1958

Report of the Department of Mines Western Australia

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

COVER PICTURE

Aerial view, looking north, of the Ord River, Kimberley Goldfield. A possible dam site, where test drilling by Mines Department will commence in the near future.

REPORT OF THE
DEPARTMENT *of* MINES
WESTERN AUSTRALIA
FOR THE YEAR 1958

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To the Hon. Minister for Mines.

Sir,

I have the honour to submit the Annual Report of the Department of Mines of the State of Western Australia for the year 1958, together with reports from the officers controlling Sub-Departments, and Comparative Tables furnishing statistics relative to the Mining Industry.

I have the honour to be, Sir,

Your obedient Servant,

A. H. TELFER,

Under Secretary for Mines.

Perth, August, 1959.

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STATE OF WESTERN AUSTRALIA

Report of the Department of Mines for the Year 1958

DIVISION I

The Honourable Minister for Mines:

I have the honour to submit a report on the Mining Industry for the year 1958.

The estimated value of the mineral output of the State for the year was £10,699,344 (calculating gold at £4 4s. 11.45d per fine ounce), a decrease of £78,735 in value compared with the preceding twelve months.

The estimated value of the exchange premium paid to gold producers by the Mint amounted to £A9,866,211, added to which, the overseas gold sales premium of £A5,146 received by the Gold Producers' Association Limited from sales of West Australian Gold from August, 1957 to July, 1958, brought the gross value of all minerals to £A20,570,701, a decrease of £A436,692 when compared with the total for the previous year which happened to be the highest on record.

The estimated value of the gold received at the Perth Branch of the Royal Mint and exported in gold-bearing material was £A13,549,788, but with the additional overseas gold sales premium mentioned above, totalled £A13,554,934, being the second highest annual value recorded for that mineral. The estimated gold value equalled 65.894 per cent. of the value of all minerals for 1958.

(See footnote to Table (1) (a), Part II).

Other minerals realised; Coal, £2,280,649; asbestos, £1,343,377; manganese, £960,474; iron ore (for export), £532,355; iron ore (for pig iron), £458,561; ilmenite, £448,218; pyrites (for sulphur), £351,847; lead ores and concentrates, £139,191; cupreous ore and concentrates (fertiliser), £114,670; silver, £79,651; tin concentrates, £77,319; copper ore and concentrates, £54,524; gypsum, £40,134; clays £39,269; talc, £35,304; beryl, £31,801; tantocolumbite concentrates, £8,550; glauconite, £5,590; glass sand, £4,267; felspar, £3,093; ochres, £1,893; phosphatic guano, £1,828; bismuth, £1,475; dolomite, £786; zinc, £511; petalite, £293; and bentonite, £153.

The effect of Company contracts for the supply of Coal to Government instrumentalities was reflected in the lower value recorded for the higher tonnage raised as compared with the previous year.

Minerals other than gold and coal however, continued the upward trend displayed over the past three years, and topped their last year's record value for such minerals by 7.21 per cent., bringing the aggregate for all minerals to £A20,570,701, the second highest annual figure recorded in the State.

Dividends paid by gold mining companies amounted to £A2,067,826, a decrease of £A345,560 when compared with the previous year. (See Table 6, Part II).

To the end of 1958, the total amount distributed by gold mining companies was £60,262,630.

To the same date the progressive value of the mineral production of the State amounted to £329,866,302, of which gold accounted for £254,493,545 (based on the normal value of £4 4s. 11.45d. per fine ounce); but the premium on the sale of gold during years 1920-1924, increasing exchange premium since 1930, payments under the Gold Bounty Act, 1930, plus additional premiums from overseas sales distributed between 1952 and 1958, increase the total value of gold and mineral production by £162,426,437, making a gross progressive value of £492,292,739.

GOLD.

The quantity of gold reported as being received at the Perth Branch of the Royal Mint (865,376,80 fine ounces), together with that contained in gold-bearing material exported for treatment (1,810.69 fine ounces), totalled 867,187.49 fine ounces, which was 29,493.49 fine ounces less than the previous year, and the second highest figure since 1941 (vide Table I (a) of Part II).

Similarly, the total gold yield for the year reported directly to the Department by the producers was 874,818.95 fine ounces, an increase of 25,078.28 fine ounces, and constituted the highest reported gold yield since 1941. (See Table 3 of Part II).

The variation between the two annual totals is principally due to the fact that the gold reported as being received at the Mint and exported for treatment, is not necessarily produced during the calendar year under review, a certain quantity being always in the transitory stage from the producer at the end of the year. The former total is accepted as the official production of the State on account of its realised monetary value, whilst the latter is utilised mainly in tracing the gold back to its source, i.e. individual mine production, to which its respective ore tonnage can be applied.

The calculated average value of the ore treated as a whole increased slightly from 24.475 shillings per ton in 1957 to 24.614 shillings per ton in 1958, calculating gold at the old rate of £4 4s. 11.45d. per fine ounce, but the exchange premium rate of 267.84 per cent. would more than treble this estimate. For East Coolgardie Goldfield (which produced 60.56 per cent. of the State's gold yield), the calculated average value of the ore treated rose slightly from 22.081 shillings to 22.467 shillings per ton. The estimates for Murchison (Hill 50 G.M. N.L.), Mt. Margaret (Sons of Gwalia Ltd.), Dundas (Central Norseman Gold Corporation N.L.) and Yilgarn (Great Western Cons. N.L.) were

49.014.s (62.879s.); 18.587s. (19.669s.); 50.298s. (46.295s.); and 14.972s. (14.742s.); respectively. Figures for 1957 being shown in parenthesis.

The tonnage of ore reported to have been treated in 1958 viz. 3,021,072 tons was 70,061 tons in excess of the previous year, and constituted 70.39 per cent. of the State record tonnage established in 1940.

The following tonnage increases were reported from the respective Goldfields—Kimberley 30, Pilbara 510, West Pilbara 41, Peak Hill 1,447, East Murchison 506, Murchison 26,248, Mt. Margaret 1,281, North Coolgardie 1,131, North-East Coolgardie 343, East Coolgardie 37,903, Dundas 14,026, and Outside Proclaimed Goldfields 19; those fields showing a reduction in tonnage being Yalgoo 826, Broad Arrow 695, Coolgardie 9,153, and Yilgarn 2,918.

Output from the East Coolgardie Goldfield again exceeded that of the previous year, this time by a further 37,903 tons. Headed by Great Boulder Proprietary GM's. 29,027 tons increase, each of the four large companies on the Golden Mile showed improvement in output, and with the exception of the Lake View & Star Ltd., a slightly higher grade of ore treated; the grade of the latter company being a shade lower.

In the Dundas Goldfield, the Central Norseman Gold Corporation was responsible for the greater tonnage reported, the grade of which rose from 10.89 to 11.83 pennyweights per ton; on the other hand, in the Murchison Goldfield where the Hill 50 G.M. contributed an extra 26,000 tons to the field's 26,428 ton increase, the company's ore declined from 15.53 to 11.60 pennyweights per ton.

The recession of 9,153 tons in the Coolgardie Goldfield was due to restricted operations at the Barbara Group by Gold Mines of Kalgoorlie (Aust.) Ltd., and the decision to let same on tribute.

In the Yilgarn Goldfield, where Great Western Consolidated's total output was less than one per cent. down on the previous year, a slightly better grade of ore was averaged, whilst yet another group was brought into production towards the end of the year, making five in all by this company.

The general strengthening of activity mentioned in my previous report as being noticeable, is reflected in the spreading of increased tonnages over 11 of the 15 operating goldfields during the year, and as such activity and interest has not abated, the prospects of the gold mining industry for the coming year still appears to be favourably inclined.

West Australian gold included in sales on open dollar markets by the Gold Producers' Association Ltd. between August 1957 and July 1958, totalled 217,889.79 fine ounces; the extra premium received therefrom in excess of Mint Value, amounted to only £A5,146, an overall average of 5.688 pence per fine ounce. This amount less expenses, was distributed to the producer members during the year and approximated 4.804 pence per fine ounce.

Subsidy payments made by the Commonwealth Government during the year under the Gold Mining Industry Assistance Act 1954, totalled £A623,441, of which £A599,037 went to Large Producers and £A24,404 to Small Producers in this State.

PART II.—MINERALS.

Once again minerals other than gold and coal continued their upward trend and the value of the production of these minerals was £7,015,767, an increase of 7.21 per cent. on last year's figure.

Increases in the value of asbestos, iron ore and beach sands produced were the major factors in overcoming losses in the value of production of lead and silver ores and concentrates. Generally there is an upward trend in the value of production of most of these minerals, but the position regarding ilmenite is still difficult owing to the state of the world market.

The search for manganese in the Pilbara goldfield was again continued actively and in August a Ministerial reserve was created over all manganese deposits pending a complete investigation of the known manganese deposits in order to assess the reserves of this mineral available for Australian requirements.

Several companies have been granted reserves in order to prospect with modern methods large areas of potential mineral country. Reserves of this type have been granted for the search for nickel, bauxite, gypsum, and evaporites.

Legislation was passed during the year to provide for payment of royalty on certain prescribed minerals, obtained on or after 1st July, 1958, from land held under the Mining Act.

Gold was excluded, as also Copper and Lead for the time being on account of the depressed state of the market. Ilmenite was included but application of royalty was temporarily suspended for somewhat similar reasons.

Royalty has been collected on Coal production practically from inception and on Iron Ore from 1951.

Apart from the regular royalty on Coal and Iron, only £1,697 was collected on the newly prescribed minerals during the initial period. This amount did not fully reflect the coverage provided for several reasons, principally because mine stockpiles of minerals obtained prior to 1st July did not attract royalty, and in some cases the disposal of these were not completed by the end of the year; then again the returns covering the latter term were only due for lodgment after the close of the year, thus any royalties paid thereon would naturally be credited to the year in which they were received.

COAL.

Coal production from Collie amounted to 870,882 tons valued at £2,280,649. The tonnage produced was 32,221 tons in excess of the 1957 production, but the value of the production was £272,007 less than last year. This is accounted for by the effect of the company contracts for the supply of coal to Government instrumentalities in place of the former cost-plus basis.

OIL.

During the year the search for oil was continued vigorously by West Australian Petroleum Pty. Ltd. which carried out further extensive exploration and drilling on its titles. Although some good indications were encountered in Meda and Frome holes no further oil finds eventuated.

During the year West Australian Petroleum Pty. Ltd. were joined by the Shell Oil Company as partners in the search for oil in the State. The entry of this Company, bringing more capital into oil search in this State, is most welcome.

WATER.

The Department's water drilling activities commenced with the drilling of a hole on the Crown reserve at Badingarra, and a good flow of excellent water was encountered at 698 feet. Both drills were then moved to the Kalannie district and boring was undertaken for a number of farmers. This is a very difficult district for water but several successful holes were put down. The programme for the Kalannie district is almost finished and the drills will remain there until all contracts have been completed.

COMPARATIVE MINERAL STATISTICS

	1957	1958	Variation	
Gold—				
Reported to Department:				
Ore (tons)	2,951,011	3,021,072	+	70,061
Gold (fine oz.)	849,741	874,819	+	25,078
Average Grade (dwts. per ton)	5·759	5·791	+	0·032
Men Employed	5,385	5,352	—	33
Dividends	§2,413,386	2,067,826	—	345,560
Mint and Export:				
Gold (fine oz.)	896,681	867,187	—	29,494
Estimated Value (£A)	14,038,185	*13,554,934	—	483,251
Coal—				
Reported to Department:				
Tons	838,660	870,882	+	32,222
Value (£A)	2,552,656	2,280,649	—	272,007
Men Employed	1,136	1,072	—	54
Other Minerals—				
Reported to Department:				
Value (£A)	4,416,552	†4,735,118	+	318,566
Men Employed	1,108	1,068	—	40
Total All Minerals—				
Value (£A)	21,007,393	*20,570,701	—	436,692
‡Men Employed	7,629	7,492	—	132

* Second highest annual value recorded in the State (highest being that for 1957).
† A new record (previous highest being that for 1957).
‡ Excluding Oil Search which engaged an average of 192 men in the field during 1957 and 151 men in the field during 1958.
§ Amendment of figure previously published.

TABLE 1.

Quantity and Value of Minerals, other than Gold and Silver, produced during Years 1957 *and* 1958.

Western Australia

Description of Minerals.	1957.		1958.		Increase or Decrease for year compared with 1957.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons	£A	Tons	£A	Tons	£A
Asbestos—						
Chrysotile	1,389·31	42,067	1,377·81	38,652	— 11·50	— 3,415
Crocidolite	11,104·87	1,195,634	11,887·10	1,304,725	+ 782·23	+ 109,091
Barytes	140·00	910	....	....	— 140·00	— 910
Bentonite	741·79	2,981	37·00	153	— 704·79	— 2,828
			lb.		lb.	
Bismuth	....	....	3,310·00	1,475	+ 3,310·00	+ 1,475
			Tons		Tons	
Beryl	350·37	64,234	170·03	31,801	— 180·34	— 32,433
Chromite	1,312·30	20,997	....	....	— 1,312·30	— 20,997
Clays—						
Cement Clay	11,551·00	12,340	13,506·00	13,439	+ 1,955·00	+ 1,099
Fireclay	17,646·70	20,816	20,211·96	25,435	+ 2,565·26	+ 4,619
White Clay	203·00	1,015	79·00	395	— 124·00	— 620
Coal	838,660·53	(a) 2,552,656	870,882·45	2,280,649	+ 32,221·92	— 272,007
Copper Ore and Concentrates	1,803·97	58,564	1,801·95	54,424	— 2·02	— 4,140
Cupreous Ore and Concentrates	4,638·69	82,127	7,643·72	114,670	+ 3,005·03	+ 32,543
Dolomite	60·00	240	196·00	786	+ 136·00	+ 546
Felspar	995·00	4,611	680·60	3,093	— 314·40	— 1,518
Glass Sand	5,692·86	3,914	6,420·41	4,267	+ 727·55	+ 353
Glauconite	126·00	5,040	112·00	5,590	— 14·00	+ 550
Gypsum	33,352·90	25,967	35,514·97	40,134	+ 2,162·07	+ 14,167
Iron Ore—						
For export	389,686·00	386,440	536,713·00	532,355	+ 147,027·00	+ 145,915
For pig	21,838·50	324,646	30,075·00	458,561	+ 8,236·50	+ 133,915
Lead and Silver/Lead Ores and Concentrates	4,179·19	314,392	2,492·43	139,191	— 1,686·76	— 175,201
Manganese—						
Metallurgical Battery and Low Grades	63,937·06	929,820	61,809·43	960,474	— 2,127·63	+ 30,654
Mineral Beach Sands—Ilmenite	40,931·99	233,476	82,926·27	448,218	+ 41,994·28	+ 214,742
Ochre—						
Red	10·00	100	171·00	1,710	+ 161·00	+ 1,610
Yellow	17·30	173	18·30	183	+ 1·00	+ 10
Petalite	....	....	67·77	293	+ 67·77	+ 293
Phosphatic Guano	586·89	8,974	169·65	1,828	— 417·24	— 7,146
Pyrties Ore and Concentrates—For sulphur	57,917·72	382,567	49,388·64	351,847	— 8,529·08	— 30,720
Quartz Grit	....	....	90·00	75	+ 90·00	+ 75
Semi-precious Stones—			lb.		lb.	
Chrysoprase	....	....	5·00	5	+ 5·00	+ 5
Opaline	....	....	25·00	4	+ 25·00	+ 4
			Tons		Tons	
Talc	3,653·65	49,906	2,500·67	35,304	— 1,152·98	— 14,602
Tanto/Columbite Ores and Concentrates	22·34	11,831	6·03	8,550	— 16·31	— 3,281
Tin	270·25	155,079	138·20	77,319	— 132·05	— 77,760
Zinc	....	....	20·06	511	+ 20·06	+ 511
Total	....	6,891,517	....	6,936,116	....	+ 44,599

TABLE 1 (a).

Quantity and Value of Gold and Silver exported and minted during Years 1957 *and* 1958.

Description of Minerals	1957		1958		Increase or Decrease for year compared with 1957	
	Quantity	Value	Quantity	Value	Quantity	Value
	Fine ozs.	£A	Fine ozs.	£A	Fine ozs.	£A
Gold—Mint and Export	896,680·98	(*b*)14,038,185	**867,187·49**	(*b*)13,554,934	— 24,493·49	— 483,251
Silver	197,114·40	77,691	**200,767·48**	**79,651**	+ 3,653·08	+ 1.960
Total	....	14,115,876	....	**13,634,585**	....	— 481,291
Grand Total	....	21,007,393	....	**20,570,701**	....	— 436,692

(*a*) Subject to adjustment. (*b*) Including Overseas Gold Sales Premium.

TABLE 2.

Value of Total Exports and Mineral Exports from Western Australia, as compared with Total Value of Mineral Production as from 1900.

Year.	Total Exports. †	Mineral Exports (exclusive of Coal).	Total Mineral Production
	£	£	£
1900	6,852,054	5,588,299	6,179,535
1901	8,515,623	6,789,133	7,439,470
1902	9,051,358	7,530,319	8,094,616
1903	10,324,732	8,727,060	8,971,937
1904	10,271,489	8,625,676	8,686,757
1905	9,871,019	7,731,954	8,555,841
1906	9,832,679	7,570,305	7,905,506
1907	9,904,860	7,544,992	7,669,468
1908	9,518,020	7,151,317	7,245,002
1909	8,860,494	5,906,673	7,056,079
1910	8,299,781	4,795,654	6,522,263
1911	10,606,863	7,171,638	6,105,853
1912	8,941,008	5,462,499	5,768,567
1913	9,128,607	4,608,188	6,036,115
1914	8,406,182	3,970,182	5,534,273
1915	6,291,934	2,969,502	5,478,149
1916	10,878,153	6,842,621	4,893,417
1917	9,323,229	5,022,694	4,629,028
1918	6,931,834	2,102,923	4,265,577
1919	14,279,240	6,236,585	4,061,600
1920	15,149,323	3,096,849	4,233,915
1921	10,331,405	1,373,810	3,470,597
1922	11,848,025	2,875,402	3,041,113
1923	11,999,500	3,259,476	2,747,108
1924	13,808,910	1,424,319	2,776,791
1925	13,642,852	173,126	2,393,890
1926	14,668,184	1,597,698	2,371,863
1927	15,805,120	472,041	2,202,438
1928	16,911,932	996,099	2,128,179
1929	16,660,742	1,802,709	2,087,893
1930	19,016,639	6,370,396	2,287,376
1931	14,266,650	4,333,421	3,353,923
1932	16,771,465	5,657,870	4,721,620
1933	18,098,214	5,328,869	5,239,498
1934	16,784,705	5,759,324	5,908,881
1935	17,611,547	5,698,721	6,132,811
1936	19,564,716	7,130,381	7,818,684
1937	21,594,942	9,026,313	9,210,079
1938	24,220,864	10,417,458	10,906,527
1939	23,244,509	11,969,562	12,331,659
1940	25,800,562	12,480,721	13,228,660
1941	24,536,777	12,411,316	12,398,141
1942	20,681,284	8,476,622	9,509,646
1943	18,014,340	6,539,295	6,401,594
1944	19,453,001	(*a*) 1,282,867	5,737,096
1945	20,170,624	205,587	5,910,518
1946	26,342,125	211,890	7,693,951
1947	42,389,125	4,162,892	8,862,292
1948	57,779,996	342,646	8,584,843
1949	58,197,775	465,124	9,629,300
1950	78,804,864	531,245	11,489,897
1951	115,880,457	7,479,601	12,706,228
1952	101,620,138	7,952,834	17,126,506
1953	106,678,014	13,239,076	19,358,268
1954	79,955,207	5,342,462	19,953,665
1955	113,044,633	17,145,741	18,893,161
1956	142,852,512	9,531,471	19,447,510
1957	148,128,361	12,483,343	21,007,393
1958	123,624,508	5,464,465	20,570,701

† Including Ship's Stores.

(*a*) Full value and use of gold, not always exported, as utilised by the Commonwealth Treasury in the financing of Australian Trade Economy from 1944, not available.

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 1958

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

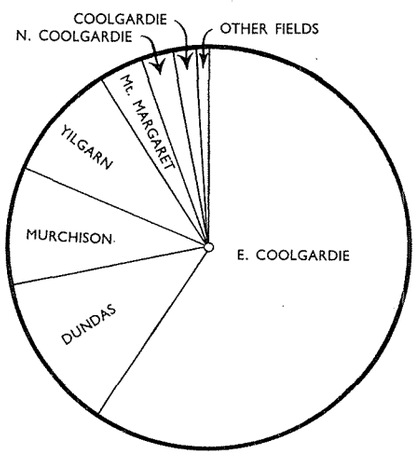


Fig. 2 Gold produced from various Goldfields as given by the Export and Mint Returns

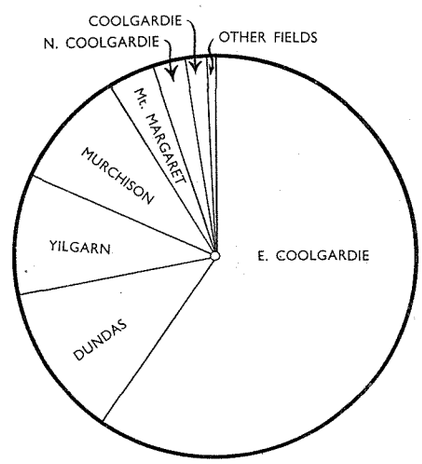


Fig. 3 Value of Gold and other Minerals

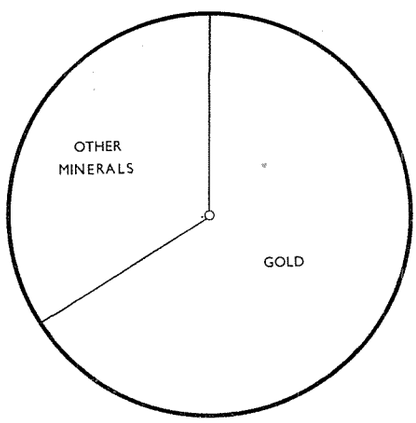


Fig. 4 Value of Minerals other than Gold

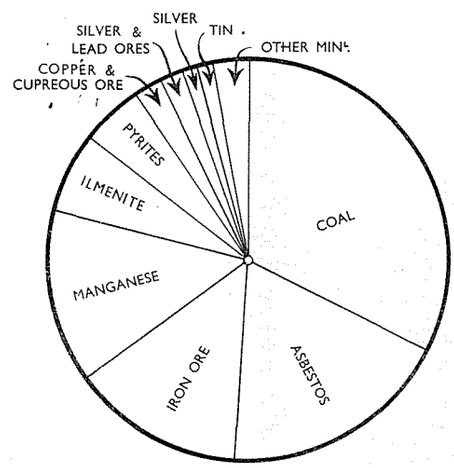


Fig. 5 Areas of land leased for Goldmining on various Goldfields

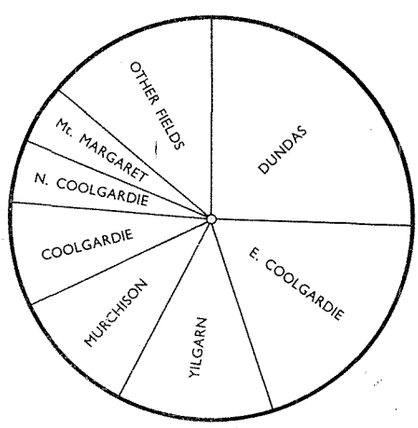
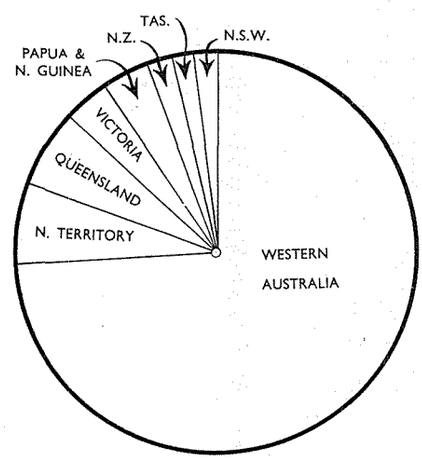


