represented, the Geological Survey of Western Australia undertook to systematically sample beach sands along the West Australian coast from Geraldton to the western end of the Great Australian Bight, inclusive. The Geological Survey also undertook to sample the river sands of the main river system in the South-West part of the State.

The Commonwealth Government provided finance for the work, which, owing to the shortage of trained geologists, has been carried out, under Geological Survey supervision, by party leaders who are reliable bushmen-prospectors. Two parties have been operating since June and August respectively, and good progress has been made. Samples are forwarded to the Government Chemical Laboratories, Perth, for examination and division, one half being forwarded to the Commonwealth Bureau of Mineral Resources, Melbourne. Work is still in progress (December, 1947).

Cordial relations have been maintained with this Commonwealth organisation throughout the year.

PUBLICATIONS.

Issued During 1947.

Bulletin No. 101, "The Mining Groups of the Yilgarn Goldfield, North of the Great Eastern Railway," by R. S. Matheson, B.Sc., Geological Survey of Western Australia.

In the Press.

Annual Progress Report of the Geological Survey of Western Australia for the Year 1945.

Annual Progress Report of the Geological Survey of Western Australia for the Year 1946.

Mineral Resources Bulletin No. 4, "The Dandaragan Phosphate Deposits," by R. S. Matheson, B.Sc., Geological Survey of Western Australia.

Geological Survey of Western Australia Bulletin No. 102, "The Greenbushes Mineral Field," by R. A. Hobson, B.Sc. (Hons.) and R. S. Matheson, B.Sc., Geological Survey of Western Australia.

Compiled and Awaiting Authority to Print.

Geological Survey of Western Australia Bulletin on the Geology of Portion of the Mt. Margaret Goldfield, by R. A. Hobson, B.Sc. (Hons.), Geological Survey of Western Australia.

Geological Survey of Western Australia Bulletin on Some Economic Aspects of the Principal Tantalum Bearing Deposits of the Pilbara Goldfield, North-West Division, by H. A. Ellis, B.Sc., A.O.S.M., Geological Survey of Western Australia.

Mineral Resources of Western Australia Bulletin, Moulding Sands by K. R. Miles, D.Sc., F.G.S., Geological Survey of Western Australia and H. A. Stephens, B.Sc., Council for Scientific and Industrial Research.

Mineral Resources of Western Australia Bulletin, Silver, Lead, and Zinc, by W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.

Mineral Resources of Western Australia Bulletin, Vermiculite, Talc and Soapstone, Fullers Earth, Bentonite, and Diatomite, by W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.

Attention is drawn to the serious lag in the printing of the various reports listed above. Unless some improvement can be expected in this matter, a basic revision of the publishing policy of the Survey will be necessary.

In conclusion, I desire to pay a tribute to all members of the staff for their co-operation in enabling the Geological Survey to get through a particularly busy year with what I consider satisfactory results.

H. A. ELLIS,
Government Geologist.

April 21, 1948.

THE YANMAH KYANITE DEPOSIT, MINERAL CLAIM 287H.

Approx. Latitude 34°-9′ South.

Approx. Longitude 116°-0′ East.

South-West Division.

By H. A. Ellis, B.Sc., A.O.S.M., Government Geologist.

Introduction.

This occurrence of kyanite was reported on by Mr. F. G. Forman in G.S.W.A. Annual Report for 1944, at pages 4 to 5 inclusive. It is situated approximately 12 miles west of Palgarup Railway Siding, which is on the Bunbury-Northcliffe railway line. The road from Palgarup Siding to the deposit is a good, all-year-round road, capable of carrying heavy loads. Palgarup Siding is 193 miles from Perth and 78 miles from Bunbury, the nearest port. The material is loaded into open trucks at Palgarup Siding and railed to Fremantle, from where it is exported.

The deposit was examined by the writer on June 17th, 1947.

Production.

The production from the locality is as follows:—

1946—139.74 tons valued at £A568.

1947 (to end of April)—792 tons valued at £A3,633.

Since May 1st, 465 tons have been produced but not yet sold. Total production to beginning of June, 1947, was 1,396.74 tons. On June 17th, 1947, there were approximately 60 tons of ore at grass on the lease.

Mode of Occurrence of the Kyanite.

All of the above production has been obtained from what can be described as eluvial kyanite, i.e., the hard resistant blocks of kyanite occur as residuals in the soil covering the rocks from which they were originally derived. There seems little doubt that the kyanite originally occurred as a series of lenses of varying dimensions, occurring in metamorphic rocks composed of quartzites, mica schists, and biotite and hornblende schists, which have been invaded by quartz reefs. These rocks form part of the Pre-Cambrian complex in this part of the State and everywhere are obscured by lateritic deposits or deep soil. The area carries a thick growth of timber (jarrah and karri).

The area over which detrital kyanite has been found in payable quantities is approximately eight acres, and only in one instance has what appears to be a lens in situ been discovered. This occurrence is situated towards the crest of the flat south-trending spur at the southern end of Nelson Location 9622, between Manjimup Brook and a small south-westerly trending tributary. The kyanite was found on the surface, partially embedded in the soil, and varied in size from boulders weighing several cwt. to small pebbles. Numerous remnants of large boulders of kyanite which have been partially excavated remain in the soil in several places.

The lens previously mentioned as being possibly an occurrence in situ, is being excavated at present, and the kyanite is eight feet wide in a hole four feet deep. It was not possible to ascertain the length of the lens on account of surface covering. A 30 feet shaft and a crosscut, extended under the anticipated downward continuation of this lens for a distance of 53 feet, failed to locate it. In all probability the lens pitches at a flat angle to the south. An indication of this direction of pitch was obtained by an examination of the very decomposed wall rocks of the crosscut.

Ore Reserves.

There is no information available whereby ore reserves of any description can be computed. There is no measured ore exposed, and on account of lack of information it is not possible to compute indicated ore or inferred ore.

It is reasonable to assume that a lot more kyanite remains buried in the soil, and there are strong indications that this is the case in some excavations at present in progress at the south end of the present workings, but the total lack of any adequate prospecting openings makes it quite impossible to form any opinion as to the future prospects of this deposit.

Future production will definitely depend on the availability of eluvial kyanite, and no reliance can be placed on production which might come from the mining of any lenses when and if found. It is possible that the kyanite-bearing horizon has been completely eroded, and that the detrital kyanite-bearing soil represents the kyanite content of this zone. On the other hand, future operations may disclose either the cap or the roots of remaining lenses, but as previously stressed, no reliance should be placed on this possibility as a source of production.

Prospecting Required to Establish Ore Reserves.

Accepting the fact that immediate future production must come from the eluvial kyanite, it is obvious that something must be done to prospect this potential source of supply. There is an area of approximately eight acres of soil and timber covered country which is ideally situated topographically for exploration by means of a series of radiating bulldozer trenches, dug to a width of the bulldozer blade and to a depth of five feet. The ground falls gently to the east, south, and west of what would appear to be the central source of supply of the kyanite, and it is only by some such form of mechanised trenching that effective exploration can be carried out. All digging would be done downhill and the trenches could be dug in, say, three sections, to avoid a long push to the terminal point. They need not be strictly straight and could be arranged in the first instance to miss the large trees.

It is suggested that the owners lay out such a series of lines, measure the total footage of trenching to be done by a bulldozer, and let a contract to some competent contractor to carry out the work. By this means a reasonable appreciation will be able to be made of the kyanite content of the soil to a depth of at least five feet. Instances can be seen where large kyanite boulders have been recovered from right on the surface, immediately above two feet of barren soil, succeeded below by upwards of four feet of kyanite-

bearing material. There has been no inducement to excavate below those areas on which kyanite boulders were found in large quantities right on the surface, but the possibility of the sub-soil containing kyanite boulders must be explored.

It is obvious that pick and shovel methods as at present employed, will not be sufficient to make this a payable enterprise, and should the bulldozer-prospecting operations prove successful, then some consideration must be given to the large-scale mechanical handling of the soil. It is suggested that some form of grizzly would enable the worthless soil to be separated from the boulders, since most of the material which is not soil is small or large kyanite boulders. There are some quartzite and quartz boulders, but kyanite predominates.

There are at present 14 men working on the lease, and although at present a patch of eluvial kyanite has been discovered in the sub-soil near the south end of the present workings, there is no indication as to the extent of this deposit. The days of easily won kyanite are over on this claim, and some definite action is required on the lines outlined above if it is going to continue to produce kyanite.

A 10 h.p. Lister oil engine together with compressor and receiver and airlines, are installed on the lease. This equipment is used to operate a jack hammer for drilling holes in the larger kyanite boulders in order to break them to handable size. This equipment has been installed by the Midland Mining Company, who hold the working rights on the lease.

Conclusions.

(1) All of the easily won eluvial kyanite, amounting to some 1,500 tons as at June 17th, 1947, has been obtained from this mineral claim.

(2) A shallow shaft and crosscut failed to definitely locate any downward continuation of a kyanite lens, but surface excavations at present in progress near the shaft suggest that the cap of a southerly pitching lens may have been exposed. Insufficient work has been done on this occurrence to enable a definite opinion to be formed.

(3) No contracts for the supply of material can be entered into in the future until extensive prospecting of the potential kyanite-bearing soil has been carried out by mechanical means. If this exploratory work is successful, then the venture could only prove successful if the kyanite content of the soil were sufficiently high to enable large-scale earth moving operations and mechanical separation of the kyanite to be carried out. Hand labour, using picks and shovels, will not be sufficient.

PROGRESS REPORT ON THE RE-SURVEY OF THE COOLGARDIE DISTRICT, COOLGARDIE GOLDFIELD.

By J. C. McMath, B.Sc. (Hons. Lond.), F.G.S.

CONTENTS.

MAP.

Plate I.	Progressive Structural Geological Map of Coolgardie District, Coolgardie Goldfield (showing area mapped in 1946 and 1947 seasons)	Scale : 1/63,360 1 inch = mile.

Introduction.

Initiated in 1946*, the re-survey was taken over by the author from Mr. R. S. Matheson consequent upon the latter's resignation from the Geological Survey of Western Australia in March, 1947.

Fieldwork.

The season's fieldwork started on April 28 and terminated December 15, 1947. The party comprised the author (in charge) and Mr. H. J. Ward (assistant). An instrument man, J. Chapman, was engaged (over and above the normal complement of fieldhands) to assist Mr. Ward.

Two aspects of the season's work were:—

(*a*) *Regional Mapping*, conducted by the author, of which approximately 150 square miles were completed. The writer was withdrawn from the field in September for economic work elsewhere.

(*b*) *Group Mapping*, carried out by Mr. H. J. Ward. Five groups were mapped on a five chain scale and an economic report on a further set of leases was made. The groups and economic report were as follows:—

(i) Three Mile Hill Group;
(ii) Bonnie Vale Group;
(iii) Lord Bob's Group;
(iv) Londonderry Group;
(v) Londonderry Felspar Group;
(vi) Report on Sydenham Leases Nos. 5748-50 inclusive.

Summarising results of 1946 and 1947 field seasons, approximately 350 square miles have been mapped on a regional basis. This leaves approximately 500 square miles to be completed. It is anticipated that more rapid progress will be made next season owing to the fact that a large proportion of the balance consists of soil-covered areas. Group maps, together with reports, have been prepared of the following:—

(i) Bayley's Group;
(ii) Hampton Group;
(iii) Burbanks Group;
(iv) Baker's Find Group;
(v) Three Mile Hill Group;
(vi) Bonnie Vale Group;
(vii) Lord Bob's Group;
(viii) Londonderry Group;
(ix) Londonderry Felspar Quarry Group.

For mining group details these reports should be consulted.

Resulting from work in the northern stretches of Block 59 (Hampton Plains) during the season, it was possible to recommend an area for further prospecting. Messrs. Gordon and Franks have made a find in the structural zone of this area to the west of Block 59 western boundary fence. Work is being carried out on this find and further geological data of interest should result.

The customary demands upon the Survey Party for advice and information were made and met wherever practicable. A suite of local rock types was made available for inspection by interested parties in the office of the Mining Registrar. Coolgardie was visited by the Australian and New Zealand Association for the Advancement of Science on August 17†.

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*Ann. Prog. Rept. G.S.W.A. 1946, R. S. Matheson.

†Ann. Prog. Rept. G.S.W.A. 1947, J. McMath.

Acknowledgments.

The every ready assistance received from the Mining Registrar, Coolgardie, officials of the Western Mining Corporation, Government Chemical Laboratories, Mines Department Drafting Office, and local residents proved most acceptable and the thanks of the Survey Party are hereby expressed. The detailed investigations of Mr. H. J. Ward have been drawn upon for the purposes of this report.

GEOLOGICAL NOTES.

1946 *Results—Recapitulation.*

Regional mapping over some 200 square miles between Bonnie Vale and Londonderry resulted in:—

(i) The definition of the major tectonic and broad geological history of the area;

(ii) the differentiation of the Coolgardie Greenstone Series into alternating, and most probably diachronous, belts of Basic Lavas and Ultra-basic Lavas together with Meta-gabbro belt. As far as could be elucidated, these belts were conformable;

(iii) the recognition of favourable auriferous horizons, within which ore localisation has been largely controlled by cross-folding*.

Work in 1947 has confirmed these findings in a major degree and enlarged the area of their application by approximately 150 square miles. The new country covered lies east of Bonnie Vale to approximately the Mungari Granite and ranges from the 14-mile on the old Coolgardie-Black Flag road to the Barbara and Surprise Leases on Hampton Plains. South-west of Coolgardie work was also carried out in the Cheapside, Grosmont, Londonderry regions. The present notes are, therefore, in large measure an extension and amplification of those for 1946.

*Ann. Prog. Rept. 1946, R. S. Matheson.

Geomorphology.

The absence of adequately contoured maps precludes, at this stage, any but general remarks.

Included in the Salt Lake Division of Western Australia by Jutson*, the district demonstrates his general characteristics, sometimes in a spectacular fashion, as for example the "breakaways" half mile south of the 7-Mile on the Kalgoorlie Road. These breakaways are associated with the "Old Plateau." Standing out as residuals or monadnocks on this "Old Plateau" are Mts. Burgess and Robinson. The former is particularly prominent. The "New Plateau" comprises, in particular, the areas north and east of Bonnie Vale and the country adjacent to Brown Lake on Block 59. On the north-western shore of this lake an old river channel, about two chains wide, can be seen showing pot-holing which is probably late Tertiary in age. This old channel drains to the south.

As pointed out by Jutson, the residual traces of the "Old Plateau" consist largely of greenstones, etc. In addition it has been noted that present drainage patterns in the area have in their major features been controlled by the major structures of the underlying rocks. This is very evident in the northern Block 59 area and again in the Bonnie Vale-Camel Farm regions. It is suggested that more attention to recent physiographic history might prove of value in the search for eluvial, alluvial, and deep lead gold. A study of past and present water tables in relation to mineralisation and secondary enrichment should also prove of benefit.

Sequence of Rock Types.

The broad classification resulting from Matheson's work in 1946 is here reproduced.

*Bull. 95 G.S.W.A. 1934, Physiography of W.A., J. T. Jutson.

Age.	Series.	Description.	Remarks.
Recent		Soils	Various Types.
Tertiary to Recent		Alluvial and Lake Deposits	These deposits may be younger or older than the laterite deposits, and possibly deposits of both ages occur.
Tertiary (?)		Ferruginous Laterite and "Cement" Deposits	The laterites of the State are generally accepted as being of Tertiary age
		Post-Alaskite Movements.	
Pre-Cambrian		Quartz veins, alaskite dykes, and probably the mineral-bearing pegmatites of the Londonderry area and elsewhere	This may possibly represent a second age of granitic intrusion or a regeneration of the granitic magma responsible for auriferous ore deposition.
		Post-Gold Faulting.	
Pre-Cambrian		Intrusive biotite granite and biotite gneiss, associated with which are quartz veins and (?) pegmatite dykes. Auriferous ore deposition is associated with this period of intrusion	Ore deposition is controlled by the regional folding and is also known to occur in places in post-porphyry shears, hence it must be younger than both.
		Regional Folding, Shearing, and Jointing.	
Pre-Cambrian		The porphyry-porphyrite series of acid intrusive sills and dykes	The rocks are folded, sheared and jointed and are, therefore, older than the regional folding. The source magma of these rocks is unknown but was presumably granitic.
		Pre-Porphyry Movements.	
Pre-Cambrian	Sedimentary Series [(?) Black Flag Series.]	Metamorphosed, interbedded erosion sediments consisting of slates, phyllites, mica schists, grits and quartzites, with some greenstone bands	The series is intruded by the porphyry-porphyrite series and by granitic rocks, and appears to conformably overlie the Greenstone Series.
Pre-Cambrian	Greenstone Series [(?) Kalgoorlie Series of Older Greenstones.]	Metamorphosed, alternating, conformable belts of basic lavas and allied rocks and ultrabasics, interbedded with which is a belt of amphibolite and thin bands of slate and mica schist.	The placement of the amphibolite in this series is in accordance with available field evidence, but petrological work suggests that it may eventually be found to be younger in age, and belong to a Quartz-Dolerite period of intrusion.

As recognised, it is not final and an amendment has to be made with regard to the relationship of the putative Black Flag Series (Sedimentary Series) to the Greenstone Series. Whilst the former overlie the latter, well demonstrated in the south-east Camel Farm and north-west Brown Lake areas, the relationship brought out in mapping was one of unconformity as is suspected from the nature of the components of the schistose conglomerate low down in the Sedimentary Series. Many of these components, on lithological grounds, appear to derive from the Greenstone Series. Comparison of this classification with that of Honman* is of interest in that the general historical sequence had already been adumbrated though, whilst recognising different components of the Greenstone Series, no attempt at differention or recognition of their continuity had been made. That this has now been done is the natural outcome of advances in geological science and, also, much improved research techniques. It is desirable to emphasise once again that this classification of rock types is as yet in no sense final.

The Greenstone Series.

This Series, centred about Coolgardie, consists of alternating belts of Basic Lavas, Ultrabasic Lavas, and a Meta-Gabbro, all of which in some measure show the results of a low grade regional metamorphism. Thin and discontinuous horizons of sediments—largely graphitic schists and quartzites—occur at formation junctions and at several horizons between flows in the Basic Lava belts. They are of field use in delineation of structures.

The rock types in the several belts are now commented upon in the light of the season's work:—

(*a*) *Basic Lavas and Allied Rocks.*—Features previously ascribed to these rocks† have continued in the new areas mapped and they show but little variation beyond an increasing paucity of sedimentary horizons. This is particularly the case in the country west of Burbanks.

Blatchford‡ regards a basic porphyritic lava in the Burbanks-Londonderry area as of later age and as an intrusive dyke in the Basic Lavas. This rock is most noticeable by reason of its fine, dark groundmass, large white porphyritic felspars, and method of weathering. Its field characters are that of a surface lava flow rather than that of an intrusion. K. R. Miles§, after work on the Tindal's Leases, regards this rock as possibly a basic extrusic pene-contemporaneous and co-magmatic with the other Basic Lavas.

This basic porphyry has now been recorded elsewhere in the field—quarter of a mile west of the Bell Bird Mine, threequarters of a mile south of the Lord Bobs and, again, two miles west of Londonderry Gold Mine. In its field relations, as far as seen, with regard to its location in the Basic Lavas, it usually outcrops within a hundred yards of the Basic Lava-Ultrabasic Junction. No transgressive criteria have been noted to date. Hence, on micro-petrological grounds as well as field evidence, this basic porphyry cannot be regarded as other than described by Miles.

(*b*) *Ultra Basic Lavas.*—The five belts delineated in 1946|| have been extended along their several strikes and two further belts possessing the same characteristics have been added. These may be referred to for convenience as the "Camel Farm" and "South Cheapside" belts respectively. The Camel Farm belt disappears eastwards beneath the overlying Sedimentary Series. Their exact relation is obscured by heavy soil cover but is, presumably, one of unconformity to judge from evidence elsewhere in the district.

Of note in regard to the Bonnie Vale, South Cheapside, and Camel Farm belts are the following:—

(*i*) *Bonnie Vale Belt.*—This shows a large development of serpentine rock which in sheer zones gives rise to talc schist. Ore deposition may also be associated with these shear zones. Magnesite is found in surface nodules throughout the belt, whilst work on M.Ls. 77 and 78 together with P.A. No. 2015¶ has recorded magnesite seams ranging from 15 to 48 inches in width. The latter has been worked to a depth of 25 feet. Old workings in the neighbourhood also show anthophyllitic asbestos of long harsh fibre. Anthophyllitic asbestos also occurs in the weathered ultra-basic rubble east of the Lord Bobs. It has not been opened up as yet.

(*ii*) *Camel Farm Belt.*—Here the ultra basic rocks are largely composed of actinolitic and tremolitic schists with occasional thin hornblendite horizons. It is expected that a major north-south sheer zone exists here.

(*iii*) *South Cheapside Belt.*—Structurally this belt is the most interesting noted during the season. It consists of a basin whose longer axis is approximately north-east - south-west. The perimeter of the basin consists of serpentine rocks which make up low peripheral hills with an inner and sub-parallel ridge of schistose actinolitic rocks which are remarkable by reason of the profusion of decomposition products, there being opaline silica, cellular quartz together with occasional displays of jasperoid ironstone.

The basin centre is largely alluvium filled but is occupied by an intrusive granite. On contacts of granite with ultra-basic rocks, re-crystallisation of the ultra-basic has taken place with the development of a hard, compact, dark rock consisting of long acicular hornblende crystals. A feature of this granite is the development of pegmatitic apophyses, which are intruded into the ultrabasic rocks. Noted in the north-west of the basin (to the south-west of Grosmont) is an area of granitised ultra-basic rocks. These have not yet been mapped. Whilst the general disposition of the rocks is basin-like, it is not suggested that the structure in detail is so simple; slight evidence has been gained of rather complex drag folding (major and minor) together with zones of shearing.

Apart from the contact phenomena already noted, it was observed that where (throughout the area) ultra basic schists had been intruded by porphyries or granites there was a development of a coarse textured felted actinolite rock along the contact. The width of these selvages is governed by size and temperature of the intrusive at time of emplacement. Float of this nature is a useful guide to the proximity of acid intrusives in the area.

Two types of this actinolitic rock were noted—

(*a*) *Rudely schistose* ultra-basics—the actinolite rock consisted of an aggregate of stellate radiating actinolite crystals. These aggregates are megascopic.

(*b*) *Highly schistose* ultra-basics—actinolite rock consisted of a felted mass of megascopic actinolite needles.

Ore deposition in the area is largely confined to the schistose ultra-basic rocks with their associated porphyry intrusives. Examples are to be found in the Fenian and Reid's Find Leases. The ore bodies consist of quartz reefs with or without associated lode material.

(*c*) *Amphibolite.*—The Amphibolites occasion further comment:—

(a) The term "Amphibolite" was, in the first place, adopted as a field convenience. "Amphibolite" is defined as "a granulose or glomero-blastic metamorphic rock, consisting essentially of amphibole and plagioclase, and often containing quartz, epidote, or garnet."**

The greater part of the Coolgardie greenstones comply with this definition—"amphibolite" now becomes only a portmanteau word and should be abandoned as applied to the rocks in question. The character of these rocks has been summed up by Dr. R. Prider††

*Bull. 56 G.S.W.A., 1914, C. S. Honman.
†Ann. Prog. Rept. G.S.W.A. 1946, R. S. Matheson.
‡Bull 53 G.S.W.A. 1913, T. Blatchford.
§Ann. Prog. Rept. G.S.W.A. 1946, K. R. Miles.
||Ann. Prog. Rept. G.S.W.A. 1946, R. S. Matheson.
¶Ann. Rept. Dept. Mines W.A., R. C. Wilson, 1922.
**A. Holmes, The Nomenclature of Petrology, 1920.
††Ann. Prog. Rept. G.S.W.A. 1946, R. Prider.

as follows: ''Rocks of this group are doleritic to gabbroidal epidiorites derived from an intrusive gabbroidal magma which probably suffered some movement during the final stages of consolidation.''

The present season's work, together with further petrological work by the author, fully supports the above diagnosis. These rocks will, in future, be referred to as ''metagabbros,'' leaving the term ''amphibolite'' to be applied to those rocks answering the definition quoted above, but whose ancestry is uncertain or obscure.

(b) The Meta-gabbro (''Amphibolite'' of 1946) continues as a conformable belt in the Greenstone Series. Whilst the distinction between ''Three Mile Hill'' and ''Mottled'' types can be sustained, the author inclines to the view that these are not separate intrusions but result from differention within one intrusion. Field evidence suggests this but is not conclusive. Textural criteria, together with field relationships (on the Sydenham Leases and elsewhere), give a sill form to this intrusion into the Basic Lavas.

(c) The question of the age of the ''Meta-Gabbro'' still remains open. Prider* inclines to the opinion that it is definitely not part of the Older Greenstone Series and ''may belong to the Younger Greenstone Series, or a still younger group of intrusives.''

Unless subsequent analyses show a magmatic relationship with the Basic Lavas, and in view of apparently similar meta-gabbros in the Mungari area, the author is inclined to concur with Dr. Prider's views and refer the Meta-Gabbro to ''the Younger or a still younger group of intrusives.''

(d) Of interest is the sulphide mineralisation of the Meta-Gabbro, which is exemplified at Three Mile Hill, Sydenham Leases, and Zadows. All yield gold values but in general ore is low grade. Insufficient work has been done to define the nature, extent, controls of the ore bodies but as far as is known they are—

(i) Confined to the Meta-Gabbro-Basic Lava contact.

(ii) Appear to consist largely of sulphide-bearing quartz infilling of fracture systems.

(iii) Some sulphidic replacement of the Meta-Gabbro.

These matters require further investigation both in the field and laboratory. In this connection the results of a geophysical survey† are of interest and further work in connection with this mineralisation should be pursued.

Metamorphism.

The Pre-Cambrian rocks (excepting the granites) of the area have in greater or lesser degree undergone metamorphosis. Three types of metamorphism are discerned—

A. *Regional*—In general this is low grade and has resulted in the production of schistose textures of the rocks together with re-crystallisation. Peculiarly consistent is the schistosity strike, varying but little from 340° Mag. throughout the area. Higher grades of regional metamorphism are encountered where the Ultrabasic belts have been drag-folded. A garnet-vermiculite schist is noted about one mile south-east of the Lord Bobs shaft.

B. *Thermal*—This type is to be seen in two degrees, minor and major—

(a) That associated with the intrusion of porphyries—usually some silicification of adjacent country rock. Should this rock be graphitic or micaceous schists these may be hardened or a hornfels produced.

(b) That associated with the Mungari Granite where a well defined aureole is developed. The granite is intrusive into the micaceous schists (usually more or less graphitic) and grits of the Sedimentary Series. Along the contact, clear cut, are argillaceous schists which have developed chiastolite and andalusite—these grade out into knotenschiefer.

(c) That associated with the granites and leading to granitisation—the production of para-gneiss and migmatites. These effects are well seen in the Sedimentary Series in the Camel Farm area and just to the north of Block 59 east. These para-gneisses are the ''sedimentary porphyries'' of Honman‡, who correctly diagnoses their origin. It is of note that the major axis of the Mungari Granite is parallel to the prevailing strike of the Sedimentary Series and the question arises as to the origin of the granite—whether it is palingenetic or magmatic.

Little gold mineralisation (as far as is known to date) can be associated with this granite apart from that on G.M.Ls. 3799 (The Yonda), 3014 (Great Mogul), 3375 (The Rajah), which lie in the contact aureole. Here the country rock consists of chiastolite and chloritoid schists cut by thin pegmatites transverse to the strike. As far as can be determined, gold was confined to a plexus of quartz stringers paralleling the schistosity. The area is approximately a mile north of Mt. Robinson.

Elsewhere granitisation of ultrabasic and basic rocks has been noted to the north-east of the Lord Bobs Group and also in the south-east of the Camel Farm, where an epidiorite dyke has been affected.

Acid Igneous Rocks.

Acid igneous rocks in the area comprise both major and minor intrusions, namely:—

(a) Porphyry-Porphyrite Series.

(b) South Grosmont Granite, Mungari Granites, and the southern edge (Slate Quarry) of the main Coolgardie Granite together with associated pegmatite phases.

Porphyry-Porphyrite Series.

This series are exhibited in the areas covered during the season and the general characteristics and age relations cited by Matheson§ are maintained. Much hybridisation or contamination can be seen when these dykes are followed along their strike. Those porphyries noted in the Sedimentary Series in the neighbourhood of the Mungari Granite are really of syntectic origin and are not related to the Porphyry-Porphyrite Series as far as at present can be ascertained. It is agreed that the ore deposition associated with the porphyries is purely fortuitous and arises from structural considerations and not from genetic. The evidence for this lies in further field evidence supporting Matheson's conclusions.

Granite and Allied Rocks.

(a) The salient features, without detailed petrology, of the Mungari Granite have been noted in remarks upon thermal metamorphism and a doubt expressed as to the origin of the granite. Further work remains to be done in the area but syntexis of adjacent sediments together with pegmatitic phases have been noted.

*Ann. prog. rept. G.S.W.A., 1946, R. Prider.
†Bureau of Mineral Resources, Geology and Geophysics rept. No. 1947/2.

‡Bull. 56, G.S.W.A., 1914, C. S. Honman.
§Ann. prog. rept. G.S.W.A., 1946, R. S. Matheson.

(b) *South Grosmont Granite.*—Intrusive into a structural basin of ultra-basic rocks and giving rise to some degree of granitisation to the north-west in the Greenstone Series, this biotite granite gives rise to pegmatitic apophyses which are intruded into the adjacent ultra-basics. These pegmatites are medium grained in the main and consist largely of biotite—some muscovite together with microcline and quartz. So far no lithium or beryllium bearing minerals have been observed in them. Future fieldwork should decide whether there is any relation to the Londonderry Felspar body some three miles to the south. Whilst of small width, these pegmatites may be persistent along the strike. To date they may be grouped with the barren pegmatites referred to in last year's Annual Progress Report and referred to the first period of intrusion adduced in the above mentioned report.

(c) *Slate Quarry Granite.*—This outcrops at the Slate Quarry on the Coolgardie-Grosmont road. It is alternatively known as Eight Mile Rocks and consists of the southern margin of the main Coolgardie Granite. Its features and contact phenomena with the Basic Lava have previously been described by Blatchford*. No evidence of assimilation is to be seen here, but the gneissose facies in the Lord Bobs area strongly suggest some incorporation of the ultra-basic rocks.

Pegmatitic apophyses are associated with this granite—one body in the Grosmont area has been worked for lepidolite mica. A community of character of the granites and pegmatites with those of South Grosmont suggest that they are the one and the same body.

(d) *Gneisses.*—These have been referred to under "Metamorphism" and consist of para-gneisses in the area north-west of Mt. Robinson and south-west of the Camel Farm granite.

Other gneissose rocks are, as far as has been noted, merely peripheral facies of the granite. They may be occasioned by assimilation during intrusion of the country rock as at the Lord Bobs, or be late marginal consolidation effects.

Of striking note is the Burbanks garnet-amphibolite gneiss now only to be seen in dumps. This has been commented on previously by Blatchford* and is suggestive of the plutono-metamorphism of Basic Lavas. Associated with this is the spectacular ptygmatic folding of quartz reefs of the Burbanks Main Lode, most excellent photographs of which appear in the above-mentioned bulletin, as also does a petrographic description by Farquharson.

Sedimentary Rocks.

Two classes of sediments occur—

(i) Arenaceous and argillaceous types arising from normal processes of rock destruction.

(ii) Laterites and "Cements" arising from chemical weathering of rocks. In this category come also the decomposition products of the ultra-basic rocks—opaline and cellular quartz. With regard to the latter, it has been noted that decomposition is initiated along joint and cleavage planes and proceeds inwards.

The first category belong to the Pre-Cambrian, where they occur as schists, etc., whilst the second category range in age from Tertiary to Recent.

Pre-Cambrian Sediments.

Two horizons are noted—

(i) *Greenstone Series.*—Graphitic and mica schists, together with thin quartzites (sometimes schistose) are developed at formation junctions and between flows in the Basic Lava belts. Far from continuous over any distance along the strike, they are of value as structural guides.

*Bull. 53, G.S.W.A., T. Blatchford, 1913.

In general these sediments show only low grade regional metamorphism, though where adjacent to intrusives (mainly acid porphyries) they are apt to pass into hornfels, become silicified, or, as in the West Grosmont area. become completely recrystallised and of medium grain whilst preserving their original lamination.

(ii) *Sedimentary Series.*—Developed to the east of Coolgardie in the Camel Paddock-Mungari-Mt. Robinson areas, this series have been correlated tentatively with the Black Flag Series. Their relationship to the Greenstone Series is one of unconformity (seen to the north-west of Mt. Robinson where the Sedimentary Series overlies and transgresses the Greenstone Series). Lithologically, the succession is one of grits, micaceous and quartzose schists, with a schistose conglomerate towards the base. This schistose conglomerate is well exposed at the eastern end of Block 59, Northern Boundary fence. Wherever seen, dips noted have been high and westerly except those which swing with the perimeter of the southern margin of the granite, where the dips become southerly.

Tertiary to Recent Sediments.

These comprise three main types—

(1) *Alluvium*—well developed in the following localities:—

(i) Block 59, north and south of the Surprise-Lady Barbara Leases. Here the drainage is easterly towards Brown Lake.

(ii) Camel Farm, where drainage is north towards the dry lake system of the north-east Coolgardie District.

(iii) East Bonnie Vale-Mt. Burgess area, the drainage is easterly towards a dry lake at the 12 Miles on the old Black Flag-Coolgardie road.

In connection with the drainage system, the following observations are of interest—

(i) In the development of the pattern a large measure of structural control is evident. This is particularly noticeable in northern parts of Block 59 where drainage parallels the anticlinal axis and in the Camel Farm where drainage coincides with the strike of both Greenstone Series and, further east, the Sedimentary Series.

(ii) General maturity of the drainage system and seasonal nature of stream flow.

(iii) Renewal of headward erosion of creeks in areas cut over for firewood and mining timber—especially notable in Three Mile Hill area. This is due to increased run-off.

(iv) The large scale development of sheet flooding —this is nicely demonstrated in the north portion of the Camel Farm in respect to the distribution of quartz on the surface of alluvium and eluvium, also to the south of the Gunga Leases.

(2) *Residual Deposits*—mantling the hill slopes, residual soils gradually merge with the alluvium of the drainage channels. In many places the boundary is quite arbitrary. Consisting of red and brown argillaceous soils (occasionally diagnostic of the underlying rocks) together with arenaceous soils associated largely with granites, gneisses, and portions of the Sedimentary Series, they sometimes, over the flatter areas, show considerable concentration of magnetite grains; sometimes to such an extent that they might be termed ironstone gravels. This is particularly noticeable in the Bonnie Vale district.

As previously remarked, soils in the area often give useful criteria by which the underlying rocks may be

mapped. Floral associations may also provide a useful general guide. The following have been remarked:—

Vegetation.	Rocks.	Remarks.
Saltbush	Basic rocks, *e.g.*, basalt	
Jam Tree	Acid rocks, granite, quartz porphyry	*e.g.*, Mungari, grow "orchard" fashion.
Broom	Sand plains—? granite or gneiss	*e.g.*, Ubini area.
Spinifex	Acid rocks, sediments	*e.g.*, N.E. Camel Farm.

(3) *Laterites.*—Two types are now distinguished—

(i) A high level ferruginous type.

(ii) A low level aluminous type.

The former finds expression about Coolgardie in the "Old Plateau" of Jutson*, where it may be seen capping erosion residuals.

The latter type belongs to the "New Plateau" of the above mentioned author, and is best developed along the western coast of Brown Lake, where it forms receding cliffs or breakaways and derives largely from acid porphyry intrusives and the "Sedimentary Series." This type may prove of future economic value. To date no criteria for a closer age approximation of the laterites, other than that generally accepted, have been found.

STRUCTURAL NOTES.

The season has seen the further delineation of the structural picture put forward by Matheson† and his conclusions, in general, have continued valid.

The structural picture west of the Burbanks-Londonderry line has been noted previously. It would appear that a complex, north pitching syncline has given rise to the semi-basin like topography.

Whilst the major cross-folding appears to be reflected in the Sedimentary Series in the Karramendie-Mt. Robinson area, subsidiary folding developed on the flanks of the major structure is hard to discern—such folding, where seen, is clearly consequent upon the intrusion of the Mungari granite. This granite is intruded parallel with the schist strike of the Sedimentary Series.

Previous findings as to the relative incompetency of of the ultra-basic rocks under regional folding have been sustained as has also, other things being equal, their preferred association with ore deposition. The Londonderry, Fenian, Reid's Find, and Grosmont leases furnish examples.

For types of ore deposition in the district, reference is made to the Annual Progress Report for 1946—no departure from these types has been noticed in the new areas examined.

SUMMARY.

During the 1947 field season, the general geology was mapped over an area of approximately 150 square miles, extending from north of Bonnie Vale south to the Barbara Leases (Block 59) and eastwards to Mungari. To the west, the country between Burbanks and Grosmont has been mapped.

In large measure the work of the previous season (1946) has been substantiated and extended. Detailed group work has assisted mining in general, both companies and individuals, in exploration and development work.

An area in the north of Block 59 was recommended as worthy of further prospecting.

FUTURE WORK.

(1) Completion of regional and group mapping of the area.

(2) Determination of mineral and chemical composition of various ores.

(3) Petrological and chemical examination of representative rock suites from the area.

(4) Investigation, as far as is possible, of secondary enrichment and its relation to past and present water tables.

(5) Examination of economic mineral deposits other than gold.

RECOMMENDATIONS.

(1) The prospecting recommendations made in 1946 are repeated‡ and a further area added: the area is defined as centred on the South Grosmont Granite and extending radially approximately two miles. The recommendation is based upon structural data and lithological data gained this year, together with the known occurrence of gold, e.g. Reid's Find.

(2) Geophysical Survey is recommended to prove structural continuation in the following areas—

(a) Basic Lava—Meta-Gabbro contact northwards through Sydenham Leases. Sulphides are distributed through the meta-gabbro. In view of production of old leases, the definition of a possible sulphide ore body would be of considerable interest. In many respects the problem is similar to that of Three Mile Hill, where good values have been obtained.

(b) Northwards from Bonnie Vale group of mines along the crossfold axis. This axis is rapidly obscured by soil cover and normal prospecting methods do not apply. In view of past production of the area and the desirability of ascertaining the relations between the eastern Basic Lavas and the Sedimentary Series, this is also recommended.

(c) An area covering the Gunga Leases (approximately south of the 5-Mile on the Kalgoorlie road). Some small production has been had in the past—the remarks in (b) above, apply.

PRODUCTION.

Gold and other mineral production for the year 1947 from the area covered by the Survey is as shown on the accompanying tables.

* Bull. 95, G.S.W.A., Physiography of W.A., 1934, J. T. Jutson.

† Ann. Prog. Rept. G.S.W.A., 1946, R. S. Matheson.

‡ Ann. Prog. Rept. G.S.W.A., 1946, R. S. Matheson.

MINERAL PRODUCTION FROM PORTION OF COOLGARDIE DISTRICT OF COOLGARDIE GOLDFIELD DURING, 1947.

MINERALS OTHER THAN GOLD.

Centre.	Mineral.	Tons.	Metallic Content.	Value.	Number of Lease or Claim.	Producer.
			Units BeO.	£		
Londonderry ...	Beryl Ore ...	2·16	25·75	93·35	P.A. 6080	S. A. Duplex.
		24·19	273·82	832·86	M.L. 80 ...	Australian Glass Manufacturers Pty., Ltd.
	Felspar	1,226·00	...	4,291·00	M.L. 80 ...	Australian Glass Manufacturers, Pty., Ltd.

PLATE Nº I

PROGRESSIVE STRUCTURAL GEOLOGICAL MAP OF THE COOLGARDIE DISTRICT COOLGARDIE GOLDFIELD

SHOWING

AREA MAPPED DURING 1946-47 FIELD SEASONS

Scale: 80 Chains = 1 Inch

80 60 40 20 0 80 160 240

Geology by R.S. Matheson April to December 1946.
Geology by J. McMath April to December 1947.

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

K.P.S. 10-3-48

LOCALITY MAP

Scale: 10 Miles = 1 Inch

COOLGARDIE — KUNANALLING DISTRICT GOLDFIELD BDY — KALGOORLIE — EAST COOLGARDIE

BONNIE VALE, COOLGARDIE, BULLA BULLING, BURBANKS, LONDONDERRY

51/80 50/80 49/80 39/80 39/80 40/80

Area surveyed
Area to be surveyed
Lands Lithe, sheet boundary and Nº 50/80

LEGEND

Ferruginous Laterite

Soil covered areas — The nature of the underlying rocks cannot be inferred with any degree of certainty

PRE-CAMBRIAN

SEDIMENTARY SERIES (Probably corresponds with Black Flag Series)

Metamorphosed Sediments. — Consisting of slates phyllites mica schists quartzites and thin bands of greenstone apparently overlying the greenstone series.

GREENSTONE SERIES (Probably corresponds with Kalgoorlie Series)

Metamorphosed Ultrabasic rocks — Fine to coarse grained actinolite schists, actinolite tremolite schists and anthophyllite and serpentine rocks, with local variations to talc chloritic and biotite schists. Decomposition products in the form of magnesite and jaspery ironstone boulders and cellular opaline quartz rubble are scattered over these belts.

Metamorphosed Basic lavas and Allied rocks — Fine to medium grained basic lavas amygdaloidal and pillow lavas, volcanic breccias and agglomerates and probably tuffs

Amphibolite (Metagabbro) — Medium to coarse grained hornblende and hornblende-felspar rocks. At present their origin is doubtful.

Granite, Gneiss, and allied rocks.

REFERENCE

Boundaries assumed

Boundaries approximate

Granite rock 15 M.
Granite rock
Road to Laurdale Hills
Track to Burtonville
N30°E 10 M
10M Road to Kunanalling
MT BURGES. E75.
10 M.
BURGESS Mine
BONNIE VALE
BONNIE VALE
CURIOSITY Gold Mine
ARMIDALE Gold Mine
ALFREDS Gold Mine
SYDENHAM Gold Mine
BELT 5M
5M
5M
DUNALLENS Gold Mine
DRYDENS FIND
H.Z.
KALGOORLIE RAILWAY
MUNGARI
Main Road To Kalgoorlie
COOLGARDIE
Breakaways
N15°E
N40°W
RAJAH AND G.T MOGUL
80°
MT ROBINSON
70
MT ROBINSON BELT
N40°W
THREE MILE HILL Workings
BAYLEYS Gold Mine
COOLGARDIE
70°
BARBARA Gold Mine
70°
SURPRISE Gold Mine
RAILWAY
CALOOLI
COOLGARDIE
CROSS
SOUTHERN
UBINI
HAMPTON
BANHAM Gold Mine
5M
TINDALS Gold Mine
LADY LOCH Gold Mine
TINDALS BELT
LORD BOBS BELT
RAILWAY
ZADOWS Gold Mine
MAYS FIND
MOORES FIND
BELT
GEARS FIND
5M
BAKERS FIND
FRANKS FIND
HAMPTON
COMET HILL
LORD BOBS Gold Mine
BURBANKS Gold Mine
5M
QUEENSLANDER Gold Mine
BURBANKS
HAMPTON
Track
COOLGARDIE
CHEAPSIDE
GROSMONT
LOC. 59
Greenstone
HAMPTON
LOC. 53
10 M.
55
LONDONDERRY Gold Mine
LONDONDERRY
REIDS FIND
Road
ESPERANCE
LONDONDERRY Felspar Quarry
MT ROBINSON BELT?
Road
15 M.
Norseman
GNARLBINE

DURING 1947.

GOLD.

Centre.	Alluvial.	Dollied and Specimens.	Milled or Smelted.		Total Gold.	Silver.	Number of Lease.	Name of Lease or Company.
			Ore Treated.	Gold Therefrom.				
	Fine ounces.	Fine ounces.	Long Tons.	Fine ounces.	Fine ounces.	Fine ounces.		
Bonnievale	....	....	200.55	173.46	173.46	....	5596	Jenny Wren.
	....	....	89.50	69.58	69.58	1.70	4600	Melva Maie.
	....	....	153.75	25.06	25.06	....	....	Sundry Claims.
CENTRE TOTAL	....	....	443.80	268.10	268.10	1.70	....	
Bullabulling*	....	....	....	....	....	....	....	
Burbanks	....	....	483.25	95.00	95.00	....	....	Sundry Claims.
Coolgardie	....	....	224.25	106.49	106.49	....	5637	Caledonia.
	....	....	891.00	352.91	352.91	....	5743	Moya Jan.
	....	....	60.25	12.60	12.60	....	5598	King Solomon.
	....	....	67.75	77.36	77.36	....	5713	Lady Grace.
	....	....	28,085.00	6,784.92	6,784.92	....	5239, etc.	Phoenix Gold Mines. Ltd.
	....	....	50.25	46.56	46.56	....	5622	Lucky Hit.
	....	....	255.00	28.99	28.99	....	5750	Sydenham.
	....	....	25.00	6.39	6.39	....	5729	Quartzite.
	....	....	180.00	41.61	41.61	....	5754	United.
	1.77	....	349.50	103.75	105.52	....	....	Sundry Claims.
CENTRE TOTAL	1.77	....	3188.00	7,561.58	7,563.35	....	....	
Gibraltar	....	....	270.00	68.19	68.19	....	5723	Lloyd George.
	....	....	60.00	12.96	12.96	....	5684	Winston Churchill.
	....	....	52.00	6.95	6.95	....	....	Sundry Claims.
CENTRE TOTAL	....	....	382.00	88.10	88 10	....	....	
Gnarlbine *	....	....	....	....	....	....	....	
Hampton Plains	....	....	553.00	169.25	169.25	1.10	P.P.L. 419, Loc. 59	Chatanooka.
	...	...	17·00	12·78	12·78	...	P.P.L. 338, Loc. 59	Dry Hill.
	...	...	21·75	3·04	3·04	...	P.P.L. 427, Loc. 59	Easter Gift.
	...	...	1,407·75	404·90	404·90	...	P.P.L. 334, 448, Loc. 59	Hampton Gold. Mining Areas.
	...	...	135·50	22·90	22·90	...	P.P.L 435, Loc. 59.	Lady Jess.
	...	...	307·75	84·45	84·45	...	P.P.L. 335, Loc. 59	Lady Marie.
	...	...	19·75	11·18	11·18	...	P.P.L. 1328, Loc. 59	Daniel Finn.
	...	...	11·00	3·82	3·82	...	P.P.L. 454, Loc. 59	Golden Dollar.
	...	...	4·50	1·35	1·35	...	P.P.L. 436, Loc. 59	May.
	...	...	14·75	2·15	2·15	...	P.P.L. 429, Loc. 59	Maureen Anne.
	...	...	15·00	5·57	5·57	...	P.P.L. 437, Loc. 59	Two Crows.
CENTRE TOTAL	...	...	2,507·75	721·39	721·39	1·10	... ...	
Londonderry	...	...	97·00	21·14	21·14	...	... ...	Sundry Claims.
Mungari	...	...	331·25	35·46	35·46	...	5785	Repulse.
	...	1·90	1,033·75	170·61	172·51	...	... ...	Sundry Claims.
CENTRE TOTAL	...	1·90	1,365·00	206·07	207·97	...	... ...	
GRAND TOTAL OF CENTRES	1·77	1·90	35,466·80	8,961·38	8,965·05	2·80	... ...	

* No production.

VISIT TO COOLGARDIE OF AUSTRALIAN AND NEW ZEALAND ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

J. C. McMath.

The Perth meeting of the Australian and New Zealand Association for the Advancement of Science in 1947, had for the Geological Section, a Field Excursion to the Eastern Goldfields based upon Kalgoorlie. The excursion, as part of its programme, visited Coolgardie, where the following locations were visited under the guidance of Messrs. McMath and Ward—

Bayley's Mine—general surface geology.

The Gorge—with reference to the Pillow Lavas.

Three Mile Cutting—with reference to the development of graphitic schists in the Basic Lavas along their contact with the Amphibolite.

Seven Mile, Kalgoorlie Road—with reference to contact metamorphism of sediments by the Mungari Granite.

The visit was very well attended.

CHEYNE BAY BEACH SANDS.

Examination of Dredging Claim 9H.

By J. C. McMath, B.Sc. (Hons. Lond.), F.G.S.

CONTENTS.

APPENDICES.

CHEYNE BAY BEACH SANDS.

Examination of Dredging Claim 9H.

Summary.

(1a) Dredging Claim 9, located at Cheyne Bay, was examined during the period 6th-14th September, 1947. The following matters were undertaken:—

(i) Sampling of beach concentrates.

(ii) General geological observations germane to the matter in hand.

(iii) Estimation of quantities.

(1b) The following conclusions were the outcome:—

(i) Exploitation would prove initially costly in capital expenditure due to the nature of access from landwards, nature of seawards approaches in heavy weather, and the terrain;

(ii) *Exploitation* is likely to be seasonal due to periodic stripping of beach to bedrock during winter storms;

(iii) 75,000 *long tons* of concentrates can only be seen from this claim. It may or may not be replaced with regard to tonnage and grade after seasonal stripping. In my opinion it is a wasting asset. The component from the dunes of 30,000 tons is irreplaceable;

(iv) *A similar tonnage* may be looked for from Dredging Claims 10H and 12H together under the same conditions as above;

(v) *Dredging Claims* 14H-18H inclusive are entirely speculative and unimpressive and require to be supported by adequate hydrographic surveying and sampling;

(vi) It is considered *unlikely*, owing to coastal conditions, that more than 80% of the estimated available tonnage would be recoverable.

2. *Location and Map References.*

(a) Location, Lat. 34° 35′ South;
Long. 118° 50′ East.

(b) Maps, I. Lands Department Litho. 446/80 of 1920;
II. Plates II. and III. for detail.

3. *Communications.*

(a) Roads—

I. 66 miles from Albany. Latter 30 miles of track will not support heavy traffic.

II. 58 miles from Borden. Last 25 miles will not support heavy traffic.

(b) *Sea.*—60 miles from Albany. A landing beach suitable to L.C.T. or lighters at Cape Riche Woolsheds. There is fair holding ground and anchorage under lee of Cheyne Island in S.W. gales. Otherwise it is an open roadstead.

(c) *Air.*—Cape Riche Station has an emergency landing ground for light aircraft.

(d) *Telephone.*—To Cape Riche Station, via Albany.

4. *General Geology.*

The following observations were made:—

(a) The area is comprised of a thickness of some 300 feet of sedimentary rocks (Tertiary), which are horizontally and unconformably disposed on an injection gneiss complex.

(b) These sediments form low vertical and overhanging cliffs, intersected by creek mouths, of height ranging from 40 to 80 feet. They are well though massively jointed, and give rise to large debris at the cliff foot. The cliffs show a marked wave cut notch (High Water Mark).

(c) *The Injection Gneiss* outcrops near Cape Riche Woolshed and again as a low nose along the coast by Black Sand Creek. It is probable that it outcrops on the bay floor. The gneiss comprises acid and basic phases together with a late, well developed pegmatite consolidation phase. The provenance of the beach concentrates is ascribed to this gneiss. Of interest is the monazite content of the pegmatite phase (ref. Appendix 2c).

(d) *The beaches* occupy a narrow wave cut bench and slope seawards at approximately 10 degrees. They find their maximum development at creek mouths. The average width of beach exposed at time of inspection was 30 feet between tide marks. Tidal range was of the order of 6 feet. The beaches are swept clean by winter storms.

(e) *Reefs.*—Offshore reefs parallel the coast but are not continuous over great distances. They offer obstacles to working the beaches from seawards.

(f) *Sand dunes* largely occur as triangular facets on cliffs at creek mouths. Their mineral content comprises the lighter and platy elements of the beach sands. There is ilmenite evenly distributed throughout the dunes, but this decreases northwards.

(g) *Fresh Water.*—Available in small quantities (slightly brackish) by shallow wells to cut sedimentary-gneiss junction. Some small springs occur where this junction is exposed.

5. *Dredging Claim* 9H (ref. Appendices 3-5).

(a) *Location.*

(i) The claim extends 200 chains north of Black Sand Creek to datum peg at Swan Gully and includes both features. Area is 300 acres.

(ii) Northwards D.C. 9H is flanked by D.C. 10H of similar dimensions.

(iii) Southwards it is flanked by D.C. 12H of 120 acres.

(iv) Seawards D.C's. 14H-18H inclusive, are set off controlled by datum peg of D.C. 9H at Swan Gully.

(b) *Communications.*

(i) By rough, obscured bridle track from Cheyne Bay Woolshed. This parallels coastal features.

(ii) By sea from Cape Riche Woolshed.

(c) *Geology.*—The general remarks of paragraph 4 apply in detail. The following further observations were made:—

(i) That major beach sand concentrations occur at creek mouths.

(ii) The abovementioned creeks have been listed for convenience as under—

Black Sand Creek	=	A
1st creek north	=	D
2nd creek north	=	E
3rd creek north	=	G
4th creek north	=	F

(iii) The inter-creek beaches were narrow and largely inaccessible by reason of rock falls, etc. They consisted rather of sand pockets between cliff debris and are largely impracticable to work.

(iv) Apart from vicinity of creeks, average beach width at time of inspection was 30 feet between tide marks approximately.

(v) Water level was at an average depth of 3 feet.

(vi) Economic minerals were concentrated in lenses—one was very persistent at two feet.

(vii) Concentration of economic minerals tails off northwards. This remark applies to all claims as far as could be determined.

(d) *Sampling.*

(i) Was carried out with posthole auger.

(ii) Holes were taken to water level or bedrock.

(iii) Fifty-seven samples were submitted for determination to the Government Chemical Laboratories. Average sample weight was 3.8 lb.

(iv) Identification of samples—refer paragraph 5.

(e) II. The north and south dunes of Black Sand Creek are B and C respectively.

6. *Estimates.*

Were based upon survey and determinations by the Government Chemical Laboratories, and are evaluated in Appendices 2-5 inclusive.

7. *Adjacent Claims.*

The following observations were made:—

(a) The seawards claims D.C. 14H-18H inclusive require adequate surveying and sampling. The impression is gained from tidal phenomena that any concentration of sands would be patchy, liable to scour, and any recovery operations hampered by rocky portions of the bottom.

(b) D.C's. 12H and 10H show the same features as D.C. 9H. It is noted that economic mineral content appears to decrease northwards. It is estimated that D.C. 10H would produce 75% of bulk tonnage of concentrate on D.C. 9H, whilst D.C. 12H would yield approximately 50%.

8. *Conclusions.*

(1) By nature of access and terrain seaward and landward, operation of this claim would prove costly in capital expenditure.

(2) By reason of stripping of beaches during storm season (winter), operation would be mainly seasonal.

(3) On the assumption that the concentrates are replaced by the same tonnage and specifications after removal by weather, the annual output would be of the order of 40,000 tons.

(4) A similar tonnage, under the same conditions, may be looked for from D. Claims 10H and 12H.

(5) D. Claims 14H-18H inclusive, are entirely speculative and unimpressive.

(6) It is considered unlikely, owing to coastal conditions, that more than 80% of estimated available tonnage would be recoverable.

APPENDIX 1 (a).

Government Chemical Laboratories,
Adelaide Terrace, Perth,
4th December, 1947.

The Government Geologist:

I herewith submit the result of an analysis of the ilmenite, Lab. No. 5533/47, occurring in the Cheyne Bay Beach Sands. The sample was prepared as arranged with you in discussion by bulking the fractions of ilmenite obtained by magnetic separation from Lab. Nos. 4482/47-4489/47 and 4507/47-4538/47. This bulked sample contained small amounts of impurities of other minerals and was further purified as follows:—

The bulked sample was quartered to produce a sample of convenient size. This portion (weight 16.74 gramme) was separated first with methylene iodine S.G. 3.3 and the heavy fraction again separated with clerici solution S.G. 4.2.

The fraction S.G. less than 3.3 consisted mainly of quartz with a little black mineral (0.04 gm.). The fraction S.G. less than 4.2 consisted of approximately equal parts of pink garnet and ilmenite or nigrine (0.65 gm. in weight).

The final heavy fraction consisting almost entirely of ilmenite was ground through a 90 mesh screen for analysis.

Analysis.	Per cent.
TiO_2	52.12
FeO	29.04
Fe_2O_3	16.15
MnO	1.61
SiO_2	0.18
CaO	Nil
MgO	0.28
Cr_2O_3	0.04
V_2O_3	0.14
P_2O_5	Not detected.
Total	99.56

Analyst: J. D. Hayton.

(Sgd.) H. P. Rowledge,
Director.

APPENDIX 1 (b).

Government Chemical Laboratories,
Adelaide Terrace, Perth,
28th November, 1947.

Report on the Examination of Fifty-Seven Samples of Beach Sands from Cheyne Bay Beach, Cape Riche, for the Government Geologist, Perth.

Location.—Black Sand Creek, Cheyne Bay, Cape Riche.

Lab. No.	4482	4483	4484	4485	4486	4487	4488	4489
Marks: G.S.Ch.	A1	A2	A3	A4a	A4b	A5	A6	A7
	Beach Sand							
Minerals—	Approximate Percentages.							
Ilmenite	56	39	29	48	34	52	55	50
Quartz	23	32	28	22	30	19	16	12
Zircon	15	13	27	17	9	18	18	19
Garnet	1	6	3	4	3	3	4	9
Nigrine	2	3	3	*	1	*	*	7
Shell grit	2	2	4	2	†	2	2	1
Magnetite	*	2	2	2	2	2	2	2
Leucoxene	*	*	2	*	*	2	1	1
Staurolite	*	1	*	2	*	*	*	*
Hypersthene	*	1	*	*	*	*	*	*
Monazite	0.2	0.2	0.2	0.2	0.1	0.3	0.3	0.4
Common spinel	*	*	*	*	*	*	*	*
Green spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

* present in amounts less than 0.5 per cent. † shell grit plus clay. ‡ some rutile in addition to nigrine.

Composite Samples.

Location.—Black Sand Creek, Cheyne Bay, Cape Riche.

Lab. No.	4490–93	4494–5	4496–7	4498–4502	4503–6
Marks	C8a–C8d	C9a–C9b	B10a, B10b	B11a–B11e	B12a–B12d
	Sand Dunes				
Minerals—					
Ilmenite	42	47	20	45	45
Quartz	41	27	65	49	29
Zircon	14	15	2	2	12
Garnet	2	3	3	3	7
Nigrine	*	2	1	*	1
Shell grit	*	1	3†	*	1
Magnetite	*	1	1	*	*
Leucoxene	*	2	2	*	2
Staurolite	*	*	*	*	*
Hypersthene	*	*	*	*	*
Monazite	0.2	0.3	0.2	0.3	0.2
Common spinel	*	*	*	*	*
Green spinel	*	*	*	*	*
Felspar	*	*	*	*	*
Tourmaline	*	*	*	*	*
Hornblende	*	*	*	*	*
Limonitic pebbles	*	....	....	....	....

Location.—D. Creek, Cheyne Bay, Cape Riche.

Lab. No.	4507	4508	4509	4510	4511	4512	4513	4514
Mark: G.S.Ch.	D13	D14	D15	D16	D17a	D17b	D17c	D18
	Beach Sands							
Minerals—	Approximate Percentages.							
Ilmenite	45	53	44	58	54	58	60	56
Quartz	12	7	28	10	10	10	7	14
Zircon	14	23	13	13	20	21	20	19
Garnet	12	5	7	6	5	3	4	4
Nigrine	9	5	3	7	4	2	4	2
Shell grit	2	2	2	1	1	1	*	1
Magnetite	3	2	1	1	2	2	2	1
Leucoxene	*	1	*	1	2	1	1	1
Staurolite	1	*	*	1	*	*	*	*
Hypersthene	*	*	*	1	*	*	*	*
Monazite	0.1	0.4	0.2	0.1	0.2	0.5	0.9	0.2
Common spinel	*	*	*	*	*	*	*	*
Green spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

Location.—Cheyne Bay, Cape Riche.

Lab. No.	D. Creek 4515	4516	4517	E. Creek 4518	4519	4520	4521	4522
Mark : G.S.Ch.	D19	D20	D21	E22	E23	E24	E25	E26
	Beach Sands							
Minerals—	Approximate Percentages.							
Ilmenite	36	37	54	36	23	24	42	28
Quartz	34	35	13	37	57	57	23	49
Zircon	13	11	15	10	8	5	18	8
Garnet	6	7	7	4	2	2	4	4†
Nigrine	3	3	3	4	2	3	3	3
Shell grit	2	2	1	3	5	5	2	3
Magnetite	2	2	2	1	1	1	1	1
Leucoxene	2	1	2	3	1	3	6	3
Staurolite	1	1	1	*	*	*	*	*
Hypersthene	*	*	*	*	*	*	*	*
Monazite	0.2	0.1	0.2	0.1	0.2	0.05	0.1	0.1
Common spinel	*	*	*	*	*	*	*	*
Green spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

Location.—F. Creek, Cheyne Bay, Cape Riche.

Lab. No.	4523	4524	4525	4526	4527	4528	4529	4530
Marks	F27	F28	F29a	F29b	F30	F31a	F31b	F32a
	Beach Sands							
Minerals—	Approximate Percentages.							
Ilmenite	18	36	41	44	50	14	3	12
Quartz	59	37	32	31	20	71	89	75
Zircon	7	14	15	14	18	4	1	3
Garnet	3	3	4	3	2	2	*	2
Nigrine	5	4‡	2‡	1‡	2‡	2‡	*	2
Shell grit	4	3	2	2	2	4	6	4
Magnetite	*	1	1	1	1	*	*	*
Leucoxene	2	1	2	2	3	2	*	1
Staurolite	*	*	*	*	*	*	*	*
Hypersthene	*	*	*	*	*	*	*	*
Monazite	<0.05	0.2	0.1	0.1	0.3	<0.05	<0.05	<0.05
Common spinel	*	*	*	*	*	*	*	*
Green spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

Location.—Cheyne Bay, Cape Riche.

Lab. No.	F. Creek 4531	4532	4533	G. Creek 4534	4535	4536	4537	4538
Marks : G.S.Ch.	F32b	F32c	G33	G34	G35	G36	G37	G38
	Beach Sands							
Minerals—	Approximate Percentages.							
Ilmenite	28	29	12	15	34	33	28	41
Quartz	52	46	74	69	43	39	48	28
Zircon	8	11	3	4	11	13	12	15
Garnet	3	3	1	2	3	2	3	5
Nigrine	1	2	1‡	1‡	2‡	2‡	2‡	2‡
Shell grit	3	3	6†	4	3	6†	3	2
Magnetite	1	1	*	1	1	1	1	1
Leucoxene	3	3	2	3	1	2	2	4
Staurolite	*	1	*	*	*	*	*	*
Hypersthene	*	*	*	*	*	*	*	*
Monazite	0.1	0.1	0.1	<0.05	<0.05	0.3	0.2	0.3
Common spinel	*	*	*	*	*	*	*	*
Green spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

In addition to the minerals listed above, the following minerals occur scattered sporadically through the sands : epidote, zoisite, kyanite, sillimanite, topaz.

(Sgd.) H. P. ROWLEDGE,
Director.

APPENDIX 1 (c).

Government Chemical Laboratories,
Adelaide Terrace,
Perth.
19th December, 1947.

Determination of Three Samples for the Government Geologist, Perth.

No.	Private Mark or Description.	Result of Examination.
	Samples of injection gneiss from Cheyne Bay Beach, Cape Riche.	
4539	G.S.Ch X39. Woolshed Point	Coarsely crystalline rocks consisting of labradorite, microperthitic microcline and quartz with small amounts of hornblende, hypersthene, biotite, magnetite and ilmenite and very small amounts of apatite and zircon. A little perthite noted.
4540	G.S.Ch. X40. Woolshed Point	Very coarsely crystalline rock consisting mainly of microperthitic microcline and quartz, with the following accessory minerals: hypersthene, biotite, hornblende, magnetite, ilmenite, apatite and zircon.
4541	G.S.Ch. X41. Woolshed Point	Coarsely crystalline rocks consisting of oligoclase, microperthitic microcline and quartz with the following accessory minerals: biotite, hornblende, hypersthene, magnetite, ilmenite, apatite, sericite, staurolite, tourmaline, garnet, MONAZITE and pyrite.

(Sgd.) C. R. LEMESURIER,
Deputy Government Mineralogist.

APPENDIX 2.

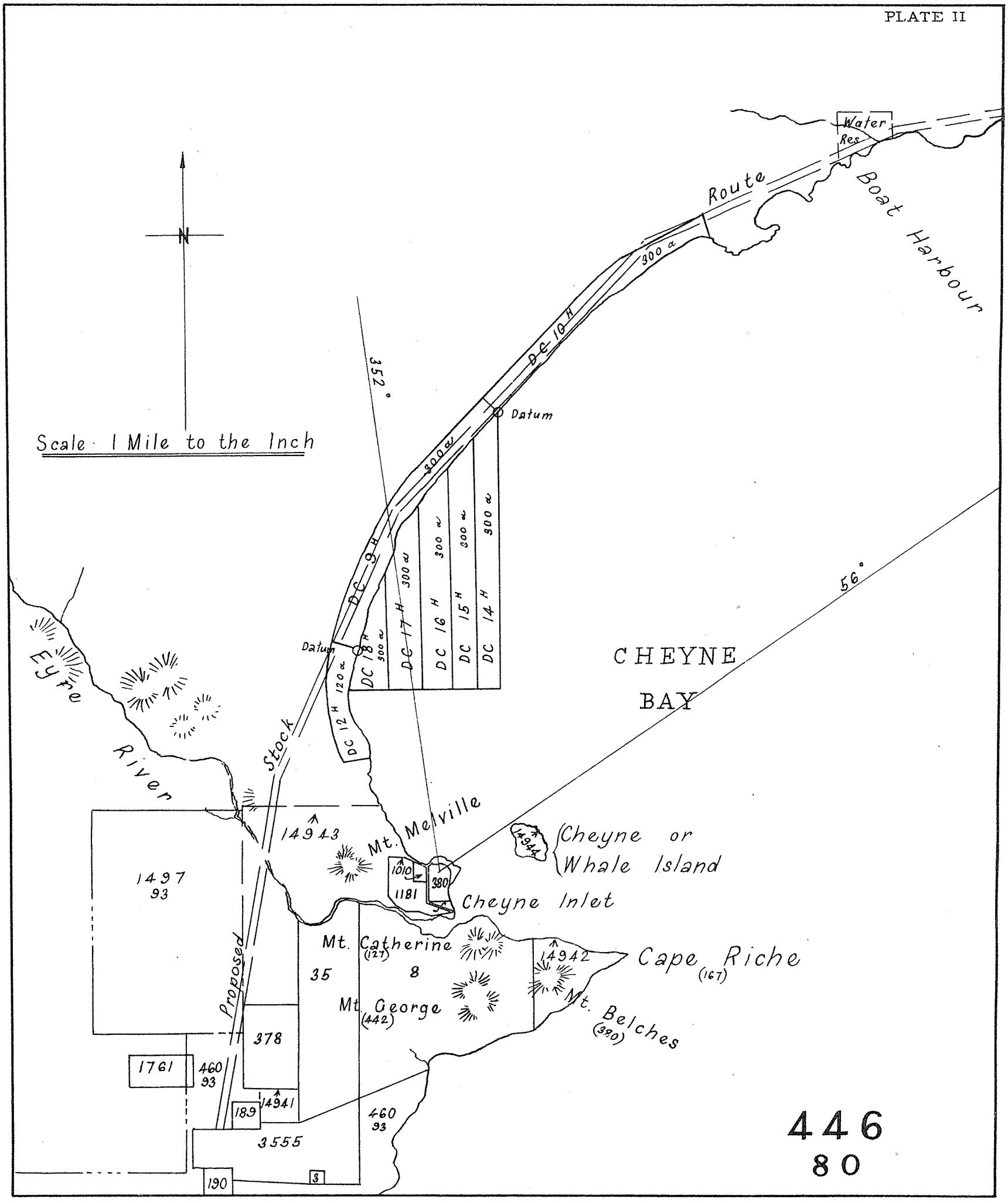
Estimates of available gross long tons of Cheyne Bay D.C. 9 Beach Sands.

Beach.*	Area.	Depth. Water or Bedrock Average.	Volume.	Approx. Long tons Concentrates.
	sq. chns.	feet.	cubic yds.	
Black Sand Creek	13	3	6,190	9,200
D Beach	10	3·5	5,700	8,400
E Beach	10	2·5	4,000	5,900
G Beach	12	3	5,800	8,500
Swan Gulley F	4	4·5	2,900	4,300
Inter Creek Strips	12 approx.	3	5,800	8,500
TOTALS	61	...	30,390	44,800

* Arranged South to North.

All Dunes.	Area.	Depth to Bedrock.	Volume.	Approx. Long tons Concentrates.
	sq. chns.	feet.	cubic yds.	
All Dunes	55	7	2,200	31,000

PLATE II


N
Scale · 1 Mile to the Inch
Water Res
Route
Boat Harbour
352°
DC 10 H
300 ∝
Datum
300 ∝
DC 9 H
DC 18 H
300 ∝
DC 17 H
300 ∝
DC 16 H
300 ∝
DC 15 H
DC 14 H
DC 12 H
120 ∝
56°
CHEYNE
BAY
Eyre
River
Stock
Proposed
14943
Mt. Melville
14944
Cheyne or
Whale Island
1010
1181
380
Cheyne Inlet
1497
93
Mt. Catherine
(127)
35
8
14942
Cape Riche
(167)
Mt. George
(442)
Mt. Belches
(380)
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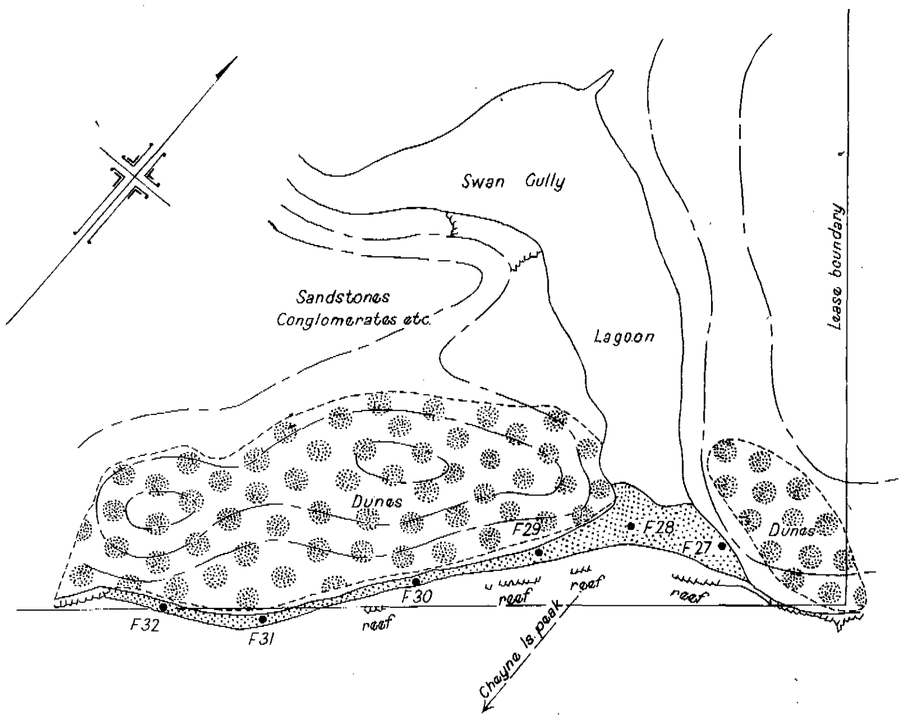
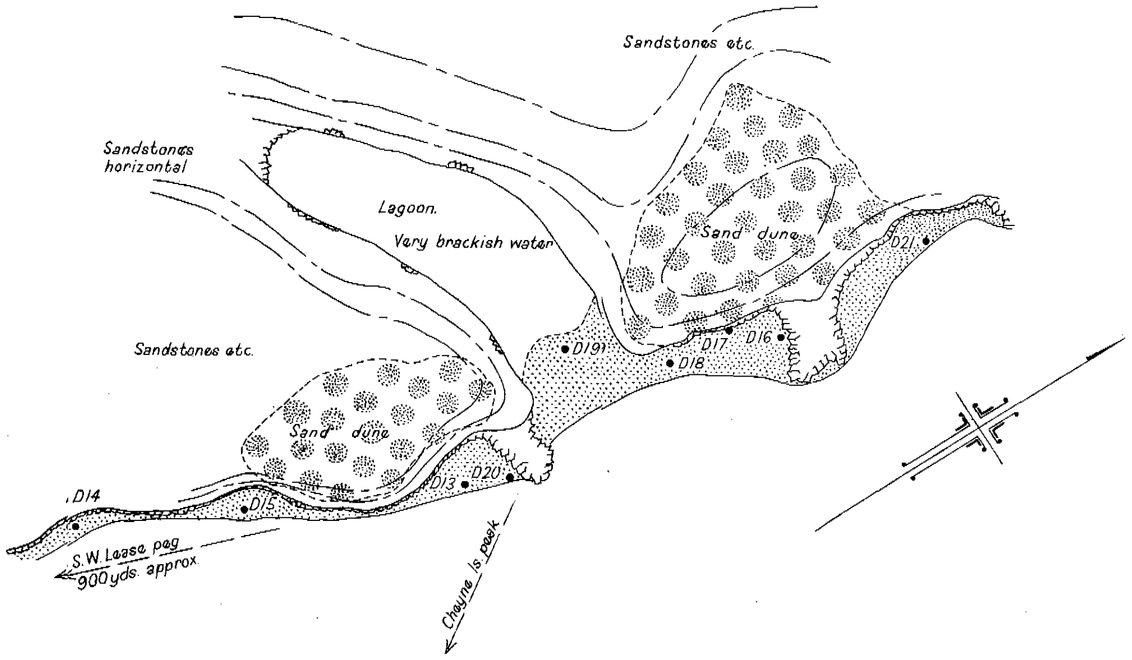
1761
460
93
14941
189
3555
460
93
190
3
446
80



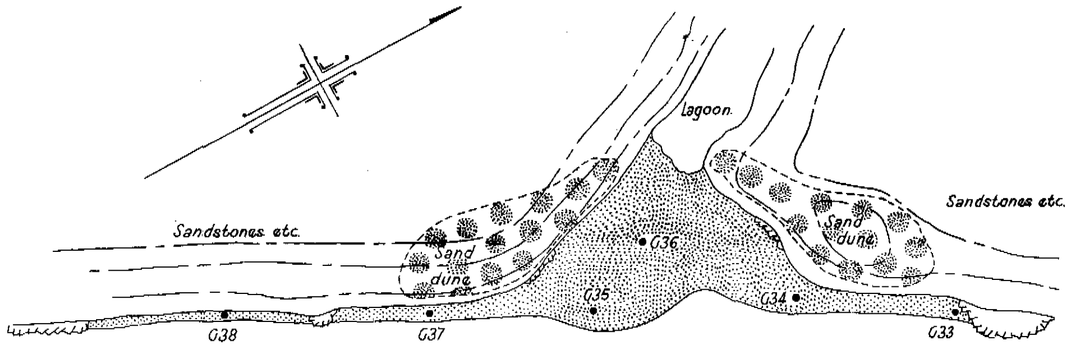
'F' BEACH *(SWAN GULLY)*

Sediments: horizontal. Vegetation: low mallee and grass



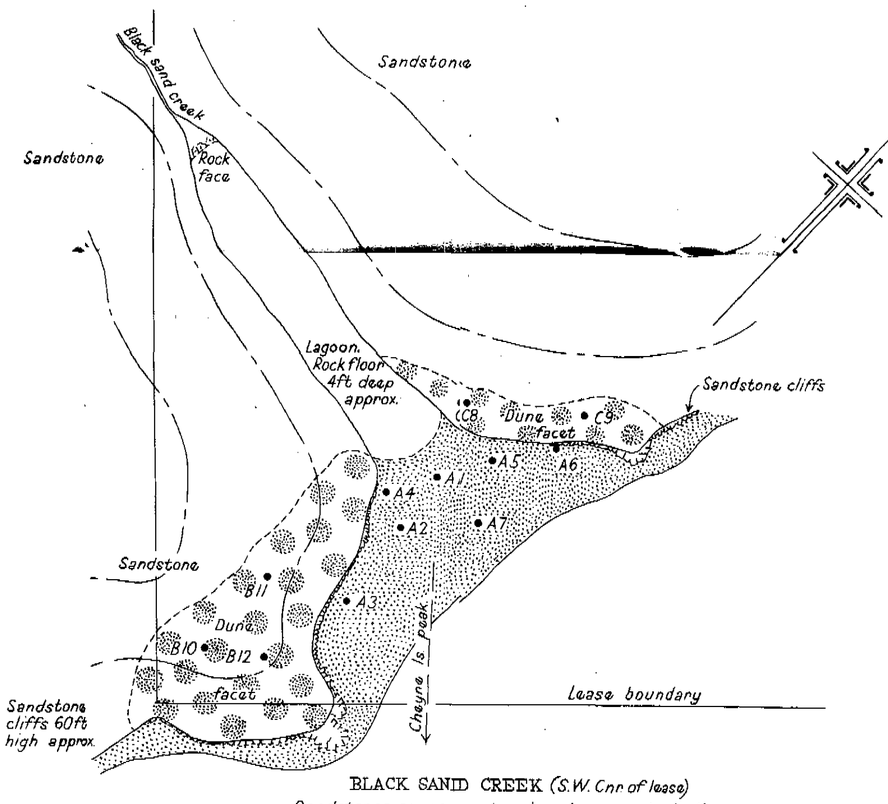
'D' BEACH

Sandstone etc. horizontal. Vegetation: Low mallee, pig face et-cetera
Cliffs average 30 to 40 feet high.



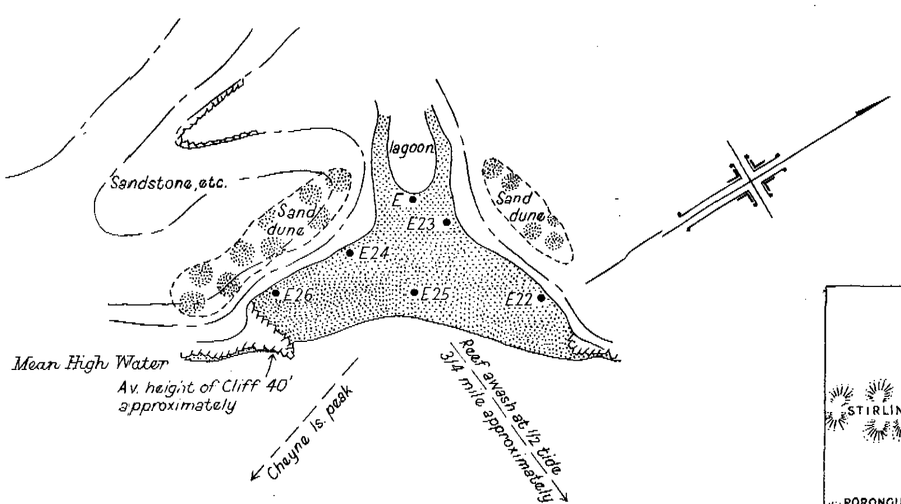
'G' BEACH

Sediments: horizontal. Vegetation: low mallee.



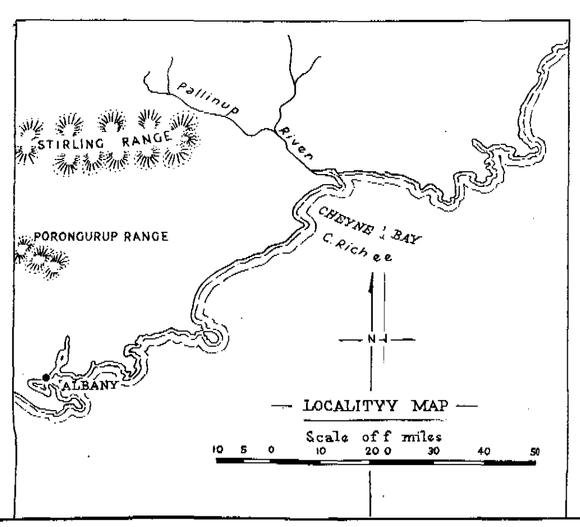
BLACK SAND CREEK *(S.W. Cnr of lease)*

Sandstones appear estuarine. Low westerly dip.
Vegetation: Low mallee, scrub, hakea.



'E' BEACH

Sandstone horizontal. Vegetation: Low mallee, and grass.



GEOLOGICAL MAP

OF

D.I.C.9. CHEYNE BAY

Approxx. 60 miles North East of Albany

Scale of chains.

2 1 0 2 4 6 8

Sampling points shown thus: • A2

Survey and geology by J.McMath. Sept 1947.

APPENDIX 3.

Dredging Claim D.C. 9.

Beach.*	Average Determination Results (% by weight).							
	Ilmenite.	Zircon.	Nigrine (Ferruginous Rutile).	Leucoxene.	Monazite.	Magnetite.	Quartz.	Garnet.
	%	%	%	%	%	%	%	%
Black Sand Creek	45·4	17	2	0·7	0·25	1·75	22·5	4
D Beach	50·5	16·5	4	1·0	0·28	1·8	16	6
E Beach	30·6	9·8	3	3·2	0·11	1·0	44·5	3
G Beach	27·1	9·6	1·7	2·3	0·2	0·8	45	2·7
Swan Gully F	27·5	9·5	2·1	1·9	1·1	0·6	53	2·5
Inter Creek Strips	36·25	12·9	2·56	1·76	0·39	1·2	36·3	3·7
Bulk Average	36·2	12·5	2·6	1·8	0·38	1·16	36	3·5

* Arranged South to North.

All Dunes	Ilmenite.	Zircon.	Nigrine (Ferruginous Rutile).	Leucoxene.	Monazite.	Magnetite.	Quartz.	Garnet.
	%	%	%	%	%	%	%	%
All Dunes	32 (approx.)	8	0·8	1·0	0·19	0·2	49	2·8

APPENDIX 4.

Estimates of Economic Mineral Content of D.C. 9.

Beach.*	Long Tons.	Approximate Long Tons.					
		Ilmenite.	Zircon.	Nigrine. (Ferruginous Rutile).	Leucoxene.	Monazite.	Garnet.
Black Sand Creek	9,200	4,176	1,564	184	64	23	368
D Beach	8,400	4,242	1,386	252	84	23·5	151
E Beach	5,900	1,805	578	177	189	5·5	177
G Beach	8,500	2,303	816	143	197	33	313
Swan Gully F	4,300	1,192	408	90	82	47	107
Inter Creek Strips	8,500	3,081	1,096	121	150	13	313
Bulk Tonnages	44,800	16,799	5,848	967	766	145	1,429

* Arranged South to North.

Estimated available tons Ilmenite 16,800
Estimated available tons TiO_2 ... ... 9,400 approx

All Dunes.	Long Tons.	Ilmenite.	Zircon.	Nigrine (Ferruginous Rutile).	Leucoxene.	Monazite.	Garnet.
All Dunes	31,000	9,900	2,480	248	31	58	868

Estimated available tons Ilmenite 9,900
Estimated available tons TiO_2 ... ... 6,600 approx.
Estimated total available tons Ilmenite 26,700
Estimated total available tons TiO_2 ... ... 16,000 approx.

NOTE ON THE OCCURRENCE OF MONAZITE IN PEGMATITES AT CAPE RICHE.

Location.

(a) Latitude 34° 35′ South; longitude 118° 50′ East.

(b) Ref. Lands Department Litho 446/80 of 1920.

General.

In the course of examination of Cheyne Bay Beach Sands, which carry Monazite in the mineral assemblage, the local basement rocks were cursorily inspected to determine the provenance of the Cheyne Bay Beach Sands.

Ref.: Cheyne Beach Sands Report—Appendix 2 (b).

The sampling of injection gneisses exposed at Cape Riche Station Woolshed resulted from this inspection. These samples were submitted to the Government Chemical Laboratory and it was found that the mineral assemblage of the beach sands derived from the injection gneiss and its pegmatitic phases.

Ref.: Cheyne Bay Report—Appendix 2 (c).

Gibb-Maitland mentions that the gneiss of Cape Riche is intersected by pegmatites.*

The Injection Gneisses.

These gneisses form the basement of the terrain and are overlain elsewhere along the coast unconformably by Kainozoic sediments and beach sands. They outcrop well at Cape Riche Station Woolshed and show the following features:—

(a) Well defined alternations of highly contact metamorphosed sediments, together with some permeation of granitic material, and granite.

(b) The strike of the banding is 65° Mag. with a high dip at 335° Mag.

(c) The average width of the bands is about twelve inches.

(d) Contemporaneous folding of small (but megascopic) amplitude together with small scale faulting, both normal and reverse.

(e) In some places stoping by pegmatic residues of the intrusive granite into the basic beds together with assimilation in various stages is seen.

(f) Whilst the pegmatites tend to occupy the fault zones, well defined walls are rarely seen.

Conclusions.

(a) To judge from the distribution of Pre-Cambrian rocks in the area, this occurrence represents the last traces of a sedimentary roof pendant submerged in a cupola of a major granite intrusive. The development of staurolite, hypersthene, garnet and spinel are significant in this connection as also are the presence of tourmaline and monazite.

(b) In view of the importance strategically of monazite a further more detailed examination of these pegmatites should be considered.

COLLIE COAL FIELD.

Geological and Geophysical Survey.

Summary of Economic Results.

By H. A. Ellis, B.Sc., A.O.S.M. and J. H. Lord, B.Sc.

The results of the Geological and Geophysical Survey of Collie from an economic aspect are briefly set out below:—

GEOLOGICAL RESULTS.

1. The Geological Survey revealed that no further information of major economic importance could be obtained without core-recovering methods of boring.

2. *Colliery Coal.*

(a) The main objective of the Survey, namely, the estimation of coal reserves and their disposition, was not reached. At the commencement of the Survey it was not anticipated that it would be reached without conducting a programme of deep boring.

(b) There is no possibility of further seams being economically worked below those already being exploited in the existing collieries. However, there is the possibility of these seams recurring in the two new depressions recognised in the basement by the Geophysical Survey (see later). This can only be determined by deep boring.

(c) There are no workable coal seams in the sequence of strata above the seam being worked at Cardiff.

(d) It is not possible to anticipate the position of any further major faults which might interfere with current mining operations. Deep boring is required to determine the behaviour of the seams at depth.

(e) No definite information is available yet to enable a correct correlation of seams along the strike; only boring can do this.

(f) Deep boring is required to prove the extension of the coal seams down the dip, and enable an estimate of the life of the existing mines to be made.

3. *Open-Cut Coal.*

Much information has been added to the knowledge of potential shallow coal, such as, (a) drilling at Ewington; (b) report on possible open-cut sites already submitted which blocked out approximately 900,000 tons of indicated coal.

Further shallow boring carried out in the light of knowledge gained during the survey should prove further suitable open-cut coal.

4. *Area and Depth of Coalfield.*

(a) The Geological and Geophysical Surveys have more clearly defined the boundary of the coalfield. In some places it has been extended, while in others it has been contracted, the net result being that the total area remains approximately the same. The main extension likely to contain coal was to the north of Shotts; this area requires boring.

(b) No new information regarding the thickness of possible coal bearing sediments was obtained geologically, this being possible only by deep boring.

GEOPHYSICAL RESULTS.

1. Although no official report has yet been received (July 18, 1947), it will reveal that no further information of major economic value can be obtained without core-recovering methods of boring.

2. Coal locating technique did not form part of the process of geophysical surveying as carried out at Collie; hence the standard procedure of verification of geophysical results by boring will be necessary before any further use can be made of the Geophysical Survey of the Collie Coalfield.

3. *Colliery Coal.*

No information obtained.

4. *Open-Cut Coal.*

No information obtained.

5. *Area and Depth of Coalfield.*

(a) Surface area is as stated in the Geological results (see paragraph 4 (a) above).

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*Gibb-Maitland, A., The Country between Cape Riche and Albany.
Ann. Prog. Rep. G.S.W.A. 1898 p. 31.

(b) The only underground information produced by this survey will be the approximate contours of the Pre-Cambrian basement and the approximate thickness of the sediments, both of which are most valuable but require deep-boring for verification before the results can be applied. There will be NO information regarding depth or thickness of coal seams contained in the report.

(c) This survey established the probable existence of depressions in the Pre-Cambrian basement NOT previously recognised, but which were known to be a part of the coal measures. One depression is centred about one mile north of Shotts, and the other about two miles west-south-west of Muja. These depressions will need to be deep bored to discover if coal is present or not.

NECESSITY FOR DEEP BORES AT COLLIE, W.A.

By J. H. Lord, B.Sc.

With fieldwork completed at Collie and preparations made for a complete geological report on the coalfield, the necessity of carrying out a deep boring programme becomes a pressing problem. Although this was recommended by previous reports, the boring has been continually postponed. Information from the boring, without which the advancement of the coalfield may be jeopardised, should be obtained with as little delay as possible.

The survey which has just been completed, has investigated the coalfield by many and varied means, both on the surface and underground. This knowledge cannot be used to full advantage without further data of the greater depths, obtainable only by deep boring.

The available tonnage of coal at Collie is one of the main results required from this survey. This task was attempted previously by Drs. Jack and Woolnough and Mr. Wilson, their result being 310, 3,500 and 1,500 million tons respectively. Although almost the same scanty deep bore information was available to each of them, there is a wide discrepancy in their estimates. This was probably brought about by varying methods of computation due to the lack of deep bore information, and it will continue until the necessary information is obtained.

The present collieries, with the exception of Wyvern, are all approaching the end of their lives. In consequence, deep shaft mining will have to be started within the next few years; before this can be done deep boring will be required.

To reap the full benefit of the Gravimetric Survey of the coalfield deep boring is required, as the latter finds the depths and proves the structures disclosed by the gravimetric work.

It is urged that a preliminary programme of deep boring as detailed below, be commenced at the earliest possible time. This programme consists of 12 deep holes to the Pre-Cambrian basement; the first six of these holes are in positions suggested by Mr. N. G. Chamberlain, geophysicist, for the purpose of interpreting the gravimetric results, and also correspond with positions of great geological value; the remainder are in positions where the geological information of the sequence and depth of seams is required. These will be an advantage to the geophysicists also.

As the preliminary programme continues, a careful study of results may lead to certain modifications and indicate at the same time the positions requiring further boring. For such an extensive programme of boring as this, upon which the future development of Collie depends, it is considered that the acquisition of a Government plant would be preferable to contract boring.

PROPOSED PRELIMINARY DRILLING PROGRAMME.

Hole No.	Approximate Position.	Depth of Hole.*	Object.†
		Feet.	
1	Near N.W. corner of Loc. 1314	1,800	To test N.W. portion of field.
2	Near S.W. corner of Loc. 1851	1,200	To test existence of ridge in Pre-Cambrian floor.
3	Middle of southern half of Lease 275	1,900	To test possibility of a small N.E. basin.
4	N.E. corner of Lease 135	700	To test existence of a ridge in granite floor.
5	Midway along western boundary of Lease 299	2,000	To test possible eastern basin.
6	N.E. corner of Lease 128	2,700	To test deepest portion of basin.
7	N.W. corner of Lease 228	2,300	do. do.
8	S.W. corner of Lease 127	2,500	do. do.
9	Middle of northern half of Lease 224	2,000	To test area S.W. of Cardiff.
10	Middle of southern half of Lease 48	2,500	To test Collie-Burn area.
11	Midway along western boundary of Lease 74	2,200	To test area between Stockton and Collie-burn.
12	Middle of Lease 152	1,900	To test area between Griffin and Collie-Burn.
	Total	23,700	

* These depths are only for general guidance and may be subject to an error of at least 25 per cent.