Fig. 6 Output of Gold in the States of Australia and the Dominion of New Zealand



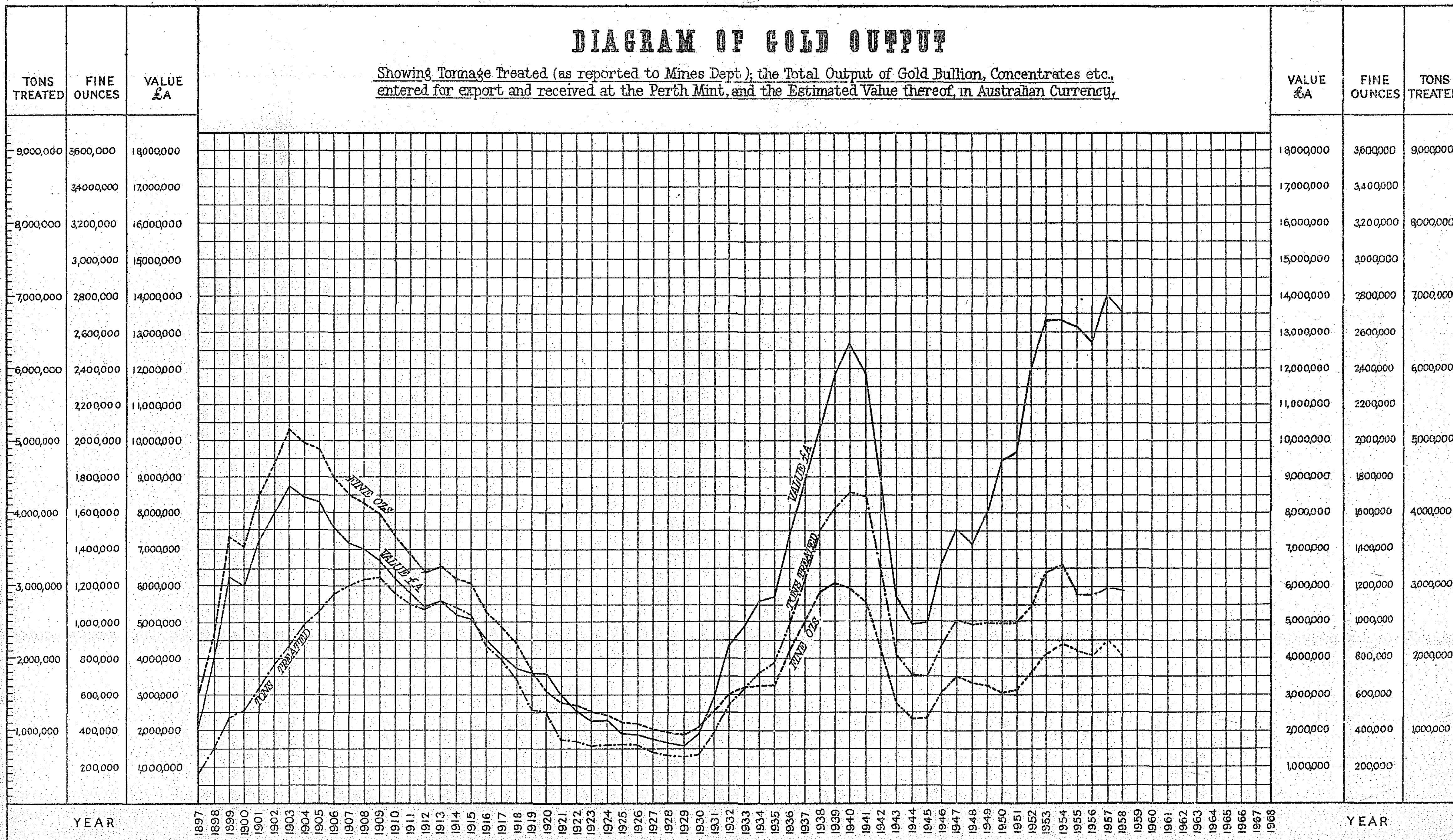


DIAGRAM OF GOLD OUTPUT
Showing Tonnage Treated (as reported to Mines Dept.); the Total Output of Gold Bullion, Concentrates etc., entered for export and received at the Perth Mint, and the Estimated Value thereof, in Australian Currency.
TONS TREATED
FINE OUNCES
VALUE £A
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
3,600,000
3,400,000
3,200,000
3,000,000
2,800,000
2,600,000
2,400,000
2,200,000
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
18,000,000
17,000,000
16,000,000
15,000,000
14,000,000
13,000,000
12,000,000
11,000,000
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
FINE OZS.
VALUE £A.
TONS TREATED
YEAR
1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 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 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968

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.)	
	1957	1958	1957	1958	1957	1958
	Fine oz.	Fine oz.	%	%	Shillings	Shillings
1. Kimberley	68	50	·008	·006	....	14·250
2. West Kimberley	....	....	....	....	....	....
3. Pilbara	785	1,004	·092	·115	33·262	33·910
4. West Pilbara	57	15	·007	·002	....	31·139
5. Ashburton	1	....	....	....	....	....
6. Gascoyne	....	6	....	....	....	....
7. Peak Hill	260	638	·031	·073	12·136	16·609
8. East Murchison	205	817	·024	·093	55·624	108·113
9. Murchison	85,627	81,984	10·077	9·371	62·879	49·014
10. Yalgoo	112	9	·013	·001	11·401	....
11. Mt. Margaret	32,519	31,010	3·827	3·545	19·669	18·587
12. North Coolgardie	23,525	21,027	2·769	2·404	49·085	42·589
13. Broad Arrow	2,928	2,385	·345	·273	43·617	40·447
14. North-East Coolgardie	115	322	·014	·037	23·783	36·274
15. East Coolgardie	510,830	529,768	60·115	60·557	22·081	22·467
16. Coolgardie	19,267	14,867	2·267	1·699	40·300	40·137
17. Yilgarn	80,995	81,740	9·532	9·344	14·742	14·972
18. Dundas	92,071	108,331	10·835	12·383	46·295	50·298
19. Phillips River	359	812	·042	·093	....	....
20. Outside Proclaimed Goldfields	16	34	·002	·004	....	152·059
Totals and Averages	849,740	874,819	100·000	100·000	24·475	24·614

The total yield of the State is shown in Table 1, being the amount of the Gold received at the Royal Mint, the 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 1957 *and* 1958.

Goldfield	1957				1958			
	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 underground	Per man employed above and underground	Per man employed underground	Per man employed above and underground	Per man employed underground	Per man employed above and underground	Per man employed underground	Per man employed above and underground
	Tons	Tons	Fine oz.	Fine oz.	Tons	Tons	Fine oz.	Fine oz.
1. Kimberley	....	....	....	....	....	....	....	....
2. West Kimberley	....	....	....	....	....	....	....	....
3. Pilbara	125·37	28·35	49·06	11·05	179·36	36·46	71·71	14·55
4. West Pilbara	....	....	....	....	....	....	....	....
5. Ashburton	....	....	....	....	....	....	....	....
6. Gascoyne	....	....	....	....	....	....	....	....
7. Peak Hill	364·20	165·45	52·00	23·64	544·50	297·00	106·33	58·00
8. East Murchison	11·33	5·91	17·08	8·93	64·20	25·68	81·70	54·46
9. Murchison	803·82	367·46	594·63	271·83	935·38	433·46	539·08	249·95
10. Yalgoo	417·50	104·47	56·00	14·00	....	....	....	....
11. Mt. Margaret	826·65	476·37	191·29	110·23	914·90	513·80	200·06	112·35
12. North Coolgardie	565·80	245·41	326·74	141·72	558·24	247·74	280·36	124·42
13. Broad Arrow	203·78	81·54	104·57	41·83	167·03	70·58	79·50	33·59
14. North-East Coolgardie	137·00	45·67	38·33	12·78	150·80	53·85	64·40	23·71
15. East Coolgardie	1,157·39	623·07	300·66	161·86	1,154·55	640·97	305·16	169·41
16. Coolgardie	347·32	189·01	164·67	89·61	297·01	162·29	140·25	76·63
17. Yilgarn	1,556·61	747·17	269·98	129·59	1,511·61	740·13	266·25	130·36
18. Dundas	716·29	409·31	390·13	222·93	756·49	431·77	447·64	255·50
19. Phillips River	....	....	....	....	....	....	....	....
20. Outside Proclaimed Goldfields	....	....	....	....	....	....	....	....
Total Averages	1,052·43	548·01	303·05	157·78	1,063·75	564·47	308·03	164·08

TABLE 5.

Output of Gold from the several States of Australia, the Northern Territory, Papua, and Mandated Territory of New Guinea, and the Dominion of New Zealand, during 1958.

State	Output of Gold	Value*	Percentage of Total	
			Output of Commonwealth	Output of Australia
	Fine oz.	£	%	%
Western Australia	867,187	3,683,577	76·222	74·587
Victoria	43,429	184,573	3·818	3·736
New South Wales	18,709	79,513	1·645	1·610
Queensland	71,511	303,922	6·286	6·151
Tasmania	20,976	89,148	1·844	1·804
South Australia	48	204	....	....
Territory of Papua and New Guinea	43,254	183,829	3·802	3·721
Northern Territory	72,616	308,618	6·383	6·246
New Zealand	24,932	105,961	....	2·145
	1,162,662	4,939,345	100·000	100·000

* Par Value (£4 4s. 11·45d. per fine ounce).

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1958, *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.	
		1958.	Grand Total to end of 1958.
		£	£
Pilbara	Various Companies	....	26,513
Peak Hill	do. do.	....	199,305
East Murchison	do. do.	....	1,194,053
Murchison	Hill 50 Gold Mine, N.L.	600,000	4,440,626
	Various Companies	....	2,764,945
Mt. Margaret	Sons of Gwalia Ltd.	....	2,075,050
	Various Companies	....	958,286
North Coolgardie	Moonlight Wiluna G.M's. Ltd.	....	15,000
	Various Companies	....	712,551
Broad Arrow	do. do.	....	92,500
North-East Coolgardie	do. do.	....	129,493
East Coolgardie	Gold Mines of Kalgoorlie (Aust.) Ltd.	176,107	1,992,088
	Great Boulder Proprietary G.M's. Ltd.	218,750	8,496,900
	Lake View and Star Ltd.	437,500	(*b*) 8,493,250
	North Kalgurli (1912) Ltd.	180,469	2,407,966
	Various Companies	....	(*a*) 19,496,816
Coolgardie	do. do.	....	410,000
Yilgarn	do. do.	....	(*c*) 1,205,556
Dundas	Central Norseman Gold Corporation, N.L.	455,000	3,672,500
	Various Companies	....	786,162
	Totals	£2,067,826	£60,289,560

(*a*) Excluding £45,091 in bonuses and profit-sharing notes in years 1935–1936 by Boulder Perseverance Ltd., and £55,000 Capital returned in year 1932 and £42,000 in bonuses and profit-sharing notes in year 1934 by Golden Horseshoe (New) Ltd.

(*b*) Excluding £75,000 in bonuses and profit-sharing notes and £93,750 Capital returned in 1932–1935.

(*c*) Excluding £67,725 Capital returned in 1948 by Edna May (W.A.) Amalgamated, N.L.

TABLE 7.

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1958.

Goldfield, District or Mineral Field.	1958.		Increase or Decrease as compared with 1957.	
	Quantity.	Value.	Quantity.	Value.
	Tons	£A	Tons	£A
ASBESTOS (Chrysotile)—				
West Pilbara	1,207·79	34,908	+ 179·00	+ 962
Pilbara	170·02	3,743	— 190·50	— 4,288
ASBESTOS (Crocidolite)—				
West Pilbara	11,887·10	1,304,725	+ 782·23	+ 109,091
BARYTES—				
Outside Proclaimed Goldfields	....	....	— 140·00	— 910
BENTONITE—				
Outside Proclaimed Goldfields	37·00	153	— 704·79	— 2,828
BERYL—				
Pilbara	130·40	23,942	— 153·65	— 28,187
Gascoyne	18·34	3,827	— 4·39	— 572
Coolgardie	20·23	3,833	— 22·17	— 3,627
Yalgoo	1·06	198	+ 0·48	+ 89
Outside Proclaimed Goldfields	....	....	— 0·61	— 127
	lb.		lb.	
BISMUTH—				
Gascoyne	3,310·00	1,475	+ 3,310·00	+ 1,475
	Tons		Tons	
CHROMITE—				
Peak Hill	....	....	— 1,312·30	— 20,997
CLAYS (Cement Clay, Fireclay, Ball Clays)—				
Outside Proclaimed Goldfields	33,796·96	39,269	+ 4,396·26	+ 5,098
COAL—				
Collie Coal Fields	870,882·45	2,280,649	+ 32,221·92	— 272,007
COPPER ORE AND CONCENTRATES—				
Peak Hill	68·49	949	— 27·67	— 6,415
East Murchison	....	....	— 264·83	— 6,906
Pilbara	....	....	— 459·10	— 21,013
Phillips River	1,726·71	53,265	+ 1,167·88	+ 40,066
Ashburton	....	....	— 4·59	— 326
West Pilbara	6·75	210	— 375·00	— 8,757
Yalgoo	....	....	— 9·35	— 193
Mt. Margaret	....	....	— 19·92	— 404
Northampton	....	....	— 9·44	— 201
CUPREOUS ORE AND CONCENTRATES—				
Pilbara	1,713·98	37,892	— 145·95	— 3,922
West Pilbara	225·25	4,985	— 404·61	— 395
East Murchison	737·79	9,161	+ 162·25	— 1,343
Peak Hill	4,624·54	51,874	+ 3,160·17	+ 31,522
Murchison	85·80	1,768	+ 85·80	1,768
Mt. Margaret	....	....	— 9·60	— 163
Gascoyne	2·10	16	+ 2·10	+ 16
Yalgoo	43·09	637	+ 43·09	+ 637
Phillips River	211·17	8,337	+ 111·78	+ 4,424
DOLOMITE—				
Murchison	196·00	786	+ 136·00	+ 546
FELSPAR—				
Coolgardie	673·00	3,062	— 322·00	— 1,549
Outside Proclaimed Goldfields	7·60	30	+ 7·60	+ 30
GLASS SAND—				
Outside Proclaimed Goldfields	6,420·41	4,267	+ 727·55	+ 353
GLAUCONITE—				
Outside Proclaimed Goldfields	112·00	5,590	— 114·00	+ 550
GYPSUM—				
Yilgarn	21,953·00	16,544	— 5,889·50	— 4,690
Dundas	4,983·72	14,893	+ 4,983·72	+ 14,893
Outside Proclaimed Goldfields	8,578·25	8,697	+ 3,067·85	+ 3,964
IRON ORE (for Pig)—				
Yilgarn	30,075·00	458,561	+ 8,236·50	+ 131,915
IRON ORE (for Export)—				
West Kimberley	536,713·00	532,355	+147,027·00	+ 145,915
LEAD ORE CONCENTRATES—				
Northampton	2,312·92	131,249	— 1,009·59	— 124,722

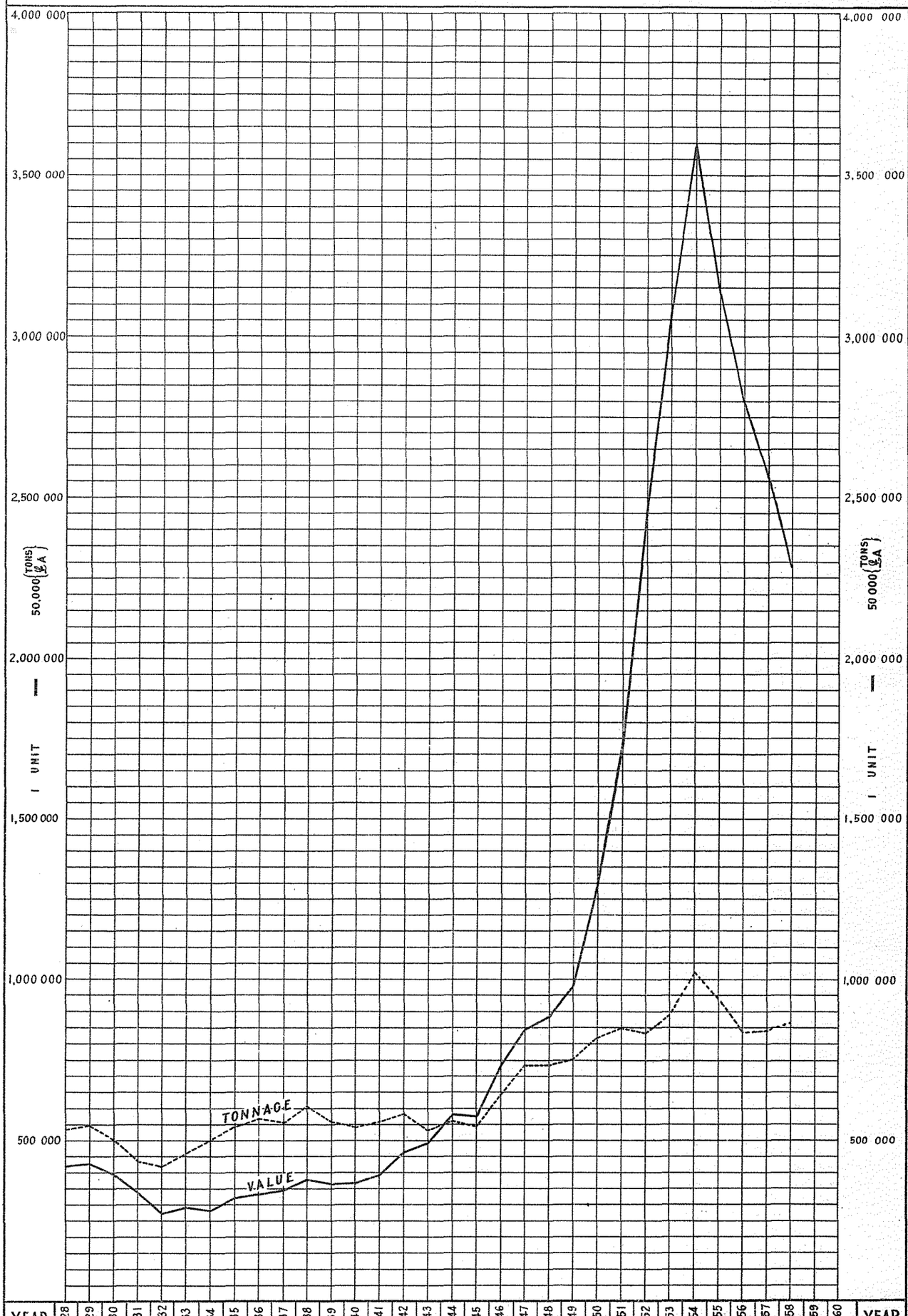
TABLE 7—*continued.*

Quantity and Value of Minerals, other than Gold and Silver, reported to the Mines Department during 1958–*continued.*

Goldfield, District or Mineral Field.	1958.		Increase or Decrease as compared with 1957.	
	Quantity.	Value.	Quantity.	Value.
	Tons	£A	Tons	£ A
SILVER LEAD ORES AND CONCENTRATES—				
Ashburton	109·45	7,227	— 87·98	— 8,135
Pilbara	70·06	715	— 587·56	— 42,223
West Pilbara	....	....	— 1·63	— 121
MANGANESE—				
Pilbara	22,372·49	563,807	+ 8,876·35	+ 336,478
Peak Hill	39,400·91	570,834	— 11,040·01	— 131,657
East Coolgardie	36·00	158	— 36·00	— 158
MINERAL BEACH SANDS (ILMENITE)—				
Outside Proclaimed Goldfields	82,926·27	448,218	+ 41,994·28	+ 114,742
OCHRE (Red)—				
Murchison	171·00	1,710	+ 161·00	+ 1,610
OCHRE (Yellow)—				
Murchison	18·30	183	+ 1·00	+ 10
PETALITE—				
Coolgardie	67·77	293	+ 67·77	+ 293
PHOSPHATIC GUANO—				
Outside Proclaimed Goldfields	169·65	1,827	— 417·24	— 7,147
PYRITES ORE AND CONCENTRATES—				
Dundas	38,915·00	303,340	— 6,427·00	— 24,421
East Coolgardie	10,473·64	48,507	— 2,102·00	— 6,299
QUARTZ GRIT—				
Collie Coal Fields	90·00	75	+ 90·00	+ 75
SEMI-PRECIOUS STONES—	lb.		lb.	
CHRYSOPRASE—East Coolgardie	5·00	5	+ 5·00	+ 5
OPALINE—East Coolgardie	25·00	4	+ 25·00	+ 4
TALC—	Tons		Tons	
East Coolgardie	....	....	— 175·45	— 877
Outside Proclaimed Goldfields	2,500·67	35,304	— 977·53	— 13,725
TANTO-COLUMBITE—				
Greenbushes	2·00	1,628	— 14·50	— 4,919
Pilbara	4·03	6,923	— 1·52	+ 2,261
Phillips River	....	....	— 0·23	— 622
TIN—				
Greenbushes	14·24	6,434	— 34·85	— 23,315
Pilbara	123·96	70,886	— 97·20	— 54,444
ZINC (Metallic)—				
Pilbara	20·06	511	+ 20·06	+ 511

GRAPH OF COAL OUTPUT

Showing Quantities and Values as reported to Mines Dept.



YEAR	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	YEAR
VALUE £A	420145	426706	334758	336178	270630	289806	278704	318013	331565	340444	375083	362811	364500	389278	461495	489721	583075	572896	730104	840249	880736	972245	1,287749	1,716788	2,457286	3073073	3,589848	3,820774	2,787,606	2,529,958	2,280,649			VALUE £A
TONS	528420	544719	501425	432400	415719	458399	500343	537188	565075	553510	604793	557535	539427	556574	581176	531546	538372	543363	642787	730506	732938	750534	814351	848475	830461	886182	1013343	903782	830,005	838660	870882			TONS

GRAPH OF TREND IN COAL OUTPUT

Showing Comparison of Annual Tonnages and Percentages
between Deep and Open Cut Mining

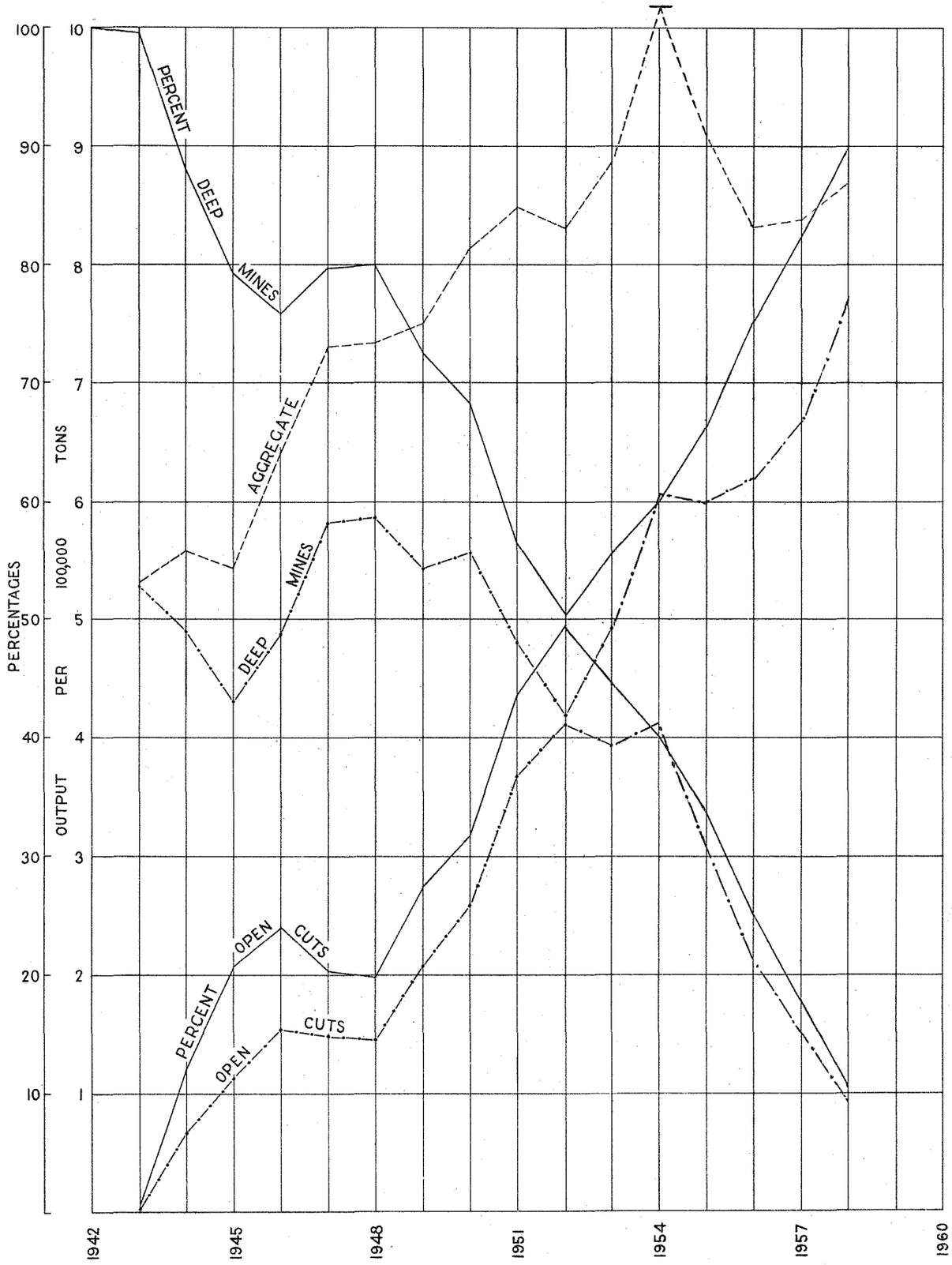


TABLE 8

Total Coal output from Collie Coalfield during 1957 *and* 1958, *estimated Value thereof, Number of Men employed, and Output per Man as reported Monthly*

Year	Total Output	Estimated Value	Men Employed			Output per Man Employed		
			Above Ground	Under Ground	Above and under Ground	Above Ground	Under Ground	Above and under Ground
	Tons	£A	No.	No.	No.	Tons	Tons	Tons
Deep Mining—								
1957	689,881	2,104,236	269	759	1,028	2,564	908	671
1958	779,395	2,053,038	178	842	1,020	4,378	925	764
Open Cut Mining—								
1957	148,779	448,420	108	....	108	1,377	....	1,377
1958	91,487	227,611	52	....	52	1,759	....	1,759
Totals—								
1957	838,660	2,552,656	377	759	1,136	2,224	1,104	738
1958	870,882	2,280,649	230	842	1,072	3,786	1,034	812

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

TABLE 9

Total Number and Acreage of Leases, Mineral Claims, Dredging Claims and Prospecting Areas held for Mining on the 31*st December,* 1957 *and* 1958

Leases and other Holdings	1957		1958	
	No.	Acreage	No.	Acreage
Gold Mining Leases on Crown Lands	1,140	20,645	1,103	20,187
Gold Mining Leases on Private Property	28	620	25	560
Mineral Leases on Crown Lands	252	43,259	207	38,783
Mineral Leases on Private Property	24	2,203	13	1,973
Dredging Claims—				
Gold	....	....	....	....
Minerals	125	10,832	147	11,050
Mineral Claims	535	38,120	574	39,338
Prospecting Areas—				
Gold	441	7,274	464	8,078
Minerals	53	1,082	39	877
Total	2,598	124,035	2,572	120,846

PART–IV. MEN EMPLOYED

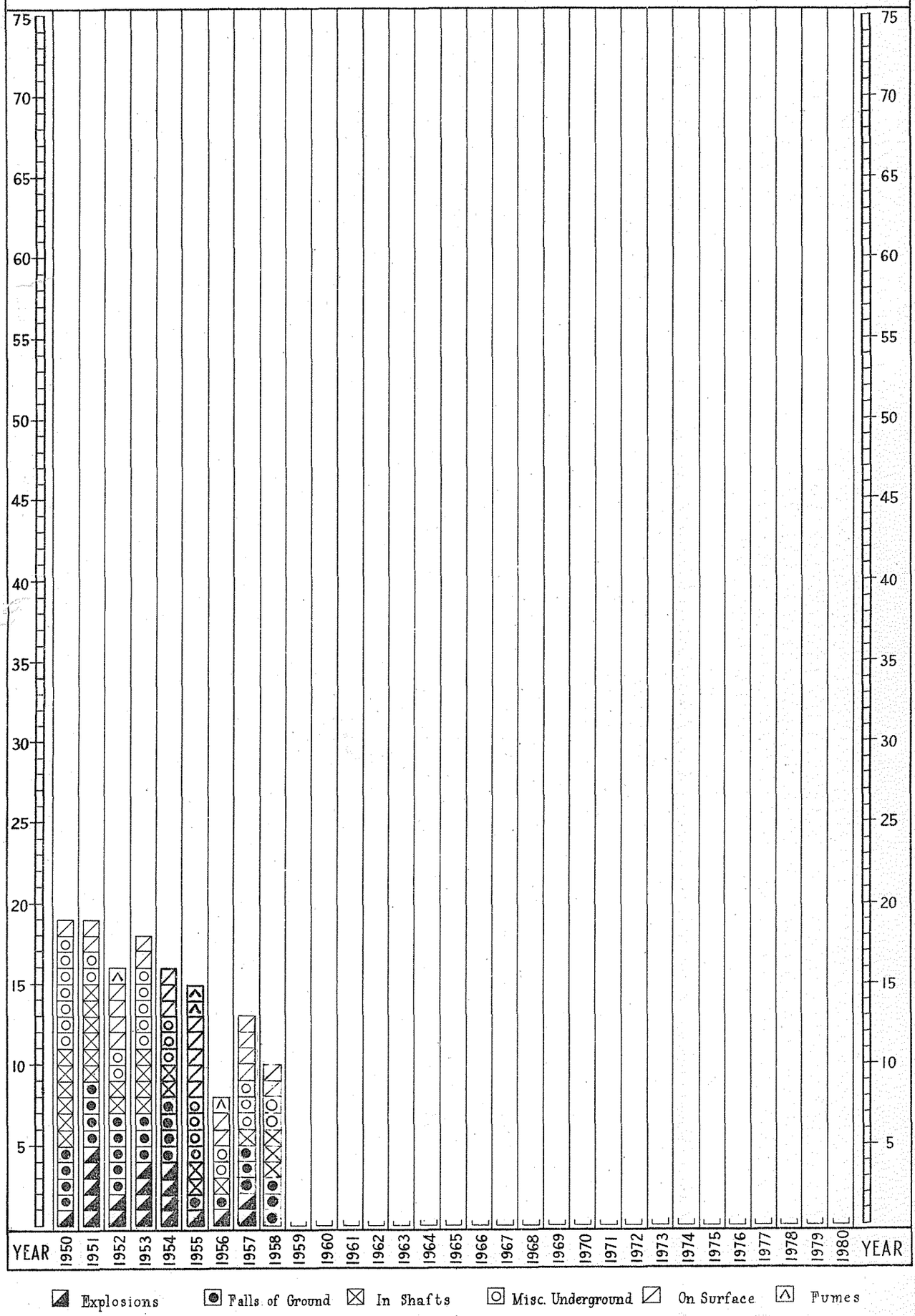
TABLE 10

Average number of Men reported as engaged in Mining during 1957 *and* 1958

Goldfield	District	Total 1957	Total 1958
Kimberley	....	4	4
West Kimberley	....	....	....
Pilbara	Marble Bar	44	52
	Nullagine	27	17
West Pilbara	....	....	3
Ashburton	....	....	....
Gascoyne	....	....	....
Peak Hill	....	11	11
East Murchison	Lawlers	8	5
	Wiluna	3	2
	Black Range	12	18
Murchison	Cue	50	31
	Meekatharra	20	20
	Day Dawn	14	14
	Mt. Magnet	231	263
Yalgoo	....	8	6
Mt. Margaret	Mt. Morgans	10	6
	Mt. Malcolm	266	262
	Mt. Margaret	19	8
North Coolgardie	Ularring	35	31
	Niagara	6	7
	Yerilla	22	24
	Menzies	103	107
Broad Arrow	....	70	71
North-East Coolgardie	Kanowna	8	12
	Kurnalpi	1	2
East Coolgardie	East Coolgardie	3,151	3,122
	Bulong	5	5
Coolgardie	Coolgardie	197	175
	Kunanalling	18	19
Yilgarn	....	626	627
Dundas	....	413	424
Phillips River	....	2	2
State Generally	....	2	2
Total, Gold Mining	....	5,385	5,352
Minerals Other than Gold—			
Asbestos	....	311	324
Barytes	....	2	1
Bentonite	....	2	1
Beryl	....	44	28
Chromite	....	3	....
Clays	....	9	9
Coal	....	1,136	1.072
Copper	....	69	120
Cupreous Ore (Fertiliser)	....	60	53
Felspar	....	4	3
Glass Sand	....	4	2
Glauconite	....	2	3
Gypsum	....	12	15
Iron Ore	....	139	122
Lead	....	137	47
Manganese	....	66	86
Mineral Beach Sands (Ilmenite, etc.)	....	69	89
Ochre	....	2	....
Pyrites	....	121	114
Talc	....	5	4
Tanto-Columbite	....	2	3
Tin	....	46	45
Total, Other Minerals	....	2,244	2,140

DIAGRAM OF ACCIDENTS

Showing the number of deaths arranged in six classes in the Mines and Quarries of Western Australia



PART V.–ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1957 AND 1958

A.—*According to Locality of Accident*

Goldfield	Killed		Injured		Total Killed and Injured	
	1957	1958	1957	1958	1957	1958
1. Kimberley	....	....	....	....	....	....
2. West Kimberley	....	....	1	1	1	1
3. Pilbara	....	1	3	1	3	2
4. West Pilbara	....	....	22	14	22	14
5. Ashburton	....	....	....	....	....	....
6. Gascoyne	....	....	....	....	....	....
7. Peak Hill	....	....	4	....	4	....
8. East Murchison	....	....	....	....	....	....
9. Murchison	1	1	11	10	12	11
10. Yalgoo	....	....	....	....	....	....
11. Mount Margaret	1	1	27	18	28	19
12. North Coolgardie	....	....	6	5	6	5
13. North-East Coolgardie	....	....	....	....	....	....
14. Broad Arrow	....	....	....	1	....	1
15. East Coolgardie	5	6	272	278	277	284
16. Coolgardie	....	....	7	2	7	2
17. Yilgarn	....	....	42	44	42	44
18. Dundas	3	1	26	35	29	36
19. Phillips River	....	....	9	19	9	19
Mining Districts—						
Northampton	....	....	6	3	6	3
Greenbushes	1	....	....	....	1	....
Collie	....	....	109	124	109	124
South-West	1	....	10	7	11	7
Total	12	10	555	562	567	572

From the above table it will be seen that the number of fatal accidents for the year 1958 was 10 as against 12 in 1957. The number injured showed an increase of seven. These accidents are classified according to their causes in the reports of the State Mining Engineer, Division II, and the Chief Coal Mining Engineer, Division X.

B.—*According to Causes of Accidents*

Cause	1957		1958		Comparison with 1957	
	Fatal	Serious	Fatal	Serious	Fatal	Serious
1. Explosives	2	9 (*b*)	....	3 (*e*)	— 2	— 6
2. Falls of Ground	3	46 (*c*)	3	34	....	— 12
3. In Shafts	1	17	3	18	+ 2	+ 1
4. Miscellaneous Underground	3	373	2	410	— 1	+ 37
5. Surface	3 (*a*)	110 (*d*)	2	97 (*f*)	— 1	— 13
6. Fumes	....	....	....	....	....	....
Total	12	555	10	562	— 2	+ 7

(*a*) Includes one fatal accident in a quarry. (*b*) Includes 1 serious accident in a quarry. (*c*) Includes three serious accidents in quarries. (*d*) Includes six serious accidents in quarries. (*e*) Includes one serious accident in a quarry. (*f*) Includes six serious accidents in quarries.

PART VI.—STATE AID TO MINING.

(a) State Batteries.

At the end of the year there were 22 State Batteries, including the Northampton Base Metal Plant.

From inception to the end of 1958, gold, tin, tungsten, lead, copper and columbite ores to the value of £17,057,916 have been treated at the State Batteries. Included in the above amount is gold premium of £6,075,063, and premium paid by sales of gold by the Gold Producers' Association Ltd., of £40,295. £16,736,032 came from 3,206,350 tons of gold ore, £94,577 from 81,818 tons of tin ore, £18,850 from 3,960 tons tungsten ore, £205,809 from 17,894¼ tons lead ore and £2,648 from 130 tons of copper ore.

During the year 41,806 tons of gold ores were crushed for 15,927 ozs. bullion, estimated to contain 13,498 ozs. fine gold, equal to 6 dwts. 11 grs. per ton. The average value of sands after amalgamation was 3 dwts. 1.7 grs. per ton, making the average head value 9 dwts. 12.7 grs. per ton. Cyanide plants produced 3,011 ozs. fine gold, giving a total estimated production for the year of 16,509 ozs. fine gold valued at £258,251.

The working expenditure for the year for all plants was £177,425 and the revenue was £44,078, giving a working loss of £133,347, which does not include depreciation or interest. Since the inception of State Batteries, the Capital expenditure has been £746,675, made up of £567,022 from General Loan Funds; £137,245 from Consolidated Revenue; £28,622 from Assistance to Gold Mining Industry; and £13,786 from Assistance to Metalliferous Mining.

Head Office expenditure including Workers' Compensation Insurance and Pay Roll Tax was £19,997, compared with £18,730 for 1957.

The working expenditure from inception to the end of 1958 exceeds revenue by £1,055,925.

(b) Prospecting Scheme.

During the year 92 men were approved for assistance on the Prospecting Scheme and at the end of the year there were 68 men still receiving assistance.

The cost of maintaining assisted prospectors during the year amounted to £10,545 11s. 7d. and refunds amounted to £1,760 15s. 6d. Since the inception of the scheme £380,669 7s. 4d. has been expended on assistance, and the total amount of refunds has amounted to £77,090 17s. 10d. Of the total amount expended £80,346 1s. 9d. was subsidised by the Commonwealth Government.

Crushings by assisted prospectors for the year amounted to 2,812½ tons for a return of 792 ozs. 14 dwts., making a progressive total of 105,060 tons 5 cwts. for a return of 51,319 ozs. 4 dwts. since the Prospecting Scheme was inaugurated in June, 1933.

(c) Drilling Programme.

During the year the Department's drills operated at Coolgardie, Tallering Peak, Great Fingall, Bamboo Creek, Mt. Morgans and Collie.

The drilling at Coolgardie, Great Fingall, Bamboo Creek and Mt. Morgans was carried out in an endeavour to establish gold mines. At Tallering Peak the Department is carrying out a drilling programme to establish the size and grade of the iron ore deposit.

The drilling at Collie was carried out by Amalgamated Collieries with the Department's Failing Drill on a deposit in order to test its possibilities as a future colliery.

(d) Geological Survey of Western Australia.

Some of the work of the Geological Survey Branch for the year 1958 is covered by the following reports, published in Division IV of this Report:

(1) The Search for Oil in Western Australia in 1958, by G. H. Low, B.Sc.

(2) Report on a Gold Find on Wildara Station, Lawlers District, East Murchison Goldfield. Approximate latitude 121° 00′ E. Approximate longitude 28° 08′ S. by G. H. Low, B.Sc.

(3) Report on Diamond Drilling for Gold. G.M.L. 924 "True Blue"—Bamboo Creek Centre, Pilbara Goldfield, by G. H. Low, B.Sc.

(4) Report on Phosphate Deposits, Lower Murchison River Area, by G. H. Low, B.Sc.

(5) Core Log and Assay Figures Mount Morgans Drilling. D.D.H. Nos. M1, M2 and M3, by J. W. Duggan, B.Sc., and A. J. Noldart, B.Sc.

(6) Notes on the Supply of Artesian and Sub-Artesian Water in the Fitzroy Basin, by J. D. Wyatt, B.A.

(7) Report on the Sandstone Deposits of Donnybrook, by J. D. Wyatt, B.A.

(8) Report on Inspection of Avon Location 27660 for Water Supply, by R. R. Connolly.

(9) Report on Inspection of Temporary Reserve 1632H and others for Gypsum, Boologooro, N.W. Division, by R. R. Connolly.

(10) Notes on a Reconnaissance for Gypsum to the West and North of Salt Marsh Salt Lake, N.W. Division, by R. R. Connolly.

(11) Report on Examination of M.C. 31 for Building Stone 9 miles W.N.W. of Northampton, by R. R. Connolly.

(12) Report on Alleged Damage from Blasting at Lockyer Housing Area, Albany, South West Division, by R. R. Connolly.

(13) Report on Application for Three Prospecting Areas for Manganese, Iron and Uranium, Norseman, by G. D. Bartram, B.Sc.

Publications Issued during 1958:

Bulletin 110—The Geology of the Phillips River Goldfield, by J. Sofoulis, B.Sc.

Bulletin 111—The Exploratory Diamond Drilling of the Koolyanobbing Iron Ore Deposits for Pyrite, by H. A. Ellis, B.Sc., A.O.S.M.

Mineral Resources Series:

Bulletin No. 6—The Gypsum Deposits of Western Australia, by L. E. de la Hunty, B.Sc., and G. H. Low, B.Sc.

Geological Sketch Map of W.A. in 1 Sheet—40 miles to 1 inch.

Annual Progress Report of the Geological Survey of Western Australia for the year 1955—Administrative Section only.

Annual Progress Report of the Geological Survey of Western Australia for the year 1956—Administrative Section only.

Officers of the Geological Survey have rendered varied types of practical assistance to individuals, syndicates and companies, as well as other Government Departments who have been concerned with the exploration of minerals and water resources in all parts of the State.

PART VII.—SCHOOL OF MINES.

(a) Kalgoorlie.

The total number of enrolments during the year was 380—a decrease of 7 by comparison with 1957. There was a small general improvement in examination results by comparison with last year, but the change was small and not particularly significant.

S. T. Hunter continued to hold a Mines Department Entrance Scholarship and it was again renewed at the end of the year. Twelve students held School of Mines Scholarships. One Scholarship was cancelled at the end of the year.

The usual scholaships and prizes were awarded at the end of the year, and a list of awards is given in Appendix 2 of the Director's Annual Report.

During the year 12 students completed Associateship Courses; 14, Certificate Courses; and 7, Technicians' Courses.

In addition to teaching the School continued to provide services to the public such as metallurgical investigations, free assays and mineral determinations for prospectors. During the year 261 samples were received for assay and for mineral determination from prospectors and others.

Eleven reports and one hundred and six certificates were issued by the Kalgoorlie Metallurgical Laboratory during the year. There was an increase in the number of certificates issued, due mainly to an increase in the number of assays received, following the closing down of a firm of Public Assayers towards the end of the year.

A new building was commenced in 1958—a mineral dressing laboratory for student use—and it should be ready for use in 1959. Alterations to the Kalgoorlie Metallurgical Laboratory were also almost completed by the end of the year, but completion is held up until exhaust fans of the required type are obtained from England.

The Advisory Committee met on nine occasions during the year. Mr. Warman moved to Sydney during the year and resigned from the Committee. He has been a member since 1947, and the Committee and the Department have valued his co-operation and advice. The Associate's Association has been asked to nominate a representative to replace Mr. Warman.

(b) Norseman.

Enrolments totalled 67 for the year 1958, an increase of seven on the previous year's figure.

Reg Dawson Scholarships were awarded to R. J. Lea and to C. F. May. The Institute of Mine Surveyors' £5 prize was awarded to S. R. Baker. This prize is open to students of the Kalgoorlie, Norseman and Bullfinch Schools.

(c) Bullfinch.

The number of students enrolled was 47—a decrease of 10 by comparison with the previous year.

Mr. K. C. Gray completed all requirements of the Mine Surveyor's Certificate Course at the Annual Examinations, and thus became the first Bullfinch student to obtain a qualification.

The Institute of Mine Surveyors' £10 prize was awarded to Mr. T. Blackley in competition with students from Kalgoorlie and Norseman.

PART VIII.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 6,919 against 6,723 for the preceding year, showing an increase of 196 boilers after all adjustments.

Of the 6,919 useful boilers 2,412 were out of use at the end of the year; 3,786 thorough and 721 working inspections were made and 3755 certificates were issued.

Permanent condemnations total 86 and temporary condemnations 4; 59 boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 40,356 against 38,516 for the previous year, showing an increase of 1,840.

Inspections made total 30,067 and 6,731 certificates were granted.

The total miles travelled for the year, were 88,612 against 87,361 miles for the previous year, showing an increase of 1,251. The average miles travelled per inspection were 2.56 as against 2.30 miles per inspection for the previous year.

532 applications were received and dealt with for Engine Drivers' and Boiler Attendants' Certificates, and 505 certificates of all classes were granted as follows:—

Winding Competency (including certificates issued under Regulation 40 and Section 60)	16
First Class Competency (including certificates issued under Regulations 40 and 45, and Sections 60 and 63)	23
Second Class Competency (including certificates issued under Regulation 40 and Section 60 of the Act)	21
Third Class Competency (including certificates issued under Regulations 40 and 45 and Sections 60 and 63)	31
Locomotive and Traction Competency (including Certificates issued under Regulation 40 and Section 60)	2
Diesel Locomotive "A" Class Certificate of Competency (including certificates issued under Regulation 40 and Section 53 and 56)	1
Diesel Locomotive "B" Class Certificate of Competency (including certificates issued under Regulation 40 and Section 53 and 56)	10
Diesel Locomotive "A" Class Certificate of Service (including certificates issued under Regulation 40 and Section 55)	7
Diesel Locomotive "B" Class Certificate of Service (including certificates issued under Regulation 40 and Section 55)	—
Internal Combustion Competency (including certificates issued under Regulation 40 and Section 60)	28
Crane and Hoist Competency (including certificates issued under Regulation 40 and Section 60)	265
Boiler Attendant Competency (including certificates issued under Regulation 40 and Section 60	95
Copies	6
	505

The total Revenue from all sources during the year £15,904 6s. 1d. as against £16,176 10s. 5d. the previous year, showing a decrease of £272 4s. 4d.

The total Expenditure for the year was £32,166 10s. 5d. against £31,334 11s. 9d. for the previous year, showing an increase of £831 18s. 8d.

PART IX.—GOVERNMENT CHEMICAL LABORATORIES.

The total number of samples received and registered during 1958 was 17,870, a decrease of about 10 per cent compared with 1957. The major cause of this decrease was a reduction in the number of sewage samples analysed, a reduction due to the coming into operation at the Subiaco Treatment Works of a Pilot Plant using activated sludge process.

The samples received were allocated to the various Divisions of the Laboratories according to the specialised work undertaken by each Division. The number of samples received by each Division was as follows:—

Agriculture, Forestry and Water Supplies	6,026
Food, Drugs, Toxicology and Industrial Hygiene	10,209
Fuel Technology	442
Industrial Chemistry	51
Mineralogy, Mineral Technology and Geochemistry	1,270

In a few cases work was done on the same sample in more than one Division so that in the above table some samples occur more than once.

Of the 6,026 samples received in the Agriculture, Forestry and Water Supply Division over 300 were of soils. A total of 1,866 water samples were received and this represented a decrease of about two per cent on the previous year's total which could probably be attributed to the better seasonal conditions in farming areas, hence decreasing the need of farmers to find alternative water supplies.

This year 136 Fertilisers Act samples, including five umpire samples, were received. This was a far greater number than ever previously received, more than 3½ times the number received in 1957. There were 92 samples of stock foods received for examination, and, in addition, many samples of pasture, herbage etc. Many other types of work were done in this Division in connection with soils and plants.

In the Foods, Drugs, Toxicology and Industrial Hygiene Division 10,209 samples were received. Of these samples 390 were of food materials and 186 of these were samples of cow's milk submitted by the Milk Boar dof W.A., and consisted largely of milks which were suspected of being adulterated or of being under the standard required by the Milk Act. 54 samples of cheese were examined for the Department of Agriculture, 28 food samples for the Government Tender Board and varied food samples for the Public Health Department.

In connection with cases of death from suspected poisoning, 284 toxicological samples from 103 cases were examined. In 50 cases no poison or drug was detected, while in 53 cases a poisonous material or drug was identified on analysis.

A large amount of work was done for the Police Department in Blood Alcohol analyses (Post mortem) in connection with traffic accidents or sudden death from various causes. There were also 63 voluntary blood alcohol tests carried out in connection with persons charged with "driving while under the influence of alcohol."

Work was carried out by the Division in connection with Animal Toxicology, Industrial Hygiene, Pollution Surveys and many other miscellaneous types of examinations, and expert evidence was given at Criminal, Coroner's and other Courts of Law.

The Fuel Technology Division carried out 442 examinations, analyses and longer investigations distributed over a large range of subjects, of which 188 related to coal survey work and coal utilisation. Work was done in connection with sawdust fired boilers and domestic heating appliances for cooking. Examinations were made of local firebricks and refractories. Five samples of gas from bores in drilling for oil were examined.

The Industrial Chemistry Division had a very busy year, and its work may be classified under these headings:—

1. Consultation Work.
2. Short Term Experimental Work.
3. Development Work.

There was a significant increase in the consultative work, and the range, if anything, was even wider than before. The most interesting development, perhaps, was the increase in the number of enquiries on plastics.

Practically all of the short term experimental work was done on behalf of Government Departments. In all, a total of 51 samples was examined. Samples on behalf of the Public Works Department included tiles, a brine solution which was expected to have a high potash content, fibre glass intended for use as wash tubs, water taps for anti-corosion treatment, and plastic hand rails and wall pannelling.

The term "Development Work" covers investigations which required some little time to complete, and the objectives of which were rather more long term than those previously mentioned. Briefly the following were investigated or are still under investigation:—Scaevola Spinescens, Alyxia buxifolia, Darwinia citriodora oil, painting of Karri timber and baits.

One thousand two hundred and seventy (1,270) samples were received for examination by the Mineralogy, Mineral Technology and Geo-Chemistry Division. Of these 954 were from the general public, 580 of which were free and 374 were paid for. The State Batteries supplied 143 samples and the Geological Surveys sent in 124 samples.

The Division carried out work in connection with Alloys and Metals, Building Materials and Ceramics. A large number of mineral examinations were carried out for the public, and other miscellaneous examinations were done in connection with calibrations of assay balance riders for the State Batteries, fire hazards in an ore grinding mill, fossils, petrological examinations and rock analyses.

PART X.—EXPLOSIVES

During the year importations of explosives were mainly by small ships berthing at the jetty at Woodman's Point Explosives Reserve.

In addition to the usual types of explosives imported there were added this year Beldyn, a highly water-resistant explosive and ammonium nitrate-fuel oil mixtures.

This year goldmining consumed 62 per cent. of explosives imported; quarrying 9.4 per cent.; geoseismic surveying 9.1 per cent., coal 5.8 per cent.; the remainder was used in base-metal industry; whaling, road construction, etc.

Laboratory and field tests were made of 2,350 explosives; 510 fuses and 600 fireworks. Almost without exception the quality of explosives was uniformly good.

Increased coverage was possible this year on inspections which were made in Eastern Goldfields, Yilgarn, South-West, metropolitan and near districts. Intensive inspections were also made of all explosives on arrival.

Major investigations were carried out at Kalgoorlie in connection with reports of poor performance, failure etc., and these reports were either not sustained or shown to be due to misuse.

Fireworks generally were found to be satisfactory. An investigation of some home-made bombs was carried out, and the explosive fuel used in a home-made experimental rocket seized by the police was investigated.

The Department was represented at a Dangerous Goods Conference in Melbourne in February.

Several investigations were made in connection with hazardous goods including a fatal acetylene explosion, grinding mill fires and spontaneous ignition of jute.

Attention has been given to the prevention of the theft of explosives from magazines and better construction of magazines recommended.

The condition of the Explosives Reserves at Kalgoorlie and Woodman's Point has been given attention and, where necessary, steps taken to carry out repairs and improvements to the installations.

PART XI.—MINERS' PHTHISIS ACT AND MINE WORKERS' RELIEF ACT

The periodical examination of miners was carried on throughout the year by the State Public Health Department, under arrangements with this Department, at the Kalgoorlie District Hospital, and a mobile X-ray unit which visited the North Coolgardie, Mt. Margaret, East Murchison, Murchison, Yalgoo, Pilbara, West Pilbara, West Kimberley, Coolgardie, Dundas, Phillips River and Yilgarn Goldfields, the Northampton Mineral Field and also Bunbury and Capel.

During the year examinations under the Mine Workers' Relief Act totalled 5,714 compared with 4,406 for the previous year. This increase of 1,308 was no doubt due to the wider coverage by the mobile X-ray unit. There were also 1,519 examinations under the Mines Regulation Act—an increase of 359 examinations over last year's figure. Details of the results of these X-ray examinations are given in the Report of the Superintendent, in Division IX of the Annual Report.

In the year 1958 compensation amounting to £14,969 15s. 0d. was paid, compared with £15,947 11s. 10d. for the previous year; a decrease of £997 16s 10d. which can be attributed to the death of some of the beneficiaries. The number of beneficiaries under the Act on the 31st December, 1958 was 137, being 12 ex-miners and 125 widows.

PART XII.—CHIEF COAL MINING ENGINEER'S BRANCH

The aggregate output out all mines was 870,882 tons of coal, as compared with 838,660 tons for the previous years—an increase of 32,222 tons. Of this production 779,395 tons or 89.50 per cent. was produced from the deep mines. This deep mine output is once again a record for the fourth successive year.

The total value of coal sold was £2,280,649 at an average cost of 52s. 4d. per ton as compared with 60s. 10d. per ton for the previous year.

The largest consumers of coal were the State Electricity who used 491,498 tons. This was an increase of 20,511 tons on the previous year, and as the capacity of the Bunbury Power Station is increased, so the consumption of the State Electricity Commission will increase accordingly.