† Object in addition to acquiring vital information regarding depth and sequence of coal seams.

Note.—The estimated depths given above are based on geological interpretation.

AN ESTIMATE OF SHALE AVAILABLE NORTH OF STATE BRICKWORKS AT BYFORD.

By J. H. Lord, B.Sc.

This area was mapped and described by H. J. Ward of the Geological Survey in 1945 (see W.A. Mines Department Annual Report, 1945, page 103), and the map referred to in this brief report is Plate XV of Ward's report.

The map shows that the shale in this area is disturbed by an infold of older basic rock and an intrusion of younger basic rock, which creates quarrying difficulties. The main block of shale, occurring between N1600 and N2000, can be extracted by working southwards from the 250 foot contour line.

It is unlikely that the shale between the older basic infold and sandstone can be extracted economically. The narrow strip between the older basic rock and the younger basic nose could be extracted. However, in winter a water problem would be experienced due to the presence of a creek. It is considered that the best method of attempting to extract this shale is to continue the present quarry northwards around the nose of younger basic rock as far as it is possible to work economically.

A bore (log below) was put down at co-ordinate position N1640, E460 with an approximate reduced level of 295 feet. This bore showed that the sandstones dip at 46 degrees to the west and that the older basic rock does not dip to the north under the shale.

Two estimates have been made. The first is of the block of shale between N1600 and N2000, and the second is of the narrow strip of shale between N1600 and N1400 which may be difficult to recover. A 70° batter has been allowed where the side of a quarry would not be defined by a geological boundary.

Between 1600N and 2000N: 60,000 cubic yards.

Between 1600N and 1400N: 14,000 cubic yards.

was recommended in order to fulfil the third requirement. Boring commenced on 30th October and was completed on 15th December, 1947, during which time the writer exercised geological supervision. A contoured geological map (Plate IV) was constructed on a scale of 100 feet to one inch using a plane table and telescopic alidade. Five transverse and two longitudinal sections (Plate V) were drawn. Due to the scale used, no attempt has been made in these sections to show the thickness of surface soil.

BORE AT STATE BRICKWORKS, BYFORD (POSITION: N1640, E460 ON WARD'S MAP).

R.L. 295 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—39	Shale	5	Cream. Powdered and pieces of shale	Chips of grey shale	From To Surf.—22	Grey shale.
39—55	Sand	10	do. do. do.	do. do.	22—39	Blue Shale.
		15	do. do. do.	Chips of grey shale and few of reddish-yellow shale	39—55	Sandstone.
		20	do. do. do.	Chips of grey and greyish brown shale		
		25	Grey. Powdered and pieces of shale	Chips of bluish-black shale		
		30	Greenish-grey. Powdered and pieces of shale	Chips of greenish and bluish-black shale		
		35	do. do. do.	do. do. do.		
		40	Yellowish. Sand, chips of quartz and shale	Sand and quartz chips. Also some chips of bluish-black shale		
		45	Yellow. Sand, chips of quartz and shale	Pieces of quartz and/or quartzite and a few worn pieces of shale together with sand		
		50	Yellowish-cream do. do.	do. do. do.		
		55	Cream .... do. do.	do. do. do.		

GEOLOGICAL INVESTIGATION OF A PORTION OF LOCATION 521 AT BYFORD FOR BRICK-MAKING MATERIALS.

By J. H. Lord, B.Sc.

This investigation was carried out to satisfy the following requirements:—

(i) To define the geology of the block with particular reference to shale and clay.

(ii) To make a contour survey of the block.

(iii) To estimate the quantity of shale and clay available for brick-making.

General Information.

The block under discussion is the eastern portion of Cockburn Sound Location 521, South-Western Division (Certificate of Title Volume 1002, Folio 282, Plan 5063), which was purchased by the State Brick Works in 1928; it comprises 42 acres 3 roods 28 perches.

The block is situated immediately to the north and north-north-west of Millar's Cardup brick works and approximately one mile south-south-west of the existing State Brick Works' quarry. The block may be reached by leaving the South-West Highway just south of Byford townsite and travelling east along Hills Road for half a mile. From here, after entering Location 498, a bush track is followed eastwards then southwards on to the block.

At present the block has a medium coverage of timber with thick scrub in the gullies. There is no permanent supply of water on the surface, as the creeks run only after rain.

Although there are two small quarries on the block, there are no production figures available for these.

Fieldwork.

The first two requirements were investigated for two weeks in September, 1947, and a boring programme

General Geology.

The oldest rocks on this block are the Proterozoic shales belonging to the Cardup Series, which have been described by numerous writers (see Literature). The shales along the eastern boundary of the block are some 20 chains west of the contact of this Cardup Series with the granitic complex. This area shows the widest exposure of the Cardup Series which has been found to the present time (1947). The reason for the great width of exposure here is the presence of the resistant north-south quartz reefs. About 80 to 100 feet east and parallel to the eastern boundary there is such a reef which in places stands out as a vertical wall, eight to 14 feet thick, rising some 20 feet above the average ground level. It appears quite evident that this quartz reef has saved the surrounding shales from erosion.

The shales have a regional northerly strike. The dip is usually almost vertical or at a high angle to the east, but in many cases it is difficult to determine. In the northern quarry, however, the dip appears to be 80-85° E. and near the greenstone at the western end becomes 65° E.

The shales are intruded by quartz and greenstone. The quartz occurs in the form of reefs, as already mentioned, but not on this block; it occurs also as veins in the shales, having the same strike and dip as the shales.

Greenstone is found in several places, but by surface evidence it does not occur at any great width on the block. In the western end of the northern quarry the greenstone strikes N. 20° W. and dips 65° E. at the contact. Further south there is evidence of weathered greenstone in several places, but shale occurs on both sides of it and it is considered that this greenstone can be discarded during quarrying operations.

The Cardup Series was subjected to a long period of erosion before further deposits were laid down, and the topographic form was probably a ridge with

PLATE IV

LEGEND

- Lateritised ferruginous sandstone or "Low-level laterite"
- Ferruginous sandstone and sands
- Greenstone
- Cardup shales
- Quartz

REFERENCE TO SIGNS

- Geological boundary observed
- Geological boundary approximate
- Geological boundary doubtful or assumed
- Outcrop with no observed strike or dip
- Strike and dip of bedding
- Strike of vertical bedding
- Fault
- Quarries
- Shafts or costeans with depth
- Shale in dumps of shafts or costeans
- Bore sites for shale
- Contours
- Boundary unfenced
- Boundary fenced
- Water-courses (non-perennial)
- Areas of available clay

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

CONTOURED GEOLOGICAL PLAN

OF THE

PROPOSED SHALE QUARRY SITE

— BYFORD —

Portion of Location 521, Cockburn Sound

SOUTH WEST DIVISION

Scale: 100 feet to an inch

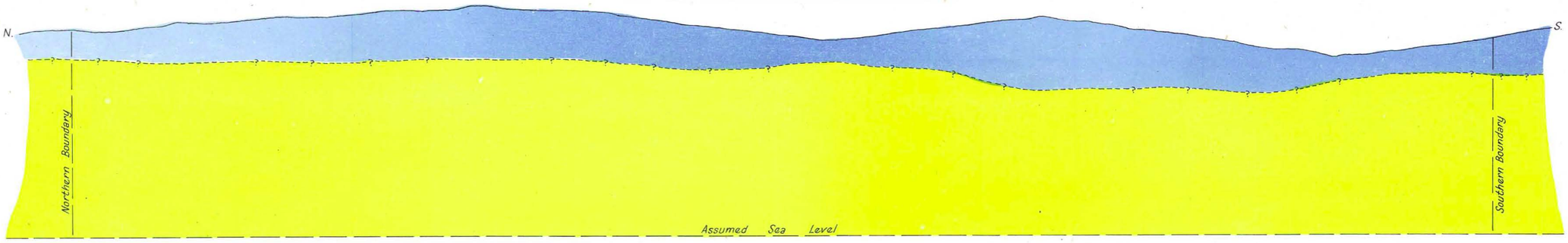
100 50 0 100 200

Assumed datum: N.E. corner of Loc. 521 = 350 feet above M.S.L.

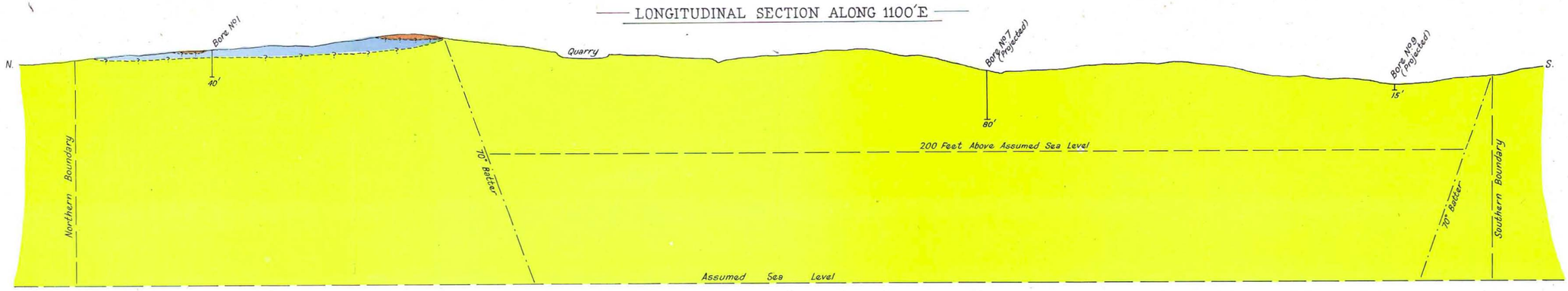
Geology, plane table and telescopic alidade survey by J.H. Lord.

Sept. 1947

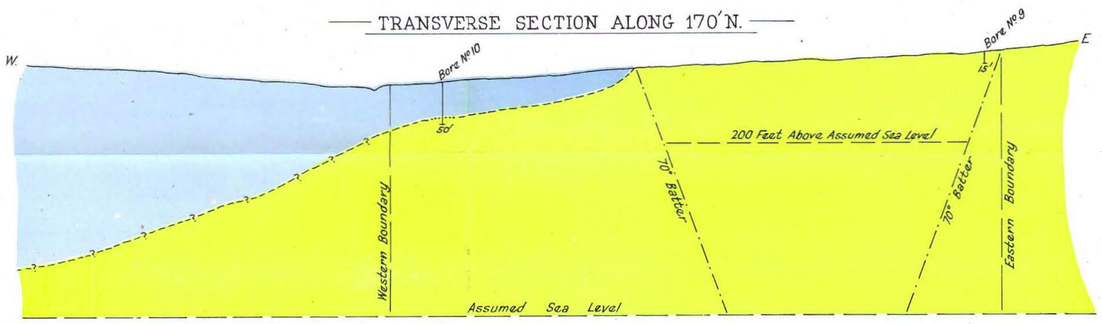
LONGITUDINAL SECTION ALONG 600′E



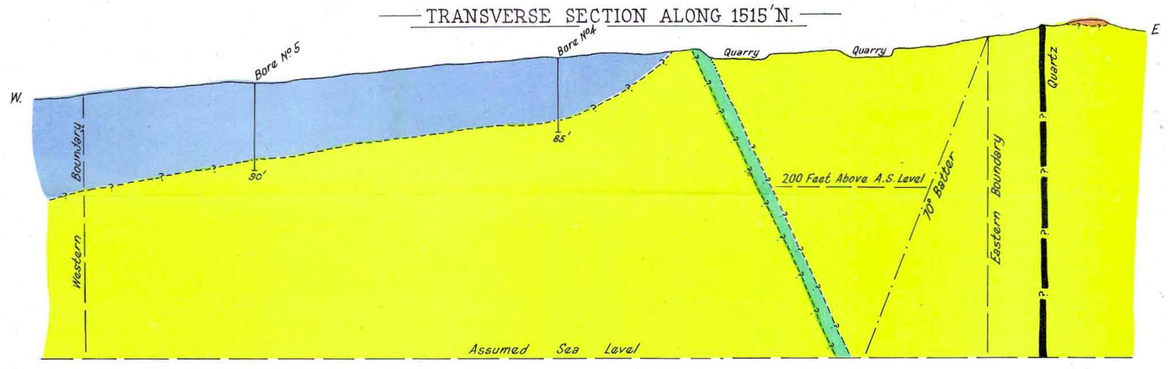
LONGITUDINAL SECTION ALONG 1100′E



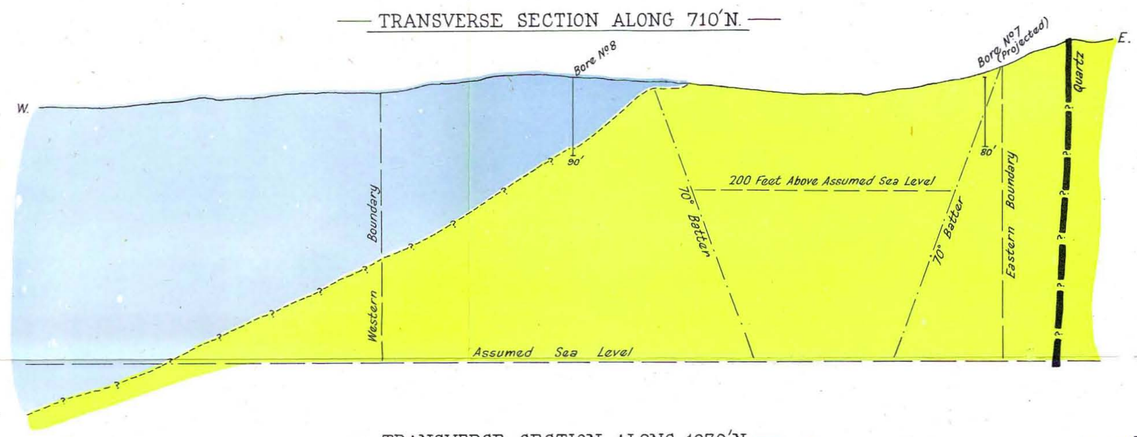
TRANSVERSE SECTION ALONG 170′N.



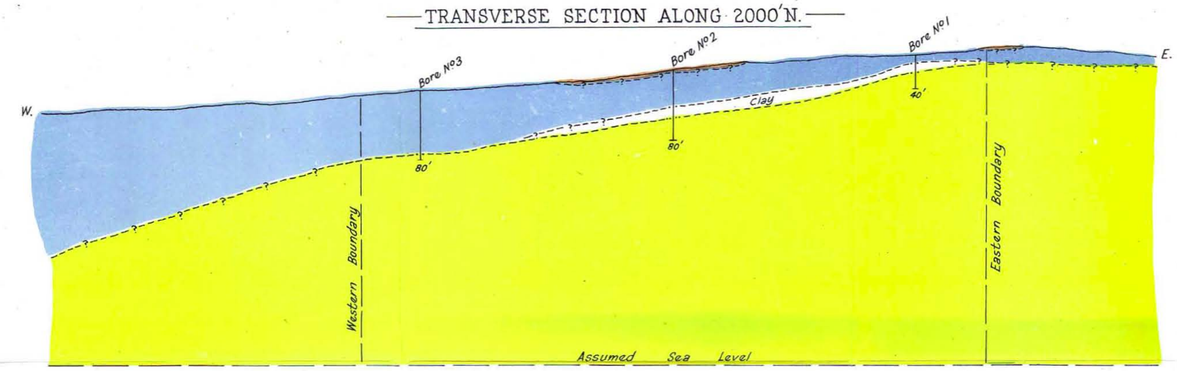
TRANSVERSE SECTION ALONG 1515′N.



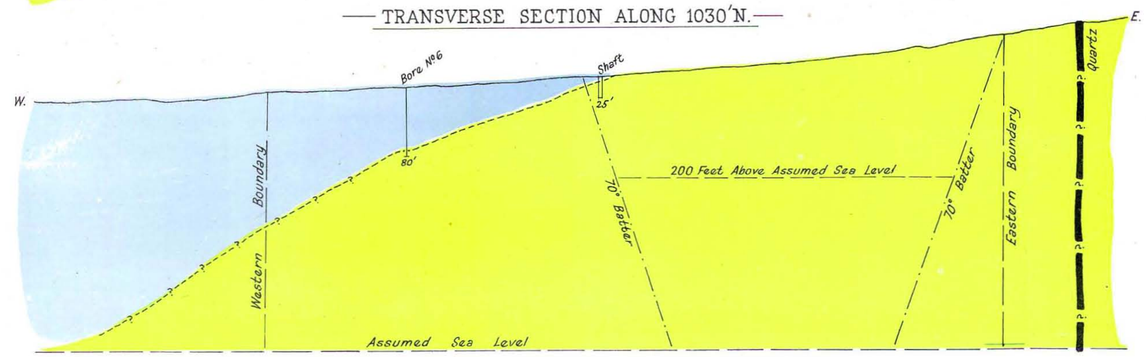
TRANSVERSE SECTION ALONG 710′N.



TRANSVERSE SECTION ALONG 2000′N.



TRANSVERSE SECTION ALONG 1030′N.



LEGEND

- Lateritised ferruginous sandstone or "Low-level laterite"
- Ferruginous sandstone and sands
- Greenstone
- Cardup shales
- Quartz

REFERENCE TO SIGNS

- Geological boundary observed
- Geological boundary approximate
- Geological boundary doubtful or assumed
- Approximate surface
- Bore hole with depth 80′

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

TRANSVERSE AND LONGITUDINAL SECTIONS OF THE PROPOSED SHALE QUARRY SITE — BYFORD —

Portion of Location 521, Cockburn Sound
SOUTH WEST DIVISION

Scale: 100 feet to an inch
100 50 0 100 200

Assumed datum: N.E corner of Loc. 521 = 350 feet above M.S.L.
Sections by J.H. Lord, Dec., 1947

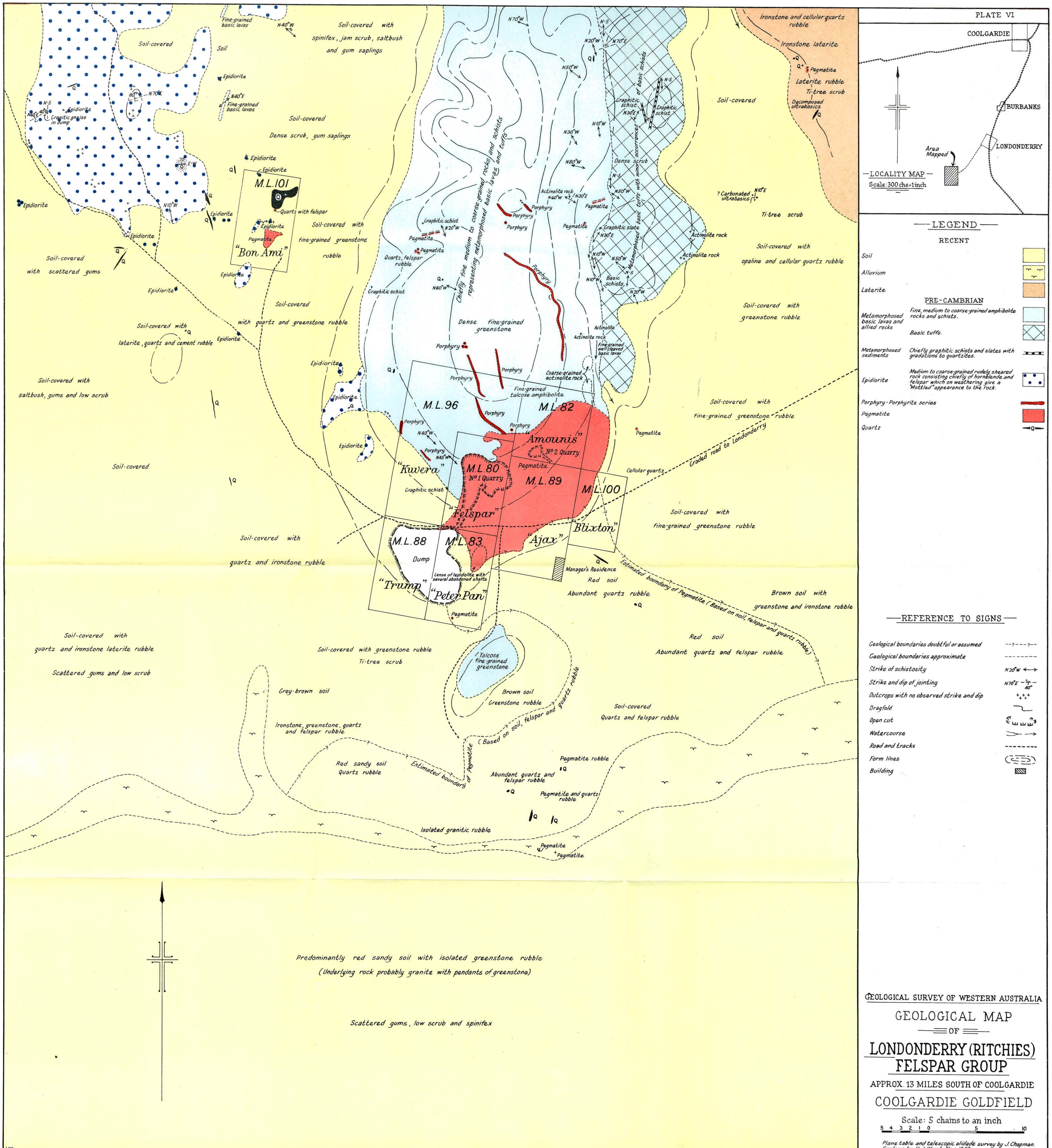


PLATE VI
COOLGARDIE
BURBANKS
LONDONDERRY
Area Mapped
LOCALITY MAP
Scale: 300 chs. = 1 inch
LEGEND
RECENT
Soil
Alluvium
Laterite
PRE-CAMBRIAN
Metamorphosed basic lavas and allied rocks
Fine, medium to coarse-grained amphibolite rocks and schists.
Basic tuffs.
Metamorphosed sediments
Chiefly graphitic schists and slates with gradations to quartzites.
Epidiorite
Medium to coarse-grained rudely sheared rock consisting chiefly of hornblende and felspar which on weathering give a "Mottled" appearance to the rock.
Porphyry - Porphyrite series
Pegmatite
Quartz
REFERENCE TO SIGNS
Geological boundaries doubtful or assumed
Geological boundaries approximate
Strike of schistosity
Strike and dip of jointing
Outcrops with no observed strike and dip
Dragfold
Open cut
Watercourse
Road and tracks
Form lines
Building
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
GEOLOGICAL MAP
OF
LONDONDERRY (RITCHIES)
FELSPAR GROUP
APPROX. 13 MILES SOUTH OF COOLGARDIE
COOLGARDIE GOLDFIELD
Scale: 5 chains to an inch
Plane table and telescopic alidade survey by J. Chapman.
Geology by H. J. Ward, Nov. 1947.
M.L. 101
"Bon Ami"
M.L. 96
M.L. 82
"Amounis"
No 2 Quarry
M.L. 80
No 1 Quarry
"Kuvera"
M.L. 89
M.L. 100
"Felspar"
"Blixton"
"Ajax"
M.L. 88
M.L. 83
Dump
"Trump"
"Peter Pan"
Lense of lepidolite with several abandoned shafts
Manager's Residence
Graded road to Londonderry
Chiefly fine medium to coarse-grained rocks and schists representing metamorphosed basic lavas and tuffs
Metamorphosed basic tuffs with minor occurrences of basic schists
Dense fine-grained greenstone
Estimated boundary of Pegmatite (Based on soil, felspar and quartz rubble)
Soil-covered with spinifex, jam scrub, saltbush and gum saplings
Soil-covered
Dense scrub, gum saplings
Soil-covered with scattered gums
Soil-covered with laterite, quartz and cement rubble
Soil-covered with saltbush, gums and low scrub
Soil-covered with quartz and ironstone rubble
Soil-covered with quartz and ironstone laterite rubble
Scattered gums and low scrub
Soil-covered with greenstone rubble
Ti-tree scrub
Talcose fine-grained greenstone
Brown soil
Greenstone rubble
Grey-brown soil
Ironstone, greenstone, quartz and felspar rubble
Red sandy soil
Quartz rubble
Abundant quartz and felspar rubble
Pegmatite rubble
Pegmatite and quartz rubble
Isolated granitic rubble
Red soil
Abundant quartz rubble
Brown soil with greenstone and ironstone rubble
Soil-covered with fine-grained greenstone rubble
Soil-covered with greenstone rubble
Soil-covered with opaline and cellular quartz rubble
Ironstone and cellular quartz rubble
Ironstone laterite
Laterite rubble
Decomposed ultrabasics
? Carbonated ultrabasics
Actinolite rock
Graphitic schist
Graphitic slate
Basic schists
Coarse-grained actinolite rock
Fine-grained talcose amphibolite
Fine-grained well cleaved basic lavas
Cellular quartz
Porphyry
Pegmatite
Epidiorite
Quartz with felspar
Quartz, felspar rubble
Graphitic gneiss in dump
Fine-grained basic lavas
Predominantly red sandy soil with isolated greenstone rubble
(Underlying rock probably granite with pendants of greenstone)
Scattered gums, low scrub and spinifex

—REFERENCE—

Metamorphosed basic lavas

Pegmatite

Geological boundary observed

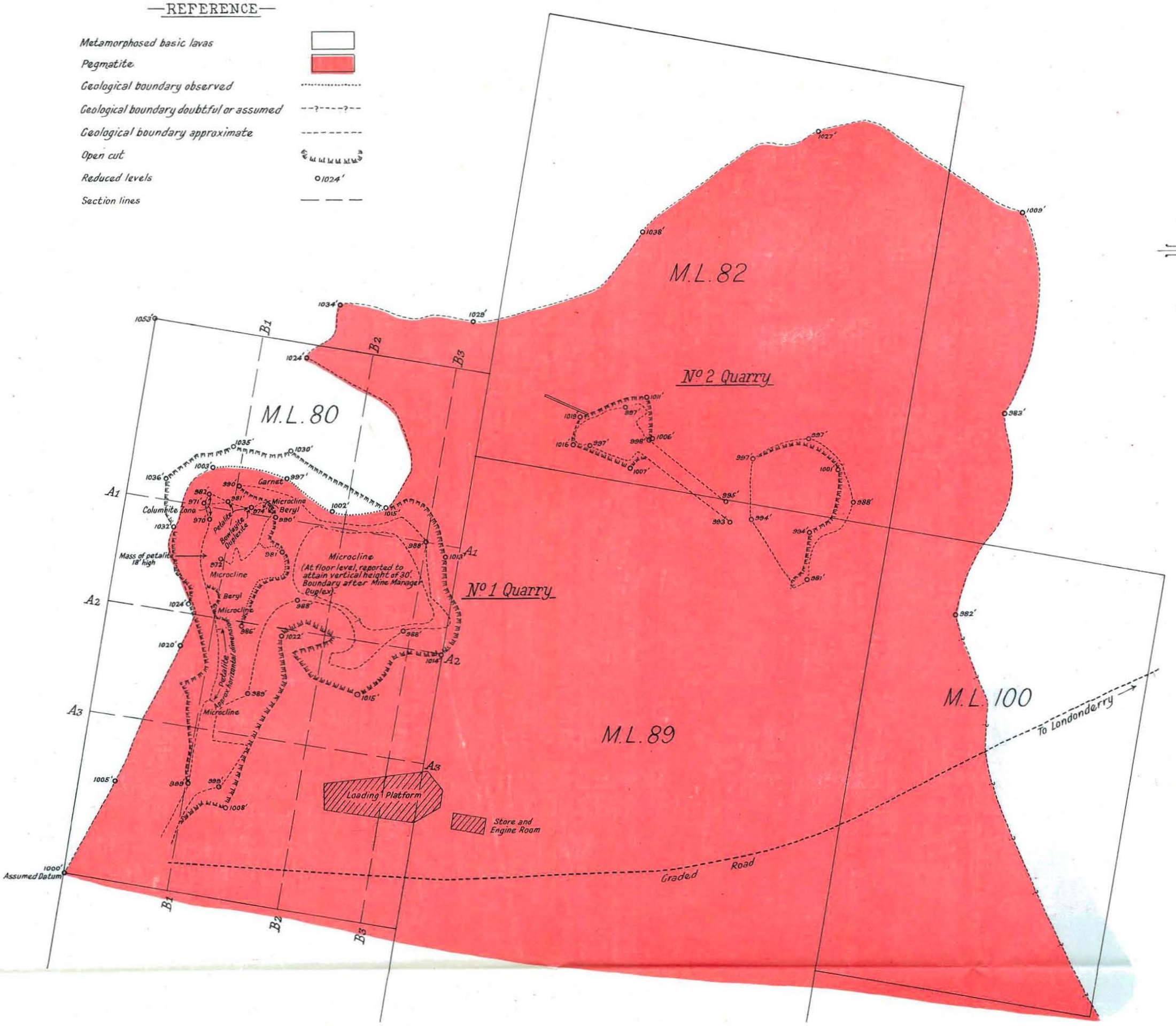
Geological boundary doubtful or assumed

Geological boundary approximate

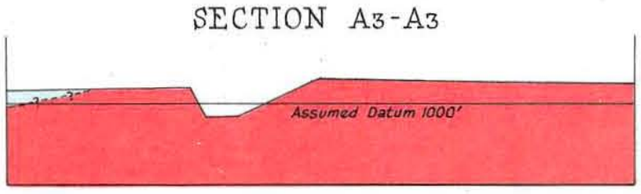
Open cut

Reduced levels 1024'

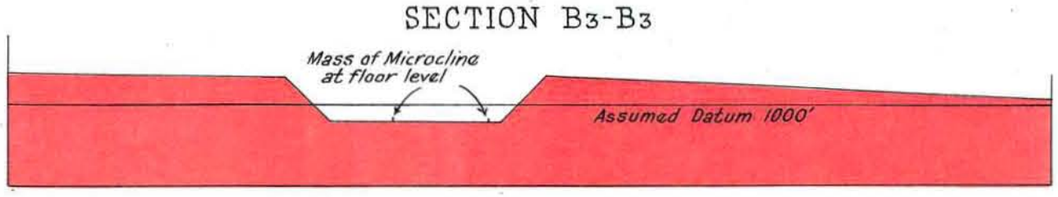
Section lines



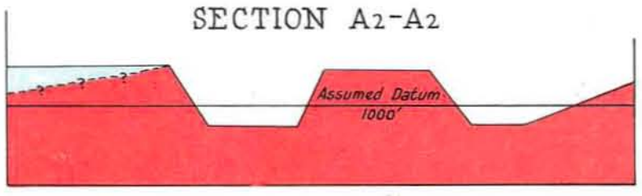
SECTION A3-A3



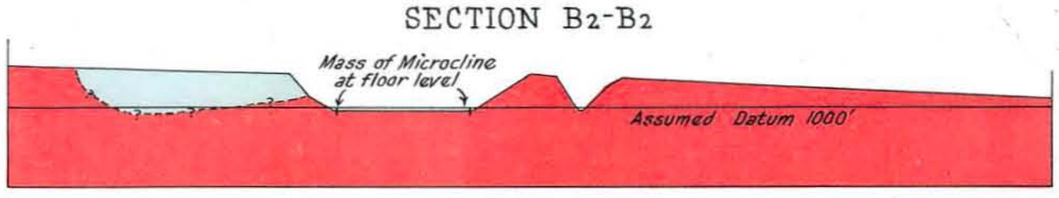
SECTION B3-B3



SECTION A2-A2



SECTION B2-B2



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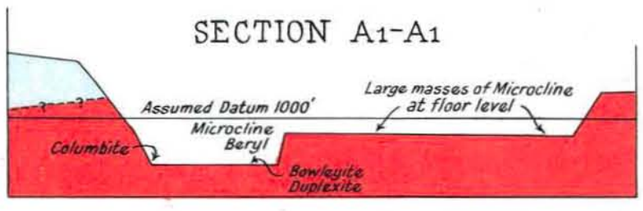
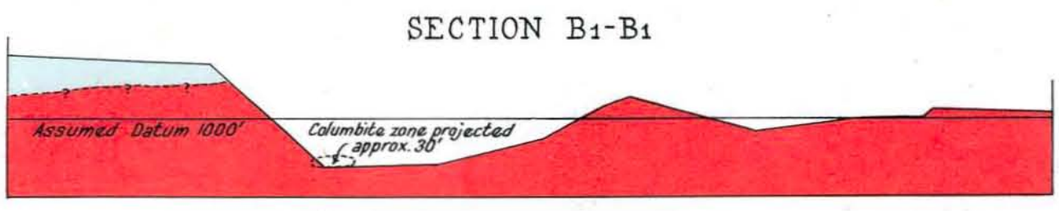


SECTION B1-B1



GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

PLAN AND SECTIONS MAIN WORKINGS M.L.80 & M.L.82

LONDONDERRY (RITCHIES) FELSPAR GROUP

APPROX 13 MILES SOUTH OF COOLGARDIE

COOLGARDIE GOLDFIELD

Scale: 100 feet to an inch

100 80 60 40 20 0 100 200

Plane table and telescopic alidade survey by J. Chapman.
Geology and sections by H.J. Ward, Nov. 1947.

J.M.L.

the quartz reef as the resistant core, while the ground fell away rapidly to the west. On this surface, sands, containing a considerable amount of clay, were deposited probably during Miocene times. The actual grains of these sands are well rounded and must have been subjected to a considerable amount of wave action. Near the base, worn pieces of quartz and shale are frequently found. No fossils were found, nor have any been recorded from other similar deposits, which might assist in fixing the exact age of these sands. This type of sand deposit has been examined and described in detail by R. T. Prider (1946) at Ridge Hill. Its existence on this block or as far south has not been previously recognised by geologists.

On the slopes of the ridges this sand outcrops in places as reddish ferruginous sandstone, while on the top of the ridges it is lateritised to form what is generally known as "low-level laterite." At depth the colour changes to white which can be seen in a creek bed about 700 feet south-west of the south-west corner of this block.

Boring Programme.

The boring programme consisted of ten holes (see Plate IV). The sites were selected for the purpose of obtaining information on that portion of the block where surface indications were lacking, and also to observe the behaviour of the deposits at depth.

As the boring was done with a percussion plant, it was only possible to obtain sludge samples, which were taken every five feet. One portion of each sample was dried, while the other was washed to remove the clay portion. Both portions were examined closely and full details of these examinations are shown in the bore logs attached to this report.

Shale Reserves.

The geological map (Plate IV) shows that the shales either outcrop or are near the surface on the eastern side of the block. They extend from the southern boundary of the block to the northern quarry, north of which they are covered by sandstone but probably reach the surface again near the northern boundary.

Westward from the contact of the shales and sands, as shown on the map, the unconformity (i.e., the contact surface between the two) dips away to the west rather rapidly as shown in the geological sections (Plate V). At present, it is not considered desirable to remove this overburden to recover the shale; however, in a long-range policy care must be taken to prevent the erection of plant on any area which may be required later.

An estimate has been made of the amount of shale, shown as such on the geological map, which may be extracted without removing any overburden except clay. This estimate has been made by drawing nine additional transverse sections of the shale to be extracted, and by obtaining the area of each by means of a planimeter. The average area of these sections has been taken as the average cross-sectional area of the proposed quarry, which extends 1,600 feet northwards from the southern boundary of the block.

It has been assumed that it will be possible to quarry the shale down to a level of 200 feet above the assumed sea-level. This means that the maximum vertical depth of the proposed quarry will be 180 feet in the north-east corner.

A batter of 70° has been allowed on the sides of the quarry. A deduction of approximately ten per cent. has been made for the narrow sill of greenstone which appears in places on the surface; also an allowance has been made equivalent to the amount of clay estimated to be lying on the shale.

Shale available: 2,250,000 cubic yards.

At the present (1947) rate of consumption by the State Brick Works (200 tons of shale and clay per day), this represents at least 50 years' supply. Further reserves of shale are available if overburden is removed or the property to the east is acquired, and the quarry extended in that direction; also the depth of the proposed quarry could be increased.

Clay Reserves.

To estimate the amount of clay available for brick-making it was found necessary to put holes down on a 200ft. grid covering the block. These holes were bored with a post-hole borer to a depth which was dependent upon the nature of material encountered. The gravelly nature of the ground, particularly in the north-east, made it impossible to bore the holes to any fixed depth; boring was stopped when shale was encountered.

With the assistance of the acting manager of the brick works, Mr. F. Payne, the material from all holes was examined to determine the amount of clay suitable for brick-making. The estimates were kept on the conservative side, particularly where the shale comes near the surface, as much of the clay will be recovered with the shale. There is a large quantity of sandy clay or clayey sand on the block, particularly on the western portion, which at present is considered unsuitable for brick-making; some of this may be of use later.

The area to the north and west of the old quarry has no clay suitable for brick-making as there is too much gravel and sand present. However, to the west of the quarry in holes Nos. 17 and 18, there is some sandy clay beneath the surface gravel layer which may be suitable for brick-making, but it is not considered economic at present to move the three feet of gravel overburden to recover the sandy clay below as the latter is underlain by sand.

To the east in the gully immediately to the south of the old quarry, the shale comes very close to the surface and, in consequence, there is not very much clay available. Moving westwards down this gully the clay becomes sandy and gravelly. Similar conditions prevail on the ridge to the south of this gully.

The gully near the southern boundary has the largest and best clay deposits. This is particularly so near the south-east corner. As usual, the clay becomes sandy towards the west but it is still considered suitable for brick-making. The estimate of the clay available is as follows:—

Southern Gully.—The whole of the block south of co-ordinate N620. Average thickness of clay shown in bore holes, 3⅓ feet.

Clay available, 51,850 cubic yards.

Northern Gully.—The area bounded by the lines starting on the eastern boundary at co-ordinate N1600 west to point co-ordinates N1600, E600, then south to point co-ordinates N1000, E600, then west to co-ordinates N1000, E500, then south to co-ordinates N800, E500, then west to the eastern boundary.

Clay available, 13,300 cubic yards.

Total clay available, 65,000 cubic yards.

Conclusion.

There is an ample supply of shale available on the block. The method of quarrying, in order to extract the shale along the suggested lines, is the only point requiring further investigations.

The supply of clay is definitely restricted. The conservative estimate made above would last only five years at the present (1947) rate of consumption by the State Brick Works. It is doubtful if the sandy clay or clayey sand, which is so abundant on the block, will ever be of use. In consequence it will be necessary to procure clay from elsewhere.

Literature.

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SHALE BORE HOLE No. 1.

Position: N1990, E1040. R.L. 361 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet)	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—2	Gravel ...	5	Brown. Clay and sand ...	Sand grains. Large amount of clay removed	From To Surf.—2	Gravel.
2— 6	Gravel and clay	10	Dull light brown. Mainly sand	Sand grains. Some clay removed	2— 6	Gravel and sandy clay.
6—10	Sandy clay ...	15	Cream. Clay and some sand	Sand grains and a few chips of quartz	6—10	Sand and clay.
10—20	Clay ...	20	Light stone. Mainly clay ...	Chips of shale and some sand	10—20	Clay (decomposed shale.)
20—40	Shale ...	25	Light flesh. Powdered shale and chips	Mainly chips of white and pink shale	20—40	Shale.
		30	Flesh. Powdered and chips of shale	do. do. do.		
		35	do. do. do.	do. do. do.		
		40	do. do. do.	do. do. do.		

SHALE BORE HOLE No. 2.

Position: N1995, E760. R.L. 341 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—2	Gravel ...	5	Red. Clay and some sand grains	Pebbles of sandstone and few sand grains, Much clay.	From To Surf.—2	Gravel.
2—11	Gravel and clay	10	Brown. Sand and clay ...	Sand and sandstone pebbles. Some clay	2—11	Gravel and sandy clay.
11—15	Sandy clay ...	15	Yellowish brown. Sand and clay	Sand. Some clay removed ...	11—15	Clayey sand.
15—56	Sticky clay ...	20	Light flesh. Sand and clay	Sand and a few chips of quartz (appeared worn)	15—40	Puggy clayey sand.
56—80	Shale ...	25	Flesh. Sand and clay ...	Sand and a few chips of quartz and reddish shale (worn)	40—56	Clay (or decomposed shale ?).
		30	Bright flesh. Sand and clay	Sand and a few chips of quartz and reddish shale	56—80	Shale.
		35	do. do. do.	do. do. do.		
		40	Bright flesh. Clay (shale ?) and some sand	Sand and chips of reddish shale		
		45	do. do. do.	Mainly chips of reddish shale		
		50	Light flesh. Clay (shale) and some sand	Chips of reddish shale, few chips of blueish shale and quartz		
		55	Bright flesh. Clay (shale) and some sand	do. do. do.		
		60	Light flesh. Clay (shale) and some sand	Chips of reddish shale and quartz		
		65	Light stone. Clay (shale) and some sand	Chips of reddish and white shale		
		70	Light stone. Clay (shale) and a little sand	Chips of reddish and yellow shale		
		75	do. do. do.	Chips of reddish and yellow shale and a few quartz chips		
		80	do. do. do.	do. do. do.		

SHALE BORE HOLE NO. 3.

Position: N2000, E460 — R.L. 318 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To					From To	
Surf.—2	Gravel	5	Light brown. Gravel, clay and sand	Gravel and sand	Surf.—2	Gravel.
2—15	Gravel and clay	10	Dull brown. Gravel, clay and sand	Sand and pebbles of sandstone	2—15	Gravel and clay.
15—60	Sandy clay....	15	Dull brown. Mainly sand	do. do. do.	15—55	Clayey sand.
60—65	Red sandstone	20	do. do. do.	Sand and a few pebbles of sandstone	55—65	Red sandstone.
65—74	Sandy clay....	25	do. do. do.	do. do. do.	65—74	Clayey sand.
74—80	Shale	30	Light reddish brown. Mainly sand	do. do. do.	74—80	Shale.
		35	Reddish brown. Mainly sand	Sand		
		40	do. do. do.	do.		
		45	do. do. do.	do.		
		50	Brown. Mainly sand	do.		
		55	Pink. Mainly sand	do.		
		60	Pinkish brown. Mainly sand	do.		
		65	Light brown. Mainly sand	do.		
		70	Very light brown. Mainly sand	do.		
		75	Light stone. Sand with powdered and chips of shale	Pink and white shale and sand		
		80	Light stone. Powdered and chips of shale with sand	do. do. do.		

SHALE BORE HOLE NO. 4.

Position: N1515, E650. — R.L. 344 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To					From To	
Surf.—2	Gravel	5	Brown. Clay and some sand	Sand and sandstone pebbles. Large amount of clay removed	Surf.—2	Gravel.
2—11	Stiff clay	10	Pinkish brown. Clay and sand	Sand and sandstone pebbles. Puggy clay removed	2—11	Gravel and sandy clay.
11—70	Sandy clay....	15	Bright brown. Mainly sand	Mainly sand	11—70	Clayey sand.
70—75	Soft shale	20	do. do. do.	Sand	70—75	Shale (weathered).
75—85	Hard shale	25	do. do. do.	do.	75—85	Shale.
		30	Bright reddish brown. Mainly sand	do.		
		35	do. do. do.	do.		
		40	Pinkish brown. Mainly sand	Slightly less sand than above. Few chips of quartz and one of shale (worn)		
		45	Pinkish brown. Mainly sand, remainder clay	Sand. Few chips of quartz and shale (worn edges)		
		50	Light brown. Mainly sand, remainder clay	do. do. do.		
		55	Brown. Mainly sand, remainder clay	do. do. do.		
		60	Dull brown. Mainly sand, remainder clay	Sand. Few chips of shale (worn edges)		
		65	Light brown. Sand and clay	Sand and a few pieces of shale (worn). Also some grains and pebbles of "ironstone"		
		70	do. do. do.	do. do. do.		
		75	Light brown. Sand, clay and shale chips	Sand and pinkish shale		
		80	Very light brown. Clay, sand and shale chips	Pink shale and some sand		
		85	Very light brown. Clay, shale chips and some sand	Pink and white shale and a little sand		

SHALE BORE HOLE NO. 5.

Position: N1515, E300. R.L. 321 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To					From To	
Surf.—1	Gravel	5	Light reddish brown. Clay, some sand and pebbles	Pebbles of "ironstone" and sandstone	Surf.—1	Gravel.
1—83	Sandy clay....	10	Reddish brown. Clay and sand	Sand and pebbles of sandstone	1—83	Clayey sand.
83—90	Shale	15	Bright reddish brown. Clay and sand	Mainly sand and some pebbles of sandstone	83—90	Shale.
		20	Bright reddish brown. Mainly sand	do. do. do.		
		25	do. do. do.	Mainly sand		
		30	do. do. do.	do.		
		35	do. do. do.	do.		
		40	do. do. do.	do.		
		45	do. do. do.	do.		
		50	do. do. do.	do.		
		55	do. do. do.	do.		
		60	do. do. do.	Mainly sand. More clay than above		
		65	Reddish brown. Mainly sand	Mainly sand		
		70	Purplish brown. Mainly sand	Mainly whitish sand		
		75	Light flesh. Mainly sand	do.		
		80	Dirty cream. Sand and clay	White sand and a few chips of purplish and yellowish shale		
		85	Light stone. Sand and powdered shale	Chips of pink and yellow shale and sand		
		90	Light stone. Powdered shale and some sand	Pink shale and some sand		

SHALE BORE HOLE NO. 6.

Postion: N1028, E452. R.L. 304 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To					From To	
Surf.—2	Gravel and sandy clay	5	Light brown. Clay and sand	Sand and chips of sandstone, gravel and shale	Surf.—2	Gravel and sandy clay.
2—73	Sandy clay....	10	Light brown. Sand and clay	Sand and sandstone gravel	2—20	Clayey sand and a little sandstone gravel.
73—80	Shale	15	Light reddish brown. Mainly sand	Sand and little sandstone gravel	20—40	Sand.
		20	do. do. do.	do. do. do.	40—73	Clayey sand.
		25	Reddish brown. Mainly sand	Mainly sand	73—80	Shale.
		30	do. do. do.	do.		
		35	do. do. do.	do.		
		40	do. do. do.	Mainly sand. One piece of shale (worn)		
		45	Brown. Mainly sand	Mainly white sand		
		50	Light brown. Mainly sand	do. do.		
		55	do. do. do.	do. do.		
		60	Light flesh. Mainly sand	do. do.		
		65	Dull reddish brown. Mainly sand	do. do.		
		70	Flesh. Mainly sand, more clay than above	do. do.		
		75	Light stone. Powdered and chips of shale and sand	Pink shale chips, a few pieces of quartz and some sand		
		80	Light stone. Powdered and chips of shale and some sand	Pink and white shale and some sand		

SHALE BORE HOLE NO. 7.

Postion : N800, E1135. R.L. 330 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet)	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—80	Shale	5	Light brown. Clay and chips of shale (worn)	Chips of shale and quartz	From To Surf.—6	Clay and weathered shale.
		10	Light creamy brown. Clay and chips of shale (worn)	Mainly shale chips	6—80	Shale.
		15	Creamy grey. Powdered shale and chips	Chips of grey, white and reddish shale		
		20	Light grey. Powdered shale and chips	Mainly grey shale		
		25	do. do. do.	do.		
		30	Creamy grey. Powdered shale and chips	Mainly grey and some yellow and reddish shale		
		35	do. do. do.	do. do. do.		
		40	Yellowish grey. Powdered shale and chips	do. do. do.		
		45	do. do. do.	do. do. do.		
		50	Light grey. Powdered shale and chips	do. do. do.		
		55	do. do. do.	do. do. do.		
		60	Yellowish grey. Powdered shale and chips	do. do. do.		
		65	Light grey. Powdered shale and chips	do. do. do.		
		70	Creamy grey. Powdered shale and chips	do. do. do.		
		75	do. do. do.	do. do. do.		
		80	do. do. do.	do. do. do.		

SHALE BORE HOLE NO. 8.

Postion : N708, E652. R.L. 330 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—83	Sandy clay....	5	Light reddish brown. Sand and clay	Sand and sandstone gravel	From To Surf.—83	Clayey sand.
83—90	Shale	10	do. do. do.	Sand	83—90	Shale.
		15	Reddish brown. Mainly sand	do.		
		20	do. do. do.	do.		
		25	Light reddish brown. Mainly sand	do.		
		30	Reddish brown. Mainly sand	do.		
		35	do. do. do.	do.		
		40	do. do. do.	do.		
		45	do. do. do.	do.		
		50	Light reddish brown. Mainly sand	do.		
		55	do. do. do.	do.		
		60	do. do. do.	do.		
		65	do. do. do.	do.		
		70	Dull reddish brown. Mainly sand	do.		
		75	Brown. Mainly sand	Sand, more clay than above		
		80	Dirty brown. Mainly sand	do. do. do.		
		85	Light stone. Powdered and chips of shale and some sand	Yellow and green shale and some sand		
		90	Light stone. Powdered and chips of shale and little sand	Yellow and blue shale		

SHALE BORE HOLE NO. 9.

Postion: N180, E1135. R.L. 305 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—8	Clay	5	Brown. Clay and pieces of shale	Mainly clay. Some worn pieces of shale	From To Surf.—8	Clay.
8—15	Shale	10	Creamy yellow. Powdered shale and chips	Abundant yellow and grey shale chips	8—15	Shale.
		15	do. do. do.	do. do. do.		

SHALE BORE HOLE NO. 10.

Position: N170, E500. R.L. 274 feet.

Driller's Log.		Samples.			Geological Log.	
Depth (Feet).	Description.	Depth (Feet).	Colour and Description of Dry Sample.	Description of Remains after Washing.	Depth (Feet).	Description.
From To Surf.—44	Sandy clay....	5	Yellowish brown. Mainly clay	Worn pebbles of quartz and shale	From To Surf.—44	Clayey sand.
44—50	Shale	10	Light brown. Clay and some sand	Worn pieces of shale and quartz and some sand	44—50	Shale.
		15	Light brown. Clay and sand	Worn pieces of shale and quartz and sand		
		20	Light brown. Sand and clay	Sand and some worn pieces of shale and quartz		
		25	do. do. do.	do. do. do.		
		30	Light brown. Mainly sand	White sand and worn pieces of reddish shale		
		35	Very light brown. Mainly sand	do. do. do.		
		40	do. do. do.	do. do. do.		
		45	Light stone. Powdered shale and sand	Sand and chips of pink and white shale		
		50	Light stone. Powdered shale and some sand	Pink, yellow and white shale and some sand		

RESULTS OF BORING FOR CLAY.

Bore Hole Number.	Position. N.	Position. E.	Depth. (feet.)	Description.	Thickness Available For Clay.
1	2100	1100	2	Gravelly sand clay	*Nil.*
2	2100	900	4	do. do. do.	*Nil.*
3	2100	700	2	Sandy gravel	*Nil.*
4	2100	500	4	do.	*Nil.*
5	1900	1100	3	Gravelly sand clay	*Nil.*
6	1900	900	3	do. do.	*Nil.*
7	1900	700	11	Sandy gravel	*Nil.*
8	1900	500	3	do.	*Nil.*
9	1700	1100	3	Gravelly sandy clay	*Nil.*
10	1700	900	6	Gravelly clay and clay	*Nil.*
11	1700	700	6	Sandy gravel	*Nil.*
12	1700	500	5	Gravelly sandy clay	*Nil.*
13	1700	300	5	Gravelly clay. Unsuitable	*Nil.*
14	1500	1100	3	Clay becoming shale at depth.	1
15	1500	900	2	do. do. do. do. do.	1
16	1500	700	6	Sandy clay.	*Nil.*
17	1500	500	10	Gravelly clay with suitable sandy clay below	*Nil.*
18	1500	300	10	do. do. do. do. do.	*Nil.*
19	1300	1100	5	Clay becoming shale at depth	1
20	1300	900	4	do. do. do. do.	1
21	1300	700	6	Sandy clay	*Nil.*
22	1300	500	10	Reddish sandy clay	*Nil.*
23	1300	300	10	do. do.	*Nil.*
24	1100	1100	5	Clay becoming shale at depth	1
25	1100	900	3	do. do. do. do.	1
26	1100	700	5	Shale almost to surface	*Nil.*
27	1100	500	5	Sandy gravel	*Nil.*
28	1100	300	5	do. do.	*Nil.*
29	900	1100	2	Shale almost to surface	*Nil.*
30	900	900	5	Clay becoming shale at depth	2
31	900	700	3	Clay. Shale below	3
32	900	500	10	Yellow sand	*Nil.*
33	700	1100	2	Shale almost to surface	*Nil.*
34	700	900	4	Clay becoming shale at depth	1
35	700	700	3	Sandy clay. Unsuitable	*Nil.*
36	700	500	9	do. do. do.	*Nil.*
37	500	1100	3	Shale almost to surface	*Nil.*
38	500	900	4	Good clay	4
39	500	700	3	Sandy clay. Unsuitable	*Nil.*
40	500	500	4	Sandy clay. Suitable	4
41	300	1100	4	Good clay becoming shale at depth	2
42	300	900	3	Shale almost to the surface	*Nil.*
43	300	700	7	Good clay	7
44	300	500	6	Poor clay. Suitable	6
45	100	1100	9	Good clay	9
46	100	900	3	Shale almost to the surface	*Nil.*
47	100	700	9	Sandy clay	3
48	100	500	5	Clay	5

THREE-MILE HILL GROUP, COOLGARDIE DISTRICT.

By H J. Ward, B.Sc., Geological Survey of W.A

CONTENTS.

GENERAL INFORMATION.

The Three Mile Hill Group lies three miles to the north-east of Coolgardie townsite.* It is traversed by both the Coolgardie-Kalgoorlie main road and railway line. A road to Bonnievale passes through the north-western corner of the group. There are numerous tracks traversing the area.

In Coolgardie there are three stores, a post office, hospital and a Mining Registrar's office. Accommodation may be obtained either at the two hotels or the boarding house opposite the railway station (December 1947). A stand pipe, from which water may be obtained at sixpence per 50 gallons, is situated in the main street. The Goldfields Water Supply pipeline passes through the group and water may be obtained from it.

The nearest public battery is at Coolgardie.

Mining timber is not plentiful; for large scale mining operations suitable timber would have to be transported from distances of over 20 miles.

At the time of inspection (May 1947) mining activity was confined to G.M.L. 5637. There was also some dry-blowing done by prospectors.

* Ref. Lands Dept. Lithos 50/8, 39/80, 50/80.

A geological map, on a scale of five chains to an inch, has been prepared and copies will be available at the Geological Survey Office, Perth, W.A.

GENERAL GEOLOGY.

The group is situated in an area of metamorphosed, interbedded, basic lavas, ultrabasic rocks and sediments which have been intruded by members of the porphyry-porphyrite series and which are presumably of Pre-Cambrian age.

The strike of the series varies from approximately N. 45° W. to E.-W. The change in strike is due chiefly to folding and partly to a fault, with a strike of N. 15° E., which traverses the area. Available field evidence shows the sedimentary bands to have a dip which varies from 60° S.-E. to vertical.

The more resistant rocks of the area have formed two main lines of ridges: one along the northern boundary of the meta-gabbro* (amphibolite) belt and the other in the basic lava belt which lies to the south of the meta-gabbro (amphibolite). Between these two ridges is a valley in which the direction of drainage is to the east and south-east.

In general, drainage is to the east and south-east. The most noticeable exception occurs in the south-western portion of the area where drainage is to the south.

Basic Lavas.

The basic lavas are generally dark green rocks varying from a fine to a coarse grained texture with the fine grained types predominating. There are two belts of basic lavas, one of which lies to the north, the other to the south of the central meta-gabbro (amphibolite) belt. It is possibe that they contain pillow structure, but the highly jointed and blocky fractured state of the surface exposures does not allow for the recognition of such features.

Ultrabasics.

The ultrabasic rocks occurring on the northern and southern edges of the area mapped, consist chiefly of dense fine grained serpentine rocks with fine to coarse grained actinolitic schists, and fine to coarse grained rudely sheared actinolitic rocks. The serpentine rocks are of a blocky nature, and mark easily when scratched. The most pronounced development of actinolitic rocks is on G.M.L. 3617.

Meta-gabbro† (Amphibolite).

The meta-gabbro (amphibolite) occupies the central portion of the area mapped. Its apparent thickness varies from 1,000 feet to 1,900 feet.

The northern boundary of the meta-gabbro (amphibolite) belt is comparatively well defined, being separated from fine grained basic lavas by a graphitic schist band intruded by a felsite sill.

The southern boundary is not so well defined. West of the main fault a band of quartzite forms the southern boundary of the belt but on the eastern side of the fault the boundary is obscured by soil and alluvium.

On the stratigraphical hanging wall is the "Three Mile Hill" type of meta-gabbro (amphibolite) which Matheson‡ has described as "a medium to coarse grained equigranular, blackish rock, consisting chiefly of hornblende with minor amounts of felspar and quartz. It is generally blocky to rudely schistose, but becomes highly schisted in the vicinity of shear zones."

This type of meta-gabbro (amphibolite) appears to occur in a zone approximately 200 feet wide, adjacent to the northern boundary. This grades into a more medium grained equigranular rock with a higher felspar content. Coarse grained varieties occur elsewhere in the belt but no continuity between outcrops could be traced.

The age relationship of the meta-gabbro (amphibolite) has not been determined by regional mapping. When attempting to establish the age and origin of these rocks, the following points must be born in mind:—

1. The occurrence of sedimentary bands along both boundaries.
2. Absence of intrusive junctions, chilled margins.
3. The presence of coarse grained "Three Mile Hill" meta-gabbro (amphibolite) along the northern boundary of the belt.

Sediments.

In the area mapped two types of sedimentary rocks outcrop. The predominant type is the light grey to black graphitic schists and slates which, in places, grade across their strike into thin sandy felspathic bands. They are to be found at or near the formation junction of the Greenstone Series, where they outcrop as thin, discontinuous and apparently highly folded, laminated bands. These sedimentary bands have been silicified and in one locality, late M.C. 1, thin seams of the "precious" variety of opal have developed along the cleavage and joint planes. It is on late M.C. 1 that the graphitic slates attain their greatest width of 30 feet.

The remaining sedimentary rock type is a band of quartzite which outcrops over a length of approximately 4,000 feet. The quartzite, which is not to be found east of the main fault, has a westerly strike with a steep southerly dip, and shows evidence of internal folding.

Porphyry-Porphyrite Series.

There are two distinct members of this series to be found in the area. They are hard, light coloured rocks which have been jointed and locally folded. Available evidence points to the porphyries being concordant intrusions.

The larger sill, felsitic in texture, has intruded the graphitic schist band which is at the northern contact of the meta-gabbro (amphibolite) with the basic lavas. This sill, over a mile in length and approximately 30 feet in width, occupies the centre of the graphitic schist. This is well illustrated in the railway cutting, approximately a quarter of a mile north-north-east of the 3-mile peg on the Coolgardie-Kalgoorlie main road.

In the extreme north-western corner of the group a porphyry sill, up to 20 feet in width, has intruded that sedimentary band which occurs along the southern contact of the northern ultrabasic belt with basic lavas.

An isolated outcrop of porphyry occurs approximately four hundred (400) feet west of the point where the Norseman pipeline crosses the Coolgardie-Kalgoorlie road. Its relationship to other members of the series has not been determined.

Quartz Reefs.

There are numerous outcrops of quartz reefs in the area but in no instance are they of any great extent. The strike of the reefs varies but it appears that the greatest number of quartz outcrops have a strike that lies between north 40 degrees east and north 60 degrees east.

Geological work in Bayley's Group* has shown that faulting is post-gold. The period of faulting in this group is the same age as that of Bayley's Group. As quartz is to be found in the fault zones, it seems reasonable to assume that there are two periods of silicification, one of which is responsible for ore deposition and the other for the barren quartz reefs of the area.

Laterite.

There is only one locality in which ferruginous laterite occurs. This is in the northern portion of late G.M.L. 5680, where the laterite occurs as a capping overlying highly sheared basic lavas.

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* McMath, J. C., G.S.W.A. Ann. Rept. 1947, p. 62.
† Matheson, R. S., G.S.W.A. Ann. Rept. 1946; McMath, J. C., G.S.W.A. Ann. Rept. 1947.
‡ Op. Cit.

* Ward, H. J., G.S.W.A. Ann. Rept. 1946.

Alluvium.

In the group are four alluvial basins. The largest basin is that whose long axis lies in an approximate west-north-west position, and which extends from about 100 feet east of the Coolgardie-Bonnievale road to over 1,200 feet east of the 3 mile peg on the Coolgardie-Kalgoorlie main road. Another alluvial basin lies to the south of this large central basin. The two remaining alluvial areas are in the north-west and south-west corners of the area.

In no part does the maximum depth of the alluvium exceed six feet.

Structure.

Regional mapping has shown that the area is on the eastern limb of the major Coolgardie structure, which is a steeply north-pitching anticline and which has been crossfolded. It appears that the group lies on a minor crossfold axis which is about four miles north of the Tindals crossfold.

The series has a general strike N. 45° W. on the eastern side of the fault and an approximate easterly strike on the west side of the fault. The change in strike is due to folding and faulting as regional mapping has shown that there is a change in strike due to folding in this locality.

In the major structure the series has a steep north-easterly dip, but available field evidence in the area shows the dip of the sedimentary beds to vary from vertical to 60° S.E.

Folding.

In the south-western corner of the area mapping has disclosed that a tongue of basic lavas occurs in the ultrabasics. The relative position of this tongue of basic lavas with respect to the basic lava belt, and the fact that there is a graphitic schist band along the contact of the basic lava tongue with the ultrabasic belt, suggest that dragfolding along this contact has occurred. On the northern boundary of this basic lava belt there is a like structure, but as it is mostly obscured by soil it is impossible to correlate the two structures.

Attention is drawn to the fact that nowhere along the continuous northern boundary of the meta-gabbro (amphibolite) does a dragfold of this dimension occur. It seems reasonable to assume that if the southern boundary of the meta-gabbro (amphibolite) is folded in such a manner, then the same would occur on its northern boundary.

Minor folds in the sedimentary bands pitch approximately 52° N.E. on the western side of the fault and 52° E. on the eastern side of the fault. Although vertical pitch has been observed there is insufficient evidence available to locate the crossfold axis which, from the results of regional mapping, should pass through the area.

Faulting.

Surface mapping has shown that a main fault traverses the area and that there are several minor ones. The main fault, which has a strike of N. 15° E. and indeterminate dip, is a continuation of the "Phoenix" fault, which passes through Bayley's Group*, approximately one and a half miles to the south. The "Phoenix" fault passes through the north-western corner peg of G.M.L. 5680 and approximately through the centre of G.M.L. 3283. On the western side of the fault the displacement of the graphitic schist—porphyry horizon has been about one thousand feet to the north.

There are three distinguishable minor faults, the displacements of which are in the same direction as that of the main fault to which they are roughly parallel. The displacements of the minor faults vary from 50 feet to 150 feet.

* Ward, H. J., G.S.W.A. Ann. Rept. 1946.

It is probable that the minor fault which is situated in the north-eastern corner of G.M.L. 5693 is a continuation of the fault which traverses the north-eastern corner of G.M.L. 5358.

Jointing and Schistosity.

The rocks of the area exhibit both jointing and schistosity.

The ultrabasics, which are the most incompetent rocks of the Coolgardie Greenstone Series, exhibit a schistosity, the strike of which varies from N. 30° E. to N. 15° W.

The meta-gabbro (amphibolite) being less susceptible to flow under pressure, has yielded by jointing and in some localities a rude schistosity has developed.

The schistosity of the meta-gabbro (amphibolite) has an approximate N.-S. strike and in some places a 50° E. dip has been observed.

The predominant set of joint planes have a N. 40° E. strike and a dip which varies from 70° W. to vertical. In one or two places these N. 40° E. joint planes dip at 50° W. Another outstanding set of joint planes have a strike of N. 60° W. and a variable dip.

In the southern belt of basic lavas the majority of joint planes have a strike of N. 40° E. In the dragfolded portion of this basic lava belt, joint planes with a strike of N. 60° W. and N. 20° E. have been developed. The dip of the joint plane striking N. 60° W. is vertical, whilst the dip of the joint plane striking N. 20° E. varies from 75° W. in one instance to 60° E. in another.

In some places, namely the railway cutting contained in G.M.L. 5693, there are several quartz reefs which are parallel to the N. 40° E. joint planes and are thought to have penetrated along them.

THE MINES.

At the time of inspection (May-June 1947) the only activity in the group, apart from some isolated instances of dry-blowing, was on G.M.L. 5637.

Surface observations indicate that the ore-bodies within the group consist chiefly of either mineralised and silicified meta-gabbro (amphibolite) or quartz reefs. In various places along the sedimentary bands, shallow potholes and shafts have been sunk indicating that they are auriferous but have contained no large ore bodies. Silicification of the graphitic slate bands has led to the formation of precious opal, but sufficient quantities are not available to warrant production.

The greatest gold production has been from those quartz reefs in the ultrabasic belts but no underground examination of any of these was made as the workings were inaccessible. However, a few notes will be given on the most productive leases.

"Garfield," Late G.M.L. 3617.

This lease is situated in the south-western corner of the group and is about 12 chains south-west of the 3 mile peg on the Coolgardie-Bonnievale road.

At least five shafts have been sunk on a quartz reef which has a strike of N. 80° E. and an indeterminate dip. The shafts extend over a distance of 350 feet but the quartz reef only outcrops over a distance of 100 feet. A vertical shaft, situated 320 feet on a bearing of 240 degrees from the north-eastern corner peg of the lease, has been sunk to a depth of at least 70 feet, which is the present water level in the shaft. The shaft is timbered over its entire visible length.

The wall rock varies from a fine to coarse grained actinolite rock.

It is possible that ore deposition was influenced by the dragfold which lies to the east of the lease. Unfortunately no evidence with which to substantiate this possibility is available.

There is no recorded production from this lease since 1911 up to which date 474.51 fine ozs. of dollied gold and 1,410.64 fine ozs. of gold were produced from the treatment of 960.50 tons of ore.

"Gleesons" G.M.L. 5653.

This lease, at present held by Messrs. McGuinness and Bates, is situated about 30 chains to the south-west of the 3 mile peg on the Coolgardie-Kalgoorlie main road.

The ground was first taken up by Gleeson's Success Gold Mines Ltd. in 1897. This company held G.M.Ls. 717, 1149, 3790. The present lease comprises the greater part of old G.M.L. 717.

The main ore body was a quartz reef, with a strike of N. 40° W. and a dip of 80° S.W. in rocks of ultra-basic composition which, adjacent to the ore channel, appear to be fine to coarse grained actinolite rocks with the coarser grained types predominating.

The main shaft, now inaccessible, is situated 730 feet on a bearing of 353 degrees from the south-eastern corner peg of the lease.

Since 1897, there has been 3,702 tons of ore treated for a yield of 2,383.58 fine ozs. of gold. The peak periods of production were 1897-1901 and 1941-1942.

"Caledonia" G.M.L. 5637.

The south-west corner of the lease is situated approximately 11.6 chains on a bearing of 62° 30′ from the 3 mile peg on the Coolgardie-Kalgoorlie main road.

The area was first held as the "Lindsay Gordon" G.M.L. 3297 in 1897, since when it has been successively known as the "Queen of Sheba" G.M.L. 3623 (1898-1899), the "Try Again" G.M.L. 4410 (1910-1911), "Caledonia" G.M.L. 5557 (1937-1939), until it was pegged out in its present form in 1940.

The present workings consist of an open cut situated approximately 370 feet on a bearing of 60 degrees from the south-western corner peg of the lease. The open cut is 140 feet long, 20 feet wide and has a maximum depth of 27 feet at its north-eastern extremity. The long axis of the open cut has a strike of N. 40° E.

The mine is situated adjacent to the northern boundary of the meta-gabbro (amphibolite), which is silicified and mineralised. The gold occurs in both the mineralised and silicified meta-gabbro and the quartz veins which irregularly traverse the meta-gabbro. Coarse gold occurs in the quartz but this cannot be said of the meta-gabbro in which the gold is reported to be of a much finer nature.

The sulphides which occur in the ore body are pyrite, pyrrhotite, and some arsenopyrite has been reported. An intergrowth of gold and pyrite has been observed in the quartz veins.

Since 1897, 1,065.21 fine ozs. of gold have been produced from 3,862.25 tons of ore.

Late M.C. 1.

This mineral claim is situated three-quarters of a mile on a bearing of 350 degrees from the 3 mile peg on the Coolgardie-Kalgoorlie main road.

The claim was taken up for the purpose of producing precious opal, but sufficient quantities were unobtainable to warrant the continuation of mining, consequently the workings have long been abandoned and are now inaccessible.

The occurrence of opal is confined to the graphitic slate bands, which, in places, grade across their strike into thin sandy felspathic bands.

These sediments, which occur along the basic lava contact with the northern ultrabasic belt of the group, have a strike of N. 60° W. and a steep southerly dip. They have undergone intense internal folding and it is possible that this is responsible for the band achieving a maximum width of 30 feet.

The claim was last visited by departmental officers in 1904 when Jackson* reported on the area.

The writer, apart from the above observations, sees no reason to disagree with Jackson's findings.†

* Jackson, C. F. V., G.S.W.A. Ann. Rept. 1904, p. 19.
† Op. Cit.

PRODUCTION FROM PORTION OF COOLGARDIE COVERED BY THE GEOLOGICAL SURVEY OF WESTERN AUSTRALIA TO 31ST DECEMBER, 1947.

Three Mile Hill Group.

Name of Lease or Company.	Lease Numbers.	Period of Production.	Alluvial.	Dollied.	Ore Treated.	Gold Therefrom.	Total Gold.	Grade dwt. Gold.	Silver.
			Fine ozs.	Fine ozs.	Tons.	Fine ozs.	Fine ozs.	Per ton.	
Princess Midas ...	3282	1898	...	...	19·00	13·45	13·45	...	...
Gleeson's Success G.M.s. Ltd.	717, 1149, 3790	1897/1901	...	...	1,132·00	1,211·26	1,211·26	...	...
Redleap	717	1903	...	...	110·00	43·89	43·89	...	...
Gleeson's Success	3790	1903	...	...	22·00	7·24	7·24	...	...
Gleesons	5585	1937/1941	...	·60	513·00	198·72	199·32	...	...
Gleesons	5656	...	*	*	*	*	*	...	...
Gleesons	5653	1941/1942	...	...	1,925·00	922·37	922·37	...	...
Lady Maud G. M.s. Ltd.	2281, 543	Previous to 1899	...	...	24·00	12·52	12·52	...	...
Gleesons, South ...	5358	...	...	...	*	*	*	...	...
Mother Mine ...	5274	1933	...	4·47	51·00	29·26	33·73	...	...
Juno	5494	1935/1936	...	...	212·00	54·61	54·61	...	...
Juno	5644	1940/1942	...	...	94·00	21·77	21·77	...	...
Caledonia, North	5693	...	*	*	*	*	*	...	...
Valentine ...	3616	1898	...	13·67	17·50	2·22	15·89	...	...
Greenhills ...	5680	1943	...	...	16·00	8·48	8·48	...	...
Garfield	3617	1898/1899	...	...	70·00	71·50	71·50	...	...
Garfield	3827	1901/1911	...	474·51	890·50	1,339·14	1,813·65	...	...
Cleopatra ...	5560	1937	...	2·74	40·00	7·32	10·06	...	...
May Queen ...	4411	1910/1913	...	...	394·25	256·69	256·69	...	...
May Queen ...	4467	1914	...	...	166·00	42·50	42·50	...	...
Union Jack, South	4407	1910/1911	...	...	22·50	69·79	69·79	...	...
Union Jack Gold Mining Co. N.L.	1385	1897/1899	...	...	644·50	599·26	599·26	...	...
Union Jack ...	4136	1905	...	...	16·00	4·73	4·73	...	...
Little Lena ...	4360	1908	...	...	10·00	8·21	8·21	...	...
Union Jack, South	4445	1912/1913	...	261·80	62·75	216·01	477·81	...	...
Lindsay Gordon...	3297	1897/1900	...	...	381·00	125·55	125·55	...	...
Queen of Sheba ...	3623	1898/1899	...	6·65	126·00	27·42	34·07	...	...
Try Again ...	4410	1910/1911	...	...	138·00	187·11	187·11	...	...
Caledonia ...	5557	1937/1939	...	...	659·00	236·87	236·87	...	...
Caledonia ...	5637	1940/1947	...	7·30	2,558·25	488·26	495·56	...	...

* No Production.

LONDONDERRY GROUP, COOLGARDIE DISTRICT.

By H. J. Ward, B.Sc., Geological Survey of W.A.

CONTENTS.

GENERAL INFORMATION.

The Londonderry Group is situated about eight and a half miles south-south-west of Coolgardie. The group is accessible by a track which branches to the west from the road to the Londonderry Felspar Quarry at a point approximately 8.7 miles from Coolgardie. A railway siding is situated on the Coolgardie-Norseman railway line about three-quarters of a mile to the east of the Londonderry Gold Mine. The group is traversed by numerous tracks.

At the time of inspection (July, 1947) there was no mining activity at the group and all the old workings were inaccessible.

The group has been denuded of suitable mining timber, and it is necessary to transport timber from south of the Londonderry Felspar Quarry.

Water for drinking purposes has to be transported from Coolgardie and if water in large quantities was required for mining purposes, it also may have to be transported.

The State battery at Coolgardie offers the nearest available crushing facilities.

All amenities, such as post office, stores, hotels, and Mining Registrar's Office, are available at Coolgardie.

The latest examination of the area, previous to the present one, by departmental officers was made by Blatchford* in 1912. A map covering an area of approximately one square mile has been prepared on a scale of five chains to an inch and copies may be obtained from the Geological Survey, Perth, W.A.

GENERAL GEOLOGY.

The leases are located in an area of metamorphosed basic lavas, ultrabasic rocks and sediments which have been intruded by epidiorite sills, pegmatite dykes, quartz reefs, and members of the porphyry-porphyrite series.

The greenstones and sedimentary bands have a general strike of N. 30° E. and a dip which is generally vertical, although there are one or two localities where the dip varies from vertical to 65° W. In the north-western corner of the area the strike of the series changes to the north. Air photos† show that this strike change is due to folding.

The basic lavas and epidiorite generally form the ridges in the group, whilst the ultrabasic rocks are to be found in the low-lying and sometimes undulating ground.

* Blatchford, T., G.S.W.A. Bull. No. 53 (1913).
† Courtesy Western Mining Corporation, Kalgoorlie, W.A.

The main drainage is towards the east. The creek, which breaks through the hills of basic lavas in the west, occupies part of an alluvial basin which widens out eastwards. Erosion by this creek has exposed bedrock in some places. The bed is not entrenched more than six feet.

Basic Lavas.

It has been possible to differentiate the basic lavas occurring in this area into two distinct types, namely—

(a) Fine to coarse grained, dark green, rudely sheared rocks which, in some localities, are amygdaloidal.

(b) Laminated, fine to medium grained, sometimes streaky rocks consisting of hornblende in a fine grained ground mass of quartz, together with minor amounts of felspar and augite.

The *laminated basic lava* belt extends for well over a mile and varies from 200 feet to 500 feet in width.

Ultrabasics.

The ultrabasics, occurring in three main belts, namely, *eastern, central,* and *western,* consist chiefly of fine to coarse grained actinolite schists, serpentine rocks and fine to coarse grained, rudely sheared actinolite rocks, which in some places are carbonated.

The serpentine rocks, which are tough, blocky and fine grained, are confined chiefly to the *eastern* and *western* belts, but other varieties occur therein.

The actinolite schists and rudely sheared actinolite rocks are the predominant rock types in the *central* belt. Evidence of internal folding in these types of ultrabasic rocks has been observed in two localities. One example, found in a mine dump about 1,000 feet on a bearing of 140 degrees from the south-eastern corner peg of G.M.L. 5630, shows coarse grained actinolite crystals folded in a sawtooth manner. At the southern extremity of the *central* ultrabasic belt, folded carbonated ultrabasic rocks are to be found. They consist of medium to coarse grained actinolite and white streaky bands of carbonate. To the east of these carbonated ultrabasics is a ridge of highly sheared soft talcose ultrabasic schists which show changes in strike of schistosity and, presumably, are folded.

To the south of late G.M.L. 983, within the western basic lava belt and near its eastern boundary, is a band of light green schists, frequently with a satiny sheen along the planes of schistosity. This schist band has been placed in the ultrabasic series and perhaps it may be a metamorphosed flow top.

Of the three ultrabasic belts, it appears that the *central* belt, in which few fine grained serpentine rocks have been observed, contains the most favourable channels for ore deposition.

In every ultrabasic belt there are the usual decomposition products of magnesite, jaspery ironstone, and cellular opaline quartz rubble. The best examples are to be found at the northern end of the *western* ultrabasic belt, where there is a number of low hills consisting almost entirely of these decomposition products.

Sediments.

Discontinuous, laminated, highly folded bands of sediments are found throughout the area. They are predominantly graphitic schists and slates which in some places grade across and along their strike into quartzites.

The sedimentary bands have been found along the formation junctions of the greenstones and also within the basic lava belts. The thickness of the bands does not exceed 40 feet and generally they average 20 feet in width.

The greatest amount of outcropping sediments occurs in the north-western portion of the group. Here, where the sedimentary bands attain their maximum thickness, both graphitic slates and quartzites occur.

About 24 chains due south of the south-west corner peg of late G.M.L. 804, and at the contact of the *laminated basic lavas,* a schistose rock, consisting

chiefly of quartz, garnet with minor amounts of felspar hornblende and graphite, occurs and it is regarded as a metamorphosed sediment.

Epidiorite.

This rock forms a distinctive feature of the area. It occurs as a coarse grained, blocky, rudely sheared rock, consisting of stellate aggregates of actinolite surrounded by felspars and quartz, giving the rock a distinct "mottled" appearance which makes it easy to recognise in the field.

There are three localities in which it occurs. The largest development of the epidiorite is along the eastern boundary of the western ultrabasic belt, where it forms the highest hills, especially in the south-west, to be found in the area and where it has a maximum width of 950 feet. Two conspicuous features of its occurrence here are the sedimentary bands along each boundary and that it fingers out into the fine to coarse grained basic lavas.

Between the *central* and *eastern* ultrabasic belts, to the south of the alluvium, there are two more belts of metadolerite, neither of which assumes the proportion of that belt which lies to the east nor does either outcrop north of the alluvium. Between these two epidiorite is a narrow belt of fine grained basic lava and along the boundaries of the more eastern epidiorite outcrops of sediments are to be found.

The field relationships of the epidiorite outside the Londonderry area has not yet been determined by regional mapping. Field evidence within the group shows it to be intrusive into the basic lava series and consequently of a later age.

Porphyry-Porphyrite Series.

Members of this series are well represented in this group. They exhibit those characteristics which are seen elsewhere in the Coolgardie district, in that they are hard, light coloured rocks consisting chiefly of quartz and albite. They have been sheared and jointed but, owing to infrequency of outcrops, there is no evidence to show that the porphyries have been folded.

An interesting occurrence of an acid and a basic porphyry is to be found on late G.M.Ls. 2271 and 2862. Neither of them attain a width greater than 10 feet. A quartz reef separates the two porphyries; the acid porphyry outcrops on the western side of the quartz reef. Outcrops in this locality are poor but it is thought that the quartz is a later intrusion and that the porphyries in this instance are dykes and not concordant intrusions as is generally the case elsewhere.

About 20 chains south of the south-western corner peg of late G.M.L. 804 a fine-grained porphyry outcrops within the laminated basic lava belt. This porphyry consists of phenocrysts of perthitic felspar and tremolite in a groundmass of anhedral quartz, some (?) cordierite is also to be found. It could be classed as a metasediment, but field occurrences lead one to believe that it is an intrusive rock.

Granite.

Granite was only observed in one locality, to wit, in an old mine shaft on late G.M.L. 2344. It is the medium grained, equigranular, biotite granite, which is found elsewhere in the Coolgardie District.

Pegmatites.

The pegmatite dykes are the youngest Pre-Cambrian rocks in the area and they are thought to be postgold in age.

The largest pegmatite dyke is to be found in the north-western corner of the area. It has an easterly trend and crosses the formation junction of the western basic lava belt with the *western* ultrabasic belt. Pegmatite outcrops between the two sedimentary bands. There is no surface evidence of the pegmatite dyke intersecting the bands, although it is highly likely that such is the case. The average width of the pegmatite is 30 feet.

In the *central* ultrabasic belt, to the east of G.M.L. 5630, there is a narrow pegmatite which has a trend parallel to the strike of the country. It does not attain a width greater than 15 feet, and has been mapped over a length of 900 feet. It is thought that this dyke may change its strike to connect with that pegmatite which passes through the south-western corner peg of late G.M.L. 2862 and which crosses the boundary of the *laminated basic lava* belt.

Just to the south of the alluvium and contained partly in the *laminated basic lava* and *central* ultrabasic belts, is a pegmatite dyke which has a flat dip and consequently outcrops over a large area.

Further south, in the *central* ultrabasic belt, are numerous outcrops of pegmatite. None are of any great extent.

In general, the mineral components of the pegmatite are quartz, microcline, biotite with some muscovite. The occurrence of rare minerals, such as beryl, topaz, lepidolite, etc., has not been observed and it is thought that these pegmatites can be classed with those barren pegmatites mentioned by Matheson*.

In the *eastern* ultrabasic belt there are several outcrops of a light coloured, blocky, rock which consists almost entirely of felspar and quartz, and which, in the field, has been termed "aplite." It is grouped with the pegmatites and it is regarded as an offshoot of the same granitic magma.

Quartz Reefs.

These are abundant throughout the area but the majority are confined to the *central* and *eastern* ultrabasic belts, and of these two the central belt has been the more favourable for the formation of auriferous quartz reefs as it is in this belt that the famous Londonderry quartz reef was found. Unfortunately, this reef has been worked out near the surface and very little is to be seen.

In the southern part of the *central* ultrabasic belt numerous quartz reefs occur. The length of outcrops is not great, but their arrangement suggests that folding has taken place in the greeenstones. The quartz reefs, which presumably belong to the period of ore deposition, are thought to have replaced folds in the ultrabasic rocks.

Some of the quartz is granular in character, but on the whole it is of milky white vitreous nature.

Laterite.

Ferruginous laterite occurs as a capping, chiefly over the ultrabasic rocks in the north-eastern portion of the area. In some places remnants of rude schistosity in the lateritised ultrabasics have been noted. The cappings are disintegrating and, as a result, lateritic rubble is scattered over large areas. Together with the lateritic rubble are found those decomposition products which result from the decomposition of ultrabasic rocks, namely, magnesite and secondary quartz.

Alluvium.

There is a belt of alluvium, with an easterly trend, which, lying within the southern half of the area, traverses the group. Its width increases to the east, especially so when it enters the eastern ultrabasic belt. A creek, whose course lies within the alluvial belt, has exposed bedrock in some places and in none of them does the alluvium exceed a depth of six feet.

Structure.

The situation of the Londonderry Group with respect to the regional structure has not yet been elucidated by regional mapping; however, air photographs† show a large fold, whose axis strikes roughly N. 60° E., to the south of Londonderry. The nose of this fold is located two miles west-south-west of the mine. As the axis of this fold is approximately parallel to the Tindals Crossfold it may have resulted from those forces which produced that structure.

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* Matheson, R. S., G.S.W.A. Ann. Rept. 1946.

† Courtesy Western Mining Corporation, Kalgoorlie, W.A.

Structures observed within the area were schistosity, jointing and minor folding along the contact boundaries and internal folding of the sedimentary bands.

The schistosity is roughly parallel to formation junctions and the general strike of the series. The strike of the schistosity varies from N. 60° E. to N. 15° W., but the general strike is about N. 30° E. This variation in schistosity is attributed to internal folding within the ultrabasic belts, in which these large variations occur. Where observed the dip of the schistosity varies from vertical to 60° S.-E.

Jointing information is scarce. Those joints observed have strike of N. 55° E. and a vertical dip. It is possible that this "jointing" may be fracture cleavage as it is parallel to the approximate strike of the fold axis.

Folding of the formation junctions is not strongly evident and is most suggested along those junctions which lie between the southern portions of the *central* and *western* ultrabasic belts. Accurate pitch information was unobtainable. The pitch of the minor folds vary immensely; a small quartz reef was observed to pitch at 50° N. whilst minor folds within the sedimentary beds have pitches which vary from vertical to 60° S., with southerly pitches predominating.

Taking everything into consideration, the writer is inclined to the belief that the series are on the eastern limb of a steep south-pitching anticline which has been cross-folded.

With regard to ore deposition, it is thought that folding has been the predominant controlling factor, and that the location of the more valuable deposits is in the vicinity of the crossfold axis.

Two points are of interest, namely:—

1. That the ore shoot on the Londonderry G.M.L. 5630 pitched to the south*.

2. That Reid's Find G.M.L. 5240, situated 120 chains to south-south-west of Londonderry Gold Mine, is also on or near the axis of the crossfold.

* Blatchford, T., G.S.W.A. Bull. 53, p. 39.

PRODUCTION FROM PORTION OF COOLGARDIE GOLDFIELD COVERED BY THE GEOLOGICAL SURVEY OF WESTERN AUSTRALIA TO 31ST DECEMBER, 1947.

Production—Londonderry Group.

Name of Lease or Company.	Lease. Numbers.	Period of Production.	Alluvial.	Dollied.	Ore Treated.	Gold Therefrom.	Total. Gold.	Grade dwt. Gold.	Silver.
			Fine ozs.	Fine ozs.	Tons.	Fine ozs.	Fine ozs.	Per ton.	Fine ozs.
Fiery Cross ...	5517	...	*	*	*	*	*	...	...
Londonderry G.M.s., Ltd. ...	575, 1076† 809	Previous to 1897/1903	...	15·67	11,337·00	10,442·47	10,458·14	...	...
Manipoto	4204	1906	...	...	63·00	30·02	30·02	...	...
Londonderry, North	5630	...	*	*	*	*	*	...	...
Londonderry (existing)	5770	...	*	*	*	*	*	...	...
Londonderry ...	5515	...	*	*	*	*	*	...	...
Londonderry Gold Mines, Ltd. ...	4049	1903/04	...	...	7·00	1,192·20	1,192·20	...	...
Londonderry ...	5584	1938	...	45·51	...	...	45·51	...	...
(Lease not named)	593	...	*	*	*	*	*	...	...
South Londonderry	4051	...	*	*	*	*	*	...	...
Londonderry, South	1076	...	*†	*†	*†	*†	*†	...	...
The Joker ...	852	...	*	*	*	*	*	...	...
Bonanza Extended	1021	...	*	*	*	*	*	...	...
Bonanza	2271	...	*	*	*	*	*	...	...
(Lease not named)	773	...	*	*	*	*	*	...	...
Triangle	823	...	*	*	*	*	*	...	...
Somerset	2862	...	*	*	*	*	*	...	...
South Londonderry	2344	...	*	*	*	*	*	...	...
Gita	784	...	*	*	*	*	*	...	...
Mologa	804	...	*	*	*	*	*	...	...
(Lease not named)	283	...	*	*	*	*	*	...	...
Tyrconnel ...	2737	...	*	*	*	*	*	...	...
(Lease not named)	220	...	*	*	*	*	*	...	...
Golden Stream ...	2709	...	*	*	*	*	*	...	...
Golden Stream ...	908	...	*	*	*	*	*	...	...
Day Dawn ...	950	...	*	*	*	*	*	...	...
Innamincka ...	1911	...	*	*	*	*	*	...	...
Dromana ...	986	...	*	*	*	*	*	...	...
Rome Consolidated G.M.s., Ltd.	831, 862, 963, 1334, 1382	1898	...	...	30·00	9·20	9·20	...	...
Garden Gully ...	3754	1899	...	...	10·00	2·63	2·63	...	...
Orkdiam	3495	...	*	*	*	*	*	...	...
Tavenor	3002	...	*	*	*	*	*	...	...
Peep O'Day ...	848	...	*	*	*	*	*	...	...
Londonderry Consols, West ...	1382A	...	*	*	*	*	*	...	...
North Rome ...	3334	...	*	*	*	*	*	...	...
Uralla	1662	...	*	*	*	*	*	...	...
Bullarra	1152	...	*	*	*	*	*	...	...
(Lease not named)	263	...	*	*	*	*	*	...	...
Londonderry, South Extended ...	862	...	*	*	*	*	*	...	...
Maud, South ...	1647	...	*	*	*	*	*	...	...

* No Production.

THE MINES.

At the time of inspection (July, 1947) no underground workings were accessible and the only information concerning any of the workings is that contained in Blatchford's* report on the area, in which he gives some information on the old Londonderry Gold Mine.

Londonderry G.M.L. 5630.

As there are no available plans or sections of this mine, the workings of which are now inaccessible, the pertinent facts from Blatchford's report will be cited.

"..... it appears that the first gold was won from a massive quartz reef outcrop, and that the gold continued down from the surface in a narrow shoot only to a vertical depth of 400 feet. Also, that this shoot pitched away to the south and became too small to profitably mine. . . . It is also probable that the gold shoot was found on the back of a double fold of the quartz body, a geological feature which is common in this locality."

With regard to the underground workings, Blatchford gives the following information:—

"On application for exemption from labour conditions, lodged in the Coolgardie Court on March 23rd, 1901, it was then stated that in all 823 feet of shaft sinking, 2,982 feet of driving, 644 feet of crosscutting, and 738 feet of winzing and rising were the total mining operations to that date. . . . . The main shaft contains one of the best supplies of water in the district; the water is salt, but not intensely so."

From the mine there has been produced 51.18 ozs. of dollied gold and 11,634.67 fine ozs. of gold from the treatment of 11,344.0 tons of ore. Except for 45.51 ozs. of dollied gold there has been no production from the mine since 1904.

Production.

The production table† on page 87 shows that the leases containing the "Londonderry" Mine have yielded by far the greatest amount of gold.

LONDONDERRY FELSPAR GROUP, COOLGARDIE DISTRICT.

By H. J. Ward, B.Sc., Geological Survey of W.A.

CONTENTS.

GENERAL INFORMATION.

The Londonderry Felspar Group is situated approximately 13 miles south-south-west of Coolgardie. The Londonderry Felspar quarries, which lie within the group, are 4.4 miles by road south-west of Londonderry Railway Siding, which is 10 miles south of Coolgardie on the Coolgardie-Esperance railway line. There is a graded road between Coolgardie and the quarries.

The mining activity, within the group, is confined to the extraction of felspar and beryl from pegmatite dykes.

At the time of inspection (November-December, 1947), there were eight existing mineral leases, namely M.Ls. 80, 82, 83, 88, 89, 96, 100 and 101, all of which, with the exception of M.L. 101, are held by Australian Glass Manufacturers Co. Pty. Ltd.

There is ample timber for mining purposes within the area.

Water, for both domestic and mining purposes, has to be transported.

At Coolgardie are stores, two hotels, post office and a Mining Registrar's Office.

The Londonderry Felspar quarry (M.L. 80) was previously visited and reported on by Ellis‡ in 1943.

A map on a scale of 5 chains to an inch, and covering an area of approximately one square mile, was prepared by the writer.

GENERAL GEOLOGY.

The rocks of the area consist of highly metamorphosed and complexly folded, basic lavas, tuffs, and sediments, together with epidiorite, members of the porphyry-porphyrite series, granite, pegmatite and quartz.

Exposures are poor, the greater part of the area being covered by soil, alluvium and, in some places, laterite. The formation junctions are generally obscured by rubble.

A ridge of hills, moderately timbered, and in some places covered by dense scrub, rises in the vicinity of the mineral leases and trends towards Tantalite Hill, approximately a mile north of the Londonderry Felspar Quarry. To the east, west and south of these hills the country is slightly undulating and almost completely soil covered.

South of the leases, and just below the centre of the area mapped, is an alluvial basin with an easterly trend. This alluvial basin possibly may have been an extension of a salt lake. Red sandy soil, on which grow spinifex grass and tall salmon gums, covers the greater part of the ground to the south of the alluvial basin.

Basic Lavas.

Fine, medium to coarse grained amphibolites are the predominant outcropping greenstone. They are thought to have been formerly basic lavas and basic tuffs.

Within the metamorphosed basic lava belt are basic schists, whose mode of origin is extremely doubtful.

A belt of fine grained, dark green, streaky rocks, with slatey cleavage, outcrops to the east of the main north ridge. Rocks within this belt appear to be highly metamorphosed, basic tuffs. They show signs of internal folding, but not intensely so.

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* Op. Cit.
† Courtesy of Mines Department Statistician.

‡ Ellis, H. A., G.S.W.A. Ann. Rept. 1943.

Sediments.

Graphitic schists and slates outcrop within the metamorphosed basic lava belt and, no doubt, at the formation junctions of successive lava flows. They do not attain any great width, nor do they outcrop continuously over any length.

The largest outcrop occurs approximately 2,000 feet north of the north-east corner peg of M.L. 82.

Epidiorite.

The epidiorite outcrops in the low-lying open country on the western side of the group, north of the alluvial basin. It is a coarse grained, blocky, rudely sheared rock containing stellate aggregates of actinolite surrounded by felspar and quartz. On weathering, the rock has a distinct "mottled" appearance, which makes it easy to recognise in the field.

It is probably a continuation of the epidiorite which occurs further north in the vicinity of the Londonderry Mine* and may be related to that magma which is responsible for the hornblendite intrusives and epidiorite sill that occur at the Lord Bobs Group.

In this group the epidiorite has no special features. It might be noted that whereas in the Londonderry Group† the epidiorite forms the hills, in this group it forms only small hillocks in flat, open country.

Granite.

Within the area mapped no granite outcrop has been observed. After an intensive search, a few pieces of medium grained, equigranular, biotite granite were found.

The granite is thought to underlie that part of the group (chiefly south of the alluvial basin) which is covered by red sandy soil, on which grows spinifex grass.

Porphyry-Porphyrite Series.

Members of this series outcrop within the metamorphosed basic lava belt. They are hard, light coloured rocks which have been sheared, jointed, and locally folded.

The igneous origin of some of these rocks is open to doubt. A specimen, which was taken from that porphyry which outcrops at a distance of 570 feet on a bearing of 25 degrees from the south-west corner peg of G.M.L. 82, was cursorily examined under the microscope. It appeared to be a metamorphosed sediment.

Pegmatite.

The pegmatite dykes are the most important economic rock unit of this group. They belong to that mineral-bearing pegmatite phase mentioned by Matheson‡.

The largest dyke in the area outcrops on M.Ls. 82, 89, 100, 83, 80. It is from this dyke that microcline felspar, petalite, beryl and columbite have been extracted.

The pegmatite dyke on M.L. 101 has also proved to be mineral-bearing, but the area of outcrop is not very large. Some beryl has been obtained from this pegmatite.

Quartz Reefs and Veins.

A few quartz reefs outcrop in the area, the largest being that on M.L. 101.

About six chains west of the north-west corner peg of M.L. 101 there are quartz veins in epidiorite, which are auriferous. Topaz is also reported to have occurred in one of these quartz veins.

Laterite.

Laterite occurs as a capping, overlying decomposed ultrabasic rocks in the north-eastern corner of the group.

Alluvium.

South of the leases and just below the centre of the area mapped, is an alluvial basin with an easterly trend. It has a maximum width of 1,000 feet. The thickness of the alluvium is not known.

Soil.

Soil obscures the geology of the greater part of the area. The soil varies in colour according to the composition of the underlying rocks. Red sandy soil overlies granite and pegmatite. The basic lavas are covered in places by a greyish brown soil and the epidiorite by a dark reddish brown soil.

THE MINES.

The only activity at the time of inspection (December, 1947) took place on M.Ls. 80, 82 and 101.

All mining was confined to the extraction of non-metallic minerals.

M.Ls. 80, 82, 83, 89, 96, 100.

General Information.

These leases are held by Australian Glass Manufacturers Co. Pty. Ltd. Production from the area first commenced in 1932 when E. Seahill pegged M.Ls. 80 and 82. He increased his holdings so that by 1938 he held M.Ls. 80, 82, 83, 84 and 85. In 1939 the present owners purchased the leases and pegged out the ground in its present form. The area contained by the leases embraces 50 acres.

At the time of inspection the minerals produced were microcline felspar, beryl and columbite—the last two minerals were produced only in small amounts.

During the war years (1939-1945) interest was shown in the petalite (a lithium-bearing mineral) content of the pegmatite. The investigation was performed and reported on by Ellis§ in 1943.

All extraction is done by quarrying, requisite water being carted from Coolgardie. When the deposit was investigated work was confined to No. 2 Quarry, in which three men were working.

A geological map of the main workings, M.Ls. 80 and 82, together with cross-sections of No. 1 Quarry, on a scale of 100 feet to the inch, accompany this report.

General Geology.

The rocks occurring within the leases are metamorphosed, basic lavas, basic tuffs, sediments, and members of the porphyry-porphyrite series, all of which have been intruded by a large pegmatite dyke.

The basic lavas are represented by fine, medium to coarse grained amphibolite rocks which, in some places, are highly schistose. The strike of the basic lavas varies from N. 10° W. to N. 45° W. The predominant strike of the rocks outcropping on the leases is N. 45° W.

The pegmatite dyke has a general north-south trend. In one place only, the north-western corner of No. 1 Quarry, has the contact been exposed in a manner which enables measurement of the dip of the contact, which is 10 degrees to the north-west. In this locality a distinct reaction rim (a result of the assimilation of the greenstone by the pegmatite) can be observed near the igneous contact. Here it attains a maximum width of 40 feet, but elsewhere it is not so wide and in some places negligible.

The quarries are situated near the northern termination of the dyke, where outcrop conditions are fair. The greater portion of the dyke is obscured by soil and rubble. Nevertheless, the pegmatite is thought to extend southwards from the leases at least as far as the alluvial flat‖.

* Ward, H. J., G.S.W.A. Ann. Rept. 1947, Londonderry Group.
† Op. cit.
‡ Matheson, R. S., G.S.W.A. Ann. Rept. 1946.

§ Ellis, H. A., G.S.W.A. Ann. Rept. 1943, pp. 14, 15.
‖ See Plate VI.

Workings.

As a result of mining operations, two quarries and some shallow shafts have been excavated. The larger quarry (No. 1) is situated on M.L. 80, the smaller (No. 2) on M.L. 82.

No. 1 Quarry.

The quarry occupies the central portion of the leases.

Quarrying operations were commenced about 120 feet north-west of the south-west corner peg of M.L. 80. An open-cut about 240 feet long and increasing from roughly 50 feet to 100 feet in width and varying in depth up to 15 feet, was formed before it was extended eastwards as well as northwards.

The quarry, except for the large rectangular entrance, is roughly oval in shape, being about 400 feet long and 180 feet wide. The maximum depth of the quarry is 60 feet in the north-western corner, but the average depth is about 30 feet.

No. 2 Quarry.

No. 2 Quarry is situated near the southern boundary of M.L. 82, approximately 200 feet east-north-east of the south-west corner peg of M.L. 82. In plan it is roughly triangular, having one side about 100 feet long and two sides about 80 feet long. In its north-western corner, it attains a maximum depth of 200 feet. The entrance to the quarry is from the south-east.

Shafts.

Some prospecting shafts, which are situated 200 feet on a bearing of 214 degrees from the north-east corner peg of M.L. 83, were sunk in a lens of lepidolite mica. The quality of the mica did not warrant further work, and the shafts are now inaccessible.

Mineral Occurrences.

For the sake of convenience, the minerals occurring within the pegmatite have been divided into two sections, as tabulated:—

Minerals of Economic Importance.	Other Minerals.
Microline	Quartz
Beryl	Albite
Columbite	Biotite
Petalite	Apatite
Lepidolite	Cassiterite
	Prehnite
	Bowleyite
	Duplexite
	Garnet

Ellis* in 1943, estimated the approximate composition of the dyke by volume as follows—

Quartz	25% approx.
Felspar	35% "
Petalite	25% "
"Hornstone" (albite, chalcedony)	15% "

The writer, from his investigation, saw no need to differ radically from these estimates.

The following notes on the mineral occurrences were made.

(a) *Economic Minerals.*

Microcline: The mine is operated primarily to produce this mineral, which occurs in large masses. The microcline is very clean and a high grade product can be obtained by hand picking.

The largest mass of felspar occurred in the No. 1 Quarry at the eastern end. It measured approximately 140 feet long by 100 feet wide and attained a maximum height of roughly 30 feet. There were 1,500 tons of felspar, which was practically free from impurities, contained in this mass.

* Op. cit.

Lepidolite: There are no extensive occurrences of lepidolite in the pegmatite dyke. The colour varies from pink, grey to almost colourless. The largest lens occurs in some old shafts* on M.L. 83. The lepidolite, in these shafts, is fairly clean, transparent mica occurring in books, whose average size is about 5 inches by 4 inches and up to one inch thick.

At one stage during the war, it was thought that if sufficiently clear this lepidolite might be used as a substitute for optical calcite†, but the quality of the lepidolite did not warrant its development.

This lens is about 50 feet long and 20 feet wide. As the deposit has been exposed to weathering for at least 40 years the books of mica are badly split apart.

Petalite: Petalite (a lithium-bearing mineral) occurs as a white to colourless mineral and, at times, it is very difficult to distinguish from microcline and quartz. Generally, it can be separated from microcline quartz and "hornstone," a replacement product, by its foliated cleavage. It occurs throughout the workings, but the greatest concentration has been in the western portion of the quarry.

Pseudomorphs of petalite, for which the term "hornstone"‡ has been used, are present in three different forms, all of which have been described by Simpson.§ These forms are—

(a) Hard, white, horny mineral, consisting chiefly of albite and quartz;
(b) Much softer, grey pseudomorphs;
(c) Lilac pink coloured pseudomorphs.

Of the three types, the first, which has the largest amount of albite, is the hardest.

Available chemical analyses of unaltered petalite show that there is from 3.72 per cent. to 4.2 per cent. of Li_2O, whilst in the "hornstone" the Li_2O content varies up to 1.11 per cent.

During the war years petalite was of economic value on account of its lithia content. At present further development is uneconomic.

Beryl: Beryl varies from colourless, light green, to rose coloured. It is generally massive and occurs principally near the western edge of the No. 1 Quarry. A mass of beryl, about 2 tons in weight, was found in the north-eastern corner of No. 1 Quarry, about 170 feet east of the main occurrences and approximately 30 feet below the surface.

Approximately two pounds of beryl have been reported from No. 2 Quarry.

Columbite.—Small quantities of this mineral have been found from time to time. It occurs only in the north-western corner of the No. 1 Quarry. Poorly developed crystals occur in a flat zone about 30 feet long, 3.0 feet deep, and of indeterminate width.

(b) *Other Minerals.*

Quartz.—There appears to be two types of quartz, one of which is milky white and the other practically colourless. The colourless variety is generally associated in minor amounts with biotite mica within the felspar.

The milky white quartz occurs in large, irregular masses. There does not seem to be any regular distribution of the masses. It is thought that this type of quartz may be a later injection into the pegmatite. The occurrences of further masses of this type of quartz, within the pegmatite, are unpredictable.

Biotite.—Biotite mica occurs sporadically throughout the dye, often in spherulitic balls‖ but the occurrences do not attain any dimensions. Platey biotite is frequently associated with glassy quartz in masses of felspar.

* Wilson, R. C., W.A. Mines Dept. Rept. 1928, pp. 110-111.
† Geological Survey File No. 28/1943.
‡ Ellis, H. A., Op. cit. p. 15.
§ Simpson, E., Journal Roy. Soc. of W.A., pp. 116-119.
‖ Simpson, E., Bull. 48, p. 95.

. *Apatite.*—There are no special characteristics of apatite to be mentioned. Occurrences are isolated and chiefly confined to the north-western side of No. 1 Quarry.

Garnet.—Small crystals of red garnet occur in the pegmatite near the igneous contact in the northern face of the No. 1 Quarry.

Prehnite, Cassiterite, Bowleyite, Duplexite.—These minerals occur in minor amounts in the north-western corner of the No. 1 Quarry.

Zoning of Minerals.

All accessory minerals, namely beryl, columbite, prehnite, cassiterite, bowleyite, duplexite, occur in the north-western corner of the quarry between 50 and 70 feet from the surface. The masses of microcline also show a tendency to be grouped near the greenstone-pegmatite contact. These occurrences are near the hanging wall which dips at 10 degrees north-west. In accordance with the classification adopted by officers of the United States Geological Survey*, this pegmatite deposit is tentatively classed as a *wall zone* deposit.

There is insufficient evidence to determine whether the structure of the greenstones (viz., folding) has had any control on the igneous contact and the zoning of minerals. This possibility should not be overlooked in further developments.

The replacement of petalite by quartz chalcedony and albite felspar supports the accepted theory that pegmatite formation occurs in two stages; firstly, a stage of magmatic intrusion and crystallisation, followed by a stage involving hydrothermal replacements.

Production†.

Microcline Felspar.

Year.	Quantity. Long Tons.	Value. £
1932	412·46	731·0
1933	444·09	856·5
1934	193·0	386·0
1935	4,208·5	8,437·0
1936	2,840·0	5,680·0
1937	2,900·0	5,801·0
1938	2,837·0	5,746·0
1939	3,542·0	7,084·0
1940	3,457·25	6,914·5
1941	3,990·0	11,970·0
1942	3,240·5	9,711·50
1943	2,289·0	6,867·00
1944	1,881·0	10,375·5
1945	1,234·5	4,321·25
1946	1,793·0	6,281·5
1947	1,226·0	4,291·0

Beryl.

Period.	Ore.	Units.	Value.	Assay.
	Long Tons.	Long Tons.	£	% BeO.
June, 1944	28·71	322·65	945·586	11·57
Sept., 1945	19·23	238·07	519·425	12·38
June, 1947	24·19	273·82	832·86	11·32
Total	72·13	834·54	2297·871	Av. 11·78

Columbite.

Period.	Net Weight.	Assay Ta_2O_5.	Content Ta_2O_5.	Value.
	lbs.	%	lbs.	£
1944	692	39·90	276·108	169

* Cameron, Larrabee and others; Economic Geology, Vol. XL, No. 6, 1945.
† Courtesy Mines Department Statistician.

Future Prospects.

Surface indications have not been a key to the mineral occurrences within the pegmatite, only albite felspar, mica and quartz outcropping at the surface. Nevertheless, it appears that the pegmatite should have excellent prospects in depth.

Development work can be divided into two sections—

(a) Surface exploratory work;

(b) proving the pegmatite at depth.

(*a*) *Surface Exploratory Work.*

The probable southward extension of the pegmatite has been outlined*.

The exact limits can be determined by costeaning.

(*b*) *Proving the Pegmatite at Depth.*

This pegmatite is classified as a "wall zone" pegmatite. This means that mineral resources are near the contact of the pegmatite with the greenstone. Where visible, this contact dips at 10° N.W. However, the lack of pegmatite outcrop in the low-lying ground to the west inclines the writer to the belief that the dip of the contact becomes steeper with depth. The lack of accessory minerals at the surface suggests that it is the top of the pegmatite which is outcropping.

Thus, it can be seen that future subsurface development depends on the attitude of the pegmatite dyke.

To prove the dip of the hanging wall of the pegmatite, inclined diamond drilling to the east from positions near the western boundary of M.L. 80 is suggested.

Once the dip of the contact has been proved, underground development can be performed by either of two methods.

Firstly, in the north-western corner of No. 1 Quarry an inclined shaft, parallel to the proven dip of the contact of the pegmatite with the greenstone, could be sunk for a vertical depth of a hundred feet and radial diamond drilling could be undertaken to the east and west. Drilling to the west would prove the continuation of the wall zone and also the igneous contact at depth. Drilling to the west would prove the large microcline felspar mass at depth.

The second method is not so extensive. It consists of vertical diamond drilling in the No. 1 Quarry to prove the extension at depth of the large microcline felspar mass at depth.

M.L. 101.

This lease is held by S. Giles, who has extracted several tons of beryl from the pegmatite within seven feet of the surface. Mines Department records show that 3¾ tons of beryl have been produced from the lease.

FURTHER NOTES ON BONNIEVALE GROUP, COOLGARDIE DISTRICT.

By H. J. Ward, B.Sc., Geological Survey of W.A.

CONTENTS.

* Plate VI.

GENERAL INFORMATION.

Bonnievale is situated approximately seven and a half miles north of Coolgardie and it is possible to reach the group by a graded road in good condition (December, 1947). There are numerous tracks traversing the area.

Bonnievale townsite is shown on the map prepared, but apart from one house nothing remains of the town which had a maximum population of 540 people between the years 1902 and 1904.

At the time of inspection (August, 1947) there was no activity in the group and all old workings were inaccessible.

The group has been denuded of suitable mining timber and it is necessary to transport timber from south of Londonderry, which is thirteen (13) miles south of Coolgardie. Water for domestic purposes has to be transported from Coolgardie. When the mines (Westralia East and Extension, New Victoria South, New Victoria Consols), were in operation sufficient water for mining purposes was obtained from a water shaft (W.R. 47) approximately half a mile to the east of the mine workings.

The State Battery at Coolgardie presents the nearest crushing facilities.

All amenities, such as post office, stores, hotels, and Mining Registrar's Office, are available at Coolgardie.

The last examination of the area, by Departmental officers, was made by Gibson* in 1908. A map covering an area of approximately one square mile has been prepared on a scale of five chains to an inch. In addition a sub-surface geological map, on a scale of five chains to an inch, showing the positions of the quartz reefs within the granite, has been compiled from the results of Gibson and this examination. Copies of the map are available at the Geological Survey Office, Perth.

GENERAL GEOLOGY.

The group lies in a broad east-west valley which is bounded to the north and south by ridges of hills, the crests of which are well over a mile apart. The valley surface consists of slightly undulating ground which has determined two main drainage channels, one towards the east, the other, in the north-western portion of the group, to the north.

Despite a heavy cover of soil and alluvium, the rocks of the area were found to consist of metamorphosed basic lavas and ultrabasic rocks which have been intruded by granite and members of the porphyry-porphyrite series. The general trend of the series is east-west but no dip information was obtainable.

Basic Lavas.

The basic lavas, which outcrop over a small portion of the southern edge of the area, are rudely sheared, dark green rocks, varying from a fine to coarse grained texture.

Ultrabasics.

The ultrabasics occupy the greatest portion of the area mapped. They are dense, fine grained, serpentine rocks, which show no signs of schistosity or jointing.

In places, near the contact of the ultrabasic rocks with the granite, some coarse grained actinolitic varieties have been observed.

The map of the area prepared by Gibson† shows a mass of ultrabasic rock contained in the granite. Present mapping did not locate the complete boundary of this mass, which is probably the remnant of a roof pendant, on account of the soil cover.

Granite.

The granite is a light coloured, medium to coarse grained, equigranular, biotite granite. It occupies the central portion of the area mapped. There are no signs of schistosity and in one place only has jointing been recorded, namely, 290 feet on a bearing of 155 degrees from the north-western corner peg of G.M.L. 5518. Here, there are two joint planes, one of which strikes N. 70° E. and dips vertically, the other strikes N. 10° E. and dips 60° W.

The contact of the granite with the greenstone, where visible, is well defined. The dip of the contact varies through 90°.

The writer agrees with Gibson* in that the Bonnievale granite probably "extends out to the south of Mt. Burgess and joins the main mass that lies between Kunanalling and Jourdie Hills."

Porphyry-Porphyrite Series.

Two members of this series have been mapped, one a felsite dyke and the other a porphyry intrusive. The felsite dyke is situated on G.M.L. 5380. It has an approximate north strike and attains a width of up to 20 feet.

The porphyry intrusive occurs in the basic lava belt. Outcrop conditions prevented determining whether the porphyry transgressed the basic lava—ultrabasic contact. It appears to be folded, and otherwise exhibits the general characteristics of this series.

Quartz Reefs.

In the area mapped all quartz reefs are in granite, but it is known that quartz reefs occur immediately outside the area, namely the old "Burgess" G.M.L. 4113, and are probably comagmatic.

As most of the quartz reefs have been stoped out to the surface and as there is much obscured by soil, little surface information is available.

The quartz reefs vary in both strike and dip. The most predominant reefs are those which strike in a north-westerly direction and dip to the north-east. It is from these reefs that the greatest amounts of gold have been produced. Some reefs with a north strike and a flat easterly dip occur on G.M.Ls. 5378, 5377, and 5401.

According to Gibson†, "The reefs are invariably of hard, clean quartz, very white and glassy, and so far carrying very little sulphide; the stone is often strongly laminated, and when this happens the values are said to be better than in the more solid stone; . . ."

Laterite.

There are two cappings of ironstone laterite, one in the vicinity of the south-western corner peg of G.M.L. 5401, the other lies approximately a quarter of a mile to the south. In the vicinity of these cappings there are large quantities of laterite rubble.

Alluvium.

A large part of the area has been mapped as alluvium, the boundaries of which may encroach upon what is really soil. The depth of the alluvium is not really excessive, the deepest parts being approximately five feet.

Ore Deposition.

The mines are situated in a granite mass, on the northern limb of the Bonnievale Crossfold and approximately a mile north of the axis of the crossfold.

The ore deposition, in this area, is not controlled by regional folding. It is directly associated with the granite. The mineralised quartz reefs have been injected along the tension cracks formed by the early cooling of the marginal portion of the Bonnievale granite.

It appears that the most favourable and persistent tension cracks are those which have a general north-westerly strike. Those quartz reefs which have a northerly or easterly distribution are short in length and low in gold content.

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* Gibson, C. G., G.S.W.A. Bull. No. 31, 1908.
† Op. Cit.

* Op. Cit. p. 11.
† Op. Cit.

THE MINES.

At the time of inspection no underground workings were accessible. Gibson* briefly described the mines.

Mining activity was greatest between the years 1897-1911, since when it has been sporadic. During this period 167,581.70 fine ozs. of gold were produced from 326,921.25 tons of ore.

LORD BOBS GROUP, COOLGARDIE DISTRICT.

By H. J. Ward, B.Sc., Geological Survey of W.A.

CONTENTS.

GENERAL INFORMATION.

Lord Bobs Group† is situated six miles south-west of Coolgardie and two and a half miles west of Burbanks. Access to the group, from Coolgardie, is gained by means of what was formerly a well graded road which has deteriorated into nothing better than a first class bush track. A track connects the group with the Coolgardie-Londonderry road at Burbanks, and a few other tracks traverse the area.

At the time of inspection there was no mining activity at the group. All old workings were inaccessible.

Sufficient timber for prospecting purposes may be obtained in the hills to the south of the workings. Water has to be transported from Coolgardie.

The State Battery at Coolgardie presents the nearest available crushing facilities.

All amenities such as post office, stores, hotels, and Mining Registrar's Office, are available at Coolgardie.

The area was visited by Blatchford‡ in 1912. A geological map, covering an area of approximately half a square mile, has been prepared on a scale of five chains to an inch. Copies of the map are available at the Geological Survey Office, Perth.

GENERAL GEOLOGY.

The group is situated in an area of highly metamorphosed basic lavas, ultrabasic rocks, and sediments which have been intruded by hornblendite bodies, an epidiorite sill, granite and members of the porphyry-porphyrite series. The series is presumably of Pre-Cambrian age.

The strike and dip of the series vary considerably. This is attributed to folding.

The highest hills in the area lie to the south of G.M.L. 5706. Here the country is very rugged and the hills consist of fine-grained basic lavas and numerous narrow belts of coarse-grained greenstone (hornblendite), which form most of the ridges. The general attitude of the ridges appears to be determined by the intrusive hornblendite bodies.

A creek, draining to the south, lies almost in the centre of the area mapped. It divides the rugged hills around the mine workings from the more rounded hills, composed of fine-grained talcose ultrabasics, amygdaloidal and porphyritic lavas, along the eastern boundary of the map.

In the south-eastern corner of the area, a laterite capping, overlying basic lavas and ultrabasic rocks, has given rise to the formation of breakaways which are undercut by weathering.

The high hills in the vicinity of the workings slope away gently to low-lying ground along the western edge of the group.

Basic Lavas.

Basic lavas are well distributed throughout the area. They consist of sheared, dark green, fine-grained rocks, fine to coarse grained amygdaloidal lavas and a porphyritic lava intrusive.

The *sheared, fine-grained, basic lavas* outcrop to the west of the creek which passes through the centre of the area. They consist of hornblende in a groundmass of fine laths of albitic felspar. It is thought that these rocks are not contemporaneous with the fine to coarse grained *amygdaloidal lavas.* These are dark green, generally blocky rocks, which outcrop along the eastern edge of the area.

Within the amygdaloidal basic lava belt are light coloured rocks which are thought to be of tuffaceous origin, but confirmatory petrological evidence is lacking.

A porphyritic lava§ is contained within the amygdaloidal lavas and consists of a dark green, fine grained groundmass with phenocrysts of felspar. In the north-eastern corner of late G.M.L. 3971 the porphyritic lava contains an inclusion of fine-grained amygdaloidal lavas. It has been intruded by members of the porphyry-porphyrite series. It attains a maximum width of about 600 feet within the group and can be traced eastwards towards Burbanks.

Basic schists occur generally near the contact of the fine-grained basic lavas with the hornblendite. In some places they are extremely schistose, for example, near the south-west corner peg of G.M.L. 5706; and in others they appear to be rather schistose, granular rocks with vermiculite, for example, 300 feet south-west of the north-west corner peg of late G.M.L. 3946. The origin of these schists is doubtful they may be the remnants of metamorphosed flow tops along which the hornblende has been intruded, but it seems more likely that they have been formed from the fine-grained basic lavas by intense shearing. They have not been mapped as a separate rock type, but have been included within the fine-grained basic lava belt.

Ultrabasics.

These rocks consist chiefly of fine-grained talcose rocks with variations to actinolite-tremolite schists and talcose, garnetiferous schists. A distinct belt of ultrabasics occurs to the east of the creek which passes through the centre of the group. Decomposition products of opaline and cellular quartz and secondary ironstone are frequently met with in this belt.

Sediments.

Sediments outcrop as quartzites and greyish white to black, graphite slates and phyllites.

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* Op. cit.
† Lands Dept. Litho. No. 39/80.
‡ Blatchford, T., G.S.W.A. Bull. No. 53, 1913.

§ Ward, H. J., G.S.W.A. Ann. Rept. 1946, Burbanks Group.

Of the few outcrops observed, the largest number occur in the amygdaloidal basic lavas belt.

Shallow shafts and potholes have been sunk on them, showing that they are auriferous but that they do not contain any large ore bodies.

Basic Intrusives.

Hornblendite.—Within the fine-grained basic lavas are numerous narrow belts of a hard, dark green, coarse-grained rock consisting of radiating crystals of tremolite and actinolite and some interstitial felspar (not visible in hand specimen). These rocks have been called hornblendites. It has not yet been possible to determine whether these rocks have been injected into the basic lavas as dykes or sills.

Epidiorite.—The epidiorite outcrops within the talcose, fine-grained, ultrabasic belt about 600 feet west of late G.M.L. 4398.

Along its western boundary is a graphitic schist-quartz porphyry horizon, and on its eastern boundary a hornblende porphyrite, which is thought to be the chilled margin of the epidiorite intrusive which is regarded as being concordant. It is possible to divide the sill into two sections. One section (the western) consists of coarse-grained epidiorite and the other section consists of medium-grained, equigranular epidiorite. Hence the bottom of the sill is regarded as that adjacent to the graphitic schist-quartz porphyry horizon.

The hornblendite and epidiorite are regarded as belonging to the same basic magma. They may be correlated with the epidiorite, on petrological grounds only, which occurs in the Londonderry Group.

In age, these rocks are younger than the basic lavas, ultrabasics and sediments, but older than the granite and allied rocks.

Granite.

Granite outcrops in the north-western corner of the group. The outcrop which is weathered, is mostly covered with laterite and lateritic rubble.

In the mine dumps the rock is a dark grey, coarse-grained, porphyritic, gneissose, biotite, granite. Felspar crystals, which appear to have been orthoclase, form the phenocrysts. It is thought that the porphyritic texture is not a result of metamorphism. The strong development of biotite lenticles, which give the rock a gneissose appearance, is ascribed to the partial assimilation of the greenstones by the granite intrusion.

Regional mapping has shown that the Lord Bobs granite outcrops about a mile to the west of the group. J. C. McMath, senior geologist, states that this granite is a microcline granite with very little mica. There are no traces of microcline in the specimens examined from the Lord Bobs group.

In an old mine dump about 200 feet south of the north-west corner peg of G.M.L. 5623, specimens of aplitic granite are to be found.

Porphyry-Porphyrite Series.

Members of this series are few in number and do not attain any large dimensions. The more basic types predominate.

Although mapped as belonging to this series, the intrusive origin of some of the members is doubted.

Microscopic examination of the quartz porphyry, which outcrops along the western boundary of the epidiorite sill, in association with the graphitic schists suggests that the quartz porphyry is a metamorphosed sediment and not an igneous intrusive.

The hornblende porphyrite, which outcrops along the eastern boundary of the epidiorite sill, is regarded as the chilled margin of the sill.

There appears to be only one example of the typical Coolgardie porphyries, namely, that which outcrops about 1,000 feet north-west of the north-west corner peg of late G.M.L. 4398.

Quartz Reefs and Veins.

Quartz reefs and veins are not abundant in the area. When occurring in the gneissic granite they have proved to be the donor of rich ore, but elsewhere their value as a gold producer is negligible.

The auriferous quartz is generally assumed to be post folding. It was with interest that examples of folded quartz veins were observed occurring in the actinolite schists which are situated in the north-western corner of late G.M.L. 4245. This quartz either belongs to a non-auriferous, prefolding period of silicification or else the quartz has replaced folds in the actinolite schists. The latter is probably the case.

Laterite.

Two large areas of laterite are to be found within the group. One area overlies ultrabasic rocks and basic lavas, the other area overlies granite. The former is situated in the south-eastern corner of the area, the latter in the north-western corner. The lateritised ultrabasics often show palimpsest structures and there are cellular quartz residuals.

Breakaways are formed in both localities but those in the south-east are the higher and more extensive.

Alluvium.

A narrow alluvial basin, almost in the centre of the area, is drained to the south by a creek not more than four feet in depth.

The distinction between soil and alluvium is purely arbitrary.

Soil.

There are quite extensive areas of soil, which vary from red sandy soil in the vicinity of granite, to dark grey brown soil derived from ultrabasic rocks. In general the basic lavas yield a dull reddish soil, sometimes containing calcareous travertine.

Structure.

Regional mapping* has shown that the Lord Bobs Group is on the eastern limb of a steeply south pitching anticline, whose axial plane has an approximate north strike.

The evidence showing that the greenstones are internally folded is—

(a) folded quartz veins in actinolite schist;
(b) large variations in the strike of the schistosity;
(c) folded intrusive hornblendite bodies.

The presence of the porphyritic lava outcrop due south of G.M.L. 1702 cannot be explained by folding. Sufficient field evidence is not available to propose faulting, yet its occurrence must not be overlooked.

Ore Deposition.

Quartz occurring as veins or reefs has formed the ore bodies. It is only in granite country that the ore bodies are of any extent.

The folding does not appear to have had any control on the ore deposition. Joint planes are the favourable ore channels within the granite. There is no evidence to suggest which are the most favourable joint planes.

THE MINES.

G.M.L. 5723.

The boundaries of this lease are identical with those of G.M.L. 5706, the most important workings of which were originally included in late G.M.Ls. 3809 and 3828.

Blatchford† reports that the maximum depth to which shafts had been sunk was 130 feet. The gold occurs in small quartz veins which, according to Blatchford, "have been followed in all directions, their strike and underlie being most variable."

Other available information‡ with respect to the workings also states that "some doubt as to the exact strike

* Matheson, R. S., G.S.W.A. Ann. Rept. 1946; McMath, J. C., G.S.W.A. Ann. Rept. 1947.
† Op. cit.
‡ Dept. of Mines: Sundry Mining Reports, File 13.

PRODUCTION FROM PORTION OF COOLGARDIE GOLDFIELD COVERED BY THE GEOLOGICAL SURVEY OF WESTERN AUSTRALIA TO 31ST DECEMBER, 1947.

Production—Lord Bobs Group.

Name of Lease or Company.	Lease Numbers.	Period of Production.	Alluvial.	Dollied.	Ore Treated.	Gold Therefrom.	Total Gold.	Grade dwt. Gold.	Silver.
			Fine ozs.	Fine ozs.	Tons.	Fine ozs.	Fine ozs.	Per ton.	Fine ozs.
1. Lord Bobs Extended ...	3984	...	*	*	*	*	*	...	...
Lord Bobs Extended ...	3948	...	*	*	*	*	*	...	...
2. Duke of Cornwall ...	3897	...	*	*	*	*	*	...	...
3. Lord Bobs Gold Mining Syndicate ...	4241, 4286, 4287	1907/1909	...	...	1,744·00	2,151·90	2,151·90	...	...
4. Burbanks New Year's Gift	3685	1899	...	...	36·00	13·65	13·65	...	...
Lord Bobs Leases ...	3809, 3828, 3960	1900/1905	...	...	3,188·50	3,243·17	3,243·17	...	...
Lord Bobs No. 1, North ...	3845	1900/1905	...	...	1,446·50	1,299·41	1,299·41	...	...
Lord Bobs ...	4183	1905/1906	...	...	441·00	653·96	653·96	...	...
Lord Bobs No. 1, North ...	4242	1906	...	...	25·00	23·84	23·84	...	...
Lord Bobs ...	4241	1906/1907	...	...	1,264·00	2,829·90	2,829·90	...	...
Lord Bobs, North ...	4290	1907	...	...	51·00	21·57	21·57	...	...
Lords Bobs: Lord Bobs Gold Mining Syndicate...	4241	1909/1911	...	...	486·00	936·84	936·84	...	...
Lord Bobs ...	4436	1912/1913	...	...	955·00	696·71	696·71	....	16·10
Lord Bobs ...	4459	1914	...	...	220·00	38·63	38·63	...	...
Lord Bobs ...	4469	1915/1918	...	...	665·75	156·96	156·96	...	...
Lord Bobs ...	5263	1932/1941	...	8·59	1,752·50	680·21	688·20	...	...
Lord Bobs ...	5706	1945/1946	...	...	171·50	45·95	45·95	...	...
Lord Bobs ...	4458	...	*	*	*	*	*	...	...
Bluduck ...	3686	...	*	*	¾	*	*	...	...
Transvaal ...	3777	...	*	*	*	*	*	...	...
Benduck, East	1992	...	*	*	*	*	*	...	...
Benduck, East	877	...	*	*	*	*	*	...	...
Q.E.D. ...	878	...	*	*	*	*	*	...	...
5. Lord Bobs No. 3, North ...	4009	1902	...	...	49·00	8·22	8·22	...	...
Duchess of Cornwall ...	3881	...	*	*	*	*	*	...	...
6. Duke of Cornwall ...	3912	...	*	*	*	*	*	...	...
Lord Bobs No. 2	4287	...	†	†	†	†	†	...	...
7. Lord Bobs Extended ...	3960	...	*	*	*	*	*	...	...
8. Lord Bobs, East	3831	...	*	*	*	*	*	...	...
Lord Bobs, East	3872	1902	...	...	34·50	11·99	11·99	...	...
Lord Bobs No. 1, East ...	3898	1902	...	...	10·00	13·55	13·55	...	...
Lord Bobs, North, Extended ...	4245	...	*	*	*	*	*	...	...
9. Brookside ...	933	...	*	*	*	*	*	...	...
Christiana ...	3946	...	*	*	*	*	*	...	...
10. Moorefield Consolidated ...	1836	...	*	*	*	*	*	...	...
Manchuria ...	4104	1904/1905	...	...	59·00	100·17	100·17	...	...
11. Mt. Emily ...	851	...	*	*	*	*	*	...	...
Mt. Emily ...	1756	...	*	*	*	*	*	...	...
Abundance ...	4073	1904	13·36	...	60·00	18·59	31·95	...	...
11a. The Moorefield	830	...	*	*	*	*	*	...	...
Burbanks Star	3200	1897	...	...	87·00	75·91	75·91	...	...
12. Moorefield, East	1702	...	*	*	*	*	*	...	...
12a. The Prince	3767	...	*	*	*	*	*	...	...
Jim Jack ...	3971	...	*	*	*	*	*	...	...
13. Mt. Martin ...	2657	...	*	*	*	*	*	...	...
14. Burbanks Eureka, South	3759	...	*	*	*	*	*	...	...
The Crown ...	4398	...	*	*	*	*	*	...	...

* No production. † See Lord Bobs G.M. Syndicate group 3.

of the lodes arises from their highly contorted and irregular shape and also from the manner in which they have been developed.'' Nevertheless the ore bodies are reported to have an approximate north-west strike and a dip of about 35 degrees to the south-west.

Apparently both lode material and quartz reefs have been worked.

The lode consisted of quartz stringers and gneissic granite and has been worked in widths up to 20 feet.

The quartz reefs are of variable thickness and diminish from a maximum width of 12 feet to a few inches.

There is no definite information as to the length of the ore bodies worked.

Recommendation.—It appears that there are no ore bodies large enough to warrant exploitation by a mining company. The ore can be best mined by prospectors on a selective basis and, when in search of new ore bodies, lateral prospecting is advised.

REPORT ON THE ''SYDENHAM'' GROUP OF GOLD MINING LEASES (G.M.Ls. 5748, 5749, 5750).

By H. J. Ward, B.Sc., Geological Survey of W.A.

CONTENTS.

GENERAL INFORMATION.

These three leases (namely G.M.Ls. 5748, 5749 and 5750), which are situated approximately four miles north of Coolgardie, can be reached by means of a bush track in fair condition. The Kunanalling telegraph line passes through the north-eastern corner of G.M.L. 5750.

G.M.L. 5750 includes the whole of late G.M.L. 1711 (the original ''Sydenham'' lease) and part of late G.M.Ls. 1721, 2515. G.M.Ls. 5748 and 5749 each include part of the late G.M.L. 4211.

The State Battery of Coolgardie presents the nearest available crushing facilities.

Domestic and mining water has to be carted from Coolgardie.

Adequate supplies of timber, suitable for prospecting purposes, are available locally.

No detailed examination of the leases has been previously carried out but references have been made to the area by Blatchford* and Matheson*.

The examination was to determine whether State Government finance was warranted for exploratory diamond drilling.

* Blatchford, T., G.S.W.A. Bull. No. 3, p. 50; Matheson, R. S., G.S.W.A. Ann. Rept. 1946.

WORKINGS.

The workings can be divided into two sections, namely:—

(a) Workings in the Amphibolite;

(b) other workings.

(a) Workings in Amphibolite.

Previous to the pegging of the present leases, work in the amphibolites has been confined to trenches and one or two underlay shafts, not more than 15 feet deep. All trenches are parallel to the strike of the schistosity and in general underlie in the same direction as the dip of the schistosity.

The present workings have been confined to two open cuts. The larger of these cuts is situated on G.M.L. 5750 and is approximately 290 feet north-east of the south-west corner peg of this lease. The cut is approximately 100 feet long and 20 feet wide. It has a maximum depth of 12 feet near the eastern end of the cut.

The remaining open cut is situated approximately 440 feet on a bearing of 172 degrees from the north-western corner peg of G.M.L. 5749. The open cut is about 40 feet long and approximately 10 feet wide. The depth of the cut varies from 14 feet (vertical depth) at the north-western end to 23 feet on an inclination of 30 degrees to the south-west.

In this cut there is a quartz reef which attains a maximum width of six inches. It has a strike of N. 55° W. and a dip of 30 degrees to the south-west. The length attained by the reef does not appear to be greater than 40 feet.

(b) Other Workings.

At the time of inspection (May-June 1947), all shafts that had been sunk, in the basic lavas and allied rocks and in the large quartz reef, were generally inaccessible, having been long abandoned.

Blatchford† shows that a vertical shaft was sunk, in the large quartz reef, to a vertical depth of 150 feet.

GENERAL GEOLOGY.

The leases are situated in an area of amphibolites, metamorphosed basic lavas and allied rocks, and sediments. The amphibolites have been intruded by granite and a member of the porphyry—porphyrite series. The country has a general strike of north 40 degrees west and a dip which varies from 35 degrees north-east to 60 degrees north-east.

The amphibolite,‡ which occupies the greater portion half of the area taken up by the leases and the fine-grained basic lavas form the lower lying ground to the north.

Drainage is to the north-east, chiefly by means of a small creek, the course of which passes through the north-eastern boundary of G.M.L. 5749, about 130 feet from the north-eastern corner peg of the lease.

Amphibolite.

The amphibolite‡, which occupies the greater portion of the area contained within the leases, varies from fine to coarse grained, equigranular rocks, consisting chiefly of hornblende with minor amounts of felspar and quartz. The coarse grained amphibolite is near the assumed boundary of the amphibolite and basic lava and allied rocks. Excellent examples of this coarse grained rock, with radiating crystals of hornblende, outcrop on G.M.L. 5750. A ''mottled'' type of amphibolite outcrops inside the south-western boundary of G.M.L. 5749, about 600 feet from the south-eastern corner peg of the lease. This rock, which breaks into rectangular blocks, consists chiefly of medium grained, equigranular hornblende and felspar, the longer axis of the minerals being oriented parallel to the direction of schistosity.

† Op. cit., Plate II., Geological Map of Coolgardie.

‡ Matheson, R. S., G.S.W.A. Ann. Rept. 1946.

Basic Lavas and Allied Rocks.

The basic lavas consist of dark green, fine grained rocks, with occasional variations to a medium grained variety. In the area mapped, the basic lavas lie to the north-east of the amphibolite from which they appear to be separated by light, compact rocks of a yellowish colour, which, owing to lack of petrological evidence, are thought to be of tuffaceous origin. In a shaft, situated 510 feet on a bearing of 260 degrees from the north-east corner peg of G.M.L. 5750, these probable tuffs are observed to overlie a graphitic schist band which dips at 50 degrees to the north-east.

Owing to poor outcrop conditions, it has not been possible to obtain the thickness of these tuffs, but they are thought to attain widths up to 120 feet when separating the basic lavas from the amphibolite.

Outcrops of tuff occur elsewhere on G.M.L. 5750, other than adjacent to the amphibolite.

Sediments.

Sediments occur as dark coloured, graphitic schists which, in places, have been opalised. Outcrop conditions prevented proving the continuity of these sedimentary bands, although several outcrops line up along their strike.

The dip of these bands has been observed to vary from 50° N.-E. to vertical.

Granite.

The granite, which outcrops on G.M.L. 5750, is a sheared, medium grained, equigranular, biotite granite. There is no visible contact of the granite with the amphibolite in which it occurs.

Owing to the proximity of the leases to the Bonnievale district, this granite is probably an offshoot of the granite mass mapped by McMath* and previous workers.

Porphyry-Porphyrite Series†.

Only one member of this series occurs in the area. It is granitic in composition with phenocrysts of felspar and quartz. This porphyry is confined wholly to the amphibolite and, on G.M.L. 5750, it has a general strike of N. 20° W., but, on G.M.L. 5749, it changes strike to a more westerly direction. Its mode of outcrop suggests that it is a dyke rather than a sill.

In the north-east corner of the open-cut, situated approximately 290 feet north-east of the south-west corner peg of G.M.L. 5750, the south-western contact of the porphyry and amphibolite dips at 45 degrees to the north-east.

Quartz Reefs and Veins.

Quartz reefs, veins and veinlets have penetrated the metomorphosed basic lavas, amphibolites and erosion sediments.

The largest quartz reef is that which outcrops near the north-western boundary of G.M.L. 5750. It is over 400 feet long and varies in width from 4 feet to 13 feet. This milky white, quartz reef, which has been brecciated, contains malachite and a little azurite. The degree of brecciation decreases north-east along the strike of the reef. Available information does not record the production of any gold from this reef.

The strike of the quartz reefs and veins vary. The greatest amount of gold has been produced from those veins which have an approximate N. 40° W. strike. These veins do not attain a thickness greater than one foot. Quartz reefs with a general north-easterly strike do not appear to contain any gold.

It is thought that there are two periods of silicification, one of which is responsible for the auriferous, the other for the non-auriferous quartz reefs and veins.

* McMath, J., G.S.W.A. Ann. Rept. 1947, Plate I.
† Matheson, R. S., Op. cit.

Structure.

The leases are situated, on a minor crossfold, approximately 1¾ miles south of the Bonnievale anticlinal crossfold axis‡, which has an approximate east-north-easterly strike.

The amphibolite is sheared and jointed. The schistosity has a general strike of N. 40° W. and a dip which varies from 35° N.E. to 60° N.E. Of the joint planes within the amphibolites, the most predominant are those which have a strike of N. 60° E. and either a vertical or steep dip to the south-east. These joint planes are parallel to the axis of the Bonnievale Crossfold. They are thought to be planes of fracture cleavage as the minor displacements of the porphyry intrusive are also approximately in a direction of N. 60° E.

The occurrence of brecciated quartz can only be attributed to movement after the formation of the large quartz reef.

The amount of displacement could not be determined, owing to poor outcrop conditions, but it is apparently small.

Ore Deposition and Mineralisation.

The ore body is of the same nature as that which occurs in the amphibolite belt§ on G.M.Ls. 5693, 5637 in the Three Mile Hill Group.‖

The gold occurs in quartz veins and veinlets, and in silicified and mineralised, medium grained amphibolite.

Sulphides have not been observed in either of the open cuts in the amphibolite, but they have been found in older workings almost at ground level as metasommatic replacements in the amphibolite.

The brecciated fragments of the large quartz reefs were cemented together by sulphides (chiefly chalcopyrite), which are now represented by the oxidation products of malachite, azurite and limonite. No gold has been reported from this quartz reef, hence it apparently belongs to a non-auriferous period of silicification.

It appears from the work done on the leases that the auriferous quartz solutions penetrated along planes of schistosity (strike N. 40° W., dip 35°-60° N.E.) and, in some cases, along jointing planes with a strike parallel to the schistosity, but with a dip to the south-west.

Production.

No production has been recorded until the leases were pegged in their present form. This indicates that, despite the numerous workings in the basic lavas, tuffs and the large quartz reef, the greatest concentration of gold is in the amphibolite.

G.M.L. No.	Period.	Alluvial.	Milled or Smelted.	
			Ore Treated.	Gold Therefrom.
		Fine ozs.	Tons, 2240 lbs.	Fine ozs.
5748	...	...	No production	
5749	1946	...	153·0	15·20
5750	1946–47	...	605·5	49·99

Conclusions and Recommendations.

Gold is being obtained from small quartz reefs, veins and silicified amphibolites. Sulphides are present in the area but they have not been observed in the present workings, although their occurrence therein is suspected.

From surface evidence the quartz reefs show no indication of increasing with depth, and it is also doubtful whether silicification will increase.

A large quantity of ore has been crushed but work to date has not disclosed the ore limits.

Taking the above factors and also the latest production figure into consideration, it is recommended that further surface exploratory work be undertaken before diamond drilling is advised.

‡ Matheson, R. S., G.S.W.A. Ann. Rept. 1946 Plate VI.
§ Matheson, R. S., G.S.W.A. Ann. Rept. 1946, Plate VI.
‖ Ward, H. J., G.S.W.A. Ann. Rept. 1947, Three Mile Hill Group.

REPORT ON HILL 50 GOLD MINE, BOOGARDIE. MURCHISON GOLDFIELD,

By W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.

INTRODUCTION.

In March, 1947, the Geological Survey was asked by the management of Hill 50 Gold Mine N.L. to undertake a surface and underground examination of the companys' leases at Boogardie. The purpose of the examination was to provide the management with an exploration programme designed to discover new ore bodies and to prove extensions of existing ore bodies.

The writer commenced surface geological mapping of the companys' leases on April 23rd, 1947. The mapping was done on a scale of 100 feet = 1 inch, using plane table and telescopic alidade. The underground mapping was commenced on May 8th, 1947, and completed in conjunction with Mr. R. A. Hobson, Senior Geologist of the Geological Survey, who started work on May 16th. Mr. Hobson directed the work and compilation of the exploration programme, but the writer is responsible for the opinions on general geology and geological structure as put forward in this report. Much valuable advice was tendered by Mr. H. A. Ellis, the Government Geologist, and the writer would like to express his appreciation of the co-operation given by Mr. L. Hadwigger, manager of the mine, and Mr. Madison, underground manager.

LOCALITY.

The Hill 50 Gold Mine N.L. plant and workings are situated on G.M.L. 1282M at Boogardie, approximately three miles N. 65° W. from Mt. Magnet, Murchison Goldfield.

ACCESS.

Mt. Magnet is on the Northern Railway, 400 miles from Perth by rail. It is also on the Great Northern Highway, via Wubin and Payne's Find. The road distance by this route is 350 miles from Perth. The nearest port to Mt. Magnet is Geraldton, 200 miles by rail or road.

Boogardie is connected by road to Mt. Magnet. The company runs motor transport to the mine at the beginning and end of day and afternoon shifts to transport mine workers who live in Mt. Magnet.

HISTORY.

The ground covered by G.M.L. 1282M has been held under various lease numbers from the year 1898 onwards.

In 1914 Jutson[1] describes open cut workings on the Sirdar, G.M.L. 696M, which may be identified with the present No. 1 open cut (see map Plate) on G.M.L. 1282M. As No. 1 open cut includes the top portion of the No. 1 lens worked by the Hill 50 Gold Mine N.L. company, it may be assumed that at least one of the ore bodies worked by the present company was worked as far back as 1914.

Gibson[2] examined the Sirdar, G.M.L. 571M (identical with 696M), in the year 1902 and described workings thereon which may have been in one of the ore-bodies worked by the present company.

The ground was held as the Sirdar G.M.L's. 571M and 696M from 1902 to 1903. From 1919 to 1924 the ground including the present workings was held as Mt. Zion G.M.L. 1183M. Feldtmann[3] described the workings existing at the time of his examination (1919) and mentions a prospecting shaft 164 feet deep. This shaft is marked on the Hill 50 mine plans as No. 1 shaft and is used by the mine as a mullock pass. An unpublished map by Feldtmann, accompanying his report of 1919, shows an open cut and a 91 feet level identical with No. 1 open cut and parts of No. 1 level respectively, as they existed at May 1947.

The Hill 50 Gold Mine N.L. company took up the Hill 50 G.M.L. 1282M in 1934 and have held it to the date of writing. The boundaries of G.M.L. 1282M are identical with those of 1183M.

Production figures from 1902 to December 1947 are appended in Table 1 on page 99 opposite.

GENERAL GEOLOGY.

The geology of Boogardie and the surrounding district was described by Gibson,[4] and Jutson.[5] In this report the geology of a small area surrounding G.M.L. 1282M is described. This is the area depicted on the accompanying map (Plate VIII).

The only rocks outcropping in the area are greenstone schists, porphyry and jaspilite. The greenstone schists originally may have been basic lavas as they nowhere discordantly intrude the jaspilite beds. On the surface the greenstone weathers to a brown or purple mass still showing the original schistosity. No outcrops of fresh rock were discovered and the character of the greenstones was determined from unweathered specimens taken from the mine workings below the zone of oxidation.

The jaspilite beds were thought by Gibson,[6] Jutson,[7] and Feldtmann[8] to be ferruginous silicified shear zones in the greenstone. The sedimentary origin of jaspilites in Western Australia was first propounded by C. S. Honman.[9]

Although this theory was then contested it is now widely held by West Australian geologists. The common name for jaspilites in Western Australia is "jasper bars." The more well defined term "jaspilite" was first applied to the varieties of banded ferruginous quartzite by Ellis in 1939.[10]

It is not proposed to enter into a discussion on the origin of jaspilites. Readers interested in this problem will find full discussions and bibliographies in articles by McKinstry[11] and Miles.[12]

The jaspilites on G.M.L. 1282M are the white and black banded type. The percentage of iron becomes high enough in places to form small lenses of iron ore. Below the oxidised zone the ferruginous bands contain much magnetite. A good illustration of the magnetic property of the jaspilite is given by the large electromagnet, placed over the conveyor belt to remove stray pieces of iron from the ore going to the ball mill of the Hill 50 Company's treatment plant. Small pieces of ore, which is jaspilitic, collect along the lines of force surrounding the poles of the electromagnet.

The quartz porphyry is an intrusive rock intruding both greenstone and jaspilite discordantly. The outcrops of porphyry are distinguishable on the surface from the outcrops of weathered greenstone by the presence of quartz phenocrysts in the porphyry and the lighter color of the porphyry. The porphyry was intruded before folding and faulting of the rocks took place.

The geology of a large part of the area mapped is obscured by tailings and the soil mantle.

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[1] Jutson, J. T., Miscellaneous Report No. 39, pp. 122-126, G.S.W.A. Bull. No. 59, 1914.

[2] Gibson, C. G., Lennonville, Mt. Magnet and Boogardie, Murchison Goldfield, G.S.W.A. Bull. No. 8, 1903, pp. 23, 24.

[3] Feldtmann, F. R., Mt. Zion G.M.L. 1183, Boogardie, Murchison Goldfield, Ann. Prog. Rept. G.S.W.A. 1919, pp. 30-34.

[4] Gibson, op. cit., 1903, pp. 11-18.

[5] Jutson, op. cit., 1914, pp. 92-94.

[6] Gibson, op. cit., 1903, p. 16.

[7] Jutson, op. cit., 1914, p. 92.

[8] Feldtmann, op. cit., 1919, p. 31.

[9] Blatchford, T., and Honman, C. S., The Geology and Mineral Resources of the Yilgarn Goldfield, Part III, G.S.W.A. Bull. 71, 1917, pp. 158-160.

[10] Ellis, H. A. E., The Geology of the Yilgarn Goldfield South of the Great Eastern Railway, G.S.W.A. Bull. 97, 1939, p. 81.

[11] McKinstry, H. E., Origin of "Jasper" bars of W.A., Proc. Aust. I.M.M. No. 114, New Series, 1939, pp. 51-65.

[12] Miles, K. R., Jasper bars and Structural Geology in W.A. Proc. Aust. I.M.M. No. 130, New Series, 1943, pp. 85-103.

TABLE 1.

GOLD PRODUCTION FROM GROUND NOW HELD AS G.M.L. 1282m (DECEMBER 1947).

Name of Lease.	Number of Lease.	Year.	Alluvial. Fine Ozs.	Dollied. Fine Ozs.	Ore. Tons. (2,240 lbs.)	Gold Therefrom Fine Ozs.	Total Gold. Fine Ozs.	Grade. Dwts. Per Ton.	Silver Fine Ozs.
Sirdar	571 M	1902	....	....	529.00	244.30	244.30	9.2	....
		1903	....	....	157.50	60.35	60.35	7.6	....
	696 M	1903	....	....	36.00	12.80	12.80	7.1	....
		1904	....	....	548.00	185.71	185.71	6.7	....
		1905	....	....	1,409.00	661.84	661.84	9.4	....
		1906	....	....	1,508.00	503.99	503.99	6.6	....
		1907	....	....	882.00	201.61	201.61	4.5	....
		1908	....	....	1,525.50	435.86	435.86	5.6	....
		1909	....	....	2,214.50	559.83	559.83	5.1	....
		1910	....	....	1,629.50	536.36	536.36	6.6	....
		1911	....	....	403.00	80.77	80.77	4.0	....
		1912	....	....	912.35	256.23	256.23	5.6	....
		1913	....	....	2,696.00	1,193.91	1,193.91	8.8	....
		1914	....	....	2,000.00	976.60	976.60	9.7	....
		1915	....	....	638.50	337.58	337.58	10.6	....
		1916	....	....	1,414.75	274.94	274.94	3.9	....
		1917	....	....	40.75	8.63	8.63	4.3	....
Mt. Zion	1,183 M	1919	....	....	278.75	114.10	114.10	8.2	....
		1920	....	....	4,628.25	1,219.88	1,219.88	5.3	....
		1921	....	....	....	....	....	....	....
		1922	....	....	....	....	....	....	....
		1923	....	....	141.45	50.61	50.61	7.2	....
Hill 50	1,282 M	1936	....	....	4,341.00	1,270.66	1,270.66	5.8	....
		1937	....	....	23,878.00	6,688.76	6,688.76	5.6	....
		1938	....	....	24,424.00	5,569.38	5,569.38	4.6	7.31
		1939	....	....	24,763.90	7,911.58	7,911.58	7.4	3.62
		1940	....	....	26,065.00	9,801.66	9,801.66	7.5	....
		1941	....	....	30,863.00	10,688.09	10,688.09	6.9	....
		1942	....	....	39,069.00	11,533.29	11,533.29	5.9	39.89
		1943	....	....	36,459.00	10,053.87	10,053.87	5.5	113.62
		1944	....	....	32,082.00	9,570.55	9,570.55	5.9	177.01
		1945	....	....	31,108.00	8,430.43	8,430.43	5.4	132.67
		1946	....	....	44,842.00	12,819.38	12,819.38	5.7	216.48
		1947	....	....	50,659.00	13,672.78	13,672.78	5.4	249.90
			....	....	410,140.70	115,884.67	115,884.67	5.6	940.50

STRUCTURAL GEOLOGY.

Folding.

Within a small area such as that mapped during the present survey, problems of major structure cannot be investigated adequately. However the preponderance of minor dragfolds with a steep southerly pitch indicates that the jaspilite beds are locally on the west limb of a south pitching anticline or east limb of a south pitching syncline. This conclusion should be taken with reservations as the area mapped is so small.

The axial planes of the dragfolds and the direction of schistosity in the greenstones are essentially parallel and at a considerable angle to the bedding planes of the jaspilite beds, indicating that the beds are close to the nose of the structure, anticline or syncline.

On the map accompanying Jutson's[13] report, the jaspilite bed outcrops (mapped as "jasper bars") trend in an asymmetrical bend from N.N.W., south of the Sirdar lease to due west, north of the Sirdar lease. Unfortunately little attention was paid to the value of the jaspilite beds in elucidating structure at the time Jutson made his report, because of the non-recognition of their sedimentary origin.

However, it may be stated that jaspilite beds on or near G.M.L. 1282M are on the limb of a fold possibly south pitching and probably near the nose of the fold. The noticeable reversals in pitch of certain dragfolds may be due to crossfolding. The area mapped was too small to solve this problem.

Faulting.

On the surface a well defined series of faults striking N. 25° E. have been mapped. One of this series of faults has caused a horizontal separation of at least 160 feet in the jaspilite bed affected. The vertical slip is immeasurable but may be considerably more than 160 feet.

Between the jaspilite beds on G.M.Ls. 1438M, 1397M, and 1282M and the jaspilite beds on 1246M and 1420M there is a gully occupied by a small stream bed and much alluvium. The jaspilite beds end abruptly on either side of the gully and the course of the stream may be along a fault zone.

Underground in the Hill 50 workings a fault has been discovered striking N. 25° W. The horizontal separation and vertical slip along this fault surface is indeterminate. As the strike of the fault coincides with the strike of the jaspilite beds the fault trace on the surface cannot be observed. It is reasonable to suppose that there are other parallel faults, also unobserved on the surface. This fault is an important feature in the Hill 50 workings as it is the path along which the ore bearing solutions travelled.

ORE BODIES.

On G.M.L. 1282M.

The ore bodies previously worked and being worked in the main workings of Hill 50 Gold Mine, are lenses or shoots within a bed or beds of jaspilite.

Six lenses had been discovered to the time of examination. Ore was being extracted from only two of these lenses, No. 4 and No. 6. No. 5 lens was being developed preparatory to extracting ore.

No. 1 lens is on the west side of the main fault (see previous section on "faulting") and extended from the surface to 40 feet below No. 2 level. It has been worked out.

[13] Jutson, J. T., op. cit., Plate 9.

No. 2 lens is also on the west side of the main fault and extended from 30 feet below No. 1 level to No. 3 level. It too has been worked out.

No. 3 lens is on the east side of the main fault and extends from the surface to 30 feet above No. 3 level. It has been worked out down to No. 2 level.

No. 4 lens is on the west side of the main fault and extends from 30 feet below No. 1 level to some distance below No. 4 level. It has been worked out between Nos. 2 and 3 levels and for 50 feet below No. 3 level.

No. 5 lens is on the east side of the main fault and extends from No. 1 level to an unknown distance below No. 4 level. It has been worked out down to No. 3 level.

No. 6 lens is on the east side of the main level and extends from No. 1 level to an unknown distance below No. 4 level. No. 6 lens has been worked out to No. 3 level.

Nos. 1, 2, 3, 4, and 5 lenses are roughly elliptical in cross section, longitudinal section, and horizontal plan, athough of varying size. No. 6 lens has the shape of an asymmetrical pyramid with a triangular cross section and the apex at No. 1 level.

The dimensions of the ore lenses are given in Table 2.

TABLE 2.

Lens No.	Maximum stope length.	Maximum stope width.	Vertical extent of lens.	Depth of top of lens below surface.
	feet.	feet.	feet.	
1	100	58	252	Reaches surface.
2	57	50	+ 180	Less than 120 ft.
3	130	42	275	Reaches surface.
4	100	55	+ 275	130 feet.
5	132	33	+ 370	30 feet.
6	200	120	+ 330	80 feet.

Note.—Stope dimensions ascertained from mine plans. Stopes inaccessible except on the levels.

The lenses were possibly originally parts of the same jaspilite bed separated by intrusions of porphyry across the strike of the beds and displaced along the main fault surface, which is almost coincident with the strike of the beds.

The disappearance of the lenses in depth can be accounted for by faulting, along or close to the axis of a fold in the jaspilite bed. The fold may be pitching. Minor dragfolding is plentiful within the jaspilite horizon and the major fold necessary to account for the disappearance of the lenses is suggested by longitudinal sections (unpublished) of the various lenses.

The shape of the lenses as shown in the sections also suggests a moderately steep northerly pitch (40 to 50 degrees) in the jaspilite horizon. The pitch of minor dragfolds within the jaspilite is confirmatory evidence for the pitch in the main structure. This pitch would account for the increasing depth to which the lenses extend, going north from the main shaft. One of the objects of the diamond drilling programme laid down by Mr. Hobson and the author was to prove or disprove this theory of the disappearance of the ore lenses in depth.

The main fault, which is definitely pre-gold, seems to have been the channel along which the ore bearing solutions travelled. A joint pattern exists within the jaspilite beds and the degree of jointing may have helped to control the deposition of gold within the jaspilite. According to Mr. Maddison, the underground manager, the gold is distributed most irregularly. From his remarks and the writers' observations it would appear that most gold has been deposited where the jaspilite has been most fractured, jointed or contorted.

Unfortunately no assay plans of the stopes were available and the distribution of gold within the ore bodies could not be determined accurately. Such assay plans would have been invaluable in determining structural control of ore deposition.

No ore bodies have been found in the greenstone and search for new ore bodies resolves itself into a search for new gold-bearing jaspilite horizons.

The mineral associates of the gold are pyrite and phyrrotite. The ore is free milling and thus the gold is not intimately connected with the pyrite and phyrrotite. Furthermore the bands of greatest mineralisation in the jaspilite have not always contained the most gold.

Ore Bodies on Other Leases.

Examination of the workings on leases surrounding G.M.L. 1282M shows that the ore bodies worked on these leases have invariably been silicified fault zones in the faults striking north 25 degrees east. The ore bodies are confined to the part of the fault zones within the jaspilite beds and are mostly small. The largest workings observed by the writer are those on the Neptune G.M.L. 1246M where a stope reaches the surface. This stope is 120 feet long and 3 feet wide at the surface, and is known to be 200 feet deep. The fault zones are all vertical or nearly so.

PREVIOUS DIAMOND DRILLING.

Up to May 1947 the Hill 50 Gold Mine Company had carried out an extensive diamond drilling campaign with the object of locating new ore bodies and proving extensions of existing ore bodies. Nos. 5 and 6 lenses were discovered by diamond drilling. In all 45 diamond drill boreholes were put down to May 1947. Only two holes discovered new ore bodies, and four or five proved extensions of existing ore bodies. With the exception of some of the later holes the diamond drilling was carried out without competent geological advice.

PROPOSED DEVELOPMENT AND EXPLORATION PROGRAMME.

The programme laid out below in tabular form is that compiled by Mr. R. A. Hobson from recommendations by himself and the writer. It will be noticed that—

(i) Most of the driving and cross cutting is to be done to establish drill stations and footage is low;

(ii) the boreholes are tabulated in order of priority;

(iii) the boring of some of the later holes depends on the results obtained from earlier holes;

(iv) the co-ordinates are those on the mine survey plans in use April-May 1947.

Driving and Crosscutting.

No. 4 Level. (i) Extend crosscut from 2641N and 1680E to intersect jaspilite-greenstone contact already intersected in bore holes 27 and 28. Extend crosscut 10 feet into greenstone and establish drill site—site A.

(ii) Drive northward from co-ordinates 2451N and 1540E to connect with existing drive.

(iii) Extend existing crosscut eastward from co-ordinates 2400N and 1520E to intersect main fault. Objective is to look for any southward extension of No. 4 lens. Estimated amount of crosscutting is 20 feet .

No. 3 Level. (i) Continue existing drive from 2756N and 1616E northwards along east side of main fault to jaspilite-greenstone contact. Extend drive 10 to 20 feet into greenstone. Cross cut 20 feet westward and establish drill site—site E. The estimated position of the jaspilite-greenstone contact is shown on the underground plan (unpublished) and the position of site E is based on the estimated position of this

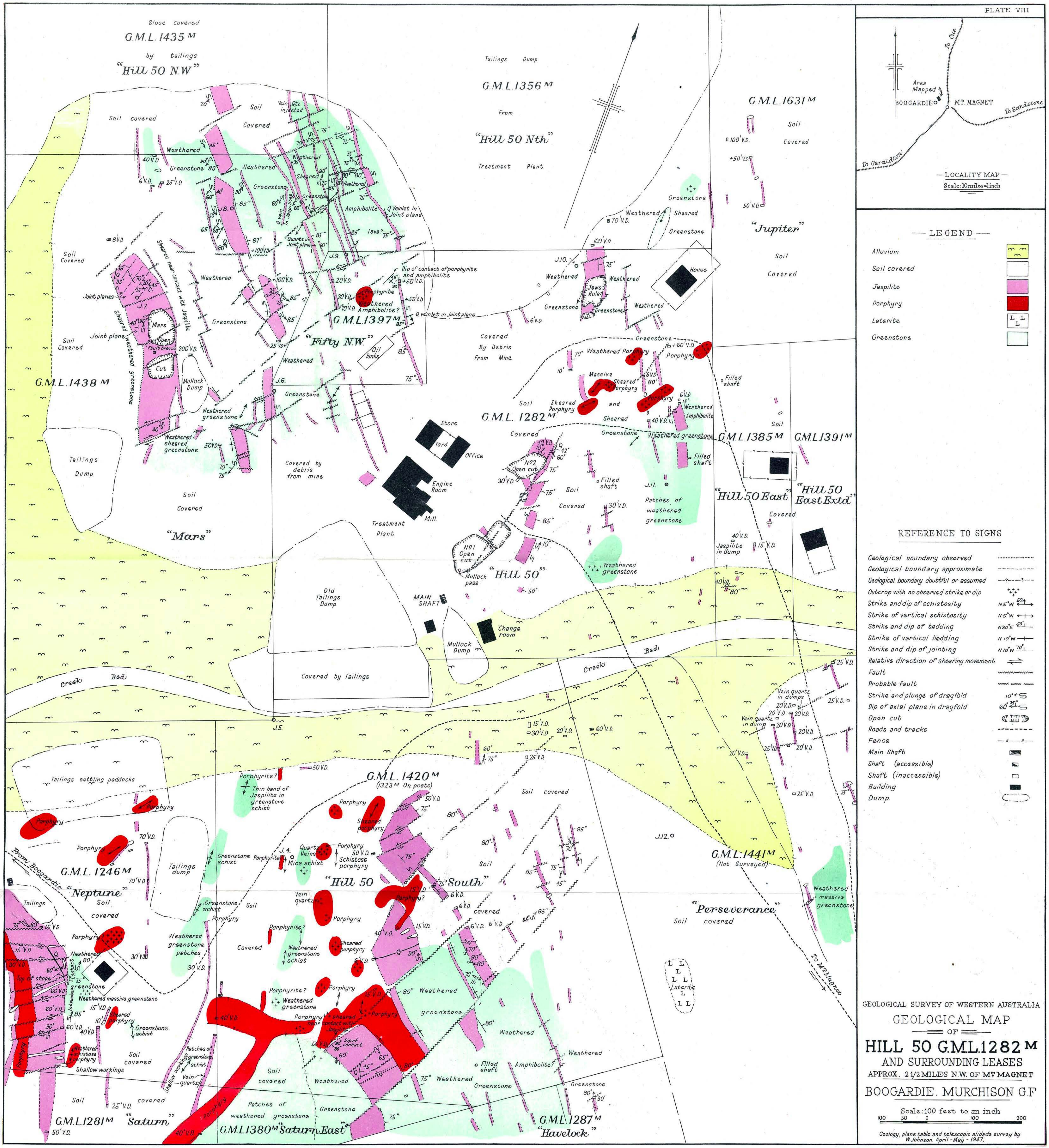
PLATE VIII
LOCALITY MAP
Scale: 10 miles = 1 inch
BOOGARDIE
MT. MAGNET
Area Mapped
To Cue
To Sandstone
To Geraldton
LEGEND
Alluvium
Soil covered
Jaspilite
Porphyry
Laterite
Greenstone
REFERENCE TO SIGNS
Geological boundary observed
Geological boundary approximate
Geological boundary doubtful or assumed
Outcrop with no observed strike or dip
Strike and dip of schistosity
Strike of vertical schistosity
Strike and dip of bedding
Strike of vertical bedding
Strike and dip of jointing
Relative direction of shearing movement
Fault
Probable fault
Strike and plunge of dragfold
Dip of axial plane in dragfold
Open cut
Roads and tracks
Fence
Main Shaft
Shaft (accessible)
Shaft (inaccessible)
Building
Dump
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
GEOLOGICAL MAP OF HILL 50 G.M.L.1282 M AND SURROUNDING LEASES
APPROX. 2 1/2 MILES N.W. OF MT MAGNET
BOOGARDIE. MURCHISON G.F.
Scale: 100 feet to an inch
Geology, plane table and telescopic alidade survey by W. Johnson. April - May - 1947.
G.M.L.1435 M "Hill 50 N.W"
G.M.L.1356 M From "Hill 50 Nth" Treatment Plant
G.M.L.1631 M "Jupiter"
G.M.L.1438 M "Mars"
G.M.L.1397 M "Fifty N.W."
G.M.L. 1282 M "Hill 50"
G.M.L.1385 M "Hill 50 East"
G.M.L.1391 M "Hill 50 East Extd"
G.M.L.1420 M (1323 M On posts) "Hill 50 South"
G.M.L.1441 M (Not Surveyed) "Perseverance"
G.M.L.1246 M "Neptune"
G.M.L.1281 M "Saturn"
G.M.L.1380 M "Saturn East"
G.M.L.1287 M "Havelock"
Treatment Plant
Tailings Dump
Old Tailings Dump
MAIN SHAFT
Change room
Mullock Dump
Engine Room
Mill
Store
Yard
Office
House
No 1 Open cut
No 2 Open cut
Creek Bed
Covered by Tailings
Tailings settling paddocks
From Boogardie
To Mt Magnet

boundary. The position of site E may have to be amended when the true position of the jaspilite-greenstone contact is found. The proposed bore from site E has been set to explore the country on the west side of the main fault, and the trend of the main fault in the proposed drive should be noted.

(ii) Extend existing crosscut at 2496N and 1523E westward for 10 feet and establish drill site F.

(iii) Extend drive at 2141N and 1650E along strike of country and crosscut north-east and south-west to determine the limits of the values.

(iv) Crosscut from co-ordinates 2448N and 1697E, on a bearing 41 degrees to determine the limits of the values and of the jaspilite of No. 5 lens.

Diamond Drilling.

TABLE 3.

Proposed Diamond Drill Exploration Programme at Hill 50 Gold Mine, Mt. Magnet.

Site.	Co-ordinates of site.	Number on plan	True bearing (degrees.)	Angle. (degrees.)	Estimated distance (feet.)	Objective.
A (No. 4 level)	2678N, 1708E	1	185	Depressed 65	230	To explore number 6 lens below number 4 level and to intersect the jaspilite-greenstone contact occurring at number 4 level immediately south of 6D winze. The bore has been set to cut this contact approximately 200 feet below number 4 level.
		2	285	Horz.	170	To explore number 6 lens between site A and the main fault.
		3	285	Depressed 44	300	To explore number 6 lens below number 4 level and between site A and the main fault. The bore has been set to cut the main fault at approximately 200 feet below number 4 level.
		4	243	Horz.	150	As for 2 above.
		5	235	Depressed 46	300	As for 3 above.
B (No. 4 level)	2602N, 1552E....	1	63	Horz.	80	To explore number 6 lens east-north-east of site B.
		2	54	Depressed 42	300	To explore number 6 lens below number 4 level and to intersect the jaspilite-greenstone contact, occurring near site A, at approximately 200 feet below number 4 level. The dip of this boundary between numbers 1 and 4 levels varies, and this variation may have some bearing on the distribution of the values.
		3	340	Horz.	400	To explore the country on the west side of the main fault and north of existing workings. This hole should not be drilled unless bore 1, site E, number 3 level, intersects favourable values.
		4	204	Depressed 63	120	To explore the jaspilite, exposed on the west side of the main fault, below number 4 level.
C (No. 4 level)	2426N, 1683E....	1	335	Depressed 15	80?	To look for any downward extension of number 5 lens.
		2	20	Horz.	100?	To intersect the northern boundary of the jaspilite exposed at 2420N and 1690E. and to see if this jaspilite contains any values. May also locate a downward extension of number 5 lens.
D (No. 4 level)	2535N, 1560E....	1	143	Depressed 45	400	To explore below numbers 3 and 5 lenses for possible repetitions of these lenses. To be drilled only if bores from sites A and B indicate the occurrence of favourable values below number 4 level.
		2	172	Depressed 30	450	To look for possible repetitions of numbers 1, 2 and 4 lenses below number 4 level. To be drilled only if bore 1, site D, gives favourable results.
E (No. 3 level)	2787N, 1589E....	1	340	Horz.	400	To explore the country north of existing workings and on the west side of the main fault.
F (No. 3 level)	2496N, 1515E....	1	342	Horz.	400	To explore the country on the west side of the fault occurring on the west side of number 4 lens. This fault is parallel to the main fault.
		2	175	Horz.	350	As for bore 1, site F.
G (No. 2 level)	2385N, 1537E....	1	280	Horz.	100?	To determine the extent of the jaspilite in number 4 lens and that in bore hole number 6 (mine consecutive number).

CONCLUSION.

The favourable horizon for deposition of gold within the Hill 50 Gold Mine lease was the jaspilite bed or beds.

Distribution within this horizon was controlled by jointing, fracturing and folding of the beds. The channel for entry of the gold-bearing solutions was a fault zone striking nearly parallel to the jaspilite beds.

The likelihood of structural control of ore deposition means that the discovery of extensions of existing ore bodies, their development, and the discovery of new parallel ore bodies depends on a knowledge of the geological structure of the rocks in the Hill 50 Gold Mine. The exploration programme was laid down with these requirements in mind and the success of the programme depends on supervision by a competent geologist.

Nos. 5 and 6 lenses, the two most productive lenses in the mine, did not reach the surface and were discovered by diamond drilling at a time when the known ore reserves of the mine were running low. Intelligent exploration by diamond drill is imperative to ensure the continued life of the mine.

Up to the time of writing (February 1948) the Geological Survey has received no information from the Hill 50 company on the progress of the diamond drilling programme.

PROGRESS REPORT ON THE GEOLOGY OF PORTION OF THE NORTH-WEST DIVISION.

Between Latitudes 24° S. and 29° S. and between Longitudes 115° 30′ E. and 118° 30′ E.

By W. Johnson, B.Sc. (Hons.), Geological Survey of Western Australia.

INTRODUCTION.

In June, 1946, work was commenced on a reconnaissance survey of portion of the North-West Division. Mr. R. A. Hobson, then Senior Geologist of the Geological Survey of Western Australia, directed the survey. He was assisted by the writer. The work done in the 1946 field season is reported on in the Annual Report for 1946.[1]

The introduction to that report contains details of mapping methods, information on camp organisation, difficulties with base maps, etc., which will not be repeated here.

It was intended to recommence field work on the reconnaissance survey in April, 1947, but Mr. Hobson and the writer were diverted to an urgent survey of Hill 50 Gold Mine N.L., Boogardie, which occupied a period from 21st April, 1947, to 31st May, 1947. Field work on the reconnaissance survey recommenced on 3rd June, 1947.

The work was to suffer yet more interruptions. In August, Mr. Hobson was appointed Director, School of Mines, Kalgoorlie, and on his leaving to take up this new appointment the writer was asked to undertake the task of completing the survey. The survey was brought to a conclusion in November, 1947.

During the 1947 field season the same scheme of work was adopted as during the 1946 field season. The same difficulties with inaccurate base maps were encountered. A much heavier rainfall in the Murchison and Gascoyne districts made travelling by motor vehicle more hazardous than in 1946.

A further 16,000 square miles of territory were mapped, making the total for the survey 31,000 square miles. The area mapped in 1947 extends from the Pink Hills to the Jack Hills in a north-south direction and from Mt. Padbury to Yalbra in an east-west direction. The entire area mapped in 1946-1947 is shown on Plate IX. Certain places mentioned in this report have reference numbers given. These reference numbers are the co-ordinates on the military grid system shown on Plate IX.

The mining activity in the area examined in 1947 was small. Two prospectors held a prospecting area near the Jillewarra Group and a prospector was at work on the Livingstone's Find Group for some part of 1947.

Gold has been mined at other places in bygone years (see Plate V) and graphite, talc and iron ore occurrences have been examined by the writer. The total mineral production from this area has been small.

Acknowledgment must be made here of the ready assistance granted by all station owners and managers, especially Mr. F. T. Steadman, Errabiddy Station, and Mr. L. C. H. Jenkins, Mileura Station, on whose stations the two base camps used in 1947 were established.

PHYSIOGRAPHY.

Drainage.

The area mapped in 1947 is drained by the upper parts of the Gascoyne, Wooramel and Murchison Rivers and their tributaries. Hobson[2] has described the middle and lower Murchison. The upper Murchison flows across a broad alluvial plain in a wide valley similar to that of the middle and lower Murchison. The river course shows all the characteristics of old age, although it is situated on a plateau 1,200 feet to 1,300 feet above sea level. Jutson[3] has advanced an explanation for this behaviour of the Murchison and its tributaries. Briefly the explanation is that lateral erosion has kept pace with vertical corrosion. The writer accepts that explanation and envisages the equality of lateral and vertical erosion as due to the processes of erosion caused by the intermittent rainfall of the district.

One of the processes is the movement of water over the entire land surface instead of being confined to the watercourses. This process is called sheet erosion. The moving sheet of water removes a thin layer of sediment from most of the land surface and deposits it on lower ground or in the watercourses.

The main stream and larger tributaries flow only after exceptionally heavy rainfall, and then most of the energy of the water is used in carrying away the deposits of earlier sheet erosion and the sediment brought down by simultaneous sheet erosion. Towards the end of the short period of flow the water has lost most of its energy and, although carrying little sediment, corrodes its bed only slightly. Thus the flood plain of such a river is continually extending owing to the inability of the river to remove the sediment brought down from higher ground by sheet erosion and small creeks.

The course of the upper Murchison follows approximately the strike of the gneiss and metamorphosed sediments which form the river valley.

The headwaters only of the Wooramel River lie within the mapped area. The relative amount of alluvium bordering the river and tributaries is equal to that bordering the Murchison. There is some evidence to confirm Jutson's[4] suggestion that the lower Murchison has beheaded an ancestor of the Wooramel. It is likely that in the future the Wooramel will cut back and capture the upper Murchison.

The Gascoyne River in its upper part presents most of the features of the Murchison. Between Mt. Arapiles and the great triangular bend its course is almost straight and due west. The river is bordered by extensive alluvial plains. Between trigonometrical survey stations L4 and K29 the direction may be controlled by the direction of the axis of a broad fold in sedimentary rocks of the Nullagine Series, remnants of which exist on both sides of the river (see Plate IX).

Five or six miles east of Mt. Puckford the river bends sharply to the north-west, follows this direction for

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[1] Hobson, R. A., and Johnson, W., Progress Report on the Geology of Portion of the North-West Division between Latitudes 24° S. and 29° S. and between Longitudes 115° 30′ E. and 118° 30′ E., G.S.W.A. Ann. Prog. Rept. 1946, Perth, by authority, pp. 60-71.

[2] Hobson, R. A., and Johnson W., op. cit. p. 62.

[3] Jutson, J. T., The Physiography of Western Australia, G.S.W.A. Bull. 95, p. 163.

[4] Jutson, J. T., op. cit., p. 165.

50 miles, bends again to the south-west, follows this direction for 50 miles and resumes its westerly course about 45 miles west of Mt. Puckford.

This large triangular bend in the Gascoyne is difficult to explain by any other process than river capture. From field evidence it seems probable that the original Gascoyne flowed south of Mt. Puckford due west along the course of Dalgety Brook and Wyndham River. There is a wind gap two to three miles south of Mt. Puckford along the supposed original course of the Gascoyne. Also, the rocks along this supposed course strike due west. It seems unlikely that the Gascoyne, flowing parallel to the strike of the containing rocks in its upper course, would suddenly break out of its own accord and flow transgressively to the strike of the rocks as does the present Gascoyne past Mt. Puckford.

To explain the formation of the two legs of the triangle by river capture, an ancestral south branch of the Minilya River has to be postulated. This river would have had a course now occupied by Norton Creek, Onslow Creek and the east leg of the triangular bend.

The ancestral South Minilya captured the upper Gascoyne and was itself captured by a south-flowing tributary of the Gascoyne. This explanation is conjectural and field evidence is lacking to prove it, although it may be noted that the west leg of the triangular bend is parallel to the lower Lyons, which has captured the upper Minilya,[5] and that the ancestral south branch of the Minilya would have had a much shorter course to the sea than the longer Gascoyne.

It has been observed in the field that the south-flowing tributaries of the upper Murchison and the upper Gascoyne are eroding much more effectively than the north-flowing tributaries. This may indicate that the most recent uplift has been greater going northwards.

Topography.

The general land form is an eroded plateau with residual hills. The area differs from that mapped in 1946 in that the amount of sand plain and the remnants of the old plateau are much smaller. Otherwise the land form is similar.

Hills.—The hills are of the two major types differentiated by Hobson[6] in 1946. Examples of the purely erosion hills are Mt. Hochstetter, Bundine and the Yaddemooga Hills. In the area surrounding Mileura Station there are several drainage divides, unnamed, but exactly similar to the Yaddemooga Hills.

Examples of the hills whose shape and occurrence is influenced by the underlying rocks are the Robinson Range, Mt. Gascoyne, Mt. Clere, the Sawback Range, and Mt. Gould.

The Quartz Range and Talbot Divide (divide between the Murchison and Gascoyne Rivers) are ranges transitional between the two above types. They owe their existence solely to the recent and present erosion cycle and their general trend to the strike of the gneiss composing them.

Talbot Divide.—The name, Talbot Divide, is a new physiographic feature name given to the divide between the Murchison and Gascoyne Rivers, between Trigonometrical Survey Station K13 and the meridian of longitude of Mt. Fraser. It bifurcates at its western end, south of K13, to form the divides between the Murchison and Wooramel Rivers and between the Gascoyne and Wooramel Rivers. At its eastern end it merges into the highlands north of Mt. Fraser and is paralleled to the south by the Robinson Range, of which Mt. Padbury and Mt. Fraser form a part. The Robinson Range ends one mile east of the track between Yarlarweelor Station homestead and Mt. Padbury Station homestead and three miles north of Mt. Padbury homestead.

The Talbot Divide is a prominent feature on the Meekatharra-Mt. Augustus mail road. The road commences to climb into the divide ten miles north of Mt. Gould, but the divide is visible from the south from Moorarie Station homestead. The crest of the divide is shown on Plate IX.

The name Talbot Divide is given in honour of Mr. H. W. B. Talbot, a former member of the staff of the Geological Survey of Western Australia and an early pioneer worker and indefatigable reconnaissance geologist in this and other areas of Western Australia.

Plateaux.—Remnants of the Old Plateau exist over the area mapped. Only in the vicinity of Mileura Station are the remnants extensive. Here the Old Plateau is underlain by granite. On top of the granite, typical laterite mesas and breakaways are plentifully developed. In the region north, north-west and north-east of Mileura Station little laterite is found and few mesas. The tops of the low rounded hills of gneiss found in the divides between watersheds may represent the old plateau level.

No extensive areas of sandplain, similar to those observed on top of the old plateau surface near Pindar, Yallalong Station, Mt. Farmer Station and Austin Downs Station, were observed in 1947.

The new plateau is represented by the alluvial plains surrounding the major rivers and their tributaries. Generally the new plateau is 50 feet to 100 feet below the level of the old plateau. That portion of the new plateau surrounding the Gascoyne River on Landor Station appears to be higher than the portion surrounding the Murchison on and near Moorarie Station.

In 1946 Hobson[7] observed what he considered to be the remnant of a plateau higher than the old plateau and to which he gave the name Woodrarrung Plateau. In 1947 possible representatives of a plateau higher than the old plateau were seen (a) in the Sawback Range, (b) at Mt. Gascoyne. The Sawback Range consists of nearly horizontal Nullagine Sediments bordered by metamorphosed sedimentary rocks and gneiss. The surface of the metamorphosed sediments is rugged but at a lower level than the nearly horizontal surface of the Nullagine rocks. The tops of the low hills of metamorphic rocks are at the same level as some laterite mesas a few miles to the south-west.

Mt. Gascoyne is a rugged mass composed of metamorphosed sedimentary rocks. A wide flat ledge surrounding the peak was observed about 100 feet below the summit. From the edges of this ledge the slopes of the mountain descend steeply to the old plateau level, 400 feet below. It is difficult to imagine any other process than erosion of a plateau responsible for the formation of such a ledge. If this ledge is the remnant of a true plateau, the portion of Mt. Gascoyne above the ledge is a residual of three cycles of erosion.

Wind Erosion.

Wind erosion has had little effect on the topography. Numerous small areas of fixed or semi-fixed incipient dunes have been observed. It is thought that the "wandery" grass ridges are low fixed dunes. These ridges rarely reach a height of three feet and are extremely broad in proportion to their height.

There is a typical area of low fixed dunes one to two miles north-west from Mt. Gould outcamp on the Meekatharra-Mt. Augustus road. The dunes are three to four feet high, 30 to 50 feet broad and only about 200 feet long. They are arranged in an overlapping pattern and their long directions bear north-east. These dunes may form or grow in drought periods when the mulga vegetation is sparse and the grass and herbage non-existent. These low dunes are probably indicators of arid erosion, locally intense and in progress at the present time.

GEOLOGY.

General.

The survey was a geological reconnaissance, implying rapid mapping of a large area on a small scale. Mapping in this fashion precludes the recording of details of lithology within the large rock systems. The rock systems differentiated in the field are shown on plate IX. accompanying this report. Additional information concerning the rocks can be found in the progress report for 1946.[8]

[7] Hobson, R. A., and Johnson, W., op. cit., p. 62.
[8] Hobson, R. A., and Johnson, W., op. cit., pp. 63, 64.

[7] Hobson, R. A., and Johnson, W., op. cit., p. 62.
[8] Hobson, R. A., and Johnson, W., op. cit., pp. 63, 64.

Similar types of rocks were encountered in 1947 as in 1946 and no new systems were observed. The distribution was different and the areas covered by the various rock systems is given below.

Rock Types.	*Area.*
Alluvium	10,200 square miles.
Gneiss	3,900
Granite	1,200
Sedimentary Series ..	1,150
Greenstone Series	340
Nullagine	70
Total	16,860

No new evidence was discovered to alter the classification of the rocks proposed in 1946. That classification is shown in Table I in this report.

Alluvium.

Though not so widespread as in the area examined in 1946, it is still the most extensive deposit. It is of varying thickness. Near Erong Spring a creek has carved a ravine-like gully 20 feet deep in alluvium without reaching bedrock although gneiss outcrops half a mile north of the gully. The alluvium is everywhere horizontally bedded. The lack of cross bedding may be due to the alluvium having been laid down by sheet erosion.

At Erong Spring beds of siliceous limestone occur, containing a layer of opaline silica. It is from these beds that the spring issues. The limestone beds are contemporaneous with the alluvium and some alluvium is interbedded with them.

No fossils were observed. It is thought that this limestone is quite distinct from the travertine mounds encountered all over the Murchison and Gascoyne districts, especially along the edges of flood plains of rivers.

Laterite.

Little attention was paid to laterite. It was noted that there were no observable differences, caused by the underlying rocks, in the laterite overlying different rock types.

Younger Intrusives.

No dyke rocks similar to the tonalites and hornblende porphyrite series described in 1946 were observed in 1947.

Numerous basic dykes and sills were observed intruding gneiss, greenstone and metamorphosed sediments. Some of these were obviously prior to metamorphism and folding of the containing rocks. Others, particularly dykes, were younger than the period of granitisation. Good examples of these younger basic intrusives, of post granite age, are the rocks forming Mt. Maitland and Barloweerie Peaks. Mt. Maitland appears to have been a centre of igneous activity, possibly the denuded site of a Pre-Cambrian volcano. From Mt. Maitland basic dykes radiate in all directions.

The dykes in the vicinity of Mt. Maitland intrude greenstones, metamorphosed sediments and gneiss and appear to have been post-folding and post-granitisation.

A basic intrusive of doubtful age is to be seen within two chains of a track on Mt. Seabrook Station (map reference 5679). The basic rock, a dolerite is intrusive into gneiss parallel to the foliation. The dyke shows no evidence of granitisation, but has been faulted and sheared near the margins. The schistosity may have been caused by flow within the partly solidified dyke, or may have been due to later earth movements.

Nullagine Series.

Outcrops of rocks, believed to belong to the Nullagine Series of Proterozoic Age, occur in the north-eastern portion of the area mapped in 1947. The outcrop area is small. The relationship between the Nullagine sediments and the surrounding rocks is obscured.

The rocks were mapped as Nullagine because of their low dips, unmetamorphosed appearance, lack of fossils and their lithology. They are mostly coarse to fine grained sandstones, or shaly sandstones. The latter show cross bedding and ripple marks.

Granite.

The area of granite outcrops mapped in 1947 was small compared with that mapped in 1946.

The largest continuous outcrops are bounded by the Weld Range to the south-east, the Jack Hills to the north-west, the Mingah Range to the north-east and longitude 117° E. to the west. Most of the granite in this area is coarse grained and porphyritic. The large phenocrysts are usually microcline feldspar. Lenses of probable gneissic granite outcrop in the porphyritic granite.

The porphyritic granite forms a group of bare rounded hills, of which Mt. Hochstetter is the most prominent. Elsewhere the granite outcrops in low laterite-topped ridges.

Other small areas of granite outcrops can be seen on Plate IX, surrounding Mt. Marquis and Red Rock and on Minnie Creek and Eudamullah Stations. The granite in these outcrops is equigranular but coarse to fine grained. At Mt. Marquis a fine-grained granite intrudes a coarse-grained granite. A similar occurrence was noted by Hobson[9] on Poona Hill.

Metamorphosed Sedimentary Series.

Belts of predominantly metamorphosed sedimentary rocks cover a much larger area in the district investigated in 1947 than in that investigated in 1946. Prominent outcrops of metamorphosed sediments occur in the Jack Hills, Mt. Gould, the Robinson Range, Mt. Gascoyne, Mt. Seabrook, and on Koonmarra Station.