The W.A. Government Railways were the next highest consumers with a consumption of 280,520 tons, an increase of 10,808 tons over the previous year's consumption.

Private consumers showed little change and consumed a total of 98,860 tons, compared with 97,954 tons the previous year.

It is once again pleasing to report that no fatal accidents occurred during the year.

PART XIII—CHIEF DRAFTSTMAN

During the year the Goldfields Map of Western Australia was drawn and published, and a new Mineral Map of the State was published.

Work was continued on the production of plans of goldfields areas on the Transverse Mercator Projection. A large number of plans were prepared for the Geological Surveys Branch and for other branches of the Department.

The Branch maintains 456 Public Plans showing mining localities and mining holdings.

Surveys of mining tenements were carried out in all areas from the Pilbara to the Dundas Goldfields, and these have been plotted on to the Standard Compilation plans.

There has been an increase in the amount of photo interpretation for the preparation of field plans and air photos for the use of the geologists in the field.

STAFF

Once again, I would like to take the opportunity of thanking all members of the staff, both at Head Office and at Outstations, for the loyal and efficient manner in which they have carried out their duties.

In this summary of the various activities I have commented only on the principal items. Divisions II to XII of this publication contain the detailed reports of the responsible Branch officers.

(Sgd.) A. H. TELFER,
Under Secretary for Mines.

Department of Mines.
Perth.

DIVISION II

Report of the State Mining Engineer for the Year 1958

Under Secretary for Mines:

The Annual Report of this branch for the year 1958 compiled by the Assistant State Mining Engineer from information supplied by Inspectors of Mines and the Statistical Branch is submitted.

Workmen's Inspector Chisholm, who has been stationed at Gwalia for several years reached the retiring age and has been succeeded by Mr. R. J. Prince.

The rate of incidence of fatal and serious accidents is very similar to that recorded in the previous year.

Those accidents which resulted from bad practice have been studied both by our Inspectors and by the Joint Safety Committee and steps have been taken to prevent similar accidents.

Ventilation has been well maintained. There were no fatal fuming accidents and very few minor cases.

Gold Mining has maintained its position, the tonnage and recovery being slightly higher than for 1957. The difficult position of the industry is reflected in a slightly higher grade, and the increase in the output per man indicates that methods of production are still being improved.

Very considerable benefits have resulted from Commonwealth assistance.

The *Eclipse mine* at Mount Magnet is now in regular production and *Great Western's mine* at Nevoria is also established as a regular producer.

Several spectacular "patches" have been found by prospectors but none appears to be likely to develop into a large mine.

Among the other minerals interest centres on Crocidolite asbestos. Production is increasing and a strong demand continues.

The demand for Beach Sand minerals is still weak but there has been some recovery from last year's low production.

The price of copper smelted in Australia is now stabilized and Ravensthorpe copper has continued in production. There is still a strong demand for copper of fertiliser grade.

The production of iron ore is increasing both at Cockatoo Island and at Koolyanobbing.

The market for lead concentrates has been rather poor and the only mine to continue in regular production has been the Ghurka at Northampton. The development of a promising prospect in this area has been reported.

Despite a poor market in the latter part of the year the production figures for manganese show a small increase.

Some interest has been shown in the export of gypsum and magnesite. There has been a modest development of the export trade in Gypsum through the port of Esperance.

The transfer of our drilling equipment from Collie was effected during the year. The store and workshop at Welshpool are now operating.

Two percussion drills have been added to the plant and a light diamond drill was purchased.

The section has proved itself capable of dealing with a wide range of drilling problems.

E. E. BRISBANE,
State Mining Engineer.

State Mining Engineer.

Mining activities for the year 1958 are described in this report, which is based on information supplied by the Statistician and Inspectors of Mines. The section on drilling written by Inspector Haddow and the report on the Board of Examiners for Mine Managers' and Underground Supervisors' Certificates appear as appendices to this report.

STAFF.

Workmen's Inspector Donald Victor Chisholm, of Gwalia, retired in June after nine years efficient and loyal service. The vacancy was filled by Mr. R. J. Prince who commenced duties as Workmen's Inspector on the 9th June.

ACCIDENTS.

Fatal and serious accidents, in metal mines and quarries, reported to the Department are shown below. The corresponding figures for 1957 are shown in brackets.

There were 10 (12) fatal and 438 (446) serious accidents.

In gold mines there were 9 (10) fatal and 389 (388) serious accidents. The number of men employed in such mines was 5,352 (5,385). The accident rate per 1,000 men was thus 1.68 (1.86) for fatal accidents and 72.68 (72.05) for serious accidents.

One man died from injuries received on a manganese mine.

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

TABLE A.

Serious Accidents for 1958.

Class of Accident	West Kimberley	Pilbara	West Pilbara	Murchison	Northampton	Mount Margaret	North Coolgardie	Broad Arrow	East Coolgardie	Coolgardie	Yilgarn	Dundas	Phillips River	South-West-	Total
Major Injuries—Exclusive of Fatal—															
Fractures—															
Head	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Shoulder	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Arm	....	....	....	....	....	1	....	....	5	....	....	....	....	....	6
Hand	....	....	....	....	....	1	....	....	6	....	1	....	....	....	8
Spine	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Rib	....	....	....	....	1	....	1	....	5	....	....	1	....	....	8
Pelvis	....	....	....	....	1	....	....	....	1	....	....	....	....	....	2
Thigh	....	....	....	....	....	....	....	....	8	....	....	2	....	....	10
Leg	....	....	....	....	....	1	....	....	4	....	....	1	....	1	7
Ankle	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Foot	....	....	....	1	....	2	....	....	8	....	....	....	....	....	11
Amputations—															
Arm	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hand	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Finger	....	....	....	1	1	....	1	2	1	....	....	1	....	....	7
Leg	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Foot	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Toe	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Loss of Eye	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1
Serious Internal	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Hernia	....	....	....	....	1	....	2	....	4	....	2	1	....	....	10
Dislocations	....	....	....	....	....	1	....	....	1	....	....	....	....	....	2
Other Major	....	....	1	....	1	....	....	....	5	....	2	1	....	1	12
Total Major	....	....	3	4	1	10	2	....	50	....	5	7	....	2	85
Minor Injuries—															
Fractures—															
Finger	....	....	....	....	....	2	....	....	14	....	....	1	....	....	17
Toe	....	....	....	2	....	....	....	....	8	....	....	....	....	....	10
Head	....	....	1	....	....	....	....	1	1	....	....	1	1	....	5
Eyes	....	....	....	....	....	....	1	....	12	....	1	2	....	....	16
Shoulder	....	....	1	....	....	....	....	....	10	....	3	....	2	....	16
Arm	....	1	....	1	....	1	....	....	9	1	7	....	....	....	20
Hand	....	....	2	....	....	4	....	....	59	1	9	9	8	....	92
Back	....	....	1	....	....	1	1	....	40	....	2	4	3	1	53
Rib	....	....	....	....	....	....	....	....	5	....	....	....	....	....	5
Leg	....	....	3	1	....	....	....	....	47	....	9	6	2	1	69
Foot	....	....	1	....	....	....	1	....	19	....	7	4	2	2	36
Other Minor	....	....	2	2	2	....	....	....	4	....	1	1	1	1	14
Total Minor	....	1	11	6	2	8	3	1	228	2	39	28	19	5	353
Grand Total	1	1	14	10	3	18	5	1	278	2	44	35	19	7	438

There were no accidents reported in the year under review in the following Goldfields :—Kimberley, Gascoyne, North-East Coolgardie, Ashburton, East Murchison, Greenbushes, Peak Hill, Yalgoo.

Table "B" shows the fatal, serious, and minor accidents reported and the number of men employed classified according to mineral mined.

TABLE B.

Minerals other than Coal and Oil.

Mineral	Men Employed	Accidents		
		Fatal	Injured	
			Serious	Minor
Asbestos	324	....	14	186
Beryl	28	....	....	....
Copper	173	....	19	88
Gold	5,352	9	389	1,890
Ilmenite	89	....	....	....
Iron Ore	122	....	1	6
Lead	47	....	3	3
Manganese	86	1	....	....
Pyrite	114	....	5	28
Tin	45	....	....	....
Other Minerals	40	....	....	....
Rock Quarries	Not available	....	7	24
Totals	....	10	438	2,225

Accidents classified according to causes for the various districts are shown in Table "C."

TABLE C.

Fatal and Serious Accidents showing Causes and Districts.

District	Explosives		Falls		Shafts		Fumes		Miscellaneous Underground		Surface		Total	
	Fatal	Serious	Fatal	Serious	Fatal	Serious	Fatal	Serious	Fatal	Serious	Fatal	Serious	Fatal	Serious
Kimberley	....	....	....	....	....	....	....	....	....	....	....	....	....	....
West Kimberley	....	....	....	....	....	....	....	....	....	....	....	1	....	1
Pilbara	....	....	....	....	....	....	....	....	....	....	1	1	1	1
West Pilbara	....	....	....	2	....	....	....	....	....	9	....	3	....	14
Ashburton	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Gascoyne	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Murchison	....	....	1	1	....	2	....	....	....	5	....	2	1	10
East Murchison	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yalgoo	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Northampton	....	....	....	1	....	....	....	....	....	1	....	1	....	3
Mount Margaret	....	....	....	3	1	2	....	....	....	6	....	7	1	18
North Coolgardie	....	....	....	....	....	....	....	....	....	3	....	2	....	5
Broad Arrow	....	....	....	....	....	1	....	....	....	....	....	....	....	1
North-East Coolgardie	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie	....	2	1	18	2	6	....	....	2	218	1	34	6	278
Coolgardie	....	....	....	....	....	....	....	....	....	2	....	....	....	2
Yilgarn	....	....	....	3	....	4	....	....	....	31	....	6	....	44
Dundas	....	....	1	....	....	2	....	....	....	21	....	12	1	35
Phillips River	....	....	....	....	....	1	....	....	....	17	....	1	....	19
Greenbushes	....	....	....	....	....	....	....	....	....	....	....	....	....	....
South-West	....	1	....	....	....	....	....	....	....	....	....	6	....	7
Total for 1958	....	3	3	28	3	18	....	....	2	313	2	76	10	438
Total for 1957	2	9	3	40	1	17	....	....	3	281	3	99	12	446

Oil well drilling companies employing 151 men in the field reported 13 serious and 27 minor accidents during the year.

I regret to have to report that a child was killed whilst playing in mine workings.

John Charles Orr, aged about 13 years, was killed on the 9th July when buried in the residue dump of Great Western Consolidated N.L. at Bullfinch. Three boys were tunnelling in the wall of the dam when some of the residue collapsed. Two boys were buried, but one was rescued.

FATAL ACCIDENTS.

A brief description of fatal accidents reported during the year is given below.

Name and Occupation	Date	Mine	Details and Remarks
Keegan, Norman Septimus (Shaft Superintendent)	Injured 31/1/58 died 19/2/58	Paringa South Shaft Gold Mines of Kalgoorlie (Aust.) Ltd., Fimiston	Death due to Uraemic Colitis following injuries received when a shaft ladder on which he was standing gave way beneath him.
Sibosado, Anthony Martin (Mechanic)	Injured 1/4/58 died 2/4/58	M.C. 268 (manganese) Woody Woody, Black Range Tin Co.	Died from pulmonary embolism following injuries received when his right forearm was severed whilst repairing the chain drive mechanism of a 19 R.B. power shovel.
Solomon, William Earnest (Tournapull Driver)	12/5/58	Lake View & Star Ltd., Fimiston	Suffered internal injuries when he was thrown from and run over by a Tournapull carryall earth moving machine. He was teaching another man to drive at the time of the accident which occurred on the surface near the Lake View shaft.
Crowley, Cornelius Vincent (Timberman)	27/5/58	Lake View Shaft, Lake View & Star, Ltd., Fimiston	Crushed by a fall of rock on the 1,900 feet level 175 West leading stope.
Renton, James Henry George (Skipman)	10/6/58	Kalgurli Shaft, North Kalgurli (1912) Ltd., Fimiston	When an upward moving cage in which he was travelling, was near the 2,000 feet level, some equipment moved which overbalanced Renton and he was dragged from the cage.
Hall, Norman Stanley (Shift Boss)	12/6/58	Horseshoe No. 2 Shaft, Lake View & Star, Fimiston	Suffered multiple injuries when the cage in which he was travelling struck a loose piece of timber and he was thrown out.
Farrell, Robert Stanley (Machine Miner)	9/7/58	Hill 50 Gold Mine N.L., Mount Magnet	Crushed by falling stone when the 940 feet level North stope bench on which he was working collapsed beneath him.
Grubisich, Kleme (Platelayer)	14/10/58	Kalgurli Shaft, North Kalgurli (1912) Ltd., Fimiston	Asphxiated when buried by sand on the No. 6 level. He was standing near the main ore pass when level timbers collapsed allowing sand fill from the stope above to fall on to the level.
Scolari, Guiseppe	Injured 16/12/58 died 17/12/58	Sons of Gwalia, Gwalia	The mine No. 2 well on water right 137C was being retimbered when a length of sawn timber slipped from the rope sling, fell some 30 feet and struck Scolari's safety helmet and fractured his skull.
Shinnick, Michael Rupert (Machine Miner)	23/12/58	North Royal Mine Central Norseman Gold Corporation, Norseman	Struck by a fall of rock in section 274 stope above the No. 10 level.

WINDING MACHINERY ACCIDENTS.

Forty one accidents involving winding machinery were reported during the year and are briefly as follows:—

Fatal.—(2) These accidents at the Kalgurli and Horseshoe No. 2 shafts have been included under the heading of fatal accidents.

Overwinds.—(8) On the 30th June an overwind occurred in the No. 2 winze internal shaft, Great Boulder mine. The cage, with one man aboard, proceeded to the thimble where the rope was detached. The cage hung up on the hook and grippers. When the cage was at the thimble the indicator showed just above the No. 19 level (brace at No. 18 level). Investigation showed that the indicator chain had jumped the sprocket and lodged on the sprocket nuts where it continued to operate the indicator. New sprockets and chains have been fitted.

An overwind occurred at the Hamilton shaft, on the 19th November. The driver had just geared in to the No. 3250 ft. bin. On receiving the first bell to hoist he forgot to reverse and took the East skip from the surface to the detaching point. No serious damage resulted.

Errors of judgment by the drivers accounted for six overwinds at the Lake View and Star (1), Sons of Gwalia (1), Central Norseman (1), Great Boulder (1) and Hill 50 (2) gold mines.

Cages Hung Up.—(9) Whilst lowering shaft repair men in the West compartment of the Enterprise shaft on the 1st February, the cage hung up and approximately 1,200 feet of slack rope was lowered on top of the cage. Luckily the hood above the cage guided the rope and it was recovered undamaged. The accident was attributed to yo-yoing, by a new driver, which allowed the grippers to operate.

A stone lodging between the skid and the shoe of the skip caused a skip to be jammed in the Kalgurli shaft on the 25th April. A month earlier at the same shaft the cage was hung up when it fouled a loose centre.

During ore hauling operations at the Oroya South shaft on the 28th April the ascending north skip stuck between the 300 and 400 levels. The skip was well loaded and spillage further jammed the skip against the plat sill. The jaw of the detaching hook was stretched by the tension and allowed the shackle to come through and detach the rope. The rope jumped off the head sheave and the winder drum and wrapped around the shafting. It was necessary to renew the rope. Overloading of the skip probably caused the accident.

Difficulty in controlling the throttle valve on the winder at the No. 6 shaft Perseverance mine probably caused the movement of the cage to be jerky and the cage was temporarily hung up. The throttle valve was replaced.

It is thought that the sudden application of the brakes caused the cage to be hung up in the Victoria shaft of the Gold Mines of Kalgoorlie on the 27th April.

On the 24th July a learner driver was operating the skip winder at the Copperhead mine, Bullfinch when he stopped the winder too quickly and the ascending skip came to rest on the grippers.

A slowly descending cage in Chaffers shaft was thought to have temporarily held up at a tight spot causing the grippers to operate. Because of kinks in the rope, that was lowered onto the cage, 180 feet of rope had to be cut off.

Due to a truck fouling the shaft timber the East cage, of the Nevoria shaft, was hung up on the 18th September. Beyond damage to the truck no other serious damage resulted. Apparently the braceman did not properly lower the bridle.

Derailments.—(20) On the 27th February a stone became jammed between the rails and the skip flange at the underlay internal shaft at the Copperhead mine, Bullfinch. Two men were travelling on the skip which overturned before the shaft sinking crew could ring the driver. One man received injuries to an arm. The skid rails and skip flanges were modified and a further safety chain, allowing the bridle to be shackled to the body of the skip, provided.

The Sons of Gwalia management reported four derailments in their mine. Three of the accidents were caused by spread rails and the fourth from unknown causes.

Spillage is thought to have been the cause of nine derailments at the Regent, five at the Royal and one at the North Royal shafts of the Central Norseman Gold Corporation. No personal injury resulted from any of these accidents.

Mechanical Failures.—(1) On the 13th July, a major accident occurred at Edwards shaft, Great Boulder Gold Mine when new ropes were being wound on the drums. The practice is to attach the shoe end to the head frame. A large pulley is then put on the loop of the rope and a skip attached. The rope is then in double purchase and this allows the full rope to be wound off the drum, fitted and re-wound tightly. The North rope was wound off the drum until approximately half a turn remained on the drum. The riggers were in the act of attaching a tail piece when the rope pulled through the U bolt holding it to the drum. As the rope flew over the head sheave it broke two cross stays in the head frame. In doing so it momentarily stopped and the weight of the skip broke the shoe end from its attachment. All the rope then fell down the shaft where it bunched above the 2,950 plat. The skip remained suspended by the grippers. The rope was a total loss and some damage was caused to shaft timber.

It is thought that one or more of three $\frac{3}{8}$ in. U bolts used to attach the rope to the drum spoke were over stressed and allowed the rope to pull through. To avoid a recurrence the size of the clamps have been increased to $\frac{7}{8}$ in. and the rope ends shoed.

Miscellaneous.—(1) Due to a cave-in on the 27th April of workings adjacent to and under one corner of the Boulder Perseverance main shaft winder the switch gear fell and was suspended by the cables to the motor. The switch gear was recovered and the winder dismantled pending filling in and consolidating the collapsed area.

PROSECUTIONS.

It was found necessary to prosecute two persons during the year. Both were successfully conducted by our Inspectors.

A miner was fined five pounds for boring in a face that had not been properly cleaned down and examined. Gelignite was found in two butts from a previous firing.

A miner was fined five pounds for riding on a kibble in a winze having an inclination of more than 60° from the horizontal, without wearing the safety belt provided.

SUNDAY LABOUR PERMITS.

Nineteen permits were issued during the year.

Hill 50 Gold Mine (N.L.) was permitted to employ men on one Sunday so that the air main down the shaft could be replaced.

Gold Mines of Kalgoorlie (Aust.) Limited was granted permission to perform any work necessary to consolidate and make safe the area where surface subsidence followed the collapse of floor pillars at the Perseverance mine.

Central Norseman Gold Corporation N.L. was granted permission to work on one Sunday to strip Regent Shaft, No. 16 level ore pocket.

Sixteen permits were granted to Great Western Consolidated N.L. for work in connection with the sinking of an inclined internal shaft in bad ground.

AUTHORISED MINE SURVEYORS.

The Survey Board issued six certificates during the year.

CERTIFICATES OF EXEMPTION (SECTION 46).

Thirteen certificates were issued as compared with 11 in 1957.

PERMITS TO FIRE OUTSIDE PRESCRIBED TIMES (REGULATION 51).

Six permits were issued.

Two permits were issued to Gold Mines of Kalgoorlie (Aust.) Limited for work in connection with the subsidence at the Perseverance and for an isolated wet stope at the Bayleys South shaft.

Central Norseman Gold Corporation was issued with two permits for major works where fumes and dust from firing exhausted directly to the return airway.

Permits were issued to Great Western Consolidated for the sinking of two isolated surface winzes.

PERMITS TO RISE (REGULATION 64).

Fifty one permits were granted and these covered 84 rises totalling 8,201 ft. Twenty nine rises were made using the rising gig and six with a borehole as a guide.

ADMINISTRATIVE.

Mines Regulation Act. Regulation 94 was amended to include diabetes to the list of diseases or other physical infirmities that would render a winder driver unfit to take charge of a winding engine. The amendment appeared in the *Government Gazette* (No. 30) of 29th April, 1958.

Mining Act.—The principal regulations were amended by adding after regulation 205 a new division namely "Division 9A—Royalties". Royalties payable appear in *Government Gazettes* of the 20th May and 30th July.

Mine Workers' Relief Act.—Scale II of the second schedule was amended. This covers payments to dependants of prohibited mine workers. The amendment appeared in *Government Gazette* (No. 38) of 20th May.

VENTILATION.

One Inspector and two assistant Inspectors were fully engaged throughout the year taking dust samples, measuring air flow and temperatures at all the major mines. There has been little change in the primary ventilation circuits of the mines but improvements have been made in working conditions by the installation of larger primary fans and increasing the cross sectional areas of airways.

Results of dust counts taken during the year are tabulated below:—

Dust Samples from	No. of Samples	Samples giving over 1,000 p.p.c.c.	Average Count
Development	429	3	178
Stoping	815	7	175
Levels	61	1	203
Surface	146	8	195
Totals	1,451	19	179

The results are comparable with those reported in the last five years.

It is with pleasure that I report that for the second year in succession there has not been a fatal accident due to the fumes of explosives. However some miners are still reluctant to use the ventilating equipment provided and a number of minor fuming cases have been reported.

One case of plumbism was reported during the year. The man affected was employed in the mixing and fluxing room of an assay office. Tests indicated that the air contained between three and five milligrams of lead per cubic metre of air. Two milligrams per cubic metre, inhaled as dust or fume, could in the course of years set up chronic plumbism.

Tunnelling operations, at the Serpentine Dam project, were visited and checks made on ventilation and dust concentration. Each of the two headings was ventilated by two E.F. 6 fans in parallel, with air delivered through 30 inch diameter duct. Dust counts were high but were principally carbon particles from the exhaust of diesel powered equipment operating in the tunnels.

An air survey of the Sons of Gwalia Limited was undertaken during the year. Ventilation of this mine would be improved by the installation of fans to ventilate the hanging wall workings at Nos. 23 and 24 levels which are at present being ventilated by return air from the main upcast shaft.

In response to a request from the International Labour Office a paper on the Prevention and Suppression of Dust in Mining, Tunnelling and Quarrying was prepared. The paper was submitted based on a uniform plan for national reports drawn up by the Office. Emphasis was required on achievements, progress, and research.

Aluminium Therapy.—This prophylactic treatment with aluminium powder was continued in most mine changerooms. The changeroom at the Croesus mine was adapted for the dispersal of aluminium powder late in 1957 and early in 1958 the treatment was made available.

A survey made during the year indicated that 2,337 underground workers or 72 per cent. of the total underground force are taking the treatment.

GOLD MINING.

The ore treated during the year amounted to 3,021,072 tons as compared with 2,951,011 tons in the previous year. Gold recovered amounted to 874,819 ounces as compared with 849,741 ounces for 1957.

Grade of ore mined was much the same as for last year, recovery being 5.79 dwts. per ton as against 5.76 dwts. per ton.

The calculated value of the gold produced was £13,674,193 which included £5,146 distributed by the Gold Producers' Association from the sale of 217,889 fine ounces of gold at an average premium of 5.67d. per fine ounce. The Mint value of gold throughout the year was £15 12s. 6d. per fine ounce.

There was a slight reduction in the labour force, in the industry, from 5,385 in 1957 to 5,352 in 1958. Average production of ore per man for the year was 564.48 tons valued at 90.53 shillings per ton as compared with 548.01 tons valued at 90.17 shillings per ton for 1957. Gold recovery per man averaged 163.46 fine ounces as compared with 157.80 fine ounces in the previous year.

Statistics relating to the gold mining industry are tabulated as follows:—

Table "D"—Gold Production Statistics.

Table "E"—Classification of Gold Output for 1958 by Goldfields.

Table "F"—Classification of Gold Output, 1954-1958.

Table "G"—Mines that have produced 5,000 ounces and upwards during the last five years.

Table "H"—Development Footages.

TABLE D

Gold Production Statistics

Year	Tons Treated (2,240 lb.)	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	Dwts.
1929	628,400	372,064	1,580,426	50·30	4,108	84·96	11·34
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	53·38	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	5,556,736	54·185	5,079	209·00	5·185
1944	1,777,128	472,588	5,966,451	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
1948	2,447,545	662,714	7,132,748	58·28	7,178	215·25	5·42
1949	2,468,297	649,572	7,977,200	64·64	6,800	245·62	5·26
1950	2,463,423	608,633	9,428,745	76·55	7,080	309·83	4·94
1951	2,471,679	648,245	10,042,392	81·26	6,766	309·83	5·25
1952	2,626,612	727,468	11,809,047	89·92	6,394	324·66	5·54
1953	3,169,875	823,331	13,290,100	83·85	6,359	322·837	5·20
1954	3,240,378	861,992	13,492,209	83·27	6,128	313·04	5·32
1955	2,865,048	834,326	13,055,574	91·13	5,845	312·96	5·82
1956	2,870,273	813,617	12,724,923	88·67	5,612	312·80	5·67
1957	2,951,011	849,741	13,304,752	90·17	5,385	313·15	5·76
1958	3,021,072	874,819	13,674,193	90·53	5,352	312·62	5·79

TABLE E.

CLASSIFICATION OF GOLD OUTPUT FOR 1958 BY GOLDFIELDS.