The rocks are mica schists, pure and ferruginous quartzites, jaspilites, amphibolitic quartzites, grey shaly quartzites, paragneisses, and metamorphosed conglomerates. The original bedding is preserved and dips nearly always vertical or more than 75°. Dragfolding is extremely common.

Because of the degree of metamorphism, the attitude and the lithology of these sediments, they are placed in the Archaeozoic System.

Greenstone Series.

North of the Mingah Range few outcrops of the Greenstone Series were discovered. The Mingah Range is composed of amphibolitised lavas and dolerites with some interbedded quartzites. The Weld Range is mainly amphibolite schist, and east of the Weld Range the greenstone outcrops are amphibolitised variolitic lavas with some amphibolite schists and possible ultrabasic rocks. The principle mineral production has been from these rocks.

Gneiss.

The principal part of the gneiss examined in 1947 appears to have resulted from granitisation of sediments or igneous rocks. In all areas of gneiss, small outcrops of metamorphosed sediments or greenstone have been mapped. In addition numerous relict patches of greenstone or metasediment were observed which were too small to map on the scale of four miles to one inch. Bedding planes, dragfolds and gradation in grain size were observed in the gneiss in areas remote from actual outcrops of metasediments, yet the mineralogical constitution is that of a granite.

No doubt some of the gneiss had a different origin. In the area marginal to granite some of the gneiss is probably orthogneiss. It is also probable that other outcrops of gneiss originated through pure regional metamorphism of sediments. It is thought that the amount of true paragneiss is small as the degree of metamorphism of the associated sediments is low.

[9] Hobson, R. A., and Johnson, W., op. cit., p. 64.

Large areas of gneiss north of the Jack Hills (see Plate IX). The typical development of the replacement gneiss is on Erong, Milly Milly, Mt. Seabrook and Yarlarweelor Stations. It is proposed to call the gneiss the Talbot Gneiss from its typical occurrence in the Talbot Divide. The Talbot Gneiss forms low rounded hills with a considerable cover of vegetation. Nowhere does it form conspicuous hills, as can be seen from Plate IX. To the writer's knowledge not one of the trigonometrical survey stations in the area mapped in 1946-1947, is on a hill composed of gneiss.

Areas underlain by replacement gneiss have more possible economic importance than those underlain by granite or granite gneiss. Some minerals have been mined from pegmatite dykes occurring in replacement gneiss; examples are mica from the area surrounding Yinnietharra homestead, bismuth from the same area, and beryl from Poona. No notable occurrences of gold have been discovered on the gneiss and men prospecting in the areas should concentrate on a search for minerals other than gold.

Inter-relationship of the Rock Systems.

The relationship between the Nullagine Series and the adjoining gneiss or metamorphic sedimentary series could not be observed in the field. The gneiss and metasediment outcrops are 50 feet to 100 feet lower than the Nullagine in the Sawback Range and the Talbot Divide. About one mile south-east of trigonometrical survey station L4 in the Sawback Range, there is a small cliff 60 feet high facing south-east. The Nullagine rocks forming this cliff face are almost horizontal. At the base of the cliff shaly sandstones exactly similar lithologically dip 50° to 60° and are much sheared and fractured. The cliff may be a fault or fault-line scarp. Otherwise there is no evidence for a faulted relationship between the Nullagine and older rocks.

The contact between the metamorphosed sedimentary series and the greenstone series was not observed.

The granite seems to have been intruded as a gigantic batholith, possibly partly by replacement and partly by disturbance of the intruded rocks. The regional strike of the surrounding rocks curves round the edges of the batholith. The granite was observed to cut the greenstone or metamorphosed sediments discordantly in only a few places.

STRUCTURAL GEOLOGY.

Reconnaissance mapping provides little detailed knowledge of the structure of the country mapped. No more than a few suppositions and inferences can be given on the broad structure of the area investigated in 1947.

In the previous section the large granite batholith was mentioned. The regional strike of the rocks surrounding this batholith seems to trend around the margin except in the vicinity of Judal Station homestead.

Two striking structural units are the Jack Hills and the Weld Range. Both ranges are composed of metamorphosed sediments with a general north-east strike and trending in a shallow curve with the convexity facing south-east. The two ranges are on diagonally opposite sides of the granite batholith.

Farther north the gneisses and metamorphosed sediments, composing the Quartz Range, Talbot Divide and the Robinson Range, have an easterly regional strike.

No evidence of major faulting was observed. The steep, straight, north-western faces of the Jack Hills and the Weld Range could easily be accounted for by differential erosion of hard sediments.

Minor faulting and folding were observed but not mapped in all areas of metamorphosed sediments.

ECONOMIC GEOLOGY.

The recorded mineral production, from the area examined in 1947, from the year 1897 to the 31st December, 1947, is as listed below.

Gold, 25,797 ounces.
Ochre, 1483.25 tons (2,240 lb.).

Minerals produced in 1947 were—
Gold, 129 ounces.
Ochre, 823-4 tons (2,240 lb.).
Magnesite, amount not reported.

The production of minerals from the area has been small. Some details of the mineral occurrences are given below.

Gold.—Gold has been produced from several localities within the area. They are the Mindoolah, Weld Hercules, Jillewarra, Carwell, Maranoa, Chesterfield, Mt. Maitland, and Livingstone's Find Groups. During 1947 prospectors were actively but spasmodically engaged at the Weld Hercules, Jillewarra, Carwell, Chesterfield and Livingstone's Find Groups. The gold occurs in areas of greenstone or metamorphosed sediments, except some gold-bearing veins in granite at Mindoolah. Table 2 gives details of the occurrence and production of gold in the above-mentioned groups.

Iron Ore.—Occurrences of iron ore on Mt. Gould were examined by the writer and Mr. Hobson. Several lenses were measured by tape and aneroid barometer and sampled. Results are shown in Tables 3 and 4. They indicate that the Mt. Gould iron ore deposits are worthy of examination if the need for iron ore should grow acute.

Minor Mineral Occurrences.—A *graphite* occurrence was examined by the writer and a sample taken was investigated by the Government mineralogist and analyst. The result is appended below.

Analysis of Graphitic Schist.—Spec. No. G.S.W.A. "/4257 percentage of carbon 5.0.

The graphite occurred as a lens in micaceous quartz schist associated with jaspilite vertically dipping. The lens of graphite was six feet long by two feet wide and had been tested by a pit two feet deep.

Mica has been mined from an open cut on a pegmatite vein in gneiss half a mile east of Salt Well on Yinnietharra Station (Reference 4492). The pegmatite vein is parallel to the strike and dip of the foliations of the gneiss, these being, strike N. 85° W., dip 70° S. The mica, clear muscovite, apparently formed around the periphery of a large mass of quartz in the pegmatite vein. It has been mined by an open-cut ten feet long, four feet wide and six feet deep and from a shaft now inaccessible.

Copper reputedly occurs about 10 miles east of Yarlarweelor Station homestead, but the occurrence was not seen by the writer.

Mr. Hobson investigated a deposit of *common opal* and *asbestos* on Byro Station (Reference 4375). Both were economically worthless.

Water.—Water supplies for pastoral and domestic purposes were adequate. Most sheep station homesteads rely on ground water for all domestic purposes. Some permanent pools are found in the Murchison and Gascoyne River beds. A permanent spring exists on Erong Station. This spring (Reference 4893), from which the station takes its name, is said to be capable of watering 200 head of cattle a day in summer. The ground water level is variable, the limits known to the writer are six feet below the surface on the alluvial plains near the Gascoyne River, and 80 feet below the surface in some of the soil covered gullies in the Talbot Divide.

The problem of water supply in these semi-arid regions is of the utmost economic importance and warrants a detailed survey. Little could be done to investigate the geology of ground water occurrence during this reconnaissance survey.

CONCLUSION.

The work done in the 1947 field season has delineated a larger area of potentially mineral-bearing rocks than that mapped in 1946. The outcrops of greenstone and metamorphosed sediments seem to have been well prospected for gold. A search for minerals other than gold might be successful in any of the areas of gneiss shown on Plate IX. The area of metamorphosed sediments around Mt. Gascoyne might repay prospecting for gold and other minerals. The possibility of finding gold-bearing quartz veins in areas of replacement gneiss should not be overlooked by any person prospecting in the area.

TABLE 1.

CLASSIFICATION OF ROCKS.

Age.	General Description.	Petrographic Information.	Notes.
Recent to Tertiary	Alluvium	....	
	Laterite	....	Distribution not mapped.
	Younger Intrusives	Intermediate intrusives—tonalite porphyries, diorite porphyrites, porphyrites and granophyres. Basic intrusives—gabbros, norites, dolerites, basalts and their derivatives.	These rocks occur fairly frequently but their extent is very small. Distribution not mapped.
	Nullagine Series	Massive and thinly bedded quartzites, frequently with current bedding	
	Sandplain (Gr/Gn.)	....	Areas of sandy soil or sandy soil and laterite rubble believed to overlie granite and/or gneiss. No rock outcrops.
Pre-Cambrian	Gneiss	....	Believed to have formed mainly as a result of granitisation of greenstones and sediments.
	Granite	Porphyritic microline granites, non-porphyritic orthoclase granites, hybrid granites, tonalite and soda granites, gneissic granites.	Pegmatite dykes and quartz reefs belong here.
	Sedimentary Series	Metamorphosed arenaceous and argillaceous sediments, with very minor quantities of lavas and ultrabasic rocks	
	Greenstone Series	Fine to medium grained amphibolites, derived from basic lavas; minor quantities of coarser grained amphibolites derived from basic intrusives; schists; metasediments; minor quantities of metamorphosed ultrabasic rocks	


GASCOYNE
PEAK HILL
G. F.
MURCHISON
YALGOO
G. F.
TO FIND A POINT ON MAP INDICATED BY GRID REFERENCE
POINT PINDAR
East
Take west edge of square in which point lies and read the figures opposite this line. 35
Estimate fifths eastwards 3
East 38
North
Take south edge of square in which point lies and read the figures opposite this line 45
Estimate fifths northwards 2
North 47
REFERENCE TO SIGNS
Approximate geological boundaries
Main roads
Railway
Fence
Sheep station homestead "Edah"
Mining groups POONA
Hills with trig stations
Hills with cairns
MINERAL LOCALITIES
Designated thus
Au. Gold
Fe. Iron
Cu. Copper
Sn. Tin
Be. Beryl
Bi. Bismuth
Wo. Scheelite
LEGEND
RECENT
Alluvium
PRE-CAMBRIAN
Horizontal quartzites, Nullagine Series
Granite. Includes small areas of sandplain and gneiss.
Gneiss. Mainly granitised greenstones or sediments. Includes frequent small ungranitised patches of greenstone or sediments May include some granite or sandplain.
Granite and/or Gneiss. Most probably granitised greenstone or metamorphosed sediments Weathered remnants only, outcropping through laterite and sandplain.
Sediments, steeply inclined and metamorphosed. Includes mica schists, phyllites and quartzites with some sandstones, conglomerates, interbedded basic lavas and intrusives.
Greenstone i.e. basic lavas with intrusive basic and acid rocks, pyroclastics and minor quantities of sedimentary rocks.
LOCALITY PLAN
Area mapped
PEAK HILL G. F.
MURCHISON G. F.
YALGOO G.F.
KALGOORLIE
PERTH
GEOLOGICAL SURVEY OF WESTERN AUSTRALIA
GEOLOGICAL SKETCH MAP
OF
PORTION OF THE
AREA BETWEEN LAT. 24°0′S. AND LAT. 29°0′S.
LONG. 115°30′E. AND LONG. 118°30′E.
Scale: 10 miles to an inch
Geology by R.A. Hobson and W. Johnson, June-Nov. 1946 & June-Nov. 1947.
J.McL. Feb. 1948

TABLE 2.

SUMMARY OF INFORMATION REGARDING MINING GROUPS, MURCHISON AND PEAK HILL GOLDFIELDS *

MURCHISON GOLDFIELD.

Group.	Total Gold. Fine ozs.	Grade. Dwts. per Ton. (2,240 lbs.)	Period of Production.	Maximum Depth. Feet.	Ore Bodies.	Country Rock.	Reference.	Remarks.
Mindoolah	3,061 .67	10 .6	1901–10, 1912–13, 1940–41, 1944	70 ft. to 100 ft. vertical	Quartz veins parallel to strike and dip of country rock when in sediments and lavas and in various directions when in granite. Veins of small dimensions, maximum width 2 ft.	Coarse equigranular granite and greenstone schists. Strike of schistosity N. 55° W., dip 56° N. ; lavas and metasediments strike N. 60° W., dip 50° E. to vertical	Bull. 57†, pp. 66–69	Granite intrusive in metasediments and lavas source of gold-bearing veins.
Weld Range	5,663 .82	13 .9	1897–99, 1906, 1937–45, 1947	+ 150 ft. on underlay of 48° E.	Quartz vein 1 ft. to 2 ft. wide at right angles to strike of country rock. Strike quartz vein N. 75° W., dip 45° to 60° N.	Jaspilite beds with interbedded amphibolitised schistose lavas ? Intruded by sill of dolerite. Strike jaspilite N. 60° E., dip jaspilite 65° S.E. ; strike of schistosity of amphibolite N. 45° W., dip 50° N.E.	Bull. 57, pp. 70, 71	Dolerite dyke probably post gold intrusive.
Ryansville	887 .17	12 .4	1939–41	140 ft. vertical.	Quartz vein strike N. 75° W., dip 60° N.	Massive amphibolitised basic lava. Schistose greenstone 50 yards south-west of working. Strike N. 45° W., dip vertical	....	Group about six miles S.W. of Weld Hercules Group.
Chesterfield	8,243 .79	21 .2	1900–13, 1935–36, 1947	+ 100 ft. vertical.	Quartz veins 1 ft. to 4 ft. wide striking and dipping mainly parallel to strike and dip of schistosity of greenstone. Some veins parallel to dragfolds in the greenstone schists	Quartzites and greenstone schists (probably amphibolitised lavas). Strike quartzite N. 41° W., dip 70° S.W. Strike schistosity of greenstone N. 21° W. to N. 10° E., dip 60° E. to 70° W. Quartzites fracture cleaved strike N. 80° W., dip 70° W.	....	Period of greatest production, 1900 to 1909.
Maranoa	99 .93	13 .4	1903–05, 1907	+ 100 ft.	Ferruginous quartz vein parallel to strike and dip of bedding of country rock	Metamorphosed impure limestone interbedded with quartzites and greenschists of sedimentary origin		
Carwell	942 .44	40 .9	1901, 1940, 1946....	60 ft. vertical to water level.	Quartz veins probably parallel to strike and dip of country rock	Metamorphosed quartzites and greenschists. Strike N. 70° E., dip 60–70° N.		
Jillewarra	4,336 .87	33 .1	1900–08, 1912–18, 1936–45, 1947	....	Thin quartz veins parallel to strike and dip of country rock. Also lode material in quartzose metamorphosed sediments	Quartzites, jaspilites strike N. 55° W., dip 60° N.E. intruded by quartz porphyry		

MURCHISON GOLDFIELD—*continued.*

Group.	Total Gold. Fine ozs.	Grade. Dwts. per Ton. (2,240 lbs.)	Period of Production.	Maximum Depth. Feet.	Ore Bodies.	Country Rock.	Reference.	Remarks.
Mt. Maitland	328.97	12.9	1924–25, 1929, 1936–40	30 to 40 feet	Quartz veins parallel to strike and dip of country rock	Amphibolite schists with some micaceous and quartzose metasediments. Schistosity of amphibolite parallel to bedding planes of sediments. Dolerite dykes intrude rocks. Strike schistosity of amphibolite N. 5° W., dip 70° E.	....	Small workings only. Dolerite dyke contains much pyrite ?
PEAK HILL GOLDFIELD.								
Livingstone's Find	1,232.11	14.8	1935–40, 1946	70 ft. vertical	Major ore bodies quartz veins parallel to strike and dip of country rocks; some minor ore bodies transverse	Ferruginous and white quartzites, black mica schists, green to grey micaceous quartz schists. Strike N. 70° W., dip 70° N. Sediments much drag folded. Folds pitching at a low angle to the west		

* Statistics in the Table have been compiled from information supplied by the Statistical Branch of the Mines Department. † Bull. 57 = Geological Survey of Western Australia, Bulletin No. 57.

TABLE 3.

INFORMATION REGARDING IRON ORE DEPOSIT S ON MT. GOULD.

Compiled by W. Johnson.

Name of Group.	Locality.	Access.	Ref. letter and number	Ore bodies. Location.	Average height above plain. feet.	Length. Feet.	Average Width. Feet.	Volume Millions of cubic feet.	Tonnage Millions of tons. (2240 lbs.)	Summary of Geology.
MT. GOULD.	Mt. Gould 89 miles in a direction N 53° W from Meekatharra. Approximate latitude 25° 48¹ S. Approximate longitude 117° 19¹ E.	Rail to Meekatharra. Mail route road Meekatharra to Mt. Augustus Station.	G_1	*Approx. 2,000 ft. N. of Trig. Stn. on Mt. Gould.	555	700	75	29.138	3.238	Rocks composing Mt. Gould are banded, ferruginous quartzites, white quartzites, knotten-schiefers, mica schists with some green schists and gniess.
			G_2	*Approx. 600 feet N. of G1.	355	500	55	9.763	1.085	
			G_3	† N. end approx. 30ft. W. of Trig. Stn. on Mt. Gould.	790	770	54	32.848	3.649	The beds are folded into a large anticlinal fold pitching about 80° S.E. The mountain is a double peak with the highest point and trigonometrical survey station on the eastern peak. At the trigonometrical survey station the quartzites strike due north and dip vertically. On the lower western peak the rocks strike N. 80° E. and dip 60° to the south. The major orebodies are on the east limb of the anicline and the largest is close to the nose of the fold.
			G_4	† N. end approx. 150ft. S.E. of S. end of G_3.	555	11,170	77	62.987	6.998	On the western slope of the main peak there is a cemented scree or iron ore and ferruginous laterite and quartzite. Small iron ore lenses outcrop through the scree and a larger orebody may be hidden by the scree.
							Total		14.970	

Notes.—1. Measurements of lengths and widths was made using a 100-feet tape.
2. Heights were measured by aneroid barometer, checking against surveyed height of the trigonometrical survey station.
3. The tonnage given for each orebody is based on the assumption that the orebody continues without change of dimensions down to the level of the surrounding plain. A conversion factor of 9 cubic feet to the ton has been used.

* Examined, measured and sampled by R. A. Hobson.

† Examined, measured and sampled by W. Johnson.

TABLE 4.

ANALYSES OF SAMPLES FROM MT. GOULD IRON ORE LENSES.

Refer Table 3. Sampling by W. Johnson and R. A. Hobson.

Ref. No.[1]	Location of Sample.	Sample. No.	Results of Analyses.[2]					
			Fe.	SiO_2.	TiO_2.	P.	S.	H_2O.
G1.	200 feet from sount end of lens	M171	66·19	2·43	0·02	0·06	0·05	1·36
	600 feet from south end of lens	M172	64·83	4·02	0·02	0·13	0·12	1·19
G2.	Middle of orebody	M173	68·70	0·52	0·03	0·04	*œl'*	0·19
G3.	300 feet from north end of orebody	M236	68·62	0·60	0·01	*œl'*	*œl'*	0·26
	600 feet from north end of orebody	M237	68·88	0·35	0·02	0·01	*œl'*	0·24
G4.	300 feet from north end of orebody	M238	66·98	1·56	0·03	0·07	*œl'*	1·52
	800 feet from north end of orebody	M239	65·18	2·41	0·06	0·07	0·02	2·07

[1]Letters and number refer to Table 3.

[2]Analyses by the Government Chemical Laboratories.

Index to Geological Survey Annual Progress Report for 1947.

INDEX TO GEOLOGICAL SURVEY ANNUAL PROGRESS REPORT FOR 1947—*continued.*

Division V.

School of Mines, Western Australia.

The Under Secretary for Mines.

I forward herewith, for the information of the Hon. Minister for Mines, my Annual Report for 1947.

1. SCHOOL OF MINES, KALGOORLIE.

Enrolments.

The total number of students enrolled in 1947 was 572. This figure includes all students who enrolled at any time during the year. Class enrolments and individual enrolments for the three terms are given below. These figures indicate an appreciable increase on the numbers enrolled for 1946.

	Class Enrolments		Individual Enrolments	
	1947.	1946.	1947.	1946.
First term ..	1807	1328	546	489
Second term ..	1551	1211	533	476
Third term ..	1374	901	513	483

The number of students enrolled in each of the various subjects is given in Table 1.

TABLE 1.

CLASS ENROLMENTS—1947.

Subject.	1st term.	2nd term.	3rd term.
Elementary Mathematics ...	30	23	14
Preparatory Chemistry	102	84	72
Preparatory Physics	90	61	54
Preparatory Drawing	80	52	41
Preparatory Mathematics ...	98	75	57
Preparatory Geology	85	67	63
Mathematics IA.	122	109	93
Mathematics IB.	3	2	2
Applied Mathematics	89	83	78
Mathematics IIA.	30	28	27
Mathematics IIB.	6	6	6
Chemistry IA.	79	69	68
Chemistry IB.	6	7	6
Analytical Chemistry I.	19	19	17
Analytical Chemistry II. ...	5	4	4
Applied Chemistry IA.	20	15	15
Applied Chemistry IB.	31	30	29
Technical English	51	45	40
Assaying I.	40	36	34
Metallurgy I.	17	11	9
Metallurgy II.	13	13	18
Geology I.	41	37	36
Geology II.	7	6	6
Mining I.	58	49	44
Mining II.	24	22	22
Ore Dressing	26	23	20
Surveying I.	36	32	27
Surveying II.	14	13	13
Mechanical Drawing I.	67	61	45
Mechanical Drawing II.	21	21	19
Structural Engineering I. ...	24	23	22
Materials of Construction ...	47	39	37
Hydraulics	15	13	13
Physics IA.	101	98	94
Physics IB.	27	26	25
Workshop Practice I.	54	37	25
Workshop Practice II.	21	20	15
Mechanical Engineering I. ...	28	25	25
Mechanical Engineering II. ...	4	4	4

CLASS ENROLMENTS—1947—*continued.*

Subject.	1st term.	2nd term.	3rd term.
Machine Design	9	7	7
Internal Combustion Engines ...	56	52	35
Electrical Engineering I. ...	30	25	25
Electrical Engineering II. ...	5	6	6
Engine Driving	46	26	20
Trade Mathematics	11	11	10
Practical Electricity	14	11	8
Petrology	16	16	16
Mining and Economic Geology ...	9	9	8
Total class enrolments, 1947	1,807	1,551	1,374
Total class enrolments, 1946	1,328	1,211	901
Individual students, 1947 ...	546	533	513
Individual students, 1946 ...	489	476	483

The number of enrolments in the correspondence classes decreased slightly.

	1947	1946
Correspondence classes	32	38

The total number of Commonwealth Reconstruction Training Scheme students also decreased slightly, but there was an appreciable increase in the number of full time C.R.T.S. students.

	1947	1946
C.R.T.S. full time students	142	99
C.R.T.S. part time students	91	144
Totals	233	243

To cope with the increased number of students the staff was increased, but even with the increased staff classes were large and all members of the staff were very busy. Laboratory classes, especially in the preparatory subjects and the first year subjects, were large and were usually divided into three divisions. Extra laboratory classes were held in the afternoons. Some of the weaker students left during the course of the year. For those who completed the full year's training and sat for the Annual Examinations the examination results were satisfactory—the average number of passes for all subjects being 80 per cent. The results obtained by the full time C.R.T.S. students were particularly good. Details regarding examination results are to be found at the end of this report, together with information regarding scholarships and prizes.

Revenue.

The total revenue from all school fees, including fees for C.R.T.S. students was £3,816 7s. 6d. Fees received for work done by the Metallurgical Laboratory are not included in this amount.

Staff.

It is with regret that I place on record here the death of Mr. R. W. Fletcher on 2/5/47. Mr. Fletcher was appointed Director of the School of Mines on 12/2/46, and continued to hold office until the time of his death. Mr. Fletcher graduated from the University of W.A.

with honours in geology in 1929. In the following year he did post-graduate work, specialising in petrology, and spent some time at the University of Melbourne. Then followed a period of service with various mining companies in Western Australia. First of all with the Western Mining Corporation as petrologist and geologist, and later with other companies as consulting geologist. In 1941 he joined the staff of the School of Mines as lecturer-in-charge of Geology and Mining and continued to act in that capacity until May, 1942, when he joined the R.A.A.F. He continued with the R.A.A.F. until late 1945. In February, 1946, he was appointed Director of the School of Mines—a position for which he was well fitted. Mr. Fletcher was well known to the writer, both as a student and later as a fellow geologist. He came to the school as Director at a very busy time and was able to cope successfully with a rapid increase in the number of students following the cessation of hostilities and the introduction of the C.R.T.S. He was a very hard worker and during his short stay at the School of Mines as Director was able to accomplish much, frequently under difficult conditions. Amongst other things he revised all courses of study and brought these into line with modern requirements.

It is also with regret that I place on record here the death of Dr. B. H. Moore on 6/1/47. Dr. Moore was associated with the School of Mines for a period of 38 years and his work here is well known to those associated with mining. He joined the staff of the school in 1907 as lecturer in Chemistry and Metallurgy. In 1933 he was appointed Principal and continued in that capacity until 1940, when the office of Principal was abolished and Dr. Moore was appointed Director. He resigned in 1945 and was succeeded by Mr. Fletcher. Dr. Moore was born in New Zealand in 1880 and educated in London, Brisbane, Sydney and Melbourne. He attained the degree of Master of Engineering at Adelaide in 1927 and some years later the degree of Doctor of Science. In 1924 he established the Metallurgical Research Laboratory at Kalgoorlie and in association with others carried out extensive investigations on the Kalgoorlie and Wiluna ores. Until the time of his retirement he acted as officer-in-charge of the Metallurgical Laboratory and took a very keen interest in its work. His name will always be associated with the School of Mines of Western Australia.

To fill the vacancy caused by Mr. Fletcher's death Mr. R. A. Hobson was appointed Director, and commenced duties on 8/8/47.

Promotions and appointments to the teaching staff are given in Table II.

To assist with the extra office work resulting from the Commonwealth Reconstruction Training Scheme, Mr. Ace was appointed as a clerk.

Advisory Committee.

During 1947 the committee held nine meetings. At its first meeting held on 19/3/47 the committee appointed Mr. J. W. Manners as deputy chairman—Mr. L. W. Stotter having been transferred away from Kalgoorlie. The committee welcomed Mr. C. H. Warman as representative of the Associate's Association. Later in the year Mr. H. G. Smith, the acting warden, was appointed chairman. Mr. Smith continued to act as chairman until Mr. T. Draper was appointed as warden. On 14/8/47 Mr. C. T. Oliver was welcomed by the committee as representative of the A.W.U.

Throughout 1947 the Registrar, Mr. G. M. Lumb, continued to act as secretary to the committee.

In 1947, as in previous years, items of major importance to the school have been referred to the committee for discussion, and at all times the committee has taken a keen interest in the affairs of the school.

Commonwealth Reconstruction Training Scheme.

Full-time and part-time trainees under the above scheme continued to attend the school during 1947. At the commencement of the year there were 142 full-time trainees and 91 part-time trainees. Some trainees did not complete the full year's work—the numbers at the end of third term being, full-time trainees 132, part-time trainees, 60. The work of the trainees during 1947 was very satisfactory and at the end of the year only seven full-time trainees were recommended for suspension of training as a result of unsatisfactory work. The annual examination results for many of the trainees, both full-time and part-time, were particularly good, and trainees generally are to be congratulated on the year's work. Seven trainees completed the courses for which they were enrolled.

Courses of Study.

The revised courses of study, as prepared in 1946, were introduced for the first time in 1947. The number of Associateship Courses was increased by one, while the number of Certificate Courses was reduced by one. An Associateship Course in Mining Geology was introduced and the Geologist's Certificate Course was abandoned. Provision was made in the regulations for sympathetic consideration to be given to students who had commenced their training prior to 1947. Students who had, at the end of 1946, completed more than half the subjects for an Associateship or Certificate Course, as set down in the 1946 regulations, were allowed to complete under those regulations. Where subjects had been abandoned suitable substitute subjects were arranged.

An Engine Operation and Maintenance Course was introduced to enable those engaged as engine drivers or in engine rooms to increase their knowledge of various types of engines and to gain a theoretical background, which they would not otherwise possess. The course can be completed in two years part-time study and includes the following subjects: Trade Mathematics I and II, Practical Electricity, Steam Engine Driving, Workshop Practice I and II, Preparatory Drawing, Drawing I, and Internal Combustion Engines.

TABLE II.

PROMOTIONS AND APPOINTMENTS TO TEACHING STAFF.

Department.	Position.	Person appointed.	Date of appointment.	Remarks.
Chemistry, Metallurgy, and Assaying	Lecturer-in-charge	D. A. Sivyer	3–2–47	
	Assistant Lecturer	C. H. S. Meharry	10–2–47	
	Assistant Lecturer	J. R. LeMesurier	17–2–47	
	Assistant	Ruth Armstrong	17–2–47	Ceased duty on 6–12–48.
Engineering	Lecturer-in-charge	S. C. Parker	10–2–47	
	Lecturer	E. N. Johns	17–2–47	
	Assistant Lecturer	K. C. Middleton-White	17–2–47	
	Assistant	S. L. Harris	13–2–47	
Geology	Assistant Lecturer	W. H. Cleverly	17–2–47	
	Assistant	Lesley Wall	17–2–47	Resigned on 7–10–47.
Mathematics and Physics	Assistant	F. G. Watson	17–2–47	
Mining and Mine Surveying	Lecturer-in-charge	M. K. Quartermaine	10–2–47	

During 1947 further consideration was given to all courses and the number of hours of study necessary to complete the courses reduced. The revised courses were introduced in 1948. For Associateship Courses the total number of hours of study was fixed at approximately 72. This means that these courses can be completed in three years' full-time study or approximately seven years' part-time study after the qualifying subjects have been completed. For Certificate Courses the total number of hours of study was fixed at approximately 50, which includes the necessary preparatory subjects. The Certificate Courses can be completed in four years' part-time study. The Industrial Chemist's Certificate Course was abandoned, and the chemistry previously included in this course transferred to the Assayer's Certificate Course. Arrangements were also made for the introduction of a welding class.

Correspondence Classes.

The number of students from whom worked papers were received regularly during 1947 are listed below. The figures in brackets are the corresponding figures for 1946:—

Mining I.	13	(16)
Mining II.	4	(3)
Metallurgy I.	6	(6)
Assaying I.	3	(6)
Ore Dressing	10	(7)
Total	36	(38)

With the re-organisation of both the Associateship and Certificate Courses in 1947 many of the individual subjects were also re-organised and the syllabi of the re-organised subjects tended to depart from those presented in the correspondence courses. It appeared likely that the departure would be still greater in 1948. In 1947 a number of new appointments were made to the staff here, and also there was a considerable increase in the number of students. The members of the staff were very busy and constant revision of the correspondence courses was not possible. It was not possible to allot time for correspondence work in normal school hours. It was therefore decided that all correspondence classes would be suspended. After discussion with Mr. Phillips, it was agreed that no further enrolments in correspondence classes should be accepted after December for civilian students or after February for C.R.T.S. students. The position will be reviewed during 1948.

Diplomas and Certificates.

The following diplomas and certificates were issued during 1947:—

Associateship Courses.

Mining	5
Metallurgy	1
Engineering	1
Total	7

Certificate Courses.

Mine Surveyor's	5
Industrial Chemist's	3
Assayer's	5
Geologist's	1
Draftsman's	2
Total	16

Scholarships and Prizes.

A list of scholarships and prizes awarded for 1947 is attached to this report. In the Director's report for 1946 Mr. Fletcher stated that he intended to revise the conditions of award of the various scholarships and prizes, but, unfortunately, this was not done prior to his death. The writer was not able to do this before the end of the year, but agrees with Mr. Fletcher that it is necessary.

Services to the Public.

In addition to its normal teaching activities the School of Mines provides a number of services to the public.

During 1947 the School continued to undertake assays and mineral determinations for prospectors under certain conditions. The number of gold assays done was 506 and the number of assays for other metals was 11. The number of mineral determinations made during the year was 156. The assays are done under the supervision of the Metallurgical Laboratory staff and the mineral determinations by the lecturer-in-charge, Geology. There was an increase in both the number of assays and number of mineral determinations by comparison with 1946. During 1946 the total number of assays (gold or other metal) done was 483 and the number of mineral determinations made was 56.

The prospector's course commenced in 1946 by Mr. Fletcher was repeated in 1947. The 1947 course extended over three days and was held from 10/12/47 to 12/12/47. It followed along the same general lines as the 1946 course, but contained less detailed information regarding rocks and also introduced some information regarding assaying and small treatment plants. The course was open to anyone interested in prospecting or mining. The number of persons who attended the course was approximately 30.

The Director acts as local secretary for the University Annual Examinations and also for University Public Examinations. Members of the staff act as supervisors and all examinations are held at the School.

Supervision and accommodation are provided for candidates for various examinations, including those conducted by the State Electricity Commission, by various Technical Colleges all over Australia and by other examining bodies.

Monthly meetings of the Kalgoorlie branch of the Australian Institute of Mining and Metallurgy are held at the School.

Buildings.

Renovations of the School buildings were completed in 1947 and it is to be hoped that the buildings will be maintained in the present condition.

Buildings 48 and 51, from the R.A.A.F. aerodrome, Boulder, were moved to the School grounds during August and by the end of the year sufficient work had been done on these two buildings to enable them to be occupied in 1948. One of these buildings has been allotted to the Geology Department and the other to the Engineering Department. Both buildings have been altered to meet the requirements of the School and both are valuable additions to the Departments concerned.

Principal Requirements of the School.

During 1946 and 1947 some new equipment was ordered for all Departments of the School, but unfortunately very little of this has yet come to hand. Much of the equipment in the School is old and new equipment will be required in all Departments if efficiency is to be maintained. Provision will be made for this equipment in the yearly estimates.

The items listed below are the major requirements of the School:—

(i) The electrical installations throughout the school should be improved. Improved lighting is urgently required in the drawing office, in the engineering lecture room, in the chemical laboratories and in the assay laboratory. Additional power points are required mainly in the chemical laboratories. Provision should be made in any work done for transfer of the school from D.C. to A.C. as soon as A.C. is available. The writer understands that approval has been given for certain re-wiring to be done, but no action has so far resulted from this approval.

(ii) The provision of at least one utility truck is essential. The work of the Geology Department is particularly handicapped by the absence of transport, but all Departments have need of transport at various times. In

1946 W.A.G. 615 was allotted to the School of Mines. This truck had been used for many years by various officers of the Mines Department and was worn out when handed over to the School of Mines. Its present condition is such that it is not safe to drive and such that it cannot be reasonably reconditioned. It is at present on blocks in the school yard.

(iii) Additional laboratories are required for the Chemistry, Metallurgy and Assaying Department. Provision has been made in the Associateship Course in Metallurgy for laboratory work in Metallurgy II, in Ore Dressing and in Metallography. The provision of metallurgical and ore dressing laboratories has long been felt at the school and proposals were put forward at least as far back as 1941. A proposal is under consideration at the present time to move the Wiluna School of Mines building to Kalgoorlie and to make the necessary additions to it here.

(iv) Improved ventilation is required in the chemical laboratories and in the assay laboratory. The existing fume cupboards are inadequate and consideration is being given at the present time to the provision of a ventilation system for the fume cupboards.

(v) Much of the equipment in the workshop is old and worn out. All machines are driven from one central motor by a system of belts, counter shafts, etc. The old machines should be replaced by modern machines, each with its own motor. Recently the purchase of a milling machine and a grinding machine has been authorised by the Advisory Committee from Trust Funds, but during the next few years additional plant will be required.

(vi) The electrical engineering laboratory requires additional equipment. In 1946 the purchase of approximately £600 worth of electrical equipment was authorised and this equipment is now being delivered. The equipment authorised represents only portion of the equipment originally asked for.

Metallurgical Research Laboratory.

The work done in the Metallurgical Laboratory consisted of routine ore-dressing investigations into ore samples submitted from various places in Western Australia. The number of samples submitted was 33. The staff was fully occupied with this work and no time was available for research. The Senior Research Metallurgist has a number of problems in mind on which work could be done if more time were available to him.

As in previous years advice was given by letters and by interviews to prospectors and small mine owners. Quite a lot of the Senior Research Metallurgist's time was also taken up interviewing prospective clients, who desired to discuss their problem before submitting a sample for investigation.

During the year a proposal to extend the laboratory by the addition of an assay laboratory and balance room was submitted for consideration, but so far no action has resulted. The present furnace room and balance room are in portion of the school workshop and away from the laboratory. The assay balance cannot be used if the machines in the school workshop are in operation.

2.—SCHOOL OF MINES, NORSEMAN.

The total number of students enrolled during the year was 62. Details regarding the enrolments for the three terms are given below:—

	Class enrolments.		Individual enrolments.	
	1947.	1946.	1947.	1946.
1st term	75	118	51	70
2nd term	68	104	50	67
3rd term	56	87	44	58

The revenue for the year was £14. As in previous years, many of the students were under 21 and consequently did not pay class fees.

As in previous years, the staff consisted principally of part-time lecturers, but early in the year (20/1/47) Mr. R. C. Dowson was appointed as full-time instructor. Mr. Dowson not only took part in the teaching work of the school, but also was able to maintain liaison between Kalgoorlie and Norseman, and also between the various part-time lecturers at Norseman. Liaison between Kalgoorlie and Norseman is somewhat difficult to maintain and Mr. Dowson is to be congratulated on the work he has done. On 1st October, 1947, Master N. B. Creagh was appointed as a cadet at Norseman to assist Mr. Dowson and members of the part-time staff.

The subjects taught at Norseman during 1947 were Preparatory Drawing, Mechanical Drawing I and II, Elementary Mathematics, Preparatory Mathematics, Mathematics IA, Preparatory Chemistry, Preparatory Physics, Preparatory Geology, Internal Combustion Engines, Workshop Practice I and II, Mining I, Surveying I, Physics IA.

The examination results for the Norseman students were very satisfactory. At the final examinations 90 per cent. of the students who took the examinations passed and thirteen credit passes were obtained. These results reflect credit on the work of the teaching staff and also on Mr. Dowson's work in maintaining liaison between Norseman and Kalgoorlie.

During the year laboratories for practical work in Preparatory Physics and Preparatory Geology were established and the chemical laboratory was extended to enable all work required for Preparatory Chemistry to be done. The drawing office was improved.

As usual classes in Workshop Practice I and II were held in the fitting shop of the Central Norseman Gold Mines.

In April, 1947, a 16 mm. sound projector was purchased for the school by the Advisory Committee from funds raised in Norseman. Films have been obtained on loan from various sources and screened for the benefit of students during the year.

The Advisory Committee, under the Chairmanship of Mr. W. L. Dutton, has continued to take a lively interest in the affairs of the school and the thanks of the Mines Department are due to members of this Committee.

In April, Mr. C. N. Taylor was appointed Mining Registrar, Norseman, and Registrar of the School of Mines in place of Mr. L. S. Macfarlane, who was transferred elsewhere. To the time of his transfer Mr. Macfarlane took a lively interest in the affairs of the school and since then this interest has been maintained by Mr. Taylor.

The co-operation between the managements of the mines at Norseman and the townspeople of Norseman with the School of Mines noted in the 1946 report has continued during 1947. It is also pleasing to record that there has been close co-operation between the School of Mines and other schools at Norseman. During the year arrangements were made for apprentices located at Norseman to attend certain classes at the School of Mines. These classes will commence in 1948.

3.—SCHOOL OF MINES, WILUNA.

The School of Mines at Wiluna was closed on 14th March, 1947. Most of the equipment was transferred to Norseman, and a proposal is under consideration at the present time for the transfer of the building to Kalgoorlie.

ACKNOWLEDGMENTS.

The writer would like to acknowledge here assistance received from the Advisory Committee and from members of the staff since his arrival in Kalgoorlie. In particular acknowledgment is due to the lecturers-in-charge of the various departments at Kalgoorlie; to the Senior Research Metallurgist, Mr. R. W. Wilson; to the Registrar, Mr. Lumb; and to Mr. Dowson of Norseman. Mention must also be made of Miss Maher, who has frequently worked outside office hours to complete outstanding work.

R. A. HOBSON,
Director, School of Mines.

SCHOOL OF MINES OF W.A.

ANNUAL EXAMINATIONS, 1947.

PASS LIST.

Names are in Order of Merit.

(*) Denotes equal.

ELEMENTARY MATHEMATICS.

Arithmetic.

Credit—
Gislingham, L.
Williams, A. R.
Willox, D.

Pass—
Basten, W. H.
MacGregor, K.
Tester, W. A.
Budiselic, D.
Sewell, H.
Gurney, E. K.
Cunningham, P.
Payne, J.
Gard, R.
MacGregor, C.
Berriman, R. W.

Algebra.

Credit—
Williams, A. R.
Leary, J.

Pass—
Snudden, M. J.
Gislingham L.
MacGregor, C.
Phillips, F.

Geometry.

Credit—
Williams, A. R.
Nuttall, W.
Gislingham, L.

Pass—
Phillips, J.
Reeves, C. A.
Lowe, J.
Leary, J.

PREPARATORY MATHEMATICS.

Algebra.

Credit—
Flottman, R. H.
Smith, C. T.
Griffith, J.
Tanner, A. C.
Munro, G.
Bosustow, C. E.
Metcher, I. S.
Boucaut, A. P.
Weston, R. J.
Loukes, K. R.

Pass—
Flanagan, J. C.
Robinson, J. R.
Wark, A. R. J.
Duke, O. S.
Krige, W.
Harris, V. J.
Lawford, D.
Dunlop, R.
Manners, M. D. L.
Williams, G. D.
Walker, H. R. C.
Nelli, W. M.
Watson, N. J.
Jeffries, R.
Jennings, R. E.
Sargent, L. B.

Geometry.

Credit—
Bosustow, C. E.
Griffith, J.
Walker, H. R. C.
Milligan, R.
Yurisich, T.
Wark, A.
Krige, W.
Jones, J. H. } *
Robinson, J. R. } *
Smailes, M. G.

Pass—
Tanner, A. C.
Flottman, R. A. } *
Rich, H. J. } *
Miles, A. T.
McLellan, G. K.
Metcher, I. S.
Gillieatt, K. P.
Smith, C. T.
Flanagan, J. C.
Munro, G.
Read, C. G.
Siggins, A. M.
Dunlop, R. } *
Harris, V. } *
Manners, M. D. L.
Heathcote, L. J. } *
Williams, G. D. } *

Trigonometry

Credit—
Griffith, J.
Williams, A. R.
Robinson, J. R.
Weston, R. J.
Manners, M. D. L.
Walker, H. R. C.
Flottman, R. A. } *
Tanner, A. C. } *
Williams, G. D.

Pass—
Milligan, R. } *
Berry, A. T. } *
Munro, G. } *
Flanagan, J. C. } *
Krige, W.
Miles, A. T.
Metcher, I. S.
Nelli, W. M.
Smith, C. T.
McLellan, G. K.
Rich, H. J.
Slade, L. K. } *
Dunlop, R. } *

MATHEMATICS IA.

Trigonometry.

Credit—
Leslie, R. T. C.
Knight, L.
Griffiths, W. J.
Kanther, H. I. } *
Young, J. G. W. } *

Pass—
Kingsbury, C. J. R.
Holtzman, V. R.
Baster, L. R.
Carter, K. J.
Holland, A. J.
Antulov, V.
Skerry, T.
Mathews, W. A. R. } *
Moriarty, C. J. } *
Thomas, A. V. } *
Amm, R. A. } *
Manners, J. E. L. } *
Casserly, F. A.
Stodart, J. W. } *
Clayton, J. } *
McCleery, J.
Faichney, J. M.
Gilbert, W. B. } *
Bird, C. R. } *
Gillson, R. V. } *
Vukobratich, S. } *
Eddy, J. G. } *
Quadrio, J. S.
Newton, R. J.
Griffiths, I. N.
Gittos, A. J. } *
Webb, H. J. } *
Forster, E. T. } *
Gardner, J. A. } *
Livingstone, J. A. } *
Edwards, N. A. } *
Stronach, B. J. } *
Steel, W. } *
Barclay, V. } *
Sublet, G. } *
Poole, R. H. } *
Zehnder, J. W. } *
Callow, R. D. } *
Rhodes, D. J. } *
Pinnock, J. H. } *
Woods, J. A. } *

Algebra.

Credit—
Young, J. G. W.
Griffiths, W. J.
Antulov, V.
Lloyd, J. K. N. } *
Zehnder, J. W. } *

Pass—
Knight, L.
Mathews, W. A. R.
Kanther, H. I.
Newton, R. J.
Kingsbury, C. J. R.
Faichney, J. M.
Forster, E. T.
Hutchinson, R. K.
Sublet, G.
Clayton, J.
Carter, K. J.
Leslie, R. T. } *
Harvey, J. J. } *
Gardner, J. A. } *
Baster, L. R. } *
Steel, W. } *
Pegler, A. V. } *
Carter, F. A. } *
Webb, H. J. } *
Thomas, A. V. } *

Geometry.

Credit—
Young, J. G. W.
Gittos, A. J.
Griffiths, W. J.
Zehnder, J. W. } *
Skerry, T. F. } *
Antulov. V.
Kingsbury, C. J. R.
Webb, H. J.
Mathews, W. A. R.
Baster, L. R.

Pass—
McGlashan, G. } *
Griffiths, I. N. } *
Carter, K. J.
Quadrio, J. S.
Casserly, F. A.
Knight, L. } *
Leslie, R. T. C. } *
Barclay, V.
Darroch, I. N. D. } *
McCleery, J. } *
Manners, J. E. L. } *
Newton, R. J. } *
Holtzman, V. R. } *
Kanther, H. I. } *
Hutchinson, R. K. } *
Lloyd, J. K. N. } *
Forster, E. T. } *
Bird, C. R. } *
Steel, W.
Faichney, J. M.
Harvey, J. J.
Sublet, G.
Compton, Miss A. G. } *
Edwards, N. A. } *

MATHEMATICS IIA.

Credit—
Rasmussen, L. A.
Hastings, R. W.
Smith, B. R.

Pass—
Tasker, E.
Spencer, W. J.
Griffin, A. F.
Hair, K. R. } *
Hille, W. C. } *
Crawford, J. H. } *
Way, I. E. } *
Collin, A.
Oakley, D. J.
Doran, R. R. H.
Cranston, A. G.
Franklyn, R. P.
Huxtable, D. A.
Ibbotson, A. W. } *
Thomson, A. W. } *

MATHEMATICS IIB.

Pass—
Oliver, B.
Collin, A.
Verran, R.

APPLIED MATHEMATICS I.

Credit—
Young, J. G. W.
Skerry, T. F.
Kanther, H. I. } *
Hogg, J. M. } *
Collin, A. } *
Griffiths, W. J. } *
Gittos, A. J. } *
Newton, R. J. } *
Darroch, I. N. D. } *
Leslie, R. T. C.
Haddow, J.
Zehnder, J. W. } *
Power, F. W. G. } *
Doran, R. R. H.
Oakley, D. J.
Long, B. W. } *
Thomas, A. V. } *
Vukobratich, S.
Lloyd, J. K. N. } *
Quadrio, J. S. } *
Edgar, G. S. } *
Baster, L. R. } *

Pass—
Knight, L. B. C. } *
Livingstone, J. A. } *
Brabazon, W. M.
Bonner, M. H.
Ibbotson, A. W. } *
Crawford, J. H. } *
Casserly, F. A. } *
Harvey, J. J. } *
Morris, L. W. } *
Martin, D. J. } *
Clark, A. M. } *
Edgar, K. R. } *
Stanley, G. } *
Holland, A. J. } *
Horan, C. B. } *
Carew-Reid, D. M. } *
Pegler, A. V. } *
Griffiths, I. N. } *
Abotomey, J. } *
Mathews, W. A. R. } *
Gardner, J. A. } *
Compton, G. R. } *
Gilbert, W. B. } *
Moriarty, C. J. } *
Johnson, G. A. } *
Airey, J. A. } *
Rhodes, D. J. } *
Bird, C. R. } *
Cant, R. G. } *
Naumoff, G. S. } *
Whitton, W. R. } *
Poole, R. H.
Harper, D. G.
Gibson, A. A. } *
Turrell, R. K. } *
McCarthy, M. G. } *
Edwards, N. A. } *

TRADE MATHEMATICS I.

Credit—
Masson, J.
Lydon, A. M.

Pass—
Marshall, R.
Yaksich, C.
Watson, R. H.
Irving, J. L. } *
Pusey, J. } *

PREPARATORY PHYSICS.

Credit—
Williams, A. R.
Griffith, J.
Nelli, W. M. } *
Hutchinson. R. K. } *
Flottman, R. A
Weston R. J.
Krige, W. } *
Smith, C. T. } *
Robinson, J. R.
Watson, N. J.
Munro, G. D. } *
Brown, S. D. } *
Miles, A. T. } *
Tanner, A. C. } *
Flanagan, J. C.
Rich, H. J. } *
Yurisich, T. } *
McLellan, G. K. } *
Beveridge, A. W. } *
Timoney, E. G.
Williams, G. D.
Walker, H. R. C. } *
Siggins, A. M. } *

Pass—
Gillieatt, K. P. } *
Milligan, R. J. } *
Berry, A. T.
Slade, L. K.
Read, C. G. } *
Robinson, K. A. } *
Manners, M. D. L. } *
Baker, M. L. } *
Ford, A. T. } *
Heathcote, L. J. } *
Smailes, M. G. } *
Dunlop, R. } *
Jennings, R. E.
Jacobsen, P. J. } *
Murphy, A. J. } *
Reeves, C. A.

Pass in Practical only—
Waddell, B. E.

PHYSICS IA.

Credit—
Gittos, A. J.
Skerry, T. F.
Newton, R. J.
Quadrio, J. S.
Holtzman, V. R.
Kelly, D. H.
Griffiths, W. J. } *
McCleery, J. } *
Kanther, H. I. } *
Griffiths, I. N.
Baster, L. R. } *
Manners, J. E. L. } *
Webb, H. J. } *

Pass—
Toms, H. E.
Leslie, R. T. C. *
McGlashan, G.
Antulov, V.
Harvey, J. J. *
Sarell, R. G.
Thomas, A. V.
McDonald, T. G. P. *
Knight, L.
Carter, K. J.
Faichney, J. M. *
Dodd, K. C.
Zehnder, J. L.
Gilbert, W. B.
Metcher, I. S. *
Turrell, R. M.
Crawford, J. H.
Edgar, K. R. *
Elliott, R.
Cranston, A. G. *
Mathews, W. A. R.
Sublet, G. *
Brabazon, W. M.
Clark, A. M.
Stanley, G.
Casserley, F. A. *
Duthie, W. H.
Eddy, J. G.
Edwards, N. A.
Bell, B. W. *
Bird, C. R.
Saunders, N. L.
Amm, R. A. *
Livingstone, J.A.
Rhodes, D. J. *
Cant, R. G.
Morris, L. W. *
Harris, G. D.
Braithwaite, A.
Pinnock, J. H. *
Fariss, L.
Jacobs, R. A. *
O'Neill, J.
Whitton, W. R.

Pass in Practical only—
Harper, D. G.
Low, W. H.
Callow, R. D.
Harlond, B. C.
Compton, Miss A. G.
Ion, C. E.
Moriarty, C. J.
Smith, A. J.
Firns, R. G. L.
Smith, K. G.
Vukobratich, S.
Melville, R. J.
Stronach, B. J.
Anderson, J. B.
Glenister, C. I.
McDermott, C. J.
Harris, V. J.

PHYSICS IB.

Credit—
Rasmussen, L. A.
Collin, A.
Darroch, I. N. D.
Chilvers, J. E. *
Wells, T.
Franklyn, R. P.
Smith, B. R.
Burrows, D. E.

Pass—
Oakley, D. J. *
Way, I. E.
Holland, A. J.
Spencer, W. J.
Airey, J. A.
Griffin, A. F.
Clarke, L. D.
Martin, D. J.
Brodie-Hall, L. C.
Martin, D. H.
Naumoff, G.
Johnson, G. A.

PREPARATORY CHEMISTRY.

Credit—
Williams, A. R.
Griffith, J.
Miles, A. T.
Hutchinson, R. K.
Sublet, G. H. *
Krige, W.
Holtzman, V. R. *
Tanner, A. C.
Weston, R. J. *
Hille, T.
Flanagan, J. C. *
Smith, C. T.
Berry, A. T.
Antulov, V.
Robinson, J. R.
Flottman, R. A.
Williams, G. D.

Pass—
Metcher, I. S.
Ford, A. T.
Martin, D. H.
Milligan, R. J.
Colgan, J. G.
Rich, H. J.
Stanley, G. *
Read, C. G.
Cain, J. M.
Jacobsen, P. J. *
Watson, N. J. *
Siggins, A. M. *
Baker, M. L.
Nelli, W. M.
Coldwell, V. G.
Smailes, M. G.
McLellan, G. K.
Compton, Miss A. *
Gilliatt, K. P.
Dunlop, R. *
Slade, L. K.
Munro, G. W.
Jacobs, R. A. *
Cedro, J.
Robinson, K. A. *
Yurisich, T *
Heathcote, L. J. *
Taylor, S. R.

CHEMISTRY IA.

Credit—
Gittos, A. J. *
Hastings, R. W.
Hogg, J. M.
Skerry, T. F.
Harvey, J. J.
Kanther, H. I. *
McCleery, J.

Pass—
Webb, H. J.
Lloyd, J. K. N. *
Thomas, A. V.
Compton, G. R. *
Power, F. W. G.
Leslie, R. T. C.
Griffiths, I. N. *
Inman, R. D.
Newton, R. J.
Baster, L. R.
Bird, C. R.
Doran, R. R. H. *
Edgar, K. R.
Manners, J. E. L.
Saunders, N. L.
Clarke, L. D. *
McDonald, T. G. P.
Faichney, J. M.
Edwards, N. A. *
Zehnder, J. W.
Harper, D. G. *
Morris, L. W.
Brabazon, W. M.
Ibbotson, A. W.
Feeney, A.
Walker, H. R. C. *
Crawford, J. H.
Abotomey, J.
Green, J. W. *
Moriarty, C. J.
Manners, M. D. L. *
Stodart, J. W.

Pass in Theory only—
Barclay, V.
McGlashan, G.

Pass in Practical only—
Clark, A. M.
Knight, L.
Loukes, K. R.
Toms, H. E.
Laffer, G.

ANALYTICAL CHEMISTRY I.

Credit—
Young, J. G. W.
Way, I. E.
Long, B. W.

Pass—
Franklyn, R. P. *
Griffin, A. F.
Casserly, F. A. *
Redmond, G. J.
Edgar, G. S.
Sweet, F. B.
Gibson, A. A.
Ryder, K. N.
Bonner, M. H.
Gray, F. E.
Brennan, Miss R. C.

Pass in Practical only—
Green, E. J.
Johnson, G. A.

ANALYTICAL CHEMISTRY II.

Pass—
Cecil, R.
Chilvers, J. E.
Ewing, D. A.
Wilson, R. G.

APPLIED CHEMISTRY IA.

Credit—
Ewing, D. A.
Wilson, R. G.
Young, J. G. W. *
Long, B. W.
Redmond, G. J.

Pass—
Way, I. E.
Gray, F. E.
Franklyn, R. P. *
Chilvers, J. E.
Casserly, F. A.
Green, E. J.
Brennan, Miss R. C.

APPLIED CHEMISTRY IB.

Credit—
Wells, T.
Griffin, A. F.
Rasmussen, L. A.
Bonner, M. H. *
Young, J. G.
Sweet, F. B. *
Way, I. E.

Pass—
Edgar, G. S.
Casserly, F. A.
Frayne, W. *
Long, B. W.
Kingsbury, C. J. R.
Johnson, G. A.
Smith, B. R. *
Davis, F. A.
Franklyn, R. P.
Gray, F. E.
Brennan, Miss R. C.
Myers, E. O.
Thomson, A. W. *
Carew-Reid, D. M.
Fisher, E. W.
Hay, W. I. *
Ryder, K. N.
Oakley, D. J.
Darroch, I. N. D.
Green, E. J.

METALLURGY I.

Credit—
Cleverly, W. H.
Edgar, G. S.
Franklyn, R. P.
Kingsbury, C. J. R.

Pass—
Green, E. J.
McCarthy, M. G.
Feeney, A.
Carew-Reid, D. M.

METALLURGY II.

Examination only (1947).

Credit—
Ewing, D. A.
Lynn, F. T.

Pass—
Redmond, G. J.
Wilson, R. G.
Griffin, A. F.
Long, B. W. *
Way, I. E.
Young, J. G. W.

Thesis Accepted.

Hughes, E. E.

METALLURGY IIC.

Credit—
Redmond, L. H.
Hastings, R. W.

Pass—
Bonner, M. H.
Gibson, A. A.

ASSAYING I.

Credit—
Lloyd, J. K. N.
Inman, R. D.

Pass—
Cecil, R.
McDonald, T. G. P. *
Webb, H. J.
Walker, H. R. C.
Compton, G. R. *
Faichney, J.
McCleery, J.
Clarke, L. D. *
Bayley, G.
Bird, C. R. *
Burrows, D. E.
Leslie, R. T.
Geen, J. *
McGlashan, G.
Horan, C. B.
Stodart, J.
Johnson, G. A. *
Feeney, A.
Harvey, J. J.
Edwards, N. A.
Harper, D. G. *
McCarthy, M. G.
Pegler, A. V.
Abotomey, J. *
Loukes, K. R.

ORE DRESSING

Credit—
Braham, P. G.
Edgar, G. S.
Gittos, A. J.

Pass—
Huxtable, D. A.
Leslie, R. T. C.
Mitchell, J. A. *
Webb, H. J.
Wells, T.
Compton, G. R.
Sweet, F. B.
Clarke, L. D.
Walker, H. R.
Bourman, G. W.
McGlashan, G.

PREPARATORY GEOLOGY.

Credit—
Williams, A. R.
Griffith, J.
Compton, Miss A. G.
Bird, C. R. *
Miles, A. T.

Pass—
Weston, R. J.
Holtzman, V. R.
Carter, K. J.
Sublet, G.
Griffiths, W. J.
Flanagan, J. C.
Berry, A. T.
Hutchinson, R. K. *
Smith, C. T.
Loukes, K. R. *
Tanner, A. C.
Heathcote, L. J. *
Stodart, J. W.
Milligan, A. *
Robinson, J. R.
Ford, A. T. *
Smailes, M. G.
Baker, M. L.
Potts, E. M.
Toms, H. E. *
Walker, H. R. C.
Krige, W.
Robinson, K. A. *
Slade, L. K.
Antulov, V.
Williams, G. D.
Nelli, W. M.
Taylor, S. R. *
Timoney, E.
McCarthy, M. G.
McDonald, T. G. *
Siggins, A. M.

GEOLOGY I.

Credit—
Wells, T.
Inman, R. D.
Hogg, J. M.
Dunstan, H. R. *
Young, J. G. W.

Pass—
Burrows, D. E.
Lloyd, J. K. N.
Royle, P. G. *
Considine, D. G.
Turrell, R. M. *
Hille, W. C.
Faichney, J. M. *
Huxtable, D. A.
Manners, J. E. L.
Burrows, H. L.
Sarell, R. G. *
Mercer, D. F.
Manners, M. D. L.
Rhodes, D. J. *
Gillson, R. S.
Myers, E. O.
Livingstone, J. A. *
Shaw, S. C.
Poole, R. H. *
Harvey, J. J.
Green, E. J.

Pass in Theory only—
Harper, D. G.

Pass in Practical only—
Edwards, N. A.

GEOLOGY II.

Pass—
Brodie-Hall, L. C.
Sweet, F. B.
Bonner, M. H.*
Gibson, A. A.
Christopher, L. F.*

PETROLOGY.

Pass—
Braham, P. G.
Walton, A. H.
Mitchell, J. A.
Wilson, R. G.
Collin, A.
Edgar, G. S.
Power, F. W. G.
Pinnock, J. H.
Naumoff, G.

Pass in Theory only—
Clarke, L. D.
Smith, A. M.

MINING AND ECONOMIC GEOLOGY.

Examination only (1947).

Pass—
Mitchell, J. A.
Collin, A.
Redmond, G. J.
Redmond, L. H.
Ryder, K. N.

Theses Accepted.

Hamilton, F. G.
Cackett, W. S.
Lee, G. S.
Crowe, I. F.
Braham, P. G.

MINING I.

Credit—
Wells, T.
Brodie-Hall, L. C.*
Redmond, G. J.
Morris, L. W.
Gibson, A. A.*
Redmond, L. H.
Wark, A. R. J.
Manners, J. E. L.
Frayne, W. L.*
Edgar, G. S.

Pass—
Kingsbury, C. J. R.
Burrows, D. E.
Potts, E. M.*
Steel, W.
Weston, R. J.
Eddy, J. G.*
Stodart, J. W.
Manners, M. D. L.
Elliott, R.
Amm, R. A.
Muncaster, N.
Trethewey, A. S.*
Miles, K.
Forster, E. T.
Kelly, D. H.
Callow, R. D.*
Wright, J.
Olsen O.
Cranston, A.*
O'Connor, J. M.
Baker, M. L.*
Abotomey, J.
Firns, R. G. L.*
Smailes, M. G.
Edwards, J. T.
Weedon, R. P. J.*
Zehnder, J. W.
Fullwood, W. H.
Sarell, R. H.*
Griffiths, I. N.
Simmons, M.
Carter, K. J.
Scott, A. W.*
Mathews, W. A. R.
Griffiths, W. J.
Slade, L. K.*
Jefferies, P. H.
Low, W. H.*
Crawford, J. H.

MINING II.

Examination only (1947)

Credit—
Wells, T.
Bonner, M. H.
Brodie-Hall, L. C.*
Lloyd, J. K. N.
Huxtable, D. A.
Hogg, J. McA.

Pass—
Burrows, H. L.
Considine, D. C.*
Faichney, J. M.
Middleton-White, K. C.
Myers, E. O.
Hille, W. C.*
Inman, R. D.
Sweet, F. B.
Woodham, H. P. F.*
Naumoff, G. S.
Gillson, R. S.
Harper, D. G.*
Crowley, P. J.
Turrell, R. M.
Poole, R. H.
Stronach, B. J.

Thesis Accepted.

(In lieu of Mining and Economic Geology Thesis).

Mitchell, J. A.

MINE SAMPLING.

Credit—
Brodie-Hall, L. C.
Cox, J. A. L.
Wells, T.
Middleton-White, K. C.
Bonner, M. H.
Hogg, J. Mc.*
Lloyd, J. K. N.
Faichney, J. M.
Considine, D. C.

Pass—
Inman, R. D.
Burrows, H. L.
Huxtable, D. A.*
Harper, D. G.
Myers, E. O.*
Hille, W. C.
Crowley, P. J.
Woodham, H. P. B.
Gillson, R. S.
Poole, R. H.
Turrell, R. M.*

SURVEYING I.

Credit—
Rasmussen, L. A.
Wells, T.
Holtzman, V. R.
Zehnder, J. W.
Hastings, R. W.
Baster, L. R.

Pass—
Carter, K. J.
Sarell, R. G.
O'Connor, J. M.*
Ibbotson, A. W.
Mathews, W. A. R.
Forster, E. T.
Clayton, J. L.
Abotomey, J.*
Turrell, R. M.
Field, D. V.
Tennant, B. N.*
O'Dea, W. J.
Bonner, M. H.*
Miles, H. G.
Morris, L. W.
Braithwaite, A.
Vukobratich, S.
Low, W. H.
Amm, R. A.
Hunt, C. A. S.*

SURVEYING II.

Examination only (1947)

Credit—
Hille, W. C.
Inman, R. D.
Redmond, L. H.*
Considine, D. C.
Lloyd, J. K. N.*

Pass—
Burrows, H. L.
Middleton-White, K. C.*
Hogg, J. Mc.
Collin, A.
Redmond, G. J.
Weedon, R. P. J.
Brodie-Hall, L. C.

Theses Accepted.

Fowler, R. W.
Power, F. W. G.
Braham, P. G.

PREPARATORY DRAWING.

Credit—
Flottman, R. A.
Tanner, A. C.
Williams, A. R.*
Smailes, M. G.
Ford, A. T.
Flanagan, J. C.*
Crawford, J. H.
Hutchinson, R. K.
Jacobsen, J. C.
Robinson, J.*
Roberts, J. E.
Rich, H. J.
Munro, G.*
Robinson, K. A.
McLellan, G. K.

Pass—
Coldwell, V. G.
Stodart, J. W.*
Heathcote, L. J.
Watson, N. J.
Smith, C. T.*
Siggins, A. M.
Milligan, R. J.*
Weston, R.
Loukes, K. R.
Nelli, W. M.
Smith, A. J.
Baker, M. L.*
Griffith, J.
Miles, A. T.
Sublet, G.*
Williams, G. D.
Bailey, W. J.*
Selkirk, L. A.
Casserley, F. A.
Gillieatt, K. P.
Harris, V.

MECHANICAL DRAWING I.

Credit—
Flottman, R. A.
Zehnder, J. W.
Baster, L. R.
Kanther, H. I.
Mathews, W. A. R.
Tanner, A. C.
Thomas, A. V.
Darroch, I. N. D.
Harris, G. D.
Stanley, G.
Doran, R. R. H.
Cant, R. G.*
Elliott, R.
Jennings, R. E.

Pass—
Knight, L.
Skerry, T. F.*
Yurisich, T.
Abotomey, J.
Long, B. W.*
Rhodes, D. J.
Turrell, R. M.*
Metcher, I. S.
Shaw, S. C.
Harlond, B. C.
Jacobs, R. A.
Carter, K. J.
Glenister, C.*
Antulov, V.
Rich, H. J.*
Amm, R. A.
Callow, R. D.
Clarke, A. M.
Low, W. H.
Holtzman, V. R.
Morris, L. W.
Taaffe, J. M.

MECHANICAL DRAWING II.

Credit—
Forster, E. T.
Smith, B. R.
Edgar, K. R.
Cackett, W. S.
Quan, L. E.
Haddow, J.
Mitchell, J.
Royle, P. G.

Pass—
Toms, H. E.
Oakley, D. J.
Ion, C. E.
Braithwaite, A.
Fariss, L.
Simmonds, G.
Laffer, G. A.
DeCampi, D. J.

MECHANICAL ENGINEERING I.

Credit—
Holland, A. J.
Smith, B. R.
Martin, J. D.
Dodd, K. C.
Sublet, G. H.*
Darroch, I. N. D.
Doran, R. R. H.
Cackett, W. S.
Taylor, S. R.
Myers, E. O.*
Gilbert, W. B.

Pass—
Power, F. W. G.
Newton, R. J.*
McDonald, T. G. P.
Bonner, M. H.
Stanley, G.
Brabazon, W. M.
Spencer, W. J.
Bradley, S. W.*
Pegler, A. V.
Green, E. J.*
Gillson, R. S.
Horan, C. B.
Harlond, B. C.

MECHANICAL ENGINEERING II.

Credit—
Hastings, R. W.
Rasmussen, L. A.
Fisher, E. W.

Pass—
Redmond, L. H.

MATERIALS OF CONSTRUCTION.

Credit—
Braham, P. G.
Griffin, A. F.
Sweet, F. B.*
Redmond, G. J.

Pass—
Metcher, I. S.
Lynn, F. T.
Redmond, L. H.*
Martin, J. D.
Harris, S. L.
Oakley, D. J.*
Naumoff, G. S.
Saunders, N. L.
Gilbert, W. B.*
Compton, G. R.
Burrows, H. L.
Clarke, L. D.*
Darroch, I. N. D.
Way, I. E.*
Tasker, E.
Shaw, S. C.
Braithwaite, A.
Christopher, L.
Hay, W. I.*
Pegler, A. V.
Sublet, G. H.
McDonald, T. G. P.
Yurisich, T.
Knight, L.*
Taylor, S. R.
McCarthy, M. G.*
Cain, J. M.
Cranston, A. G.*
Stanley, G.
Henderson, D. C.
Fariss, T. W. L.*
Armstrong, L. H.

HYDRAULICS.

Credit—
Lynn, F. T.
Mead, G. F.*
Martin, J. D.
Tasker, E. W.*
Redmond, L. H.
Fisher, E. W.
Brodie-Hall, L. C.
Clarke, L. D.

Pass—
Redmond, G. J.
Thomson, A. W.
Edgar, K. R.
Davis, F. A.
Hunt, C. A. S.

MACHINE DESIGN.

Examination only (1947)

Credit—
Burrows, D. E.
Smith, B. R.
Redmond, L. H.

Pass—
Lazberger, A.
Moir, G. A.
Madin, R. J.

Theses Accepted.

Slee, A. P.
Hastings, R. W.

STRUCTURAL ENGINEERING I.

Credit—
Sweet, F. B. }
Martin, J. D. }*
Tasker, E.
Burrows, H. L.
Mead, G. F.

Pass—
Clarke, L. D. }
Martin, D. H. }*
Way, I. E. }
Smith, B. R. }
Martin, D. J. }*
Griffin A. F.
Chilvers, J. E. }
Gilbert, W. B. }*
Collin, A.
Brodie-Hall, L. C. }
Lynn, F. T. }*
Harris, S. L.
Braithwaite, A.
Moir, G. A. }
Taylor, S. R. }*
Naumoff, G. }
Holland, A. J. }*

ELECTRICAL ENGINEERING I.

Credit—
Wells, T.
Mitchell, J. A. }
Hastings, R. W. }*
Thomas, A. V.
Kanther, H. I.
Smith, B. R.

Pass—
Burrows, H. L.
Myers, E. O. }
Doran, R. R. H. }*
Newton, R. J. }
Colin, A. }
Considine, D. }*
Skerry, T. F.
Sweet, F. B.
Darroch, I. N. D.
Brodie-Hill, L. C.
Power, F. W. G.
Kelly, K. W.
Ibbotson, A. W. }
Braithwaite, A. }*

ELECTRICAL ENGINEERING II.

Credit—
Burrows, D. E.
Rasmussen, L. A.

Pass—
Fisher, E. W.
Redmond, L. H.
Thomson, A. W.

WORKSHOP PRACTICE I.

Credit—
Hastings, R. W.
Hudson, H. R.
Taylor, S. R.

Pass—
Munro, G.
Cant, R. G.
Colgan, J. G.
Church, E. G.
Pusey, I. J.
Masson, J. W.
Selkirk, L. A.
Peake, M.
Jordan, H.

WORKSHOP PRACTICE II.

Credit—
Foulkes, E. A.
Rasmussen, L. A. }
Oakley, D. J. }*
Redmond, L. H.
Thomson, A.W.
Hewitson, G. H.
Flottman, R. A.
Edgar, K. R.

Pass—
Doran, R. R. H. }
Fariss, T. W. L. }*
McEwan, V. H. }
Hay, W. I.
Sargent, L. B.
Robertson, A. D.
Irving, J. L.

Pass in Practical only—
Jennings, R. E.
Cammilleri, O.

INTERNAL COMBUSTION ENGINES.

Credit—
Redmond, L. H. }
Davis, F. A. }*
Metcher, I. S. }
Rasmussen, L. A. }
Flottman, R. A. }*
Saunders, N. L. }
Foulkes, E. A. }
Yurisich, T.

Pass—
Braithwaite, A. }
Moir, G. A. }*
McIvor, J. R. }
Sheil, S. T. }
Stewart, B. }*
Moyle, L. }
Munro, G. }
Ferguson, D. J.
Mills, R. S.
Masson, J. W.
Henderson, D. C.
Trythall, W.
Miller, C. H.
Baker, M. D.
Beck, A. }
Taaffe, S. }*
Warren, R. E.
Annear, R. J. }
Pusey, I. J. }*
O'Donnell, R.

PRACTICAL ELECTRICITY

Pass—
Coombs, G. F.
Masson, J. W.

ENGINE DRIVING.

Credit—
Jordan, N.F.
Steinhauser, H. E.

Pass—
Melville, J. M.
Bostelman, E. J. }
Lobb, E. J. }*
McEwan, V. H. }
Grant, E. C.
McAlister, A.
Brooks, S. A.

TECHNICAL ENGLISH.

Pass—
Gibson, A. A.
Manners, J. E. L.
Metcher, I. S.
McDonald, T. G. P.
Shaw, S. C. }
Weston, R. J. }*
Mathews, W. A. R. }
Smith, B. R. }*
Toms, H. E. }
Zehnder, J. W. }*
Abotomey, J. }
Griffiths, I. N. }*
Manners, M. D. L. }
Dodd, K. C.
Baster, L. R.
Franklyn, R. P. }
Jacobs, R. A. }*
Edgar, K. R. }
Skerry, T. F. }*
Long, B. W.
Firns, R. G. L. }
Green, E. J. }*
Saunders, N. L. }
Whitton, W. R. }

SUPPLEMENTARY EXAMINATIONS, 1947.

PREPARATORY GEOLOGY.

Anderson, J. B.
Murphy, H. W.
Franklyn, R. P.
Field, D. V.
Bell, B. W.

PREPARATORY MATHEMATICS.

Algebra.

Smailes, M. G.
Miles, A. T.
Sargent, L. B.
McLellan, G. K.

FREPARATORY MATHMATICS GEOMETRY

McEwan, V. H.
Ford, A. T.
Nelli, W. M.

APPLIED MATHEMATICS.

Franklyn, R. P.
Boyd, J. P.
Fowler, R. W.

MATHEMATICS I.

Tigonometry.

Bonner, M. H.
Hutchinson, R. K.
Brabazon, W. M.
Harvey, J. J.

Algebra.

Casserly, F. A.
Darroch, I. N. D.
Quadrio, J. S.

MATHEMATICS II.

Brodie-Hall, L. C.
Myers, E. O.

MINERALOGY.

Pinnock, J. H.
Gillson, R. S.
Fennell, W.

SURVEYING I.

Gibson, A. A.

SURVEYING II.

Paper A.

Ion, C. E.

PHYSICS IA.

Tennant, B.
Field, D. V.

MECHANICAL ENGINEERING I.

Collin, A.

MACHINE DESIGN.

James-Wallace, W.

ASSAYING I.

Brabazon, W. M.

ENGINEERING CHEMISTRY I.

Olive, L.

MINING I.

Trethewey, R. G.

MINING II.

Mine Sampling.

Stronach, B. J.

YEAR'S FEE SCHOLARSHIPS.

PREPARATORY PHYSICS.

Williams, A. R.

PREPARATORY DRAWING.

Flottman, R. A.

PREPARATORY CHEMISTY.

Williams, A. R.

PREPARATORY GEOLOGY.

Williams, A. R.

TRADE MATHEMATICS.

Masson, J. W.

MINING I.

Wells, T.

SURVEYING I.

Rasmussen, L. A.

SURVEYING II.

Hille, W. C.

CHEMISTY IA.

Gittos, A. J.

ANALYTICAL CHEMISTY I.

Young, G. J.

APPLIED CHEMISTRY IA.

Ewing, D. A.

APPLIED CHEMISTRY IB.

Wells, T.

METALLURGY I.

Cleverly, W. H.

METALLURGY II.

Ewing, D. A.

MACHINE DESIGN.

Burrows, D. E.

METALLURGY IIC.

Redmond, L. H.

ASSAYING I.

Lloyd, J. K. N.

ORE DRESSING.

Braham, P. G.

GEOLOGY I.

Wells, T.

MATHEMATICS IIA.

Rasmussen, L. A.

APPLIED MATHEMATICS.

Young, J. G. W.

PHYSICS I.

Gittos, A. J.

PHYSICS IB.

Rasmussen, L. A.

DRAWING I.

Flottman, R. A.

DRAWING II.

Forster, E. T.

MECHANICAL ENGINEERING I.

Holland, A. J.

MECHANICAL ENGINEERING II.

Hastings, R. W.

MATERIALS OF CONSTRUCTION.

Braham, P. G.

HYDRAULICS.

Lynn, F. T.

STRUCTURAL ENGINEERING I.

Sweet, F. B.

ELECTRICAL ENGINEERING I.

Wells, T.

ELECTRICAL ENGINEERING II.

Burrows, D. E.

NORSEMAN SCHOOL OF MINES.

ELEMENTARY MATHEMATICS.

Arithmetic.

Pass—
Gordon, K. D.
Franklyn, D. C.
Sharpe, C. K. } *
Winston, J. T. }

Algebra.

Credit—
O'Connell, J. C.

Pass—
Sharpe, C. K.

Geometry.

Credit—
O'Connell, J. C.

Pass—
Gordon, K. D.
Sharpe, K. C.

PREPARATORY MATHEMATICS.

Algebra.

Pass—
Meacock, W. G.
Kerr, P. H.
Cottrell, R. H.

Geometry.

Pass—
Cottrell, R. H.
Meacock, W. G.

Trigonometry.

Credit—
Creagh, N.

Pass—
Meacock, W. G.
Cottrell, R. H.
Kerr, P. H.

PREPARATORY DRAWING.

Credit—
O'Connell, J. C.
Winston, J.

Pass—
Turner, J. S.
Kerr, G.

PREPARATORY GEOLOGY.

Credit—
Brett, R. L.

PREPARATORY PHYSICS.

Credit—
Creagh, N.

Pass—
Trotter, E.

PREPARATORY CHEMISTRY.

Credit—
Creagh, N.

INTERNAL COMBUSTION ENGINES.

Credit—
Dickenson, W.

Pass—
Clark, L.
Turnor, J. S.
Pugh, D. D.
Baker, I. A.
Halse, E. J.

WORKSHOP PRACTICE I.

Pass—
Delamotte, H. C.
Kerr, R. N.
Bird, R. J.
Kerr, W. J.
Bermingham, I. J.
Regolini, J. A.

WORKSHOP PRACTICE II.

Credit—
Guest, C.

Pass—
Guest, A.
Winston, J.
Lord, S.

MECHANICAL DRAWING I.

Credit—
Brett, R. L.

Pass—
Creagh, N.
Kerr, R.

MECHANICAL DRAWING II.

Credit—
Brett, R. L.

Pass—
Lord, S. J.

MINING I.

Credit—
Pickering, F. J.

Pass—
Morton, J. L.
Gordon, K. D.

YEAR'S FEE SCHOLARSHIPS.

PREPARATORY DRAWING.
O'Connell, J. C.

PREPARATORY GEOLOGY.
Brett, A. R.

PREPARATORY PHYSICS.
Creagh, N.

INTERNAL COMBUSTION ENGINES.
Dickenson, W.

WORKSHOP PRACTICE II.
Guest, C.

MECHANICAL DRAWING II.
Brett, R. L.

MINING I.
Pickering. F. J.

SCHOOL OF MINES OF W.A.

SCHOLARSHIP AND PRIZE LIST, 1947.

MINES DEPARTMENT SCHOLARSHIPS.

Junior—No Award.
Entrance—L. Smith.
Senior—No Award.

CHAMBER OF MINES SCHOLARSHIPS.

Metallurgy—R. A. Flottman.
Mining—J. M. Hogg.

STUDENTS' ASSOCIATION SCHOLARSHIP.

J. D. Martin.

INSTITUTE OF MINE SURVEYORS SCHOLARSHIP.

L. H. Redmond.

SOCIETY OF ASSOCIATES OF THE W.A. SCHOOL OF MINES SCHOLARSHIP.

Divided between—
T. Wells.
B. R. Smith.

C. A. HENDRY PRIZE.

A. J. Gittos.

CRITCHLEY PARKER PRIZES.

R. W. Hastings.
J. G. W. Young.

WESLEY LADIES GUILD PRIZES.

E. W. Fisher.
L. R. Baster.

Division VI.

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1947.

OPERATIONS UNDER THE INSPECTION OF MACHINERY ACT, 1921.

ANNUAL REPORT OF THE CHIEF INSPECTOR OF MACHINERY AND CHAIRMAN OF THE BOARD OF EXAMINERS FOR ENGINE-DRIVERS FOR THE YEAR ENDED 31st DECEMBER, 1947, WITH STATISTICS.

The Under Secretary for Mines:

For the information of the Hon. Minister for Mines, I submit the report of the Deputy Chief Inspector of Machinery on the administration of the Inspection of Machinery Act, 1921, for the year ended 31st December, 1947.

JOHN S. FOXALL,
Chief Inspector of Machinery.

SECTION 1.

INSPECTION OF BOILERS, MAINTENANCE, ETC.

See Returns Nos. 1, 2, and 3.

The term "boiler" as defined in the Act includes any vessel in which steam is generated, above atmospheric pressure for working any kind of machinery, or for any manufacturing purpose, also unfired pressure vessels, such as steam jacketed pans, stills, sterilisers, digesters, vulcanisers, air or gas receivers, montejus, etc.

The type and the country of origin of the 215 boilers which were registered during the year 1947 are given in Return No. 1. The total number of boilers and pressure vessels of all types on the register at the end of 1947 was 5,675, but as only 2,416 certificates were issued during the year, the number of boilers actually in use or likely to be used again is probably only about 50 per cent. of the total number registered, the remainder were potentially useful when discarded, but owing to a variety of causes the majority of the discarded power boilers will never be used again to generate steam.

From Return No. 3 it will be seen that four second-hand boilers from the Eastern States, seven transferred from the jurisdiction of other departments in this State, and one reinstated were added to the register, while 28 permanently condemned or cut up, two sent out of this State and four transferred to other departments, were deleted leaving a net increase of 193 registered boilers and pressure vessels.

Thorough inspections increased by 55 and working inspections for which separate reports were submitted increased by 234, there were 65 more certificates issued, but 195 fewer repair notices.

NEW CONSTRUCTION.

Return No. 1 shows that 149 new boilers and pressure vessels were built in this State, but none was of unusual design, and the steam boilers were all of small size, this also applies to those built in the Eastern States.

MAINTENANCE.

Generally speaking maintenance of boiler plant has been fair to good. Many owners have adopted methods of feed water treatment.

Boiler quality plates and tubes are still in short supply, but sufficient stocks are available for essential repairs, although in most cases many months elapse between the placing of the order and the delivery of the materials.

Coal is still strictly rationed, and firewood is both scarce and dear as compared with pre-war conditions, making the use of oil fuel still an economical proposition.

As an example of poor maintenance the following would take some beating. An underfired return multitubular boiler 7ft. 6in. x 2ft. 9in. diameter was installed on the ground floor of a three storey building, to take the place of a smaller boiler. The chimney of the original boiler passed through three floors and the roof, and was only about half the area of that of the new boiler, yet the new boiler was coupled to the old chimney just below the ceiling of the ground floor. The owners found that they could not obtain sufficient steam for their processing, and asked for advice as to the advisability of installing a larger boiler. When an inspector visited the plant he found that there was not sufficient draught to allow the oil burner to give a clean flame, he then struck the outside of the chimney bringing down a large amount of soot. On his advice a chimney sweep was called in to clean the chimney, when it was found that the portion above the roof had corroded badly and collapsed, almost completely blocking the chimney. After the chimney had been cleaned and repaired no further trouble was experienced, the draught was sufficient to allow the oil burner to function correctly and the steam supply was ample at all times.

RETURN No. 1.—SHOWING THE NUMBER OF BOILERS OF EACH TYPE, AND COUNTRY OF ORIGIN OF NEW REGISTRATIONS FOR THE YEAR ENDED 31ST DECEMBER, 1947.

Type.	Country of Origin.					Total.
	United Kingdom.	U.S.A.	Eastern States.	Western Australia.	Unknown Sources.	
Cornish	....	....	....	12	....	12
Vertical Stationary	....	....	2	2	....	4
Return Multi-Stat. Underfired	....	....	....	2	....	2
Return Multi-Stat. Int. Fired	....	1	....	....	....	1
Water Tube	2	....	2	28	....	32
Saddle Back	....	....	1	6	....	7
Digester	....	....	....	14	....	14
Vulcaniser	....	....	2	2	....	4
Steam Jacketed Vessel	....	....	8	22	....	30
Steriliser	....	....	5	7	1	13
Air Receiver	7	....	23	48	12	90
Calorifier	....	....	....	1	....	1
Hot Plate	....	....	....	2	....	2
Blow Down Tank	....	....	....	1	....	1
Electric Immersion Heated Boiler	....	....	....	1	....	1
Hot Water Tank	....	....	....	1	....	1
	9	1	43	149	13	215

RETURN No. 2.—SHOWING CLASSIFICATION OF VARIOUS TYPES OF USEFUL BOILERS IN PROCLAIMED DISTRICTS ON 31ST DECEMBER, 1947.

Types of Boilers.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals. 1947.	Totals. 1946.
Lancashire	41	55	96	98
Cornish	125	471	596	586
Semi-Cornish	11	37	48	49
Vert. Stationary	369	351	720	721
Vert. Portable	71	15	86	87
Vert. Mult. Stat.	42	25	67	67
Vert. Mult. Port.	18	1	19	21
Vert. Pat. Tubular	49	....	49	49
Loco. Rect. Firebox Stat.	88	64	152	152
Loco. Rect. Firebox Port.	255	67	322	322
Loco. Circ. Firebox Port.	139	7	146	145
Locomotive	81	38	119	114
Water Tube	290	120	410	376
Return Mult. Underfired Stat.	202	62	264	265
Return Mult. Underfired Port.	1	7	8	8
Return Mult. Int. Fired Stat.	44	12	56	55
Return Mult. Int. Fired Port.	2	....	2	2
Egg ended and other types not elsewhere specified	295	26	321	299
Digesters	184	7	191	184
Air Receivers	784	472	1,256	1,164
Gas Receivers	7	....	7	7
Vulcanisers	298	10	308	304
Steam Jacketed Vessels	419	13	432	407
Total Registrations useful Boilers	3,815	1,860	5,675	5,482
Total Boilers out of use, 31st December, 1947	1,793	1,466	3,259	3,131

RETURN No. 3.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31ST DECEMBER, 1947.

	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals. 1947.	Totals. 1946.
Total number of useful boilers registered	3,815	1,860	5,675	5,482
New boilers registered during year	213	2	215	325
Boilers reinstated	1	....	1	....
Boilers converted	....	....	....	1
Boilers inspected—				
Thorough	2,044	395	2,439	2,384
Working	392	7	399	165
Boilers condemned during year—				
Temporarily	11	1	12	10
Permanently	25	3	28	25
Boilers sent to other States during year	2	....	2	2
Boilers sent from other States during year	1	3	4	1
Transferred to other Departments	4	....	4	3
Transferred from other Departments	7	....	7	4
Number of Notices for Repairs issued during year	513	13	526	721
Number of Certificates issued, including those issued under Section 30 during the year	2,022	394	2,416	2,351

SECTION 2.

EXPLOSIONS AND INTERESTING DEFECTS.

After the renewal of some tubes and other minor repairs, a watertube boiler was tested by hydraulic pressure to 30% above the working pressure. Owing to the fact that over a number of years, broken rivets had been found in the double riveted double butt strap longitudinal seam of the drum of other sister boilers in the same nest, the lagging was stripped from the seams and from around the pads for the various mountings to facilitate the detection of any defects. This test did not reveal any weeps or defects in the drum, but several tubes were found to require further expanding, after the tubes had been re-expanded a further hydraulic test was made which did not disclose any defects. The boiler was then put into commission, and worked for nearly three months, when steam was seen to escape from a fine crack, which was found to extend from underneath a mild steel pad to which the 7-inch saturated steam pipe flange was attached. This pad was 15¾ inches diameter with a minimum thickness of 1⅜ inch, it was attached to the shell by 24 ⅞-inch rivets in a double row. In order to leave room for the 12 studs of ¾-inch diameter for the steam pipe flange, the 15/16-inch rivet holes were not staggered. When the pad was removed the crack in the shell opened up, it ran from the opening through the plate between two rivet holes at one o'clock from the longitudinal centre line. The pad was cracked on both sides of the opening from the underside in way of the longitudinal centre line, but not right through to the upper surface. The defective part of the 11/16-inch boiler shell was cut out to about 18-inch diameter and a circular patch 28-inch diameter of ¾-inch plate, was riveted to the shell by ⅞-inch rivets staggered in two rows at 20½-inch and 24¾-inch pitch circle respectively. The new pad was made 1⅜-inch minimum thickness as before, but was attached to the patch by a single row of 12 rivets ⅞-inch diameter.

A small air receiver used for starting internal combustion engines was damaged by an explosion which was caused by excess lubricating oil and the overheating of the air, due to the fact that the air was compressed in a single cylinder single stage air cooled air compressor which was installed in a corner where there was little or no draught to help cool the cylinder, and in addition the compressor which had been in use for a long period was in bad condition. The receiver was 5ft. x 19½in. diameter with ⅜-inch shell and ½-inch ends which were dished to 18-inch radius, the top end was concave and the bottom convex. The longitudinal seam was double zigzag rivetted with ⅝-inch rivets in 11/16-inch holes at 2 7/16 pitch. The top and bottom end seams were single riveted with ⅝-inch rivets at 1¾-inch pitch. When the explosion took place the curvature of the bottom end was reversed and the longitudinal seam was sprung without much distortion. If we assume that the shell was made of 28-ton steel the bursting pressure would be 1,437 pounds per square inch and the collapsing pressure of the end would be 1,372 pounds per square inch, using the appropriate formula given by Hiller in each case. As the difference is only 65 pounds the close agreement is a good proof of Bach's formula for convex dished ends, for this particular case at any rate.

An explosion occurred in the case of a small steam boiler of a type which is designed for the use of dairymen, consisting of 6½-inch diameter solid drawn mild steel tube 28-inch long, closed at each end by a flat plate welded in, with several 1-inch circulating tubes welded top and bottom to the main tube. This boiler is placed in a casing and is externally fired. The working water level is about 2 to 3 inches above the top of the junction of the circulating tubes with the main centre tube. This boiler had been in use about six years and had been regularly inspected each year, but owing to the method of construction it was practically impossible to inspect the internal surfaces. While under steam at 40 lbs. pressure, a piece about 3-inches circumferentially by 1½ high blew out of the main tube at the water line, luckily no one was injured, but a quantity of cream was spoilt by ashes and water. The designers of many of these small boilers make little or no provision for cleaning and inspection. Many of these small boilers have previously failed by pitting through in small areas, but this is the first case in which a piece has been blown out of the shell.

An autoclave with a 10-gauge copper inner shell 35-inches long by 17½-inches diameter was purchased from the Disposals Board. The outer shell of all welded construction was ¼-inch mild steel, 19½-inches internal diameter and the blank end was also ¼-inch dished to a radius of 17-inches. The working steam pressure in the jacket was 15 p.p. sq. in. plus say a 20-inch vacuum or say 25 p.p. sq. in. tending to collapse the inner shell. When seen by an inspector the inner shell and the conical end had both bulged inwards. A new inner shell was made of 6-gauge copper with the end plate dished to 17½ radius.

On the bottom of the outer shell a rectangular compartment was welded on to carry the three electric heating elements. The bottom of this compartment was 20-in. x 14-in. x ¼-in. and not stayed in any way. This will be supported by welding on ribs.

SECTION 3.

Inspection of Machinery. See returns 4, 5, 6.

The number of groups of machinery registered increased by 1,135, but the number of groups inspected only increased by 55. The corresponding figures for 1946 were 1,109 and 517 respectively. There were 404 more inspections made in districts worked from Perth office but there were 349 less inspections made on the Goldfields.

The number of passenger lifts increased by three and goods lifts by two, the number of other types remained unchanged.

RETURN No. 4.—SHOWING CLASSIFICATION ACCORDING TO MOTIVE POWER OF GROUPS OF MACHINERY IN USE OR LIKELY TO BE USED IN PROCLAIMED DISTRICTS AND WHICH WERE ON THE REGISTER DURING THE YEAR ENDED 31ST DECEMBER, 1947.

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1947.	1946.
No. of Groups driven by steam engines	462	526	988	981
No. of Groups driven by oil engines	1,439	896	2,335	2,277
No. of Groups driven by gas engines	67	187	254	257
No. of Groups driven by compressed air	....	63	63	63
No. of Groups driven by electric motors	13,705	3,802	17,507	16,434
No. of Groups driven by hydraulic pressure....	5	....	5	5
	15,678	5,474	21,152	20,017

RETURN No. 5.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31ST DECEMBER, 1947. (*Machinery only.*)

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1947.	1946.
Total registrations useful machinery	15,678	5,474	21,152	20,017
Total inspections made	9,107	2,698	11,805	11,750
Certificates (bearing fees)	2,852	472	3,324	3,103
Certificates (steam without fees)	33	2	35	52
No. of extension certificates issued under Section 42 of Act....	....	....	....	....
Notices issued (Machinery Dangerous)	277	3	280	318

RETURN No. 6.—SHOWING CLASSIFICATION OF LIFTS ON 31ST DECEMBER, 1947.

Types.	How Driven.	Totals.	
		1947.	1946.
Passenger	Electrically driven	192	189
	Hydraulically driven	1	1
Goods	Electrically driven	96	94
	Hydraulically driven	3	3
	Belt driven	4	4
Service	Electrically driven	33	33
		329	324

Accidents to Machinery.

An inspector visited a chaffcutting plant to make a working inspection of the steam boiler, and shortly after he arrived the crankshaft of the engine on the portable boiler broke. The crankshaft was of the type forged from round stock, the fracture took place in the angle between the crank web and one of the journals. Some time before a crack had been detected at this point and an attempt had been made to vee out the crack and effect repairs by welding, but the penetration of the weld was very slight. Luckily no one was hurt.

On 5th June an accident occurred at East Perth Power Station which might easily have caused serious bodily injury and possibly death to a number of persons, also serious material damage to the other machines in the turbine room, but luckily the machine which disintegrated was at one end of the room, and most of the broken parts were thrown off at a tangent away from the other machines, which luckily escaped damage. Although there were several people near the machine, and many more in the fitting shop and other buildings which were in the direction in which most of the broken parts were thrown, no one was injured. Some large pieces fell in the fitting shop and others passed right through it, one being found 300 yards away, where it had hit a railway bridge. This machine was an impulse reaction type turbine with one Curtiss impulse stage, it was direct coupled to a Brown Boveri 3-phase alternator 3000 K.W., 6600 V. 2400 r.p.m. It was first put on load in November, 1916 and ran nonstop for three months, when the white metal bearings melted owing to the failure of the oil circulating pump.

Tradition says that the turbine shaft was slightly bent and was trued up by peaning. This machine has had fairly constant use and at times had been run continuously for long periods. The shaft fractured in four places, what appeared to be the initial fracture started at the bottom of the inside groove of the L.P. labyrinth packing gland. The corners at the bottom of these grooves were very sharp, and the inside groove was positioned where the fillet started for the flange by which the shaft was attached to the drum carrying the reaction blades. As this was not a clean break the shaft was forced out of position lengthways, and badly bent, which smashed the bearing close to the coupling, which was also smashed into several pieces. The shaft extension driving the governor was broken off carrying the governor with it, and the adjacent bearing was also broken. The momentum of the generator rotor twisted off the shaft at each end of the rotor, owing to the shaft being held when the main bearing at the L.P. end of the turbine and the coupling broke, and the bearing at the exciter end of the shaft was forced out of place.

SECTION 4.

There were no prosecutions.

SECTION 5.

Accidents to Persons.

Return No. 7 records only those accidents to persons in which the injuries were caused by working machinery which is subject to the provisions of the Act, and the injuries were of such a nature as to prevent the injured person from following his usual occupation for a period of two weeks or more. Accidents which occurred on timber mills that are subject to the provisions of the Timber Industry Reg. Act, 1926, are not included. Those which occurred on mines are also included in the report of the State Mining Engineer.

There were two accidents which caused death, one was due to the deceased's clothing becoming entangled in a line of shafting, the bearings of which he was greasing at the time of the accident. The other occurred on an internal shaft of a gold mine, when through a mistake on the part of the driver, a skip was raised instead of being lowered. When the skip reached the automatic tipping device at the ore bin one of the men who was riding on the skip fell into the bin, but did not receive serious injuries. Unfortunately the other man fell down the shaft a distance of about 450 feet.

RETURN NO. 7 SHOWING NUMBER OF SERIOUS ACCIDENTS BOTH FATAL AND NON-FATAL WHICH OCCURRED IN PROCLAIMED DISTRICTS DURING THE YEAR ENDED 31ST DECEMBER, 1947.

(F) denotes FATAL.

———	Wood Working Furniture.	Firewood Cutting.	Building.	Leather Goods.	Metal Working and Engineering.	Printing, etc.	Lifts.	Flour Milling.	Laundry.	Fertilizer.	Architectural Modelling.	Butchering.	Food Processing.	Power House.	Refrigeration.	Wool Scouring.	Mining.	Total Machines.
Boiler (scalding)	....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	2
Circular Saw	4	4	1	1	1	....	....	....	....	....	....	....	....	....	....	....	1	12
Buzzer	3	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	4
Spindle Moulder	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Drill	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Belting Shafting	....	....	....	....	1	....	....	1	....	1F	1	....	1	....	....	....	....	5
Guillotine	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	2
Swedging Machine	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Press	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Riveting Machine	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Emery	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Lathe Spinning	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Lathe Polishing	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	3
Planing Machine	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Envelope Machine	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Sewing Machine	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Box-Staying	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Printing Press	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Paper Perforator	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Lift	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1
Hydro Extractor	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	1
Hemp Teaser	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Mincer	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Ammonia Compressor....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1
Refining Rolls	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Crushing Machine	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1
Cornering Machine	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Brattice	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Winding Engine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2 (1F)	2
Total	9	4	1	2	15	8	1	1	1	1	1	1	3	1	1	1	3	54 (2)F

Out of a total of 54 accidents recorded 44 caused injury to hands, varying from cut or lacerated fingers, amputated fingers or thumbs to complete loss of the injured person's left hand, which occurred when a new hemp teasing machine was being tested by the leading hand. By some mishap his hand was caught between the spiked drum and a baffle plate, with the result that his hand was so badly lacerated that it had to be amputated.

The lift accident was due to a boy skylarking, and catching his toe between the car floor and part of the lift well, luckily when he called out, his companion stopped the automatic lift, otherwise he might have been very seriously injured, or possibly killed.

SECTION 6.

Examination of Engine-drivers.

Examinations were held as follows:—

Perth 4, Kalgoorlie 4, Collie 1, Geraldton 1, Yampi 1, Stirling Dam 1.

Examinations were held at all advertised centres except Mt. Magnet and Bunbury; 18 days spent on actual examination by Travelling Board; 35 days spent in Perth dealing with applications for Competency Certificates, examination papers and inquiries, etc.; 21 days spent in travelling and looking into matters connected with engine-drivers and boiler attendants.

Three hundred and eighty-nine applications received, 339 certificates granted.

RETURN No. 8.—SHOWING TOTAL OF ENGINE DRIVER'S AND BOILER ATTENDANTS' CERTIFICATES (ALL CLASSES) GRANTED IN 1947 COMPARED WITH 1946.

	Number Granted.	
	1947.	1946.
Winding Competency, including certificates issued under Regulation 40 and Section 60 of the Act	9	6
First Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	22	16
Second Class Competency, including certificates issued under Regulation 40 and Section 60 of the Act	33	39
Third Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	41	42
Locomotive Competency, including certificates issued under Regulation 40 and Section 60 of the Act	19	10
Traction Competency, including certificates issued under Regulation 40 and Section 60 of the Act	2	3
Internal Combustion Competency certificates issued under Regulation 40 and Section 60 of the Act	59	47
Crane and Hoist Competency certificates issued under Regulation 40 and Section 60 of the Act	27	32
Boiler Attendant Competency certicates issued under Regulation 40 and Section 60 of the Act	120	130
Interim	1	....
Copies	6	13
Transfer	....	1
	339	339

SECTION 7.

Staff, Revenue, Expenditure, Mileage, General.

Staff.—The two Inspectors who were serving in the R.A.N.R. as Engineer Lieutenant Commander and Engineer Commander, returned to duty on 11th February and 2nd April respectively, but the former transferred

to a more lucrative position in another Department on 19th May. The Senior Inspector and one of the clerical staff commenced six months' long service leave on 1st July. One inspector on the temporary staff was appointed to the permanent staff in July and was transferred to Kalgoorlie office in October. Two more inspectors were appointed to the temporary staff, one of whom had previously been on the staff but had resigned to join the R.A.A.F. One of these appointments was necessary to fill the vacancy recorded above and the other to fill the place of inspectors on long service leave, because for some years to come as soon as one inspector completes his long service leave another will be due to commence.

Revenue and Expenditure.—Return No. 9—The financial result of the year's work was a deficit of £2,347 13s. 3d.

Mileage.—Return No. 10 gives the particulars of the miles travelled in making inspections. Because the North-West and Kimberley Districts were not visited, there were no air miles to record.

General.—This is the 13th annual report which I have made on the work of this branch of the Mines Department, and in all probability it will be my last, as I am due to retire before the returns for the year 1948 will be completed. The number of boiler inspections made in 1934 was 1,734 and in 1947 the number was 2,838, or an increase of 63.5%; the number of groups of machinery inspected were respectively 7,830 and 11,805 or an increase of 50%. There were seven inspectors on the staff in 1934, and during the past 12 months the effective number was equivalent to 10, or an increase of approximately 43%. The graph shown at the end of this report shows how the volume of work has increased in the past 20 years. The drop in machinery inspections since the peak year. 1941, was due to shortage of staff and owing to the increased number of boiler inspections we have not been able to make up the leeway to date.

I sincerely thank all those who have assisted in carrying out the work of this branch, and to record my appreciation of the co-operation of officers of the Commonwealth and other Departments of this State, more particularly the Police Department, for reporting cases of injury caused by machinery. I wish especially to thank all the officers of this branch for the good work they have performed, and also all other officers of the Mines Department for their unfailing courtesy and assistance.

G. MOORE,
Deputy Chief Inspector of Machinery.

RETURN NO. 9 SHOWING REVENUE AND EXPENDITURE FOR YEAR ENDING 31ST DECEMBER, 1947.

Revenue.			Expenditure.		
	1947.	1946.		1947.	1946.
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
Fees for Boiler Inspections	3,079 10 7	2,915 12 4	Salaries	9,342 8 4	7,992 11 0
Fees for Machinery Inspections	5,290 6 6	4,876 14 7	Incidentals	1,723 19 2	2,229 16 6
Engine Drivers' Fees	443 5 6	457 18 0	Engine Drivers	171 18 7	49 5 3
Incidentals	77 10 3	70 3 8			
Increase £570 4s. 3d.	£8,890 12 10	£8,320 8 7	Increase £966 13s. 4d.	£11,238 6 1	£10,271 12 9

Loss = £2,347 13s. 3d.

RETURN NO. 10 SHOWING DISTANCES TRAVELLED, NUMBER OF INSPECTIONS MADE AND AVERAGE MILES TRAVELLED PER INSPECTION FOR THE YEAR ENDED 31ST DECEMBER, 1947.

Areas Traversed.	Rail Miles.			Road Miles.			Water Miles.			Air Miles.			Total Miles.			Total number of Inspections.			Average miles per Inspection.		
	1947	As compared with 1946.		1947	As compared with 1946.		1947	As compared with 1946.		1947	As compared with 1946		1947	As compared with 1946		1947	As compared with 1946		1947	As compared with 1946	
		Increase	Decrease		Increase	Decrease		Increase	Decrease		Increase	Decrease		Increase	Decrease		Increase	Decrease		Increase	Decrease
Districts worked from Perth	407	240	....	50,593	5,288	....	5	....	10	....	....	3,946	51,005	1,572	....	11,543	653	....	4.41	....	.12
Districts worked from Kalgoorlie	....	....	1,650	16,757	811	....	....	....	....	....	....	....	16,757	....	839	3,100	....	309	5.40	.24	....
Totals	407	240	1,650	67,350	6,099	....	5	....	10	....	....	3,946	67,762	1,572	839	14,643	653	309	4.62	= Average all Districts, 1947.	
																			4.68	= Average all Districts, 1946.	
Increases or Decreases	Decrease 1,410			Increase 6,099			Decrease 10			Decrease 3,946			Increase 733			Increase 344			= Average decrease .06 mile per inspection.		

Division VII.

Annual Report of the Director Government Chemical Laboratories for the Year 1947.

The Under Secretary for Mines:

I have the honour to present for the information of the Hon. the Minister for Mines, my report on the operations of the Government Chemical Laboratories for the year ending 31st December, 1947.

STAFF.

The staff as at 31st December, 1947, numbered 44 and consisted of 32 professional, six clerical, six general officers.

On 18th June, 1946, the laboratories were re-organised to meet the expansion of work when Mr. H. Bowley was reclassified as Director, Government Mineralogist, Analyst and Chemist, as from 1st January, and three new positions were created, the appointees to which will take charge of the three main divisions, namely, Foods, Drugs, Toxicology and Industrial Hygiene; Mineralogy, Mineral Technology, and Geo-Chemistry; and Agriculture, Forestry and Water Supply.

The first of these positions was filled on 16th December, 1946, by the appointment of Mr. J. C. Hood as Deputy Government Analyst. On 6th January, 1947, the second was filled by the appointment of Mr. H. P. Rowledge as Deputy Government Mineralogist and the third by the appointment of Dr. L. W. Samuel as Deputy Government Agricultural Chemist on 10th February, 1947.

During the year two other senior positions created in the re-organisation were filled by the appointment of Mr. A. Reid on 3rd February, as Chief Industrial Chemist, to take charge of the newly created Industrial Chemistry Division, and Mr. R. P. Donnelly, on 1st April, as Fuel Technologist, to take charge of the Fuel Technology Division. All the senior positions provided for in the re-organisation are now filled with the exception of the Soil Mineralogist. Dr. D. Carroll resigned from this position on 8th January.

Mr. H. Bowley, Director, Government Mineralogist, Analyst and Chemist, retired on 30th June, after many years of service. During his period of office the work of the laboratories expanded considerably under his able leadership. Mr. J. C. Hood was appointed Acting Director until the appointment of Mr. H. P. Rowledge as Director, Government Mineralogist, Analyst and Chemist, on 28th August, 1947.

The re-organised staff as constituted on 31st December, 1947, consists of—

Foods, Drugs, Toxicology and Industrial Hygiene Division.

Deputy Government Analyst.
1 Senior Analyst and Research Officer.
3 Analysts and Research Officers.
3 Analysts and Chemists.
1 Laboratory Assistant.

Mr. B. L. Southern, who was a Chemist and Research Officer in the Agriculture, Forestry and Water Supply Division, was appointed to the position of Senior Analyst and Research Officer in this division and took over duties on 18th August.

Mr. E. G. Fletcher was appointed to the temporary staff on 6th February, and subsequently to the permanent staff as an Analyst and Chemist.

Agriculture, Forestry and Water Supply Division.

Deputy Government Agricultural Chemist.
1 Senior Chemist and Research Officer.
2 Chemists and Research Officers.
6 Chemists.
2 Chemists (temporary).
1 Laboratory Assistant.

Several staff changes occurred in this Division during the year. Misses R. Selby and J. Johnston resigned prior to marriage, Mr. B. L. Southern was transferred to the Foods, Drugs, Toxicology and Industrial Hygiene Division, and Mr. T. Hick was appointed as Chemist. These resignations and transfer have depleted the staff of this Division. Three permanent and one temporary positions are vacant. There has been considerable difficulty in filling the vacant positions owing to a shortage of chemists, but it is hoped that the conditions will improve next year.

Mineralogy, Mineral Technology and Geo-Chemistry Division.

Deputy Government Mineralogist.
1 Senior Mineralogist and Research Officer.
4 Mineralogists and Research Officers.
3 Mineral Chemists.
1 Chemist and Assayer.
1 Laboratory Technician.
1 Laboratory Assistant.

Mr. C. R. LeMesurier was appointed Deputy Government Mineralogist on 11th November, consequent upon the promotion of Mr. H. P. Rowledge to Director. Mr. H. J. Manns was promoted to a consequential vacancy of Mineralogist and Research Officer on 11th August. During the year Mr. F. Drake retired from the position of laboratory assistant, the vacant position being filled by the appointment of Mr. F. G. O'Halloran on 11th August. The positions of one Mineralogist and Research Officer, and the Chemist and Assayer, are vacant due to promotions and will have to be filled.

Industrial Chemistry Division.

Chief Industrial Chemist.
1 Industrial Chemist and Research Officer.
1 Industrial Chemist.
1 Laboratory Assistant (temporary).

All the appointments in this Division were made during the year. Mr. G. A. Greaves was appointed Industrial Chemist and Research Officer on 4th August, and Mr. N. K. Jones was transferred from the Soil Mineralogy Division to the position of Industrial Chemist on 24th September. Mr. L. Sutton was appointed temporary laboratory assistant on 25th August.

Fuel Technology Division.

Fuel Technologist.

2 Chemists.

1 Laboratory Assistant.

Mr. C. E. Thomas was transferred to the position of laboratory assistant from the Soil Mineralogy Division. The two positions of Chemists are vacant and arrangements are in progress to fill these positions early in the New Year as opportunity offers.

Office.

Mr. R. B. Mackenzie, Senior Clerk, was transferred to another department on 22nd September, and his duties were taken over by Miss Henderson. Miss J. McColl, resigned on 28th March, and Misses M. Anderson and H. Knight were appointed Junior Typists on 28th March, and 21st May respectively.

It is proposed to consider the re-organisation of the office next year.

ACCOMMODATION.

The question of accommodation was raised by my predecessor, Mr. Bowley, in the Annual Report for 1945. Since that time the activities of the laboratories have increased both in the three original divisions and by the establishment of the Industrial Chemistry and Fuel Technology Divisions.

The Fuel Technology Division has been erected and occupied, but the Chief Industrial Chemist with his skeleton staff of two is very inadequately housed in scattered positions of the building belonging to other Divisions, which has cramped the activities of all concerned. The building difficulties of the times are recognised, but it is essential to proceed with the erection of the Industrial Chemistry Block including a pilot plant, plans for which have already been prepared, if this Division is to satisfactorily function to its full extent. Very serious consideration should now be given to the erection of this building.

As far as the existing building is concerned two Divisions are occupied to capacity. The Foods and Drugs and the Mineral Divisions have reached the stage when extensions will have to be made to cope with the volume of work which is being undertaken. Plans have already been prepared for the extension of the latter division to provide for a cement testing section. The increase in staff and activities of the laboratory will necessitate in the near future the increased space for refectory, administration and stores. These were referred to in the Annual Report for 1945.

ADMINISTRATION.

The administrative duties have been heavy, as apart from the normal activities, much time and thought has been given to the organisation of the technical work and the provision of equipment for the newly established Industrial Chemistry and Fuel Technology Divisions. Much progress has been made in this connection. Equipment has been ordered but deliveries have been delayed considerably, due to circumstances which are outside our control.

The Industrial Chemistry Division began to operate in February, 1947. Its development has been hindered by the lack of laboratory facilities and the difficulty in obtaining equipment. The Division has, nevertheless, been able to demonstrate that it can be of service to secondary industries. When the extent to which it can help in this connection is better known by the numerous small industries on which Western Australian economy must largely be based, there is no doubt that the Division will be fully occupied.

It is also necessary to consider the developments of industries made possible by the availability of our raw materials. It now seems to be the time to begin research on such projects and it is advisable that the laboratory facilities necessary for this research should be made available at the earliest possible moment. Much time has been spent in the organisation of this Division in determining along what lines effort can best be directed.

The Fuel Technology Division began to operate at the end of June when the Fuel Technologist commenced duties in Western Australia. Much time was spent on organisation of the work and in taking steps for the procurement of necessary equipment for the important problem of the study of the constitution of our native coals and the development of processes for its most effective treatment and use. It is anticipated that two chemists will be appointed early in the New Year to assist the Fuel Technologist.

The Industrial Chemistry and the Fuel Technology Divisions are both vitally concerned in the establishment of secondary industries and they are co-operating well to attain this end.

Arrangements have been made between the Commonwealth Government and the State Department of Agriculture for a five-year programme of work in the production of tobacco in Western Australia. The chemical work will be carried out in this laboratory on soil and plant analyses early in the New Year when it is proposed to appoint a chemist for this work.

INTER-DEPARTMENTAL COMMITTEES.

Close co-operation is being maintained with other departments.

Mr. J. C. Hood, the Deputy Government Analyst, is a member of the Drug Panel under the Department of Industrial Development, and has acted at various meetings of the Water Purity Committee and Food Advisory Committee. He has also continued to act as Convener of the Fruit Technical Committee and Dairy Products Committee, and is a member of the Insecticide and Fungicides Committee.

Dr. L. W. Samuel, the Deputy Government Agricultural Chemist, continues to be a member of the Soil Technical Committee, and the Technical Committee of Investigation of Standards for Waters for Irrigation.

Mr. H. P. Rowledge is a member of the Coal Panel, Water Purity Committee and Foods and Drugs Advisory Committee and is one of the Government representatives on the West Australian State Committee of the Council for Scientific and Industrial Research.

GENERAL.

In May, Mr. H. Bowley, accompanied by Messrs. J. C. Hood, H. P. Rowledge and A. Reid, visited Collie to study the conditions under which the laboratory could assist in the development of the district's natural resources.

In June, Mr. H. P. Rowledge accompanied Mr. H. A. Ellis, the Government Geologist, on a visit to Adelaide in connection with radio-active minerals.

Publications.

The following papers were read before the Royal Society and are now in the press, "Two New Beryllium Minerals from Londonderry," by H. P. Rowledge and J. D. Hayton, and "Grazing Incidence Method for the Determination of High Refractive Indices," by S. E. Terrill. Mr. Terrill also read a paper on "Laterites of the Darling Range" in connection with a discussion on "Laterites in Australia" at the meeting of the Australian and New Zealand Association for the Advancement of Science, held in Perth on 21st August, 1947. A paper on "Laterite Developed in Acid Rocks in South-Western Australia," by Dorothy Carroll and Neal K. Jones, was published in Soil Science on 20th March, 1947.

TABLE SHOWING SOURCE OF SAMPLES FOR 1947.

	No.
Chemical Laboratories	55
Under Secretary for Mines	5
State Mining Engineer	104
State Batteries	270
Government Geologist	241
Explosives Branch	17
Kalgoorlie School of Mines	3
Inter-departmental Irrigation Committee	141
Pipe Investigation Committee	95
State (W.A.) Alunite Industry	2
Charcoal Iron, and Wood Distillation Industry	2
Bureau of Mineral Resources Atomic Mineral Survey	319
Public Health Department	222
Hospitals	30
Agriculture Department	1,125
War Service Land Settlement Scheme	29
Agriculture Department and Midland Junction Abattoirs	2
Police—	
Coroners	69
Criminal Investigation Branch	54
Liquor Inspection Branch	11
Government Stores and Tender Board	48
Metropolitan Water Supply Department	1,722
Department of Works and Labour	291
Industrial Development Department	23
Chief Inspector of Factories	18
Forests Department	4
Royal Commission on Railways	3
Free	385
Pay—	
Public	819
Commonwealth Works Department	1
Mechanical and Plant Engineer	6
Government Printer	2
Main Roads Department	1
Aeronautical Inspection Directorate	74
Department of Army	1
Western Australian Government Railways	37
Repatriation Department	2
Wyndham Meat Works	1
Commonwealth Oil Refineries	1
Local Governing Bodies	3
State Gardens Board	1
State Sawmills	1
Rural and Industries Bank	1
State Electricity Commission	6
	6,247

H. P. ROWLEDGE,
Director.

FOODS, DRUGS, TOXICOLOGY AND INDUSTRIAL HYGIENE DIVISION.

ANNUAL REPORT FOR THE YEAR ENDED 31st DECEMBER, 1947.

By J. C. HOOD, B.E.M., A.A.C.I.,
Deputy Government Analyst.

FOOD.

Food inspection samples amounted to 121.

Milk (89).

Although the quality of milk supplied to the metropolitan area is controlled by comprehensive samples taken by the Milk Board and municipal inspectors through the W.A. Analytical Committee, periodic checks are made by the Department of Public Health.

Out of 36 samples from that source a total of seven did not comply with the chemical standards of the Food and Drug Regulations, three with respect to fat, three solids not fat and one with both fat and solids not fat.

These milks are chiefly sub-standard milks which now constitute the greater proportion of samples which fail to comply with the legal standard.

Cocoa and Chocolate.

The branding of some cocoas now being sold, leads to confusion as to whether they can be rightly considered as cocoa, soluble cocoa or prepared cocoa. In common with many other foodstuffs, labelling calls for more lucid and accurate trade descriptions.

Included amongst the samples of cocoa examined was a chocolate labelled "drinking chocolate." Apart from the fact that it did not comply with the general regulations of the Food and Drug Regulations with respect to colouring matter, the composition would require an addition to the existing regulation to bring it under the definitions for chocolate.

Lemon Butter.

A sample of "lemon butter" submitted for analysis was found to be of syrupy consistency and had none of the normal characteristics of lemon butter—which is defined as a product prepared from butter, eggs, sugar and lemon flavouring substances.

The analysis disclosed that it was undoubtedly an artificial mixture, for, although a small amount of lemon pulp was present it was fortified with citric acid and lemon oil. The fat and nitrogen content showed that the butter and egg, if present, could be no more than merest traces and insufficient to comply with the labelling. A survey of existing brands is proposed to determine whether standards can be made for minimum contents of butter and egg or even if any justification can be found for the use of the word "butter."

Self-raising Meals.

The practice of adding raising material to cereal products other than flour and briefly designated "meal," again focuses attention to the inaccuracy of description commented upon elsewhere in this report.

The nature of the product should be indicated e.g., wheatmeal or wholewheat meal.

Vienna Bread.

The survey of Vienna bread and doughs initiated last year to establish analytical data which could be used to differentiate it from ordinary bread, was continued.

Fat in the form of butter or margarine being a statutory addition to Vienna bread as defined by the Bread Act provided the most consistent analytical constituent from a diagnostic point of view.

Miscellaneous Food Samples.

Amongst miscellaneous foodstuffs examined were mince meat, sausages, manufactured meats, butter, cream, condensed milk, hydrolised casein, olive oil, coffees, tomato pulp, sauces and soups, pickles, self-raising flours.

Liquors, Beverages and Cordials.

The number of samples submitted by the Liquor Inspection Branch amounted to only 11, which is still considerably below pre-war figures.

The samples consisted of wines examined for spirit strength and preservatives and for false trade description, also samples of rum, whisky and brandy for adulteration by the addition of water.

A survey of artificial and fruit juice cordials showed them to be substantially as labelled. The ascorbic acid (vitamin C) content of bottled natural fruit juices is, in most cases, lamentably low. In advocating the increased use of natural fruit juices every effort should be made in processing to retain a high proportion of the vitamin content of the original fruit.

Human Milks.

Twenty-two samples of human milk were received for partial analysis from Infant Health clinics and from the country.

As usual this work was given a high priority to permit of early corrective measures being taken.

DRUGS AND MEDICINES

Anaesthetic Ether.

Eighty-one samples of ether were tested for peroxides and aldehyde as an indication of purity in supplies to the Government Stores and Royal Perth Hospital.

Mainly due to shipping delays the shortage of anaesthetic ether became very acute at times throughout the year, the gravity of the situation being accentuated when a high proportion of the samples failed to comply with the British Pharmacopoeia tests for purity.

The need for a supply of ether which is chemically pure and free from products of autoxidation and will remain so for a reasonable period has frequently been expressed. It has been claimed by manufacturers that this could not be assured at all times and permission was sought to add hydroquinone as a preservative in the proportion of 1—50,000 of ether.

The effectiveness of this substance as a preservative had been confirmed under varying circumstances by this laboratory.

At a meeting convened by the Commissioner of Public Health and attended by an anaesthetist, analyst, trade and stores representatives, it was agreed to continue testing and review the situation from the anaesthetist's and chemical aspects, supplies and storage experience. Mr. Hood also agreed to trace the history of suspected ethers impounded by order of district coroners.

Patent Medicines and "Cures."

Following the practice of examining preparations deemed to be spurious or for which exaggerated claims are made, a fluid preparation and two types of tablets—"Botanic gland tablets for regaining lost youth" were examined for the Commissioner of Public Health.

It would appear that these preparations only played a small part in the so-called treatment which is, in the main, vegetarian diet, avoiding or renouncing smoking, alcoholic drinking and certain foods—all said to cause acidity.

The preparations are briefly mentioned in accompanying literature as "A special botanic tonic is supplied which embodies essential gland and cell builders —featuring vitamin E which works wonders in reviving the "prostate" gland. As acidity is usually a contributing factor to your complaint we supply tablets which will eliminate acids from the blood stream and purify it."

The tablets were found to consist of phenol phthalein, sucrose and a starch excipient; the fluid preparation consistent with it being essentially a preparation of wheat germ meal and yeast together with a flavouring agent.

The complete identification, separation and evaluation of vitamins in the "vitamin tablets" and the fluid preparation was impracticable. Although all tests were negative in character on the quantity of material available in this respect the analyses were inconclusive, and it was extremely doubtful whether any vitamin potency of these preparations would have material effect on the human reproductive system. A prosecution against the vendor was successful.

Another much advertised proprietary "tonic" was examined under this heading.

The tablets contained chlorophyll, ferrous phosphate, dibasic calcium phosphate, sugar and excipient.

Chlorophyll when administered in large doses is stated to possess blood forming properties particularly when given with iron. The other constituents are recognised therapeutic agents and the preparation as a whole would consequently have weak tonic properties.

INDUSTRIAL HYGIENE.

Lead and Arsenic Hazards in Industry.

A total of 63 samples of urine, hair and nails were examined as routine checks on workers exposed to lead or arsenic hazards or to support diagnosis of chronic metallic poisoning by medical practitioners. The samples were submitted by the Department of Public Health, W.A. Government Railways, Repatriation Commission and the Department of the Army.

Factory Sanitation.

At the request of the Factories Department, an investigation was made of working condition at premises used for the preparation of zeolites from raw glauconitic material. Samples of dust-laden air were taken for dust concentrations and mineralogical examination.

As the result of these observations, supported by a report on the mineralogical examination by the Mineral Division of these laboratories, recommendations were made to alleviate the existing conditions.

Recommendations were also made for a more permanent solution of the dust nuisance involving alteration to plant equipment and design, the nature of which had largely been dictated by the premises converted from an abandoned brickyard.

A report was also made for the Factories Department on the operation of an Anderson's degreaser which was said to be causing acute discomfort to workers at the Plant Engineers' Workshops.

The unit, which consisted of a kerosene fired boiler delivering high pressure steam, together with a detergent substance "Colosyl" ejected with the steam as an atomised spray.

The "Colosyl" was found to consist essentially of sodium silicate and trisodium phosphate which, in the form of a spray, would undoubtedly be exceedingly iritating to the nasal passage and bronchial tubes.

It was recommended that the workers should wear an efficient respirator but, it was preferable that all operations should take place outside the building, as considerable discomfort was also occasioned to other workers in the vicinity by steam and humidity and a nuisance created to adjacent painting operations.

Complaints by electricians of abdominal pain and diarrhoea as the result of inhalation of dust whilst working in a Government department, caused the "dust" to be submitted for analysis and report.

The so-called dust consisted of fragments of green soap-like material, similar to a preparation sold as rat poison, which contained 0.8% of free phosphorus.

It was doubtful whether the phosphorus volatilised from rat baits would be sufficient to create a toxic atmosphere to workers with such intermittent exposure as electricians.

Phosphorus acts as an irritant when ingested, a condition which could only be possible if the particle size of the poison baits was sufficiently small to be air-borne or introduced as a contaminant of food from unwashed hands of workers.

A metallic dust which was being used as a rust preventative on ironwork after incorporation with a vehicle, was stated to be causing irritation to workers.

The analysis of the dust showed that the irritation arose mainly as the result of the fine state of division and recommendations were made to minimise the incidence during mixing operations.

The services of the Division was sought to check by the determination of nitrous fumes, efforts which were being made to improve ventilation conditions during acid treatment of silver-gold alloy at the Royal Mint.

The results indicated that for the period workers were exposed to the fumes, the ventilation was inadequate.

TOXICOLOGY.

Human Poisoning Cases.

The fatal human poisoning cases amounted to 29, in which the common poisons found were: Lysol, 3; strychnine, 3; barbiturates, 4; alcohol, 3; chloral, 3; cyanides, 1; chlorodyne, 1; A.B.C. and other liniments, 2.

In eight cases no poisons were detected or death was attributed to other causes.

There were no outstanding cases calling for special comment, although attention may be drawn to the increasing number of deaths attributable to barbiturates.

Some tightening up of regulations dealing with the sale of barbiturates should be introduced, such as supplying the drugs on an original prescription which should be retained and supplying a repeat only on authorisation.

In addition to the poisoning fatalities, a number of specimens in connection with chronic poisoning, attempted suicide or mistaken administration were received.

A sample of self-raising flour which was thought to be responsible for sickness in a family was found to contain sodium fluosilicate.

The self-raising flour had been made from the several ingredients purchased at a country store. On investigation a sack crayoned with the name of a proprietary brand of baking powder was found to contain 20 per cent. of sodium fluosilicate, which is frequently used as an insecticide.

The origin of the material could not be traced as the sack had been discovered amongst discarded stores left by a previous storekeeper. The whole of the material sold was located and destroyed.

The addition of a yellow arsenical powder to some home-made pickles in mistake for turmeric caused severe sickness but, fortunately, without fatal consequences. The powder was identical with a proprietary brand of sheep dip which is frequently used in the country against ants.

Through the application of superphosphate contaminated with lead arsenate as a dressing, an orchardist caused the death of some orange trees which at the time were heavily laden with fruit.

Examination of the leaves, stems and whole fruit showed traces of arsenic. The edible portion of the oranges contained no detectable arsenic whilst the lead and arsenic in the whole fruit was considerably less than the limit for fresh fruit in the Food and Drug Regulations.

Some waters from domestic supplies were found to contain arsenic and lead respectively in amounts rendering them unfit for human consumption.

Criminal Investigation.

The number of specimens and exhibits received under this heading amounted to 33, and covered a wide sphere.

A number of exhibits in connection with a fatal hit and run accident was examined for the Criminal Investigation Branch.

It was thought to establish that oil and grease marks on the clothing of the deceased were identical with oil and grease from various parts of the undercarriage of the motor car.

When examined under ultraviolet light, similar fluorescent characteristics were observed in both the oil and grease from the undercarriage and the stains on the clothing.

Volatile solvent extracts of the exhibits on further examination confirmed the similarity of stains and the car oils and greases. No valid inferences could be drawn from a mineralogical examination of dusts and mineral residues obtained from oils and clothing stains.

As the result of a fire at a station in the North-West there was the complete loss of the shearing sheds, and the sheep penned in preparation for shearing.

Certain features called for investigation by the C.I.B. and a number of specimens were subsequently submitted for analysis. These were fragments of burnt wool sacks and sand, all of which were examined for inflammable substances with negative results. At the coroner's inquest, chemical evidence was tendered which discountenanced any suggestion of arson and the finding was that of misadventure.

The sudden sickness of a man and his wife after eating some foodstuffs thought to be contaminated with poison, was investigated and three exhibits consisting of tea, sugar and flour submitted for analysis.

Lead arsenate was found in each of the exhibits, being greatest in the specimen of flour.

The hair and nails of the affected persons were examined for arsenic and large traces were found in the hair of each. A man in joint possession of the house was subsequently charged and convicted of maliciously administering poison in the form of lead arsenate.

Miscellaneous exhibits also examined for the Criminal Investigation Branch included the identification of chloroform used in a case of assault on a woman; examination of pills in a case of abortion; identification of dyes used to disguise Government-owned rugs for subsequent private sale; the examination of stomach contents and blood of a deceased person to ascertain degree of intoxication prior to death; examination of prepared milk, lactose and the contents of an infant's feeding bottle in connection with the death of a baby through neglect; vomitus examined for poison with negative result. Rain water from a tank suspected, with little justification, to be the cause of occasional sickness, was examined for poisons, also with negative result.

Animal Toxicology.

Fourteen specimens of viscera, baits and materials were received in connection with real or supposed animal poisoning. A number of these were the subject of

investigation by the Police and Criminal Investigation Branch as being of malicious intent, the poisons found being mainly strychnine, phosphorus and arsenic.

Powdered glass was suspected to have caused the death of a valuable dog but no indication whatever was found of its administration.

Insecticides.

Work in this field has been largely in connection with analysis of D.D.T. and problems associated with its use. Much work has been done in investigating methods of analysis of total D.D.T. in complex mixtures and dusts and also selective methods for the determination of the p.p′. isomer.

An analysis of a spray drawn from supplies to a Government institution was made because it was alleged to be ineffective against flies. The analysis showed it to conform to the declared pyrethrum and D.D.T. and consequently the mode of application seemed implicated. Attention was drawn to the fact that D.D.T. preparations are most effective when sprayed on to surfaces where insects will subsequently come into contact with the dry deposit of the insecticide. The porous natures of some wall surfaces have been responsible for absorbing almost completely fairly heavy sprayings.

A sample of an insecticide which was reputed to be a residual from the recrystallisation of technical D.D.T. was found to contain 35.8 per cent. of the p.p′. isomer together with other isomers and chlorinated compounds.

A five per cent. solution which was being used for experimental purposes by the Department of Public Health would, consequently, be an effective spray for specific purposes. In addition to 1.8 per cent. of the p.p′. isomer, the other constituents being highly chlorinated and odourous bodies, have been shown to confer additional repellent and toxic properties. The complex nature of the crude insecticide would make it unsafe to use in places where it would be in contact with man or animal or liable to contaminate foodstuffs.

The examination of two preparations being sold for the control of Argentine ants were found to vary considerably in arsenic content from the formula recommended by the Department of Agriculture and also the declaration on the labels. On representation being made, the products were corrected and further stocks were found to comply substantially with the recommended formula.

Sheep and Cattle Dips (25).

From time to time mortality occurring amongst stock following dipping operations, particularly with arsenical dips, casts doubt on the nature and composition of the dipping fluids. Almost invariably the preparations are found to be within the prescribed limits of manufacture and the cause of mortality more frequently being due to faulty dipping operations, e.g., stock insufficiently watered prior to dipping.

Analyses made on behalf of an investigation carried out by the Stock Branch of the Department of Agriculture in connection with the use of D.D.T. for dipping sheep, did not indicate an appreciable change in D.D.T. content during the passage of the sheep through the dip. Samples taken from the top and bottom of the dip after standing 48 hours however, showed a gradient from 0.07 per cent. to 0.53 per cent. total D.D.T.

A more extensive investigation was carried out for the Government Entomologist to determine mixing properties of certain proprietary brands of D.D.T. cattle dips, chemical stability with particular reference to the p.p′. isomer and mechanical stability, permanence of emulsification or suspension of particulate D.D.T. determined as the p.p′. isomer.

It was indicated that the success of any preparation of D.D.T. in an aqueous medium depends chiefly on the nature and influence of the dispersing agent and this so outweighs possible chemical changes as to constitute the major factor in differentiating between various brands.

It was recognised that the passage of cattle through dips would maintain a degree of agitation which would tend to reduce segregation of D.D.T. in solution or deposition of solid D.D.T. It was found however, that after standing for a period, some dips could only be restored to something like the original dispersal by most vigorous paddling; on the other hand, no amount of agitation would be successful with others.

The quality of water used for making dips would also have a material effect on the permanence of D.D.T. suspensions as soap and some wetting agents are affected by hard water or water with high salinity.

The investigation would suggest that better results would be achieved with D.D.T. preparations by spraying, the sprays being fed by a tank provided with an agitating device.

CHEMICAL SEWAGE CONTROL.

Weekly.

Routine weekly control consisted, as in the past, of weekly inspections together with the examination of 1,456 samples for reaction (pH), solids in suspension and combustible matter in raw and digested sludge.

The number of determinations of biochemical oxygen demand of influents and effluents from the Swanbourne and Subiaco treatment works has been greatly increased. These figures considered with suspended solids and reaction indicate that generally the plants are functioning satisfactorily. With the completion of the new digester at Swanbourne in mid-October, a definite improvement in the efficiency of the plant was observed.

Complete Analyses.

The complete analyses of influent and effluent at the three sewage treatment plants are periodically made to check the overall efficiency of each plant and for comparison purposes.

Usually the efficiency of the Subiaco plant, expressed as percentage reduction of solids and biochemical oxygen demand, is higher than that of the remaining two plants but in September the Fremantle plant was shown, on this basis, to be by far the most efficient.

Careful examination of the analytical figures, however, indicate that it was undoubtedly due to the bad quality of the crude sewage, and even with the high percentage reduction achieved, the final effluent only approximates, in composition to the crude sewage received by the other plants.

Ocean Outfall and Beach Surveys.

One ocean outfall and four beach surveys were carried out during the year.

A modification of sampling was carried out on the beach surveys by having samples collected by four parties in an endeavour to have the survey taken within as short a time as possible. By this means uniformity of weather conditions over the thirty miles of coastline, from which the samples are taken, is assured.

No remarkable results were obtained. Both the chemical and bacteriological analyses show the beaches are not being contaminated by the sewage effluent, the area of pollution only extending a few hundred feet from the outfall sewer.

Trade Wastes.

Ten samples of trade wastes were examined during the year. These were all found to be suitable for sewer disposal either directly or after certain preliminary treatment had been applied.

In general, however, the position with regard to trade wastes needs much clarification. Whilst each trade effluent requires to be considered on its merits, piecemeal examination of occasional wastes is not conducive to a uniform policy.

TABLE I.

FOODS, DRUGS, TOXICOLOGY, HYGIENE, AND INDUSTRIAL SECTION.

Source and Description of Samples received during 1947.

	Department of Public Health.	Department of Agriculture.	Metropolitan Water Supply, Sewerage and Drainage Department.	Police Department—Coroner.	Police Department—Criminal Investigation Branch.	Police Department—Liquor Inspection Branch.	State Mining Engineer.	Department of Industrial Development.	Chief Inspector of Factories.	Government Stores and Tender Boards.	Explosives Branch.	Departmental—Government Chemical Laboratories.	Department of Works and Labour (Mechanical Plant Engineer.)	Royal Perth Hospital.	Free.	Pay—Forests Department.	Pay—Aeronautical Inspection Directorate.	Pay—Department of the Army.	Pay—Western Australian Government Railways.	Pay—Repatriation Commission.	Pay—Wyndham Meat Works.	Pay—Commonwealth Oil Refineries.	Pay—Public.	TOTAL.
Foods—																								
Cows Milk	89				1																			90
Hydrolised Casein	1																							1
Meats	8																							8
Salt	1							2																3
S.R. Flour	1	4																						5
S.R. Meal	1																							1
Actorise	2																							2
Bread and Dough									6															6
Butter	3																							3
Lemon Butter	1																							1
Cream	3																							3
Condensed Milk	1																							1
Coffee	5																							5
Cocoa	2																							2
Chocolate	1											1												2
Pickles	1																							1
Tomato Sauce	1																							1
Tomato Soup	1																							1
Canned Tomato Pulp								1																1
Oranges		27																						27
Foods, etc. (Suspected Poison)—																								
Beans														1										1
Flour	1																							1
Cauliflower	1																							1
Rainwater					2																		1	3
Liquors and Beverages—																								
Wine						4																		4
Beer						2																		2
Whisky						1																		1
Cider						2																		2
Brandy						1																		1
Rum						1																		1
Coca Cola	1																							1
Cordials	7																							7
Human Toxicology—																								
Specimens	10																							10
Exhibits				63	24																			87
Hair, Nails and Urine	7																							7
Toy Balloon	1																							1
Homemade Jam				1																				1
Anaesthetic				5																				5

Industrial Toxicology—																												
Urine	13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	37	2	....	....	4	57
Hair and Nails	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Dust (Taxation Department)	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Glauconite	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Air (Royal Mint)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Colocyl Solution	....	....	....	....	....	....	....	....	....	....	1	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	1
Powder (Rust preservative)	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Animal Toxicology—																											
Exhibits	....	9	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14
Criminal Cases—																											
Blanket and Dye	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Woolpack and Sand	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Hit-run Case	....	....	....	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12
Abortion	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Drugs and Medicines—																											
Ether	3	....	....	....	....	....	....	....	....	....	....	48	....	....	....	30	....	....	....	....	....	....	....	....	....	....	81
Medicine and Tablets	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Chloroform	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Tablets	....	....	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Phyllosan	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Insecticides—																											
Fly Sprays	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Ant Bait	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Sheep and Cattle Dips—																											
Sheep and Cattle Dip	....	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	25
D.D.T. Preparations	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Air from Mines—																											
Coal Mine Air	....	....	....	....	....	....	26	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	26
Biochemical Work—																											
Blood	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Human Milk	22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	23
Timber	....	....	....	....	....	....	....	....	....	....	....	....	....	23	....	....	....	....	....	....	....	....	....	....	....	....	23
Flax and Linseed	....	106	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	106
Sewage—																											
Weekly Routine	....	....	1,456	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1,456
Quarterly Complete	....	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Trade Waste	....	....	10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	10
Neutraliser Liquids	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Sewer Gas	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Beach Survey—																											
Ocean Waters	....	....	172	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	172
Effluent	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Plastics—																											
Bucket	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Beaker	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Oils—																											
Neatsfoot	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	2
Lighting Kerosene	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1
Olive Oil	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Lubricating Oil	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	2
Putative Petroleum—																											
Mud	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Explosives—																											
Fireworks	....	....	....	....	....	....	....	....	....	....	....	....	17	....	....	....	....	....	....	....	....	....	....	....	....	....	17
Tanning Bark	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	1	....	3
Tallow	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1
Coal Gasification—																											
Coal Gas (Fox Plant)	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Acids—	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	72	....	....	....	....	....	....	....	72
Fruit Trees (affected by soil dressing)—																											
Orange Leaves, Stems and Fruit	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Miscellaneous—																											
Powder (?Turmeric)	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Tinplate (Food Canning)	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Jellylike Substance	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
	207	181	1,656	69	54	11	26	5	9	48	17	25	3	30	3	2	74	1	37	2	1	1	8	2,470

Much investigational work must be undertaken in the near future and a systematic survey of existing wastes, quantities and periods for disposal, carried out in an attempt to "type" industries rather than to fix a hard and fast standard for all industrial wastes.

Sewer Gases.

Three samples of sewer gas were examined following complaints of unusual odours in a main sewer.

No untoward constitutents were detected. The source of the odours which had been variously described as aromatic, sickly sweet, pungent and irritating to the eyes, was probable an intermittent or accidental discharge of essential oils, the most likely source of which would be a chemical factory.

This further emphasises the unsatisfactory position regarding indiscriminate discharges and the necessity for legislation to cover not only sewage disposal but all sources of pollution.

Air from Coal Mines.

Twenty-six samples of air in all were taken from the Proprietary Mine, Collie, following reports of distress whilst working in various sections of the mine.

In the first series of samples taken from various localities within Section 21, the carbon dioxide only varied from 1.9 per cent. to 2.2 per cent. and the oxygen from 17.4 per cent. to 17.7 per cent.

The uniformity of the composition suggested circulation in an almost closed system.

Personal observations were, that conditions were undoubtedly bad and respiration laboured owing to the low oxygen content and high humidity of the air rendering work difficult.

Subsequent samples supporting personal observations showed progressive improvement in the composition of the air, but the improvement in humidity was not so marked and still contributed some discomfort in working conditions.

Gasification of Collie Coal.

In collaboration with other divisions of these laboratories, an investigation of the Fox gas plant at Welshpool was made for the Department of Industrial Development.

A sample of gas taken over 10 hours during a trial run gave the following analysis:—

	Per cent.
Carbon dioxide	1.7
Unsat. hydrocarbons	nil
Oxygen	1.1
Carbon monoxide	37.6
Hydrogen	39.5
Methane	9.1
Nitrogen	11.0
	100.0
Calorific value (calculated)	339

(B.Th.U. gross per cubic foot. Measured at 60° F. and 30 inches moist.)

Further work on the investigation of the plant was taken over by the newly appointed fuel technologist.

NATURAL PRODUCTS.

Linseed.

One hundred and six samples of flax and linseed grown in experimental plots at Avondale Experimental Station were submitted for analysis for moisture and oil content.

The linseed oil content, on a moisture-free basis, of the varieties grown varied from 32.5 per cent. to 44.6 per cent. with an average oil content of 40.8 per cent.

Identification of Timber.

Twenty-five samples of timber were submitted by the Forests Department for the purpose of identification by the determination of ash and alkalinity of ash. It was also requested that the work be extended to carry out selected chemical tests proposed by the C.S.I.R. Division of Forest Products to determine suitability of these tests for differentiation between jarrah and karri and their application by field officers.

Two chemical tests, namely the ferric chloride and bichromate turbidity tests, appeared to be the most applicable. When compared with timbers authenticated by the ash and alkalinity of ash, ferric chloride gave complete confirmation in all cases and the bichromate turbidity test in all but two cases.

The need for reasonably sized samples, free from external contamination, crayon markings, etc., was demonstrated by discrepancies in the ash and alkalinity of ash figures attributed to these causes.

Miscellaneous Work on Industrial Products.

The miscellaneous work on industrial products included the identification of lubricating oils and a quantity of acids for the A.I.D., kerosene for flash point determination, analysis of tallow and neatsfoot oil, tan barks, lake salts for analysis and report as to their suitability for various purposes, plastic bucket tested for resistance to acid and solvents, plastic beakers for suitability as food containers, mud examined as possible source of petroleum, fireworks examined for prohibited constituents, and a sample of so-called tin plate found to consist of "terne" plate—a tin-lead alloy containing 75 per cent. lead and strongly condemned for manufacture into food containers.

AGRICULTURE, FORESTRY AND WATER SUPPLY DIVISION.

ANNUAL REPORT FOR THE YEAR ENDED 31st DECEMBER, 1947.

By L. W. Samuel, B.Sc. (H) (W.A.) Ph.D. (Lon.), A.A.C.I., A.R.I.C., Deputy Government Agricultural Chemist.

During the year 2,042 samples were received for analysis, some requiring the determination of only a single element, or constitutent, but some, e.g. flax, requiring the determination of nine elements. The source and description of these samples are shown in the accompanying table.

SOILS.

Only 71 samples of soil were received during 1947, compared with 568 samples in the previous year, and this has enabled the completion of the chemical work on some of the soils received prior to 1947. Included in the soils now completed were:—

(a) Soils from the Many Peaks area, Albany District, in connection with the soil survey of that area, intended for settlement by ex-servicemen. For ten of these samples a determination was made of the silica soluble in five per cent. caustic potash by the method of K. Gedroiz (Chemische Bodenanalyse, Berlin, 1926). This is not a normal routine determination for soils, but it is stated that the silica soluble in five per cent. caustic potash is characteristically high in solonetz soils and solodi. A satisfactory silica balance was obtained from determinations of silica on the original soil, the acid extracted soil and the residue after extraction with both acid and alkali.

For only one of the ten soils was an appreciable amount of alumina extracted by the alkali and in this case the silica : alumina ratio ($SiO_2 : Al_2O_3$) in the solution was 26, indicating that the major portion of the dissolved silica was not derived from an aluminium silicate.

For these ten soils the silica soluble in five per cent. caustic potash ranged from 0.8 to 8.1 per cent. of the soil and the values were closely related to the percentage of clay in the soil.

(b) Forty-nine soil samples in connection with the Dystokia problem which were examined for mechanical analysis, pH, carbon, nitrogen, phosphate, potash and replaceable cations.

(c) One hundred and twenty-three soil samples in connection with the investigation of the infertility in sheep, which were examined similarly to those for the Dystokia problem. For these 123 soils, there was a broad general relation between the pH value and the loss on acid treatment, no relation between the acid soluble potash and the replaceable potassium and practically no relation between the clay content and the sum of the replaceable calcium, magnesium, potassium and sodium.

(d) Thirty-seven samples of soil from various sources which were examined for phosphate fertility level by the method of J. S. Burd and H. F. Murphy (Hilgardia, Feb., 1939, Vol. 12, No. 5). The object of this work was to ascertain whether such determinations could be used to forecast the response of the soil to phosphatic fertilisers. Should such objective be attained, it would enable more efficient use of phosphatic fertilisers by relating the amount applied to the expected response as measured by crop yields. The comparison of the analytical values with field response to phosphatic fertilisers has not yet been completed, but several points were noted with respect to the chemistry of the method.

(i) The method requires the determination of the phosphate absorption capacity of the soil by measuring the phophate absorbed by the soil from a phosphate solution. An ultimate value for this could not be obtained because of the increase of phosphate absorbed by the soil with increasing concentration of phosphate in the solution used and also with increasing time of contact of soil and solution. The amount of phosphate absorbed by the soil was also affected by the soil to solution ratio and by the reaction, pH, of the solution. An arbitrary value for the absorption capacity could be obtained using controlled conditions of reaction, concentration of phosphate in the solution, soil to solution ratio and time of contact.

(ii) The use of sodium hydroxide as the phosphate displacing solution resulted in attack on, and decomposition of, the soil and further the quantity of phosphate displaced depended on the soil to solution ratio and on the time of extraction.

(iii) The addition of phosphate ions to the sodium hydroxide solution used for extracting the soil, resulted in very low recoveries of the added phosphate.

(iv) The phosphate fixing capacity of a dialysed soil is greater than that of the undialysed soil.

(v) For a surface soil from the Merredin Agricultural Research Station the removal of the organic matter by hydrogen peroxide did not affect significantly the quantity of phosphate extracted by sodium hydroxide, but acid treatment of the soil doubled the amount of phosphate extracted by sodium hydroxide.

Owing to pressure of other work and to shortage of staff, it has not been possible to proceed with the chemical work on (a) 83 samples of soil from the Kimberley Soil Survey; (b) 98 samples of soil in connection with the growth of Pituri (Duboisia Hopwoodii) a drug plant; and (c) 85 soil samples related to the sheep infertility investigations.

WATERS.

A total of 1,060 samples of water was received during the year, approximately half of these being from farmers, graziers and market gardeners, for examination for suitability for stock, irrigation and domestic purposes. The importance of water supplies in the agricultural and pastoral areas of this State needs no emphasis so that this phase of the Division's work is of great value. These samples have been received not only from the farmers and graziers concerned, but also from the Department of Agriculture, the Rural and Industries Bank and the War Service Land Settlement Scheme.

(a) The routine examination of existing water supplies to towns and cities has been continued and involved the analysis of 43 samples from the Canning Dam; 118 samples from Mundaring Weir (including 101 daily samples during the period of overflow); seven samples from the Wellington Dam; 19 other samples from the Metropolitan Water Supply. These included samples from Churchman's Brook and Victoria Reservoirs, and the pipe head dam at Wungong Brook, supplying the metropolitan area and from the inlet and outlet of Mt. Eliza Reservoir supplying Perth.

Periodic analyses including hygienic analyses, were also made of samples from the Mundaring and Mt. Charlotte Reservoirs and from the Kalgoorlie reticulation for the Goldfields Water Supply.

(b) The survey of the waters from rivers and streams in the South-West was continued and 60 samples were examined during the year. These analyses show considerable variation in salt content not only between different rivers and streams, but also for individual rivers and streams at different periods of the year.

(c) A number of samples of waters from bores, wells, rivers and creeks have been examined for the Water Supply Department, including both existing supplies to country towns, and also waters proposed to be used for supply to country towns.

Analyses were made of the existing water supplies to Onslow, Katanning and Boyup Brook, and of waters proposed to be supplied to Donnybrook, Big Bell, Linden, Carnamah, Esperance and Hall's Creek. Other samples from this department were from Udialla Native Settlement, Derby Native Hospital, a well at Moora, the Waychinnicup River East Albany, a creek at Denmark, Hammersley Range, Lake Biddy, Roelands, Mingenew and Bolgart.

(d) The determinations of the amount of silt carried by the Ord River were continued and 33 samples were examined during 1947, being three sets of samples taken at different periods of the year.

(e) *Inter-departmental Committee on Standards for Irrigation Waters.*

During 1947, there were 136 samples of water examined for this committee. These included samples from two areas in which it is desired to ascertain the variation in soluble salts content with season of the year.

(i) *Armadale-Cannington District.* Monthly samples of 11 waters used on a commercial scale for the irrigation of fruit and vegetables, were examined until it was evident that the samples from seven sites would not at any time be sufficiently saline to assist the committee in determining standards for irrigation waters and then the sampling was continued from the remaining four sites only. One of these sites is a well which remained remarkably constant throughout the year. The remaining three sites are from the Canning River and show marked variation between sites sampled at the same time, as well as marked variation at individual sites during the year. Although the distance between sites on the river is small the maximum difference in soluble salts content between two sites (in April, 1947) was from 24 grains per gallon to 137 grains per gallon of total soluble salts. The maximum variation at any one site was from 137 grains per gallon in April, 1947, to 35 grains

per gallon in December, 1947. This variation is of considerable importance and exemplifies the difficulty of assessing the suitability for irrigation of a water which varies in salinity throughout the year. Had this water been tested in April only it would have been considered too saline for many crops but as in fact the water reached this salinity for only a short period, it is actually suitable for practically all irrigation purposes.

(ii) *Geraldton District.* Late in 1947, systematic monthly sampling was commenced at seven sites in the Geraldton district because a preliminary examination showed that several of the waters used with apparent success for irrigating tomato plants on a commercial scale, were above the safe upper limit usually accepted in this State.

For the majority of the waters examined for this committee, there has been collected data on the growth of the plants being irrigated and it is hoped that this will assist in defining the limits of salinity for individual plants.

FEEDING STUFFS.

(a) A large number of feeds were received for the normal feeding stuffs analysis and the determination of calcium and phosphorus. The Department of Agriculture forwarded 230 samples of cereals from the various Research Stations, including grain, green plant, straw, stubble and chaff of wheat, oats and barley. These samples were of different varieties of different cereals grown under the same conditions and also samples of the same variety grown under different conditions, e.g., from the rate and time of fertiliser experiments. The feeding stuffs analyses of these provides data as to the home-grown fodders used in the agricultural areas and also as to the effect on feeding value of treatment, either fertiliser or farm management such as grazing or feeding off and recovery.

A number of samples from the wheat belt districts were of pastures with a low growing, trailing or spreading habit of growth and many were found on arrival at the laboratory to be seriously contaminated with soil. Although much of this soil could be removed it was not possible to remove it all, so that some measure of this contamination of the final sample was desirable, preferably an analysis convenient to the ordinary feeding stuffs analysis. Two measures were tried, the ash from the crude fibre estimation and the silica in the ash of the original material. There was an extremely good correlation between these two analyses and since the ash from the crude fibre analysis is the more convenient it is now being used. This determination is not an absolute measure of the contamination but it gives a good indication of the extent of the soil contamination of the pasture.

(b) The dry weight of 108 samples of pasture cuts from the rate and time of application of superphosphate experiments on irrigated and on dry land in the South-West dairy areas was determined and the samples analysed for nitrogen, phosphorus and calcium. The results indicate that the nitrogen and calcium content are not affected by treatment, but that some treatments affect the phosphorous content of the pasture.

(c) In view of the shortage of protein concentrates in this State, considerable importance attaches to the analysis of nine samples of leguminous seeds for which the crude protein varied from 27.4% to 41.4%.

(d) *Feedings Stuffs Act*: During the year 29 samples of feeding stuffs on sale were analysed and only 10 of these complied with the Feeding Stuffs Act, 1928-1946. The extreme shortage of protein feeds in this State is illustrated by the fact that of the 18 samples which did not comply with their registration under the Act, 16 were deficient in crude protein (one sample was not registered). There were five samples which did not comply with the registered crude fat content and three samples contained an excess of crude fibre.

(e) *Miscellaneous Feeding Stuffs*: A variety of materials were examined for feeding value, including meatmeals, a semi-fluid meat concentrate, fish meal, a mixed fish and meat meal, three samples of pig-swill, 11 samples of the feeds used in the poultry feeding experiment at the Muresk Agricultural College, digester refuse, two species of Calandrinia, known as Parakeelia, from Albion Downs Station, the rat and mice food being used in animal feeding experiments, lupin stalks, lucerne and sub-clover. The analytical figures for two samples of pig-swill, processed at the State Abattoirs, Midland Junction, and for the Calandrinia were:—

	Pig-swill	
	1	2
	Per cent.	
Moisture	6.1	10.1
Ash	18.8	15.6
Crude protein (N x 6.25)	16.9	18.8
Crude fat (petroleum ether extract)	20.0	8.8
Crude fibre	9.4	9.7
Nitrogen free extractives	28.8	37.0

	Calandrinia	
	sp.	maryonii
Moisture, per cent. as received	79.6	83.3
	Per cent. on dry basis.	
Ash	6.42	17.59
Crude protein (N x 6.25)	3.20	13.0
Crude fat (petroleum ether extract)	3.0	4.9
Crude fibre	16.7	20.0
Nitrogen free extractives	70.7	44.5
Calcium	0.34	0.46
Magnesium Mg	0.31	0.79
Phosphorus P	0.057	0.109

The lupin stalks were reported as being readily eaten by sheep and for the purpose of analysis were separated into casing and pith and the analytical results were:—

Total weight of sample	75 g.
Weight of casing	70 g.
Weight of pith	5 g.

	Casing	Pith
	Per cent.	
Moisture (after drying and grinding)	8.60	11.8
Ash	4.22	8.53
Crude protein (N x 6.25)	3.38	5.13
Crude fat (petroleum ether extract)	0.3	0.6
Crude fibre	41.9	26.1
Nitrogen free extractives	41.6	47.8
	Per cent. on dry basis.	
Calcium, Ca	0.17	0.59
Phosphorus, P	0.03	0.04

FERTILISERS.

(a) Analyses of 35 fertilisers and two samples of lime were made. In furtherance of the Department of Agriculture's trials with compost a sample of the compost was analysed and showed, on the dry basis, 1.61% of nitrogen, 0.32% of phosphorus and 0.92% of potassium.

A sample of guano was also analysed and contained nearly 27% of phosphoric acid (P_2O_5) and 1% of nitrogen and 0.1% potash (K_2O).

Two samples of superphosphate analysed for "minor" elements showed considerable differences:—

	Superphosphate August, 1947.	
	1946-47 season.	Christmas Island rock.
	Parts per million on dry basis.	
Copper, Cu		
Water soluble	12	35
Total	34	48
Zinc, Zn		
Water soluble	163	124
Total	256	151
Manganese, Mn		
Total	39	63
Molybdenum, Mo		
Total	0.5	5.0

The quantity of "minor" elements for fertiliser purposes applied to the soil from the superphosphate would therefore be small. For the minor element present in highest concentration in these samples, namely zinc, the amount applied would be less than half an oz. per acre per cwt. of superphosphate per acre used.

Two samples of wood ash to be used as a fertiliser were found to contain about 0.3% of manganese, with no material difference between the ash from the firebars or from the flue. Spectroscopic examination showed no material difference in composition of the two ashes.

(b) *Fertiliser Act.*

Of the 14 samples of fertiliser analysed for compliance with the Fertiliser Act, 1928, eight samples complied with the Act, two showed a deficiency in water soluble phosphoric acid, one a deficiency in acid soluble phosphoric acid, three a deficiency in fine material and one a deficiency in water soluble potash.

PLANT NUTRITION.

A number of samples of plant materials including the whole plant for cereals, leaves, cuttings and prunings have been analysed for major and minor elements concerned in plant nutrition in connection with the Department of Agriculture experiments on fertiliser treatment, the seasonal drift of minerals in fruit trees and suspected cases of minor element deficiencies.

Apples.

Analyses for manganese have been made on 86 samples of apple leaves for the investigation of the zone of absorption of the roots, the manganese fertiliser being applied at different depths in the soil. Similarly analyses for phosphorus of 40 samples of leaves have been made for the study of the absorption of this element under different fertiliser treatments. Some of these samples were also analysed for potassium to trace its absorption and a further 12 samples were analysed for magnesium to determine its absorption by the tree from different magnesium fertilisers applied in different ways.

Analyses for the minor elements copper, manganese and zinc, were made on eight samples of leaves of trees which had applications for some years of fertilisers containing these elements and a further three samples analysed for copper were from trees showing injury after continued soil applications of a copper fertiliser.

Flax.

Samples (55) of flax have been analysed for zinc and phosphorus in connection with fertiliser experiments and eight of these, together with one further sample, were analysed for copper, manganese and molybdenum.

Oats.

Samples (36) of oat plants from various minor element fertiliser experiments have been analysed for the various minor elements concerned, copper, manganese, molybdenum and zinc. A further 10 samples of plants showing symptoms of minor element deficiencies have been analysed for copper, manganese and zinc, in order to characterise the deficiency.

Subterranean Clover.

A further 20 samples of subterranean clover were analysed for copper, manganese and zinc in continuation of the survey of the minor element status of this pasture.

Vines.

Samples (19) of currant fruit from the minor element experiment with vines at Upper Swan were examined for moisture, nitrogen, phosphorus, potassium, copper, manganese and zinc, and nine samples of vine leaves were examined for manganese or zinc.

Cover crops of New Zealand Blue Lupins growing on the experimental area were sampled and analysed for nitrogen, phosphorus, potassium, copper, manganese and zinc.

Wheat.

Of 17 samples of wheat plants received from experiments with minor element fertilisers on wheat, all were analysed for the minor elements, copper, manganese and zinc, and five were also analysed for calcium, magnesium, phosphorus and potassium.

Miscellaneous.

Samples of barley plants (7) and of orange tree leaves (2) were analysed for minor elements in connection with fertiliser trials or suspected minor element deficiencies.

WHEAT AND FLOUR.

As in past years, samples of the season's f.a.q. wheat sample (1946-47) and of the flour milled experimentally from it were received from the Department of Agriculture and these were analysed with the following results:—

	Wheat	Flour
Moisture (1hr. at 130°C) %	12.2	13.4
Crude protein, %	9.21 (Nx5.83)	7.87 (Nx5.7)
Ash %	1.35	0.51
Gluten, %, wet	—	22.5
dry	—	8.0
Maltose figure (Kent Jones)	—	1.81

MISCELLANEOUS.

(a) An outbreak of apple scab in the Pemberton and Manjimup area on imported apple seedlings suggested that the exporting States may not have dipped the seedlings in Bordeaux mixture before export. Analysis of leaves on the seedlings for copper was inconclusive, but comparison of the analyses for copper of the wood and the bark of the seedlings gave reasonably satisfactory evidence that the seedlings had been treated with some copper containing material.

(b) Two samples of iron oxide for stock lick manufacture contained respectively 116 and 196 parts per million of cobalt, soluble in five normal hydrochloric acid.

(c) In connection with an occurrence of flag smut disease on the wheat variety Bencubbin which is normally resistant to this disease, analyses of affected and unaffected plants for nitrogen, calcium, potassium, phosphorus, magnesium, copper, manganese and zinc, reevaled no material differences between affected and unaffected plants.

TABLE 2.

AGRICULTURE, FORESTRY AND WATER SUPPLY DIVISION.

Source and Description of samples received during 1947.

	Department of Agriculture.	Metropolitan Water Supply, Sewerage and Drainage Department.	Department of Works and Labour.	Department of Public Health.	Under Secretary for Mines.	Departmental—Government Chemical Laboratories.	Inter-departmental Irrigation Committee.	Free.	War Service Land Settlement Scheme.	Pay—Public.	Pay—State (W.A.) Alunite Industry.	Pay—Midland Junction Abattoirs.	Pay—Local Governing Bodies.	Pay—Forests Department.	Pay—State Gardens Board.	Pay—State Saw Mills.	Pay—Rural and Industries Bank.	TOTAL.
Water	15	62	272	9	1	5	141	13	29	502	....	....	3	2	1	1	1	1,057
Water (Brine)	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	2
Water (Cattle Dip)	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Fodders—																		
Sub-clover	51	....	....	....	....	....	....	....	.....	....	....	....	....	....	....	....	....	51
Lupin Stalks	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pasture	124	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	124
Leguminous Seeds	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Grain, Cereals, Straw, Stubble, Chaff, etc.	294	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	294
Sunflower Seeds	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Stock Food	18	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	18
Fishmeal, Meatmeal and Bone meal	2	....	....	....	1	....	....	....	....	12	....	2	....	....	....	....	....	17
Pigswill	2	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	3
Other Feeding Stuffs under the Feeding Stuffs Act	22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22
Rat and Mice Food	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Iron Oxide	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	2
Ferlisers—																		
Guano	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Potash Products	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	2
Potato Manure	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Superphosphate	16	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	18
Blood and Bone	4	....	....	....	....	....	....	....	....	5	....	....	....	....	....	....	....	9
Digester Refuse	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	1
Other Fertilisers under the Fertiliser Act	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5
Straw Compost	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Soils—																		
Farm Soils	47	....	....	....	....	....	....	....	....	13	....	....	....	....	....	....	....	60
Pipeline Soils	....	....	4	....	....	7	....	....	....	....	....	....	....	....	....	....	....	11
Fruit Investigations—																		
Currants	19	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	19
Apple Leaves, etc.	163	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	163
Vine Leaves	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Citrus Leaves	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Leaves—																		
Oat Leaves	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Cereal Leaves	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24
Grain and Cereals—																		
Wheat	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Flour	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Flax	86	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	86
Lime	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	2
Woodash	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Deposit (Canning Dam)	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Clay	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	2
Sinter	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
TOTAL	940	62	276	9	1	15	141	19	29	539	1	2	3	2	1	1	1	2,042

MINERAL, MINERAL TECHNOLOGY AND GEOCHEMISTRY DIVISION.

Annual Report for the Year Ended 31st December, 1947.

By C. R. LeMesurier, A.W.A.S.M., A.A.C.I., Deputy Government Mineralogist.

One thousand, seven hundred and four (1,704) samples were entered for examination during the year, an increase of 673 on the previous year's total.

The main sources of these samples were:—Free assays and determinations for the general public, 363; State Batteries, 270; Geological Survey, 241; Bureau of Mineral Resources (radio-active mineral survey), 319.

ALLOYS AND METALS.

Specimens of American and British arc- and oxy-welded stainless steel tube to be used in the installation of a sterile water service in the Royal Perth Hospital, were submitted for corrosion test. American tubing was of type 347 (niobium stabilized) the English being F.D.P. 321 (itanium stabilized). Composite tubes combining both types were also tested.

After 72 hours digestion under a reflux condenser with acid copper sulphate solution, type 347 specimens showed no sign of corrosion while type F.D.P. 321 showed only slight corrosion; in all cases the weld showed no corrosion.

Samples of stainless steel to be used in the manufacture of locker tops, for th esame institution, which showed hand marks not readily removable after hand-

ling, were found to be coated with a wax-like substance easily marked by the fingers. Petrol and kerosene had little effect on the coating but treatment with acetone followed by rubbing with a cloth was effective.

Two samples of fabricated bronze were submitted for determination of zinc content.

A sample of copper-sprayed steel for proposed use in the refrigeration installation in the Royal Perth Hospital was tested for resistance to calcium chloride brine. Microscopical examination of the polished copper surface revealed numerous cavities and lack of homogeniety. Exposure of the specimen to brine of specific gravity 1.24 resulted in the formation of numerous corrosion loci.

A brass ball valve with soldered seam for proposed use in flushing cisterns in the metropolitan area was submitted for analysis of component metals and corrosion test. Analysis of the float showed it to be of typical cartridge brass, the nipple, however, which is a casting, contained four per cent. lead and a little tin and iron.

Immersion in aerated tap water for four weeks produced no noticeable effect, but exposure to one per cent. sodium chloride solution resulted in considerable attack on the solder within 24 hours. The brass showed no appreciable attack.

The syphonic component of a flushing system submitted for similar tests, was found to consist of antimonial lead main casting and piston, with brass valve and delivery tube. It is probable that a certain amount of corrosion will take place in the lead at its junction with the brass delivery tube and the seating of the brass flap valve.

Two samples of stereo metal were submitted for analysis by the Government Printer, results showed considerable difference in lead-antimony-tin ratios as follows:—

Sample.	Ingot.	Type.
	Per cent.	
Lead, Pb	75.14	81.08
Antimony, Sb	17.80	13.79
Tin, Sn	7.08	3.45

CLAYS AND REFRACTORIES.

Clays.

Nineteen samples of clay were received and clay tests carried out on nine of these.

A somewhat hard clay from three miles south-east of Clackline consisted mainly of kaolin, some of which does not readily soften in water, with a little quartz and contained 0.4 per cent. common salt. Briquettes made after washing out the salt burn to a good white body with incipient vitrification at 1,350 deg. C. This clay could be used in the manufacture of refractory ware or, after fine grinding, as a constituent of fine white ware. A mottled creamy white and buff kaolinitic clay from the Kojonup district is moderately plastic and burns to a fairly dense creamy grey body at 1,350 deg. C. It could be used in the manufacture of fire bricks and other coarse refractory ware.

A white, gritty clay from five miles south of Yarloop contained the following proportions of clay substance and grit:—

	Per cent.
Clay substance	58.3
Grit under 90 mesh	12.2
Grit under 60 mesh	9.5
Grit under 30 mesh	6.9
Grit over 30 mesh	13.1

The clay material obtained by washing free from coarse grit is highly plastic, and when burned at 1,250°C gives a dense vitrified body of good white colour. With the addition of finely ground quartz to reduce shrinkage, this washed material would be suitable for the manufacture of vitrified ware and utility china ware.

Refractories.

Sillimanite, Kyanite and Andalusite. These minerals, all silicates of aluminium, are in demand by manufacturers of high grade refractories. To be marketable, they should occur in large tonnages of high purity, particularly as regards freedom from quartz, iron oxides and fluxing minerals such as mica.

A specimen of massive sillimanite, said to come from a locality north-east of Pearce Aerodrome, was of high purity, but the extent of the deposit is not known. A soft rock containing approximately 15 per cent of sillimanite, was submitted from a locality about two miles south of Toodyay. A chloritised biotite schist from the vicinity of Hopetoun contained bladed crystals of kyanite up to 1½ inches in length, associated with large crystals of staurolite and a little ilmenite and tourmaline. Specimens from Napier Downs Station, Kimberley Division, were of a similar nature. It is doubtful whether an economical separation of the kyanite would be possible on account of the small difference in the specific gravity of this mineral and staurolite. A greyish rock consisting mainly of andalusite intergrown with a little quartz, limonite and ilmenite, was received from the vicinity of Mt. Palmer, Yilgarn Goldfield; it contained approximately 53 per cent. alumina, Al_2O_3.

Magnesite. A sample of magnesite from the vicinity of Northam was analysed.

	Per cent.	Per cent.
Magnesia, MgO	45.00	
equal to		
Magnesium Carbonate, $MgCO_3$		94.12
Lime, CaO	1.98	
equal to		
Calcium Carbonate, $CaCO_3$		3.53
Silica, SiO_2		1.28
Ferric oxide and Alumina, $Fe_2O_3+Al_2O_3$		0.47

This sample conforms fairly well to the best magnesite from other localities and can be considered a marketable grade.

Talc. A block of brownish soapstone approximately 9in. x 6in. x 6in. received from Yanmah, consisted mainly of talc with some anthophyllite and a little limonite. Test pieces heated in an electric muffle to 1,150°C showed no distortion but darkened in colour and increased in hardness to almost steel hard. On further heating to 1,250°C. appreciable shrinkage accompanied by the formation of extensive honeycombing, due to the fluxing property of the iron oxides, took place. This material would find a use in the manufacture of domestic fire grates and for insulating bricks not exposed to excessive temperatures.

NATURAL MINERAL PIGMENTS.

Seventeen samples of ochres were received and examined for suitability as pigments. Results of tests of red and yellow ochres of good quality are as follows:—

Locality.	Classification	Insol. in Acid	Ferric Oxide, Fe_2O_3	Oil Paints.		Water Paints.		Body and Appearance in Oil.
				Natural Pigment Ridgway	Roasted Pigment Ridgway	Natural Pigment Ridgway	Roasted Pigment Ridgway	
Kendenup, S.W.	Iron Ore	10.19	68.26	9k Burnt Sienna.	9l Between Burnt Sienna and Chestnut	5'k Brick Red	7'k Hay's Russet	Dense and bright.
Toodyay, S.W.	Red Ochre	35.09	38.60	8k Between Burnt Sienna and Mahogany Red	As natural	5'k Brick Red	As natural	Dense and bright but rather brown.
Weld Range, Murchison	Red Ochre	40.77	24.69	7j Between English Red and Mahogany Red	9j Between Burnt Sienna and Mars Orange	9'j Ferruginous	8'i Between Vinaceous Rufus and Ferruginous	Dense and bright, good red.
Weld Range	Yellow Ochre	39.64	49.42	17i Raw Sienna	8j Between English Red and Burnt Sienna	16'h Ochraceous	5'k Brick red	Dense and bright.

FUELS.

Five samples of natural and treated coal and briquettes were submitted for proximate analysis and calorific value. Proximate and ultimate analyses and calorific values were also determined on samples of coal taken during tests on the gasification of Collie coal (see report of Chief Industrial Chemist).

Samples of supposed lignite from between the mouths of the Murray and Serpentine Rivers were found to be charcoal, or charred wood, probably the result of forest fires.

METALLIC ORES AND MINERALS.

Antimony.

A sample of antimony ore from the Blue Spec Mines, Nullagine, consisted mainly of compact earthy stibiconite (hydrous antimony ochre) with some crystalline cervantite (antimony oxide) and quartz.

Following a proposal by the buyer to increase the splitting limits of antimonial gold concentrates, a review of differences between buyer and seller assays of eight parcels was made as follows:—

Drums	121	124	136	155	135	284	65	108
Assay Differences								
Gold, ozs. per ton	0.01	0.04	0.04	0.05	0.05	0.02	0.04	0.10
Lead, %	0.07	0.04	0.03	0.01	*nil*	*nil*	*nil*	0.02
Arsenic, %	0.04	0.05	0.05	0.01	0.03	0.05	0.10	0.09
Antimony, %	0.2	0.4	0.2	*nil*	0.3	0.1	0.2	0.5

The values of the splitting limits proposed were:—

Metal.	Value.	Proposed splitting limit.	s. d.
Gold	£10 15s. 3d. per oz	0.1 oz	= 21 6 per ton of conc.
Lead	5s. per ton for each 0.1% or part	0.05 %	= 5 0 do. do.
Arsenic	5s. per ton for each 0.1% or part	0.1 %	= 5 0 do. do.
Antimony	14s. 4d. per unit	0.5 %	= 7 2 do. do.

In recommending the following splitting limits consideration was given to the degree of accuracy that would be expected from experienced and reliable assayers and the accuracy that has been demonstrated in sampling the parcels under review. In arriving at these recommendations consideration was given also to fixing the minimum values of the difference that would justify submitting the sample to referee.

An examination of the assay differences shows:—

Gold: In seven of the eight parcels, the buyer and seller assays have agreed within 0.05 oz. per ton. It is reasonable therefore, to regard the eighth as a stranger and expect agreement between buyer and seller assays to within 0.05 oz. per ton.

Recommended:—That the splitting limit be fixed at 0.05.oz. per ton.

Lead: Agreement between buyer and seller assays within 0.05 per cent. has been obtained on seven of the parcels quoted above.

Recommended:—That the request to fix the splitting limit at 0.05 per cent., be agreed to.

It is to be noted in fixing the penalties, that 0.1 per cent. or part thereof are taken into consideration only.

Arsenic: Although the assay differences in two of the parcels quoted in Table I above are 0.10 per cent. and 0.09 per cent. respectively, closer agreement should be expected.

Recommended:—That 0.05 per cent. should be the maximum splitting limit.

Antimony: The figures quoted in Table I indicate it is possible to obtain closer agreement than the proposed 0.5 per cent. and that there is justification for adopting a splitting limit of 0.25 per cent.

Recommended:—That the splitting limit for antimony should be fixed at 0.25 per cent.

Beryllium.

Notwithstanding the favourable price ruling for Beryllium ores, at present £5 per long ton unit giving a price of £60 to £65 per long ton for good grade beryl, comparatively few samples of beryl were received during the year.

Many of the samples submitted were found to be quartz, from which it is difficult to distinguish the massive variety of beryl. It is unfortunate that no easily applied test for distinguishing between these two minerals in the field exists, as it is probable that beryl is frequently passed over as valueless quartz.

Several specimens of iron-stained beryl were received from a locality about three miles south-west of Londonderry Felspar Quarry.

A specimen said to be from Mooloo Downs Station varied in colour from pale milky green to colourless and glassy, being very similar in appearance and physical properties to material from Yinnietharra which station adjoins Mooloo Downs on the north.

Complete analyses of three pink beryls from different localities were made by Mr. J. D. Hayton and results of analyses and notes on procedure are given in Appendix II.

Copper Ores.

Twenty samples of copper ores were received during the year, some of them fairly high grade.

A sample from 56 miles north-west of Tableland Station, Kimberley, assayed 36.8 per cent. copper, one from Mooloo Downs Station, Murchison, 29.1 per cent. and another from Barrambi, 40 miles north-west of Sandstone, contained 25.8 per cent. copper.

Gold.

During the year about 650 samples were assayed for gold content. Of these 357 were gold ores, 24 gold concentrates, 68 umpire tailings and 202 battery tailings. One hundred and six samples were received from the Government Geologist and 58 samples assayed free of charge for prospectors.

Iron Ores.

Partial analyses of seven samples of iron ore were carried out for Wundowie Charcoal Iron Project, six of them in connection with sizing analyses of the Wundowie deposit. Numerous specimens of iron ore, many of them of high grade, were received from prospectors and other members of the public, but in no case were these from new deposits sufficiently large and accessible to transport to constitute a marketable ore body.

Lead Ores.

The high price of lead resulting from a world wide shortage of supplies has been responsible for considerable activity in this field. During the year 54 samples of lead ore were received for determination and/or assay for lead and silver.

A number of specimens of high grade lead ore have been received from the Ashburton basin where the lead, usually in the form of galena carrying up to 20 oz. per ton of silver, occurs in veins in the metamorphosed sediments of the Ashburton Series. Considerable activity is also apparent at Northampton where the ore is mainly sulphide carrying little silver and at Derby where a large formation of oxidised ore is being mined.

Manganese.

A partial analysis of a sample of manganese ore from what is claimed to be a large deposit close to Tenindewa Siding, near Mullewa, gave the following results:—

	Per cent.
Metallic Manganese, Mn	51.03
Metallic Iron, Fe	4.50
Insoluble in Acid	6.48

Ore of this grade is valued at about £5 a ton.

Tantalum and Niobium.

Only two samples of tantalite were received, one of which consisted of material from a narrow seam in the old Cornwall Lease, Greenbushes, and gave the following results by specific gravity assay:—

Minimum S.G. 6.58, equivalent to
Tantalic oxide, Ta_2O_5 52.8 per cent.
Niobic oxide, Nb_2O_5 30.4 per cent.

Maximum S.G. 6.92, equivalent to
Tantalic oxide, Ta_2O_5 62.5 per cent.
Niobic oxide, Nb_2O_5 21.5 per cent.

A sample of columbite from two miles north of White Springs Station Homestead, near Woodstock contained, by specific gravity assay:—

Niobic oxide, Nb_2O_5 .. 62 per cent.
Tantalic oxide, Ta_2O_5 .. 18 per cent.

Some small fragments of columbite received from a locality 10 miles west of Spargoville assayed Ta_2O_5, 44 per cent. and Nb_2O_5, 39 per cent. Columbite assaying 60 per cent. Nb_2O_5 is worth about £230 per ton.

OTHER ECONOMIC ORES AND MINERALS.

Abrasives.

A sample of fine grained, moderately soft rock received from an undisclosed locality was found to consist of approximately 60 per cent. halloysite (a clay mineral) and 40 per cent. quartz. The rock crushed readily under moderate pressure to an off white powder, 99 per cent. of which passed a 250 mesh Tyler screen, the remainder all passing a 115 mesh screen.

This material may be useful as an abrasive in the manufacture of fine abrasive soaps and metal polishes.

Asbestos.

Notwithstanding the keen demand for asbestos and the high prices ruling for marketable varieties, few samples were received during the year. Of these only a small sample of anthophyllite from Goomalling was suitable for the production of fibres possessing sufficient flexibility and tensile strength for use in spinning or the manufacture of asbestos cement sheet.

Barite.

Seven samples of barite were received but none were sufficiently free of impurities, chiefly silica, iron oxides and galena to produce a pigment of the whiteness and density required of the first grade material.

Gypsum.

A sample of gypsum from three miles north of Young's Siding in the Denmark District was examined for suitability for manufacture of plaster of Paris with the following results:—

Partial Analysis.	Per cent.	Per cent.
Insoluble in acid		4.22
Water soluble lime CaO equal to	31.25	
Gypsum, $CaSO_4 2H_2O$ ..		95.94
Acid soluble lime, CaO equal to	0.04	
Calcite, $CaCO_3$		0.07

Plaster Test.

The sample was calcined at 130°C to form the hemihydrate, $2CaSO_4.H_2O$ and then water added to give the right consisteney for casting. The plaster formed was quick setting, possessed good strength and was slightly off white in colour.

Several samples of Kopi (impure powdery gypsum) were also examined. Tests show that the plasters prepared from calcined kopi lack strength and are usually cream to buff coloured and therefore of no value in the

manufacture of plaster of Paris. Kopi may find a limited use as a dressing for heavy clay soils which it renders more friable and in small amounts for settling muddy water in dams, etc.

Limestone.

Nine samples of limestone and lime sands were submitted for report on suitability for lime burning or cement manufacture.

Analysis of a sample of oyster shell from Leschenault Inlet gave the following results:—

	Per cent.
Insoluble in acid	4.39
Ferric oxide and alumina, $Fe_2O_3 + Al_2O_3$	1.46
Lime, CaO	50.06
Magnesia, MgO	0.62
Moisture, H_2O	0.45
Ignition Loss	41.85
Water soluble chlorine	1.26

This shell would be suitable for the manufacture of portland cement.

Three samples of limestone were submitted for report on suitability for flux for charcoal-iron blast furnace.

Vermiculite.

Six samples of vermiculite were received during the year, none of them, however, gave sufficient expansion on heating to be marketable for the manufacture of insulating material. However, mineral of better grade may occur at a greater depth in the deposits.

COMPLETE ANALYSES.

Complete analyses were made of a sample of alunite residue from Lake Chandler, a phlogopite-olivine rock from the "Iron King" Mine, Norseman, believed to represent a rock type new to Western Australia (see Appendix I) and three pink beryls from different localities (see Appendix II).

MISCELLANEOUS.

Caustic Lime.

Partial analyses of 17 samples of caustic lime for use in cyaniding were made for the Superintendent of State Batteries. Only one sample complied with the specification requirement of 86% lime in the ignited sample, although in two cases the lime fell short of this figure by less than 0.5%.

Cement.

Three samples of local tested cement were analysed for conformity with British Standard Chemical Specification.

The samples were selected from 19 samples of cement tested by the Western Australian University between 25th September, 1946, and 11th April, 1947. They represent three cements which show large variations in compressive strength tests at three and seven days as follows:—

Laboratory No.	1701	1702	1870
Test No.	6693	6697	6704
Compressive strength—			
3 days	1660	2791	1268
7 days	2652	3795	1943

Analyses are as follows:—

Laboratory No.	1701	1702	1870
Test No.	6693	6697	6704
Silo No.	7	2	4
Date Sampled	30–1–47	26–2–47	9–4–47
Silica, SiO_2	24·07	23·14	25·16
Alumina, Al_2O_3	4·77	4·57	4·49
Ferric Oxide, Fe_2O_3 ...	3·75	3·86	3·20
Titanium Dioxide, TiO_2 ...	0·35	0·38	0·38
Lime, CaO	62·88	63·64	62·21
Magnesia, MgO	1·27	0·95	1·50
Sulphuric Anhydride, SO_3	1·62	1·44	1·44
Loss on ignition	1·17	1·59	1·08
	99·88	99·57	99·46
Insoluble residue ... ... consisting of—	0·81	0·90	0·80
SiO_2	0·64	0·73	0·63
Al_2O_3	0·17	0·17	0·17

Compound Composition (calculated on loss on ignition free basis).

Laboratory No.	1701	1702	1870
Tricalcium silicate, 3CaO. SiO_2	36·2	49·0	28·1
Dicalcium silicate, 2CaO. SiO_2	40·7	28·5	50·0
Tricalcium aluminate, 3CaO. Al_2O_3	5·8	5·1	6·0
Tetracalcium alumina ferrite, 4CaO. Al_2O_3. Fe_2O_3	11·6	11·9	9·7
Lime saturation index ...	0·81	0·87	0·78
Ratio, Fe_2O_3: Al_2O_3 ...	0·80	0·85	0·71

Analyst: C. R. LeMesurier.

Remarks.

All three cements conform to the chemical requirements of the British Standard Specification. The ratio of silica to lime in Lab. No. 1870 is excessive and would account for low early strength.

Fly Ash.

Mechanical and chemical analyses of a sample of fly ash from the East Perth Power House were carried out in connection with tests for suitability as an admixture in concrete structures and gave the following results:—

Mechanical Analysis.

U.S. Series No.	Screen size meshes per inch	Aperture. inch.	Aperture. m.m.	Fly Ash Per cent
Refuses 80 ...	80	·0069	·175	8·4
do. 120 ...	115	·0049	·124	4·4
do. 200 ...	200	·0029	·074	9·4
do. 230 ...	250	·0024	·061	2·5
Passes 230 ...	250	·0024	·061	75·3

Chemical Analysis. (On sample dried at 105°C.)

	Per cent.
Silica, SiO_2	59·34
Alumina, Al_2O_3 ... ... (includes Titania, TiO_2)	20·37
Ferric oxide, Fe_2O_3	10·00
Manganese oxide, MnO	0·22
Magnesia, MgO	0·65
Lime, CaO	0·97
Soda, Na_2O	0·16
Potash, K_2O	0·26
Ferric sulphide, FeS_2	0·22
Sulphuric anhydride, SO_3 ...	0·65
Loss on ignition (carbon, etc.) ...	7·07
	99·91

Analyst: D. Burns.

Fibrolite Pipes Investigations.

Fifty-eight samples of soil and 22 samples of fibrolite pipe were examined in an endeavour to determine the cause of failure of pipes in the Ora Banda main.

The main, which consists of 28 miles of 4-inch uncoated fibrolite pipe carries water from the main Goldfields Supply, which at the take off from the 30-inch main has a pH of approximately nine.

With few exceptions bursts have been confined to a section of line between nine miles and twelve miles from the take off, lying in a depression in which several salt lakes occur. Gypsum in the form of seed gypsum occurs in the soil on the lake shores and, often with kopi (an impure powdery form), in sand dunes.

The results of the investigation are given in Appendix III.

Two 4-inch fibrolite pipes internally coated with Colas, a bitumen emulsion, which failed in service were examined for cause of failure. Examination of one pipe showed that the coating was not continuous and the uncoated area, in which the split was located, was badly affected. The coating of the second pipe was intact but was thin and somewhat oxidised and moderate internal sulphate attack had taken place. Fibrolite pipes from Bunbury and Busselton local water supplies were also examined for evidence of deterioration.

Garnet.

Tests were carried out to determine the best conditions for magnetic separation of garnet in a sample of "Middling Product" from the separation of galena at the Prothero Mine, Nabawa. The sample contained sphalerite 36.9%, galena 16.6%, almandine-pyrope garnet 16% with quartz and pyrite and traces of zircon and biotite mica.