Goldfield	Unclassified Sundry Claims Alluvial, etc.	Up to 100 ozs.		101–500 ozs.		501–1,000 ozs.		1,001–5,000 ozs.		5,001–10,000 ozs.		10,001–20,000 ozs.		20,001–50,000 ozs.		50,001–100,000 ozs.		Over 100,000 ozs.		Total
	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.	No. of Producers	Gold fine ozs.	No. of Producers	Gold fine ozs.	No. of Producers	Gold fine ozs.	fine ozs.
Kimberley	42	1	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	50
West Kimberley	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara	354	14	150	2	500	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1,004
West Pilbara	15	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	15
Ashburton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill	149	2	36	2	453	....	....	....	....	....	....	....	....	....	....	....	....	....	....	638
Gascoyne	....	1	6	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Murchison	896	23	548	3	389	....	....	1	2,942	....	....	....	....	....	....	1	77,209	....	....	81,984
East Murchison	146	2	18	4	653	....	....	....	....	....	....	....	....	....	....	....	....	....	....	817
Yalgoo	9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9
Mt. Margaret	320	4	52	1	369	....	....	....	....	....	....	....	....	1	30,269	....	....	....	....	31,010
North Coolgardie	1,170	15	383	6	1,591	1	856	1	1,281	....	....	1	15,746	....	....	....	....	....	....	21,027
Broad Arrow	663	4	302	3	662	1	758	....	....	....	....	....	....	....	....	....	....	....	....	2,385
North-East Coolgardie	119	....	....	2	203	....	....	....	....	....	....	....	....	....	....	....	....	....	....	322
East Coolgardie	976	14	610	3	448	1	648	2	3,498	....	....	....	....	....	....	1	84,199	3	439,389	529,768
Coolgardie	978	14	409	3	363	....	....	1	1,302	....	....	1	11,815	....	....	....	....	....	....	14,867
Yilgarn	52	9	161	1	486	1	544	2	3,856	....	....	....	....	....	....	1	76,641	....	....	81,740
Dundas	148	1	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	108,176	108,331
Phillips River	1	....	....	....	....	1	811	....	....	....	....	....	....	....	....	....	....	....	....	812
State Generally	34	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	34
Totals	6,072	104	2,690	30	6,117	5	3,617	7	12,879	....	....	2	27,561	1	30,269	3	238,049	4	547,565	874,819

TABLE F.

Classification of Gold Output, 1954-1958.

Range of Output	1958			1957			1956			1955			1954		
	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	4	547,565	62·6	3	428,334·08	50·5	2	289,315	35·5	2	280,878	33·6	2	275,139	31·9
50,001–100,000	3	238,049	27·2	4	302,421·19	35·6	5	377,203	46·3	5	368,426	44·1	6	387,840	45·1
40,001– 50,000	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
30,001– 40,000	1	30,269	3·5	1	31,043·09	3·6	....	....	....	....	....	....	1	31,150	3·6
20,001– 30,000	....	....	....	....	....	....	1	27,376	3·4	3	68,600	8·2	4	69,964	8·1
10,001– 20,000	2	27,561	3·2	3	38,930·24	4·6	4	63,742	7·8	4	68,958	8·3	3	44,664	5·2
5,001– 10,000	....	....	....	2	13,499·79	1·6	3	21,112	2·6	2	12,282	1·5	3	22,798	2·6
4,001– 5,000	....	....	....	....	....	....	1	4,045	0·5	....	....	....	....	....	....
3,001– 4,000	....	....	....	2	6,318·31	0·7	1	3,906	0·5	1	3,454	0·4	....	....	....
2,001– 3,000	1	2,942	0·3	2	5,160·59	0·6	2	5,376	0·7	1	2,451	0·3	....	....	....
1,001– 2,000	6	9,937	1·1	1	1,864·91	0·2	3	4,074	0·5	5	7,233	0·9	5	7,641	0·9
501– 1,000	5	3,617	0·4	6	4,205·13	0·5	5	3,798	0·5	8	5,579	0·7	14	9,666	1·1
101– 500	30	6,117	0·7	31	6,595·81	0·8	33	7,817	0·9	39	9,119	1·1	22	4,611	0·5
Up to 100	104	2,690	0·3	117	3,284·65	0·4	112	2,893	0·4	121	3,414	0·4	149	4,280	0·5
Sundry Claims, etc.	....	6,072	0·7	....	8,082·88	0·9	....	2,960	0·4	....	3,932	0·5	....	4,239	0·5
Totals	156	874,819	100·0	172	849,740·67	100·0	172	813,617	100·0	191	834,326	100·0	209	861,992	100·0

TABLE G.

Mines that have Produced 5,000 ounces and upwards during the last Five Years.

Mine	1958			1957			1956			1955			1954		
	Tons Treated	Fine ozs.	Dwts. per ton	Tons Treated	Fine ozs.	Dwts. per ton	Tons Treated	Fine ozs.	Dwts. per ton	Tons Treated	Fine ozs.	Dwts. per ton	Tons Treated	Fine ozs.	Dwts. per ton
Big Bell Mines Ltd.	....	....	....	....	137	....	....	481	....	14,691	5,675	7·73	405,684	59,985	2·96
Boulder Perseverance Ltd.	Now included in Gold Mines of Kalgoorlie (Aust.) Ltd.						122,397	18,354	3·00	126,251	25,046	3·97	133,800	31,150	4·66
Callion (New Coolgardie Gold Mines N.L.)	....	....	....	....	....	....	8,305	4,045	9·74	26,922	13,037	9·69	30,974	15,385	9·93
Central Norseman Gold Corporation N.L.	182,822	108,176	11·83	168,846	91,913	10·89	160,961	89,039	11·06	160,224	95,700	11·95	157,877	83,396	10·56
Gold Mines of Kalgoorlie (Aust.) Ltd.	519,168	147,310	5·67	523,617	147,341	5·63	222,456	61,217	5·50	195,732	52,552	5·37	209,311	60,370	5·77
Great Boulder Pty. Gold Mines Ltd.	488,761	134,307	5·50	459,734	128,928	5·61	428,571	122,313	5·71	423,879	114,560	5·41	417,874	107,670	5·15
Great Western Consolidated N.L.	459,119	75,754	3·30	462,799	73,367	3·17	444,185	76,279	3·43	423,012	62,136	2·94	445,864	55,330	2·48
Haoma Gold Mine	2,759	1,602	11·61	4,043	3,233	15·99	3,731	2,725	14·61	3,565	3,454	19·38	4,609	5,487	23·81
Hill 50 Gold Mines N.L.	133,081	77,209	11·60	107,128	83,193	15·53	106,479	83,720	15·72	104,010	81,801	15·72	92,411	71,813	15·5
Horseshoe (Anglo Westralian Mining Pty. Ltd.)	....	....	....	1,339	160	2·39	....	....	....	....	....	....	45,347	8,524	3·76
Kalgoorlie Enterprise Mines Ltd.	Now included in Gold Mines of Kalgoorlie (Aust.) Ltd.						66,744	12,839	3·85	74,429	19,627	5·27	69,789	21,599	6·19
Lake View & Star Ltd.	665,998	161,899	4·86	664,895	159,811	4·81	657,105	158,487	4·82	656,099	157,527	4·80	657,197	157,667	4·80
New Coolgardie Gold Mine N.L.	Now included in Gold Mines of Kalgoorlie (Aust.) Ltd.						32,560	16,109	9·90	33,296	19,180	11·52	33,534	15,761	9·40
North Kalgurli (1912) Ltd.	345,983	84,199	4·87	337,888	75,327	4·46	351,374	66,948	3·81	348,829	76,237	4·37	251,988	56,945	4·52
South Kalgurli Consolidated Ltd.	Now included in Gold Mines of Kalgoorlie (Aust.) Ltd.						70,631	15,375	4·35	84,928	20,328	4·79	97,711	22,197	4·54
State Batteries	41,806	13,498	6·46	42,837	15,813	7·38	35,740	13,218	7·40	42,207	15,203	7·20	34,600	11,848	6·84
The Sons of Gwalia Ltd.	137,377	30,269	4·41	137,934	31,043	4·50	113,598	27,376	4·82	102,742	23,226	4·52	103,237	26,168	5·07
Timoni (Moonlight Wiluna Gold Mines Ltd.)	31,838	15,746	9·89	31,445	15,781	10·04	30,754	17,174	11·17	30,056	17,114	11·39	24,290	13,518	11·13
Total	3,008,712	849,969	5·65	2,942,505	826,047	5·62	2,855,591	785,699	5·50	2,850,872	802,403	5·63	3,216,097	824,813	5·13
Other Sources (excluding large Retreatment Plants)	12,360	11,963	18·55	8,506	6,542	15·38	14,682	11,578	15·80	14,176	14,106	19·90	24,281	16,288	13·42
Total (excluding large Retreatment Plants)	3,021,072	861,932	5·71	2,951,011	832,589	5·64	2,870,273	797,277	5·56	2,865,048	816,509	5·70	3,240,378	841,101	5·19
Golden Horseshoe Sands Retreatment	....	....	....	....	....	....	....	5,003	....	....	6,607	....	....	8,787	....
Great Western Consolidated N.L., Sands Retreatment	....	887	....	....	3,712	....	....	....	....	....	....	....	....	....	....
Lake View & Star Treatment	....	8,989	....	....	9,934	....	....	8,515	....	....	8,791	....	....	8,802	....
State Batteries Tailing Treatment	....	3,011	....	....	3,506	....	....	2,822	....	....	2,419	....	....	3,302	....
GRAND TOTAL	3,021,072	874,819	5·79	2,951,011	849,741	5·76	2,870,273	813,617	5·67	2,865,048	834,326	5·82	3,240,378	861,992	5·32

TABLE H.

Development Footages Reported by the Principal Mines.

Gold or Mineral Field	Mine	Shaft Sinking	Driving	Cross-Cutting	Rising and Winzing	Diamond Drilling	Total
		feet	feet	feet	feet	feet	feet
Gold—							
Murchison	Hill 50 Gold Mines N.L.	239	3,089	1,598	1,961	1,841	8,728
	Hill 50 Eclipse	321	207	52	271	....	851
	Hill 50 Consolidated, N.L. (Burnakura)	110	90	25	....	....	225
Mount Margaret	Sons of Gwalia	....	1,499	572	1,310	8,014	11,395
North Coolgardie	Yilgangie Queen	158	181	....	....	....	339
	Altona	....	50	....	190	....	240
East Coolgardie	Lake View and Star Ltd.	....	18,888	3,281	5,640	14,362	42,171
	Great Boulder Pty. Gold Mines Ltd.	358	8,643	2,074	3,851	5,950	20,876
	North Kalgurli (1912) Ltd.	489	9,046	2,033	3,389	13,671	28,628
	Gold Mines of Kalgoorlie (Aust.) Ltd.	....	17,724	5,519	4,405	55,495	83,143
	Haoma Gold Mine	....	101	46	133	....	280
Coolgardie	Gold Mines of Kalgoorlie (Aust.) Ltd.	....	1,972	341	481	....	2,794
Yilgarn	Great Western Consolidated N.L.	1,619	1,880	798	927	8,726	13,950
	Radio Gold Mine	50	320	35	....	....	405
Dundas	Central Norseman Gold Corporation N.L.	542	8,883	2,758	1,720	38,730	52,633
	Total in Gold Mines	3,886	72,573	19,132	24,278	146,789	266,658
Pyrite—							
Dundas	Norseman Gold Mines N.L.	....	53	10	247	1,077	1,387
Asbestos—							
West Pilbara	Australian Blue Asbestos	....	3,044	717	584	....	4,345
Copper—							
Phillips River	Ravensthorpe Copper Mines N.L.	....	1,801	106	325	492	2,724
Pilbara	Copper Hills	150	210	130	260	360	1,110
	Total in Copper Mines	150	2,011	236	585	852	3,834
Lead—							
Northampton	Wheal Fortune Extended	....	120	36	20	....	176
	Gurkha Lead Mine	....	83	....	131	....	214
	Total in Lead Mines	....	203	36	151	....	390
Iron—							
West Kimberley	Australian Iron and Steel	....	....	....	....	3,240	3,240
	Total in all Mines	4,036	77,884	20,131	25,845	151,958	279,854

OPERATIONS OF THE PRINCIPAL MINES.

EAST COOLGARDIE GOLDFIELD.

The total ore treated in this goldfield amounted to 2,004,316 tons with a recovery of 529,768 fine ounces of gold at an average of 5.29 dwts. per ton. This production was equal to 60.6 per cent. of the gold production for the State. In the previous year 1,966,413 tons of ore averaging 5.29 dwts. were treated for a recovery of 510,830 fine ounces of gold.

There was very little activity in the *Bulong District,* the total production being 179 fine ounces from the treatment of 836 tons of ore.

In the *East Coolgardie District* 529,589 fine ounces were recovered from the treatment of 2,003,480 tons of ore. Following are notes on the activities of the principal producers in the district.

Lake View and Star Ltd. with a production of 665,998 tons of ore for a return of 161,899 fine ounces of gold at an average of 4.86 dwts. per ton was the State's leading producer. Retreatment of tailings yielded an additional 8,989 fine ounces.

The previous year's production was 159,811 fine ounces from the treatment of 664,895 tons plus 9,934 fine ounces from tailings retreatment.

Ore reserves are listed as 3,534,000 short tons of an average grade of 4.84 dwts.

A programme is in hand to convert the Chaffers winder from steam to electricity. Work completed comprises the installation of an electrical substation and switchboard and the foundations for the electric winder.

Gold Mines of Kalgoorlie (Aust.) Ltd. produced 147,310 fine ounces from the treatment of 519,168 tons at an average recovery of 5.67 dwts. per ton. The Kalgoorlie group of mines produced 134,193 ounces from 492,328 tons with an average recovery of 5.45 dwts. per ton.

Ore reserves are stated as 1,325,000 long tons at 5.7 dwts.

A programme of fill and consolidation under the Perseverance winder has been completed and the winder is again operating. This will enable the company to complete their project of closing the South Kalgurli shaft and work the lease from the Perseverance and Enterprise. The Nos. 23 and 28 levels of the Enterprise shaft are being driven to connect with the South Kalgurli and Perseverance workings.

Great Boulder Pty. Gold Mines Ltd. treated 488,761 tons of ore for a recovery of 134,307 fine ounces of gold, average recovery being 5.50 dwts. per ton. During the previous year 459,734 tons yielded 128,928 fine ounces at an average grade of 5.61 dwts. per ton.

Ore reserves have been maintained and are given as 2,015,000 tons at 5.52 dwts. per ton.

Hamilton shaft is now operative to below the 3,100 level with a connection at that horizon to Edwards shaft.

Main shaft has been deepened and is now 2,952 feet below the collar.

Development work continued in the Internal shaft and it is expected that levels will be developed at and below the 3,250 horizon.

North Kalgurli (1912) Ltd. treated 345,983 tons of ore for a recovery of 84,199 fine ounces at an average of 4.87 dwts. per ton. This production compares more than favourably with the previous year's output of 75,327 ounces from 337,888 tons.

No major development programme was undertaken in 1958. Following the completion of shaft sinking in 1957 normal development of known ore bodies was continued.

Good values have been intersected in diamond drilling and crosscutting.

During the year stoping by cut and hydraulic fill methods passed the experimental stage and is now an established practice of the mine.

Kalgoorlie Southern Gold Mines N.L.—No exploratory drilling was carried out during the year. Work will be resumed on supply of a larger capacity diamond drill.

A geophysical survey was extended a further four and a half miles southerly into an area covered by lake deposits.

At *Mount Monger* the *Haoma* mine, being worked by the Mount Monger Mining Syndicate, produced 1,602 fine ounces from 2,759 tons. The syndicate have been working on remnants left by the previous company and unless repetitions of the ore shoots are discovered, mining is limited.

The *Daisy* mine at the same centre produced 1,896 fine ounces from 2,697 tons. If development continues to be favourable, Mr. Lydiate proposes to sink the vertical shaft to the 470 foot level and cross cut to his underlay shaft workings.

At the *Rosemary* the party continued stoping of developed ore. Returns yielded 648 fine ounces from 286 tons.

DUNDAS GOLDFIELD.

The production of 108,331 fine ounces of gold from the treatment of 183,071 tons of ore was equivalent to 12.4 per cent. of the State's total production. In the previous year 169,045 tons were mined for a recovery of 92,071 ounces.

Practically all of the production was from the *Central Norseman Gold Corporation* which treated 182,822 tons for a recovery of 108,176 fine ounces. Gold recovery was at a rate of 11.83 dwts. per ton of ore treated. Values were higher than in the previous year when 168,846 tons yielded 91,913 ounces at the rate of 10.89 dwts. per ton.

During the year shaft sinking was resumed at the *Royal shaft* and with a Cryderman mucker in service the shaft advanced 543 feet to 2,624 feet. At the *Crown shaft,* workings are being serviced to the No. 15 level. Ore breaking in the *Regent* section of the mine, with the exception of two blocks on the 11 and 22 levels, has been completed.

Estimated ore reserves are 584,663 tons at 9.2 dwts. per ton.

Norseman Gold Mines continued their diamond drilling programme for gold with little success. Mining operations were confined to Pyrite production from the *Iron King* mine.

A new find at Beete, some 40 miles south of Norseman by rail and 12 miles east of the railway line, created interest during the year. The first crushings from the find yielded 34.83 ounces from 19.25 tons; almost two ounces per ton.

MURCHISON GOLDFIELD.

142,178 tons of ore were treated in this goldfield for a return of 81,984 fine ounces of gold. This production was equal to 9.04 per cent. of the State's total.

In the previous year 85,627 ounces were obtained from the treatment of 115,751 tons of ore averaging 14.8 dwts. per ton recovery.

The *Cue District* produced 582 ounces from the treatment of 795 tons of ore. Most of the production was from the Big Bell area where salvage operations in the mill area and rubbish dumps yielded 327 fine ounces of gold from 114 tons treated.

In the *Meekatharra District* 845 ounces were recovered from the treatment of 4,134 tons of ore. The most successful mines were the *Bluebird* with 83 ounces from 60 tons, *Lady Central* with 107 ounces from 432 tons and the *Margueritta* with 47 ounces from 190 tons.

Day Dawn District produced 86 ounces from 1,087 tons. Further drilling was undertaken by this department at the *Great Fingall.* This programme should be complete by mid 1959.

Mount Magnet District produced 80,472 fine ounces from the treatment of 136,161 tons of ore. The principal producer was *Hill 50 Gold Mines N.L.* with 77,209 fine ounces from 133,081 tons. Average recovery was 11.60 dwts. per ton which was well below the recovery of 15.53 dwts. for the previous year.

Ore reserves are quoted as 852,000 short tons.

Sinking of the main shaft continued to 1,654 feet and at the 1,552 foot horizon another level was developed. A further programme of shaft sinking is contemplated. Some exploratory work was undertaken on the *Hesperion.*

The primary ventilation of the mine was improved when a Sirrocco axial-flow fan was brought into service on the south exhaust shaft.

Additions to the power-house and fine grinding sections have permitted the mill through-put to exceed 14,000 short tons per four weekly period.

During its initial year of production *Eclipse Gold Mines N.L.* produced 2,942 fine ounces of gold from 2,840 tons of ore. The mine is now equipped with a steel headframe and a 60 h.p. double drum electric winder. The power house consists of one 336 h.p. and one 224 h.p. Paxman diesels driving alternators, and one 204 h.p. Ruston diesel driving a 500 c.f.m. Drowett-Lindley compressor. A 300 c.f.m. Sentinel compressor is driven by an electric motor.

The mill is capable of a through-put of 90 tons per day. An average of 31 men have been employed since the completion of the construction work.

YILGARN GOLDFIELD.

Production for the year was 81,740 fine ounces of gold from 464,065 tons averaging 3.52 dwts. per ton as compared with 80,995 fine ounces from 466,984 tons of ore in the previous year. This goldfield was responsible for 9.34 per cent. of the State's production.

Great Western Consolidated N.L. milled 459,119 tons for a recovery of 75,754 fine ounces of gold averaging 3.30 dwts. per ton. An additional 887 fine ounces were recovered from sands retreatment. Production for the previous year was 73,367 fine ounces from 462,799 tons plus 3,712 ounces from sands.

At the *Copperhead* mine sinking was continued on the inclined internal shaft. 1,060 feet were completed in 1958 and it is expected that the shaft has to be sunk a further 115 feet. It was unfortunate that a band of schist was encountered in this shaft as this necessitated the using of arched steel sets for support. Some concreting was necessary which slowed up the rate of advance.

All ore from the company's mines was treated at the Copperhead plant, the ore being transported by road from the mines in the district.

Included in the total production above was 12,154 ounces from 36,482 tons from the *Frasers* group, 10,250 ounces recovered from 39,572 tons from the *Nevoria,* 4,258 ounces from 37,498 tons from the *Corinthian* and 325 ounces from 2,188 tons mined at the *Pilot* mine. All these mines reported satisfactory developments.

In the Golden Valley centre the *Radio Gold Mine* produced 2,344 ounces from the treatment of 1,930 tons. Development work on the No. 10 level has exposed ore expected to average at least one ounce per ton.

The *Sunshine Reward* at Edwards Find, now known as *King Solomon Gold Mines,* produced 544 ounces of gold from the treatment of 1,901 tons of ore. All underground work was confined to the No. 3 level. On the surface a completely mechanised leaching plant was installed. The battery was repaired and 10 heads are now in use.

The *Marjorie Glen* mine reported the recovery of 486 ounces from 429 tons. The ore was mined at the 150 and 250 feet levels.

No new finds were discovered during the year although *Great Western Consolidated* started opening up the *Pilot* mine which has been idle for some years, and the same company has carried out test drilling at *Burbidge*.

MOUNT MARGARET GOLDFIELD.

The total ore treated in this goldfield amounted to 141,810 tons and the gold yield of 31,010 fine ounces was at an average recovery rate of 4.37 dwts. per ton. The output from this goldfield represented 3.54 per cent. of the State's total. In the previous year 140,530 tons averaging 4.62 dwts. were treated for a recovery of 32,519 fine ounces of gold.

In the *Mount Morgans District* 390 ounces were produced from 1,887 tons. Nearly all of this output came from the *Queen of The May* which produced 369 ounces from 1,811 tons. Operations on this property have now ceased.

The Sons of Gwalia Ltd. was the only producer of note in the *Mount Malcolm District*. Employing an average of 251 men this mine's production was 30,269 fine ounces from the treatment of 137,377 tons of ore. The average recovery was 4.41 dwts. per ton. The output for the previous year amounted to 31,043 ounces from 137,934 tons.

Ore reserves are stated as 230,300 tons.

At the mine a development programme is in progress on the Nos. 27 and 29 levels. Stoping operations range from the four to the 31 levels.

A new crushing and screening section should be in operation early in 1959.

The *Mount Margaret District* continues to decline as a gold producer. Total production was 78 ounces from 1,311 tons.

NORTH COOLGARDIE GOLDFIELD.

This goldfield produced 21,027 fine ounces of gold from the treatment of 41,868 tons of ore averaging 10.04 dwts. per ton recovery. As a comparison the production for the previous year was 23,525 ounces from 40,738 tons averaging 11.55 dwts. per ton. Production for 1958 was 2.4 per cent. of the State's total.

The main producer in the *Menzies District* was *Moonlight Wiluna Gold Mines Ltd.* which reported the extraction of 15,746 fine ounces of gold from 31,838 tons of ore from the *Timoni* mine at Mount Ida. The average yield was 9.89 dwts. per ton. Sixty six men are employed at this mine.

Very little development work was attempted during the year except 14 feet of cross cutting and 45 feet of driving to exploit a rich short shoot of gold discovered in the southern workings.

The *First Hit* mine at Menzies was worked full time to produce 119 ounces from 282 tons.

Sands retreatment by the *State Batteries* at *Mount Ida* and *Menzies* produced 819 fine ounces of gold.

Production from the *Ularring District* was 1,866 fine ounces from the treatment of 3,017 tons of ore. Output for the previous year was 2,710 fine ounces from 2,592 tons of ore.

At Mulline the *Golden Wonder* reported 462 ounces from 90 tons. Most of this ore was from a patch some eight to 10 feet below the surface. At the same centre 309 ounces were obtained from 957 tons from the *Ajax West*.

The *First Hit* at Morleys reported 255 ounces from 976 tons. This was mostly dump material. At Davyhurst the *Oakley* crushed 300 tons for a return of 283 ounces.

The principal producer in the *Niagara District* was the *Altona* with 856 ounces from 2,391 tons. The total production from this and other claims in the district was 971 ounces from 2,758 tons.

In the *Yerilla District* 1,336 fine ounces of gold were obtained from 3,125 tons of ore. Practically all of this output was from tributors working the *Yilgangie Queen* where 1,281 ounces were obtained from 2,944 tons.

COOLGARDIE GOLDFIELD.

During 1958, 31,484 tons of ore were treated for a return of 14,867 fine ounces of gold average recovery being 9.44 dwts. per ton. In the previous year 40,637 tons yielded 19,267 fine ounces. The decrease in tonnage can be attributed to the closure of the Barbara mine early in the year.

Gold Mines of Kalgoorlie (Aust.) Ltd.'s operations in the Coolgardie district were mostly confined to mining at *Bayley's* where 25,019 tons yielded 11,815 ounces at the rate of 9.44 dwts. per ton. Salvaging operations at the *Barbara* mine yielded 1,302 ounces from 1,821 tons. Sixty three men were employed throughout the year, mostly in workings off Price's shaft where two high grade shoots were developed on the Nos. 6 and 8 levels. At the South shaft work was restricted to stoping.

Among the smaller mines the best returns were from the *Rayjax* with 135 ounces from 71 tons, *Pakeha's Son* with 119 ounces from 272 tons, *Sons of Erin* with 109 ounces from 48 tons.

Production reported from the *Kunanalling District* was 113 fine ounces of gold recovered from 589 tons.

No crushings were put through the State Battery at Coolgardie, from the *Jackpot* mine during the year, but there is about 1,000 tons of ore at grass ready for crushing.

PILBARA GOLDFIELD.

In this goldfield 1,004 ounces were recovered from the treatment of 2,516 tons of ore averaging eight dwts. per ton.

The principal producers were the *Prince Charlie* at Bamboo Creek with 389 ounces from 823 tons, and the *Barton* at Middle Creek with 111 ounces from 394 tons. *State Battery* sands retreatment yielded 272 ounces.

Bamboo Creek Gold Mines N.L. continued to test and develop the leases they have under option.

BROAD ARROW GOLDFIELD.

A number of small mines in this goldfield produced a total of 2,385 ounces from 5,011 tons.

The best return from this field was from the *New Mexico* mine where 854 fine ounces of gold were obtained from 1,357 tons of ore.