The sample was first graded by sieving on Tyler Screens Nos. 9, 16, 32 and 60. Each grade was passed separately under the electro-magnet using a current density of 4.0 amps. The magnetic fractions were found to contain nearly all the garnet present in the sample, with appreciable amounts of sphalerite and quartz, the exception being the coarse fraction which was fairly free from contaminating minerals.

The coarse magnetic fraction was cleaned by hand picking. The remaining magnetic fractions were passed under the electro-magnet using a current density of 1.5 amps. The resulting 1.5 amp. magnetic fraction consisted of garnet with very small amounts of sphalerite and quartz.

The yield of garnet obtained from the screened grades was as follows:—

Tyler Screen No.	Original Sample Per Cent. of sized grade.	Original Sample Garnet Recovered Per Cent.
+ 9	30	1.8
+16	42	7.7
+32	16	3.3
+60	8	1.8
—60	4	1.4

Total garnet recovered from the original sample 16.0%.

The coarse garnet is somewhat weathered and iron stained; the finer grades are in angular fragments with some surface staining limonite.

Heavy Sands.

Eighty-eight samples of heavy sands were examined for determination of mineral content, of these 58 samples were received from the Government Geologist, the remainder from private individuals and firms. The majority of samples were beach sands from the South-West, the major heavy constituents of which are ilmenite, zircon and garnet. Monazite is a frequent minor constituent mineral, in amounts rarely exceeding 0.5%. Ilmenite from the South-West beach sands is notable for the low chromic oxide content which rarely exceeds 0.03% Cr_2O_3. Typical mineral content of beach and dune sands, from Cheyne Bay, Cape Riche, are as follows:—

MINERAL CONTENT OF HEAVY SANDS FROM CHEYNE BAY BEACH, CAPE RICHE.

LOCATION: Black Sand Creek, Cheyne Bay, Cape Riche.

Lab. No.	4482	4483	4484	4485	4486	4487	4488	4489
	Beach Sand							
Minerals	Approximate Percentages.							
Ilmenite	56	39	29	48	34	52	55	50
Quartz	23	32	28	22	30	19	16	12
Zircon	15	13	27	17	9	18	18	19
Garnet	1	6	3	4	3	3	4	9
Nigrine	2	3	3	*	1	*	*	7
Shell grit	2	2	4	2	†	2	2	1
Magnetite	*	2	2	2	2	2	2	2
Leucoxene	*	*	2	*	*	2	1	1
Staurolite	*	1	*	2	*	*	*	*
Hypersthene	*	1	*	*	*	*	*	*
Monazite	0·2	0·2	0·2	0·2	0·1	0·3	0·3	0
Common Spinel	*	*	*	*	*	*	*	*
Green Spinel	*	*	*	*	*	*	*	*
Felspar	*	*	*	*	*	*	*	*
Tourmaline	*	*	*	*	*	*	*	*
Hornblende	*	*	*	*	*	*	*	*

* Present in amounts less than 0·5 per cent.

† Shell grit, clay and silicified kaolin, total 19 per cent.

LOCATION: Black Sand Creek, Cheyne Bay, Cape Riche.

Lab. No.	4490–93	4494–5	4496–7	4498–4502	4503–
	Sand Dunes				
Minerals.	Approximate Percentages.				
Ilmenite	42	47	20	45	45
Quartz	41	27	65	49	29
Zircon	14	15	2	2	12
Garnet	2	3	3	3	7
Nigrine	*	2	1	*	1
Shell grit	*	1	3†	*	1
Magnetite	*	1	1	*	*
Leucoxene	*	2	2	*	2
Staurolite	*	*	*	*	*
Hypersthene	*	*	*	*	*
Monazite	0·2	0·3	0·2	0·3	0·2
Common spinel	*	*	*	*	*
Green spinel	*	*	*	*	*
Felspar	*	*	*	*	*
Tourmaline	*	*	*	*	*
Hornblende	*	*	*	*	*
Limonitic pebbles	*	....	....	....	....

* Present in amounts less than 0·5 per cent.

† Shell grit plus clay.

Industrial Hazard.

Fifteen samples were received from the Public Health Department for examination and report on possible health hazard. Samples included a siliceous coating ground off steel castings, mixtures used in the paint industry, dusts from processing of minerals, iron pyrites from a fertilizer works, foundry dust and ground brick used in dusting moulds.

Determinations of free silica were made where the nature of the sample permitted and in all cases microscopic estimation of the relative abundance and particle size of the siliceous constituent in the fraction passing a 250 mesh Tyler screen.

TABLE 3.

MINERALOGY, MINERAL TECHNOLOGY, AND GEOCHEMISTRY DIVISION.

Sources and Description of Samples received during 1947.

	Pay.	Free.	Superintendent of State Batteries.	Under Secretary for Mines.	State Mining Engineer.	Geological Survey.	Kalgoorlie School of Mines.	Departmental (Director, Government Chemical Laboratories).	Fibrolite Pipe Investigation Committee.	Industrial Development Department.	Department of Works and Labour.	Metropolitan Water Supply, Sewerage and Drainage Department.	Public Health Department.	Department of Agriculture.	Chief Inspector of Factories.	State (W.A.) Alunite Industry.	Charcoal Iron and Wood Distillation Industry.	Pay—Commonwealth Works Department.	Pay—Mechanical and Plant Engineer.	Pay—Government Printer.	Pay—Main Roads Department.	Bureau of Mineral Resources Radioactive Mineral Survey.	TOTAL.
Alloys and Metals—																							
Brass ball-valve	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1
Cistern parts	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1
Copper sprayed steel	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Ferrosilicon	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Metal	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Oxywelds	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	6
Phosphor-bronze gauze	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Socket	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Stereo metal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	2
Untreated stainless steel	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Ceramics (including refractories)—																							
Clays	5	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	22
Firebricks	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Kyanite	....	1	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Magnesite	5	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Sillimanite	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Talc	3	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Natural Mineral Pigments—																							
Ochres and oxides	2	14	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	17
Fuels—																							
Charred woods	....	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Coal	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	1	....	....	....	....	4
Coal briquettes	....	5	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5
Metallic Ores and Minerals—																							
Amblygonite	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Antimony	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Arsenopyrite	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Beryllium	1	13	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	15
Bismuth tailings	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Columbite conc.	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Copper ores	2	17	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20
Gold bullion	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Gold ores	158	58	1	1	33	106	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	357
Gold conc.	....	....	....	....	24	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	24
Gold umpire	3	....	65	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	68
Gold tailings	16	....	186	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	202
Heavy sands	9	21	....	....	....	63	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	260	353
Injection gneiss	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Iron ores	....	5	....	....	....	....	....	1	....	7	....	....	....	....	....	....	....	....	....	....	....	....	13
Lead ores	16	36	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	54
Manganese	7	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Marcasite	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Mill products	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	31	31
Molybdenite	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Pyrite	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Pyrrhotite	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Sulphide ores	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Tantalum	....	....	....	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Tin ores	1	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Various	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	28
Yttrotantalite	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Smithsonite	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Other Economic Ores and Minerals—																							
Andalusite	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Asbestos	1	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8
Barite	2	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
Calcite	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Dolomite	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Felspar	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Garnet	....	3	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Graphite	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	2
Gypsum	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Ilmenite	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Lime sand	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Limestone	1	4	....	....	....	1	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	9
Mica	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Monazite	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Opal	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Potash product	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1
Rutile	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Sandstone	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3
Vermiculite	....	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Zircon	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Minerals and Rocks for complete analysis—																							
Alunite residue	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Beryl	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Rock	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Carried Forward	241	262	252	3	61	189	3	7	....	13	2	2	....	....	....	1	2	1	6	2	....	319	1,366

TABLE 3.—continued.

MINERALOGY, MINERAL TECHNOLOGY, AND GEOCHEMISTRY DIVISION.

Sources and Description of Samples received during 1947.

	Pay.	Free.	Superintendent of State Batteries.	Under Secretary for Mines.	State Mining Engineer.	Geological Survey.	Kalgoorlie School of Mines.	Departmental (Director, Government Chemical Laboratories).	Fibrolite Pipe Investigation Committee.	Industrial Development Department.	Department of Works and Labour.	Metropolitan Water Supply, Sewerage and Drainage Department.	Public Health Department.	Department of Agriculture.	Chief Inspector of Factories.	State (W.A.) Alunite Industry.	Charcoal Iron and Wood Distillation Industry.	Pay—Commonwealth Works Department.	Pay—Mechanical and Plant Engineer.	Pay—Government Printer.	Pay—Main Roads Department.	Bureau of Mineral Resources Radioactive Mineral Survey.	TOTAL.
Brought Forward	241	262	252	3	61	189	3	7	....	13	2	2	....	....	....	1	2	1	6	2	....	319	1,366
Miscellaneous—																							
Ashes (Power House)	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Building lime	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Brickbats	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	3
Caustic lime	....	....	17	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	17
Cement	1	....	....	....	....	....	....	8	1	....	....	....	....	....	....	....	....	....	....	....	....	....	10
Cement and liquid	....	....	....	....	....	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	3
Deposit, Canning Dam	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	2
Dung bitumen	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Fibrolite pipes	2	....	....	....	....	....	....	....	34	....	....	....	....	....	....	....	....	....	....	....	....	....	36
Fly ash	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	2
Material from zeolite filter	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1
Oyster shell	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Pipeline soils	....	....	....	....	....	....	....	....	60	....	....	....	....	....	....	....	....	....	....	....	....	....	60
Quartz	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	2
Sand (miscellaneous)	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Soil (miscellaneous)	....	....	....	....	....	....	....	....	....	....	....	....	....	4	....	....	....	....	....	....	....	....	4
Unclassified mineral determinations	22	100	1	1	....	52	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	177
Industrial Hazard—																							
Asbestos powder	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Brick dust	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	1
Dust from Collie	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	2
Foundry dust	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	1
Iron pyrites	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Paint mixtures	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	....	....	....	....	....	....	....	7
Steel casting coating	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Talc powder	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	1
Total	268	363	270	4	61	241	3	15	95	17	12	4	6	4	9	1	2	1	6	2	1	319	1,704

MINERAL NOTES.

Andalusite (silicate of alumina) from shaft dump on G.M.L. 1980 Grosmont. Occurs in considerable amount in a green schist.

Fuchsite (chromiferous variety of muscovite) from the same locality, occurs in a microcrystalline form disseminated through the schist; both it and the andalusite exhibit inclusions of minute needles of rutile.

Gold crystals from Baker's New Find, Coolgardie Gold Field were in the form of simple octahedra, some being twinned on (111) and presenting a flattened appearance. These are the common form for gold.

Prehnite (hydrated silicate of calcium and aluminium) from a dump on the main shaft at Burbanks is associated with calcite and quartz. Prehnite has been reported from the felspar quarry at Londonderry.

Pucherite (bismuth vanadate) from about 40 chains north-west of Londonderry Felspar Quarry, occurs as a yellow stain on quartz.

Rutile (titanium oxide) from 10 miles east of Cone Bay, Kimberley Division, occurs as reddish brown crystals about ½in. long associated with chlorite and a little quartz and limonite.

Scheelite (calcium tungstate) from G.M.L. 5290, Bayley's Group, Coolgardie Goldfield, and from the Surprise Lease, Hampton Group. In the former it occurs in small amount associated with dolomite and in the latter with actinolite and calcite.

Smithsonite (zinc carbonate) from Russell's Lead Mine in the Napier Range 93 miles north-west of Derby, occurs as a thin white encrustation on a brownish ground mass of smithsonite and limonite.

Yttrotantalite (yttrium tantalate) from "Old Shaw" workings, Pilbara Goldfield, associated with cassiterite in concentrates, and with monazite and cassiterite in concentrates from Cooglegong.

Zircon (zirconium silicate) from an area adjoining Old Three C's M.C., Greenbushes. A concentrate examined contained 44% zircon, 34% cassiterite and smaller amounts of ilmenite, staurolite and rutile. A heavy sand from three miles south-west of Denmark contained approximately 42% zircon associated with ilmenite, garnet, quartz and shell matter.

INDUSTRIAL CHEMISTRY DIVISION.

ANNUAL REPORT FOR YEAR ENDING 31st DECEMBER, 1947.

By A. Reid, M.A., B.Sc., A.R.I.C., Chief Industrial Chemist.

Owing to the absence of suitable laboratory facilities the work done during the year was largely of consultative nature. A good deal of time has been spent in the establishment of a reference card index system, a very essential part of an industrial chemistry set-up. The following is indicative of the wide scope of the division's actual and potential activity:—

(a) *Gelatine and Glue.*

Advice was given and a number of samples examined from the process angle for a client attempting to open

up a gelatine and glue business. At the end of the year glue was being manufactured and sold in increasing quantities and negotiations were in progress to obtain machinery for gelatine manufacture. The process adopted for glue and gelatine manufacture has several by-products notably a fertiliser which is believed to be of good quality, as well as hair, and fire-foam both of which have good markets.

(b) *Pig Lard.*

De-odorisation of pig lard was accomplished for a manufacturer by a combination of steaming and aeration.

(c) *Filtration of Agar-Agar from Local Seaweed.*

Two officers were present at a demonstration of equipment for clarifying the local agar-agar used in the canning industry. The demonstration was a qualified success but it was quite clear that with a little research the problem could be solved.

(d) *Water Paints.*

A problem regarding the preparation and colouring of a lime-base water paint was investigated and solved.

(e) *Glycerine.*

Advice was given a W.A. firm regarding the distillation of crude glycerine.

(f) *Gasification of Collie Coal.*

A test on a blue water gas process was carried out in co-operation with members of the Mineralogy and Food and Drugs Divisions, prior to the arrival of the Fuel Technologist.

(g) *Silk Transfer Printing.*

Some assistance was afforded a manufacturer and the Division was able to place the inquirer in contact with a supplier of the required materials.

(h) *Production of Dairy Salt.*

The possibilities of producing a good grade dairy salt from coarse-grained material have received a preliminary examination.

(i) *Market Survey for Melbourne Firm.*

An examination of market potentialities and availability of raw materials was made on behalf of a firm contemplating the establishment of a chlorine and caustic soda industry in the State. The Division records its appreciation of the willing and active help received from Government Statistician in course of this work.

(j) *Enamelling.*

A fault in the enamelling of number plates was traced to the presence of sulphur dioxide in the furnace; when the gas was removed normal results were obtained.

(k) *Miscellaneous.*

Advice has been given inquirers on a large number of small matters ranging from the purification of mercury to staining of concrete. In a number of cases it has been possible to put a caller in touch with a supplier of the material he was seeking.

RESEARCH.

(i) *Soda Ash.*

Following a request by the Director of Industrial Development to look into the possibilities of making soda ash from Chandler sodium sulphate by the LeBlanc process, some research was undertaken towards the manufacture of sodium and potassium carbonates from the corresponding sulphates by a new method involving the preparation of sodium acetate (from Wundowie acetic acid) and the subsequent recovery of the acetic acid. The final products expected are sodium and potassium carbonates, the corresponding acetates (if desired) and finely-divided calcium sulphate suitable for calsomine and crayon preparations. Thermodynamically the process reactions are quite sound and attention is now being devoted to making the rates of reaction and final yields high enough for economic exploitation of the process.

(ii) *Furfural from Straw Wastes, etc.*

The existing literature on this subject has been studied. Bench experiments are now proposed. Furfural is a valuable material as an intermediate in a number of chemical processes.

A number of other lines of research have been studied with a view to future work when space is provided.

General Conclusions.

The future of the Division and its potentialities are so bound up with the question of accommodation and equipment that to make any prediction as to what that future will be is not easy. Nevertheless it has been established that the Industrial Chemistry Division has a definite function to fulfil within the ambit of activities compassed by the Government Chemical Laboratories and it is, therefore, much to be hoped that the very real difficulties of provision of facilities for the Division's efficient operation will be met in the near future.

FUEL TECHNOLOGY DIVISION.

Annual Report for the Year Ended 31st December, 1947.

By R. P. Donnelly, M.A., B.Sc. (Oxon) A.M.I. Chem. Engr., M. Inst. Fuel.

Fuel Technologist.

My appointment as head of the Fuel Technology Division dates from 1st April 1947. I reached Western Australia at the end of June, and took up the charge of the Fuel Laboratory on 1st July, 1947. In the interval between my appointment and my departure from England, visits were made to a number of fuel laboratories in England and a considerable amount of work was done in connection with the ordering of apparatus for the Fuel Laboratory.

The main activities discussed in this report belong to the six-monthly period July-December, 1947. During this period the appointment of laboratory staff and the completion of provision of apparatus has been attended to. Investigations have been undertaken into the gasification and coking of Collie coals. Analyses have been made on 34 samples of coal; 14 of these were taken in connection with the exploration of Eradu coal deposits.

Establishment.

At present there is one laboratory attendant and one chemical assistant will commence duties in the New Year. A further assistant is being sought and the request for a third will be advanced when the trend and scope of work to be done has resolved itself.

The laboratory is equipped with the apparatus required for proximate analysis of coal and the determination of calorific value of coal. Apparatus for examination of the gas-making properties of coal has arrived but until a gas analysis apparatus has been provided, full use cannot be made of it. Apparatus for the ultimate analysis of coal and for the determination of the melting points of coal ash is also on order. A Boys calorimeter for determination of the calorific value of gas has been ordered. When all this apparatus is to hand the laboratory will be sufficiently equipped to enable all the routine determinations of a fuel laboratory to be performed. It may be added that the design and arrangements of the laboratory is of an excellent standard and it will be possible to build it up in keeping with the already good reputation which the laboratory holds amongst fuel chemists in the Commonwealth.

Work Done.

Proximate analyses and calorific value determinations have been made on 31 coal samples, 14 of which have been those obtained in the exploration of the Eradu mine. At Welshpool the results obtained in the manufacture of blue water gas have been verified and experiments have been conducted on the production of

low temperature coke from Collie coal. A report on Blue Water Gas Production and Methane synthesis from Collie coal has been made to the Coal Panel.

The use of Collie coal in the Lurgi, high pressure, complete gasification plant has been discussed with German technicians in Melbourne and a report prepared in which the main conclusion is that gas can be made from Collie coal at Collie and delivered to Perth through a high pressure main as economically as it can be produced from Newcastle coal and imported gas oil by standard carbonisation methods and carburetted water gas plants. One visit has been made to Collie. The East Perth Power Station and Perth City Gasworks have been visited and liaison has been established with the State Railway Laboratories. Contact has been established with the State Forestry Department on the question of wood fuel supplies. It is felt that the retention of wood as a domestic fuel can be a major source of coal economy in the State. Assistance has been given in the drafting of the Gas Undertakings Regulations Act.

Outline of Work for the Forthcoming Year.

There are two tasks of immediate importance: one is the characterisation of the behaviour of Collie coal at the pressures used in the Lurgi complete gasification process; the other an investigation into the methods of analysis of Collie coal with a view to selecting the most satisfactory procedure. There are also a considerable number of samples of Collie coal taken by the Geological Survey of W.A. which must be studied as a guide to future systematic sampling at Collie. The task of greatest urgency at Collie is a check on the quality of coal loaded and determination of the extent of beneficiation by coal washing. High and low temperature carbonisation assays of Collie coal will also be undertaken in the course of the year. It is hoped that a beginning will be made with investigation of the coal deposits of the Lower South-West. The Flybrook and the Pallinup River areas appear to be those which have given low ash content fuels in the past, but about which there is very little known.

Eradu Coal.

Considerable time has been given to the analysis of coal from the Eradu mine as the shafts sunk there reached coal in August. The seam has been twice sampled from top to bottom. The ash content of the coal from the top and bottom of the seam is higher than the body of the seam. Otherwise the seam is fairly consistent over the whole of the 17-22 feet of its depth. An average of the representative analyses is:—

	Per cent.
Moisture	34.8
Ash	15.2
Volatile matter	20.7
Fixed carbon	29.3

Calorific value, 5,980 B.Th.U. per lb.

Eradu coal, as a boiler fuel, is inferior to Collie coal. A boiler with forced draught is required to burn it effectively.

mated to have a calorific value of 130-150 B.Th.U. per cu. ft.; in the manufacture of water gas, 30,000 cu. ft. per ton of a calorific value of 330 B.Th.U. per cu. ft. was produced. The figures are such as might be expected from a fuel with the characteristics of Collie coal. The figures for water gas production were subsequently verified. It is perhaps important to note that under the conditions of gasification Collie coal did not clinker and the disintegration of the coal in heating did not proceed to such limits that the generator developed excessive back pressure. Subsequent coking experiments show that Collie coal breaks down on heating to about ½in. to 1in. nut size. The back pressure from coal of this size would not be excessive.

Coke Production.

A number of coked samples prepared from briquetted coal were submitted. These had been made from Collie coal blended with varying percentages of Newcastle coal. The latter was evidently a coking coal. When used in proportions of 50% or greater it formed a firm coke with Collie coal. In lesser proportions the coke was weak and fragile. Improved results could have been obtained by finer grinding of the materials used.

The production of low temperature coke from Collie coal has been studied. Coke has been made in one ton lots by a method of internal heating in which the products of carbonisation of the coal are returned and burnt above the coal bed, the hot burnt products are then drawn down through the coal and effect further and continuous distillation and coking. It was found by this method that Collie coal could be dried and partially stripped of its volatile content leaving a residue of low temperature coke, which although nothing other than the fragments produced in the cleavage of the coal as it is heated, nevertheless appear to have a natural resistance to further breakdown at the size of about ¾in. nuts. In consequence over 50% of the coke residue consists of ⅜in. to 1in. nuts and the amount of breeze under ¼in. is only 15%. The bulk density of the material is 37.5 lbs. per cu. ft. and its resistance to abrasion is in some cases as high as an Abrasion Index of 75%. The hard coals such as Stockton and Co-operative give better figures than Wyvern or Griffin. A coke with an abrasion index of 75 or over can just be considered as a possible blast furnace fuel. In selecting the larger pieces of the carbonised coal there is a danger of including shale bats as these break up less than the coal during carbonisation.

The method of treatment may also be considered for the production of a stabilised fuel containing considerably less moisture than raw Collie coal and therefore more suitable and perhaps more economical for transport over long distances. There is little doubt that it would be a suitable fuel if burnt on the right kind of boiler furnace grate but calculation shows that the cost per 10,000 B.Th.U. of fuel is greater for the semi-coke than for the raw Collie coal even taking into account the cost of freight to such a distant consump-

ANALYSES OF ERADU COAL SAMPLES.

Position.	South Face Top to 4 ft. down.	East Face 4ft. to 8 ft. down.	East Face 8ft. to 12ft. down.	East Face 12ft.to16ft. down.	East Wall of South Drive 15 ft from South Wall of Shaft.			In South Drive but position not specified.		
					Bottom to 3 ft. up.	3ft to 6ft. up.	6ft. to 9ft. up.	9ft. to 12ft. up.	12ft.to16ft. up.	16ft.to22ft. up.
Moisture	29·4	38·45	35·82	40·8	31·7	34·0	36·2	32·3	35·1	48·75
Ash	23·87	15·42	12·42	13·73	18·3	12·6	10·7	15·5	14·4	9·72
Volatile Matter	20·4	18·3	20·2	16·6	19·9	25·2	21·9	22·6	18·3	16·10
Fixed Carbon	26·33	27·83	31·56	28·87	30·1	28·2	31·2	29·6	32·2	25·43
Calorific Value B.Th.U. per lb.	5,510	5,170	5,720	5,630	5,995	6,620	6,460	6,130	5,580	4,530

Water Gas and Producer Gas.

The tests carried out by Mr. Reid in May and June of this year on the performance of the experimental water gas plant at Welshpool show that, in the manufacture of producer gas the make per ton of coal is of the order of 130,000 cu. ft. of gas esti-

tion centre as Kalgoorlie. This position arises from the fact that for every 10,000 B.Th.U. of raw coal only 8,000 B.Th.U. remains as coke and it is not considered that the tar and gas liberated in the treatment would be of sufficient value to cover this loss plus the operating costs of the process.

Gas Production from Collie Coal.

The production of coal gas of calorific value suitable for distribution as town's gas has been a subject of inquiry. It is considered that the Lurgi Process for high pressure gasification of Collie coal with steam and oxygen hold out most promise of producing gas at prices competitive with those current for present methods of town's gas production in the State. It also appears to be economical to produce the gas at Collie and then to transmit it through a high pressure pipeline to Perth. The size and cost of the necessary pipeline are not excessive. Before a decision can be taken on the Lurgi process it must however, be shown that the melting point of the ash from Collie coal is sufficiently high and that Collie coal does not coke at the pressure of the process. The amount of coal required to make sufficient gas to meet the immediate needs of the metropolitan area and the middle South-West is estimated as being 54,000 tons per annum.

TABLE 4.

FUEL TECHNOLOGY DIVISION.

TABLE OF SAMPLES RECEIVED DURING 1947.

	State Mining Engineer.	Department of Industrial Development.	Royal Commission Railways.	Pay—State Electricity Commission.	Pay—Griffin Coal Mining Co.	TOTAL.
Coal—						
Collie ...	...	...	2	6	4	12
Ex Engine Tender ...	...	...	1	...	...	1
Shotts ...	2	...	...	...	...	2
Eradu ...	14	...	...	...	...	14
Pallingup ...	...	1	...	...	...	1
Fly Brook (Nannup)	1	...	...	...	...	1
TOTAL ...	17	1	3	6	4	31

APPENDIX I

AN UNUSUAL ROCK TYPE FROM THE "IRON KING" MINE, NORSEMAN.

By J. D. Hayton, B.Sc., A.A.C.I.

The rock sample (Lab. No. 885/47), marked "Iron King Mine, Norseman, G.S. 63/44, 157, Feb. 24, 1947," was submitted by the Government Geologist, Mr. H. A. Ellis, for analysis and determination of its mineral content. It was accompanied by seven thin sections. The fragments of rock as received had been cleaned of external staining and freed from calcite stringers. A minus 90 mesh sample for analysis was prepared from these fragments.

SiO_2	32.10	5,345
Al_2O_3	6.55	643
Fe_2O_3	6.61	414
FeO	11.51	1,602
MnO	0.21	30
Mgo	14.77	3,663
CaO	8.37	1,493
Na_2O	1.03	166
K_2O	1.52	161
Li_2O	Nil	——
TiO_2	7.54	944
P_2O_5	0.68	48
H_2O+	3.74	2,076
$H_2O—$	1.43	——
BaO	Nil	——
NiO	Nil	——
Cr_2O_3	0.05	——
V_2O_3	0.04	——
CO_2	3.63	825
SO_3	0.13	16
S	0.36	113
F	0.14	74
	100.41	
O = F	.06	
O = S	.09	
Total	100.26	
S.G.	3.05	

Analyst: J. D. Hayton.

Examination of thin sections showed the rock to be porphyritic, with phenocrysts of colourless *olivine* and reddish brown *biotite*, together with black patches of *iron ore*, in a fine-grained microcrystalline groundmass. Embedded in the ground mass were numerous small colourless prisms of *diopside* showing strong cross parting and large extinction angle (40-50°); occasional crystals of *apatite* and small shreds of reddish brown biotite smilar to the large phenocrysts.

The olivine was considerably serpentinised and some crystals were completely replaced by a granular carbonate mineral. Attempts were made to dissolve out the carbonate mineral by use of, first, dilute mineral acid (1 x N HNO_3) and, subsequently, dilute organic acid (2 x N and 5 x N acetic acid) in order to determine its exact composition. It was found however, that the mineral acid attacked other constituents to a considerable extent while the organic acid did not completely decompose the carbonate, and at the same time attacked some of the silicate minerals. The inert behaviour of the carbonate in cold dilute HCl suggests it to be dolomite.

The reddish brown biotite showed partial alternation to bright green chlorite, particularly along parallel cleavage lines which were evident in a fair number of grains. In grains thus oriented, pleochrism was marked, from reddish brown to light buff. The refractive index, Nm, of the fresh biotite lies between 1.607 and 1.617. It is optically negative with 2E very small (0-5°). A partial analysis of a small sample of the biotite prepared by hand picking the coarser material, gave the following results:—

	Per cent.	Mols.			
SiO_2	36·9	615		615	3·7
Al_2O_3	13·3	130	+ 13 =	163	1
Fe_2O_3 ...	3·2	20			
FeO	7·5	104		664	4·1
MgO	22·6	560			
CaO	very small	...	...	...	...
TiO_2	2·1	26	=	Ti_2O_3. 13	

$$\frac{FeO}{MgO} = \frac{0\cdot19}{1} \qquad \frac{RO}{R_2O_3} = \frac{4\cdot1}{1}$$

The figures obtained place the composition of the biotite between that of phlogopite and eastonite.

RO	:	R_2O_3	:	SiO_2	
6	:	1	:	6	phlogopite
4·1	:	1	:	3·7	mineral
5	:	2	:	5	eastonite

The iron ore was separated from much of the other material by the use of methylene iodide, S.G. 3.1. A fairly clean sample was obtained, finally, by use of the bar magnet and electromagnet, although some silicate mineral remained adhering to the iron ore.

It was readily soluble in HCl (5N), the solution giving strong reactions for Fe and Ti. It is probably titanium-bearing magnetite. No perovskite or other titanium-bearing mineral was detected in this heavy mineral fraction.

APPENDIX II.

PINK BERYL FROM WESTERN AUSTRALIA.

By J. D. Hayton, B.Sc., A.A.C.I.

During the year 1947, an investigation was carried out on some of the pink or rose-coloured beryl which occurs fairly frequently in Western Australian pegmatites. Three specimens were selected as being representative of the mineral in widely separated localities.

Locality and Description.

A. Londonderry.—This sample was collected by the Government Geologist, Mr. H. A. Ellis, from the Londonderry Felspar Quarry which is 13 miles south-southwest by road from Coolgardie. It consists of small fragments of rose pink beryl, in parts lightly stained with limonite and showing no crystal form or pronounced cleavage. Most of the beryl is opaque or translucent, with small patches of perfectly clear mineral in some fragments, but too small to be of value.

B. Wodgina.—The exact locality is uncertain, but the sample probably came from the main Tantalite Mine workings. It occurs in massive form, pale pink in colour and slightly stained with limonite. Like the previous sample, it contains small patches of translucent and transparent beryl which are too small to be of value.

C. Poona.—The specimen was donated to the mineral collection of this laboratory by Mr. A. S. Giles who obtained it while preparing a shipment parcel of beryl from the Poona district. The lump, weighing several pounds, consists mainly of transparent and translucent pale pink beryl with some greenish, opaque beryl in the centre. On one end of the specimen there is a good development of parallel growth of typical hexagonal crystals. A number of the clear patches are fairly large, but most of them are traversed by numerous flaws and cracks. However, some gem quality material could possibly be obtained from similar specimens.

Specific Gravity.

The specific gravity of each mineral was determined on small fragments of a total weight of about 4 gms. using an ordinary specific gravity bottle. The results are expressed to two places of decimals only.

Refractive Index.

The refractive index ω in sodium light was determined by the immersion method and the index of the liquid checked with the Abbe Refractometer.

Chemical Analysis.

The samples for analysis were prepared from carefully selected clean fragments of beryl. Clear fragments only were used to prepare the sample from the Poona specimen, but it was found impracticable to separate the clear and opaque beryl in the other two. Each sample was tapped lightly in a steel mortar until reduced in size to pass a 60-mesh screen and then ground in an agate mortar to pass a 90-mesh screen. Metallic iron was removed by treating the powder with warm dilute (2N) HNO_3 followed by thorough washing by decantation. The dried powder was again passed through a 90-mesh screen, mixed and bottled for analysis. The colour of the powder in each case was pure white.

The methods of analysis used followed generally those recommended for refractory minerals. The mineral powder was further finely ground before commencing each portion of the analysis. Particular care was given to those aspects of beryl analysis which, in the past, have presented difficulties, namely, the determination of BeO, combined H_2O and the alkalies.

BeO. 8-hydroxyquinoline was used to separate BeO from Al_2O_3 after initial fusion of the sample with Na_2CO_3 and dehydration of SiO_2 with H_2SO_4. With method in use in this laboratory has been shown to be capable of producing results with an error not greater than $\pm$ .05%.

Combined Water was determined by ignition of the sample in a platinum crucible in a gas-air blast, the temperature of which reached at least 1300°C. Constant weight was reached after 20 minutes blasting.

It was thought that heating the beryl at temperatures as high as 1300°C. might result in loss of alkalies, particularly Li_2O. A determination of alkalies was made on one of the samples after blasting, in order to remove any doubts on that point.

The beryl from Wodgina (Lab. No. 4581/47) was selected because of its high Li_2O content (0.84%). The sample (.6 gm) was heated to constant weight (20 mins.) in the gas-air blast. The beryl formed a thin disc on the bottom of the crucible, the grains being held together by slight fritting. This disc was easily detached from the crucible with practically no loss, and after light crushing, was finely ground in a mortar and the determination of alkalies made as described below.

The results showed that there was no significant change in the alkali content. The total weight of mixed chlorides was comparable with that obtained from the unignited sample and the Li_2O content was the same (0.85%)—slight contamination by Na_2O. There was no detectable loss of Na, K, Rb or Cs.

It can be concluded therefore, that combined water can be determined under the condition described above, without fear of loss of the alkali metals.

Alkalies. Complete extraction of the mixed chlorides of the alkali metals was obtained by using the Lawrence Smith method on finely ground material, followed by retreatment of the residue.

Separation of Na and Li from K, Rb and Cs was effected by extracting the mixed platinichlorides with 86% alcohol, in the usual manner. The chlorides of Na, and Li were recovered after evaporating off the alcohol, by reducing the platinichloride solution with formic acid and removing the precipitated platinum. Na was separated from Li by the alcohol-ether method.

Extraction of the dry platinichloride residue with 15% alcohol suggested by Wells and Stevens[1] removed the small amount of K_2PtCl_6 and the amount was determined by difference.

For the separation of Rb and Cs both the silicotungstic acid method proposed by O'Leary and Papish[2] and the alcoholic ammonium sulphate method proposed by Wells and Stevens[1] were tried. Tests on known mixtures of

RbCl and CsCl showed that in the first instance, the precipitated caesium silicotungstate complex tended to occlude or co-precipitate Rb, whilst in the second instance the Rb_2SO_4 precipitate contained appreciable amounts of Cs_2SO_4. In the latter case, reprecipitation of the impure Rb_2SO_4 usually resulted in reducing the amount of Cs in the precipitate, but nothing could be done with silicotungstic complexes without considerable trouble.

However, the figures given here for Rb_2O, Cs_2O are considered to be reasonably correct within the limits of accuracy of the methods available.

The rapid improvement in technique and equipment in the fields of spectroscopy and photometry suggests that methods should soon be available which would result in more rapid and more accurate determination of all the alkali metals in their salt mixtures. The use of such methods however, would be limited to laboratories which could afford the high cost of equipment.

It is hoped that this laboratory will be able, shortly, to co-operate with the Chemistry Department of the University of Western Australia in the carrying out of such work.

RESULTS OF ANALYSES.

Lab. No. ...	597/46.		4581/47.		4582/47.	
Locality ...	Londonderry.		Wodgina.		Poona.	
	Per cent.	Mols.	Per cent.	Mols.	Per cent.	Mols.
SiO_2	64·59	10,754	64·45	10,731	65·64	10,929
Al_2O_3	17·93	1,759	18·04	1,770	18·18	1,783
Fe_2O_3 ...	0·36	23	0·10	6	0·11	7
BeO	12·62	5,044	12·50	4,996	13·05	5,216
MnO	0·01	1	trace	...	*Nil*	...
CaO	*Nil*	...	*Nil*	...	*Nil*	...
MgO	0·03	7	0·02	5	0·02	5
Li_2O	0·69	231	0·84	281	0·44	147
Na_2O	1·24	200	1·21	195	0·66	106
K_2O	0·07	7	0·04	4	0·03	3
Rb_2O	trace	...	0·06	3	*0·13	5
Cs_2O	0·32	11	0·70	25		
TiO_2	*Nil*	...	*Nil*	...	*Nil*	...
P_2O_5	trace	...	*Nil*	...	*Nil*	...
H_2O+ ...	2·23	1,238	2·18	1,210	1·87	1,038
	100·09	...	100·14	...	100·13	...
S.G.	2·74		2·73		2·72	
Refractive Index ω ...	1·587 Na		1·586 Na		1·582 Na	

* Calculated as Cs_2O.

Analyst: J. D. Hayton.

Conclusion.

The only feature of these analyses which may account for the pink colour of the beryl, is rather high Li_2O content. This seems likely in view of the fact that the pink colouration of a number of other minerals such as lepidolite and elbaite, is generally assumed to be due to the presence of Li_2O.

It may be of interest to note here the occurrence, in the Londonderry Felspar Quarry, of a bright pink, clay-like mineral with a composition similar to that of kaolin. This mineral is an alteration product of petalite and contains up to 2.0 per cent. Li_2O.

References.

1. *R. E. Wells and R. E. Stevens,* Industrial and Engineering Chemistry, An. Ed., Nov., 1934.

2. *W. J. O'Leary and J. Papish,* Industrial and Engineering Chemistry, An. Ed., March, 1934.

APPENDIX III.

THE EFFECT OF SULPHATE-BEARING SOILS ON FIBROLITE PIPES.

By C. R. LeMesurier, A.W.A.S.M., A.A.C.I.

This investigation was undertaken in an endeavour to determine whether the failure of fibrolite pipes in the Ora Banda main was due to soil conditions. Failures have been confined, with few exceptions, to a section of main two miles long commencing at a point nine miles from the Kalgoorlie take off, and being portion of a depression containing several salt lakes which extends to the 17 mile post.

The pipeline is carried over the lake beds on trestles, but pipes are on or below ground at the lake shores, the soil of which is gypsum bearing.

The pipes examined were selected from a number taken up by Mr. Wilson, District Engineer, for test, together with selected failures; soil samples were taken at the sites of selected pipes.

Test pipes were subjected to a pressure equal to a head of from 410 feet to 480 feet for three hours, two only of 42 pipes tested failed, one at 290 feet and the other at 425 feet head. The working pressure in the main seldom exceeds a 230 feet head.

Pipes were examined by noting the penetration of dye under pressure and by determining sulphate and chloride in turnings taken from the interior and exterior surfaces. The average increase of sulphuric anhydride, SO_3, in the affected zone of the pipe wall is taken as an indication of the extent of attack. The chlorine content of the pipe material is an indication of the permeability of the pipe, since unused pipe shows only a trace of chlorine and therefore in any one pipeline the chlorine content is approximately proportional to the volume of water percolating through the pipe walls.

Analyses of the cement portion of the unaltered pipe material were also made from which the compound composition of the cement used was deduced.

Results are shown in the attached table and lead to the following conclusions:—

1. Failure is not due to soil conditions, as with two exceptions failures occurred in pipes laid in soil containing negligible amounts of sulphate.

2. The extent of interior sulphate attack is insufficient to cause failure.

3. High sulphate concentration in moist soil conditions leads to swelling of the outer layers of the pipe wall resulting in lamination.

4. Lamination may also be due to poor bonding during manufacture.

5. Extensive lamination results in appreciable loss of water through percolation (note high figures for chlorine), but does not apparently cause a serious reduction in strength.

6. There is no significant difference in the cement composition of sound and failed pipes.

From the above it appears evident that failure is due to faulty pipes in this section of the line and not to either internal or external attack.

THE EFFECT OF SOIL SULPHATE ON FIBROLITE PIPE—ORA BANDA MAIN.

Mileage.	Approximate R.L.	Soil.			Pipe.							Remarks.
		Type.	pH.	Soluble SO_3.	Increase SO_3 in affected Zone.		Total Chlorine.	Composition of Cement.				
					Internal.	External.		C_3S.	C_2S.	C_3A.	C_4AF.	
	feet.			%	%	%	%	%	%	%	%	
4m. 20c.	1,212	moist sandy loam	8.6	*Nil*	0.05	0.08	0.48	46.0	25.0	12.0	11.0	Passed test. Excellent condition. No appreciable dye penetration.
6m. 40c.	1,162	sandy loam	9.2	<0.01	0.22	0.25	0.83	45.0	25.0	12.0	11.0	Passed test. Fine surface cracks. Lime leaching from seam, slight lamination.
7m. 58c.	1,132	sand	9.7	0.02±	0.08	*Nil*	0.50	56.0	16.8	10.8	10.6	Passed test. No surface cracks. Appreciable lamination.
7m. 72c.	1,133	sandy loam	9.1	<0.01	0.07	0.05	1.06	50.1	21.0	11.4	11.4	Failed. Split along seam. Lime leaching from seam. Slight lamination.
7m. 77c.	1,134	....	....	....	0.09	0.11	0.90	52.8	19.8	11.3	10.6	Failed. Split along seam. No surface cracks. Appreciable lamination.
9m. 08c.	1,129	loamy sand	8.2	<0.01	0.21	0.17	0.67	42.9	29.4	11.9	10.0	Passed test. Lime leaching from seam. Deep radial cracks.
9m. 16c.	1,125	sandy loam	8.8	<0.01	0.09	0.15	1.00	47.1	25.2	11.5	10.0	Failed. Split near seam. Numerous surface cracks. Appreciable lamination.
9m. 16c.	1,125	sandy loam	8.8	<0.01	0.15	0.15	0.96	45.9	26.7	11.6	10.0	Failed on test. 425 ft. head. Split on seam. Radial cracks. Appreciable lamination.
9m. 20c.	1,122	sandy loam with Kopi	8.0	14.4	0.19	0.14	1.05	43.9	28.3	12.0	10.2	Failed. Split near seam. Lime leaching from seam. Radial cracks. Slight lamination.
9m. 22c.	1,120	sandy loam	8.9	<0.01	0.16	0.17	0.91	42.8	28.5	12.3	10.8	Failed. Split on seam. Lime leaching from seam. Deep radial cracks. Slight lamination.
9m. 71c.	1,126	clayey loam	8.6	0.02±	0.20	0.17	0.83	43.0	27.7	12.6	10.7	Failed. Split on seam. Lime leaching from seam. Radial cracks. Slight lamination.
10m. 00c.	1,134	Kopi dune	8.1	37.0	0.11	0.03	0.79	48.4	24.1	11.7	10.0	Passed test. No surface cracks. Slight lamination.
10m. 16c.	1,119	sandy loam	8.2	0.05	0.22	0.09	2.85	49.1	22.0	12.3	10.6	Passed test. Radial cracks. Appreciable lamination.
10m. 25c.	1,117	loam with seed gypsum. Edge of lake	7.9	2.0	....	0.31	0.78	44.8	27.3	12.0	10.0	Failed. Fine surface cracks. Appreciable lamination.
10m. 32c.	1,117	On trestle over lake	....	....	....	0.46	1.20	46.0	24.0	13.0	10.0	Passed test. No surface cracks. Appreciable lamination.
10m. 40c.	1,117	loam with seed gypsum. Edge of lake	7.4	0.5	....	0.50	3.32	56.0	16.0	12.0	10.0	Passed test. Surface attacked. Seam lifting. Appreciable lamination.
10m. 66c.	1,121	loamy sand	....	<0.01	0.14	0.05	0.76	48.5	23.7	11.3	10.6	Failed. Split along seam. Lime leaching from seam. Radial cracks. Slight lamination.
12m. 79c.	1,116	silt with seed gypsum. Edge of lake	8.0	14.5	....	0.30	2.78	46.0	27.0	11.0	10.0	Passed test. Surface attacked. Seam lifting. Fine surface cracks. Considerable lamination.
17m. 46c.	1,128	sandy loam	9.0	0.02±	0.11	0.25	n.d.	47.0	27.0	11.0	10.0	Failed. Split opposite seam. Fine surface cracks. Appreciable lamination.

Division VIII.

Annual Report of the Chief Inspector of Explosives for the Year 1947.

The Under Secretary for Mines,

I have the honour to submit for the information of the Hon. Minister for Mines, in compliance with Section 45 of the Explosives Act, 1895, my report on the working of the branch for the year 1947.

The quantity of explosives imported into the State during the year is shown in Table No. 1, and Table No. 2 gives a comparison of the quantities imported during the past five years.

Table No. 1.

Importation of Explosives into Western Australia during 1947.

Gelignite	3,379,650	lbs.
Gelatine Dynamite	548,800	„
Permitted Explosives	443,750	„
Blasting Powder	22,500	„
Total	4,394,700	lbs.
Detonators: Number	3,360,000	
Fuse: Yards	5,344,800	

The following tests were made during the year for the purpose of determining the suitability for use, and the chemical stability of explosives—

Explosives	1,751
Fuse	639

The following table shows the number of licenses issued during the year—

Magazines on Government Reserves	53
Magazines used by Government Departments and on private property	111
Store Licenses Mode A	81
Store Licenses Mode B	2
Fireworks Licenses	14
Importation Licenses	2

During the year inspections were made of Licensed premises and enquiries made with a view to ascertaining whether the requirements of the Act and Regulations were being complied with. As a result of these inspections and enquiries it was found necessary to have the undermentioned explosives destroyed.

Table No. 2.

Explosives.	1943.	1944.	1945.	1946.	1947.
Gelignite ... ... lbs.	2,230,800	1,481,500	1,634,850	3,038,950	3,379,650
Gelatine Dynamite ... ... lbs.	139,850	154,800	235,300	297,500	548,800
Permitted Explosives ... ... lbs.	265,900	160,000	945,250	472,250	443,750
Powder (Blasting and Pellet) ... ... lbs.	67,500	11,150	15,000	15,000	22,500
Detonators ... ... No.	1,933,000	1,300,000	1,814,000	2,543,500	3,360,000
Fuse ... ... Yards	3,861,600	1,864,800	3,768,000	4,318,533	5,344,800

The quantity of explosives used in the different classes of industry for the years 1946 and 1947 is given hereunder.

	1946.	1947.
	lbs. used.	lbs. used.
Gold Mining	2,903,300	3,620,700
Coal Mining	237,100	246,450
Agriculture	11,250	32,950
Quarrying	82,800	147,300
Mining and base metals ...	24,000	48,050
Government Departments ...	58,600	84,800
Miscellaneous	53,900	61,350
	3,370,950	4,241,600

Date.	Place.	Kind and Quantity.	Reason for Destruction.
Feb.	Coorow	160 lbs. Gelignite 90 coils fuse	Absorption of moisture and chemical deterioration.
Dec.	Reedy	200 lbs. Monobel	Absorption of moisture.
Dec.	Yampi	7,200 lbs. Monobel	Absorption of moisture.

It is a pleasure for me to record my appreciation for the loyal and helpful services of Mr. Wood and the staff of the Explosives Reserve.

T. N. KIRTON,
Chief Inspector of Explosives.

6th February, 1948.

Division IX.

Report of Superintendent, Mine Workers' Relief Act.

The Under Secretary for Mines,

I have the honour to submit, for the information of the Honourable Minister for Mines, my report on this branch of the Mines Department for the year 1947:—

Under arrangements similar to previous years the Commonwealth Health Department continued the periodical examination of mine workers, the work being carried on continuously by the health laboratory at Kalgoorlie and by a mobile laboratory which visits the mining centres in the various Goldfields. The goldfields not visited during the year were the Ashburton, Gascoyne, Kimberley and Phillips River, which are all remote and contain few mine workers.

MINE WORKERS' RELIEF ACT.

Examinations under the Mine Workers' Relief Act during the year totalled 6,450, compared with 5,606 for the previous year, an increase of 744.

The results of the examination for 1947, together with those for the previous years are shown in the tables annexed hereto. A graph is also attached illustrating the trend of the examinations since their inception in 1925. In explanation of these figures, I desire to make the following comments:—

Normal, etc.—These number 6,021 or 93.34 per cent. of the men examined and include men having first class lives or suffering from pneumoconiosis only—the figure for the previous year was 94.43 per cent.

Early Silicosis.—These number 338, an increase of 77 compared with the previous year. Of these 101 were new cases and 237 were reported previously. The figures for 1946 being 89 and 172 respectively. Early silicotics represent 5.24 per cent. of the men examined, the percentage for the previous year being 4.66.

Advanced Silicosis.—Of the 58 cases reported 49 were men who advanced from early silicosis during the year; the others had previously been reported. Advanced silicotics represented 0.90 per cent. of the men examined, compared with 0.70 per cent. for the previous year.

Silicosis plus Tuberculosis.—Twenty-five cases were reported compared with six for the previous year and represent 0.30 per cent. of the men examined.

Tuberculosis only.—Eight cases were reported compared with six for the previous year and represent 0.12 per cent. of the men examined.

General.—It will be noted that the industrial diseases increased to an alarming extent during the year as compared with other years.

MINES REGULATION ACT.

Examinations under the Mines Regulation Act totalled 2,124. This was in addition to the 6,450 examined under the Mine Workers' Relief Act. These examinations show an increase of 779 compared with the previous year.

The 2,124 men comprise 1,284 new applicants and 840 re-examinees for the initial certificate..

Particulars of the examinations are as follows:—

NEW APPLICANTS.

Normal	1,134
Pneumoconiosis	37
Silicosis Early	1
Silicosis Advanced	—
Query Tuberculosis	32
Tuberculosis	3
Pneumoconiosis plus Query Tuberculosis	3
Pneumoconiosis plus Tuberculosis	—
Silicosis Early plus Query Tuberculosis	1
Silicosis Early plus Tuberculosis	—
Silicosis Advanced plus Query Tuberculosis	—
Silicosis Advanced plus Tuberculosis	—
Other Conditions	73
	1,284

Of the above applicants for admission to the industry 1,134 received the Initial Certificate (Form 2), four received Re-admission Certificates (Form 6), 140 received Special Certificates (Form 9), four received Temporary Rejection Certificates (Form 3), and two received Rejection Certificates (Form 4). Thus of 1,284 new applicants, 1,134 were eligible for employment anywhere on a mine, 144 were eligible for surface employment and six were not eligible for any employment on a mine. There is however no information available as to the number of these new applicants who actually entered the industry.

RE-EXAMINATIONS.

Normal	522
Pneumoconiosis	154
Silicosis Early	39
Silicosis Advanced	5
Query Tuberculosis	26
Tuberculosis	2
Pneumoconiosis plus Query Tuberculosis	10
Pneumoconiosis plus Tuberculosis	—
Silicosis Early plus Query Tuberculosis	5
Silicosis Early plus Tuberculosis	—
Silicosis Advanced plus Query Tuberculosis	—
Silicosis Advanced, plus Tuberculosis	—
Other Conditions	77
	840

These men had previously been examined and some were engaged in the industry prior to this examination, —522 received the Initial Certificate (Form 2), four received Temporary Rejection Certificates (Form 3), eight received Rejection Certificates (Form 4), 98 received Re-Admission Certificates (Form 6) and 208 received Special Certificates (Form 9). Thus of the 840 men examined, 522 were eligible for employment anywhere on a mine, 306 were eligible for surface employment and 12 were not eligible for any employment.

Grouping the two sets of figures discloses that the following certificates were issued under the Mines Regulation Act:—

Initial Certificate (Form 2)	1656
Temporary Rejection Certificate (Form 3)	8
Rejection Certificate (Form 4)	10
Re-Admission Certificate (Form 6) ..	102
Special Certificate (Form 9)	348
	2124

The percentage of men of normal health to the number examined was 78, compared with 79.1 for the previous year.

MINERS' PHTHISIS ACT.

The amount of compensation paid during the year totalled £32,171 4s. 6d., compared with £31,555 5s. 8d. for the previous year, the increase being due to claims for compensation having been received from beneficiaries residing in Jugo Slavia, whose payments were suspended during the war years.

The number of beneficiaries under the Act on the 31st December, 1947, was 258, being 47 ex-miners and 211 widows.

J. THOMAS,
Superintendent,
Mine Workers' Relief Act.

20th February, 1948.

TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS FROM INCEPTION OF EXAMINATIONS (1925) TO 31st DECEMBER, 1947.

First Examination (1925–26).

		Per cent.
Normal, etc.	3,239 =	80·5
Silicosis Early	459 =	11·4
Silicosis Advanced	183 =	4·5
Silicosis plus Tuberculosis	131 =	3·3
Tuberculosis only	11 =	·3
Total number of men examined	4,023 =	100·0

Second Examination (1927).

			Per cent
Normal, etc.—			
Previously reported as normal, etc.	2,290		
New cases (*i.e.*, cases examined for the first time)	826		
		3,116 =	83·6
Silicosis Early—			
Previously reported as early	348		
New cases	33		
		381 =	10·2
Silicosis Advanced—			
Previously reported as Advanced	85		
New cases	8		
		93 =	2·5
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	13		
Previously reported as Silicosis Early	27		
Previously reported as Silicosis Advanced	62		
New cases	26		
		128 =	3·4
Tuberculosis only		10 =	·3
Total number of men examined		3,728 =	100·0

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Third Examination (1928).

			Per cent.
Normal, etc.—			
Previously reported as Normal, etc.	2,738		
New cases	239		
		2,977 =	85 5
Silicosis Early—			
Previously reported as Normal, etc.	47		
Previously reported as Silicosis Early	303		
New cases	12		
		362 =	10·4
Silicosis Advanced—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	16		
Previously reported as Silicosis Advanced	79		
New cases	2		
		98 =	2·8
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	10		
Previously reported as Silicosis Early	14		
Previously reported as Silicosis Advanced	10		
New cases	8		
		42 =	1·2
Tuberculosis only—			
Previously reported as Normal, etc.	3		
New cases	1		
		4 =	·1
Total number of men examined		3,483 =	100·0

Fourth Examination (1929).

			Per cent.
Normal, etc.—			
Previously reported as Normal, etc.	2,099		
New cases	21		
		2,120 =	81·9
Silicosis Early—			
Previously reported as Normal, etc.	100		
Previously reported as Silicosis Early	224		
New cases	2		
		326 =	12·6
Silicosis Advanced—			
Previously reported as Silicosis Early	34		
Previously reported as Silicosis Advanced	60		
		94 =	3·6
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	8		
Previously reported as Silicosis Early	14		
Previously reported as Silicosis Advanced	19		
		41 =	1·6
Tuberculosis only—			
Previously reported as Normal, etc.		7 =	·3
Total number of men examined		2,588 =	100·0

Fifth Examination (1930).

			Per cent.
Normal, etc.—			
Previously reported as Normal, etc.	2,751		
New cases	34		
		2,785 =	81·9
Silicosis Early—			
Previously reported as Normal, etc.	133		
Previously reported as Silicosis Early	247		
New cases	3		
		383 =	11·3
Silicosis Advanced—			
Previously reported as Silicosis Early	22		
Previously reported as Silicosis Advanced	43		
New cases	2		
		67 =	2·0
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	6		
Previously reported as Silicosis Early	60		
Previously reported as Silicosis Advanced	46		
New cases	2		
		114 =	3·3
Tuberculosis only—			
Previously reported as Normal, etc.	47		
New cases	3		
		50 =	1·5
Total number of men examined		3,399 =	100·0

Sixth Examination (1931).

			Per cent.
Normal, etc.—			
Previously reported as Normal, etc.	2,530	=	84·0
Silicosis Early —			
Previously reported as Normal, etc.	94		
Previously reported as Silicosis Early	252		
		346 =	11·5
Silicosis Advanced—			
Previously reported as Silicosis Early	18		
Previously reported as Silicosis Advanced	35		
		53 =	1·8
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	4		
Previously reported as Silicosis Early	35		
Previously reported as Silicosis Advanced	19		
		58 =	1·9
Tuberculosis only—			
Previously reported as Normal, etc.		25 =	·8
Total number of men examined		3,012 =	100·0

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Seventh Examination (1932).

			Per cent.
Normal, etc.		3,835 =	89.5
Silicosis Early—			
Previously reported as Normal, etc.	35		
Previously reported as Silicosis Early	338		
		373 =	8.7
Silicosis Advanced—			
Previously reported as Silicosis Early	6		
Previously reported as Silicosis Advanced	47		
		53 =	1.2
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	3		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	4		
		16 =	.4
Tuberculosis only—			
Previous reported as Normal, etc.		8 =	.2
Total number of men examined		4,285 =	100.0

Eight Examination (1933).

			Per cent.
Normal, etc.		2,920 =	86.5
Silicosis Early—			
Previously reported as Normal, etc.	57		
Previously reported as Silicosis Early	322		
		379 =	11.2
Silicosis Advanced—			
Previously reported as Normal, etc.	1		
Previous reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	44		
		60 =	1·8
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	2		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	4		
		15 =	.4
Tuberculosis only—			
Previously reported as Normal, etc.		3 =	.1
Total number of men examined		3,377 =	100.0

Ninth Examination (1934).

			Per cent.
Normal, etc.		5,140 =	92.4
Silicosis Early—			
Previously reprted as Normal, etc.	54		
Previously reported as Silicosis Early	315		
		369 =	6.6
Silicosis Advanced—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	24		
Previously reported as Silicosis Advanced	12		
		37 =	.7
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	6		
Previously reported as Silicosis Advanced	6		
		12 =	.2
Tuberculosis only—			
Previously reported as Normal, etc.		5 =	.1
Total number of men examined		5,563 =	100.0

Tenth Examination (1935).

			Per cent.
Normal, etc.		4,437 =	92.3
Silicosis Early—			
Previously reported as Normal, etc.	35		
Previously reported as Silicosis Early	303		
		338 =	7.0
Silicosis Advanced—			
Previously reported as Silicosis Early	24		
Previously reported as Silicosis Advanced	2		
		26 =	.6
Silicosis plus Tuberculosis—			
Previously reported as Silicosis Early		5 =	.1
Tuberculosis only—			
Previously reported as Normal, etc.		2 =	.0
Total number of men examined		4,808 =	100.0

Eleventh Examination (1936).

			Per cent.
Normal, etc.		6,972 =	94.7
Silicosis Early—			
Previously reported as Normal, etc.	29		
Previously reported as Silicosis Early	323		
		352 =	4.8
(Note.—Of the 352 cases of Early Silicosis reported 23 were already suffering from Early Silicosis and 4 from Pneumoconiosis when re-admitted to the industry on the Re-Admission Certificate under Regulation 7 of the Mines Regulation Act, 1906).			
Silicosis Advanced—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	4		
		20 =	.3
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	3		
Previously reported as Silicosis Early	8		
		11 =	.1
Tuberculosis only		8 =	.1
Total number of men examined		7,363 =	100.0

PERIODICAL EXAMINATION OF MINE WORKERS—*continue*

Twelfth Examination (1937).

			Per cent.
Normal, etc.		7,487 =	95.4
Silicosis Early—			
Previously reported as Normal, etc.	15		
Previously reported as Silicosis Early	319		
		334 =	4.3
(Note.—Of the 334 cases of Early Silicosis reported 37 were already suffering from Early Silicosis when re-admitted to the industry on the Re-Admission Certificate under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Silicosis Early	14		
Previously reported as Silicosis Advanced	4		
		18 =	.2
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	10		
		11 =	.1
Tuberculosis only		2 =	.0
Total number of men examined		7,852 =	100.0

Thirteenth Examination (1938).

			Per cent.
Normal, etc.		6,833 =	95.68
Silicosis Early—			
Previously reported as Normal, etc.	13		
Previously reported as Silicosis Early	266		
		279 =	3.91
(Note.—Ot the 279 cases of Silicosis Early reported, 32 were already suffering from Early Silicosis and 4 from Pneumoconiosis when re-admitted to the industry on Re-admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normal, etc.			
Previously reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	2		
		17 =	.24
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	8		
Previously reported as Silicosis Advanced			
		9 =	.13
Tuberculosis only—			
Previously reported as Normal, etc.		3 =	.04
Total number of men examined		7,141 =	100.00

Fourteenth Examination (1939).

			Per cent.
Normal, etc.		6,670 =	95.63
Silicosis Early—			
Previously reported as Normal, etc.	18		
Previously reported as Silicosis Early	264		
		282 =	4.04
(Note.—Of the 282 cases of Early Silicosis reported, 28 were already suffering from Early Silicosis and one from Pneumoconiosis when re-admitted to the industry on Re-Admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normal, etc.—			
Previously reported as Silicosis Early	7		
Previously reported as Silicosis Advanced	3		
		10 =	.14
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	1		
		11 =	.16
Tuberculosis only—			
Previously reported as Normal, etc.		2 =	.03
Total number of men examined		6,975 =	100.00

Fifteenth Examination (1940).

			Per cent.
Normal, etc.		7,023 =	96.218
Silicosis Early—			
Previously reported as Normal, etc.	12		
Previously reported as Silicosis Early	245		
		257 =	3.521
(Note.—Of the 257 cases of Early Silicosis reported, 23 were suffering from Early Silicosis and 12 from Pneumoconiosis when re-admitted to the industry on Re-Admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normal, etc.			
Previously reported as Silicosis Early	10		
Previously reported as Silicosis Advanced	1		
		11 =	.151
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.			
Previously reported as Silicosis Early	4		
Previously reported as Silicosis Advanced			
		4 =	.055
Tuberculosis only—			
Previously reported as Normal, etc.		4 =	.055
Total number of men examined		7,299 =	100.000

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Sixteenth Examination (1941).

			Per cent.
Normal, etc.		6,840	= 95.785
Silicosis Early—			
Previously reported as Normal, etc.	32		
Previously reported as Silicosis Early	248		
		280	= 3.921
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	11		
Previously reported as Silicosis Advanced	3		
		14	= .196
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	....		
Previously reported as Silicosis Advanced	....		
Tuberculosis only—			
Previously reported as Normal, etc.		7	= .098
Total number of men examined		7,141	=100 000

Seventeenth Examination (1942).

			Per cent.
Normal, etc.		5,469	= 93.905
Silicosis Early—			
Previously reported as Normal, etc.	61		
Previously reported as Silicosis Early	264		
		325	= 5.580
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	20		
Previously reported as Silicosis Advanced	5		
		25	= 0.430
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	2		
Previously reported as Silicosis Advanced	....		
		2	= 0.034
Tuberculosis only—			
Previously reported as Normal, etc.		3	= 0.051
Total number of men examined		5,824	=100.000

Eighteenth Examination (1943).

			Per cent.
Normal, etc.		3,932	= 91.47
Silicosis Early—			
Previously reported as Normal, etc.	63		
Previously reported as Silicosis Early	262		
		325	= 7.57
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	25		
Previously reported as Silicosis Advanced	7		
		32	= 0.75
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	5		
Previously reported as Silicosis Advanced	....		
		5	= 0.12
Tuberculosis only—			
Previously reported as Normal, etc.		4	= 0.09
Total number of men examined		4,298	= 100.0

Nineteenth Examination (1944).

			Per cent.
Normal, etc.		4,079	= 91.51
Silicosis Early—			
Previously reported as Normal, etc.	70		
Previously reported as Silicosis Early	270		
		340	= 7.45
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	21		
Previously reported as Silicosis Advanced	14		
		35	= 0.76

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

			Per cent.
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	7		
Previously reported as Silicosis Advanced	....		
		8	= 0.15
Tuberculosis only—			
Previously reported as Normal, etc.		6	= 0.13
Total number of men examined		4,468	= 100.00

Twentieth Examination (1945).

			Per cent.
Normal, etc.		3,071	= 92.11
Silicosis Early—			
Previously reported as Normal, etc.	54		
Previously reported as Silicosis Early	166		
		220	= 6.60
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	26		
Previously reported as Silicosis Advanced	10		
		36	= 1.08
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	3		
Previously reported as Silicosis Early	2		
Previously reported as Silicosis Advanced	....		
		5	= 0.15
Tuberculosis only—			
Previously reported as Normal, etc.		2	= 0.06
Total number of men examined		3,334	= 100.00

Twenty-first Examination (1946).

			Per cent.
Normal, etc.		5,294	= 94.43
Silicosis Early—			
Previously reported as Normal, etc.	89		
Previously reported as Silicosis Early	172		
		261	= 4.66
Silicosis Advanced—			
Previously reported as Normal, etc.	1		
Previously reported as Silicosis Early	36		
Previously reported as Silicosis Advanced	2		
		39	= 0.69
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	3		
Previously reported as Silicosis Early	1		
Previously reported as Silicosis Advanced	2		
		6	= 0.11
Tuberculosis only—			
Previously reported as Normal, etc.		6	= 0.11
Total number of men examined		5,606	% 100.00

Twenty-second Examination (1947).

			Per cent
Normal, etc.		6,021	= 93.34
Silicosis Early—			
Previously reported as Normal, etc.	101		
Previously reported as Silicosis Early	237		
		338	= 5.24
Silicosis Advanced—			
Previously reported as Normal, etc.	....		
Previously reported as Silicosis Early	49		
Previously reported as Silicosis Advanced	9		
		58	= 0.90
Silicosis plus Tuberculosis—			
Previously reported as Normal, etc.	13		
Previously reported as Silicosis Early	11		
Previously reported as Silicosis Advanced	1		
		25	= 0.30
Tuberculosis only—			
Previously reported as Normal, etc.		8	= 0.12
Total number of men examined		6,450	= 100.00

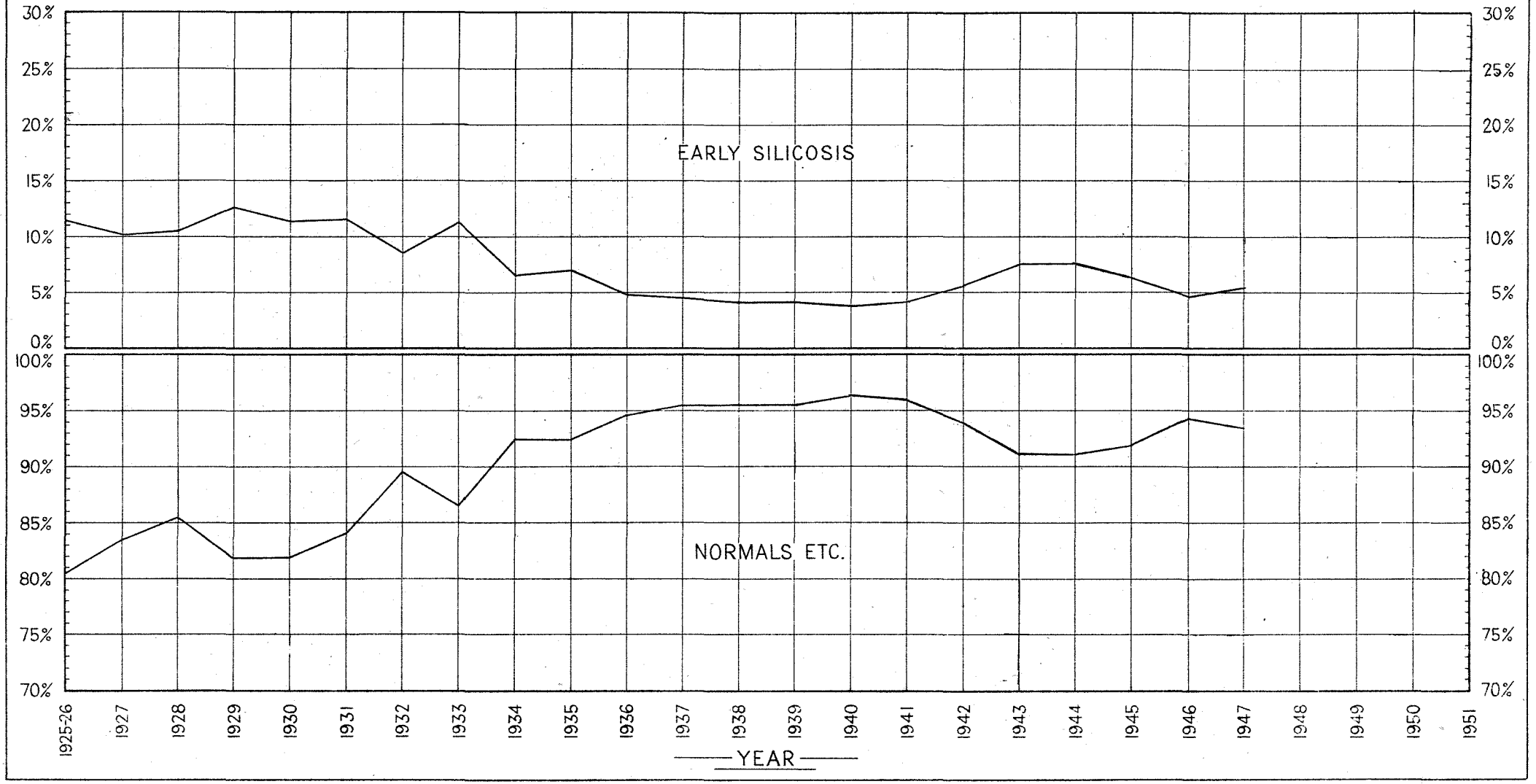
Men employed in the outlying districts were not examined during 1929 or 1931 ; only those employed in Kalgoorlie and surrounding districts being examined. The increase in numbers diagnosed as Early Silicosis and Tuberculosis in 1930 was due to the improved plant and radiographic technique.

Only new miners and those whose previous diagnosis warranted review were examined in the outlying districts, during 1933.

PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No.1

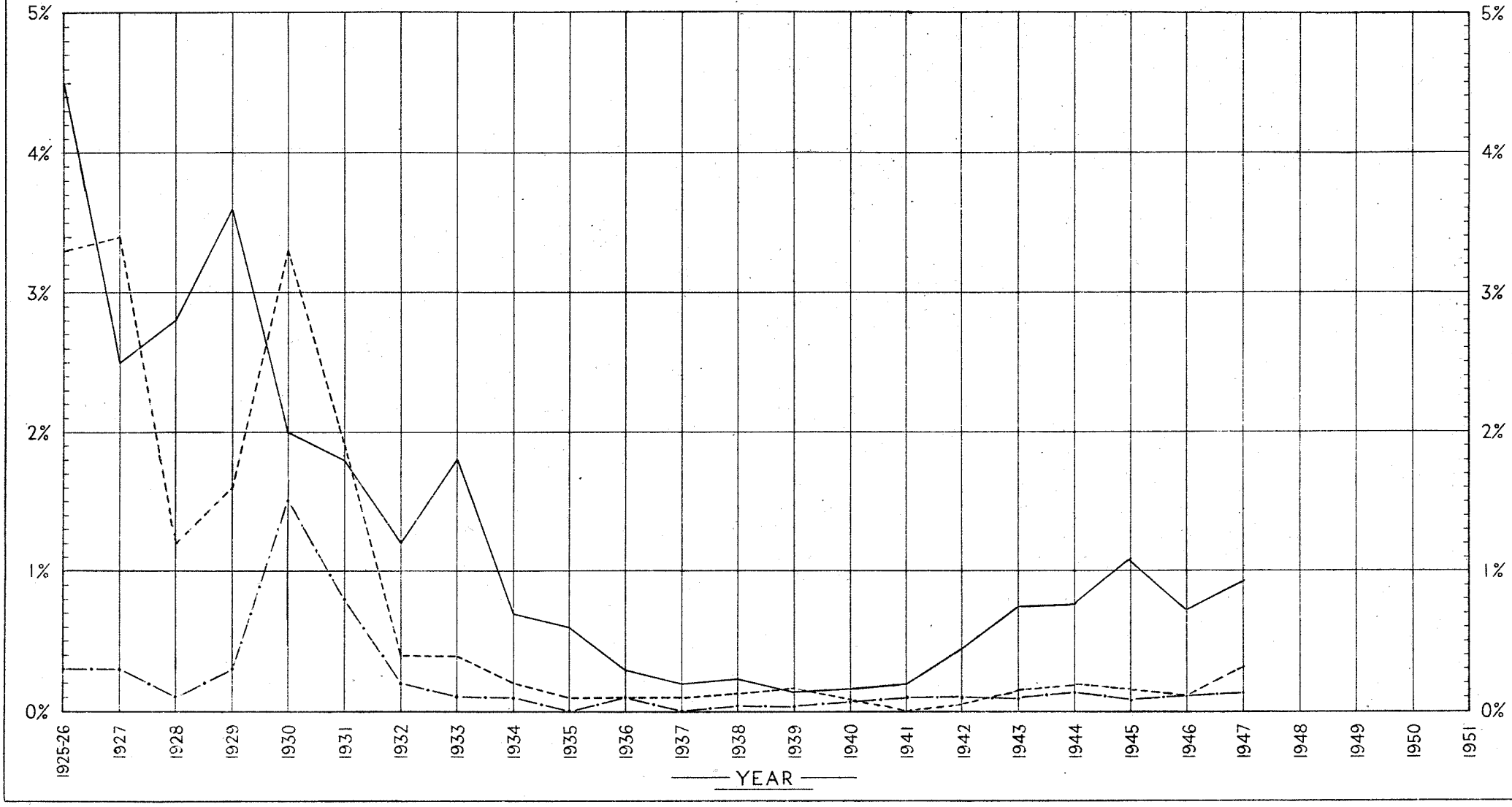
Showing Percentages of Normals and Early Silicotics, from 1925-26 onwards



PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No. 2

Showing Percentages of Silicosis Advanced, Silicosis plus Tuberculosis and Tuberculosis only, from 1925-26 onwards



Silicosis Advanced ———— *Silicosis Plus Tuberculosis* - - - - - - - - *Tuberculosis Only* —·—·—·—·—

Mining Statistics to 31st December, 1947.

TABLE OF CONTENTS.

TABLE I.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1947, AND THE TOTAL PRODUCTION TO DATE.

(*Note.*—Lease numbers in brackets indicate that the holding was *voided* during the year.)

(*Note.*—* denotes mainly derived from treatment of tailings.)

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Kimberley Goldfield.												
Brockman	109	Mt. Bradley	....	....	....	....	....	....	....	193·00	50·94	....
		Voided leases	....	....	....	....	....	....	....	1,352·75	1,404·40	....
		Sundry claims	....	....	....	....	....	7·62	7·62	2,484·00	1,871·92	....
Hall's Creek	....	Voided leases	....	....	....	....	....	....	....	423·00	477·76	....
		Sundry claims	....	....	....	....	....	27·73	....	204·55	159·68	....
Mt. Dockrell	95	Irish Lass	....	....	....	....	....	9·17	13·66	341·00	266·75	....
		Voided leases	....	....	....	....	....	....	....	832·70	939·34	93·00
		Sundry claims	....	....	....	....	....	....	20·03	160·00	89·64	....
Ponton	114, etc.	Granite Leases	....	....	8·25	1·77	....	....	....	8·25	1·77	....
		Voided leases	....	....	....	....	....	....	....	34·70	138·70	....
		Sundry claims	....	....	....	....	....	....	....	6·15	18·01	....
Ruby Creek	98	Goliath	....	*....	....	....	....	....	....	120·70	103·72	....
	97	Ruby Queen	....	....	120·00	74·45	2·14	....	....	2,919·25	1,631·30	2·14
	100	St. Lawrence	....	....	....	....	....	....	....	10·00	11·32	....
	96	West and Left	....	....	....	....	....	....	....	10·00	5·30	....
		Voided leases	....	....	....	....	....	....	16·05	12,761·50	9,499·48	....
		Sundry claims	12·71	....	8·00	6·03	....	12·71	....	281·25	183·30	....
The Mary	....	Voided leases	....	....	....	....	....	....	....	399·00	210·03	....
		Sundry claims	....	....	....	....	....	....	....	46·85	53·66	....
	From Goldfield generally :—											
		Reported by Banks and Gold Dealers	207·10	125·40	....	....	....	8,263·08	276·02	·75	1·54	....
		Totals	**219·81**	**125·40**	**136·25**	**82·25**	**2·14**	**8,320·31**	**333·38**	**22,589·40**	**17,118·56**	**95·14**
Pilbara Goldfield.												
MARBLE BAR DISTRICT.												
Bamboo Creek	856	Bulletin	....	....	....	....	....	....	8·36	3,156·00	999·41	....
	850	Federation	....	....	125·00	265·76	....	....	....	1,536·00	1,193·00	....
	866, 901	Greater Bonnie Doon (1935), Ltd.	....	....	....	....	....	....	....	2,530·00	1,043·86	....
	866	(Bonnie Doon)	....	....	....	....	....	....	....	204·00	78·03	....

	707	Kitchener	....	....	....	....	180·00	44·33	....	....	....	9,969·50	13,718·62	....
	1010	Mickey	....	....	....	....	30·00	8·22	....	....	....	1,654·00	444·29	....
	740, 794, 878	Mt. Prophecy Leases	....	....	....	....	1.0·00	44·84	....	....	....	8,310·50	8,354·45	....
	740	(Mt. Prophecy)	....	....	....	....	....	....	....	....	1·11	1,040·50	1,898·07	....
	794	(Perseverance)	....	....	....	....	....	....	....	....	....	290·50	584·21	....
	817	Prince Charlie	....	....	....	....	240·00	62·98	7·31	....	3·68	2,486·00	3,223·24	7·31
	1075	Queen	....	....	....	....	48·00	40·95	....	....	....	98·00	93·32	....
	924	True Blue	....	....	....	....	78·00	·83	....	....	....	2,057·25	84·54	....
		Voided leases	....	....	....	....	....	....	....	13·54	550·72	18,375·85	25,744·37	....
		Sundry claims	....	....	....	....	10·00	2·68	....	8·97	307·83	4,984·85	2,977·99	....
Boodalyerrie				Voided leases	....	....	....	....	....	....	....	292·07	120·25	587·86	....
				Sundry claims	....	....	....	....	....	....	....	7·16	....	....	....
Lalla Rookh				Voided leases	....	....	....	....	....	....	....	4·78	3,612·00	4,696·33	574·01
				Sundry claims	....	....	....	....	....	....	....	....	7,943·00	7,675·09	....
Marble Bar	927, etc.		....	Comet Gold Mines, Ltd.	....	....	2,767·75	3,744·27	....	....	....	106,610·94	96,722·83	....
	930, etc.		....	Prior to transfer to present holders	....	....	....	....	....	....	....	2,195·75	1,235·42	....
	1063		....	General	....	....	10·50	22·58	....	....	....	220·75	464·58	....
	912		....	Homeward Bound	....	....	347·75	246·07	....	....	....	6,019·00	3,064·41	....
	1054		....	Illareen	....	....	40·00	6·32	·36	....	....	40·00	6·32	·36
	1050		....	Stray Shot	....	....	3·75	1·01	....	....	....	96·25	77·29	....
				Voided leases	....	....	....	....	....	....	199·09	40,018·80	40,154·49	....
				Sundry claims	....	....	90·75	44·13	·05	67·08	251·77	19,599·54	12,408·35	·05
North Pole	1040		....	Normay	....	....	....	....	....	....	....	69·00	31·07	....
				Voided leases	....	....	....	....	....	....	....	548·00	400·52	....
				Sundry claims	....	....	....	....	....	....	....	549·75	286·38	....
North Shaw				Voided leases	....	....	....	....	....	7·53	....	1,072·45	996·29	....
				Sundry claims	....	....	....	....	....	2·84	567·06	179·75	121·72	....
Pilgangoora				Voided leases	....	....	....	....	....	16·65	....	2,255·00	403·60	....
				Sundry claims	....	....	....	....	....	161·08	8·13	481·60	146·39	....
Sharks				Voided leases	....	....	....	....	....	1·43	....	1,720·75	1,951·08	....
				Sundry claims	1.04	4.12	36·00	39·26	....	163·14	45·54	1,114·75	1,645·58	....
Talga Talga				Voided leases	....	....	....	....	....	....	93·15	1,799·00	1,760·68	....
				Sundry claims	....	....	....	....	....	64·70	85·18	1,975·90	1,499·86	....
Tambourah				Voided leases	....	....	....	....	....	....	73·90	1,576·50	1,882·29	....
				Sundry claims	....	....	....	....	....	89·52	294·75	3,742·25	2,689·78	....
Warrawoona				Voided leases	....	....	....	....	....	....	16·99	12,748·80	18,830·50	....
				Sundry claims	....	....	321·25	23·77	....	70·98	623·67	6,478·79	4,228·40	....
Western Shaw				Voided leases	....	....	....	....	....	....	....	1,222·50	957·80	....
				Sundry claims	....	....	....	....	....	22·34	67·47	71·50	81·49	....
Wymans Well	1002, 1003		....	Copenhagen Leases	....	....	....	....	....	....	....	785·75	39·29	....
	1002		....	(Copenhagen)	....	....	....	....	....	....	....	1,046·75	42·87	....
	1013		....	Trump	....	....	124·30	20·10	....	....	....	2,547·05	463·99	....
				Voided leases	....	....	....	....	....	....	42·86	1,144·79	1,176·28	....
				Sundry claims	3.33	....	48·60	29·34	....	4·47	51·52	2,475·96	1,247·95	....
Yandicoogina				Voided leases	....	....	....	....	....	....	140·76	3,159·20	6,218·83	....
				Sundry claims	....	....	....	....	....	4·32	239·89	574·50	642·82	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

PILBARA GOLDFIELD—*continued.*

MARBLE BAR DISTRICT—*continued.*

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1947.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
		From District generally:										
		Sundry Parcels treated at:										
		Bamboo Creek State Battery	....	....	....	*228·12	....	....	....	40·00	*10,077·91	181·04
		Marble Bar State Battery	....	....	....	*416·39	....	....	....	12·00	*10,030·76	....
		Ironclad Battery	....	....	....	....	....	....	....	....	*237·71	....
		The Great North-Western Gold Co., Ltd. Cyanide Plant	....	....	....	1·32	·65	....	....	....	*271·37	·65
		Various Works	....	....	....	....	....	....	....	237·95	*1,391·56	....
		Reported by Banks and Gold Dealers	102·84	....	....	....	1·27	14,196·95	436·76	....	·90	1·27
		Totals	**107·21**	**4·12**	**4,641·65**	**5,293·27**	**9·64**	**14,895·54**	**4,414·20**	**292,799·47**	**297,286·04**	**764·69**
		NULLAGINE DISTRICT.										
Eastern Creek	276L	Rose	....	....	5·00	3·86	....	....	....	56·50	72·11	....
		Voided leases	....	....	....	....	....	8·96	8·19	5,261·00	9,567·00	11·77
		Sundry claims	....	....	....	....	....	....	12·74	1,409·10	1,600·71	16·90
Elsie		Voided leases	....	....	....	....	....	....	....	586·25	1,675·91	....
		Sundry claims	....	....	....	....	....	....	8·28	58·00	188·08	....
McPhee's Creek		Voided leases	....	....	....	....	....	....	....	113·00	137·92	....
		Sundry claims	....	....	....	....	....	....	....	134·00	197·09	....
Middle Creek	279L	All Nations	....	....	85·50	32·20	·15	....	....	634·50	209·43	·15
	229L	Barton	....	....	191·00	27·66	....	1·22	....	1,610·50	278·72	....
	231L, etc.	Blue Spec Leases	....	....	4,028·89	4,645·11	....	....	....	21,130·39	10,138·88	....
	247L	Hopetown North	....	....	699·00	185·19	·08	....	....	1,212·50	296·46	·08
	267L	Little Wonder	....	....	....	....	....	....	....	3,226·00	869·72	....
		Voided leases	....	....	....	....	....	....	....	11,857·15	10,005·43	....
		Sundry claims	....	....	361·00	87·79	....	....	....	4,929·10	2,142·62	....
Mosquito Creek		Voided leases	....	....	....	....	....	1·07	30·12	8,232·30	12,814·22	....
		Sundry claims	....	....	32·00	9·10	....	....	181·64	3,692·94	3,780·41	....
Nullagine	283L	Grant's Hill	....	....	24·00	4·46	....	....	....	24·00	4·46	....
	289L	Paul's Leader	....	164·66	5·50	189·05	7·20	....	175·97	14·50	275·27	7·20
	270L	Valentine	....	7·77	....	....	....	....	7·77	156·50	81·64	....
		Voided leases	....	....	....	....	....	....	32·79	8,646·25	12,306·39	....
		Sundry claims	2·51	81·91	25·00	33·51	4·86	315·53	598·92	5,825·55	10,113·97	4·86
Twenty Mile Sandy	256L	Bill Jim	....	....	91·50	9·15	....	....	....	1,982·50	1,022·55	....
		Voided leases	....	....	....	....	....	....	3·20	5,221·20	7,971·21	....
		Sundry claims	....	....	119·00	70·23	·13	33·10	30·50	7,290·35	6,002·04	·13

		From District generally :—											
		Sundry parcels treated at :											
		Twenty Mile Sandy Cyanide Plant	....	....	....	....	12·00	16·66	....	....	....	12·00	*1,329·48	....
		Various Works	....	....	....	....	....	....	....	....	....	112·50	*6,340·55	....
		Reported by Banks and Gold Dealers	....	....	47·47	....	....	2·64	·80	9,378·87	97·45	....	29·81	·80
		Totals	....	....	**49·98**	**254·34**	**5,679·39**	**5,316·91**	**13·22**	**9,738·75**	**1,187·57**	**93,428·58**	**99,452·08**	**41·89**

Ashburton Goldfield.

Belvedere	....	Voided leases	....	....	....	....	....	....	....	....	9·88	1,560·00	435·86	176·48
Dead Finish	47	Star of the West	....	....	....	....	301·00	140·03	....	....	....	749·50	433·67	....
		Voided leases	....	....	....	....	....	....	....	....	....	281·50	279·51	....
		Sundry claims	....	....	....	....	....	....	....	....	11·89	78·75	235·31	....
Melrose	....	Voided leases	....	....	....	....	....	....	....	....	....	2,704·00	840·26	213·11
		Sundry claims	....	....	....	....	....	....	....	12·41	21·88	562·00	262·78	6·40
Mt. Edith	....	Sundry claims	....	....	....	....	....	....	....	....	....	5·00	3·97	....
Mt. Mortimer	....	Sundry claims	....	....	....	....	....	....	....	364·63	315·64	44·50	40·25	74·47
Uaroo	....	Voided leases	....	....	....	....	....	....	....	....	....	....	....	7,713·22
		From District generally :—												
		Reported by Banks and Gold Dealers	....	....	2·85	....	....	....	....	8,883·37	120·11	....	7·12	....
		Totals	....	....	**2·85**	....	**301·00**	**140·03**	....	**9,260·41**	**479·40**	**5,985·25**	**2,538·73**	**8,183·68**

Gascoyne Goldfield.

Bangemall	....	Voided leases	....	....	....	....	....	....	....	....	6·22	350·70	313·82	....
		Sundry claims	....	....	....	....	....	....	....	88·97	33·55	36·30	203·47	....
		From District generally :—												
		Reported by Banks and Gold Dealers	....	....	....	....	....	....	....	604·47	1·80	....	....	....
		Totals		....	....		....	....	....	**693·44**	**41·57**	**387·00**	**517·29**	....

Peak Hill Goldfield.

Egerton	556P	Pegasus	....	....	....	....	89·00	402·35	....	....	84·84	1,357·00	3,286·80	....
		Voided leases	....	....	....	....	....	....	....	60·86	30·91	5,077·25	2,842·45	....
		Sundry claims	....	....	....	....	46·00	12·94	....	235·35	23·51	1,501·77	791·34	....
Horseshoe	568P	Horseshoe Lights	....	....	....	....	1,081·75	265·33	....	....	....	1,081·75	265·33	....
	(564P)	Labourchere Main Lode	....	....	....	....	1,248·00	161·63	....	....	12·71	1,746·50	272·85	....
	565P	Nathan Bitter	....	....	....	....	34·00	15·73	....	....	....	475·00	121·88	....
		Voided leases	....	....	....	....	....	....	....	15·57	1,962·66	2,051·88	2,240·09	2·00
		Sundry claims	....	....	....	....	....	....	....	20·12	829·58	1,812·05	691·38	....
Jimblebar	....	Voided leases	....	....	....	....	....	....	....	....	172·75	7,526·25	2,561·95	·58
		Sundry claims	....	....	....	....	....	....	....	13·79	65·95	1,048·05	574·16	....

TABLE 1.—*Production of Gold and Silver from all sources, etc.*—continued.

PEAK HILL GOLDFIELD—*continued.*

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1947.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
Mt. Fraser	....	Voided leases	....	....	....	....	....	....	....	389·50	320·96	....
		Sundry claims	....	....	....	....	....	88·28	40·61	400·75	341·14	....
Mt. Seabrook	....	Voided leases	....	....	....	....	....	....	5·05	620·25	428·26	....
		Sundry claims	....	....	....	....	....	....	....	1,079·10	798·80	....
Peak Hill	512P	Atlantic	....	....	....	....	....	1·69	2·87	4,461·25	560·30	....
	552P	Bobby Dazzler	....	....	85·00	5·83	....	·63	....	590·50	264·70	....
	511P	Commercial	....	....	75·00	13·46	....	....	....	2,777·75	483·69	....
	448P	Evening Star	....	....	181·00	28·28	....	....	70·17	7,314·00	4,903·97	....
	567P	Miner Bird	....	....	219·00	135·44	....	....	....	492·00	285·03	....
	553P	Morning Star	....	....	103·00	28·57	....	....	4·43	2,757·25	363·13	....
	506P	No. 1 North	....	....	109·00	18·89	....	....	86·47	6,057·20	1,452·66	...
	492P	North Star	....	....	305·00	60·58	....	23·20	69·63	13,147·50	2,064·51	....
	573P	Wimpie	....	....	270·00	13·14	....	....	....	270·00	13·14	....
		Voided leases	....	....	....	....	....	6·76	850·04	513,042·83	241,783·14	2,285·63
		Sundry claims	....	2.42	77·00	24·83	....	61·51	278·03	34,013·85	8,915·79	....
Ravelstone	....	Voided leases	....	....	....	....	....	....	101·64	4,219·85	3,117·68	....
		Sundry claims	....	....	....	....	....	....	....	553·60	283·17	....
Wilgeena	....	Voided leases	....	....	....	....	....	....	23·54	128·50	146·79	....
Wilthorpe	....	Voided leases	....	....	....	....	....	....	....	47·00	20·93	....
		Sundry claims	....	....	....	....	....	....	....	89·00	25·71	....
Yowereena	....	Voided leases	....	....	....	....	....	....	....	19·50	36·46	...
		Sundry claims	....	....	....	....	....	....	....	117·25	203·16	....
		From Goldfield generally :—										
		Sundry parcels treated at :										
		State Battery, Peak Hill	....	....	....	*2·59·28	....	....	3·05	15·00	*6,701·19	....
		Australian Machinery Investment Co.	....	....	....	*172·25	....	....	....	....	*1,677·23	....
		Various Works	....	....	....	....	....	....	....	30·00	*5,661·37	23·12
		Reported by Banks and Gold Dealers	....	....	....	1·08	....	2,846·35	444·36	....	12·51	....
		Totals	....	2·42	3,922·75	1,629·61	....	3,374·41	5,162·80	616,310·93	294,513·65	2,311·33

East Murchison Goldfield.

LAWLERS DISTRICT.

Kathleen Valley	1330	Beth Heno	....	....	106·50	69·42	....	....	....	654·50	292·22	....
	1348	M. Harris	....	....	77·83	40·04	....	....	....	77·83	40·04	....
		Voided leases	....	....	....	....	....	....	144·85	78,824·00	48,174·48	....
		Sundry claims	....	....	110·75	151·94	....	14·37	526·03	5,369·75	2,373·02	....

Lawlers	1336	Caroline East	....	....	21·00	11·22	....	....	1·79	234·00	96·29	....
	1236, 1240, etc.	Emu Gold Mines, Ltd.	....	....	26,720·00	6,247·05	....	....	....	333,557·68	81,558·04	452·00
	1236, 1240, 1249	Prior to transfer to present holders	....	....	....	....	....	13·02	....	168·50	1,216·93	....
	1340	Never Can Tell	....	....	....	....	....	....	....	119·50	35·98	....
	1347	New Leviathan	....	....	12·00	2·99	....	....	....	12·00	2·99	....
		Voided leases	....	....	....	....	....	....	690·66	1,284,979·72	491,274·87	14,350·93
		Sundry claims	....	....	346·00	158·73	....	400·21	388·51	16,935·48	9,280·31	268·34
Sir Samuel	1333	Vanguard	....	....	104·00	15·05	....	....	....	1,566·00	206·03	....
		Voided leases	....	....	....	....	....	....	359·03	273,477·55	141,386·56	10,227·52
		Sundry claims	....	....	18·00	15·20	....	53·89	64·96	7,148·00	4,454·14	....
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Sir Samuel	....	....	....	18·97	....	....	....	53·50	*2,347·82	....
	Australian Machinery & Investment Co.	....	....	....	2·47	....	....	....	5·00	*4,291·25	29·00
	Prior to transfer to present holders	....	....	....	....	....	....	....	....	*1,371·33	15·64
	Australian Machinery & Investment Co., Ltd. (McPherson's Cyanide Plant)	....	....	....	....	....	2·12	....	12·03	*4,265·25	....
	Great Eastern Mining Syndicate	....	....	....	....	....	....	....	....	*352·19	·12
	Tallon Doon Battery	....	....	....	....	....	....	....	....	*101·50	....
	Vanguard Cyanide Plant	....	....	....	5·26	....	....	....	4·00	*841·68	....
	Various Works	....	....	....	....	....	....	2·35	1,699·50	*26,067·02	936·09
	Reported by Banks and Gold Dealers	1.58	....	....	....	....	6,377·46	101·09	·05	9·84	....
	Totals	**1.58**	....	**27,516·08**	**6,728·34**	....	**6,861·07**	**2,279·27**	**2,004,898·59**	**820,039·78**	**26,279·64**

WILUNA DISTRICT.

Coles	662J	Black Adder	....	....	240·00	163·62	....	....	....	1,348·50	683·95	....
		Voided leases	....	....	....	....	....	....	....	830·50	156·85	....
		Sundry claims	....	....	....	5·23	....	....	21·03	3,844·50	1,507·23	....
Corboys	671J	Barwidgee	....	....	90·00	40·18	....	....	....	135·00	55·71	....
	435J	Old Toscana	....	....	42·00	146·41	....	5·24	....	991·50	788·04	....
	669J	Vinaurum	....	....	67·00	8·61	....	....	....	683·00	390·61	....
	433J	Waratah	....	....	....	....	....	....	....	288·00	106·73	....
	433J, etc.	(Waratah Leases)	....	....	....	....	....	....	....	1,188·04	568·94	....
	433J, etc.	(Waratah G.M., N.L.)	....	....	....	....	....	....	....	359·00	587·92	....
		Voided leases	....	....	....	....	....	....	1·25	10,593·25	7,403·59	5·00
		Sundry claims	....	....	257·50	89·55	....	21·58	....	8,531·35	4,884·61	....
Gum Creek	....	Voided leases	....	....	....	....	....	20·75	....	1,380·00	595·73	....
		Sundry claims	....	....	28·00	10·19	....	....	1·36	407·25	131·08	....
Mt. Eureka	....	Voided leases	....	....	....	....	....	....	....	142·25	96·36	....
		Sundry claims	....	....	....	....	....	....	....	783·75	548·56	....
Mt. Keith....	....	Voided leases	....	....	....	....	....	....	44·54	20,259·50	13,551·08	....
		Sundry claims	....	....	....	....	....	4·81	227·29	3,862·50	2,480·03	....
New England	672J	Lady Lila	....	....	28·00	19·70	....	....	....	28·00	19·70	....
		Voided leases	....	....	....	....	....	5·74	95·70	5,333·25	3,471·17	....
		Sundry claims	....	....	....	....	....	9·31	5·78	4,534·75	3,111·97	....
Wiluna	552J (664J)	Coolgardie Brilliant, N.L.	....	....	....	....	....	....	....	21,257·00	7,297·61	....
	552J	Prior to transfer to present holders	....	....	....	....	....	....	....	7,257·00	2,202·75	12·40
	674J	Essex....	....	....	1,013·00	244·99	....	....	....	1,013·00	244·99	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued

EAST MURCHISON GOLDFIELD—*continued.*

WILUNA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
	631J	Gypsy Gold Mines	....	....	55·50	22·29	....	....	....	55·50	22·29	....
	631J	Prior to transfer to present holders	....	....	....	....	....	....	....	1,962·75	267·42	....
	676J	International	....	....	376·00	73·76	....	....	....	376·00	73·76	....
	677J	Lucky Hit	....	....	195·00	33·01	....	....	....	195·00	33·01	....
	675J	Tried Again	....	....	51·75	2·72	....	....	....	51·75	2·27	....
	194J, etc.	Wiluna Gold Mines, Ltd.	....	....	3,854·50	11,100·79	3,660·00	....	....	7,345,442·50	1,318,141·89	5,759·41
		Prior to transfer to present holders	....	....	....	....	....	....	....	341,730·57	133,457·92	89·32
		Voided leases	....	....	....	....	....	....	574·76	1,051,600·83	308,597·03	1,337·00
		Sundry claims	....	....	940·75	434·64	....	105·39	219·08	26,211·30	10,585·34	0·33
	From District generally :—											
	Sundry parcels treated at :											
	Black Adder Battery		....	....	....	....	....	....	....	....	*154·02	....
	Coolgardie Brilliant Battery		....	....	....	*44·05	....	....	....	....	*219·34	....
	Toscana Cyanide Plant		....	....	....	*69·39	....	....	....	....	*2,577·90	....
	Waratah Cyanide Plant		....	....	....	*90·92	....	....	....	....	*753·10	....
	State Battery, Wiluna		....	....	....	*6·95	....	....	....	637·00	*22,167·25	218·70
	Various Works		....	....	....	....	....	....	....	....	*1,237·68	12·68
	Reported by Banks and Gold Dealers		....	....	....	....	....	49·54	56·58	....	51·48	....
	Totals		....	....	**7,249·00**	**12,607·00**	**3,660·00**	**222·36**	**1,247·37**	**8,863,327·09**	**1,849,227·36**	**7,434·84**
		BLACK RANGE DISTRICT.										
Barrambie	972B, 976B	Sheelite Leases	....	....	181·25	168·72	....	....	....	797·75	866·83	....
	972B	(Sheelite)	....	....	....	....	....	....	....	105·50	108·88	....
	976B	(Sheelite North)	....	....	....	....	....	....	....	92·75	92·83	....
		Voided leases	....	....	....	....	....	....	22·49	17,359·42	16,200·76	125·60
		Sundry claims	....	2.10	....	....	....	5·07	170·20	833·55	915·51	....
Bellchambers	....	Voided leases	....	....	....	....	....	....	111·80	4,249·27	3,130·56	....
		Sundry claims	....	....	334·50	113·34	....	....	....	1,008·30	547·06	....
Berrigrin	....	Voided leases	....	....	....	....	....	....	820·68	12,042·93	15,086·09	....
		Sundry claims	....	....	....	....	....	....	179·92	2,187·55	1,238·22	....
Curran's Find	....	Voided leases	....	....	....	....	....	18·24	222·89	7,252·25	3,116·68	....
		Sundry claims	....	....	....	....	....	....	29·38	2,158·75	827·18	....
Erroll's	....	Voided leases	....	....	....	....	....	14·17	152·29	14,170·50	9,328·92	....
		Sundry claims	....	....	....	....	....	6·53	399·11	964·75	595·45	....
Hancock's....	1074B	Apples	....	....	72·25	316·54	....	....	443·79	672·00	967·70	....
		Voided leases	....	....	....	....	....	....	6,524·37	32,624·50	33,433·33	55·72
		Sundry claims	....	....	48·50	20·40	....	4·21	142·89	8.434·60	3,215·21	....

Maninga Marley	....	Voided leases	....	....	....	....	....	....	....	195·20	60,833·48	48,494·40	22·55
		Sundry claims	....	....	8·25	3·88	....	....	....	158·16	3,079·65	1,768·16	....
Montagu	967B, 998B	North Erd Leases	....	....	1,286·00	120·32	....	....	....	....	36,773·95	4,998·48	....
		Voided leases	....	....	....	....	....	....	....	100·17	39,672·65	16,888·02	....
		Sundry claims	....	....	....	....	....	....	....	71·09	5,018·60	3,147·93	....
Nunngarra	1085B	Sonny James	....	....	12·25	2·30	....	....	....	....	12·25	2·30	....
		Voided leases	....	....	....	....	....	25·94	952·34	9,483·75	3,643·38	....	
		Sundry claims	....	....	54·00	4·14	....	50·27	1,458·06	7,561·15	2,942·80	....	
Sandstone	959B, etc.	Atlas Gold Mines, Ltd.	....	....	....	....	....	....	....	959·00	168·60	....	
	959B, 1017B	Prior to transfer to present holders	....	....	....	....	....	....	136·06	537·75	686·59	....	
	1076B, 1080B....	Black Range Gold Mines, Ltd.....	....	....	....	....	....	....	....	84·00	14·34	....	
	1075B	Doolette South	....	....	359·75	330·40	....	....	217·54	1,407·00	1,916·84	....	
	958B	Lady Mary	....	....	303·50	487·12	....	....	....	6,889·00	6,604·98	2·28	
		Voided leases	....	....	....	....	....	4·75	4,010·09	692,530·07	444,309·77	11,754·22	
		Sundry claims	....	....	324·75	71·79	....	44·95	1,421·07	15,232·20	6,777·54	....	
Youanme	1046B	Camberra	....	....	....	....	....	....	....	1,501·00	443·13	....	
	960B, etc.	Youanme Leases	....	....	....	*164·30	....	....	....	1·50	271·36	....	
	960B, etc.	(Youanme Gold Mines, Ltd.)	....	....	....	....	....	....	....	370,977·77	96,279·42	5,865·55	
	960B	(Youanme)	....	....	....	....	....	....	....	38·50	3·91	....	
		Voided leases	....	....	....	....	....	0·36	126·92	358,978·78	176,882·54	4,608·55	
		Sundry claims	....	....	....	....	....	1·07	18·79	6,258·55	1,814·66	....	
	From District generally :—												
	Sundry parcels treated at :												
	State Battery, Sandstone	....	....	....	*340·55	....	....	....	....	290·50	*23,005·08	59·53	
	State Battery, Youanme	....	....	....	....	....	....	....	....	40·00	*5,461·83	....	
	North End Battery Cyanide Plant	....	....	....	....	....	....	....	....	....	*4,934·14	....	
	Dume Paskov (L.T.T. 1056H)	....	....	55·50	4·43	....	....	....	....	55·50	4·43	....	
	Various Works	....	....	....	....	....	....	....	....	37·00	*6,505·69	....	
	Reported by Banks and Gold Dealers	....	....	....	....	....	1,457·11	52·23	....	20·38	....		
	Totals	....	**2.10**	**3,040·50**	**2,148·23**	....	**1,632·67**	**18,137·53**	**1,723,607·97**	**947,661·91**	**22,494·00**		

Murchison Goldfield.

CUE DISTRICT.

Big Bell	2050, etc.	Big Bell Mines, Ltd.	....	....	357,623·00	41,048·18	12,601·58	....	....	2,737,430·00	351,296·71	119,056·51	
	2050	(Little Bell)	....	....	....	....	....	....	4·49	579·75	60·95	....	
	2219	Pindar	....	....	61·25	64·65	....	....	....	126·25	144·00	....	
		Voided leases	....	....	....	....	....	....	....	274·75	278·83	....	
		Sundry claims	....	....	....	....	....	0·39	6·32	359·50	339·41	....	
Cuddingwarra	....	Voided leases	....	....	....	....	....	10·59	132·46	102,020·41	56,131·93	100·71	
		Sundry claims	....	13.31	507·25	297·59	....	1·46	379·49	8,822·14	5,169·50	9·00	
Cue	2236	Hill View	....	....	147·75	77·38	....	95·96	298·39	1,076·00	1,091·33	2·48	
	2247	Victory	....	....	84·75	51·66	....	....	....	92·00	57·33	....	
		Voided leases	....	....	....	....	....	106·75	613·21	287,720·44	220,011·47	66·63	
		Sundry claims	9.47	....	685·00	284·09	....	252·92	894·70	42,460·74	19,262·53	....	
Eelya	2241	Eagle Hawk	....	....	81·00	16·63	....	....	....	81·00	16·63	....	
		Voided leases	....	....	....	....	....	....	8·78	1,039·00	1,811·26	....	
		Sundry claims	....	....	19·00	4·48	....	6·20	143·81	1,587·90	921·69	....	

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

CUE DISTRICT.—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
Mindoolah	....	Voided leases	....	....	....	....	....	3·07	2·54	9,380·28	5,672·31	42·97
		Sundry claims	....	....	128·50	120·70	....	....	29·30	3,130·60	2,301·25	....
Reedy	2253	Rand No. 3	....	....	333·00	109·02	....	....	....	333·00	109·02	....
	1977, etc	Triton Gold Mines, N.L.	....	....	55,961·00	14,381·96	1,380·76	....	....	660,031·00	205,423·42	19,172·38
	1977, etc.	Prior to transfer to present holders	....	....	....	....	....	....	....	16,338·50	7,471·50	5·00
		Voided leases	....	....	....	....	....	1·46	214·65	6,552·93	10,128·90	1·22
		Sundry claims	....	....	408·65	79·64	....	170·71	120·73	5,465·20	2,347·49	....
Tuckabianna	2130	Garibaldi	....	....	18·75	12·87	....	....	45·22	317·63	557·23	....
	2237	Gidgie	....	....	191·50	63·81	....	....	....	2,419·90	893·96	....
	2244	Winston	....	....	....	....	....	....	198·46	71·00	40·13	....
		Voided leases	....	....	....	....	....	649·70	252·46	12,590·85	6,764·20	....
		Sundry claims	....	....	296·25	52·32	....	143·17	480·56	4,560·60	2,548·79	....
Tuckanarra	2079	Bachelor	....	....	....	....	....	70·72	75·39	450·25	381·43	....
		Voided leases	....	....	....	....	....	14·65	3,435·71	19,034·00	22,436·76	172·77
		Sundry claims	....	....	46·75	9·28	....	115·23	769·93	9,898·30	10,205·49	....
Weld Range	2252	Peter	....	....	102·25	97·87	....	....	....	102·25	97·87	....
		Voided leases	....	....	....	....	....	....	23·64	1,593·75	834·35	....
		Sundry claims	....	....	147·25	342·72	....	....	3·90	1,351·00	1,108·85	....
		From District generally :—										
		Sundry parcels treated at :										
		State Battery, Cue	....	....	....	*990·55	18·29	....	....	76·25	*21,776·42	110·22
		State Battery, Tuckanarra	....	....	....	....	....	....	....	518·50	*5,535·57	....
		Various Works	....	....	....	....	....	....	....	7,158·52	*29,387·81	1,147·77
		Reported by Banks and Gold Dealers	14.88	5.56	....	....	....	3,347·00	103·62	....	22·62	....
		Totals	**24.35**	**18.87**	**416,842·90**	**58,105·40**	**14,000·63**	**5,006·98**	**8,237·76**	**3,945,074·19**	**992,638·94**	**139,887·96**
		MEEKATHARRA DISTRICT.										
Abbotts	....	Voided leases	....	....	....	....	....	....	26·45	3,341·35	38,775·28	....
		Sundry claims	....	....	17·75	11·14	....	....	5·29	3,679·02	2,248·97	....
Burnokura	1849N	New Alliance	....	....	....	....	....	....	....	132·25	114·39	....
		Voided leases	....	....	....	....	....	....	3,247·59	39,040·45	30,775·77	26·90
		Sundry claims	....	....	....	....	....	17·03	129·24	2,218·05	1,163·75	1·54
Chesterfield	(1904N)	Margueritta	....	....	6·00	16·81	....	....	....	6·00	16·81	....
		Voided leases	....	....	....	....	....	29·02	420·32	6,869·26	7,483·76	0·80
		Sundry claims	....	....	29·25	4·59	....	....	42·19	917·80	718·79	....

Gabanintha	1854N	Golden Star	....	....	53·75	13·26	....	....	....	290·50	268·46	....
	1896N	Mab	....	....	94·25	215·26	....	....	....	94·25	215·26	....
	1725N	New Brew	....	....	1,138·25	1,437·82	....	....	....	3,844·60	5,322·10	....
		Voided leases	....	....	....	....	....	11·79	28·82	23,826·75	14,039·87	815·57
		Sundry claims	....	....	122·00	86·10	....	16·78	158·94	4,064·00	2,492·88	....
Garden Gully	....	Voided leases	....	....	....	....	....	26·36	74·91	30,238·32	21,847·71	1,102·59
		Sundry claims	....	....	40·75	10·79	....	....	7·51	2,905·44	1,695·15	....
Gum Creek	....	Voided leases	....	....	....	....	....	25·27	91·96	3,893·08	3,819·91	....
		Sundry claims	....	....	....	....	....	4·37	84·86	727·25	636·85	....
Holden's	1551N	New Waterloo	....	....	....	....	....	....	0·99	1,468·00	918·92	....
		Voided leases	....	....	....	....	....	....	18·00	16,593·00	6,401·50	....
		Sundry claims	....	....	....	....	....	164·95	49·07	425·15	279·25	....
Jillawarra	1908N	Dusty Galah Gold Mining Co., Ltd.	....	....	49·00	14·25	....	....	....	49·00	14·25	....
	1871N	Werribee	....	....	....	....	....	....	128·85	410·50	703·74	....
		Voided leases	....	....	....	....	....	....	1,134·68	1,499·55	2,801·53	....
		Sundry claims	....	....	30·50	18·77	....	173·02	150·04	404·50	378·36	....
Meeka Pools	....	Voided leases	....	....	....	....	....	....	....	111·58	82·27	....
		Sundry claims	....	....	....	....	....	....	2·84	233·57	205·38	....
Meekatharra	1861N	Adele May	....	....	15·00	23·63	....	....	....	24·00	28·00	....
	(1905N)	Britannia	....	....	301·25	33·96	....	....	....	301·25	33·96	....
	(1883N)	Coffee Pot	....	....	6·75	2·10	....	....	....	211·75	85·08	....
	1855N	Commodore	....	....	280·00	114·38	....	....	....	1,015·25	327·84	....
	1553N	Consols North	....	....	48·50	26·68	....	....	....	659·75	1,359·33	....
	1900N	Danube	....	....	47·00	8·16	....	....	....	107·25	45·35	....
	1894N, 814N	Fenian Leases	....	....	129·25	792·57	....	....	....	329,406·69	261,612·21	....
	477N)	Fenian	....	....	....	....	....	....	....	8,831·75	18,289·22	....
	1890N	Gold Jay	....	....	....	....	....	....	12·21	49·25	217·06	....
	1893N	Halcyon	....	....	903·25	144·37	....	....	0·78	2,114·25	350·70	....
	1888N	Haveluck	....	....	649·25	2·5·08	....	....	....	856·50	314·05	....
	1559N	Ingliston	....	....	14·50	22·58	....	....	491·80	1,780·80	1,596·75	....
	1542N	Ingliston Alberts	....	....	....	....	....	....	....	305·50	446·00	....
	(1542N)	Ingliston Alberts Leases	....	....	....	....	....	....	....	2,983·70	1,283·06	....
	1895N, etc.	Ingliston Consols Extended Leases	....	....	....	....	....	....	....	873,719·47	357,046·42	....
	475N	Prior to transfer to present holders	....	....	....	....	....	....	....	1,536·25	4,248·25	0·30
	1547N	Lady Central	....	19.36	....	....	....	....	19·36	32·75	26·05	....
	(1547N)	Meekatharra Central Gold, N.L.	....	....	....	....	....	....	5·29	4,842·25	2,463·30	....
	(1547N)	Lady Central Leases	....	....	....	....	....	....	11·06	2,951·42	5,198·33	....
	1899N	Marmont	....	....	80·00	49·34	....	....	89·33	60,425·20	43,171·40	....
	1906N	Marmont Extended	....	....	81·00	251·56	....	....	....	1,748·95	1,813·96	....
	580N	Marmont Extended Leases	....	....	....	....	....	....	....	152·00	129·61	....
	1577N	Mopoke	....	....	....	....	....	....	12·47	1,338·25	820·16	....
	1860N	New Gwalia	....	....	21·50	4·57	....	....	....	544·50	127·40	....
	1800N	Peter Pan	....	....	....	....	....	....	....	948·00	90·78	....
	1571N	Phar Lap	....	....	261·75	96·86	....	....	....	7,682·50	4,777·76	....
	1529N	Prohibition G.M. Co., N.L. (In liquidation)	....	....	700·00	736·55	0·04	....	....	25,544·25	5,535·97	11·87
	1529N	Prior to transfer to present holders	....	....	....	....	....	....	....	29,422·00	4,971·30	....
		Voided leases	....	....	....	....	....	3·88	1,323·77	392,770·73	217,963·57	2,454·74
		Sundry claims	....	45.63	870·00	273·42	....	229·71	622·94	23,834·95	9,484·74	....
Mistletoe	....	Voided leases	....	....	....	....	....	4·15	1,000·24	417·00	486·21	....
		Sundry claims	....	....	....	...	....	119·14	71·85	19·75	2·03	....
Mt. Maitland	....	Voided leases	....	....	....	....	....	....	....	88·00	80·11	....
		Sundry claims	....	....	....	....	....	....	....	420·75	240·86	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MEEKATHARRA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
Munara Gully	....	Voided leases	....	....	....	....	....	....	....	13,283·50	6,559·93	....
		Sundry claims	....	....	....	....	....	....	3,423·00	1,009·75	373·74	....
Nannine	1872N	Blue Pedro	....	....	639·25	101·53	....	....	....	7,643·00	1,751·65	....
	1580N	Caledonian	....	....	306·40	132·91	....	....	2·18	1,331·50	625·63	....
	1919N	Devil's Dice	....	....	395·80	101·83	....	....	....	395·80	101·83	....
		Voided leases	....	....	....	....	....	37·25	826·58	113,302·32	72,373·24	167·45
		Sundry claims	....	....	101·75	11·34	....	116·99	1,248·76	6,109·43	4,658·63	....
Quinns	....	Voided leases	....	....	....	....	....	7·30	1,186·50	33,356·91	13,464·37	90·70
		Sundry claims	....	....	....	....	....	15·07	1,289·65	3,841·67	2,718·33	....
Ruby Well	....	Voided leases	....	....	....	....	....	....	43·46	7,461·00	4,046·70	....
		Sundry claims	....	....	....	....	....	1,015·87	409·39	520·25	629·60	....
Stake Well	....	Voided leases	....	....	....	....	....	....	200·12	21,362·00	9,566·18	....
		Sundry claims	....	....	....	....	....	31·91	34·73	1,003·60	584·54	....
Star of the East	....	Voided leases	....	....	....	....	....	....	....	27,244·00	20,305·40	....
		Sundry claims	....	....	....	....	....	....	....	127·62	94·97	....
Yalogindа	1853N	Bluebird	....	....	....	....	....	....	....	4,002·00	1,219·21	....
	1898N	Rocklee	....	....	....	....	....	....	....	72·00	41·37	....
		Voided leases	....	....	....	....	....	19·03	1,972·23	28,103·54	14,567·99	8·68
		Sundry claims	....	....	118·75	150·16	....	61·89	647·51	10,253·17	4,850·81	....
	From District generally :—											
	Sundry parcels treated at :											
	Meekatharra Sands Treatment and Mining, N.L.		....	....	....	*141·67	....	....	....	....	*141·67	....
	State Battery, Meekatharra		....	....	....	*394·45	....	....	....	88·50	*24,007·64	19·00
	Various Works		....	....	....	....	....	....	....	172·75	*6,729·60	342·17
	Reported by Banks and Gold Dealers		11·35	0·90	....	18·66	....	12,130·16	179·70	13·50	40·66	....
	Totals		**11·35**	**65·89**	**7,552·45**	**5,727·15**	**0·04**	**14,260·94**	**17,538·60**	**2,238,567·69**	**1,277,541·42**	**5,042·31**
		DAY DAWN DISTRICT.										
Day Dawn	652D	Creme D'Or	....	....	27·00	13·59	....	....	....	252·00	181·21	....
	573D	Mountain View	....	....	1,922·25	12,795·32	....	....	94·05	10,050·78	32,623·97	....
	576D	New Fingall....	....	....	....	....	....	6·12	6·84	3,230·00	1,226·01	....
	L.T.T. 1078H	G. Arrigoni	....	....	25·25	2·68	....	....	....	25·25	2·68	....
		Voided leases	....	....	....	....	....	160·34	826·65	1,921,704·61	1,225,385·07	169,210·44
		Sundry claims	....	....	165·25	131·24	....	93·42	508·85	12,702·76	6,307·68	....

Lake Austin	....	Voided leases	....	....	....	....	....	613·00	3,079·62	36,872·20	51,050·49	....
		Sundry claims	....	....	42·25	20·13	....	59·07	965·49	3,215·69	1,262·84	....
Mainland	....	Voided leases	....	....	....	....	....	0·41	3,296·77	7,575·62	25,026·07	....
		Sundry claims	1.28	4.37	....	....	....	17·85	771·56	1,337·95	701·31	....
Pinnacles	....	Voided leases	....	....	....	....	....	4·90	1,213·68	18,117·00	9,869·29	....
		Sundry claims	....	....	9·75	1·45	....	62·93	446·50	4,275·92	1,643·22	....
	From District generally :—											
	Sundry Parcels treated at :											
	Various Works	....	....	....	....	....	....	16·61	962·75	*1,985·65	....
	Reported by Banks and Gold Dealers	41.78	2.64	....	....	....	2,071·25	37·30	....	12·57	....
	Totals	**43.06**	**7.01**	**2,191·75**	**12,964·71**	....	**3,092·59**	**11,263·92**	**2,020,332·53**	**1,357,278·06**	**169,210·44**

MOUNT MAGNET DISTRICT.

Jumbulyer	1410M	Gold Bug	....	....	11·25	7·86	....	....	....	142·50	142·84	....
		Voided leases	....	....	....	....	....	....	13·37	680·10	361·74	....
		Sundry claims	....	....	31·50	25·64	....	20·32	116·27	1,150·95	823·27	....
Lennonville	1308M	Empress	....	....	....	....	....	....	....	435·00	125·24	....
	1379M	Galtee Moore	....	....	145·00	41·18	....	....	....	5,721·00	1,509·15	....
	1378M	Gambier Lass	....	....	....	....	....	....	5·85	419·00	101·26	....
	1430M	Souvenir	....	....	121·00	273·23	....	....	....	267·00	421·96	....
	1436M	Splendour Group	....	....	....	....	....	....	....	9·75	5·25	....
		Voided leases	....	....	....	....	....	....	3,221·06	144,095·30	126,061·37	458·82
		Sundry claims	....	....	75·75	107·86	....	23·30	108·82	13,885·27	5,338·75	....
Mt. Magnet	1255M, 1415M....	Edward Carson Leases	....	....	....	*51·59	....	....	....	17,890·50	12,783·83	7·00
	1286M	Evening Star	....	....	27·00	14·07	....	....	36·37	3,109·32	1,223·17	....
	1287M	Havelock	....	....	....	....	....	....	11·05	4,332·50	840·14	....
	1282M, etc.	Hill 50 G.M. Co., N.L.	....	....	50,659·00	13,672·78	249·90	....	....	368,552·90	108,010·43	940·50
	1361M	Jupiter	....	....	130·00	33·79	....	....	·83	437·00	141·77	....
	(1411M)	Leap Year	....	....	....	6·34	....	....	6·54	646·75	482·99	....
	1246M	Neptune	....	....	....	....	....	....	829·41	8,787·65	4,103·31	·21
	1441M	Perseverance	....	....	123·00	12·90	....	....	....	123·00	12·90	....
	1281M, etc. ...	Saturn Leases	....	....	....	....	....	....	101·24	37,413·00	5,771·04	....
	(1251M, etc.)	Swan Bitter G.M. Co., N.L.	....	....	129·50	25·32	·02	....	18·02	14,112·45	5,301·79	·02
	(1251M)	Prior to transfer to present holders	....	....	....	....	....	....	320·12	6,081·25	3.180·61	....
	1322M	Three Boys	....	....	....	....	....	....	231·11	500·78	668·29	....
		Voided leases	....	....	....	....	....	29·26	9,098·14	771,238·41	295,774·96	851·37
		Sundry claims	....	....	765·25	534·89	....	122·27	2,626·24	58,107·45	28,754·99	4·49
Mt. Magnet, East	....	Voided leases	....	....	....	....	....	63·29	764·53	5,522·28	2,811·75	....
		Sundry claims	....	....	....	....	....	....	37·22	418·25	428·29	....
Moyagee	1355M	Moyagee	....	....	....	*356·19	1·57	....	....	2,621·25	4,878·13	353·05
	1355M (1398M)	(Moyagee Leases)	....	....	....	....	....	....	....	4,641·00	5,489·13	382·52
	1440M	Try Again	....	....	24·75	41·97	....	....	....	24·75	41·97	....
		Voided leases	....	....	....	....	....	....	23·59	5,107·60	7,575·88	....
		Sundry claims	....	....	32·25	68·91	....	14·44	176·21	1,516·25	1,746·42	....
Paynesville	....	Voided leases	....	....	....	....	....	....	1,613·34	449·77	1,116·15	....
		Sundry claims	....	....	....	....	....	3·36	540·21	882·57	1,372·00	....
injongoo	....	Voided leases	....	....	....	....	....	·99	191·88	72·00	69·98	....
		Sundry claims	....	....	....	....	....	....	223·32	237·53	71·58	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MOUNT MAGNET DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Boogardie	....	....	....	*117·14	....	....	....	125·26	*33,218·04	4·20
		B. Carratti's Plant, L.T.T. 1048H	....	....	....	....	....	....	....	3·00	*30·38	....
		Empress Battery	....	....	....	....	....	....	....	....	*36·98	....
		Heines Tailing Treatment Plant	....	....	....	....	....	....	....	....	*48·68	5·26
		Welcome Cyanide Plant	....	....	....	....	....	....	....	10·00	*941·39	....
		Various Works	....	....	....	....	....	....	....	43·06	*17,428·06	1·00
		Reported by Banks and Gold Dealers	12.73	....	....	....	....	2,259·07	88·43	8·00	64·95	·22
		Totals	**12.73**	....	**52,275·25**	**15,397·66**	**251·49**	**2,536·30**	**20,403·17**	**1,479,821·40**	**679,310·81**	**3,008·66**
		Yalgoo Goldfield.										
Bilberatha		Voided leases	....	....	....	....	....	1·27	90·94	3,384·50	1,845·05	....
		Sundry claims	....	....	....	....	....	....	6·64	3,075·05	1,401·56	....
Carlaminda		Voided leases	....	....	....	....	....	1·28	3·39	2,056·57	862·42	3·30
		Sundry claims	....	....	....	....	....	....	....	1,368·50	600·68	....
Field's Find	907	Brown's Reward	....	....	....	....	....	....	....	300·00	75·91	....
	907, etc.	Brown's Reward Leases	....	....	....	....	....	....	....	4,540·55	3,800·16	....
	1119	Field's Find Central West	....	....	26·00	7·33	....	....	....	51·00	14·00	....
	1119 (1114)	Field's Find Central West Leases	....	....	....	....	....	....	....	4,625·00	1,074·53	56·69
	1207	Rose Marie	....	....	80·52	62·62	....	....	....	177·67	137·22	....
		Voided leases	....	....	....	....	....	....	226·72	40,635·41	28,671·03	....
		Sundry claims	....	....	19·00	4·04	....	5·77	179·54	5,434·25	1,763·09	....
Goodingnow	1063	Ark	....	....	60·50	22·29	....	....	1·23	1,021·00	432·50	....
	1102	Astor	....	....	....	....	....	....	....	5,442·75	2,925·64	....
	1198	Astor South	....	....	....	....	....	....	....	498·50	114·17	....
	1025	Carnation	....	....	944·00	789·06	....	....	....	17,205·55	12,616·02	....
	1206	Orchid	....	....	....	....	....	....	....	157·50	33·74	....
	1145	Oversight	....	....	214·50	63·82	....	....	....	2,053·35	709·40	....
	1208	Oversight South	....	....	....	....	....	....	....	235·00	33·78	....
	1085	Sweet William	....	....	....	....	....	....	2·97	792·00	249·45	....
		Voided leases	....	....	....	....	....	146·70	277·66	49,369·06	46,525·98	....
		Sundry claims	....	....	25·50	4·48	....	152·96	169·70	10,082·25	5,080·62	....
Gullewa	1189	King Solomon's Mine	....	....	....	....	....	....	....	315·00	135·89	5·79
	1189, etc.	(King Solomon's Mines, Ltd.)	....	....	....	....	....	....	....	5,130·10	2,101·25	26·49
	1047	Mugga King	....	....	120·00	7·55	....	....	7·76	8,932·50	2,846·44	81·38
		Voided leases	....	....	....	....	....	....	11·29	25,536·00	15,882·93	·04
		Sundry claims	....	....	....	....	....	....	170·45	4,391·25	1,918·24	....

Kirkalucka	....	Voided leases	....	....	....	....	....	....	....	....	61·25	45·10	....
		Sundry claims	....	....	....	....	....	....	....	17·79	257·30	126·29	....
Messenger's Patch	1197	Gnow's Nest	3.21	....	....	....	....	8·64	....	....	115·00	248·42	....
		Voided leases	....	....	....	....	....	....	349·71	39,721·51	28,314·92	1,083·01
		Sundry claims	....	....	....	....	....	463·12	333·98	1,585·35	583·39	....
Mt. Farmer	....	Voided leases	....	....	....	....	....	....	....	64·00	40·19	....
		Sundry claims	....	....	....	....	....	....	....	462·90	145·06	....
Mt. Gibson	....	Voided leases	....	....	....	....	....	....	6·44	526·50	888·70	....
		Sundry claims	....	....	28·00	30·54	....	1·03	44·72	1,050·85	460·74	1·00
Ninghan	....	Voided leases	....	....	....	....	....	....	....	10·00	1·41	....
		Sundry claims	....	....	....	....	....	....	....	324·75	123·28	....
Noongal	1201	Hard to Find	....	....	....	....	....	....	....	114·00	111·83	....
	1203	Revival	....	....	....	*·67	....	....	....	80·00	*132·93	4·04
		Voided Leases	....	....	....	....	....	7·88	31·96	11,069·75	5,526·90	....
		Sundry Claims	3.16	....	1·75	4·47	....	39·32	310·31	8,499·05	3,561·25	....
Nyounda	....	Voided Leases	....	....	....	....	....	....	217·63	416·00	183·91	....
		Sundry Claims	....	....	....	....	....	....	30·88	722·00	180·83	....
Pinyalling	....	Voided Leases	....	....	....	....	....	....	93·80	2,296·35	959·50	....
		Sundry Claims	....	....	38·00	21·63	....	3·13	134·09	1,456·50	754·74	....
Retaliation	(1046)	Alma May	....	....	28·00	9·80	....	....	....	1,869·25	762·13	....
		Voided Leases	....	....	....	....	....	....	....	3,220·00	1,110·85	....
		Sundry Claims	....	....	....	....	....	....	....	778·25	304·71	....
Rothsay	(1204)	Exchange	....	....	126·00	22·54	....	....	24·06	126·00	34·08	....
		Voided Leases	....	....	....	....	....	....	....	40,554·75	10,741·76	....
		Sundry Claims	....	....	....	....	....	....	·73	6,469·50	2,562·03	....
Wadgingarra	....	Voided Leases	....	....	....	....	....	....	....	691·11	650·63	....
		Sundry Claims	....	....	....	....	....	....	....	2,131·30	559·83	....
Wardawarra	....	Voided Leases	....	....	....	....	....	....	....	10.760·50	5,862·04	....
		Sundry Claims	....	....	....	....	....	....	....	933·75	369·87	....
Warriedar	....	Voided Leases	....	....	....	....	....	....	....	13,661·50	4,607·88	7·30
		Sundry Claims	....	....	....	....	....	....	2·84	8,782·85	1,892·46	....
Yalgoo	....	Voided Leases	....	....	....	....	....	....	3·23	6,314·50	9,965·18	....
		Sundry Claims	....	....	....	....	....	....	23·56	2,615·25	998·46	....
Yuin	....	Voided Leases	....	....	....	....	....	....	127·12	68,139·50	27,908·57	130·13
		Sundry Claims	....	....	....	....	....	....	4·70	335·50	67·53	....
	From Goldfields Generally :—											
	Sundry Parcels treated at :											
	State Battery, Payne's Find	....	....	....	....	....	....	....	....	38·50	*4,529·92	....
	State Battery, Warriedar	....	....	....	....	....	....	....	....	....	*6,503·21	....
	State Battery, Yalgoo	....	....	....	....	....	....	....	....	....	*1,193·63	....
	P. W. Nevill's Rothesay Cyanide Plant	....	....	....	*98·39	....	....	....	....	....	*242·98	72·23
	W. J. Greeve's Tailings Treatment Plant	....	....	....	*11·90	·94	....	....	....	....	*11·90	·94
	Yuin Cyanide Plant	....	....	....	*5·15	....	....	....	....	....	*62·46	....
	Various Works	....	....	....	....	....	9·42	....	664·00	*2,958·99	26·67

YALGOO GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
		Reported by Banks and Gold Dealers	2.72	....	....	....	....	928·31	58·32	....	34·44	·11
		Totals	**9.09**	....	**1,711·77**	**1,166·29**	**·94**	**1,768·83**	**2,964·16**	**433,729·38**	**258,176·63**	**1,499·12**

Mt. Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United	....	Voided Leases	....	....	....	....	....	....	1,911·63	15,913·69	23,305·76	1·76
		Sundry Claims	..	....	....	....	....	....	580·98	1,307·50	2,227·65	....
Eucalyptus	....	Voided Leases	....	....	....	....	....	....	2,878·56	1,603·85	3,251·01	....
		Sundry Claims	....	....	100·00	25·73	....	....	588·28	2,129·30	1,973·15	....
Linden	522F	Ailsa	....	....	76·50	191·53	....	....	....	1,025·00	525·35	....
	539F	Democrat	....	....	952·75	1,997·30	....	....	....	3,221·75	5,529·31	....
	554F	Devon	....	....	11·50	13·39	....	....	....	11·50	13·39	....
	553F	Local Lady	....	....	585·00	701·52	....	....	....	585·00	701·52	....
	521F	North Democrat	....	....	150·00	266·41	....	....	....	2,489·75	5,081·94	....
	529F	Second Fortune	....	....	....	....	....	....	....	517·00	282·05	....
		Voided Leases	....	....	....	....	....	7·53	565·78	60,096·31	48,051·10	·68
		Sundry Claims	....	....	328·50	161·86	....	132·11	244·96	18,854·10	13,607·05	....
Mt. Margaret	M.A. 12F	Mt. Margaret Mission Station	....	....	....	....	....	113·08	18·87	403·00	133·14	·09
		Voided Leases	....	....	....	....	....	12·13	1·89	8,900·39	5,291·51	12·55
		Sundry Claims	....	....	....	....	....	25·22	102·12	1,701·35	652·62	....
Mt. Morgans	(555F)	Bernborough	....	....	70·75	33·51	....	....	....	186·25	97·07	....
	399F, etc.	Morgans Gold Mines, Ltd., ...			....	....	....	....	....	4,466·80	*13,776·04	....
		prior to transfer to present holders	....	....	....	....	....	....	16·66	779,578·43	354,225·86	5,552·63
	550F	Multi Millionaire	....	....	9·25	3·84	....	....	....	9·25	3·84	....
	547F	Vodice	....	....	....	....	....	....	....	543·50	115·94	....
		Voided Leases	....	....	....	....	....	17·95	148·79	60,503·25	34,541·15	77·86
		Sundry Claims	....	9.63	112·00	70·26	....	36·41	395·41	4,856·32	3,259·75	....
Murrin Murrin	....	Voided Leases	....	....	....	....	....	10·43	231·35	136,940·22	104,029·97	29·60
		Sundry Claims	....	....	37·75	15·85	....	51·15	557·24	6,361·58	4,423·22	....
Redcastle	557F	Trixie	....	....	62·00	6·27	....	....	....	62·00	6·27	....
		Voided Leases	....	....	....	....	....	4·49	436·54	4,107·20	4,043·41	....
		Sundry Claims	....	....	118·00	24·41	....	....	113·84	1,133·57	636·03	....

Yundamindera	510F	Landed At Lost	....	....	....	....	....	....	....	4,332·00	683·02	....
	548F	Mulga Rose	....	....	20·00	7·30	....	....	....	310·00	211·09	....
	558F	Spud Murphy	....	....	100·00	18·00	....	....	....	100·00	18·00	....
		Voided Leases	....	....	....	....	....	....	110·93	73,663·85	48,967·55	5·82
		Sundry Claims	....	....	....	....	....	3·01	271·93	6,409·35	4,694·45	....
	M.A. 14F	C. C. Crocker's Plant	....	....	....	2·30	....	....	....	10·00	18·70	....
	From District Generally :—											
	Sundry Parcels treated at :											
		Hill End Cyanide Plant, 482F	....	....	....	....	....	....	....	....	*556·95	....
		State Battery, Linden	....	....	....	*830·94	....	....	9·16	285·29	*13,494·01	....
		Rymer's Cyanide Plant	....	....	....	....	....	....	....	....	*1,162·22	....
		K. McPherson's L.T.T. 1065H	....	....	....	·58	....	....	....	....	·58	....
		Turbett's Cyanide Plant, L.T.T. 841H	....	....	....	....	....	....	....	....	*1,232·20	....
		Various Works	....	....	....	....	....	....	....	1,257·81	*5,587·24	99·97
		Reported by Banks and Gold Dealers	15·23	....	....	....	....	2,932·73	141·84	10·30	95·75	·68
		Totals	**15·23**	**9·63**	**2,734·00**	**4,371·00**	....	**3,346·24**	**9,326·76**	**1,203,886·46**	**706,506·86**	**5,781·64**

MOUNT MALCOLM DISTRICT.

Cardinia	1795c	Rangoon	....	6·49	....	1·46	....	....	6·49	250·00	118·60	....
		Voided Leases	....	....	....	....	....	13·87	1,591·66	4,600·24	3,979·15	....
		Sundry Claims	....	....	....	....	....	4·25	119·83	1,865·25	575·01	·66
Diorite	1786c	Puzzle	....	....	240·00	246·12	....	....	....	2,032·00	2,352·48	....
		Voided Leases	....	....	....	....	....	....	945·65	36,103·03	32,335·98	33·18
		Sundry Claims	....	....	18·50	17·17	....	11·21	329·32	4,615·80	4,422·68	....
Dodgers Well	....	Voided Leases	....	....	....	....	....	....	57·90	1,373·30	1,936·52	....
		Sundry Claims	....	....	....	....	....	·95	28·32	1,440·25	904·23	....
Lake Darlot	1823c	Billie	....	....	33·00	37·27	....	....	....	33·00	37·27	....
	1784c	British King, West	....	....	115·00	222·70	....	....	....	657·00	857·02	....
	1820c	The Dragon	....	....	282·00	202·17	....	....	....	315·00	238·34	....
	1816c	Zangbar	....	....	204·00	47·21	....	....	....	669·00	102·44	....
		Voided Leases	....	....	....	....	....	....	4,482·18	68,021·46	49,995·88	·03
		Sundry Claims	....	....	294·00	186·69	....	67·68	557·70	7,722·34	5,164·21	2·60
Leonora	1594c	Leonora Central Gold Mining Co., N.L.	....	....	....	....	....	....	....	8,621·00	853·23	....
	1788c	Little Gwalia	....	....	....	*16·96	....	....	....	635·00	32·58	....
	1341c, etc.	Sons of Gwalia, Ltd.	....	....	81,510·00	24,986·07	2,200·02	....	....	5,254,037·53	2,149,386·03	151,356·10
		Prior to transfer to present holders	....	....	....	....	....	....	....	109,081·00	55,989·21	8·66
		Voided Leases	....	....	....	....	....	....	1,866·86	166,178·00	89,768·33	94·57
		Sundry Claims	....	....	91·00	31·07	....	37·73	351·39	17,754·25	11,439·89	....
Malcolm	(1812c)	North Star Extended	....	....	....	2·73	....	11·65	....	....	2·73	....
		Voided Leases	....	....	....	....	....	....	47·07	62,656·53	47,560·70	....
		Sundry Claims	....	....	48·50	22·57	·12	5·75	33·39	4,329·47	2,656·08	·12
Mertondale	....	Voided Leases	....	....	....	....	....	....	....	89,024·75	60,935·32	1,497·58
		Sundry Claims	....	....	21·00	11·63	....	1·82	85·74	3,165·91	2,274·27	....
Mt. Clifford	....	Voided Leases	....	....	....	....	....	....	1,623·35	9,556·96	16,492·17	....
		Sundry Claims	....	....	12·00	3·22	....	53·98	351·65	5,523·70	3,475·17	....
Pig Well	....	Voided Leases	....	....	....	...	....	....	....	13,587·32	14,676·58	63·68
		Sundry Claims	....	....	....	....	....	....	34·61	2,896·65	1,225·46	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MT. MARGARET GOLDFIELD—*continued.*

MOUNT MALCOLM DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
Randwick	1794c	Mighty Splash	....	....	....	1·92	....	....	7·27	759·00	79·01	....
		Voided Leases	....	....	....	....	....	....	239·49	10,141·65	9,653·78	....
		Sundry Claims	....	....	8·00	±·09	....	66·57	164·02	2,483·64	1,307·45	....
Webster's Find	....	Voided Leases	....	....	....	....	....	30·30	....	22,167·50	14,377·65	....
		Sundry Claims	....	....	128·75	30·75	....	36·84	695·68	2,356·15	1,530·56	....
Wilson's Creek	....	Voided Leases	....	....	....	....	....	....	....	333·50	168·27	....
		Sundry Claims	....	....	....	....	....	·70	4·24	316·00	261·12	....
Wilson's Patch	....	Voided Leases	....	....	....	....	....	....	99·38	28,863·35	13,050·19	1·05
		Sundry Claims	....	....	....	....	....	4·68	50·57	1,514·16	1,371·66	....
		From District Generally :—										
		Sundry Parcels treated at :										
		State Battery, Darlot	....	....	....	*35·92	....	....	....	10·00	*373·99	....
		H. J. Maund, L.T.T. 1061H	....	....	....	*59·62	....	....	....	....	*59·62	....
		H. J. Maund, L.T.T. 1012H	....	....	....	....	....	....	....	....	*90·67	....
		K. J. McPherson, L.T.T. 1044H	....	....	....	....	....	....	....	....	*89·29	12·82
		Reefers Cyanide Plant	....	....	....	....	....	....	....	20·00	*2,744·15	22·38
		Various Works	....	....	....	....	....	....	....	789·50	*21,936·35	123·15
		Reported by Banks and Gold Dealers	24.60	....	....	5·67	....	3,439·34	249·87	21·50	51·57	....
		Totals	**24.60**	**6.49**	**83,005·75**	**26,173·01**	**2,200·14**	**3,787·32**	**14,023·63**	**5,946,526·69**	**2,626,932·89**	**153,216·58**
		MOUNT MARGARET DISTRICT.										
Burtville	2446T	Boomerang	....	....	270.75	1,073.76	27.91	....	....	772.75	5,009.68	49.45
	2476T	Happy Find	....	....	172.00	241.18	....	2.60	....	435.50	1,201.90	....
	2485T	Karridale	....	....	70.50	16.93	....	....	....	141.00	55.03	....
	2480T	Mocking Bird	....	....	16.75	18.22	....	....	....	95.90	152.88	....
	2138T	Nil Desperandum	....	....	80.25	98.86	....	....	5.30	1,508.12	3,224.09	....
		Voided Leases	....	....	....	....	....	2.29	413.80	68,990.93	104,704.63	275.27
		Sundry Claims	....	....	7·75	4.47	....	2.65	208.27	7,201.41	5,343.07	....
Duketon	....	Voided Leases	....	....	....	....	....	5.35	3,216.10	31,889.42	22,542.63	....
		Sundry Claims	....	....	20.00	6.36	....	....	528.26	2,387.65	2,146.58	29.76
Eagle's Nest	....	Voided Leases	....	....	....	....	....	....	145.34	534.50	1,238.22	....
		Sundry Claims	....	....	....	....	....	24.07	474.28	1,041.10	356.44	....
Erlistoun	2141T	King of Creation Gold Mines, Ltd.	....	....	....	....	....	....	....	6,358.00	1,288.92	11.00
		Prior to transfer to present holders	....	....	....	....	....	....	....	13,723.00	3,199.66	....
	2458T	Westralia	....	....	....	....	....	....	....	192.00	171.69	....

	2345T	Morgood	....	....	216.75	198.96	....	....	....	336.00	339.93	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	106,057.00	75,902.56	4,316.81
		Voided Leases	....	....	....	....	....	10.07	393.41	29,693.15	20,237.69	....
		Sundry Claims	....	....	....	....	....	1,181.65	148.23	5,434.59	3,702.17	....
Euro	....	Voided Leases	....	....	....	....	....	....	65.14	91,821.50	37,678.25	....
		Sundry Claims	....	....	8.25	2.55	....	4.87	73.04	1,308.50	793.54	....
Laverton	2216T	Beria Main Lode	....	4.74	....	....	....	....	4.74	6,550.35	1,516.89	....
	2408T, etc.	Gladiator Gold Mines, Ltd.	....	....	....	*14.16	....	....	....	103,538.00	25,979.51	....
	2245T, etc.	Lancefield Leases	....	....	2,985.00	926.80	....	....	....	6,331.00	1,294.43	....
	2245T	Lancefield Extended, West	....	....	....	....	....	....	....	881.25	846.77	....
	2489T	Wedge	....	....	....	....	....	....	....	222.00	21.19	....
	2478T	Lancefield, North	....	....	1,094.75	177.14	....	....	....	1,244.00	293.78	....
		Voided Leases	....	....	....	....	....	28.59	2,024.11	1,964,884.27	785,630.10	56,923.16
		Sundry Claims	5.40	....	87.75	37.88	....	215.58	1,475.35	16,897.25	9,010.85	....
Mt. Barnicoat	....	Voided Leases	....	....	....	....	....	....	23.08	1,788.50	654.65	....
		Sundry Claims	....	....	44.25	69.42	....	....	.68	1,170.25	913.89	....
Mt. Shenton	....	Voided Leases	....	....	....	....	....	....	....	15.00	26.65	....
		Sundry Claims	....	....	....	....	....	....	....	279.25	209.67	....
	From District Generally :—											
	Sundry Parcels treated at :											
	State Battery, Laverton	....	....	....	*626.58	....	....	....	97.50	*8,650.05	15.64
	United Gold Recoveries Pty., Ltd.	....	....	....	*154.48	47.12	....	....	....	....	*154.48	47.12
	D. Cable's Plant, L.T.T. 1067H	....	....	....	*12.01	....	....	....	....	....	*12.01	....
	D. Cable's Plant, L.T.T. 976H, etc.	....	....	....	*111.76	....	....	....	....	....	*1,257.13	....
	G. E. Grey's Cyanide Plant	....	....	....	*5.22	.24	....	....	....	....	*5,555.28	.24
	J. Shepherd, M.A. 23T	....	....	....	*25.23	....	....	....	....	....	*99.55	....
	Various Works	....	....	....	....	....	....	....	....	159.50	*12,377.72	....
	Reported by Banks and Gold Dealers	8.88	1.09	....	....	....	2,507.63	108.08	....	26.76	....
	Totals	**14.28**	**5.83**	**5,074·75**	**3,821·97**	**75·27**	**3,985·35**	**9,307·21**	**2,473,980·14**	**1,143,820·92**	**61,668·45**

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale	5719Z	Coonega	....	....	....	....	....	....	....	8.00	5.21	....
	5732Z	Central Coonega	....	....	58.00	15.03	....	....	....	58.00	15.03	....
	5476Z, etc.	Sand Queen Gladsome Mines, N.L.	....	....	....	*25.95	....	....	....	42,216.75	14,649.74	6.45
		Prior to transfer to present holders	....	....	....	....	....	....	....	75,754.50	59,007.25	1,505.65
		Voided leases	....	....	....	....	....	....	419.74	148,660.47	119,413.11	3,839.28
		Sundry claims	....	....	49.50	24.11	....	....	40.19	1,768.41	913.31	....
Goongarri	5726Z	Pretty Easy	....	....	30.00	45.18	....	....	5.84	57.25	94.05	....
		Voided leases	....	....	....	....	....	.94	1,378.20	29,771.54	17,966.00	....
		Sundry claims	....	81.82	70.00	68.30	....	46.46	2,053.46	2,479.77	2,951.21	....
Menzies	5703Z	Aspacia	....	....	378.00	227.30	....	....	23.47	1,398.50	1,139.23	5.24
	5543Z	Black Swan	....	....	....	....	....	....	....	982.63	1,619.74	9.08
	5694Z	Dark Horse	....	....	....	....	....	....	....	83.00	293·76	....
	5511Z, etc.	First Hit G.M. (1934), N.L.	....	....	1,162.75	951.37	....	....	....	68,327.70	48,859.96	6,676.23
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,672.75	4,687.69	....
	5542Z	Good Block Lease	....	....	....	....	....	....	7.32	1,472.00	2,277.89	....
	5714Z	Lady Harriet North	....	....	21.00	4.01	....	....	....	21.00	4.01	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

MENZIES DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Menzies—*contd.*	5549z	Lady Harriett	....	....	....	....	....	....	....	548.00	164.46	....
	5737z	Lady Shenton	....	....	24.00	1.93	....	....	....	24.00	1.93	....
	5520z	Mignonette	....	....	22.00	11.94	....	....	....	453.50	336.89	....
	5697z	New Florence	....	....	17.00	6.59	....	....	6.56	1,036.50	391.40	....
	5733z	Olive Branch	....	....	38.75	66.01	....	....	....	38.75	66.01	....
	5663z	Springfield	....	....	....	....	....	....	....	142.00	51.66	....
	(5734z)	Three Augegher	....	....	45.00	32.28	....	....	....	45.00	32.28	....
	5671z, etc.	Woolgar Gold Mines, Ltd.	....	....	....	....	....	....	....	42.00	8.85	....
		Voided leases	....	....	....	....	....	45.42	1,095.38	931,338.00	723,812.49	13,581.15
		Sundry claims	....	3.95	704.50	367.99	....	49.50	594.27	31,701.44	24,269.66	776.49
Mt. Ida	5537z, etc.	Goldfields Australian Development Co., Ltd.	....	....	3,876.00	2,080.62	....	....	....	11,782.00	6,540.03	269.18
	5537z, etc.	Mt. Ida Gold Mines, Ltd.	....	....	....	....	....	....	....	17,638.50	8,075.96	558.74
		Prior to transfer to Mt. Ida G.M., Ltd.	....	....	....	....	....	....	....	1,512.75	737.95	....
		Voided leases	....	....	....	....	....	....	92.21	68,731.17	72,769.14	106.63
		Sundry claims	....	2.24	229.50	92.77	....	48.14	323.25	15,805.41	8,056.73	.12
Twin Hills		Voided leases	....	....	....	....	....	....	....	582.30	574.93	....
		Sundry claims	....	....	....	....	....	....	....	97.80	86.69	....
		From District generally :—										
		Sundry Parcels treated at :										
		Gold Tailings, Ltd. (on Menzies Consolidated G.M.)	....	....	....	....	....	....	....	....	*345.87	5.84
		Lady Harriet Battery	....	....	....	*800.08	....	....	....	279.50	*17,116.39	30.00
		State Battery, Mt. Ida	....	....	....	....	....	....	....	1,876.25	*6,829.04	....
		Sanders Cyanide Plant, L.T.T. 1043H	....	....	....	*171.22	235.67	....	....	....	*171.22	235.67
		Yumndaga Sands Syndicate	....	....	....	....	....	....	....	....	*35.12	....
		Various Works	....	....	....	....	....	....	....	2,512.30	37,947.97	2,453.31
		Reported by Banks and Gold Dealers	3.93	....	....	....	....	1,436.49	382.80	35.00	7.72	....
		Totals	**3.93**	**88.01**	**6,726.00**	**4,992.68**	**235.67**	**1,626.95**	**6,422.69**	**1,460,944.44**	**1,182,237.58**	**30,059.06**

CLARRING DISTRICT.

Davyhurst	1137U	Frog	....	....	20.00	2.08	....	....	5.39	20.00	2.08	....
	1102U	Lights of Israel	....	....	....	....	....	....	....	1,075.00	176.42	....
	1016U	New Callion	....	....	....	....	....	....	....	5,293.30	2,002.37	119.67
	1136U	New Golden Pole	....	....	960.00	91.33	....	....	2.63	1,072.00	116.54	....
		Voided leases	....	....	....	....	....	2.93	144.62	164,441.32	125,626.21	5,408.47
		Sundry claims	....	....	137.00	95.83	....	....	164.15	13,155.44	5,570.38	....

Morley's	1101U	Emerald	....	.21	80.00	21.20	....	....	26.24	674.00	1,188.88	....
	1094U	First Hit	....	....	135.50	275.14	....	....	....	993.25	3,106.28	....
	1141U	Gamma	....	.84	24.00	5.01	....	....	.84	24.00	5.01	....
	1081U	Mabel Gertrude	....	....	59.00	90.15	....	....	....	513.00	678.28	....
	1089U	Paramount	....	....	404.00	280.72	....	....	....	1,379.50	1,409.90	....
	1078U	Rabbit	....	....	96.50	192.01	....	....	265.66	374.00	879.48	....
	1144U	Shirley Patricia	....	....	17.00	15.63	....	....	....	17.00	15.63	....
	1074U	Two Chinamen	....	....	160.00	64.08	....	....	3,411.83	954.50	2,948.45	....
		Voided leases	....	....	....	....	....	....	121.96	443.50	754.84	....
		Sundry claims	....	....	61.50	29.67	....	2.16	932.23	1,504.75	2,359.27	....
Mulline	1107U	Ajax West	....	....	50.50	132.08	....	....	1.37	444.75	949.55	....
	1146U	Lady Gladys North	....	....	74.00	30.77	....	....	....	74.00	30.77	....
	1069U, etc.	Riverina Gold Mines, Ltd.	....	....	27.50	7.03	.07	....	....	32,085.50	11,669.45	.07
		Voided leases	....	....	....	....	....	....	274.09	102,556.22	103,327.32	530.75
		Sundry claims	....	.95	14.50	41.11	....	10.82	198.67	10,528.89	8,652.92	1.10
Mulwarrie	1113U	Oakley	....	....	240.50	304.59	....	....	....	435.50	552.99	....
		Voided leases	....	....	....	....	....	....	165.29	19,480.68	26,369.21	38.47
		Sundry claims	....	....	16.00	103.78	....	.80	282.29	3,102.33	2,704.43	....
Ularring	....	Voided leases	....	....	....	....	....	....	563.34	9,771.60	13,907.76	....
		Sundry claims	....	....	....	....	....	....	....	671.50	309.48	....
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Mulline	....	....	....	....	....	....	....	....	639.99	*16,459.89	....
	State Battery, Mulwarrie	....	....	....	....	....	....	....	....	613.18	*6,564.16	....
	M.A. 13U, E. Rowe	....	....	....	....	....	....	....	....	....	*21.65	....
	Waihi Battery, M.A. 14U	....	....	....	*125.15	....	....	....	....	5.00	*651.74	....
	Waihi—Golden Pole Cyanide Plant	....	....	....	....	....	....	....	....	....	*936.58	....
	Prior to Amalgamation	....	....	....	....	....	....	....	....	....	*5,032.24	....
	Various Works	....	....	....	....	....	....	....	15.82	233.15	*1,784.67	....
	Reported by Banks and Gold Dealers	4.88	....	....	....	....	111.51	63.08	100.00	22.67	....
	Totals	**4.88**	**2.00**	**2,577.50**	**1,907.36**	**.07**	**128.22**	**6,639.50**	**372,676.85**	**346,787.50**	**6,098.53**

NIAGARA DISTRICT.

Desdemona	....	Voided leases	....	....	....	....	....	....	7.12	9,809.00	7,555.81	12.04
		Sundry claims	....	....	....	....	....	....	8.99	2,225.45	892.48	....
Kookynie	911G	Cosmopolitan South	....	....	247.00	120.41	....	....	....	1,094.00	502.16	....
	925G	New South Champion	....	....	90.00	113.69	....	....	....	90.00	113.69	....
	916G	Ruby	....	....	110.00	71.34	....	....	....	296.00	198.03	....
	922G	Victory	....	....	....	....	....	....	....	8.00	1.79	....
		Voided leases	....	....	....	....	....	3.35	347.30	744,253.21	393,929.73	5,375.97
		Sundry claims	....	....	332.00	186.33	....	56.74	103.40	8,431.30	6,383.89	.18
Niagara	913G	New Gladstone	....	....	....	....	....	....	....	639.00	269.99	....
		Voided leases	....	....	....	....	....	....	104.54	85,237.50	52,095.06	....
		Sundry claims	....	....	95.00	41.97	....	28.10	97.22	14,300.66	8,061.89	....
Tampa	902G	Grafter	....	....	....	....	....	....	....	192.00	20.30	....
		Voided leases	....	....	....	....	....	....	41.58	50,285.57	23,267.41	174.24
		Sundry claims	....	....	25.00	12.83	....	32.60	283.40	8,041.33	4,113.02	....

TABLE 1.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

NIAGARA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
		From District generally :—										
		Sundry Parcels treated at :										
		Grafter Battery, Tampa	....	....	....	....	....	....	....	....	*137.63	....
		Niagara State Battery (P. Ward)	....	....	....	....	....	....	....	....	*10.08	....
		Various Works	....	....	....	....	....	....	....	1,220.50	16,226.67	41.17
		Reported by Banks and Gold Dealers	3.11	....	....	....	....	1,590.60	823.66	....	63.53	....
		Totals	**3.11**	....	**899.00**	**546.57**	....	**1,711.39**	**1,817.21**	**926,123.52**	**513,843.16**	**5,603.60**
		YERILLA DISTRICT.										
Edjudina	1011R, etc.	Paget Gold Mines of Edjudina, Ltd.	....	....	....	....	....	....	....	841.50	187.51	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	738.75	559.80	....
		Voided leases	....	....	....	....	....	....	18.44	33,943.45	42,627.48	37.79
		Sundry claims	....	....	32.00	10.89	....	....	26.89	6,848.58	4,776.17	....
Patricia	....	Voided leases	....	....	....	....	....	....	....	4,158.50	5,396.40	25.40
		Sundry claims	....	....	12.00	3.02	....	....	....	47.00	20.78	....
Pinjin	....	Voided leases	....	....	....	....	....	....	48.34	17,463.30	10,742.77	....
		Sundry claims	....	....	....	....	....	....	154.86	5,623.59	3,466.70	....
Yarri	1320R	Margaret	....	....	72.00	17.60	....	....	....	72.00	17.60	....
	(1211R)	Margaret	....	....	29.00	6.80	....	....	....	799.50	184.57	....
	1126R, etc.	Porphyry (1939) G.M., N.L.	....	....	67.00	12.90	....	....	....	66,715.00	9,867.95	261.86
		Prior to transfer to present holders	....	....	....	....	....	....	....	30,344.50	5,448.82	507.51
	1319R	Valerie May	....	....	34.00	95.77	....	....	....	34.00	95.77	....
		Voided leases	....	....	....	....	....	6.30	87.08	43,397.25	20,872.18	2.00
		Sundry claims	....	....	490.00	166.20	....	.87	5.93	14,637.05	5,561.56	....
Yerilla	1321R	Yerilla King	....	....	319.50	192.20	....	....	....	319.50	192.20	....
		Voided leases	....	....	....	....	....	....	3,107.25	16,161.93	12,733.54	13.93
		Sundry claims	....	....	....	....	....	19.30	54.93	2,728.58	1,559.52	....
Yilgangie	1221R	Golden Hill	....	....	....	....	....	....	....	958.00	462.65	....
	(1318R)	Rainbow	....	....	....	....	....	....	....	41.00	35.26	....
	1176R, etc.	Western Mining Corporation	....	....	....	....	....	....	....	646.75	446.89	....
		Prior to transfer to present holders	....	....	....	....	....	....	.85	1,244.75	1,830.28	....
		Voided leases	....	....	....	....	....	....	9.94	1,342.75	949.08	....
		Sundry claims	....	....	134.00	89.54	....	121.67	98.20	3,116.80	1,964.31	....

From District generally :—														
Sundry Parcels treated at :														
State Battery, Yarri	....	....	....	....	....	....	....	....	....	271 .50	*7,496 .64	3 .50
State Battery, Yerilla (N. C. Parry)	....	....	....	....	....	....	....	....	....	....	*43 .52	....
Various Works	....	....	....	....	....	....	2 .17	....	642 .25	6,049 .24	....
Reported by Banks and Gold Dealers	.29	....	....	....	....	1,161 .37	160 .08	....	4 .11	....
Totals	**.29**	....	**1,189 .50**	**594 .92**	....	**1,311 .68**	**3,772 .79**	**253,137 .78**	**143 573 .30**	**851 .99**

Broad Arrow Goldfield.

Bardoc	2102w	Despatch	....	....	....	....	....	....	....	450 .00	150 .00	....
	2198w	Ellen Pearce	....	....	....	....	....	....	....	1,101 .75	752 .53	....
	2219w	Gippslander	....	....	11 .00	10 .12	....	....	....	37 .00	36 .88	....
	2246w	Ora Munda	....	....	35 .50	86 .55	....	....	....	35 .50	86 .55	....
	2241w	Zoroastrian	....	....	472 .00	38 .50	....	....	....	472 .00	38 .50	....
		Voided leases	....	....	....	....	....	....	2,335 .41	83,208 .34	54,590 .50	203 .60
		Sundry claims	....	....	210 .25	107 .68	....	54 .95	1,193 .45	14,790 .03	7,679 .64	....
Black Flag	2229w	Bellevue	....	....	103 .25	73 .66	....	....	37 .54	141 .50	164 .18	....
		Voided leases	....	....	....	....	....	27 .81	405 .90	48,223 .79	28,152 .20	....
		Sundry claims	....	....	155 .25	127 .58	....	712 .92	251 .59	7,557 .21	4,691 .13	....
Broad Arrow	2226w	Chancelot	....	....	3 .00	1 .14	....	....	....	3 .00	1 .14	....
	2039w	Golden Arrow	....	....	987 .00	101 .20	....	....	....	5,581 .50	806 .71	....
	2239w	Good Luck	....	....	35 .00	36 .33	....	....	9 .33	65 .50	76 .66	....
	1958w	Grace Darling	....	1 .88	353 .00	115 .77	....	....	3 .55	4,149 .00	2,740 .02	....
	2244w	Highland Fling	....	126 .16	....	4 .95	....	....	126 .16	....	4 .95	....
	2216w	Kimra	....	....	60 .00	7 .91	....	....	....	1,068 .75	1,278 .96	....
	2148w	Lady Betty	....	....	18 .00	3 .77	....	....	....	408 .80	83 .20	....
	2247w	Monte Carlo	....	....	37 .25	24 .15	....	....	....	37 .25	24 .15	....
	2223w	North Bulletin	....	....	67 .65	61 .86	....	....	....	636 .90	498 .46	....
	1771w	North Duke	....	....	40 .00	4 .24	....	....	1,670 .51	236 .80	634 .35	....
	1933w	Oversight Tara United	....	....	23 .00	9 .73	....	....	1,147 .01	860 .29	919 .45	....
		Voided leases	....	....	....	....	....	70 .32	7,489 .92	139,569 .60	111,595 .19	20 .23
		Sundry claims	....	4 .36	251 .75	128 .67	....	1,007 .72	2,866 .38	30,742 .14	15,996 .57	.11
Canegrass	....	Voided leases	....	....	....	....	....	....	27 .77	669 .82	460 .72	....
		Sundry claims	....	....	....	....	....	....	227 .55	717 .45	505 .06	....
Carnage	....	Voided leases	....	....	....	....	....	176 .04	659 .31	2,402 .00	2,170 .67	....
		Sundry claims	....	....	....	....	....	....	6 .61	1,791 .33	869 .06	....
Cashman's	....	Voided leases	....	....	....	....	....	67 .51	813 .76	8,172 .15	7,090 .91	....
		Sundry claims	....	....	....	....	....	....	39 .55	997 .27	313 .75	....
Christmas Reef	2175w	New Mexico....	....	....	176 .85	409 .94	....	....	....	614 .35	1,349 .86	....
	2211w	New Year's Gift	....	....	....	....	....	....	....	11 .25	9 .03	....
		Voided leases	....	....	....	....	....	....	29 .68	783 .52	207 .21	....
		Sundry claims	....	....	14 .50	9 .36	....	....	307 .15	2,792 .39	2,593 .52	....
Fenbark	2188w	Golden Penny	....	....	57 .25	40 .80	....	....	....	2,394 .75	437 .75	....
	2228w	New Fenbark	....	....	75 .75	7 .34	....	....	....	187 .50	33 .76	....
		Voided leases	....	....	....	....	....	....	4 .42	3,319 .50	1,959 .75	....
		Sundry claims	....	....	177 .00	16 .17	....	....	51 .96	2,702 .52	951 .92	....
Grant's Patch	2245w	Bent Tree	....	....	281 .50	111 .63	....	....	....	281 .50	111 .63	....
	2242w	Lady Agnes	....	....	203 .00	46 .00	....	....	2 .11	265 .25	102 .37	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

BROAD ARROW GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Grants' Patch—*contd.*	2227w	Magpie	....	....	89.00	104.21	....	....	....	295.50	420.03	....
	1966w, etc.	Ora Banda Amalg. Mines, N.L.	....	....	12,896·75	3,704·43	....	....	....	167,562·00	62,028·00	175·00
		Prior to transfer to present holders	....	....	....	....	....	....	....	12,424·50	9,540·07	....
	2208w	Wentworth	....	....	176·50	67·98	....	....	....	991·25	299·28	....
	2224w	Whip Pole	....	....	105·00	54·86	....	....	....	126·75	63·84	....
		Voided leases	....	....	....	....	....	....	258·52	14,501·60	4,560·62	....
		Sundry claims	....	....	49·00	23·22	....	....	356·66	5,525·54	2,781·77	....
Ora Banda	1336w, etc.	Associated Northern Ora Banda, N.L.	....	....	....	*12·55	....	....	....	2,727·50	419·08	4·87
		Prior to transfer to present holders	....	....	....	....	....	....	....	315,958·95	123,252·22	1,664·70
	(2232w)	Cave Hill North	....	....	11·50	8·66	....	....	15·97	48·50	78·50	....
	1943w, etc.	Ora Banda United Mines, Ltd.	....	....	....	....	....	....	....	2,182·25	74·80	....
		Prior to transfer to presne tholders	....	....	....	....	....	....	....	76,612·22	14,630·93	....
		Voided leases	....	....	....	....	....	....	829·75	24,532·10	12,526·19	....
		Sundry claims	....	....	104·00	31·17	....	....	336·76	12,335·00	4,181·87	....
Paddington	(2105w)	Minnie Palmer	....	....	26·00	20·59	....	....	....	9,803·50	848·60	....
	2122w	Pakeha	....	....	289·00	87·01	....	....	....	2,312·90	761·60	....
		Voided leases	....	....	....	....	....	5,566·30	463·31	179,865·91	83,685·57	18·96
		Sundry claims	....	....	388·50	65·57	....	1,714·16	291·43	15,928·98	8,986·89	....
Riche's Find	....	Voided leases	....	....	....	....	....	....	7·01	7,357·09	5,283·87	71·36
		Sundry claims	....	....	....	....	....	....	212·26	1,602·30	1,698·06	·13
Siberia	2248w	Beauty	....	....	18·50	82·11	....	....	....	18·50	82·11	....
	(2234w)	Cat	....	....	12·75	102·89	....	....	67·97	21·50	169·38	....
		Voided leases	....	....	....	....	....	1·07	2,581·31	28,854·47	31,364·62	....
		Sundry claims	....	....	185·00	53·09	....	289·06	1,233·18	20,366·04	12,505·61	....
Smithfield	....	Voided leases	....	....	....	....	....	....	....	4,700·71	1,174·69	....
		Sundry claims	....	....	23·00	7·85	....	....	123·37	2,493·59	961·73	....
	From District generally :—											
	Sundry parcels treated at :											
	Brearley's Treatment Works		....	....	....	....	....	....	....	....	*2,374·39	1,227·68
	P. Doherty, L.T.T. 1026H		....	....	....	....	....	....	....	71·00	2·79	....
	Golden Arrow Battery		....	....	10·00	*324·03	....	....	....	36·00	*3,022·54	....
	Ora Banda Tailings Syndicate Retreatment Works		....	....	....	*32·71	....	....	....	....	*32·71	....
	T. J. Hennebury Plant, L.T.T. 1015H		....	....	....	....	....	....	....	....	·26	....
	Minnie Palmer Battery and Cyanide Plant		....	....	....	*47·47	....	....	....	....	*3,082·62	....
	R. G. Oliver, L.T.T. 1014H		....	....	....	4·44	....	....	....	....	*20·88	....
	State Battery, Ora Banda		....	....	....	*1,686·41	....	....	....	128·05	*18,851·95	....
	Various Works		....	....	....	....	....	2,275·66	1·24	16,896·02	*43,961·92	1,875·77
	Reported by Banks and Gold Dealers		13.79	....	....	....	....	9,940·84	131·39	61·68	90·35	....
	Totals		**13.79**	**132.40**	**18,233·25**	**8,106·30**	....	**21,904·36**	**26,616·75**	**1,293,821·10**	**703,989·23**	**5,262·41**

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Gindalbie	1561x	Kurrajong	....	....	....	....	....	....	....	....	16·25	5·55	....
	1540x	Lady Betty	....	358.61	66·75	181·85	....	....	782·97	318·00	723·88	....
		Voided leases	....	....	....	....	....	....	19·94	44,077·78	39,512·90	38·31
		Sundry claims	....	....	31·75	9·80	....	....	716·52	4,872·77	2,772·06	....
Gordon	1568x	Mt. Eba	....	....	56·75	12·07	....	....	....	56·75	12·07	....
	1532x	Sirdar	....	....	112·75	88·89	....	....	92·66	4,838·60	3,389·96	517·61
		Voided leases	....	....	....	....	....	....	589·88	48,723·78	16,562·53	....
		Sundry claims	....	....	44·50	23·95	....	....	177·38	2,044·45	1,170·95	....
Kalpini	1565x	Atlas	....	....	80·00	14·21	....	....	....	80·00	14·21	....
		Voided leases	....	....	....	....	....	....	38·73	13,463·50	6,739·57	·07
		Sundry claims	....	....	25·00	3·36	....	24·70	269·72	1,492·50	1,026·37	....
Kanowna	1564x	John Terence	....	....	25·00	50·82	....	....	....	25·00	50·82	....
	1569x	Kanowna Red Hill	....	4.35	58·75	19·49	....	....	4·35	58·75	19·49	....
		Voided leases	....	....	....	....	....	24·94	4,511·34	684,992·35	380,159·53	2,482·24
		Sundry claims	....	....	330·75	89·05	....	118·94	2,154·37	24,588·77	11,286·43	1·50
Mulgarrie	....	Voided leases	....	....	....	....	....	....	1,216·63	6,902·26	4,197·98	....
		Sundry claims	....	....	....	....	....	....	16·78	1,261·75	631·40	....
Six Mile	....	Voided leases	....	....	....	....	....	....	1,603·72	559·00	767·72	....
		Sundry claims	....	....	....	....	....	....	54·14	739·25	225·56	....
	From District generally :—											
	Sundry parcels treated at :											
	Various Works	....	....	....	....	....	330·42	867·52	158,935·05	*153,205·89	....
	Reported by Banks and Gold Dealers	10.13	1.23	....	....	....	105,977·16	36·91	·50	101·55	....
	Totals	**10.13**	**364.19**	**832·00**	**493·49**	....	**106,476·16**	**13,153·56**	**998,047·06**	**622,576·42**	**3,039·73**

KURNALPI DISTRICT.

Jubilee	....	Voided leases	....	....	....	....	....	....	145·13	2,122·50	1,465·16	....
		Sundry claims	....	....	....	....	....	25·57	13·52	1,219·25	511·63	....
Kurnalpi	....	Voided leases	....	....	....	....	....	371·18	3,166·80	4,052·51	3,957·71	6·27
		Sundry claims	6.51	....	50·00	26·56	....	324·12	727·39	4,305·36	2,089·90	....
Mulgabbie....	....	Voided leases	....	....	....	....	....	....	1,402·66	226·75	7,845·87	4·95
		Sundry claims	....	6.09	1·50	3·79	....	8·06	2,770·97	1,263·45	2,221·03	....
	From District generally :—											
	Sundry parcels treated at :											
	Various Works	....	....	....	....	....	....	....	101·50	*388·63	....
	Reported by Banks and Gold Dealers	.55	....	....	....	....	12,104·93	68·59	....	2·35	....
	Totals	**7.06**	**6.09**	**51·50**	**30·35**	....	**12,833·86**	**8,295·06**	**13,291·32**	**18,482·28**	**11·22**

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Binduli	6025E	Red Star	....	....	40·50	6·41	....	....	....	440·75	62·01	....
		Voided leases	....	....	....	....	....	....	....	803·10	385·19	....
		Sundry claims	....	....	53·25	9·15	....	....	13·01	4,812·77	1,631·18	....
Boorara	5486E	Olympian	....	....	67·00	65·35	3·01	....	....	1,542·25	868·25	3·01
		Voided leases	....	....	....	....	....	....	459·07	306,930·82	171,842·83	408·36
		Sundry claims	....	....	20·75	1·84	....	·49	145·56	2,785·09	1,408·01	....
Boulder	5465E	Birthday Gift	....	....	137·25	10·57	....	....	....	5,382·14	1,376·87	....
	5690E	Boulder Perseverance, Ltd.	....	....	137,456·42	33,497·94	16,218·37	....	....	2,062,099·83	843,466·47	258,960·75
		Prior to transfer to present holders	....	....	....	....	....	....	....	3,306,942·88	1,841,159·00	203,821·43
	6077E	Brown Hill Consols	....	....	....	....	....	....	....	66·00	5·87	....
	5472E	Golden Key	....	....	....	....	....	18·27	22·78	415·00	158·96	....
	5692E, etc.	Gold Mines of Kalgoorlie, Ltd.	....	....	158,337·00	39,137·95	7,166·35	....	....	1,307,007·86	369,496·23	111,681·03
	5466E	South Star	....	....	....	....	....	....	233·46	4,237·43	1,494·78	....
	5466E, etc.	Prior to transfer to present holders	....	....	....	....	....	....	5·22	1,835·75	748·78	....
	5159E, etc.	Lake View South (G.M.K.), Ltd.	....	....	....	....	....	....	....	62,278·38	21,536·66	....
		Prior to transfer to present holders	....	....	....	....	....	....	545·23	527,790·53	568,643·05	4,844·50
	4366E, etc.	Great Boulder Proprietary G.M., Ltd.	....	....	367,293·00	94,050·79	49,366·94	....	1·53	8,448,751·97	4,880,525·23	902,306·03
	5845E	Happy Returns	....	....	....	....	....	....	....	446·00	112·82	....
	5345E, etc.	Kalgoorlie Enterprise Mines, Ltd.	....	....	57,276·64	17,806·80	1,962·82	....	....	546,973·13	169,992·85	16,861·03
		Prior to transfer to present holders	....	....	....	....	....	....	....	15,320·68	8,957·01	....
	4334E, etc.	Lake View & Star, Ltd.	....	....	518,431·00	148,766·38	17,820·14	....	....	7,751,145·30	2,591,208·92	200.434·73
		Prior to transfer to present holders	....	....	....	....	....	....	8·49	15792500·38	9,149,223·80	1,348,055·82
	5431E, etc.	North Kalgurli (1912), Ltd.	....	....	151,710·08	44,608·96	13,280·11	....	111·55	1,898,242·06	660,091·62	184,720·02
	5405E, etc.	North Kalgurli (1912), Ltd. (Croesus Pty. Group)	....	....	....	....	....	....	51·20	90,159·00	19,261·22	....
	5891E	(New Croesus)	....	....	....	....	....	....	....	193·00	48·74	....
	5700E, etc.	Prior to transfer to present holders	....	....	....	....	....	43·99	....	4,018,436·01	2,815,911·21	97,625·03
	5429E, etc.	North Kalgurli United Mines, Ltd.	....	....	....	....	....	....	....	4,661·51	928·18	232·93
		Prior to transfer to present holders	....	....	....	....	....	....	....	131·74	76·74	....
	5853E, etc.	Paringa Junction North Leases	....	....	152·75	60·61	....	....	5·12	1,335·25	525·91	....
	5853E	(Paringa Junction)	....	....	....	....	....	....	....	123·75	17·77	....
	5854E	(Paringa Junction North)	....	....	....	....	....	....	....	60·50	10·64	....
	5855E	(Paringa Junction South)	....	....	....	....	....	....	....	1,473·25	228·42	....
	5434E, etc.	Paringa Mining and Exploration Co., Ltd.	....	....	97,701·75	21,428·81	1,861·86	....	....	830,514·81	201,457·27	14,205·38
		Prior to transfer to present holders	....	....	....	....	....	1·07	·79	57,618·03	24,452·83	....
	6095E	Raymond	....	....	69·00	6·10	....	....	....	69·00	6·10	....
	5808E, etc.	South Kalgurli Consolidated, Ltd.	....	....	79,173·00	19,503·42	451·74	....	....	2,563,276·67	1,000,302·47	25,785·72
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,344,254·70	531,792·77	17,722·97
		Voided leases	....	....	....	....	....	109·90	11,998·25	621,233·84	472,550·60	6·83
		Sundry claims	....	8.95	67·50	29·30	....	24·58	210·25	11,539·99	4,267·18	....

Cutter's Luck	6056E	New Black Cat	45 .87	....	....	....	....	45 ·87	100 ·06	31 ·00	203 ·31	....	
		Voided leases	....	....	....	....	....	....	20 ·83	12 ·25	9 ·13	....	
		Sundry claims	....	....	....	....	....	8 ·11	501 ·65	751 ·65	362 ·59	....	
Feysville	....	Voided leases	....	....	....	....	....	....	110 ·93	561 ·30	394 ·24	....	
		Sundry claims	....	....	20 ·75	2 ·06	....	....	199 ·00	1,117 ·10	620 ·09	....	
Hampton Plains	P.P.L. 1	Consolidated Gold Areas, N.L.	....	....	....	....	....	....	....	140,168 ·73	37,039 ·14	5,835 ·85	
	P.P.L. 9	Consolidated Gold Areas, N.L.	....	....	....	....	....	....	....	215 ·75	4 ·27	....	
	P.P.L. 86	Golden Hope, N.L.	....	....	....	....	....	....	....	5,964 ·00	2,006 ·14	....	
	P.P.L. 192	Golden Hope North	....	....	....	....	....	....	....	353 ·00	201 ·02	....	
	P.P.L. 177	Great Northern	....	....	29 ·75	5 ·36	....	....	....	29 ·75	5 ·36	....	
	P.P.L. 12	Junction Extended	....	....	774 ·75	96 ·36	....	....	....	3,581 ·75	527 ·74	....	
	P.P.L. 227	McGrath Lease	....	....	....	....	....	....	....	215 ·75	47 ·87	....	
	P.P.L. 289	Hampton Syndicate	....	....	....	....	....	....	....	....	*157 ·41	....	
	P.P.L. 252	Mount Martin	....	....	....	....	....	....	....	14,953 ·75	5,574 ·11	....	
	P.P.L. 279	Mutooroo	....	....	....	....	....	....	....	6,151 ·88	1,087 ·26	....	
	P.P.L. 277	New Hope	....	....	1,953 ·25	259 ·11	....	....	17 ·23	56,938 ·30	10,540 ·87	....	
	P.P.L. 371	Victory	....	....	1,088 ·00	100 ·68	....	....	....	1,294 ·25	167 ·06	....	
	P.P.L. 81	Villers Brettaneaux	....	....	....	....	....	....	....	3,562 ·02	1,435 ·55	....	
		Voided leases	....	....	....	....	....	4,565 ·62	203 ·94	110,492 ·44	36,077 ·27	69 ·60	
		Sundry claims	....	....	20 ·00	2 ·09	....	2 ·68	70 ·85	46,356 ·91	8,479 ·97	....	
Kalgoorlie....	5927E	A.I.F.	....	....	18 ·00	4 ·44	....	....	....	31 ·00	10 ·34	....	
	6048E	Auld Acquaintance	....	....	....	....	....	....	....	7 ·50	2 ·36	....	
	6078E	A.W.A. Extended	....	....	....	....	....	....	....	82 ·50	4 ·71	....	
	5519E	Barbican Corporation, Ltd. (Hannans Enterprise)	....	....	....	....	....	....	....	362 ·00	79 ·80	....	
	5735E	Bonnie Lass	....	....	....	....	....	....	....	250 ·50	74 ·67	....	
	5449E	Broken Hill Proprietary Co., Ltd.	....	....	44,307 ·00	13,893 ·19	....	....	3 ·99	353,125 ·01	140,538 ·76	1,843 ·28	
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,558 ·49	316 ·58	....	
	6046E	Colleen Bawn	....	....	134 ·00	11 ·35	....	....	....	412 ·50	71 ·60	....	
	5867E	Concord	....	....	15 ·50	2 ·18	....	....	8 ·64	184 ·75	67 ·72	....	
	5839E	Coronation	....	....	....	....	....	....	....	40 ·00	9 ·03	....	
	5913E	Devon Consols	....	....	194 ·00	61 ·90	....	....	93 ·19	1,432 ·21	480 ·02	....	
	5924E	Federal	....	....	....	....	....	....	....	36 ·25	4 ·51	....	
	5737E	Golden Mile Channel	....	....	96 ·75	5 ·35	....	....	·97	2,631 ·25	204 ·76	....	
	6020E	Golden Mile North....	....	....	....	....	....	....	....	106 ·25	23 ·77	....	
	6019E	Golden Seam	....	....	....	....	....	....	....	201 ·00	161 ·16	....	
	5904E	Great Patience	....	....	41 ·50	3 ·14	....	....	1 ·07	261 ·00	68 ·16	....	
	5966E	Hidden Secret	....	....	....	....	....	....	2 ·20	139 ·00	134 ·76	....	
	6044E	Kapai	....	....	....	....	....	....	....	51 ·00	4 ·55	....	
	5878E	Lady May	....	....	246 ·00	82 ·10	....	....	62 ·05	2,615 ·00	683 ·85	....	
	6091E	Lesanben	....	32 .19	24 ·75	39 ·95	....	....	40 ·29	36 ·50	72 ·65	....	
	6057E	Little Ray	....	....	25 ·75	3 ·01	....	....	....	96 ·75	16 ·25	....	
	4547E, etc.	Mt. Charlotte (Kalg.) Gold Mines, Ltd.	....	....	....	....	....	....	....	1,234 ·00	252 ·17	....	
		Prior to transfer to present holders	....	....	....	....	....	....	5 ·72	48,292 ·60	13,930 ·79	....	
	5437E	North End Extended	....	6 .19	....	....	....	....	996 ·89	356 ·35	521 ·79	....	
	5468E	Phar Lap	....	....	....	....	....	....	....	474 ·00	349 ·08	....	
	5415E, 5803E	Return Leases	....	....	....	....	....	....	5 ·64	3,698 ·75	644 ·44	....	
	5934E, etc.	Sceptre Leases	....	....	....	....	....	....	....	28 ·00	4 ·63	....	
	5852E, 6024E	Pedestal Leases	....	....	91 ·00	13 ·49	....	....	....	91 ·00	13 ·49	....	
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,667 ·50	481 ·60	....	
		Voided leases	....	....	....	....	....	242 ·48	9,556 ·47	963,115 ·45	397,264 ·40	44,017 ·12	
		Sundry claims	....	....	....	....	....	232 ·41	1,122 ·17	59,096 ·29	22,932 ·86	....	
Wombola	6051E	Big Bull	....	....	50 ·50	50 ·67	....	....	....	98 ·00	79 ·55	....	
	5688E, 5967E	Caledonian Leases	....	....	149 ·00	76 ·16	....	....	....	149 ·00	76 ·16	....	
	5967E	(North Caledonian)	....	....	....	....	....	....	1 ·27	22 ·25	8 ·15	....	

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Wombola—*contd.*	5688E	(Caledonian)	....	....	250·00	186·79	....	....	....	4,275·00	3,632·98	....
	5497E, 5500E	Daisy Leases	....	....	570·00	296·66	....	....	....	570·00	296·66	....
	5500E	(Happy Go Lucky)	....	....	....	....	....	....	....	2,075·25	1,675·85	....
	5497E	(Daisy)	....	....	629·00	300·95	....	....	....	6,282·25	5,031·93	....
	6032E	Dry Mount	....	....	161·00	356·69	....	....	....	277·50	569·43	....
	5962E	G.D.N.	....	....	....	....	....	....	68·71	68·50	283·36	....
	4766E	Great Hope	....	....	28·00	5·46	....	....	....	28·00	5·46	....
	4766E	(Great Hope (Pericles G.M., Ltd.))	....	....	....	....	....	....	358·11	4,728·03	19,305·86	....
	5689E, 5525E	Haoma Leases	....	....	803·00	554·94	....	....	....	7,265·50	4,869·24	....
	5525E	(Xmas Flat)	....	....	....	....	....	....	....	330·25	264·74	....
	5689E	(Haoma)	....	....	....	....	....	....	....	2,168·00	1,948·36	....
	6043E, 5872E	Launa Doone Leases	....	....	32·50	42·76	....	....	....	32·50	42·76	....
	6043E	(Launa Doone)	....	....	45·00	52·78	....	....	....	150·50	114·87	....
	5872E	(Everly)	....	....	....	....	....	....	....	101·00	136·35	....
	5961E	Loganberry	....	....	....	....	....	....	....	288·25	101·02	....
	5798E	Maronoa	....	....	334·00	222·73	....	....	32·17	2,524·00	1,332·11	....
	5493E, etc.	New Milano, N.L.	....	....	141·00	483·66	....	....	·25	17,296·75	11,395·35	479·00
		Prior to transfer to present holders	....	....	....	....	....	....	....	4,614·75	12,615·82	....
	6022E	Proprietary	....	....	112·50	35·88	....	....	....	369·75	423·90	....
	5866E	Rosemary	....	....	....	....	....	....	....	32·50	67·19	....
		Voided leases	....	....	....	....	....	....	2,037·96	20,812·81	19,403·72	....
		Sundry claims	....	9.46	674·25	234·47	....	....	710·89	21,290·18	13,179·28	....
	From District generally :—											
	Sundry claims		....	....	....	....	....	11,014·57	465·61	5,440·46	2,541·10	....
	Sundry parcels treated at :											
	State Battery, Kalgoorlie		....	....	12·00	*1,563·00	39·40	....	....	317·20	*22,191·71	39·40
	A. J. Cavalier Treatment Works		....	....	....	....	....	....	....	10·50	*31·43	....
	Prior to transfer to present holders		....	....	....	....	....	....	....	....	*1,538·16	1,507·65
	Golden Horseshoe (New), Ltd.		....	....	....	*10,647·93	26,799·48	....	....	....	x276,412·30	268,940·05
	Pericles Mill		....	....	....	*343·75	....	....	....	....	*2,918·39	....
	Polkinghorne's Cyanide Plant		....	....	....	....	....	....	....	....	*149·38	....
	M.A. 1, J. F. Poynton		....	....	....	....	....	....	....	9·50	6·06	....
	Various Works		....	....	....	....	....	384·36	64·70	41,115·02	*264,204·51	12,606·81
	Reported by Banks and Gold Dealers		56.66	.16	·02	353·31	....	16,694·78	9,956·00	355·65	3,505·53	....
	Totals		**102.53**	**56.95**	**1,621,059·41**	**449,384·73**	**134,970·22**	**33,389·18**	**40,630·96**	**53,571,495·98**	**27,710,958·77**	**3,723,014·33**

BULONG DISTRICT.