At the *Ora Banda Amalgamated* tributors continued working the two main shafts. From the *Coronation* 81 tons yielded 86 ounces and from the *Prince of Wales* 161 tons returned 135 ounces.

Open cutting on the *Gimlet South* leases yielded 251 ounces from 1,120 tons. These workings form part of the old *Ora Banda United mine*.

EAST MURCHISON GOLDFIELD.

Increased activity in this goldfield has boosted gold production from 205 ounces in 1957 to 817 ounces from 642 tons in 1958.

In the *Black Range District* the *Dingo* yielded 202 ounces from one ton of ore. This parcel was from a patch in a 10 feet deep shaft situated about eight miles north west of Barrambie. From the same centre the *Scheelite Leases* yielded 144 ounces from 177 tons. At the old *Black Range Gold Mine* at Sandstone 203 ounces were obtained from 36 tons. This ore was mined from a shaft pillar.

PHILLIPS RIVER GOLDFIELD.

Ravensthorpe Copper Mines N.L. obtained 812 fine ounces of gold as a by-product from copper mining. This was the only production from this field.

From the *North East Coolgardie Goldfield* 322 ounces were obtained from 754 tons of ore.

In the *Peak Hill Goldfield*, 3,267 tons yielded 638 ounces. The *Horseshoe Lights* reported a yield of 342 ounces from 2,438 tons. The only other producer of note was the *Miner Bird* with 111 ounces from 350 tons of ore.

Production from the other Goldfields in the State amounted to 105 ounces of fine gold from 90 tons of ore treated.

MINERALS OTHER THAN GOLD AND COAL

The production of minerals, other than Gold and Coal, for 1957 and 1958 is shown in the table below.

PRINCIPAL MINERALS OTHER THAN GOLD AND COAL.

Mineral	1957		1958	
	Tons	Value £A	Tons	Value £A
Asbestos—				
Chrysotile	1,389·31	42,067	1,377·81	38,652
Crocidolite	11,104·87	1,195,634	11,877·10	1,304,725
Barytes	140·00	910	....	....
Bentonite	741·79	2,981	37·00	153
Bismuth	....	....	1·48	1,475
Beryl	350·37	64,234	170·03	31,801
Chromite	1,312·30	20,997	....	....
Clays—				
Cement Clay	11,551·00	12,340	13,506·00	13,439
Fireclay	17,646·70	20,816	20,211·96	25,435
White Clay	203·00	1,015	79·00	395
Copper—				
Ore and Concentrates	1,803·97	58,564	1,801·95	54,424
Fertiliser grade	4,638·69	82,127	7,643·72	114,670
Dolomite	60·00	240	196·00	786
Felspar	995·00	4,611	680·60	3,093
Glass Sand	5,692·86	3,914	6,420·41	4,267
Glauconite	126·00	5,040	112·00	5,590
Gypsum	33,352·90	25,967	35,514·97	40,134
Ilmenite	40,931·99	233,476	82,926·27	448,218
Iron Ore—				
(Exported)	389,686·00	386,440	536,713·00	532,355
(For pig)	21,838·50	324,646	30,075·06	458,561
Lead Ore and Concentrates	4,179·19	314,392	2,492·43	139,191
Manganese	63,937·06	929,820	61,809·43	960,474
Ochre—				
Red	10·00	100	171·00	1,710
Yellow	17·30	173	18·30	183
Petalite	....	....	67·77	293
Phosphatic Guano	586·89	8,974	169·65	1,828
Pyrites	57,917·72	382,567	49,388·64	351,847
Quartz Grit	....	....	90·00	75
Semi-Precious Stones—				
Chrysoprase (lb.)	....	....	5·00	5
Opaline (lb.)	....	....	25·00	4
Silver (fine oz.)	197,114·40	77,691	200,767·48	79,651
Talc	3,653·65	49,906	2,500·67	35,304
Tantalo/Columbite	22·34	11,831	6·03	8,550
Tin	270·25	155,079	138·20	77,319
Zinc	....	....	20·06	511
Totals	....	4,416,552	....	4,735,118

Brief notes on mineral production are given below.

Asbestos.

Chrysotile production from *Nunyerry* and *Lionel* was 1,378 tons valued at £38,652. During the last two years, output has been doubled as compared with previous years. Virtually all the fibre was obtained from the Nunyerry deposit.

Australian Blue Asbestos Limited recovered 11,877 tons of crocidolite from the treatment of approximately 200,000 tons of broken ore. The fibre was valued at £1,304,725.

A change over to the new Colonial Mill was effected during 1958 and by the end of the year all ore was being mined from the Colonial mine and treated at the new mill. The company employed an average of 185 men on the surface and 124 underground.

Bentonite.

Production, from the *Marchagee* deposit, fell to 37 tons which was the lowest production for some years. The sudden decline can be attributed to the fact that the milling company had ample stocks of ground material on hand from the previous year.

Bismuth.

An initial shipment of 1½ tons from *Morrisey Hill* in the Gascoyne Goldfield realised £1,475.

Beryl.

A number of small producers, in the Pilbara, Gascoyne, Coolgardie and Yalgoo Goldfields, obtained 170 tons (2,006 units BeO) of Beryl valued at £31,801.

Clays.

Clay production, from sources within 100 miles of Perth, totalled 33,797 tons valued at £39,269.

Copper.

Fertilizer grades, obtained from widely separated centres between Whim Creek and Ravensthorpe, amounted to 7,644 tons valued at £114,670. Average Assay of this ore was 9 per cent Cu. The principal producers were the *Thaduna Copper Mining Company* in the Peak Hill Goldfield with 4,054 tons valued at £38,894 and the *Copper Hills Copper mine* in the Pilbara with 1,682 tons valued at £36,611.

In the Phillips River Goldfield, *Ravensthorpe Copper Mines N.L.* produced 1,727 tons of concentrate valued at £53,265. Operations by this company have been concentrated at the Elverdton shaft area some 6½ miles south of Ravensthorpe. Most of the ore is now coming from underground mining operations. The treatment plant consists of crushing and grinding sections, and flotation to produce a concentrate of about 25 per cent Cu.

Dolomite.

Westralian Ores Pty. Ltd. mined 196 tons of ore from their mineral leases situated at the southern end of Mount Magnet townsite. The parcel was valued at £786.

Felspar.

Mining operations, at the Londonderry quarries, were on a reduced scale throughout the year. Very little is left of the stock pile built up during previous years and it is expected that production will increase in 1959.

Glass Sand.

Production from the Lake Gnangarra deposit amounted to 6,420 tons valued at £4,267.

Glauconite.

One hundred and twelve tons of glauconite, valued at £5,590 were recovered from the treatment of 560 tons of greensand obtained from the Gingin deposit.

Gypsum.

Plaster manufacturers obtained their supplies of raw material from Lake Cowcowing, Nukarni, Baandee, Yellowdine and Lake Brown. Just under 5,000 tons were obtained from Norseman for export.

Ilmenite.

Ilmenite production more than doubled the previous year's output. 82,926 tons, assaying 54.82 per cent. TiO^2 and valued at £448,218, were exported during the year under review.

The four producing companies, *Western Titanium N.L., Cable (1956) Limited, Westralian Oil Limited* and *Ilmenite Pty. Ltd.* experienced difficulty in shipping, as ships were not always available to lift their product. In all cases plant through-put was reduced after stockpiling had filled all available bins.

Iron Ore.

During the year 536,713 tons of 63.98 per cent Fe iron ore was shipped from *Yampi*. This tonnage represents an increase of 147,000 tons over the 1957 shipments. A considerable amount of drilling and geological examination has been carried out on the *Koolan Island* deposits.

Bell Bros. continued mining iron ore at *Koolyanobbing* for the *Charcoal Iron and Steel Industry* at *Wundowie*. 30,075 tons of ore was broken and transported, the average assay being 60.54 per cent Fe.

Lead.

Lead production declined still further as compared with the downward trend in 1957. Only 2,492 tons of concentrate valued at £139.191 was produced during the year.

Reported production from the Kooline field amounted to 109 tons and from the Pilbara 70 tons. The yield from the Northampton field was 2,313 tons valued at £131,249.

Anglo Westralian operating at Protheroe closed down early in the year with 1958 production given as 245 tons valued at £13,609.

The only producers now in the Northampton district are *Wheel of Fortune Extended, Mary Springs* lead mine, and the *Gurkha* lead mine. Production from these mines was 393, 24, and 1,365 tons respectively.

Manganese.

Manganese deposits throughout the north-west received continued attention during 1958. The main producers are now providing portable crushing and screening plants to up grade the ore at the deposit thus eliminating the cartage of low grade material. Production for the year was 61,809 tons of approximately 47 per cent. Mn valued at £960,474.

Westralian Ores Pty. Ltd. operating in the Peak Hill and Pilbara Goldfields was the leading producer with 43,020 tons. From the Mount Sydney area *Rhodes* and *Northern Minerals* obtained the remainder of the State's output.

Ochre.

From Mindoolah and the Weld Range 18 tons of yellow and 171 tons of red ochre were obtained. The total value of production was £1,893.

Oil.

West Australian Petroleum Pty. Ltd. continued its exploration programme during 1958. 151 men were employed in the field by the company Some shows of gas and oil were obtained but formation testing failed to disclose any concentration of commercial importance.

Petalite.

Sixty eight tons valued at £293, were obtained from the Felspar quarry at Londonderry.

Phosphatic Guano.

From Jurien Bay 170 tons valued at £1,828 were obtained.

Pyrites.

Norseman Gold Mines railed 38,915 tons, of concentrate containing 18,431 tons of sulphur, to superphosphate works in the metropolitan area. At the mine very little development work was carried out in view of the very healthy ore reserve of three and a half million tons. A considerable amount of stope preparation was done which consisted of 1,307 feet driving, 539 feet of rising and 87 feet of crosscutting.

Gold Mines of Kalgoorlie (Aust.) Limited forwarded to works at Fremantle 10,474 tons of auriferous pyritic concentrate containing 3,881 tons of sulphur valued at £48,507.

Quartz Grit.

Ninety tons for local use was obtained in the Collie Coalfield.

Semi-Precious Stones.

Two small parcels containing five pounds of chrysoprase and 25 pounds of opaline were obtained from the Taurus group in the East Coolgardie Goldfield.

Silver.

Silver as a by-product of gold, lead and copper mining, amounted to 200,767 ounces valued at £79,651.

Talc.

The *Universal Milling Company's* mine at Three Springs was the only producer with 2,501 tons of talc valued at £35,304.

Tantalo-Columbite.

No work of any magnitude was attempted for the purpose of recovering these minerals. Several small operators produced tantalite in conjunction with tin or beryl mining operations.

The six tons of concentrate produced came from Greenbushes, Cooglegong and Moolyella.

Tin.

Tin concentrate production fell to half that produced in 1957. In the Pilbara good general rains are needed to ensure the water supplies necessary for treatment plants. In the Greenbushes field production has virtually ceased.

Production for the year under review was 138 tons of concentrate containing 93½ tons of the metal and valued at £77,319.

Water.

On the 24th July the first of two Ruston-Bucyrus 22-RW water well drills purchased by the department commenced operations at the *Badgingarra* recreation ground. Water bearing sands were cut at 378 feet and the bore was completed at 720 feet in the same formation. Equipment necessary for the development and testing of the aquifer, was not available and it will be necessary to return to the site to test the bore. Bailing indicated that the flow would exceed 5,000 gallons per day. The water in the bore is of good quality containing only 26 grains per gallon of soluble salts. 709 feet of six-inch casing plus a 10-foot bronze wire screen were placed in the hole.

The plant was then transferred to the *Kalannie* district where eight holes totalling 773 feet were drilled before the machine was shut down for the Christmas holidays. None of these holes intersected water bearing strata yielding more than 1,000 gallons per day and containing less than 700 grains of salt per gallon.

The second machine started at the end of October in the *Kalannie* district and till the middle of December had drilled eight holes totalling 703 feet. Two of the holes yielded potable water in quantity.

Zinc.

Twenty tons of zinc, as a by-product of lead ores, were produced.

J. K. N. LLOYD,
Assistant State Mining Engineer.

APPENDIX No. 1.

EXPLORATORY DRILLING.

State Mining Engineer.

Report on Drilling Activities for Year Ended 31st December, 1958.

During the period under review the BBS4 at Cue was engaged full time. Hole number two was advanced from 1,392 feet to its completed depth of 4,199 feet. Quite a number of wedges were set in our efforts to control the course of the hole in both azimuth and dip. Full azimuth wedges were set at 2,304 feet, 2,449 feet and at 2,581 feet depth in order to deflect the hole onto its projected path.

A Thompson Retrievable Wedge was set at 2,600 feet after which drilling proceeded normally to the completion of the hole.

In order to obtain a second intersection of the ore body wedges were set at a depth of 3,197 feet and a deflection was made. This setting proved difficult and due to a number of causes had to be reset three times. Finally a Hall-Rowe wedge was set at 3,184 feet 10 inches by the end of the period, from which to recommence drilling.

The Failing drill was engaged in drilling six holes totalling 683 feet on the north side of the Swan River at the Narrows Bridge site testing for foundation conditions. At the completion of this work the drill was taken to the site of the proposed new railway bridge at Fremantle. On behalf of the Railway Department, five holes were drilled here totalling 1,306 feet testing for foundation conditions. Difficult drilling conditions were experienced and the core recovery was low. A four-inch diameter core was required for the testing apparatus used by the Railway Department and many expedients were adopted to obtain the specified core size. This programme was suspended on instructions from the Government pending a final decision on the site of the new bridge.

Late in the year the Failing was taken to Collie and under arrangements with Amalgamated Collieries of W.A. Ltd. was engaged drilling on the leases of this firm. One hole was completed to a depth of 389 feet and the second drilled to 601 feet by the end of the year.

The A3000 owned by the Department commenced drilling at Tallering Peak under contract arrangements with Mr. A. E. Horsham. One hole was

drilled to 562 feet and difficulty was experienced with caving ground.

The second hole was drilled to a depth of 341 feet by the end of the year.

On the Westralia Renown leases at Morgans, Mr. Honey was operating one of the Department's A2000 drills on a contract basis. Hole No. 1 was advanced from 490.5 feet to 756 feet. No. 2 was completed at 1,001 feet deep and No. 3 at 1,206 feet. After which this machine was returned to our store at Welshpool.

Another A2000 was drilling at Bamboo Creek in the early part of the year under contract arrangements with Mr. McCallum. Hole No. 21 was advanced from 133 feet to its completed depth of 349 feet. Hole No. 22 was drilled to 306 feet. Following which the plant was returned to Perth.

This plant was then transported to Bridgetown where three holes were drilled for the Railway Department testing foundation conditions for a proposed new bridge over the Blackwood River. The first hole went to 84 feet, the second to 97 feet and the third to 90 feet. Difficult drilling conditions were experienced at this site due to the unconsolidated nature of the formations and the presence of large alluvial boulders in the wash. This work was done on a wages basis.

In October an A2000 rig commenced drilling operations on the Lady Loch leases at Coolgardie. One hole was completed to a depth of 590 feet and the second advanced to 130 feet by the end of the year.

Generally most of the assignments in drilling were of a specialised nature and much of the time normally spent in actual boring was used in conducting various tests required to obtain full information on the foundation conditions met with in the holes. Drilling speeds were also slow at the Great Fingall job due to the necessity to control the rate of deflection and the placing of wedges to bring the hole onto its projected course.

TABLE SHOWING FOOTAGE DRILLED FOR YEAR ENDED 31/12/58.

Rig	Place	Purpose	Footage (feet)	Basis
Failing	Narrows Bridge	Foundation Testing	683	Wages
Failing	Fremantle Railway Bridge	Foundation Testing	1,306	Wages
Failing	Collie	Coal Exploration	990	Wages Recoup by Amalgamated Collieries
		Total	2,979	
BBS4	Cue	Goldfields Exploration	2,807	Wages
A3000	Tallering	Iron Resources	903	Contract
A2000	Morgans	Goldfields Exploration	2,472·5	Contract
A2000	Bridgetown	Bridge Foundations	271	Wages Recouped by Railways
A2000	Coolgardie	Goldfields Exploration	720	Wages
A2000	Bamboo Creek	Goldfields Exploration	522	Contract
		Total	10,674·5	

Construction of our new store at Welshpool was completed in July and we commenced occupancy. The cost of the building now stands at £15,600. All our stores and equipment were transferred from our depot at Collie and installation of the workshop plant was completed.

Two lathes, grinding wheel and power hack saw were wired up and a vigorous programme of rehabilitating our plant was commenced. There was a large quantity of worn and damaged equipment to be repaired as little in this way could be done at Collie due to insufficient labour. A back lag of about four years repairs to the Failing equipment was to be done when we commenced operations here. This programme is well under way but is constantly interrupted by pressing demands for repairs and replacements to our machines in the field.

J. HADDOW,
District Inspector of Mines.

Appendix No. 2.

REPORT ON ACTIVITIES OF BOARD OF EXAMINERS FOR UNDERGROUND SUPERVISORS' AND MINE MANAGERS' CERTIFICATES FOR 1958.

School of Mines,
Kalgoorlie, 22nd July, 1959.

Chairman, Board of Examiners, Mine Managers' and Underground Supervisors' Certificates, Mines Department, Perth, W.A.

Dear Sir,

Hereunder I submit the Annual Report on the activities of the Board of Examiners for Mine Managers and Underground Supervisors' Certificates during the year 1958.

Mining Law Examination.—An examination in Mining Law for the Mine Manager's Certificate was held on the 15th April, 1958. Details relating to the examination are as follows:—

Number of entries received	9
Number of candidates passed	5
Number of candidates failed	2
Did not sit	1
Inadmissable	1

The names of the successful candidates were as follows:—

R. J. Hardy.
J. K. A. McLeod.
J. B. Oliver.
E. F. Shenton.
C. L. Smith.

A copy of the examination paper is attached hereto.

Underground Supervisors' Examination.—An examination for the Underground Supervisors' Certificate of Competency was held on the 1st September, 1958.

Applications to sit for the examination were received from the undermentioned centres:—

Kalgoorlie	15
Bullfinch	2
Southern Cross	1
Norseman	4
Wittenoom	1
Mt. Magnet	2
Gwalia	3
Total	28

Two applications were not admissible (one being from Kalgoorlie and one from Norseman) but the remainder of the candidates sat for the examination. In addition two candidates from the previous year were re-examined in certain sections of the examination.

The results were as follows:—

Number of candidates passed	14
Number of candidates failed	12
Number of candidates deferred	3

Names of successful candidates.—

R. O. Baker.	A. K. Holman.
J. W. Eaton.	C. N. Johnston.
N. W. Foote.	J. B. Oliver.
H. W. Gibbs.	W. C. Parkinson.
R. D. Goode.	P. Powell.
L. V. Goodhill.	E. F. Shenton.
G. Gould.	J. E. Trinidad.

Copies of the examination papers in Mining and Mining Law are attached.

A restricted Certificate of Competency as Underground Supervisor was issued to Gerald Anthony O'Callaghan.

A duplicate certificate replacing Certificate of Competency as Underground Supervisor No. 808 declared lost, was issued to Harold Schofield Horrocks.

Mine Managers' Certificates.—Four applications for Mine Managers' Certificates of Competency were received. Three were approved and one refused.

The names of the successful applicants were as follows:—

S. W. Silvester.
E. F. Shenton.
A. H. Parbo.

At the beginning of the year Mr. L. J. Carroll, Secretary to the Board of Examiners, was on Long Service Leave. Mr. R. J. Gething, a member of the staff of the office of the Mining Registrar, Kalgoorlie, who was appointed Acting Registrar School of Mines, carried out the duties of Secretary to the Board of Examiners during the Secretary's absence.

Yours faithfully,

L. J. CARROLL,

Secretary, Board of Examiners for Mine Managers' and Underground Supervisors' Certificate of Competency.

MINES REGULATION ACT, 1946.

Examination for Mine Manager's Certificate of Competency.

MINING LAW.

April, 1958.

Attempt twelve (12) questions from Section A.
Attempt eight (8) questions from Section B.
Time allowed—Three hours.

Candidates should note:—

(a) The Mining Act and Regulations may be used at the examination, but not the Mines Regulation Act.
(b) In answering questions in Section B reference to the appropriate Sections of the Act or to the Regulations alone will not be sufficient. Candidates must summarise the requirements of the Act and/or Regulations, and also should make reference to the relevant section or regulation (s).
(c) Candidates are required to pass in both sections of the paper.

SECTION A.

Mines Regulation Act and Regulations.

Attempt twelve (12) questions from this section. Do not attempt more than twelve (12) questions from this section.

Marks allowed are five (5) per question.

What is required by the Mines Regulation Act and/or Regulations regarding the following:

1. (a) Temporary absence of the registered manager?
   (b) Temporary absence of the certificated underground manager?
2. Age requirements of the following:
   (a) Boys employed underground.
   (b) Boys using explosives.
   (c) Hoist driver.
   (d) Braceman.
   (e) Underground Manager.
3. Sunday labour in Mines.
4. Time of blasting.
5. Men working alone.
6. Rises in Mines.
7. Use of safety belts.
8. Clearing passes and chutes.
9. Men riding in cages. Note—give three protective regulations.
10. Method of obtaining hoist driver's certificate.
11. Examination of ropes and winding appliances.
12. Safety provisions for underground locomotives.
13. (a) Return airways.
    (b) Recirculation of air.
14. Electric firing.
15. (a) Dams, other than open dams, underground.
    (b) Use of tailings for filling stopes.
16. Plans to be furnished regularly to Mines Department.

SECTION B.

Mining Act and Regulations.

Attempt eight (8) questions from this section. Do not attempt more than eight (8) questions from this section.

Marks allowed are five (5) per question

17. Is a Miner's Right necessary for a person to:
    (a) hold land as a Prospecting Area for gold?
    (b) hold land as a Mineral Claim for copper?
    (c) hold land as a Mining Lease?
    (d) to apply for the forfeiture of a lease not being worked in accordance with the Regulations?
    (e) to recover possession of any claim or authorised holding?
18. Assuming that the rent (if any) is paid regularly and that the required labour conditions are observed how long can the following mining tenements be held:
    (a) Prospecting Area.
    (b) Gold Mining Lease.
    (c) Mineral Claim for copper.
    (d) Mineral Lease for copper.
19. If no exemption or partial exemption has been granted, when must labour conditions be first observed on the following:
    (a) a Gold Mining Lease?
    (b) a Mining Lease for copper?
    (c) a Mineral Claim?
    (d) a Prospecting Area?
    (e) a Dredging Claim?
20. Under what conditions may exemption be granted from the labour covenants of a mining lease? To whom is the application made?
21. A mining lease may extend into a townsite, suburban area, or other reserve. What protection does the Act provide, for those who have surface rights?
22. Dredging claims may be granted on certain areas where specific circumstances prevail. Where may they be granted and what are the specific circumstances?
23. A holder of a pastoral lease builds a dam on his property. How is he protected from miners?
24. A lease may be declared void, cancelled, or forfeited. If this is done, when is the land again open for selection?
25. What is the minimum term for a Tribute Agreement?
26. Under what conditions may leases, other than coal mining leases, be amalgamated and what labour is required on leases which are amalgamated?
27. What are the important differences between a Gold Mining Lease and a Mineral Lease?
28. A miner desires to search for gold or minerals on private land. What must he first do?

Western Australia

MINES REGULATIONS ACT, 1946.

Examination for Certificate of Competency as Underground Supervisor.

MINING.

September, 1958.

Time allowed—Three hours.

Answer Six questions.

Note.—Read the Examination Paper carefully.

Answers must be written in ink.

Candidates should illustrate with sketches where possible.

1. You are an Underground Supervisor in charge of a vertical shaft on Afternoon Shift. It is necessary to carry out the following work:—
   (a) Lower two timber stulls each 15 feet long and 12 inches diameter from the surface to No. 10 level.
   (b) Lower eight 2 in. pipes, each 18 feet long from the surface to No. 6 level.
   (c) Raise blunt drill steel from Nos. 10, 8 and 6 levels to the surface.

   You have a braceman and platman available besides other workers, but you yourself have to supervise this work.

There is adequate handling room on the plats which are all situated on the western side of the shaft.

The cage is 10 feet high.

Explain how you would have this work carried out and what precautions you would take.

2. Two levels, one at the 1,050 feet horizon and the other at 1,200 feet horizon have been opened up on an ore body which is vertical. It is necessary to connect these two levels by either a winze or a rise.

Explain in detail how you would have this work carried out, the equipment you would use, and why you chose your particular method.

3. Explain in detail how you would make a weekly examination of a close timbered, 3 compartment vertical shaft, 1,500 feet deep.

Or

Explain in detail how you would make a weekly examination of an underlay 3 compartment shaft, 3,000 feet deep.

4. Rails are to be laid in a drive for a distance of 600 feet:
   (a) Estimate the labour cost to lay the rails, if wages are £2 19s. per man shift and the work takes two men five shifts to complete.
   (b) Estimate the weight and cost of the rails to be used.
   Rails weigh 14lb. per yard and cost £24 per ton.

5. A 6 dwt. ore body, 200 feet long, 10 feet wide and which dips at 70° has been opened up by driving. There is a good airflow through this drive and also the one above. The ore body has a schisted hanging wall of only moderate holding ability, but the ore body itself and the footwall rock are strong and of good holding.

Explain in detail how you would take off the leading stope, and then continue stoping the ore body. Detailed sketches are required with your answer.

6. (a) Write what you know about explosives and the necessary precautions for safe handling of same.
   (b) Describe how you would bore, charge and fire an 8-feet by 8-feet drive face in hard ground. Give sketches showing two successive faces and also your reasons for using the method described.
   (c) A winze has been fired.
   Describe how you would clean out the broken rock and examine the bottom before boring the next face.

7. Write what you know of underground ventilation, the suppression of dust, and how to keep all working faces free from fumes and dust.

8. A winze being sunk encountered a water flow making 300 gallons of water per hour on a flat head, causing the winze to be stopped 20 feet above the back of an exploratory drive below. It is necessary that the connection be completed.

How would you make the connection?

9. Describe in detail one method of timbering or supporting a three compartment vertical shaft in which ore is to be hoisted in skips.

Or

Describe in detail one method of timbering or supporting a three compartment underlay shaft in which ore is to be hoisted in skips.

Complete sketches must be given with either answer.

Western Australia.

MINES REGULATION ACT, 1946.

Examination for Certificate of Competency as Underground Supervisor.

MINING LAW.

September, 1958.

Paper "A."

Time allowed one and a half hours.

Answer Ten questions.

NOTE.—Read the Examination Paper Carefully.

Answers Must Be Written in Ink.

What is required by the Mines Regulation Act or the Regulations made under that Act regarding Any Ten (10) of the following:—

1. Detonators.
2. Examination of faces to be drilled.
3. Time of blasting.
4. Misfires.
5. Men working alone.
6. Rises in mines.
7. Winzes.
8. (a) Raising or lowering tools.
   (b) Men travelling with timber, tools, or other material in the cage.
9. Ladders in shafts.
10. Safety precautions when repairing shafts.
11. Stoppings and doors underground.
12. Ventilation of development ends.
13. Crib places.
14. Safety provisions for underground locomotives.
15. Place where a serious accident has occurred.

Western Australia.

MINES REGULATION ACT, 1946.

Examination for Certificate of Competency as Underground Supervisor.

MINING LAW.

September, 1958.

Paper "B".

Time allowed—half (½) an hour.

Note: Read the Examination Paper carefully.

Answers must be written in ink.

For this you are provided with a copy of the Mines Regulation Act and you are required to give the Section of the Act or the Regulation referred to in the question.

Example.

Question—what Section of the Act or what Regulation refers to "Guides in shafts"?

Answer—Regulation 102.

Answer all questions.

What Section of the Act or what Regulation refers to each of the following:

1. The quantity of explosives which may be stored in the various types of main magazines.
2. Quantity of fresh air to be provided underground.
3. Signals to be given to the engine driver before firing in the bottom of shafts.
4. Age requirements for the following:
   (a) Boys using explosives.
   (b) Hoist driver.
   (c) Braceman.
5. Inspection of roads used by locomotives underground.
6. Clearing passes and chutes.
7. Employees underground who must satisfy the manager that they know the Code of Signals before being employed.
8. Position of a ladder in a box timbered shaft while this is being sunk.

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DIVISION III

Report of the Superintendent of State Batteries

Under Secretary for Mines:

For the information of the Hon. Minister for Mines, I have the honour to submit my report on the operations of the State Batteries for the year ending 31st December, 1958.

Crushing Gold Ores:

One 15 head, six 10 head, and eleven 5 head mills crushed 41,806 tons of ore made up of 606 separate parcels, an average of 68.97 tons per parcel. The bullion produced amounted to 15,927 ounces which is estimated to contain 13,498 ounces of fine gold, equal to 6 dwts. 11 grs. of gold per ton of ore.

The cost of crushing, including administration was 59s. per ton, an increase of 2s. 4d. per ton compared with the previous year when 42,837½ tons were crushed at a cost of 56s. 8d. per ton.

The average value of the ore after amalgamation, but before cyanidation was 3 dwts. 1.7 grs. Thus the average head value of the ore was 9 dwts. 12.7 grs., which is 14.3 grs. less than the previous year's average.

Values in this ore before cyanidation can be segregated as follows:—

	Tons	Per cent.
Over 2 dwts. 8 grs. per ton	16,016·75	38·3
1 dwt. 18 grs. to 2 dwts. 8 grs. per ton	4,671·75	11·2
Under 1 dwt. 18 grs. per ton	20,109·25	48·1
Refractory	1,008·25	2·4
	41,806	100·0

Cyaniding:

Six plants treated 22,327 tons of tailings from amalgamation for a production of 3,011 fine ounces of gold worth £46,947. The average content was 3 dwts. 16 grs. before cyanidation, while the residue after treatment averaged 22 grs. The theoretical extraction was therefore 75 per cent. The actual extraction was 73 per cent.

The cost of cyaniding was 40s. 10d. per ton, an increase of 5s. 2d. per ton on the previous year, when 18,553 tons were treated at a cost of 35s. 8d. per ton.

Estimated Overall Recovery:

Figures for estimated recovery are:—

	Content	Per ton crushed	Per cent.
	Fine oz.	dwts. grs.	
Head Value	19,917	9 12·7	100
Amalgamation Recovery	13,498	6 11	67·8
Cyanidation Recovery	3,011	1 10·6	15·1
Total Recovery	16,509	7 21·6	82·9

Treatment of Ores other than Gold:

Lead Ores:

During the year the Northampton State Battery crushed 2,903.5 tons of lead ore with an estimated average content of 19.1 per cent. lead. There were 15 separate parcels, giving an average of 193.6 tons of ore per parcel.

A total of 659.02 tons of concentrates were produced. The concentrates averaged 76.0 per cent. lead giving an estimated content of 500.3 tons of lead in concentrates.

2,244.5 tons of tailings were discarded. These had an average content of 2.39 per cent. lead, giving a total of 53.9 tons of lead discarded in tailings.

The recovery of lead in the concentrates was 90.2 per cent. of the lead in the ore delivered to the plant.

The cost of operating the Northampton State Battery, including administration, was £8,526 10s. 1d., being 58s. 9d. per ton of ore crushed. Revenue received was £3,047 19s. 0d., 21s. per ton. The corresponding figures for 1957, when 4,911 tons of ore was crushed, were operating cost £11,218 14s. 4d., 45s. 6d. per ton, and revenue £8,368 15s. 0d., 34s. per ton.

Sales of lead concentrates from the Northampton State Battery for the year were valued at £37,409.

Value of Production:

The estimated value of production from the State Batteries since their inception, excluding the value of gold tax paid to the Commonwealth, is:—

GOLD

	1958	Grand Total
Par production—	£	£
Crushing	57,338	8,513,970
Cyanidation	12,802	2,106,704
Gold premium—		
Crushing	153,576	4,706,621
Cyanidation	34,145	1,368,442
Open Market premium—		
Crushing	319	30,082
Cyanidation	71	10,213
Total Gold Production	£258,251	£16,736,032

OTHER ORES REALISED

	£	£
Tin—		
Ores	*Nil*	94,005
Residues	*Nil*	572
Tungsten Concentrates	*Nil*	18,850
Agricultural Copper Ore	*Nil*	2,648
Lead Concentrates	37,409	205,809
Total Other Ores	£37,409	£321,884
Grand Total	£295,660	£17,057,916

FINANCIAL

	Tons	Expenditure	Receipts	Loss
		£	£	£
Crushing—				
Gold Mills	41,806	123,279	20,818	102,461
Northampton	2,903·5	8,527	3,048	5,479
Cyaniding	22,327	45,620	20,213	25,407
		£177,426	£44,079	£133,347

The loss of £133,347 is an increase of £17,826 on the previous year. It does not include depreciation and interest on capital.

Capital Expenditure, all from General Loan Fund, was incurred as below:—

	£ s. d.
Bamboo Creek—	
Pipes for Water Supply	14 13 1
Kalgoorlie—	
Cyanide Plant	1,404 12 1
Leonora—	
Purchase and Improvements of Battery	305 18 7
Marble Bar—	
Renovations and Improvements to Foreman's House	882 11 9
Sandstone—	
Installation of Diesel Power Plant	5,312 9 7
North-West—	
Completion of payment on Truck	253 15 6
General Erection and Maintenance—	
Purchase of Truck	1,253 0 0
	£9,427 0 7

Cartage Subsidies:

	Tons	Cost
Ore carted to State Plants	19,517	£9,674

Comparative figures for the last three years are:—

Year	State Plants				Private Plants		
	Tons Crushed	Tons Subsidised	Per cent. Subsidised	Cost	Tons Subsidised	Cost	Total Cost
				£		£	£
1956	35,740	12,679	35·5	4,847	70	44	4,891
1957	42,837	16,032	37·4	8,098	*Nil*	*Nil*	8,098
1958	41,806	19,517	46·7	9,674	*Nil*	*Nil*	9,674

Administrative:

Expenditure amounted to £19,997 8s. 5d., equivalent to 6s. per ton of ore crushed and cyanided, compared with an expenditure of £18,730 2s. 9d. 6s. 1d. per ton, for 1957.

	1957 £ s. d.	1958 £ s. d.
Salaries	9,682 6 10	10,247 6 10
Pay Roll Tax	2,708 1 2	2,682 4 10
Workers' Compensation	3,855 8 4	4,809 5 8
Travelling and Inspection	2,082 8 8	1,950 18 6
Sundries	401 17 9	307 12 7
	£18,730 2 9	£19,997 8 5

Staff:

Manager Mack who had been seconded to the Mines Department, Northern Territory in June, 1956, resigned to take a permanent appointment as Superintendent of State Batteries with that Department.

Field Engineer Cherry also resigned to take a position with the Northern Territory Mines Department.

W. Bracegirdle was appointed Field Engineer.

R. G. Coumbe was appointed Assistant Manager at Meekatharra and Peak Hill.

Manager Morrow was transferred from Boogardie to Marvel Loch.

I wish to thank all Officers at Head Office and at the Batteries for their capable and willing service during the year.

General Remarks:

The 41,806 tons of gold ore crushed was 1,031 tons less than the previous year, and the average head value of ore treated was 14 grains per ton lower. Tonnages crushed were appreciably lower at Boogardie, Kalgoorlie, Marvel Loch and Paynes Find, but these were almost counteracted by increases at Lake Darlot, Leonora, Marble Bar, Peak Hill and Sandstone. Gold ore crushing costs increased by 2s. 4d. per ton crushed. With a slightly lower tonnage and slightly higher receipts, gold ore crushing losses were £1,159 more than in 1957.

Although the tonnage cyanided was considerably increased to 22,327 tons, the cost per ton increased by 5s. 2d., and the revenue per ton decreased by 6s., resulting in a loss on cyaniding of £25,407 in 1958 compared with £11,369 in 1957. The causes of this increased loss were:—

(1) The reduction in head value of tailings treated to 3 dwt. 16 grains compared with 5 dwt. 4 grains in 1957. This caused a reduction in revenue.

(2) The unusually high rainfall in most of the Goldfields. This caused increased costs and at some plants, particularly Kalgoorlie, where flooding occurred, also loss of gold, so reduced revenue.

(3) High maintenance costs at Bamboo Creek, Marble Bar and Ora Banda where considerable repairs to cyanide plants were necessary.

The Northampton plant treated 2,903.5 tons of lead ore, compared with 4,911 tons in 1957. This reduced tonnage caused the increase in the cost per ton treated. Late in 1957 the price of lead dropped and to assist producers, the treatment charge at the Northampton Battery was reduced from 30s. to 20s. per ton. This lower treatment charge was made during all 1958, causing reduced receipts.

The operating loss of the State Batteries was £133,347 in 1958 compared with £115,521 in 1957. Gold milling showed an increase of £1,159, cyaniding £14,038, and Northampton £2,629. Present indications are that increased tonnages will be treated in 1959, but the grade of tailings cyanided is expected to be higher, so with normal weather conditions cyaniding should show a considerable improvement and the total operating loss should be reduced.

(Sgd.) K. M. PATERSON,
Superintendent of State Batteries.

SCHEDULE No. 1

Return showing tons crushed, Gold Yield by Amalgamation, Average per ton in shillings, and Total Value without Premium for the Year ended 31st December, 1958

Battery	Tons Crushed	Gold Yield Bullion oz.	Value per Ton in Shillings	Total Value without Premium £ s. d.
Bamboo Creek	479	148·10	22·26	533 3 2
Boogardie	252·25	162·50	46·38	585 0 0
Coolgardie	4,280	1,613·30	27·14	5,807 17 7
Cue	2,380·5	869·15	26·29	3,128 18 10
Kalgoorlie	7,969·5	3,075·75	27·79	11,072 14 0
Lake Darlot	981·75	141·25	10·36	508 10 0
Laverton	1,387·5	39·40	2·04	141 16 10
Leonora	1,765·5	696·40	28·39	2,507 0 5
Marble Bar	1,555·75	651·95	30·17	2,347 0 2
Marvel Loch	1,021·5	631·15	44·48	2,272 2 10
Meekatharra	4,221·25	862·50	14·71	3,105 0 0
Menzies	4,298·5	2,033·65	34·06	7,321 3 0
Norseman	388	166·60	30·91	599 15 2
Nullagine	562	151·45	19·40	545 4 5
Ora Banda	3,235·5	2,026·10	45·09	7,293 19 2
Peak Hill	3,121·5	554·65	12·78	1,996 14 10
Sandstone	641	448·35	50·36	1,614 0 6
Yarri	3,265	1,655·00	36·49	5,958 0 0
Total	41,806	15,927·25	27·43	57,338 0 11

SCHEDULE No. 2

Number of Parcels Treated, Tons Crushed and Head Value for the Year ended 31st December, 1958

No. of Parcels Treated	Battery	Tons Crushed	Yield by Amalgamation Bullion oz. dwts.	Yield by Amalgamation Fine Gold oz. dwts.	Tailings Gross at 100 per cent. oz. dwts.	Total Contents of Ore Fine Gold oz. dwts.	Average per Ton Fine Gold dwts. grs.	Gross Value per Ton Fine Gold @ £4 4s. 11½d per Ounce £ s. d.
7	Bamboo Creek	479	148 2	125 10	117 2	242 12	10 3	2 3 0
12	Boogardie	252·25	162 10	137 14	35 5	172 19	13 17	2 18 3
105	Coolgardie	4,280	1,613 6	1,367 5	908 6	2,275 11	10 15	2 5 1
49	Cue	2,380·5	869 3	736 12	422 7	1,158 19	9 9	1 19 10
128	Kalgoorlie	7,969·5	3,075 15	2,606 14	1,074 19	3,681 13	3 8	14 2
8	Lake Darlot	981·75	141 5	119 14	217 6	337 0	6 10	1 7 3
9	Laverton	1,387·5	39 8	33 8	276 17	310 5	4 12	19 2
30	Leonora	1,765·5	696 8	590 4	101 4	691 8	7 10	1 11 6
22	Marble Bar	1,555·75	651 19	552 11	614 11	1,167 2	15 0	3 3 9
23	Marvel Loch	1,021·5	631 3	534 18	152 2	687 0	13 11	2 17 2
45	Meekatharra	4,221·25	862 10	731 0	419 12	1,150 12	5 5	1 2 1
57	Menzies	4,298·5	2,033 13	1,723 10	624 4	2,347 14	10 22	2 6 4
8	Norseman	388	166 12	141 4	55 2	196 6	10 3	2 3 0
3	Nullagine	562	151 9	128 7	67 9	195 16	6 23	1 9 7
45	Ora Banda	3,235·5	2,026 2	1,717 2	760 8	2,477 10	15 8	3 5 2
23	Peak Hill	3,121·5	554 13	470 1	204 19	675 0	4 4	17 9
6	Sandstone	641	448 7	380 0	165 13	545 13	17 1	3 12 4
26	Yarri	3,265	1,655 0	1,402 12	201 14	1,604 6	9 20	2 1 9
606	Total	41,806	15,927 5	13,498 6	6,419 0	19,917 3	9 12·7	1 19 3

Average Tons per Parcel .... 68·97
Average Yield by Amalgamation per ton (Fine Gold) .... 6 dwts. 10·98 grs.
Average Value by Amalgamation per ton (Fine Gold) .... £1 7s. 5d.
Average Head Value of Tailings per ton (Fine Gold) .... 3 dwts. 1·7 grs.
Average Value of Tailings per ton (Fine Gold) .... 13s.

SCHEDULE No. 3

Segregation of Tailings Produced according to Value Year ended 31st December, 1958

Battery	Payable			2 dwts. 8 grains to 1 dwt. 18 grains			1 dwt. 18 grains and under			Refractory			Total		
	Tons	oz.	dwts.	Tons	oz.	dwts.	Tons	oz.	dwts.	Tons	oz.	dwts.	Tons	oz.	dwts.
Bamboo Creek	448	114	5	18	1	16	13	1	1	....	....		479	117	2
Boogardie	71	21	12	103	10	4	78·25	3	9	....	....		252·25	35	5
Coolgardie	2,458·75	804	14	234·5	23	14	1,586·75	79	18	....	....		4,280	908	6
Cue	1,140·5	280	1	423·5	42	1	656·5	41	10	160	58	15	2,380·5	422	7
Kalgoorlie	2,531·25	777	16	361·75	35	19	5,076·5	261	4	....	....		7,969·5	1,074	19
Lake Darlot	981·75	217	6	....	....		....	....		....	....		981·75	217	6
Laverton	987·5	241	3	324	31	12	76	4	2	....	....		1,387·5	276	17
Leonora	60·75	15	13	63·5	6	7	1,641·25	79	4	....	....		1,765·5	101	4
Marble Bar	1,352·25	596	2	122	13	4	79·5	4	10	2		15	1,555·75	614	11
Marvel Loch	341	85	0	55·75	5	14	505·25	40	0	119·5	21	8	1,021·5	152	2
Meekatharra	1,063	276	14	308·75	28	18	2,122·75	109	5	726·75	4	15	4,221·25	419	12
Menzies	1,591·75	398	16	1,424·75	146	8	1,282	79	0	....	....		4,298·5	624	4
Norseman	155	34	15	....	....		233	20	7	....	....		388	55	2
Nullagine	394	52	11	90	9	4	78	5	14	....	....		562	67	9
Ora Banda	2,014·75	679	18	531·25	55	10	689·5	25	0	....	....		3,235·5	760	8
Peak Hill	81·5	19	6	282	31	14	2,758	153	19	....	....		3,121·5	204	19
Sandstone	245	132	16	247	24	16	149	8	1	....	....		641	165	13
Yarri	99	15	4	82	9	0	3,084	177	10	....	....		3,265	201	14
Total	16,016·75	4,763	12	4,671·75	476	1	20,109·25	1,093	14	1,008·25	85	13	41,806	6,419	0

SCHEDULE No. 4

Details of Extraction Tailings Treatment, 1958

Battery	Tons Treated	Head Value	Contents	Tail Value	Contents	Recovery	Call	Recovery	Shortage	Surplus
		dwts. grs.	dwts.	dwts. grs.	dwts.	Per cent.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,204	7 8	8,821	2 8	2,808	68	1,277 4 7	1,175 0 4	102 4 3	....
Boogardie	1,031	3 8	3,458	0 18	800	77	565 2 10	580 17 0	....	15 14 2
Coolgardie	3,810	2 22	11,149	0 17	2,719	75	1,800 2 10	1,613 19 8	186 3 2	....
Cue	68	....	....	....	....	....	271 10 3	304 12 11	....	33 2 8
Kalgoorlie	5,616	3 5	17,988	0 18	4,319	76	2,903 16 8	2,613 15 11	290 0 9	....
Laverton	Slags	....	....	....	....	....	....	32 15 7	....	32 15 7
Marvel Loch	Slags	....	....	....	....	....	....	9 0 10	....	9 0 10
Meekatharra	3,544	2 16	9,386	0 14	2,476	74	1,467 14 8	1,303 0 2	164 14 6	....
Menzies	5,780	3 20	22,115	0 22	5,426	76	3,544 15 0	3,645 8 9	....	100 13 9
Ora Banda	1,274	7 6	9,252	1 17	2,191	76	1,499 16 0	1,523 15 4	....	23 19 1
Total	22,327	3 16	82,159	0 22	20,739	75	13,330 3 1	12,802 6 6	743 2 8	215 6 1

Net Shortage	£527 16s. 7d.
Head Value	3 dwts. 16 grains
Tail Value	22 grains
Theoretical Recovery	75%
Actual Recovery	73%

SCHEDULE No. 5

Direct Purchase of Tailings, Year ended 31st December, 1958

Battery	Tons of Tailings Purchased	Amount Paid at £4 4s. 11½d. per oz.	Amount Paid Account of Premium
		£ s. d.	£ s. d.
Bamboo Creek	403·25	145 5 5	681 5 7
Boogardie	95·75	42 4 1	198 11 7
Coolgardie	1,853·75	919 6 11	2,408 14 7
Cue	1,060·75	649 0 8	1,581 12 0
Kalgoorlie	2,177·00	1,266 0 1	3,524 18 10
Lake Darlot	580·25	200 5 6	459 15 4
Laverton	888·75	358 11 3	823 3 1
Leonora	54·75	24 10 6	56 6 0
Marble Bar	1,275·50	1,068 5 11	2,452 10 3
Marvel Loch	174·25	86 10 6	198 12 8
Meekatharra	1,453·50	405 13 2	1,071 3 6
Menzies	1,426·25	377 8 5	1,503 14 10
Norseman	139·50	47 10 9	109 3 5
Nullagine	365·00	23 19 7	55 0 11
Ora Banda	1,895·75	1,290 1 11	3,408 19 6
Peak Hill	58·75	22 19 9	52 15 5
Sandstone	220·50	167 15 0	385 1 11
Yarri	68·50	22 14 9	52 4 0
Total	14,191·75	7,118 4 2	19,023 13 5

SCHEDULE No. 6

Cyanide Yield, 1958

Battery	Tons	Fine oz.	Value	Premium	Total
			£	£	£
Bamboo Creek	1,204	272·07	1,175·017	3,095·496	4,270·513
Boogardie	1,031	136·76	580·854	1,555·704	2,136·558
Coolgardie	3,810	379·67	1,613·984	4,318·920	5,932·904
Cue	68	71·00	304·646	807·734	1,112·380
Kalgoorlie	5,616	614·32	2,613·796	6,989·204	9,603·000
Laverton	....	7·72	32·779	87·833	120·612
Marvel Loch	....	2·13	9·042	24·320	33·362
Meekatharra	3,544	306·75	1,303·009	3,490·025	4,793·034
Menzies	5,780	853·14	3,645·438	9,706·624	13,352·062
Ora Banda	1,274	367·65	1,523·766	4,069·038	5,592·804
	22,327	3,011·21	12,802·331	34,144·898	46,947·229

SCHEDULE No. 7

Statement of Receipts and Expenditure for the Year ended 31st December, 1958

Milling

Battery	Tons Crushed	Management and Supervision	Wages	Stores	Total Working Expenditure	Cost per Ton	Repairs and Renewals	Sundries	Gross Expenditure	Cost per Ton	Receipts	Receipts per Ton	Profit	Loss
		£ 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	479	176 2 10	1,352 8 0	488 14 1	2,017 4 11	84 3	209 13 5	158 8 1	2,385 6 5	99 7	257 15 10	10 9	....	2,127 10 7
Boogardie	252·25	1,296 0 3	319 2 7	248 1 10	1,863 4 8	147 9	144 19 7	769 9 10	2,777 14 1	220 3	239 9 8	19 0	....	2,538 4 5
Coolgardie	4,280	1,617 5 1	2,834 16 5	2,382 7 11	6,834 9 5	31 11	2,521 1 11	1,418 0 6	10,773 11 10	50 4	2,087 12 10	9 9	....	8,685 19 0
Cue	2,380·5	1,400 18 11	1,903 18 4	1,322 17 3	4,627 14 6	38 11	606 15 1	961 4 5	6,195 14 0	52 1	1,449 2 3	12 2	....	4,746 11 9
Kalgoorlie	7,969·5	3,779 0 3	4,461 19 11	4,073 11 9	12,314 11 11	30 11	1,810 12 11	3,109 5 1	17,234 9 11	43 3	3,711 2 1	9 4	....	13,523 7 10
Lake Darlot	981·75	674 9 7	1,629 15 6	474 9 11	2,778 15 0	56 7	292 11 11	307 3 10	3,378 10 9	68 10	515 8 5	10 6	....	2,863 2 4
Laverton	1,387·5	1,190 14 5	1,232 3 0	913 3 2	3,336 0 7	48 1	387 16 10	902 16 2	4,626 13 7	66 8	830 6 0	12 0	....	3,796 7 7
Leonora	1,765·5	844 4 5	3,072 13 3	1,205 17 8	5,122 15 4	58 0	651 9 2	926 4 5	6,700 8 11	75 11	942 0 5	10 8	....	5,758 8 6
Marble Bar	1,555·75	1,707 13 8	2,686 2 10	1,676 9 4	6,070 5 10	78 0	1,126 8 8	1,733 6 1	8,930 0 7	114 10	881 6 4	11 4	....	8,048 14 3
Marvel Loch	1,021·5	1,217 13 11	2,020 0 10	988 13 4	4,226 8 1	82 9	910 10 11	556 4 10	5,693 3 10	111 6	585 18 10	11 6	....	5,107 5 0
Meekatharra	4,221·25	1,342 15 5	4,092 12 9	2,031 12 4	7,467 0 6	35 5	854 17 5	1,609 2 8	9,931 0 7	47 1	1,663 9 3	7 11	....	8,267 11 4
Menzies	4,298·5	1,664 3 5	3,968 14 10	2,532 5 6	8,165 3 9	38 0	857 18 9	1,529 10 2	10,552 12 8	49 1	2,164 1 7	10 1	....	8,388 11 1
Norseman	388	128 2 6	428 2 4	64 7 10	620 12 8	32 0	49 11 7	147 5 7	817 9 10	42 2	149 3 9	7 8	....	668 6 1
Nullagine	562	458 1 6	1,091 0 9	560 5 10	2,109 8 1	75 1	744 0 4	223 7 3	3,076 15 8	109 6	342 2 9	12 2	....	2,734 12 11
Ora Banda	3,235·5	1,114 18 5	3,105 15 0	2,128 0 2	6,348 13 7	39 3	1,746 6 1	1,065 3 8	9,160 3 4	56 7	1,769 10 6	10 11	....	7,390 12 10
Paynes Find	....	42 14 11	174 0 0	....	216 14 11	....	....	7 0 0	223 14 11	....	....	....	....	223 14 11
Peak Hill	3,121·5	1,066 3 1	3,753 12 3	1,274 13 7	6,094 8 11	39 1	844 8 0	1,126 6 2	8,065 3 1	51 8	1,256 17 9	8 1	....	6,808 5 4
Sandstone	641	375 7 8	1,082 4 8	466 8 7	1,924 0 11	60 0	722 1 4	461 1 10	3,107 4 1	96 11	325 11 7	10 2	....	2,781 12 6
Yarri	3,265	1,430 17 9	4,728 3 9	1,567 7 1	7,726 8 7	47 4	687 18 10	1,234 6 3	9,648 13 8	59 1	1,634 11 9	10 0	....	8,014 1 11
Head Office	....	....	....	....	....	....	....	....	....	....	11 19 2	....	11 19 2	....
	41,806	21,527 8 0	43,937 7 0	24,399 7 2	89,864 2 2	43 0	15,169 2 9	18,245 6 10	123,278 11 9	59 0	20,817 10 9	10 0	11 19 2	102,473 0 2
Northampton (Lead)	2,903·5	2,387 2 5	1,967 11 5	1,002 12 4	5,357 6 2	36 11	1,744 4 10	1,424 19 1	8,526 10 1	58 9	3,047 19 0	21 0	....	5,478 11 1
Totals	44,709·5	23,914 10 5	45,904 18 5	25,401 19 6	95,221 8 4	42 7	16,913 7 7	19,670 5 11	131,805 1 10	59 0	23,865 9 9	10 8	11 19 2	107,951 11 3
Net Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	107,939 12 1