Balagundi	....	Voided leases	....	....	....	....	....	....	2,408·98	1,110·68	1,473·73	12·92
		Sundry claims	....	9.11	8·00	8·43	....	3·51	291·91	769·51	484·97	....

Bulong	1311Y	Blue Quartz	....	....	....	....	....	....	....	784·00	214·24	....
	1315Y	Lady Gwen	....	....	92·50	14·48	....	....	....	34·47	560·50	129·56	....
	1308Y	Southern Cross	....	....	491·25	115·73	....	....	....	1·30	1,934·50	328·05	....
		Voided leases	....	....	....	....	....	107·54	8,490·35	104,142·55	85,090·08	....
		Sundry claims	....	9.60	115·75	71·95	....	1,655·86	1,601·79	14,866·73	17,484·33	....
Majestic	....	Voided leases	....	....	....	....	....	19·45	63·91	1,317·94	647·62	....
		Sundry claims	....	....	10·00	4·67	....	42·88	154·58	1,909·05	945·29	....
Moorlands	....	Sundry claims	....	....	....	....	....	....	·13	183·00	58·51	....
Mt. Monger	....	Voided leases	....	....	....	....	....	....	2,771·39	1,437·85	1,256·10	....
		Sundry claims	....	....	....	....	....	215·60	....	379·05	308·48	....
Randalls	....	Voided leases	....	....	....	....	....	....	60·04	33,180·35	11,100·46	....
		Sundry claims	....	....	26·75	3·65	....	20·70	8·11	4,814·31	1,211·05	....
Taurus	....	Voided leases	....	....	....	....	....	2·06	3·70	1,765·10	909·84	
		Sundry claims	....	....	....	....	....	112·69	51·88	2,608·35	1,037·88	
Trans Find	P.P.L. 308A	Dawn of Hope	....	....	268·50	20·96	....	....	2·87	1,092·50	314·76	....
		Voided leases	....	....	....	....	....	....	....	983·92	865·71	....
		Sundry claims	....	....	69·00	11·41	....	....	5·93	795·25	330·72	....
	From District generally :—											
	Sundry parcels treated at :											
	Various Works		....	....	....	....	....	....	....	6,102·15	*6,675·38	....
	Reported by Banks and Gold Dealers		1.90	....	....	....	....	25,198·12	70·15	·01	28·44	....
	Totals		**1.90**	**18.71**	**1,081·75**	**251·28**	....	**27,378·41**	**16,021·49**	**180,737·30**	**130,895·20**	**12·92**

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnivale	5596	Jenny Wren	....	....	200·55	173·46	....		150·23	948·30	1,114·18	4·17
	5622	Lucky Hit	....	....	....	....	....	....	....	703·25	297·46	....
	4600	Melva Maie	....	....	89·50	69·58	1·70	....	....	1,874·90	3,222·92	1·70
		Prior to transfer to present holders	....	....	....	....	....	....	....	614·50	1,099·21	11·63
		Voided leases	....	....	....	....	....	....	30·03	352,675·34	188,804·77	....
		Sundry claims	....	....	153·75	25·06	....	....	158·69	6,209·18	4,559·91	....
Bulla Bulling	....	Voided leases	....	....	....	....	....	....	....	776·81	668·19	....
		Sundry claims	....	....	....	....	....	5·21	15·98	1,318·26	561·29	....
Burbanks	5605	Burbanks Deeps	....	....	....	....	....	....	....	103·00	53·46	....
	5443	New Gift	....	....	....	....	....	....	2·00	625·50	228·69	....
		Voided leases	....	....	....	....	....	14·90	372·17	415,756·21	304,615·58	521·06
		Sundry claims	....	....	483·25	95·00	....	55·05	477·11	14,704·10	8,597·69	....
Cave Rocks	5645	Gold Coin	....	....	293·50	94·04	....	....	....	636·50	158·21	....
	5665	Nornadeen	....	....	210·00	36·75	....	....	....	779·00	162·42	....
		Voided leases	....	....	....	....	....	....	....	2,302·05	588·18	....
		Sundry claims	....	....	444·75	76·45	....	....	50·00	3,860·40	861·73	....
Coolgardie	5679	Ada	....	....	....	....	....	....	....	1,130·25	107·11	....
	5637	Caledonia	....	....	224·25	106·49	....	....	7·30	2,558·25	488·26	....
	5297, etc.	Consolidated G.M.'s of Coolgardie, Ltd.	....	....	....	....	....	....	....	282,560·70	50,610·27	4,812·12
									4·55	1,946·35	547·45	3·22
		Prior to transfer to present holders	....	....	....	....	....	....				

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

COOLGARDIE GOLDFIELD—*continued.*

COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Coolgardie—*contd.*	5653	Gleeson's	....	....	....	....	....	....	....	1,925·00	922·37	....
	5638	Grey's Hill	....	....	....	....	....	....	....	129·00	87·50	....
	5686	Hillside	....	....	....	....	....	....	....	12·00	17·69	....
	5598	King Solomon	....	....	60·25	12·60	....	2·69	....	724·75	114·39	....
	5713	Lady Grace	....	....	67·75	77·36	....	....	....	129·25	185·21	....
	5643	Lloyd George South	....	....	....	....	....	....	....	....	*10·25	....
	5622	Lucky Hit	....	....	50·25	46·56	....	....	....	50·25	46·56	....
	5743	Moya Jan	....	....	891·00	352·91	....	....	....	1,029·75	424·22	....
	5239, etc.	Phoenix Gold Mines, Ltd.	....	....	28,085·00	6,784·92	....	....	....	227,520·00	62,494·76	2·54
		Prior to transfer to present holders	....	....	....	....	....	....	2·74	167·56	237·80	....
	(5729)	Quartzite	....	....	25·00	6·39	....	....	....	25·00	6·39	....
	(5750)	Sydenham	....	....	255·00	28·99	....	....	....	582·00	44·79	....
	5749	Sydenham North	....	....	....	....	....	....	....	153·00	15·20	....
	5754	United	....	....	180·00	41·61	....	....	....	484·50	376·68	....
		Voided leases	....	....	....	....	....	1,299·02	4,660·89	571,685·43	326,922·90	0·96
		Sundry claims	1.77	....	349·50	103·75	....	205·49	2,674·09	64,943·28	23,928·72	....
Eundynie	5624	Eundynie	....	....	....	....	....	....	....	54·00	71·56	....
		Voided leases	....	....	....	....	....	0·92	16·09	31,697·20	16,423·28	1·75
		Sundry claims	....	....	28·00	3·17	....	....	10·18	658·19	314·69	....
Gibraltar	5723	Lloyd George	....	....	270·00	68·19	....	....	....	270·00	68·19	....
	5684	Winston Churchill	....	....	60·00	12·96	....	....	....	60·00	12·96	....
		Voided leases	....	....	....	....	....	....	33·97	38,592·63	20,097·49	....
		Sundry claims	....	....	52·00	6·95	....	1·39	50·76	2,943·70	1,280·51	....
Gnarlbine		Voided leases	....	....	....	....	....	....	13·95	2,731·75	1,341·60	....
		Sundry claims	....	....	....	....	....	....	4·90	1,186·10	504·18	....
Hampton Plains	P.P.L. 330	Barbara	....	....	....	....	....	....	....	2,157·75	1,655·63	....
	P.P.L. 361	Mistletoe	....	....	....	....	....	....	....	20·00	5·11	....
	P.P.L. 419	Chatanooka	....	....	553·00	169·25	1·10	....	....	749·25	214·00	1·10
	P.P.L. 338	Dry Hill	....	....	17·00	12·78	....	....	....	39·00	54·90	....
	P.P.L. 427	Easter Gift	....	....	21·75	3·04	....	....	....	21·75	3·04	....
	P.P.L. 119	Golden Eagle	....	....	....	....	....	....	7·63	2,807·59	2,548·42	....
	P.P.L. 348	Hampton Gold Mining Areas, Ltd.	....	....	....	....	....	....	....	43·75	4·69	....
	P.P.L. 348	(Goldfields Australia Development Co., Ltd.)	....	....	....	....	....	....	....	78·00	12·89	....
	P.P.L. 334	Hampton Gold Mining Areas, Ltd.	....	....	1,407·75	404·90	....	....	....	1,538·25	453·60	....
	P.P.L. 454	Hampton Gold Mining Areas, Ltd.	....	....	11·00	3·82	....	....	....	48·75	7·53	....
	P.P.L. 435	Lady Jess	....	....	135·50	22·90	....	....	2·79	151·00	30·47	....
	P.P.L. 355	Lady Marie	....	....	307·75	84·45	....	....	....	373·25	109·58	....
	P.P.L. 319	Lady May	....	....	....	....	....	....	....	1,742·25	981·39	....
	P.P.L. 389	Lassie Come Home	....	....	....	....	....	....	....	30·00	6·54	....

	P.P.L. 315	Malvern Star	....	....	....	....	....	....	....	....	16·00	10·14	....
	P.P.L. 316	Surprise G.M.	....	....	....	....	....	....	....	....	7,189·00	3,425·59	....
	P.P.L. 436	May	....	....	4·50	1·35	....	....	....	....	4·50	1·35	....
	P.P.L. 429	Maureen Anne	....	....	14·75	2·15	....	....	....	....	14·75	2·15	....
	P.P.L. 1328	Daniel Finn	....	....	19·75	11·18	....	....	....	....	19·75	11·18	....
	P.P.L. 437	Two Crows	....	....	15·00	5·57	....	....	....	....	15·00	5·57	....
		Voided leases	....	....	....	....	....	....	403·05	8,518·25	7,798·76	....	
		Sundry claims	....	....	....	....	....	1·63	132·06	1,738·25	799·38	....	
Higginsville	5647	Fair Play	....	....	1,095·00	190·87	....	....	....	9,434·00	1,836·76	....	
	5293	Two Boys	....	....	....	*42·93	....	....	....	460·00	*750·01	....	
	5293	(Two Boys)	....	....	....	....	....	....	....	6,888·00	3,193·95	....	
	5666	War Time	....	....	....	....	....	....	26·28	64·00	75·43	0·06	
		Voided leases	....	....	....	....	....	....	347·65	38,077·35	17,363·06	159·44	
		Sundry claims	....	....	15·50	2·11	....	....	149·47	3,638·23	1,920·14	....	
Larkinville	5667	Ground Lark	....	....	60·00	8·49	....	....	7·96	197·25	46·38	....	
		Voided leases	....	....	....	....	....	22·77	46·48	2,098·91	3,198·09	....	
		Sundry claims	....	....	....	....	....	....	147·20	448·53	1,029·03	....	
Logan's	5324, etc.	Spargo's Reward G.M., L. (1935), N.L.	....	....	....	....	....	....	....	105,397·50	26,318·11	....	
	5681	Twenty Grand	....	....	....	....	....	....	....	81·00	75·93	....	
		Voided leases	....	....	....	....	....	....	....	1,182·31	531·33	....	
		Sundry claims	....	....	190·00	18·89	....	....	128·95	1,771·35	879·61	....	
Londonderry	5250	Vice Regal	....	....	....	....	....	....	1·91	4,056·50	1,309·88		
		Voided leases	....	....	....	....	....	....	93·13	29,817·35	20,886·19	....	
		Sundry claims	....	....	97·00	21·14	....	16·68	38·72	3,199·17	2,466·94	22·42	
Mungari	5785	Repulse	....	....	331·25	35·46	....	....	....	331·25	35·46	....	
		Voided leases	....	....	....	....	....	....	17·71	735·00	331·78	....	
		Sundry claims	....	1.90	1,033·75	170·61	....	1·77	153·24	2,417·19	670·86	....	
Paris	5311, etc.	Lister's Gold Mine	0.88	....	1,119·00	889·47	38·65	0·88	....	5,055·00	3,329·15	75·95	
	5311, etc.	(Lister's Gold Mine)	....	....	....	....	....	....	....	8,582·00	4,423·84	....	
	5311, etc.	(Paris Central)	....	....	....	....	....	....	....	113·00	24·16	....	
	5514	Paris	....	....	103·00	34·63	....	....	....	879·00	400·08	3·24	
		Voided leases	....	....	....	....	....	....	4·30	463·00	209·47	....	
		Sundry claims	....	....	67·00	13·51	....	....	....	2,104·25	515·32	....	
Red Hill	....	Voided leases	....	....	....	....	....	14·87	1,551·81	40,797·40	31,070·65	....	
		Sundry claims	....	....	19·75	5·12	....	15·29	90·33	1,344·52	715·19	....	
Ryan's Find	....	Voided leases	....	....	....	....	....	....	....	54·16	151·69	....	
		Sundry claims	....	....	....	....	....	....	0·44	101·69	228·66	....	
St. Ive's	5682	Alice May	1.44	....	30·00	7·75	....	1·44	....	101·00	152·72	....	
	(5617), etc.	Ive's Reward Leases	....	....	....	....	....	....	....	1,617·00	450·47	....	
		Voided leases	....	....	....	....	....	61·90	146·87	37,600·46	15,603·59	....	
		Sundry claims	....	....	....	....	....	211·25	944·85	4,078·56	1,441·72	....	
Wannaway	(5725)	Little Mary	....	1.56	....	....	....	....	9·51	18·60	417·81	....	
		Voided leases	....	....	....	....	....	....	19·10	1,813·35	1,047·89	....	
		Sundry claims	....	....	148·35	35·42	....	....	191·42	1,254·32	1,215·62	....	
Widgiemooltha	5663	Bobs	....	....	16·00	4·94	....	....	....	16·00	4·94	....	
	5702	Cardiff Castle	....	....	985·00	244·73	....	....	....	1,575·00	391·65	....	
	5451	Host Group	....	....	....	....	....	....	....	1,601·00	434·38	....	
	5711	Imperial	....	....	36·00	4·59	....	....	....	101·00	9·62	....	

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

COOLGARDIE GOLDFIELD—*continued.*

COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Widgiemooltha—*contd.*	5658	Iron Knob	....	....	240·00	9·83	....	....	6·02	385·00	62·02	....
		Voided leases	....	....	....	....	....	9·42	1,108·92	20,362·70	11,292·64	0·17
		Sundry claims	....	5.81	283·15	100·87	0·07	46·49	430·58	15,678·86	6,690·32	0·07
		From District generally :—										
		Sundry parcels treated at :										
		State Battery, Coolgardie....	....	....	....	*678·73	....	....	....	771·01	*33,057·04	9·65
		Australian Machinery and Investment Co., Ltd., T.L.'s 3/63H, 5/127H	....	....	....	....	....	....	....	....	*3,043·48	86·31
		Franks Cyanide Plant	....	....	....	....	....	....	....	....	*1,343·17	....
		Imperial Battery	....	....	....	....	....	....	....	26·00	*340·76	....
		Lister's Cyanide Plant	....	....	....	....	....	....	....	....	*269·23	....
		Paris Central Cyanide Plant	....	....	....	....	....	....	....	....	*77·64	....
		U. C. Parry, M.A. 96	....	....	....	....	....	....	....	....	*23·77	....
		Widgiemooltha Battery, M.A. 85	....	....	....	....	....	....	....	....	*1,165·31	....
		Various Works	....	....	....	....	....	7·75	....	3,871·61	*26,465·97	223·06
		Reported by Banks and Gold Dealers	49.00	2.44	....	....	....	14,762·39	717·62	48·25	66·70	....
		Totals	**53.09**	**11.71**	**40,850·80**	**11,464·67**	**41·52**	**16,759·20**	**15,661·63**	**2,427,861·91**	**1,270,494·37**	**5,940·62**

KUNANALLING DISTRICT.

Carbine	970s	Carbine	....	....	....	....	....	....	....	13,820·00	7,047·96	....
	970s, etc.	Carbine Leases	....	....	....	....	....	....	687·98	51,991·86	39,862·25	....
		Voided leases	....	....	....	....	....	....	....	20,116·00	5,470·81	....
		Sundry claims	....	....	8·50	2·07	....	136·08	93·96	5,932·28	2,012·75	....
Chadwin	1014s	Magdala	....	....	48·00	18·89	....	....	....	503·00	543·83	....
		Voided leases	....	....	....	....	....	....	....	4,278·55	4,688·42	2·50
		Sundry claims	....	....	548·50	99·91	....	14·28	78·02	5,359·55	2,756·79	....
Dunnsville	1033s	Wealth of Nations	....	....	28·00	8·23	....	....	....	28·00	8·23	....
		Voided leases	....	....	....	....	....	....	828·58	17,489·60	8,642·30	....
		Sundry claims	....	....	....	....	....	3·35	1,020·90	2,533·56	1,798·37	....
Jourdie Hills	....	Voided leases	....	....	....	....	....	....	18·00	28,009·74	19,401·09	28·45
		Sundry claims	....	....	24·25	7·45	....	1·86	49·81	1,673·00	819·25	1·05
Kintore	1026s	Makale	....	....	139·25	30·60	....	....	....	207·50	71·58	....
		Voided leases	....	....	....	....	....	18·70	169·33	54,044·64	39,197·31	677·88
		Sundry claims	....	....	430·00	113·57	....	111·91	102·70	3,350·38	2,177·12	....

Kunanalling	1024s	Kiora....	....	....	49·00	29·55	....	....	....	318·70	184·26	....
	987s	Premier	....	....	....	*7·16	....	0·23	....	4,096·00	2,432·00	....
	919s	(Kunanalling Gold, N.L.)....	....	....	....	....	....	....	....	6,482·50	5,440·77	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	690·00	847·30	12·78
	988s	Premier North	....	....	....	....	....	....	....	410·00	288·08	....
		Voided leases	....	....	....	....	....	85·90	1,734·92	117,678·66	91,323·50	27·99
		Sundry claims	....	....	498·85	112·53	....	216·53	808·12	13,654·42	9,136·93	....
										465·00	68·12	....
Kundana	....	Voided leases	....	....	....	....	....	....	....	431·50	50·37	....
		Sundry claims	....	....	21·25	5·89	....	....	....			
	From District generally :—											
	Sundry parcels treated at :											
	Goldfields Australia Development, M.A. 31s,										*548·07	....
	T.A. 30s	....	....	....	....	....	....	42·23	....	1,782·26	*5,061·33	....
	Various Works	....	....	....	....	....	....	858·30	17·93	....	5·85	0·49
	Reported by Banks and Gold Dealers	0.32	....	....	....	....						
	Totals	**0.32**	....	**1,795·60**	**435·85**	....	**1,489·37**	**5,610·25**	**355,346·70**	**249,884·64**	**751·14**

Yilgarn Goldfield.

Blackbourne	....	Voided leases	....	....	....	....	....	....	....	1,282·50	341·37	....
		Sundry claims	....	....	52·00	6·56	....	....	....	392·50	81·15	....
Bullfinch	3345, etc.	Copperhead	....	....	....	....	....	....	....	7,427·32	2,076·32	....
	3378, etc.	Copperhead Deeps	....	....	....	....	....	....	....	13,554·65	4,102·83	....
	3337, etc.	Easter Gift Leases	....	....	....	....	....	....	....	1,597·00	472·43	....
		Prior to transfer to present holders	....	....	....	....	....	....	48·03	3,594·26	1,169·82	....
	3400, etc.	Frances May	....	....	....	....	....	....	7·74	8,683·55	3,341·69	....
	3397, etc.	Goldfinch	....	....	....	....	....	....	6·73	6,456·03	2,634·10	....
	4009	Reynold's Find	....	....	....	....	....	....	....	241·00	114·95	....
	3350, 3965	Rising Sun	....	....	....	....	....	....	2·30	37,059·53	10,837·80	....
		Voided leases	....	....	....	....	....	....	10·14	490,120·07	185,374·08	27,958·41
		Sundry claims	....	....	....	....	....	8·47	37·04	7,322·75	3,961·29	....
Corinthian	45PP	Babylonia	....	23.46	55·00	50·47	....	....	23·46	127·00	105·25	....
	3398, 3425	Corinthian Leases	....	....	....	....	....	....	....	3,081·83	1,770·09	....
	3398	(Corinthian)	....	....	....	....	....	....	....	7,383·75	2,543·16	....
	3425	(Corinthian North)	....	....	....	....	....	....	....	3,951·00	1.934·78	....
	4180	Deliverance	....	....	163·00	54·52	....	....	....	163·00	54·52	....
	(3415)	Deliverence	....	....	....	3·13	....	....	....	3,019·40	3,176·20	....
		Voided leases	....	....	....	....	....	....	....	135,095·00	30,011·76	....
		Sundry claims	....	....	....	....	....	....	0·68	1,088·35	640·61	....
Eenuin	4020	Birthday	....	1.30	13·00	60·05	0·01	....	2·25	45·00	193·97	0·01
	4129	Birthday West	....	....	13·00	7·78	....	....	....	13·00	7·78	....
	4130	Birthday West Extended	....	....	14·00	60·02	....	....	....	14·00	60·02	....
	4042	Birthday South	....	....	....	....	....	....	1·03	15·00	50·50	....
	4067	Lone Pine	....	....	55·00	20·42	....	....	....	161·75	49·83	....
	3936	Newfield Central	....	....	25·00	32·81	....	....	....	306·00	450·85	....
	3936	(Yellowdine Gold Areas, N.L.)	....	....	....	....	....	....	....	7,341·50	7,605·06	....
		Voided leases	....	....	....	....	....	....	178·46	1,749·81	1,841·75	....
		Sundry claims	....	....	40·00	39·05	....	2·50	73·97	2,351·60	1,648·97	....
Evanston	3868, etc.	Evanston Gold, N.L.	....	....	11,585·00	5,019·19	....	....	....	12,333·20	5,264·19	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	48,359·30	25,905·04	10·14
	3869	Evanston North	....	....	....	....	....	....	....	1,598·76	1,079·93	....

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

YILGARN GOLDFIELD —*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Evanston—*contd.*	3895	Blue Peter	....	....	....	....	....	....	....	1,288·00	285·84	....
	3997	Gravel Pit	....	....	....	....	....	....	79·27	238·80	160·25	....
		Voided leases	....	....	....	....	....	....	....	649·00	230·70	....
		Sundry claims	....	....	80·00	15·01	....	4·98	....	583·35	148·67	....
Forrestonia	....	Voided leases	....	....	....	....	....	....	....	1,185·00	298·15	....
		Sundry claims	....	....	....	....	....	....	....	372·00	141·78	....
Golden Valley	4127	Bulwark	....	....	17·00	15·97	....	....	....	17·00	15·97	....
	3575, etc.	Great Bingin Leases	....	....	....	....	....	....	....	16,771·00	10,248·61	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	922·50	517·98	....
	4173	Inspiration	....	....	59·00	100·46	....	....	....	59·00	100·46	....
	3248	Radio Deeps	....	....	....	....	....	....	....	5,720·58	6,297·01	....
	2994, etc.	Radio Leases	....	....	1,026·00	1,214·73	221·45	....	2·70	19,424·80	40,865·97	299·55
	3993	Stumpy Doodle	....	....	....	....	....	....	0·58	2,280·00	824·22	8·99
		Voided leases	....	....	....	....	....	....	35·76	10,802·84	10,584·40	2·00
		Sundry claims	....	68.17	105·00	64·34	....	4·58	129·46	6,452·77	4,687·60	1·02
Greenmount	....	Voided leases	....	....	....	....	....	45·99	21·62	125,022·64	31,575·09	944·50
		Sundry claims	....	....	120·00	8·91	....	0·46	4·27	2,976·58	788·58	....
Holleton	37PP	Brittania	....	....	182·00	153·36	....	....	....	505·00	641·13	....
	4169	Holleton East	....	....	160·00	31·36	0·15	....	....	160·00	31·36	0·15
		Voided leases	....	....	....	....	....	....	9·33	44,700·25	13,037·52	34·53
		Sundry claims	....	....	....	....	....	....	3·75	3,464·05	923·78	0·20
Hopes Hill	3414 (14PP)	Pilot	....	....	....	....	....	....	....	19,446·12	2,948·68	....
	4033	Queen Elizabeth	....	....	56·00	31·46	....	....	....	169·00	77·68	....
		Voided leases	....	....	....	....	....	....	74·78	132,361·55	36,369·69	1·00
		Sundry claims	....	10.99	262·00	84·10	....	18·67	44·35	4,431·02	1,387·00	....
Kennyville	4136	Leviathan	....	....	157·00	67·49	....	....	....	182·00	83·03	....
	3875	Victoria	....	....	161·00	47·53	....	....	....	4,203·00	932·93	0·63
		Voided leases	....	....	....	....	....	....	18·76	55,581·63	21,520·61	0·59
		Sundry claims	....	....	51·00	56·65	....	....	5·06	8,478·50	2,275·41	....
Koolyanobbing	4190	Robert's Find	....	....	30·50	57·75	....	....	....	30·50	57·75	....
		Voided leases	....	....	....	....	....	....	....	1,707·05	884·28	....
		Sundry claims	....	1.21	43·10	82·03	....	0·26	1·21	628·10	313·13	....
Marvel Loch	4046	Banker	....	....	35·00	4·75	....	....	....	110·00	31·80	....
	4170	Battler	....	....	30·00	3·66	....	....	....	30·00	3·66	....
	3987, etc.	Burbidge Gold Mines, N.L.	....	....	27,787·00	2,277·83	....	....	....	104,422·00	9,830·70	....
	3987	(Grand National)	....	....	....	....	....	....	....	19,739·00	2,647·30	....
	4003	Christmas Gift	....	....	40·00	132·34	....	....	1,026·44	130·00	178·92	....
	3957	Comet	....	....	20·00	6·02	....	....	....	1,087·00	645·68	6·85

	13PP	Cricket	....	....	....	....	....	....	....	1,616·00	921·75	....
	4039	Cromwell	....	....	115·00	15·05	....	....	....	115·00	15·05	....
	3966	Donovan's Find	....	....	....	....	....	....	....	200·05	56·02	....
	3942, etc.	Edwards Reward Leases	....	....	3,844·00	1,538·64	....	....	....	25,656·50	12,217·22	....
	3942, 11PP	(Edward's Reward)	....	....	....	....	....	....	....	2,080·00	2,016·32	....
	3942, 12PP	(Sunshine)	....	....	....	....	....	....	....	3,866·00	2,384·79	....
	4034	Firelight	....	....	405·00	135·94	....	....	....	1,244·00	289·81	....
	3724	Frances Firness	....	....	1,838·00	474·42	....	....	....	9,850·00	4,206·18	....
	3941	Geelong	....	....	....	....	....	....	1·95	413·50	73·37	....
	4069	Gentle Annie	....	....	....	....	....	....	....	20·00	16·74	....
	3683	Golden Cube	....	....	38·50	11·97	....	....	20·27	1,368·50	672·95	....
	4074	Greenbird	....	....	30·05	37·45	....	....	60·51	110·05	145·25	....
	3718	Kurrajong	....	....	115·00	40·62	....	....	....	9,221·00	3,271·73	....
	3431, etc.	Levado Leases	....	....	....	....	....	....	....	5,006·00	1,032·14	·36
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,056·00	177·67	....
	3914	May	....	....	....	....	....	....	....	145·00	45·86	....
	3459	May Queen	....	....	35·00	19·14	....	....	....	3,798·00	6,954·01	....
	4073	Mountain King	....	....	126·00	27·72	....	....	....	205·00	60·96	....
	3970	Mountain Queen	....	....	....	....	....	....	....	661·00	382·37	....
	3390	N.G.M., Ltd.	....	....	....	....	....	....	....	4,067·50	351·36	0·50
		Prior to transfer to present holders	....	....	....	....	....	....	....	2,675·00	459·60	....
	4068	Try Again	....	....	115·00	44·12	....	....	....	1,560·00	508·99	....
	4035	Undaunted	....	....	....	....	....	....	....	742·00	92·19	....
		Voided leases	....	....	....	....	....	....	385·60	628,238·16	177,144·03	2,465·74
		Sundry claims	....	....	296.02	45.97	....	11.35	230.20	34,278.86	13,024.60	0.02
Mt. Jackson	3449	Die Hardy	....	....	60.00	63.98	....	....	....	492.50	498.11	....
	3859	Great Unknown	....	1.54	43.00	19.85	....	....	16.25	777.50	694.73	....
	3418	Clamp's Central	....	....	151.00	105.18	....	....	....	151.00	107.14	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	8,456.50	7,122.89	6.34
		Voided leases	....	....	....	....	....	....	164.60	44,202.28	30,726.43	2,307.43
		Sundry claims	....	....	251.05	170.36	....	6.44	52.87	10,395.95	4,714.80	70.74
Mt. Palmer	3544, etc.	Yellowdine Gold Development, Ltd.	....	....	22.00	306.15	....	....	....	304,256.50	155,886.94	....
		Prior to transfer to present holders	....	....	....	....	....	....	....	1,564.65	2,540.71	....
		Voided leases	....	....	....	....	....	....	....	67.25	22.90	....
		Sundry claims	....	....	....	....	....	1,643.48	18.19	395.25	367.90	....
Mt. Rankin	3555	No Trumps	....	....	....	....	....	....	....	5,205.37	819.29	....
		Voided leases	....	....	....	....	....	3.84	5.20	496.00	122.17	....
		Sundry claims	....	....	....	....	....	....	....	491.00	117.59	....
Parker's Range	4191	Centipede	....	6.52	48.00	56.27	....	....	6.52	48.00	56.27	....
	4174	Constance Una	....	....	215.00	641.99	....	....	....	215.00	641.99	....
	4198	Maroomba	....	60.58	40·00	15·50	....	....	60·58	40·00	15·50	....
	4052	McIntosh	....	....	....	....	....	....	....	354·00	258·71	....
	4000	Olga	....	....	21·00	42·25	....	....	....	127·00	167·15	....
	(4115)	Ranchi	....	....	135·00	80·28	....	....	....	135·00	80·28	....
	4201	Scot's Grey's	....	....	....	·44	....	....	....	....	·44	....
	(4062)	Victory	....	....	60·00	15·42	....	....	....	1,035·00	601·87	....
	(3969)	White Horseshoe	....	....	220·00	94·16	....	....	....	3,074·60	1,799·84	25·95
		Voided leases	....	....	....	....	....	·42	149·33	54,897·75	26,562·23	·45
		Sundry claims	....	219.98	674·05	382·41	....	6·59	271·71	10,973·80	4,896·68	·08
Southern Cross	4082	Day Dawn	....	....	....	....	....	....	....	50·00	4·50	....
	4004	Excelsior	....	....	486·00	51·57	....	....	....	1,399·00	319·73	....
	4018	Fraser's	....	....	148·00	9·71	....	....	....	1,359·50	162·12	....
	3944	Nil Desperandum	....	....	100·00	5·74	....	....	....	1,533·00	216·77	....
	3444, etc.	Three Boys Gold Mines, Ltd.	....	....	210·00	16·39	....	....	....	10,157·00	1,392·95	1·26

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

YILGARN GOLDFIELD—*continued.*

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1947.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.
	3934	(Three Boys North)	....	....	....	....	....	....	....	106·00	14·66	....
	3981	(Three Kings)	....	....	....	....	....	....	....	104·00	10·01	....
	3444, etc.	(Yellowdine Options, N.L.)	....	....	....	....	....	....	....	8,074·25	2,000·29	....
	3444	(Three Boys)	....	....	....	....	....	....	....	4,180·00	727·75	....
		Voided leases	....	....	....	....	....	4·89	261·35	453,476·68	215,028·52	364·41
		Sundry claims	....	....	....	....	....	95·90	642·09	8,149·66	2,620·77	....
Westonia	3308, etc.	Edna May (W.A.) Amalgamated G.M's., N.L.	....	....	17,498·00	6,774·50	371·63	....	....	142,152·00	60,161·20	4,933·64
		Prior to transfer to present holders	....	....	....	....	....	....	....	4,092·00	2,867·26	....
	4023	Greenfinch	....	....	11·00	1·01	....	....	....	490·65	433·14	....
		Voided leases	....	....	....	....	....	....	4·06	445,495·49	314,459·63	21·78
		Sundry claims	....	....	....	....	....	9·51	64·96	3,861·41	2,488·87	....
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	Butcher Bird Battery, M.A. 43		....	....	....	*40·51	....	....	....	....	*58·36	....
	Centenary Cyanide Plant		....	....	....	*17·33	....	....	....	....	*472·85	....
	Beckwith and Trembath's Cyanide Plant, L.T.T. 1034H		....	....	....	*24·44	....	....	....	....	*24·44	....
	Copperhead Cyanide Plant		....	....	....	*95·47	....	....	....	....	*16,472·97	....
	Holleton Cyanide Plant		....	....	....	....	....	....	....	....	*691·34	47·50
	Howlett's Battery		....	....	....	....	....	....	....	110·00	*13,405·34	....
	T. W. Howlett's Plant, L.T.T. 1013H		....	....	....	*345·84	....	....	....	....	*743·48	16·75
	Invermay Cyanide Plant		....	....	....	....	....	....	....	....	*608·49	3·57
	Kurrajong Battery, 3718		....	....	....	....	....	....	....	....	*409·57	....
	A. Maifri's Plant, L.T.T. 1045H		....	....	....	....	....	....	....	20·00	4·34	....
	Pilot Cyanide Plant		....	....	22·00	5·23	....	....	....	30·00	*3,753·59	....
	Pringle's Cyanide Plant L.T.T. 1039H		....	....	....	....	....	....	....	....	*26·43	....
	Queen Ann Battery		....	....	....	....	....	....	....	....	*169·05	....
	Radio Deeps Cyanide Plant		....	....	....	*48·27	....	....	....	....	*1,588·67	....
	Three Boys Cyanide Plant		....	....	....	*24·49	....	....	....	7·00	*2,273·86	....
	Wesley Cyanide Plant		....	....	....	....	....	....	....	....	*1,220·67	....
	Various Works		....	....	....	....	....	....	....	161·28	*61,553·57	36·54
	Reported by Banks and Gold Dealers		.47	3.35	....	3·33	....	314·38	70·45	....	12·87	....
	Totals		**.47**	**397.10**	**69,809·27**	**21,658·86**	**593·24**	**2,182·71**	**4,335·86**	**3,673,314·98**	**1,673,237·08**	**39,571·63**
		Dundas Goldfield.										
Baldania	....	Voided leases	....	....	....	....	....	....	3·02	846·05	708·99	....
		Sundry claims	....	....	10·25	1·78	....	....	39·25	1,324·27	861·36	·72
Dundas	....	Voided leases	....	....	....	....	....	1·88	28·02	6,103·48	2,545·38	155·02
		Sundry claims	....	....	....	....	....	·76	413·85	2,007·25	1,089·55	18·32

Norseman	1596	Abbotshall	....	....	....	....	....	....	....	2,511·45	1,096·71	754·37
	1468	Bronzewing	....	....	488·25	78·13	1·52	....	33·89	2,883·75	1,948·04	143·88
	1617	Caesar	....	....	....	....	....	....	....	54·00	42·72	....
	1319, etc.	Central Norseman Gold Corporation, N.L.	....	....	107,750·00	34,410·60	28,430·53	....	....	972,989·20	351,906·55	318,461·59
		Prior to transfer to present holders	....	....	....	....	....	....	1,663·32	69,819·83	47,892·08	16,508·85
	1421	Dundas Gold Mines, N.L.	....	....	2,323·00	1,492·50	229·48	....	....	2,800·75	1,727·75	249·85
	1421, 1534	(Empress Gold Mines, N.L.)	....	....	....	....	....	....	....	567·50	516·08	54·61
	1674	Golden Ole	....	....	135·25	81·61	6·46	....	....	288·75	206·00	16·06
	1665	Lady Eunice	....	....	21·75	6·70	·42	....	....	94·50	71·53	6·54
	1315, etc.	Norseman Gold Mines, N.L.	....	....	5,858·00	845·00	1,084·00	....	....	964,099·00	240,900·95	353,206·54
		Prior to transfer to present holders	....	....	....	....	....	....	....	20,657·00	3,909·60	4,981·00
	1422	Onkaparinga	....	....	....	....	....	....	....	624·75	1,178·29	110·42
	1422, 1468	Onkaparinga-Bronzewing	....	....	....	....	....	....	....	843·00	1,396·98	3·62
	1530	Second Try	4.02	....	54·75	62·02	7·29	4·02	4·37	2,096·50	1,280·83	147·45
	1667, etc.	Sun leases	....	....	187·00	175·19	9·93	....	....	764·00	608·82	47·78
	(1671)	Surprise	....	....	61·75	31·33	1·31	....	....	117·00	49·20	2·37
	1682	Tunnel	....	....	117·50	9·66	....	....	....	117·50	9·66	....
	1624	Valhalla	....	....	51·50	31·84	2·83	....	....	451·75	353·66	18·30
		Voided leases	....	....	....	....	....	9·31	10,562·89	893,252·97	587,628·71	36,762·70
		Sundry claims	10.78	15.56	533·29	160·64	7·95	1,052·09	3,393·11	45,067·70	21,651·69	187·60
Peninsula	1616	Day Dawn	....	....	13·00	1·24	·10	....	....	522·25	480·31	3·80
	(1597)	Peninsula North	....	....	27·50	2·87	·11	....	....	245·50	246·55	8·40
		Voided leases	....	....	....	....	....	....	24·29	8,817·14	5,373·87	....
		Sundry claims	....	....	....	....	....	....	....	217·25	119·32	·97
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	State Battery, Norseman	....	....	....	*172·52	·04	....	....	405·39	*24,627·10	1,050·37
	R. and E. Matson Treatment Plant, L.T.T. 1022H	....	....	....	*53·80	40·79	....	....	....	*53·80	40·79
	Princess Royal Cyanide Plant	....	....	....	....	....	....	....	....	*1,949·04	1,571·78
	Various Works	....	....	....	....	....	....	54·52	483·14	*12,857·24	844·36
	Reported by Banks and Gold Dealers	....	....	....	....	....	1,181·77	48·76	47·50	18·62	·70
	Totals	**14.80**	**15.56**	**117,632·79**	**37,617·43**	**29,822·76**	**2,249·83**	**16,269·29**	**3,001,120·12**	**1,315,306·98**	**735,358·76**

Phillips River Goldfield.

Hatter's Hill	....	Voided leases	....	....	....	....	....	....	4·38	1,499·55	1,182·75	....
		Sundry claims	....	....	....	....	....	74·91	21·69	5,225·60	2,720·90	26·09
Kundip	249, etc.	Beryl Gold Mines, Ltd.	....	....	135·00	24·47	....	....	....	2,572·00	2,364·48	197·78
	261	Gem Restored	....	....	35·00	1·40	....	....	....	103·00	11·69	....
		Voided leases	....	....	....	....	....	113·28	556·17	82,109·58	58,196·98	3,811·03
		Sundry claims	....	....	....	....	....	90·27	73·02	6,434·68	1,951·87	54·65
Mt. Desmond	....	Voided leases	....	....	....	....	....	....	1·40	9·00	†3,905·46	6,891·59
		Sundry claims	....	....	....	....	....	....	....	....	†32·81	51·01
Ravensthorpe	....	Voided leases	....	....	....	....	....	....	141·80	24,723·55	26,070·94	4,384·07
		Sundry claims	....	....	....	....	....	163·96	7·68	7,261·57	3,195·67	41·12
West River	....	Voided leases	....	....	....	....	....	....	....	....	10·34	31·06
		Sundry claims	....	....	....	....	....	....	....	....	†6·60	3·44
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	Cordingup Copper Smelter, L.T.T. 1079H	....	....	....	*6·56	....	....	....	....	....	*16·74	4·27

†Copper Ore.

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

PHILLIPS RIVER GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1947. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons. (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.	Total Production. Alluvial. Fine ozs.	Dollied and Specimens. Fine ozs.	Ore treated. Tons. (2,240 lb.).	Gold therefrom. Fine ozs.	Silver. Fine ozs.
		Cordingup Cyanide Plant	....	....	....	....	....	....	....	....	*909·37	4·36
		Floater Cyanide Works	....	....	....	....	....	....	....	12·00	*245·95	....
		Daw and Toleman Cyanide Plant	....	....	....	....	....	....	....	....	*342·19	....
		Kundip Cyanide Plant	....	....	....	....	....	....	....	15·00	15·25	....
		Various Works	....	....	....	....	....	....	....	....	*1,932·66	496·46
		Reported by Banks and Gold Dealers	....	....	....	....	....	164·69	12·14	....	....	....
		Totals	....	....	170·00	32·43	....	607·11	818·28	129,965·53	103,112·65	15,996·93

† Copper Ore.

OUTSIDE PROCLAIMED GOLDFIELD.

Burracoppin	....	Voided leases	....	....	....	....	....	....	....	710·85	706·38	....
		Sundry claims	....	....	....	....	....	....	....	372·75	213·97	....
Donnybrook	....	Voided leases	....	....	....	....	....	23·24	....	1,613·30	816·23	....
		Sundry claims	....	....	....	....	....	44·01	42·29	119·50	15·71	15·18
Jimperding	....	45PD — Hillsdale	....	....	....	....	....	....	....	1,261·75	298·05	....
Roebourne	....	68H, 70H, 94H, 95H — Corderoy Mines, Ltd.	....	....	....	....	....	....	....	1,954·50	451·44	10·79
		Voided leases	....	....	....	....	....	177·74	93·21	19,975·11	22,105·90	1,258·16
		Sundry claims	2.03	....	522·50	153·13	2·57	48·42	92·26	1,596·85	998·26	101·68
		Reported by Banks and Gold Dealers	19.22	....	....	....	·11	6,086·74	170·45	103·50	228·32	·11
		From State generally :—										
		Sundry Parcels treated at :—										
		Fremantle Smelters, Ltd.	....	....	....	....	....	....	....	....	*1,879·08	1,109·06
		Sundry Specimens	....	....	....	....	....	4·24	56·85	....	....	....
		Various Works	....	....	....	....	....	....	....	27·00	*7,233·06	30,417·57
		Voided leases and sundry claims	....	2.70	....	....	....	245·45	16·83	201·60	43·58	....
		Reported by Banks and Gold Dealers	28.44	10.00	....	....	....	1,067·54	878·43	....	279·85	59·99
		Totals	**49.69**	**12.70**	**522·50**	**153·13**	**2·68**	**7,697·38**	**1,350·32**	**27,936·71**	**35,269·83**	**32,972·54**

TABLE II

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT, AS REPORTED TO THE MINES DEPARTMENT DURING THE YEAR 1947.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lb.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	... ...	....	....	....	....	....	....	219·81	125·40	136·25	82·25	427·46	2·14
Pilbara	Marble Bar ...	107·21	4·12	4,641·65	5,293·27	5,404·60	9·64	157·19	258·46	10,321·04	10,610·18	11,025·83	22·86
	Nullagine ...	49·98	254·34	5,679·39	5,316·91	5,621·23	13·22						
Ashburton	... ...	....	....	....	....	....	....	2·85	....	301·00	140·03	142·88	....
Gascoyne	... ...	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill	... ...	....	....	....	....	....	....	....	2·42	3,922·75	1,629·61	1,632·03	....
East Murchison ...	Lawlers ...	1·58	....	27,516·08	6,728·34	6,729·92	....	1·58	2·10	37,805·58	21,483·57	21,487·25	3,660·00
	Wiluna ...	....	....	7,249·00	12,607·00	12,607·00	3,660·00						
	Black Range ...	....	2·10	3,040·50	2,148·23	2,150·33	....						
Murchison	Cue	24·35	18·87	416,842·90	58,105·40	58,148·62	14,000·63	91·49	91·77	478,862·35	92,194·92	92,378·18	14,252·16
	Meekatharra ...	11·35	65·89	7,552·45	5,727·15	5,804·39	·04						
	Day Dawn ...	43·06	7·01	2,191·75	12,964·71	13,014·78	....						
	Mt. Magnet ...	12·73	....	52,275·25	15,397·66	15,410·39	251·49						
Yalgoo	... ...	....	....	....	....	....	....	9·09	....	1,711·77	1,166·29	1,175·38	·94
Mt. Margaret ...	Mt. Morgans ...	15·23	9·63	2,734·00	4,371·00	4,395·86	....	54·11	21·95	90,814·50	34,365·98	34,442·04	2,275·41
	Mt. Malcolm ...	24·60	6·49	83,005·75	26,173·01	26,204·10	2,200·14						
	Mt. Margaret...	14·28	5·83	5,074·75	3,821·97	3,842·08	75·27						
North Coolgardie ...	Menzies ...	3·93	88·01	6,726·00	4,992·68	5,084·62	235·67	12·21	90·01	11,392·00	8,041·53	8,143·75	235·74
	Ularring ...	4·88	2·00	2,577·50	1,907·36	1,914·24	·07						
	Niagara ...	3·11	....	899·00	546·57	549·68	....						
	Yerilla ...	·29	....	1,189·50	594·92	595·21	....						
Broad Arrow ...	... ...	....	....	....	....	....	....	13·79	132·40	18,233·25	8,106·30	8,252·49	....
N.E. Coolgardie ...	Kanowna ...	10·13	364·19	832·00	493·49	867·81	....	17·19	370·28	883·50	523·84	911·31	....
	Kurnalpi ...	7·06	6·09	51·50	30·35	43·50	....						
East Coolgardie ...	East Coolgardie	102·53	56·95	1,621,059·41	449,384·73	449,544·21	134,970·22	104·43	75·66	1,622,141·16	449,636·01	449,816·10	134,970·22
	Bulong ...	1·90	18·71	1,081·75	251·28	271·89	....						
Coolgardie	Coolgardie ...	53·09	11·71	40,850·80	11,464·67	11,529·47	41·52	53·41	11·71	42,646·40	11,900·52	11,965·64	41·52
	Kunanalling ...	·32	....	1,795·60	435·85	436·17	....						
Yilgarn	... ...	....	....	....	....	....	....	·47	397·10	69,809·27	21,658·86	22,056·43	593·24
Dundas	... ...	....	....	....	....	....	....	14·80	15·56	117,632·79	37,617·43	37,647·79	29,822·76
Phillips River ...	... ...	....	....	....	....	....	....	....	....	170·00	32·43	32·43	....
Outside Proclaimed Goldfields ...		....	....	....	....	....	....	49·69	12·70	522·50	153·13	215·52	2·68
		....	....	....	....	....	....	**802·11**	**1,607·52**	**2,507,306·11**	**699,342·88**	**701,752·51**	**185,879·67**

TABLE III.

RETURN SHOWING TOTAL PRODUCTION REPORTED TO THE MINES DEPARTMENT, AND RESPECTIVE DISTRICTS AND GOLDFIELDS FROM WHENCE DERIVED, TO 31ST DECEMBER, 1947.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240lb.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lb.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	... ...	....	....	....	....	....	....	8,320·31	333·38	22,589·40	17,118·56	25,772·25	95·14
Pilbara	Marble Bar ...	14,895·54	4,414·20	292,799·47	297,286·04	316,595·78	764·69	24,634·29	5,601·77	386,228·05	396,738·12	426,974·18	806·58
	Nullagine ...	9,738·75	1,187·57	93,428·58	99,452·08	110,378·40	41·89						
Ashburton	... ...	....	....	....	....	....	....	9,260·41	479·40	5,985·25	2,538·73	12,278·54	8,183·68
Gascoyne	... ...	....	....	....	....	....	....	693·44	41·57	387·00	517·29	1,252·30	....
Peak Hill	... ...	....	....	....	....	....	....	3,374·41	5,162·80	616,310·93	294,513·65	303,050·86	2,311·33
East Murchison ...	Lawlers ...	6,861·07	2,279·27	2,004,898·59	820,039·78	829,180·12	26,279·64	8,716·10	21,664·17	12,591,833·65	3,616,929·05	3,647,309·32	56,208·48
	Wiluna ...	222·36	1,247·37	8,863,327·09	1,849,227·36	1,850,697·09	7,344·84						
	Black Range ...	1,632·67	18,137·53	1,723,607·97	947,661·91	967,432·11	22,494·00						
Murchison	Cue	5,006·98	8,237·76	3,945,074·19	992,638·94	1,005,883·68	139,887·96	24,896·81	57,443·45	9,683,795·81	4,306,769·23	4,389,109·49	317,149·37
	Meekatharra ...	14,260·94	17,538·60	2,238,567·69	1,277,541·42	1,309,340·96	6,042·31						
	Day Dawn ...	3,092·59	11,263·92	2,020,332·53	1,357,278·06	1,371,634·57	169,210·44						
	Mt. Magnet ...	2,536·30	20,403·17	1,479,821·40	679,310·81	702,250·28	3,008·66						
Yalgoo	... ...	....	....	....	....	....	....	1,768·83	2,964·16	433,729·38	258,176·63	262,909·62	1,499·12
Mt. Margaret ...	Mt. Morgans ...	3,346·24	9,326·76	1,203,886·46	706,506·86	719,179·86	5,781·64	11,118·91	32,657·60	9,624,393·29	4,477,260·67	4,521,037·18	220,666·67
	Mt. Malcolm ...	3,787·32	14,023·63	5,946,526·69	2,626,932·89	2,644,743·84	153,216·58						
	Mt. Margaret...	3,985·35	9,307·21	2,473,980·14	1,143,820·92	1,157,113·48	61,668·45						
North Coolgardie ...	Menzies ...	1,626·95	6,422·69	1,460,944·44	1,182,237·58	1,190,287·22	30,059·03	4,778·24	18,652·19	3,012,882·59	2,186,441·54	2,209,871·97	42,613·18
	Ularring ...	128·22	6,639·50	372,676·85	346,787·50	353,555·22	6,098·53						
	Niagara ...	1,711·39	1,817·21	926,123·52	513,843·16	517,371·76	5,603·60						
	Yerilla ...	1,311·68	3,772·79	253,137·78	143,573·30	148,657·77	851·99						
Broad Arrow ...	... ...	....	....	....	....	....	....	21,904·36	26,616·75	1,293,821·10	703,989·23	752,510·34	5,262·41
N.E. Coolgardie ...	Kanowna ...	106,476·16	13,153·56	998,047·06	622,576·42	742,206·14	3,039·73	119,310·02	21,448·62	1,011,338·38	641,058·70	781,817·34	3,050·95
	Kurnalpi ...	12,833·86	8,295·06	13,291·32	18,482·28	39,611·20	11·22						
East Coolgardie ...	East Coolgardie	33,389·18	40,630·96	53,571,495·98	27,710,958·77	27,784,978·91	3,723,014·33	60,767·59	56,652·45	53,752,233·28	27,841,853·97	27,959,274·01	3,723,027·25
	Bulong ...	27,378·41	16,021·49	180,737·30	130,895·20	174,295·10	12·92						
Coolgardie	Coolgardie ...	16,759·20	15,661·63	2,427,861·91	1,270,494·37	1,302,915·20	5,940·62	18,248·57	21,271·88	2,783,208·61	1,520,379·01	1,559,899·46	6,691·76
	Kunanalling ...	1,489·37	5,610·25	355,346·70	249,884·64	256,984·26	751·14						
Yilgarn	... ...	....	....	....	....	....	....	2,182·71	4,335·86	3,673,314·98	1,673,237·08	1,679,755·65	39,571·63
Dundas	... ...	....	....	....	....	....	....	2,249·83	16,269·29	3,001,120·12	1,315,306·98	1,333,826·10	735,358·76
Phillips River ...	... ...	....	....	....	....	....	....	607·11	818·28	129,965·53	103,112·65	104,538·04	15,996·93
Outside Proclaimed Goldfields ...		....	....	....	....	....	....	7,697·38	1,350·32	27,936·71	35,269·83	44,317·53	32,972·54
		....	....	....	....	....	....	**330,529·32**	**293,763·94**	**102051074·06**	**49,391,210·92**	**50,015,504·18**	**5,211,465·78**

TABLE IV.

TOTAL OUTPUT OF GOLD (BULLION AND CONCENTRATES ENTERED FOR EXPORT AND GOLD RECEIVED AT THE ROYAL MINT, PERTH), FROM 1ST JANUARY, 1886 TO 31st DECEMBER, 1947; SHOWING IN FINE OUNCES THE QUANTITY CREDITED TO THE RESPECTIVE GOLDFIELDS.

Year.	Export.	Mint.	Total.	Export.	Mint.	Total.
		KIMBERLEY.			PILBARA.	
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
Prior to 1944	22,422.06	13,351.63	35,773.69	147,612.59	312,277.22	459,889.81
1944	....	154.00	154.00	234.60	12,871.67	13,106.27
1945	....	113.81	113.81	....	8,203.99	8,203.99
1946	....	168.08	168.08	2,671.75	10,536.27	13,208.02
1947	....	350.75	350.75	2,645.68	7,733.88	10,379.56
Total	22,422.06	14,138.27	36,560.33	153,164.62	351,623.03	504,787.65
		(*a*) WEST PILBARA.			ASHBURTON.	
Prior to 1944	4,351.11	26,760.61	31,111.72	4,104.96	5,792.52	9,897.48
1944	....	....	....	....	69.21	69.21
1945	....	....	....	....	53.36	53.36
1946	....	....	....	....	54.21	54.21
1947	....	....	....	....	150.76	150.76
Total	4,351.11	26,760.61	31,111.72	4,104.96	6,120.06	10,225.02
		(*b*) GASCOYNE.			(*c*) PEAK HILL.	
Prior to 1944	304.55	1,063.89	1,368.44	41,102.76	202,601.68	243,704.44
1944	....	....	....	....	446.42	446.42
1945	....	....	....	....	389.95	389.95
1946	....	4.28	4.28	....	949.93	949.93
1947	....	....	....	....	1,086.25	1,086.25
Total	304.55	1,068.17	1,372.72	41,102.76	205,474.23	246,576.99
		EAST MURCHISON.			MURCHISON.	
Prior to 1944	255,117.74	2,854,593.23	3,109,710.97	1,573,714.15	2,916,180.66	4,489,894.81
1944	23.76	44,926.42	44,950.18	1.18	16,304.32	16,305.50
1945	3,723.82	43,178.04	46,901.86	....	18,498.50	18,498.50
1946	97.59	29,563.16	29,660.75	248.07	39,065.42	39,313.49
1947	70.79	22,591.28	22,662.07	125.56	89,592.05	89,717.61
Total	259,033.70	2,994,852.13	3,253,885.83	1,574,088.96	3,079,640.95	4,653,729.91
		(*d*) YALGOO.			(*e*) MT. MARGARET.	
Prior to 1944	13,573.15	189,148.80	202,721.95	691,856.94	3,586,022.67	4,277,879.61
1944	....	1,042.47	1,042.47	297.57	23,414.33	23,711.90
1945	....	788.86	788.86	413.27	20,755.71	21,168.98
1946	20.97	608.95	629.92	569.82	28,775.41	29,345.23
1947	24.08	1,117.24	1,141.32	222.01	28,525.15	28,747.16
Total	13,618.20	192,706.32	206,324.52	693,359.61	3,687,493.27	4,380,852.88
		(*f*) NORTH COOLGARDIE.			(*g*) BROAD ARROW.	
Prior to 1944	263,172.06	1,973,786.42	2,236,958.48	122,439.61	407,522.98	529,962.59
1944	3.08	5,937.46	5,940.54	8.56	2,398.22	2,406.78
1945	48.62	4,792.75	4,841.37	1.33	976.11	977.44
1946	57.05	5,869.50	5,926.55	17.67	3,751.69	3,769.36
1947	18.31	6,744.87	6,763.18	79.39	7,704.06	7,783.45
Total	263,299.12	1,997,131.00	2,260,430.12	122,546.56	422,353.06	544,899.62
		(*f*) NORTH-EAST COOLGARDIE.			(*f*) EAST COOLGARDIE.	
Prior to 1944	235,837.45	456,055.38	691,892.83	7,021,140.82	20,991,198.08	28,012,338.90
1944	38.71	492.21	530.92	488.24	293,919.88	294,408.12
1945	....	235.28	235.28	513.14	319,060.21	319,573.35
1946	11.85	500.01	511.86	1,334.89	425,167.70	426,502.59
1947	....	827.76	827.76	1,253.91	462,611.28	463,865.19
Total	235,888.01	458,110.64	693,998.65	7,024,731.00	22,491,957.15	29,516,688.15
		(*h*) COOLGARDIE.			YILGARN.	
Prior to 1944	662,803.96	1,144,976.13	1,807,780.09	218,955.62	1,472,968.12	1,691,923.74
1944	48.59	14,022.60	14,071.19	87.90	9,287.35	9,375.25
1945	55.55	11,590.78	11,646.33	12.47	5,160.98	5,173.45
1946	48.49	13,817.57	13,866.06	322.25	9,525.64	9,847.89
1947	20.98	13,620.32	13,641.30	259.88	19,909.27	20,169.15
Total	662,977.57	1,198,027.40	1,861,004.97	219,638.12	1,516,851.36	1,736,489.48
		(*i*) DUNDAS.			(*j*) PHILLIPS RIVER.	
Prior to 1944	168,929.01	1,120,797.92	1,289,726.93	40,596.54	62,409.93	103,006.47
1944	376.43	38,559.52	38,935.95	5.85	106.99	112.84
1945	55.81	29,157.22	29,213.03	....	109.98	109.98
1946	424.24	41,801.85	42,226.09	4.52	22.13	26.65
1947	204.09	35,441.76	35,645.85	....	29.13	29.13
Total	169,989.58	1,265,758.27	1,435,747.85	40,606.91	62,678.16	103,285.07
		¶ DONNYBROOK.			OUTSIDE PROCLAIMED GOLDFIELD.	
Prior to 1944	282.21	557.53	839.74	21,200.97	35,448.32	56,649.29
1944	....	....	....	210.52	486.69	697.21
1945	....	....	....	205.37	455.81	661.18
1946	....	....	....	260.98	691.72	952.70
1947	....	....	....	295.41	630.48	925.89
Total	282.21	557.53	839.74	22,173.25	37,713.02	59,886.27

(*a*) Prior to 1st May, 1898, included with Pilbara, and abolished 12th July, 1929. (*b*) Prior to March, 1899, included with Ashburton. (*c*) From 1st August, 1897. (*d*) Prior to 1st April, 1897, included with Murchison. (*e*) From 1st August, 1897. (*f*) Prior to 1st May, 1896, included with Coolgardie. (*g*) From 1st September, 1897. (*h*) Declared 5th April, 1894, to which date included with Yilgarn. (*i*) Prior to 1893, included with Yilgarn. (*j*) Prior to 1902, included in Outside Proclaimed Goldfields. ¶ Abolished 4th March, 1908.

TABLE V.

TOTAL OUTPUT OF GOLD BULLION, CONCENTRATES, ETC., ENTERED FOR EXPORT AND RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT.

FROM 1st JANUARY, 1886.

Year.	Export.	Mint.	Total.	Estimated Value.
	fine ozs.	fine ozs.	fine ozs.	£A.
1886	270·17	...	270·17	1,147
1887	4,359·37	...	4,359·37	18,518
1888	3,124·82	...	3,124·82	13,273
1889	13,859·52	...	13,859·52	58,871
1890	20,402·42	...	20,402·42	86,664
1891	27,116·14	...	27,116·14	115,182
1892	53,271·65	...	53,271·65	226,284
1893	99,202·50	...	99,202·50	421,385
1894	185,298·73	...	185,298·73	787,099
1895	207,110·20	...	207,110·20	879,749
1896	251,618·69	...	251,618·69	1,068,808
1897	603,846·44	...	603,846·44	2,564,977
1898	939,489·49	...	939,489·49	3,990,697
1899	1,283,360·25	187,244·41	1,470,604·66	6,246,732
1900	894,387·27	519,923·59	1,414,310·86	6,007,610
1901	923,686·96	779,729·56	1,703,416·52	7,235,654
1902	707,039·75	1,163,997·60	1,871,037·35	7,947,661
1903	833,685·78	1,231,115·62	2,064,801·40	8,770,719
1904	810,616·04	1,172,614·03	1,983,230·07	8,424,226
1905	655,089·88	1,300,226·00	1,955,315·88	8,305,654
1906	562,250·59	1,232,296·01	1,794,546·60	7,622,749
1907	431,803·14	1,265,750·45	1,697,553·59	7,210,750
1908	356,353·96	1,291,557·17	1,647,911·13	6,999,881
1909	386,370·58	1,208,898·83	1,595,269·41	6,776,274
1910	233,970·34	1,236,661·68	1,470,632·02	6,246,848
1911	160,422·28	1,210,445·24	1,370,867·52	5,823,075
1912	83,577·12	1,199,080·87	1,282,657·99	5,448,385
1913	86,255·13	1,227,788·15	1,314,043·28	5,581,701
1914	51,454·65	1,181,522·17	1,232,976·82	5,237,352
1915	17,340·47	1,192,771·23	1,210,111·70	5,140,228
1916	26,742·17	1,034,655·87	1,061,398·04	4,508,532
1917	9,022·49	961,294·67	970,317·16	4,121,646
1918	15,644·12	860,867·03	876,511·15	3,723,183
1919	6,445·89	727,619·90	734,065·79	3,618,509
1920	5,261·13	612,581·00	617,842·13	3,598,931
1921	7,170·74	546,559·92	553,730·66	2,942,526
1922	5,320·16	532,926·12	538,246·28	2,525,812
1923	5,933·82	498,577·59	504,511·41	2,232,186
1924	2,585·20	482,449·78	485,034·98	2,255,927
1925	3,910·59	437,341·56	441,252·15	1,874,320
1926	3,188·22	434,154·98	437,343·20	1,857,715
1927	3,359·10	404,993·41	408,352·51	1,734,572
1928	3,339·30	390,069·19	393,408·49	1,671,093
1929	3,037·12	374,138·96	377,176·08	1,602,142
1930	1,753·09	415,765·00	417,518·09	1,864,442
1931	1,726·66	508,845·36	510,572·02	2,998,137
1932	3,887·07	601,674·33	605,561·40	4,403,642
1933	2,446·97	634,760·40	637,207·37	4,886,254
1934	3,520·40	647,817·95	651,338·35	5,558,873
1935	9,868·71	639,180·38	649,049·09	5,702,149
1936	55,024·58	791,183·21	846,207·79	7,373,539
1937	71,646·91	928,999·84	1,000,646·75	8,743,755
1938	113,620·06	1,054,171·13	1,167,791·19	10,363,023
1939	98,739·88	1,115,497·76	1,214,237·64	11,842,964
1940	71,680·47	1,119,801·08	1,191,481·55	12,696,503
1941	65,925·94	1,043,391·96	1,109,317·90	11,851,445
1942	15,676·48	832,503·97	848,180·45	8,865,495
1943	6,408·34	540,067·08	546,475·42	5,710,669
1944	1,824·99	464,439·76	466,264·75	4 899 997
1945	5,029·38	463,521·34	468,550·72	5,010,541
1946	6,090·14	610,873·52	616,963·66	6,640,069
1947	5,220·09	698,666·29	703,886·38	7,575,574
Total	11,527,684·54	40,011,012·95	51,538,697·49	290,512,318

	1946. £A	1947. £A
Estimated total par value of above production	215,932,503	218,922,421
Premiums received on sales of gold during 1920–1924 and 1930–1947 (approximate)	67,004,241	71,589,897
Estimated Total	£A282,936,744	£A290,512,318
Gross estimated value of gold won (including £161,448, bonus paid under the Commonwealth Bounty Act, 1930)	£A283,098,192	£A290,673,766

TABLE VI.—MINERALS OTHER THAN GOLD.

GENERAL RETURN OF ORE AND MINERALS, OTHER THAN GOLD, SHOWING THE QUANTITY PRODUCED AND THE VALUE THEREOF AS REPORTED TO THE MINES DEPARTMENT FROM THE RESPECTIVE GOLDFIELDS AND MINERAL FIELDS, DURING 1947, AND PREVIOUS YEARS.

Period.	ALUNITE (POTASH).				ARSENIC.†	
	Yilgarn Goldfield.		Total.		East Murchison Goldfield (Wiluna District).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value
	tons.	£	tons.	£	tons.	£
Prior to 1944	....	....	....	....	31,318.70	588,901
1944	943.20	14,229	943.20	14,229	2,304.00	48,384
1945	1,358.80	23,902	1,358.80	23,902	1,989.00	41,771
1946	1,735.80	41,658	1,735.80	41,658	1,624.50	33,935
1947	1,724.70	41,212	1,724.70	41,212	‡1,191.13	‡28,738
Total	**5,762.50**	**121,001**	***5,762.50**	***121,196**	**38,427.33**	**741,729**

* Includes Alunite valued at £195 from State generally. † By-product from Wiluna Gold Mines, Ltd. ‡ Includes 1.13 tons Arsenic valued at £24 from Yilgarn Goldfield.

Period.	ANTIMONY.*								
	East Murchison Goldfield.			Pilbara Goldfield.			Total.		
	Conc.	Metal.	Value.	Conc.	Metal.	Value.	Conc.	Metal.	Value.
	tons.	tons.	£	tons.	tons.	£	tons.	tons.	£
Prior to 1944	7,282.26	3,564.86	143,317	64.77	27.36	1,106	†7,367.81	3,603.78	144,914
1944	....	....	....	5.92	3.60	252	5.92	3.60	252
1945	....	....	....	....	....	....	....	....	....
1946	601.40	306.07	13,981	388.53	155.94	9,477	989.93	462.01	23,458
1947	....	....	....	281.78	117.82	9,622	‡287.23	119.82	9,731
Total	**7,883.66**	**3,870.93**	**157,298**	**741.00**	**304.72**	**20,457**	**8,650.89**	**4,189.21**	**178.355**

* By-product of Goldmining. † Includes 20.78 tons Conc. containing 11.56 tons Metal valued at £491 from State generally. ‡ Includes 5.45 tons Conc. containing 2.00 tons Metal valued at £109 from State generally.

Period.	ASBESTOS.								BARYTES.	
	Ashburton Goldfield.		Pilbara Goldfield.		State Generally.		Total.		North-East Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	
Prior to 1944	10.00	959	1,662.25	73,735	*1,651.84	50,724	*3,324.09	125,418	....	....
1944	....	....	2.00	200	306.53	10,656	308.53	10,856	....	....
1945	....	....	....	....	1,091.94	44,663	1,091.94	44,663	....	....
1946	....	....	....	....	†374.06	13,525	†374.06	13,525	10.00	50
1947	....	....	.50	7	1,051.99	37,386	1,052.49	37,393	....	....
Total	**10.00**	**959**	**1,664.75**	**73,942**	**4,476.36**	**156,954**	**6,151.11**	**231,855**	**10.00**	**50**

* Includes 5 tons valued at £20 from East Coolgardie Goldfield. † Includes 3.5 tons valued at £21 from East Coolgardie Goldfield.

Period.	BERYL ORE.									
	Pilbara Goldfield.		Murchison Goldfield.		Coolgardie Goldfield.		State Generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	476.75	13,560	....	....	....	....	48.29	1,087	525.04	14,647
1944	298.89	9,380	21.53	824	28.71	946	37.83	1,452	386.96	12,602
1945	11.13	324	3.00	104	19.23	519	.25	5	33.61	*952
1946	15.49	581	....	....	....	....	....	....	15.49	581
1947	16.04	513	....	....	28.85	1,012	....	....	44.89	1,525
Total	**818.30**	**24,358**	**24.53**	**928**	**76.79**	**2,477**	**86.37**	**2,544**	**1,005.99**	**30,307**

* Incomplete.

TABLE VI.—*Minerals other than Gold*—continued.

Period.	KAOLIN.		BENTONITE.		BISMUTH.		CLAYS.					
	State Generally.		State Generally.		State Generally.		Collie Mineral Field.		State Generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	lbs.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	137.00	435	174.73	370	3,958.40	1,166	1,051.00	738	8,071.80	4,807	9,122.80	5,545
1944	124.00	620	290.90	660	1,042.00	482	....	....	1,491.50	1,106	1,491.50	1,106
1945	54.00	270	50.00	120	506.00	152	....	....	2,318.00	1,154	2,318.00	1,154
1946	....	....	62.00	186	....	....	....	....	2,682.00	1,341	2,682.00	1,341
1947	581.00	310	44.75	134	....	....	....	....	6,277.50	6,064	6,277.50	6,064
Total	**896.00**	**1,635**	**622.38**	**1,470**	**5,506.40**	**1,800**	**1,051.00**	**738**	**20,840.80**	**14,472**	**21,891.80**	**15,210**

Period.	COAL.		COPPER ORE.									
	Collie Coalfield.		West Kimberley Goldfield.		Pilbara Goldfield.				West Pilbara Goldfield.		Ashburton Goldfield.	
					Marble Bar District.		Nullagine District.					
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	16643550.21	11210540	109.52	1,709	32.87	386	14.00	480	82,745.45	748,482	353.07	6,431
1944	558,322.11	583,076	....	....	....	....	....	....	....	....	....	....
1945	543,362.55	572,895	....	....	....	....	....	....	....	....	....	....
1946	642,286.70	730,104	....	....	....	....	....	....	....	....	....	....
1947	730,506.32	840,249	....	....	....	....	....	....	....	....	....	....
Total	**19118027.89**	**13936864**	**109.52**	**1,709**	**32.87**	**386**	**14.00**	**480**	**82,745.45**	**748,482**	**353.07**	**6,431**

Period.	COPPER ORE—*continued.*											
	Peak Hill Goldfield.		East Murchison Goldfield. (Lawlers District).		Murchison Goldfield.		Yalgoo Goldfield.		Northampton Mineral Field.		Yandanooka Mineral Field.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons .	£	tons.	£
Prior to 1944	1,043.35	32,632	248.39	4,710	1,024.02	11,236	51.90	606	24,026.25	119,497	171.55	1,889
1944	....	....	26.80	183	18.00	54	....	....	....	....	....	....
1945	....	....	9.12	159	....	....	30.45	205	....	....	....	....
1946	....	....	....	....	....	....	....	....	....	....	....	....
1947	....	....	....	....	....	....	....	....	....	....	....	....
Total	**1,043.35**	**32,632**	**284.31**	**5,052**	**1,042.02**	**11,290**	**82.35**	**811**	**24,026.25**	**119,497**	**171.55**	**1,889**

Period.	COPPER ORE—*continued.*											
	Mt. Margaret. Goldfield.		North Coolgardie Goldfield. (Menzies District).		East Coolgardie Goldfield (East Coolgardie District).		Phillips River Goldfield.		Yilgarn Goldfield.		State Generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	47,860.52	230,846	6.12	51	50.67	379	95,756.43	588,705	16.00	77	5.11	56
1944	....	....	....	....	....	....	*1.21	130	....	....	....	....
1945	....	....	....	....	....	....	....	....	....	....	....	....
1946	....	....	....	....	....	....	74.00	105	....	....	....	....
1947	....	....	....	....	....	....	....	....	....	....	....	....
Total	**47,860.52**	**230,846**	**6.12**	**51**	**50.67**	**379**	**95,831.64**	**588,940**	**16.00**	**77**	**5.11**	**56**

* Incomplete.

Period.	COPPER ORE—*continued.*		COPPER FERTILISER.		DIATOMACEOUS EARTH.		DOLOMITE.		DIAMONDS.		EMERALDS.	
	Total.		Peak Hill Goldfield.		State Generally.		Murchison Goldfield. (Mt. Magnet District).		Pilbara Goldfield. (Nullagine District).		Murchison Goldfield. (Cue District).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	carats.	£	carats (cut and rough).	£
Prior to 1944	253,515.22	1,748,172	....	....	40·00	640	....	....	....	24	18,373·00	1,609
1944	46.01	367	80.00	547	....	....	158.51	795	....	....	....	....
1945	39.57	364	257.00	1,974	30.00	480	105.35	502	....	....	....	....
1946	74.00	105	72.00	447	....	....	98.09	490	....	....	....	....
1947	....	....	508.00	3.103	5.00	50	56.85	285	....	....	....	....
Total	**253,674.80**	**1,749,008**	**917.00**	**6,071**	**75.00**	**1,170**	**418.80**	**2,072**	....	**24**	**18,373.00**	**1,609**

TABLE VI.—*Minerals other than Gold*—continued.

Period.	EMERY.		FELSPAR.						GLASS SAND.	
	State Generally.		Coolgardie Goldfield.		State Generally.		Total.		State Generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	
Prior to 1944	13.00	130	30,388.75	70,184	450.50	895	30,839.25	71,079	503.05	503
1944	....	....	1,881.00	10,376	77.50	155	1,958.50	10,531	157.50	204
1945	....	....	1,234.50	4,321	....	....	1,234.50	4,321	175.00	227
1946	....	....	1,793.00	6,282	....	....	1,793.00	6,282	180.50	227
1947	....	....	1,226.00	4,291	....	....	1,226.00	4,291	364.40	469
Total	**13.00**	**130**	**36,523.25**	**95,454**	**528.00**	**1,050**	**37,051.25**	**96,504**	**1,380.45**	**1,630**

Period.	GADOLINITE.		GLAUCONITE.		GRAPHITE.		JAROSITE.		KYANITE.	
	Pilbara Goldfield (Marble Bar District).		State Generally.		State Generally.		Phillips River Goldfield.		State Generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	1.00	112	2,505.50	26,621	18.10	97	....	....	....	....
1944	....	....	144.00	3,600	....	....	....	....	....	....
1945	....	....	180.00	4,500	....	....	....	....	19.95	100
1946	....	....	366.50	9,162	....	....	....	....	139.74	568
1947	....	....	350.50	8,763	....	....	9.54	37	2,931.00	14,597
Total	**1.00**	**112**	**3,546.50**	**52,646**	**18.10**	**97**	**9.54**	**37**	**3,090.69**	**15,265**

Period.	LEAD ORE.									
	Pilbara Goldfield (Marble Bar District).		Ashburton Goldfield.		Northampton Mineral Field.		State Generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	195.35	3,658	2,982.87	35,905	417,953.32	1,281,294	118.76	1,542	421,250.30	1,322,399
1944	....	....	....	....	....	....	....	....	....	....
1945	....	....	....	....	....	....	....	....	....	....
1946	....	....	....	....	36.21	1,068	....	....	36.21	1,068
1947	16.47	611	....	....	5.89	326	....	....	22.36	937
Total	**211.82**	**4,269**	**2,982.87**	**35,905**	**417,995.42**	**1,282,688**	**118.76**	**1,542**	**421,308.87**	**1,324,404**

Period.	GYPSUM.								IRON ORE.	
	Dundas Goldfield.		Yilgarn Goldfield.		State Generally.		Total.		State Generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	1,401.00	351	11,374.00	10,892	104,028.54	124,468	116,803.54	135,711	*58,064.35	37,048
1944	....	....	....	....	3,604.45	3,722	3,604.45	3,722	....	....
1945	....	....	....	....	7,232.50	9,136	7,232.50	9,136	....	....
1946	212.00	317	4,012.00	6,018	11,126.16	14,819	15,350.16	21,154	....	....
1947	376.00	564	8,953.00	13,430	10,952.00	14,780	20,281.50	28,774	....	....
Total	**1,989.00**	**1,232**	**24,339.50**	**30,340**	**136,943.65**	**166,925**	**163,272.15**	**198,497**	**58,064.35**	**37,048**

* Includes 450 tons from East Coolgardie Goldfield.

Period.	MAGNESITE.						MANGANESE.		PHOSPHATIC GUANO.	
	East Coolgardie Goldfield (Bulong District).		Coolgardie Goldfield.		Total.		Peak Hill Goldfield.		State Generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	924.75	1,141	291.65	342	1,216.40	1,483	77.00	436	101.73	335
1944	....	....	....	....	....	....	....	....	2,215.00	12,183
1945	....	....	....	....	....	....	....	....	8,483.00	46,656
1946	10.50	26	....	....	10.50	26	....	....	....	....
1947	73.00	73	....	....	73.00	73	....	....	....	....
Total	**1,008.25**	**1,240**	**291.65**	**342**	**1,299.90**	**1,582**	**77.00**	**436**	**10,799.73**	**59,174**

TABLE VI.—*Minerals other than Gold*—continued.

Period.	MICA.		PYRITES.		RED OCHRE.					
	State Generally.		Dundas Goldfield.		East Coolgardie Goldfield.		Murchison Goldfield. (Cue District).		North-East Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	lbs.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	*23,308.75	1,362	†88,357.56	65,181	15.35	46	....	....	....	....
1944	8,367.50	1,279	43,648.00	68,340	20.00	80	74.00	563	....	....
1945	....	....	66,504.00	102,053	....	....	50.00	320	....	....
1946	....	....	77,784.00	107,250	....	....	505.85	4,398	....	....
1947	....	....	86,952.00	187,621	....	....	823.40	8,123	10.40	83
Total	**31,676.25**	**2,641**	**363,245.56**	**530,445**	**35.35**	**126**	**1,453.25**	**13,404**	**10.40**	**83**

* Includes 7,868 lbs. Crude Mica. † Includes 74,047.56 tons valued at £45,496 from Mt. Margaret Goldfield.

Period.	RED OCHRE—*continued.*				SOAPSTONE.					
	State Generally.		Total.		Greenbushes Mineral Field.		State Generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	1,530.40	16,100	1,545.75	16,146	255.00	950	10.00	25	265.00	975
1944	903.00	11,446	997.00	12,089	262.00	828	....	....	262.00	828
1945	600.00	8,677	650.00	8,997	....	....	....	....	....	....
1946	354.05	5,133	859.90	9,531	....	....	....	....	....	....
1947	*193.30	2,650	1,027.10	10,856	....	....	....	....	....	....
Total	**3,577.75**	**44,006**	**5,079.75**	**57,619**	**517.00**	**1,778**	**10.00**	**25**	**527.00**	**1,803**

* Includes 2.10 tons valued at £15 from Pilbara Goldfield.

Period.	TALC.		VERMICULITE.							
	East Coolgardie Goldfield.		East Coolgardie. Goldfield. (Bulong District).		Yilgarn Goldfield.		State Generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1944	110.55	227	95.40	677	20.00	60	725.55	4,420	840.95	5,157
1944	....	....	....	....	....	....	123.00	738	123.00	738
1945	....	....	....	....	....	....	59.00	354	59.00	354
1946	389.41	1,499	2.50	12	....	....	201.00	1,206	203.50	1,218
1947	213.00	813	....	....	....	....	82.00	492	82.00	492
Total	**712.96**	**2,539**	**97.90**	**689**	**20.00**	**60**	**1,190.55**	**7,210**	**1,308.45**	**7,959**

Period.	TIN.											
	Kimberley Goldfield				Pilbara Goldfield (Marble Bar District).				East Murchison Goldfield.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Prior to 1944	....	.60	.60	143	372.62	5,544.98	5,917.60	550,115	.14	....	.14	53
1944	....	....	....	....	9.87	....	9.87	2,175	....	....	....	....
1945	....	....	....	....	....	10.81	10.81	2,250	.25	....	.25	50
1946	....	....	....	....	....	13.99	13.99	2,750	....	....	....	....
1947	....	....	....	....	....	17.90	17.90	4,109	....	....	....	....
Total	....	**.60**	**.60**	**143**	**382.49**	**5,587.68**	**5,970.17**	**561,399**	**.39**	....	**.39**	**103**

TABLE VI.—*Minerals other than Gold*—continued.

Period.	TIN—*continued.*								TANTALITE.			
	Greenbushes Mineral Field.				Total.				Pilbara Goldfields (Marble Bar District).			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Prior to 1944	357.28	10,967.46	11,324.74	995,837	†730.64	16,517.91*	17,248.55	1,546,569	53.40	201.45	254.85	117,540
1944	....	.90	.90	176	9.87	.90	10.77	2,351	9.86	....	9.86	12,851
1945	....	10.70	10.70	2,069	.25	21.51	21.76	4,369	....	....	....	....
1946	....	14.53	14.53	3,088	....	28.52	28.52	5,838	....	.36	.36	281
1947	....	5.73	5.73	1,456	....	23.63	23.63	5,565	....	....	....	....
Total	**357.28**	**10,999.32**	**11,356.60**	**1,002,626**	**740.76**	**16,592.47**	**17,333.23**	**1,564,692**	**63.26**	**201.81**	**265.07**	**130,672**

† Includes .60 tons valued at £46, from Yilgarn Goldfield. * Includes 4.72 tons valued at £360 and .15 tons valued at £15 ; the product of Murchison and Coolgardie Goldfields respectively.

Period.	TANTALITE—*continued.*								TIN-TANTALUM.	
	Greenbushes Mineral Field.				Total.				Greenbushes Mineral Field.	
	Quantity.			Value.	Quantity.			Value.	Quantity.	Value. (Tin content only).
	Lode.	Stream.	Total.		Lode.	Stream.	Total.			
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	£
Prior to 1944	....	11.51	11.51	9,079	*55.90	212.96	268.86	128,959	....	....
1944	....	....	....	....	†10.17	....	10.17	13,020	20.16	2,045
1945	....	....	....	....	....	....	....	....	6.17	915
1946	....	....	....	....	....	.36	.36	281	....	....
1947	....	....	....	....	....	....	....	....	....	....
Total	....	**11.51**	**11.51**	**9,079**	**66.07**	**213.32**	**279.39**	**142,260**	**26.33**	**2,960**

* Includes 2.50 tons valued at £2,340 from Coolgardie Goldfield † Includes .31 tons valued at £169 from Coolgardie Goldfield.

Period.	WOLFRAM.								SCHEELITE.			
	Broad Arrow Goldfield.		Yalgoo Goldfield.		State Generally.		Total.		Murchison Goldfield.		Yalgoo Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	units.	£	units.	£	units.	£	units.	£	units.	£	untis.	£
Prior to 1944	16	88	15	88	601	1,506	632	1,682	....	....	194	1,050
1944	....	....	....	....	....	....	....	....	11	59	....	....
1945	....	....	....	....	....	....	....	....	....	....	....	....
1946	....	....	....	....	....	....	....	....	....	....	....	....
1947	....	....	....	....	....	....	....	....	....	....	....	....
Total	**16**	**88**	**15**	**88**	**601**	**1,506**	**632**	**1,682**	**11**	**59**	**194**	**1,050**

Period.	SCHEELITE—*continued.*											
	Broad Arrow Goldfield.		Coolgardie Goldfield (Coolgardie District).		North Coolgardie Goldfield (Menzies District).		Yilgarn Goldfield.		Dundas Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	units.	£	units.	£	units.	£	untis.	£	untis.	£	units.	£
Prior to 1944	70	175	1,062	4,077	405	1,030	8	41	6	19	1,745	6,392
1944	....	....	16	90	....	....	3,873	21,271	....	....	3,900	21,420
1945	....	....	....	....	....	....	1,638	8,946	....	....	1,638	8,946
1946	....	....	27	150	....	....	258	1,402	....	....	285	1,552
1947	....	....	31	130	....	....	612	3,710	....	....	643	3,840
Total	**70**	**175**	**1,136**	**4,447**	**405**	**1,030**	**6,389**	**35,370**	**6**	**19**	**8,211**	**42,150**

TABLE VII.

Quantity and Value of Minerals, other than Gold and Silver, reported during year, 1947.

Number of Lease, Claim, or Area.	Goldfield.	Registered Name of Company or Lease.	Quantity.		Value.
		ALUNITE.			
			tons.	Crude Potash tons.	£A.
M.L.'s 38, etc.	Yilgarn ...	State (W.A.) Alunite Industries ...	34,331·00	1,724·70	41,211·80
		ANTIMONY.			
			Concentrates. tons.	Antimony. tons.	
G.M.L.'s 231L, etc. ...	Pilbara ...	Blue Spec Gold Mines, N.L.	281·78	117·82	9,622·11
P.A. 851H (Mallina) ...	State Generally	Barrett, J. G.	3·94	1·40	75·88
P.A. 850H (Balla Balla)	State Generally	Radley, C.	1·51	0·60	33·45
			287·23	119·82	9,731·44
		ARSENIC.			
G.M.L.'s 667J, etc. ...	East Murchison	Wiluna G.M.'s, Ltd.	1,190·00	...	28,714·00
G.M.L.'s 3868, etc. ...	Yilgarn ...	Evanston Gold, N.L.	1·13	...	24·00
			1,191·13	...	28,738·00
		ASBESTOS—(ANTHOPHYLLITE).			
Private Property (Bindi Bindi)	State Generally	Midland Mining Co., Ltd.	75·00	...	988·00
		ASBESTOS—(CHRYSOTILE).			
M.C. 263H (Nunyerri) ...	State G3nerally	Hancock, L.G.	88·00	...	6,172·58
Crown Lands	Pilbara ...	Lamont, G.	0·50	...	6·75
			88·50	...	6,179·33
		ASBESTOS—(CROCIDOLITE).			
M.C.'s 269H, etc. (Wittenoom Gorge) ...	State Generally	Australian Blue Asbestos, Ltd. ...	888·99	...	30,226·00
			1,052·49	...	37,393·33
		BERYL ORE.			
				BeO Long Ton Units.	
M.L. 365	Pilbara ...	Hooley, G. J.	16·04	208·05	513·19
P.A. 5990	Coolgardie ...	Giles, A.	2·50	18·24	86·00
P.A. 6080	Coolgardie ...	Duplex, S.A.	2·16	11·89	93·25
M.L.'s 80, etc.	Coolgardie ...	Australian Glass Manufacturers Pty., Ltd.	24·19	273·82	832·86
			44·89	512·00	1,525·40
		BENTONITE.			
M.C. 282H (Marchagee) ...	State Generally	Fennell, W. G.	44·75	...	134·25
		CLAYS.			
M.C.'s 380, etc. (Clackline)	State Generally	Clackline Firebrick Coy.	1,663·50	...	831·75
M.L. 357H (Mt. Helena)	State Generally	Swan Portland Cement, Ltd.	714·00	...	357·00
M.C.'s 78H, etc. (Goomalling	State Generally	Brisbane & Wunderlich, Ltd. ...	3,900·00	...	4,875·00
			6,277·50	...	6,063·75
		COAL.			
M.L.'s 314, etc. ...	Collie Mineral Field ...	Griffin Coal Mining Co., Ltd.	91,640·60	...	95,263·00
		Wyvern Colliery	43,034·50	...	45,856·90
M.L.'s 85, etc.	Collie Mineral Field	Amalgamated Collieries of W.A., Ltd.			
		Cardiff Mine	87,020·03	...	102,093·03
		Co-operative Mine	103,983·83	...	123,470·95
		Proprietory Mine	156,242·49	...	178,816·20
		Stockton Mine...	100,239·42	...	118,760·06
		Stockton Open Cut	96,461·31	...	114,543·06
		Wallsend Open Cut	51,884·14	...	61,445·62
			730,506·32	...	840,248·82

TABLE VII—*continued.*

Quantity and Value of Minerals, other than Gold and Silver, reported during year 1947.

Number of Lease, Claim, or Area.	Goldfield.	Registered Name of Company or Lease.	Quantity.		Value.
		COPPER FERTILISER.			
M.C. 23P	Peak Hill ...	Wright, A. E.	*917·00	...	6,071·00
		DIATOMACEOUS EARTH.			
M.C. 241H (Lake Gnangara)	State Generally	Brisbane & Wunderlich, Ltd. ...	5·00	...	50·00
		DOLOMITE.			
M.L.'s 11M, etc. (Mt. Magnet)	Murchison ...	Atkinson & Giles	56·85	...	284·75
		FELSPAR.			
M.L.'s 80 etc.	Coolgardie ...	Australian Glass Manufacturers Pty., Ltd.	1,226·00	...	4,291·00
		GLASS SAND.			
M.C. 365H (East Wanneroo)	State Generally	Leach, R. J.	151·40	...	173·75
M.C.'s 161, etc. (Lake Gnangara)	State Generally	Leach, W. M.	213·00	...	295·00
			364·40	...	468·75
		GLAUCONITE.	Greensand. tons.	Glauconite. tons.	
Private Property (Gin Gin)	State Generally	Brook, G. E.	1,752·50	350·50	8,762·50
		GYPSUM.			
M.C.'s 280, etc. (Lake Brown)	State Generally	Saunders, G. R. (Jnr.)	4,262·00	...	6,121·25
M.C.'s 33H, etc. (Woolundra)	State Generally	Ajax Plaster Co., Ltd.	1,082·00	...	1,484·00
M.C. 359H (Welbunging)	State Generally	Ajax Plaster Co., Ltd.	267·00	...	367·13
M.C. 366H (Kellerberrin)	State Generally	Ajax Plaster Co., Ltd.	7·00	...	9·63
M.C.'s 30, etc.	Yilgarn ...	Ajax Plaster Co., Ltd.	2,207·50	...	3,311·25
M.C. 293H (Woolundra) ...	State Generally	Ripper, P.	920·00	...	1,038·47
M.C. 's126H, etc. Baandee)	State Generally	Perth Modelling Works, Ltd.	3,471·00	...	4,338·35
M.C.'s 8, 9, 10	Dundas ...	Perth Modelling Works, Ltd.	376·00	...	564·00
M.C.'s 9, etc.	Yilgarn ...	Perth Modelling Works, Ltd.	6,746·00	...	10,119·00
M.C.'s 31H, etc. (Baandee)	State Generally	Millars Timber and Trading Co., Ltd.	943·00	...	1,420·50
			20,281·50	...	28,773·58
		JAROSITE.			
P.A. 735	Phillips River	Smith, H....	9·54	...	37·50
		KAOLIN.			
M.C. 247H (Mt. Kokeby)	State Generally	Linton, J. B.	581·00	...	310·00
		KYANITE.			
M.C. 287H (Yanmah) ...	State Generally	Smith, J. H.	2,896·00	...	14,412·00
M.C. 368H (Ross's Swamp)	State Generally	Payne, H. D.	35·00	...	185·00
			2,931·00	...	14,597·00
		LEAD.	Lead Ore.	Tons Pb.	
P.A. 188	Northampton Mineral Field	Jenkins & Camp	5·89	4·59	326·00
M.C.'s 170, 171	Pilbara ...	Kennedy, S.	16·47	12·36	610·62
			22·36	16·95	936·62

*Includes 409 tons, valued at £2,968, late reported for 1944, 1945, 1946.

TABLE VII.—*continued.*

Quantity and Value of Minerals, other than Gold and Silver, reported during year 1947.

Number of Lease, Claim, or Area.	Goldfield.	Registered Name of Company or Lease.	Quantity.		Value.
		MAGNESITE.			
...	East Coolgardie	The Broken Hill Pty. Co., Ltd. ...	73·00	...	73·00
		PYRITES.			
				Sulphur tons	
...	Dundas ...	Norseman M..G's., N.L.	86,952·00	19,008·78	187,621·00
		RED OCHRE.			
M.L. 370H (Opthalmia Range)	State Generally	Smith, R. J.	191·20	...	2,635·00
Crown Lands	Pilbara ...	Lamont, G.	2·10	...	15·00
P.A. 490K	N.E. Coolgardie	Barrett, T. A.	10·40	...	83·20
M.C. 26 (Cue)	Murchison ...	Cassidy & Zadow	823·40	...	8,122·51
			1,027 10	...	10,855·71
		TALC.			
G.M.L. 5961E	East Coolgardie	Collett, J. H.	213·00	...	813·00
		TIN.			
M.C.'s 56, etc.	Greenbushes...	Fremem, F. E. D.	5·73	...	1 455·94
D.C.'s 16, etc. (Moolyella)	Pilbara ...	Brompton-Byrns, R.	4·84	...	1,431·98
Sundry Claims	Pilbara ...	Sundry Claims	13·06	...	2,677·08
			23·63	...	5,565·00
		TUNGSTEN ORES—(SCHEELITE).			
			Scheelite Concentrates. lbs.	W.O.3 Long Ton Units.	
G.M.L. 5666	Coolgardie ...	Urlich, M.	1,054· 0	30·58	130·37
T.L. 132, G.M.L. 3447 ...	Yilgarn ...	Edna May (W.A.) Amalg. G.M.'s., N.L.	21,967·99	611·96	3,709·73
			23,021·99	642·54	3,840·10
		VERMICULITE.			
M.C.'s 187H, etc. (Young River)	State Generally	Perth Modelling Works, Ltd.	82·00	...	492·00

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