SCHEDULE No. 8

Statement of Receipts and Expenditure for the Year ended 31st December, 1958

Cyaniding

Battery	Tons Treated	Management and Supervision	Wages	Stores	Total Working Expenditure	Cost per Ton	Repairs and Renewals	Sundries	Gross Expenditure	Cost per Ton	Receipts	Receipts per Ton	Profit	Loss
		£ 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	1,204	102 11 2	1,022 14 4	567 10 1	1,692 15 7	28 1	356 14 9	458 11 0	2,508 1 4	41 8	900 5 7	14 11	....	1,607 15 9
Boogardie	1,031	322 9 4	1,286 17 9	292 4 5	1,901 11 6	36 11	13 0	753 1 0	2,655 5 6	51 6	2,114 12 7	41 0	....	540 12 11
Coolgardie	3,810	655 3 9	3,040 3 8	1,262 8 1	4,957 15 6	26 0	644 17 0	1,378 18 4	6,981 10 10	36 8	2,730 2 9	14 4	....	4,251 8 1
Cue	68	....	....	103 2 3	103 2 3	30 4	5 13 3	32 1 0	140 16 6	41 5	350 17 2	103 2	210 0 8	....
Kalgoorlie	5,616	1,766 17 4	3,671 17 1	4,254 12 10	9,693 7 3	34 6	705 18 6	2,784 16 3	13,184 2 0	46 11	4,140 11 11	14 9	....	9,043 10 1
Laverton	....	254 11 10	179 3 8	33 15 8	467 11 2	....	30 10 10	91 14 3	589 16 3	....	120 12 3	....	....	469 4 0
Marble Bar	....	89 5 5	364 11 1	195 5 10	649 2 4	....	490 18 9	428 14 6	1,568 15 7	....	....	....	....	1,568 15 7
Marvel Loch	....	....	....	....	....	....	....	....	....	....	33 7 3	....	33 7 3	....
Meekatharra	3,544	....	2,690 12 1	1,194 8 2	3,885 0 3	21 11	109 10 7	1,269 9 3	5,264 0 1	29 8	2,222 17 0	12 7	....	3,041 3 1
Menzies	5,780	748 12 4	3,767 1 4	1,679 11 3	6,195 4 11	21 5	165 19 2	1,920 9 11	8,281 14 0	28 8	7,199 19 4	24 11	....	1,081 14 8
Norseman	....	....	33 18 0	....	33 18 0	....	....	10 2 3	44 0 3	....	....	....	....	44 0 3
Ora Banda	1,274	434 0 7	1,533 16 10	902 12 2	2,870 9 7	45 1	1,113 13 0	417 14 6	4,401 17 1	69 1	2,559 4 6	40 2	....	1,842 12 7
	22,327	4,373 11 9	17,590 15 10	10,485 10 9	32,449 18 4	29 1	3,624 8 10	9,545 12 3	45,619 19 5	40 10	22,372 10 4	20 0	243 7 11	23,490 17 0
Interest Paid to Treasury	....	....	....	....	....	....	....	....	....	....	2,160 0 0	....	....	2,160 0 0
	....	....	....	....	....	....	....	....	....	....	20,212 10 4	....	....	....
Gross Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	25,650 17 0
Less Profit	....	....	....	....	....	....	....	....	....	....	....	....	....	243 7 11
Net Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	25,407 9 1

STATE BATTERIES

Trading and Profit and Loss Account for the Year ended 31st December, 1958

1957		1958	
£		£	£
	Trading Costs—		
87,580	Wages	91,784	
31,321	Stores	35,887	
19,529	Repairs, Renewals and Battery Spares	20,538	
27,917	General Expenses and Administration	29,216	
166,347			177,425
	Earnings—		
50,827	Milling and Cyaniding Charges		44,078
115,520	Operating Loss for the Year		133,347
	Other Charges—		
22,915	Interest on Capital	23,356	
13,283	Depreciation	13,259	
1,887	Superannuation—Employer's Share	2,453	
38,085			39,068
£153,605	Total Loss for the Year		£172,415

STATE BATTERIES

Balance Sheet as at 31st December, 1958

31st December, 1957	Funds Employed	31st December, 1958	
£		£	£
	Capital—		
557,213	Provided from General Loan Fund	567,022	
137,398	Provided from Consolidated Revenue Fund	137,245	
694,611			704,267
	Reserves—		
28,622	Commonwealth Grant—Assistance to Goldmining Industry	28,622	
13,786	Commonwealth Grant—Assistance to Metalliferous Mining	13,786	
42,408			42,408
	Liability to Treasurer—		
902,268	Interest on Capital		925,624
....	Advance for Purchase of Tailings		5,000
	Other Funds—		
915,857	Provided from Consolidated Revenue Fund (Excess of payments over collections)		1,055,925
2,555,144			2,733,224
	Deduct—		
	Profit and Loss :		
2,214,230	Loss at commencement of year	2,367,835	
153,605	Loss for year	172,415	
2,367,835	Total Loss from Inception		2,540,250
£187,309			£192,974
	Employment of Funds		
	Fixed Assets—		
689,020	Plant, Buildings and Equipment	698,676	
577,869	*Less* Depreciation	591,128	
111,151			107,548
	Current Assets—		
3,783	Debtors	3,269	
46,710	Stores	55,710	
1,008	Battery Spares	1,694	
	Purchase of Tailings :		
1,941	Treasury Trust Account	6,808	
47,391	Tailings not treated	50,546	
7,039	Estimated Gold Premium	7,398	
107,872			125,425
219,023	Total Assets		232,973
	Deduct—		
	Current Liabilities :		
3,644	Creditors	6,096	
19,699	Liability to Treasurer (Superannuation—Employer's Share)	22,152	
	Purchase of Tailings :		
1,332	Creditors	4,353	
7,039	Estimated Premium Due	7,398	
31,714			39,999
£187,309			£192,974

DIVISION IV

Annual Progress Report of the Geological Survey Branch of the Mines Department for the Year 1958

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NOTE.

A change in the Mines Department's publication policy now re-establishes the practice in vogue up to and including 1953, whereby reports compiled for publication during the year are published with the Annual Report. The above reports are therefore published herewith. Reports for the years 1954, 1955, 1956 and 1957 have yet to be published. (20/1/59).

DIVISION IV

Annual Progress Report of the Geological Survey Branch of the Mines Department for the year 1958

Under Secretary for Mines,

I have the honour to submit for the information of the Honourable the Minister for Mines, my report on the operations and progress of the Geological Survey for the year ended 31st December, 1958.

STAFF.

Strength as at 31st December.

Professional.

Ellis, H. A., B.Sc., A.O.S.M. (N.Z.)	Government Geologist	9
Berliat, K., D.Sc. (Switzerland)	Senior Geologist	
Sofoulis, J. B.Sc. (W.A.)	Geologist Grade 1	
de la Hunty, L. E. B.Sc. (W.A.)	Geologist Grade 1	
Low G. H., B.Sc. (W.A.)	Geologist Grade 1	
Noldart, A. J. B.Sc. (Syd.)	Geologist Grade 1	
Wyatt, J. D., B.A. (W.A.)	Geologist Grade 2	
Connolly, R. R.	Geologist Grade 2	
Bartram, G. D., B.Sc. (W.A.)	Geologist Grade 2	

Clerical.

Rasmussen, R. F.	Clerk	3
Potts, H. G.	Junior Clerk	
Miller, J. B. (Mrs.)	Typist	

Laboratory.

Fimmell, L. H.	Laboratory Technician	1

Promotions, Resignations, Appointments.

Mr. J. W. Duggan, Geologist, resigned on 2nd April, 1958.

Miss S. V. White resigned on 9th April, 1958 after a lengthy period of loyal and very efficient service as technical stenographer and typist.

Mrs. J. B. Miller replaced Miss White on 9th April, 1958.

PROFESSIONAL STAFF.

The approved establishment for professional officers as at 31st December, is as follows:—

Position	Occupant
Government Geologist	H. A. Ellis
Senior Geologist	K. Berliat
Geologist Grade 1	J. Sofoulis
Do. do.	L. E. de la Hunty
Do. do.	G. H. Low
Do. do.	A. J. Noldart
Geologist Grade 2	J. D. Wyatt
Do. do.	R. R. Connolly
Do. do.	G. D. Bartram
Do. do.	Vacant
Do. do.	Vacant
Do. do.	Vacant

Despite repeated attempts to fill the three Geologist Grade 2 vacancies by Australia-wide advertisement throughout the year, no suitable persons applied, and the requirements of the Hydrological Section had to be met from existing staff. This meant reduced activities in the other spheres of our operations.

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

Period	No. of Geologists available including the Government Geologist	Area of State (sq. miles)	Square Miles per Geologist	Population of State
Jan.-Mar.	10	975,920	97,592	709,307
Apl.-Dec.	9	....	108,400	....

Activities of Professional Officers.

H. A. Ellis, Government Geologist.

In addition to head-office duties, I attended a Conference of State and Commonwealth Government Geologists in Adelaide in August. In July a visit was made to the Nullagine-Marble Bar area in connection with the Manganese Survey in progress there. Field inspections were made in Busselton area in connection with Water Supplies during February, in the Esperance district on the same subject during April, and in the Leonora district in connection with the Sons of Gwalia Gold Mine during May.

K. Berliat, Senior Geologist.

January.—Annual Leave. Preparatory work in connection with Hill River Hydrological Survey.

February-April.—Long Service Leave.

May.—Sick Leave.

June-December.—Hydrological Survey—Selection of water drill sites and drilling supervision, Hill River and Kalannie areas.

J. Sofoulis, Geologist, Grade 1.

January-February.—Office duties and compilation of reports.

March-June.—Hydrological field work, Eneabba-Hill River-Gingin areas.

July-September.—Survey of Belele, Meekatharra, Wiluna and Kingston 4-mile sheets in conjunction with C.S.I.R.O. Land Research Unit.

October-December.—Photogrammetric work in connection with above Survey.

L. E. de la Hunty, Geologist, Grade 1.

January.—Inspection manganese deposits Phillips River Goldfield.

February.—Report writing.

March.—Water Supply Beverley. Manganese investigations (Horseshoe deposit).

April.—Iron reconnaissance with South Australian Director of Mines.

May-October.—Field work on Manganese Survey Pilbara Goldfield.

November.—Report writing.

December.—Visited Bureau of Mineral Resources, Canberra, A.C.T.

G. H. Low, Geologist, Grade 1.

January.—Supervision and report writing of Bamboo Creek and Burnakura Diamond Drilling.

February-May.—Long Service Leave.

June.—Survey of Tallering Range Iron Ore Deposit.

July.—Various investigations connected with coal, oil and beach sands. Preparation of a Tectonic Map of Western Australia.

August.—Work on Tectonic Map. Supervision of Tallering Diamond Drilling. Investigation of Wildara Station Gold Find.

September.—Investigation of proposed new colliery areas at Collie. Work on Tectonic Map.

October.—Various investigations connected with coal and oil. Supervision of Tallering Diamond Drilling. Work on Tectonic Map.

November.—Indexing Bulletin 109. Investigation of Murchison River Phosphate Deposit.

December.—Western No. 4 Colliery investigation. Investigation of proposed new colliery area south-east of Cardiff. Supervision of Tallering Diamond Drilling.

A. J. Noldart, Geologist, Grade 1.

January-March.—Pilbara Goldfield Resurvey Bulletin compilation.

April-July.—Supervision Goldfields Drilling and Bulletin compilation.

August.—Preparation Leonora-Gwalia District Survey.

September.—Field work Leonora-Gwalia District and Goldfields Drilling Supervision.

October-December. — Supervision Goldfield Drilling—Bulletin compilation and compilation Explanatory Notes—Marble Bar Sheet.

J. D. Wyatt, Geologist, Grade 2.

January.—Office duties.

February.—Report on Water Supply at Dalwallinu, Wongan Hills and Moulyinning. Report writing and office duties.

March.—Examination of manganese deposits at Peak Hill and Tendindewa with L. E. de la Hunty. Office duties.

April.—Examination of various iron deposits in State with L. E. de la Hunty. Miscellaneous inspections.

May-July.—Miscellaneous investigations. Report writing.

August-November.—Mapping in Donnybrook area. Visit to Ord River damsite, Wyndham. Report writing.

December.—Examination of Serpentine damsite. Report writing and office duties.

R. R. Connolly, Geologist, Grade 2.

January-July.—Iron Survey, Tallering area. Mapping and miscellaneous inspections.

August-December.—Miscellaneous inspections and Coolgardie drilling programme.

G. D. Bartram, Geologist, Grade 2.

January.—Annual leave. Investigation of possible manganese, iron and uranium deposit, Norseman.

February.—Investigation Bremer Range iron deposit. Hydrological Survey, Hill River Area.

March-December.—Hydrological Survey of Hill River, Gingin, Dandaragan, Mendel-Wongoondy, Tenindewa-Bindoo Hill and Kalannie areas. Annual leave.

J. W. Duggan, Geologist, Grade 2.

January-March.—Diamond drilling supervision, Great Fingall and Mount Morgan.

FIELD WORK.

Field Work Completed during the year and in Progress as at 31st December.

(1) Completion of Diamond Drilling at Bamboo Creek.

(2) Completion of Diamond Drilling at Mt. Morgans.

(3) Completion of Diamond Drilling at Burnakura and Agnew.

(4) Commencement of Diamond Drilling at Coolgardie.

(5) Continuation of Diamond Drilling at Day Dawn.

(6) Preparation for Diamond Drilling at Yilgangie.

(7) Preparation for detailed geological survey of an area surrounding Leonora.

(8) Continuation of Iron-Ore Survey of the State.

(9) Continuation of Manganese-Chromite Survey of the State.

(10) Commencement of exploratory Diamond Drilling of the Tallering Range iron-ore deposits.

(11) Geological mapping, the collection of underground water data, and supervision of percussion drilling for water in various parts of the State.

Field Work Planned for 1959.

(1) Supervision of Diamond Drilling at Coolgardie, Yilgangie, Tallering Range, Day Dawn and any other operations arising out of the Mines Department's drilling policy.

(2) Continuation of geological work and supervision of water-boring in connection with the Water Drilling Section of the Mines Department and the Hydrological Section of the Geological Survey.

(3) Commencement of a Regional Geological Survey of an area between Coolgardie and Norseman covered by the 4-mile = 1 inch Sheets Boorabin, Widgiemooltha, Lake Johnston and Norseman.

(4) A geological survey of the country surrounding Leonora and the Sons of Gwalia Gold Mine.

(5) A regional geological survey of the Balfour Downs 4-mile = 1 inch Sheet in continuation of the search for manganese.

TRANSPORT.

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

Vehicle W.A.G.	Make and Type	Load (cwt.)	Mileage as at 31/12/58	Mileage for 1958	Date Vehicle Purchased	Remarks
3678	Dodge Utility	15	33,433	9,405	1955 (new)	
4475	Land Rover Utility	10	22,155	15,640	1957 (new)	
3535	Land Rover Utility	10	43,012	5,732	1955 (new)	
2044	Dodge Utility	18	73,787	3,577	1950 (new)	Disposed of 16/4/58
4793	International Utility	20	4,254	4,254	1958 (new)	Purchased 7/5/58
3135	Fargo Utility	15	55,347	10,207	1954 (new)	
2412	International Utility	14	95,643	1,791	1950 (new)	Disposed of 2/10/58
5009	International Utility	20	2,610	2,610	1958 (new)	Purchased 19/9/58
4691	International Utility	20	18,164	17,776	1957 (new)	
3876	Land Rover Utility ...	10	29,672	8,728	1956 (new)	
2393	International Utility	14	108,901	10,944	1950 (new)	
4559	Land Rover Utility	10	21,872	18,375	1957 (new)	
909	Willys Jeep	5	43,136	471	1953 (new)	

Total miles : 109,510.

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

This Branch continues to render an extensive service under this heading in the form of consultations, written reports, field examinations and making publications available. The lag in publication of our reports is a serious handicap to our efficiency in dealing with many enquiries.

Hydrological Section.

Two officers of the existing staff of nine were continuously in the field in connection with the search for underground water during the year. The areas investigated were broadly, the coastal area south from Dongara to Gingin west of the Midland Railway Line, the Kalannie district and the Mullewa-Mingenew area.

The section has not been able to function as it was intended it should, on account of having to devote most of its time to the selection and supervision of three holes per location (block) on the basis of "no water-no pay."

A valuable aquifer containing potable subartesian water was discovered at around 600 feet in the Badgingarra Townsite area (about 30 miles north-west of Moora) in the initial stages of the work, but requirements of the Government's policy precluded its further exploration, and nothing further is known about its attitude or extent. This could be an important aquifer in an area in which shallower ground water is very scarce.

ACTIVITIES OF THE COMMONWEALTH BUREAU OF MINERAL RESOURCES.

The principal activities of the Bureau during the year were centred in some stratigraphic drilling in the Canning and Carnarvon Sedimentary Basins, airborne magnetometer and scintillometer surveys in the Eastern Goldfields, and detailed investigations of some major manganese deposits under the direction of an officer from this Survey. The airborne magnetometer surveys are being made at my request, as the technique is of great value in regional geological surveying.

PUBLICATIONS.

Issued during 1958.

Bulletin 110—The Geology of the Phillips River Goldfield, by J. Sofoulis, B.Sc.

Bulletin 111—The Exploratory Diamond Drilling of the Koolyanobbing Iron Ore Deposits for Pyrite, by H. A. Ellis, B.Sc., A.O.S.M.

Mineral Resources Series.

Bulletin 6—The Gypsum Deposits of Western Australia, by L. E. de la Hunty, B.Sc., and G. H. Low, B.Sc.

Geological Sketch Map of W.A. in 1 Sheet—40 miles to 1 inch.

Annual Progress Report of the Geological Survey of Western Australia for the year 1955—Administrative Section only.

Annual Progress Report of the Geological Survey of Western Australia for the year 1956—Administrative Section only.

In the Press.

Bulletin 109—Miscellaneous Bulletin—contains reports for 1954.

Bulletin 112—Miscellaneous Bulletin—contains reports for 1955.

Bulletin 113—Miscellaneous Bulletin—contains reports for 1956.

Compiling and Awaiting Authority to Print.

Reports for 1957—previously published as part of our Annual Report up to 1953 inclusive.

In Course of Preparation.

A bulletin on the Geology of the Nullagine and Marble Bar 4-mile = 1 inch military sheets.

A Mineral Resources Bulletin on the Iron Ore Resources of W.A.

A Mineral Resources Bulletin on the Manganese and Chromite Resources of W.A.

A Mineral Resources Bulletin on the Copper Deposits of W.A.

H. A. ELLIS,
Government Geologist.

19/1/59.

THE SEARCH FOR OIL IN WESTERN AUSTRALIA IN 1958.

By G. H. Low, B.Sc.,
Geological Survey of Western Australia.

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Introduction.

The oil search activities in W.A. during 1958 have been confined to drilling and survey operations by West Australian Petroleum Pty. Ltd., and to drilling operations by the Bureau of Mineral Resources.

Kalgoorlie Goldfields Petroleum Pty. Ltd., allowed their Permits 42H and 46H in the Eucla Basin to expire on 9th February, 1958 and Westralian Oil Ltd., allowed Permits 69H and 70H in the Canning Basin, to expire on 12th July, 1958.

Oil Drilling and Exploration (W.A.) Pty. Ltd., applied for, and was granted, on 15th September, 1958, seven Permits to Explore covering 91,240 square miles in the Eucla Basin.

West Australian Petroleum Pty Ltd. completed the hole at Learmonth (total depth 7,636 feet on 28th January), and have also completed test wells at Samphire Marsh (6,664 feet), Meda (8,809 feet), and Goldwyer (4,720 feet). This amounts to 20,699 feet of drilling during 1958.

The Bureau of Mineral Resources have completed stratigraphic holes at Wallal (total depth of Buromin No. 4A—2,229 feet), at Gwalia (2,070 feet) and at Mudenong (1,002 feet and 1,997 feet).

A summary of these holes and the results is as follows:—

Company: West Australian Petroleum Pty. Ltd.

Licence to Prospect: 52H.

Well: Learmonth No. 1 Test Well.

Position: Approx. Lat. 22° 10′ 58″ S. Approx. Long. 114° 03′ 30″ E. Height of derrick floor above sea level—75 feet.

Spudded in: 24th September, 1957. Completed at 7,636 feet on 28th January, 1958 in Permian Sandstone. Some minor amounts of gas were detected in cores.

Company: West Australian Petroleum Pty. Ltd.

Licence to Prospect: 53H.

Well: Samphire Marsh No. 1 Test Well.

Position: Approx. Lat. 19° 31′ 08″ S. Approx. Long. 121° 10′ 8″ E. Height of derrick floor above sea level—28 feet.

Spudded in: 18th February, 1958.

Status: Abandoned at 6,664 feet on 4th May, 1958 in Pre-Cambrian rocks. There were no indications of oil or gas.

Company: West Australian Petroleum Pty. Ltd.

Licence to Prospect: 54H.

Well: Meda No. 1 Test Well.

Position: Approx. Lat. 17° 24′ 00″ S. Approx. Long. 124° 11′ 30″ E. Height of derrick floor above sea level—100 feet.

Spudded in: 8th June, 1958.

Status: Completed at 8,809 feet on 19th November, 1958 in Pre-Cambrian rocks. Several gas and slight oil showings were recorded from the Laurel Formation (Lower Carboniferous) and from the Devonian section. An estimated three gallons of crude oil was recovered by a drill stem test at 5,110-5,133 feet in the Upper Member of the Laurel Formation.

Company: West Australian Petroleum Pty. Ltd.

Licence to Prospect: 55H.

Well: Goldwyer No. 1 Test Well.

Position: Approx. Lat. 18° 22′ 47″ S. Approx. Long. 122° 22′ 58″ E. Height of derrick floor above sea level—268 feet.

Spudded in: 17 August, 1958.

Status: Completed at 4,720 feet on 25th October, 1958 in Pre-Cambrian rocks. Traces of hydrocarbon were recorded at various depths in Ordovician limestone and shale between 2,910-4,013 feet.

Drilled by: Bureau of Mineral Resources.

Permit to Explore: 30H.

Well: B.M.R. No. 4A Stratigraphic Hole (Wallal). (B.M.R. No. 4 was spudded in on 1st April, 1958 and reached a total depth of 1,410 feet on 6th April, 1958. It flowed as an uncontrolled artesian bore and was subsequently plugged and abandoned.)

Position: Approx. Lat. 19° 44′ 12″ S. Approx. Long. 120° 44′ 28″ E. Height of derrick floor above sea level—32 feet.

Spudded in: 22nd April, 1958.

Status: Completed at 2,229 feet on 7th May, 1958 in Pre-Cambrian gneiss.

Drilled by: Bureau of Mineral Resources.

Permit to Explore: 30H.

Well: B.M.R. No. 5 Stratigraphic Hole (Giralia).

Position: Approx. Lat. 22° 40′ S. Approx. Long. 114° 15′ E. Height of derrick floor above sea level—not available.

Spudded in: 26th June, 1958.

Status: Completed at 2,070 feet on 11th August, 1958 in Carbonaceous rocks (Artinskian-Byro Group equivalent).

Drilled by: Bureau of Mineral Resources.

Permit to Explore. 28H.

Well: B.M.R. No. 6 Stratigraphic Hole (Muderong).

Position: Approx. Lat. 24° 06′ 55″ S. Approx. Long. 114° 46′ 20″ E. Height of derrick floor above sea level—not available.

Spudded in: 10th August, 1958.

Status: Completed at 1,002 feet on 20th August, 1958 in the Wandagee (Artinskian) Formation.

Drilled by: Bureau of Mineral Resources.

Permit to Explore: 28H.

Well: B.M.R. No. 7 Stratigraphic Hole (Muderong).

Position: Approx. Lat. 24° 5′ 55″ S. Approx. Long. 114° 46′ 30″ E. Height of derrick floor above sea level—not available.

Spudded in: 25th August, 1958.

Status: Completed at 1,997 feet on 14th September, 1958 in the Cundlego (Artinskian) Formation.

LIST OF PERMITS TO EXPLORE

The following companies and syndicates held Permits to Explore during 1958 (See Plate 1).

Company or Syndicate	Number of Permit to Explore	Date of Approval	Area Sq. Miles approx.
West Australian Petroleum Pty. Ltd.	27H	23/10/52	50,000
	28H	23/10/52	49,600
	29H	23/10/52	34,500
	30H	23/10/52	151,050
Jackson Explorations	133H	3/9/57	15,800
Kalgoorlie Goldfields Petroleum N.L.	42H	Expired	13,000
	46H	9/2/58	6,500
Westralian Oil Ltd.	69H	Expired	9,400
	70H	12/7/58	9,550
	106H	29/3/55	9,600
Gulf Oil Syndicate	127H	29/3/55	14,000
Oil Drilling and Exploration (W.A.) Pty. Ltd.	134H	15/9/58	13,000
	135H	15/9/58	13,000
	136H	15/9/58	13,000
	137H	15/9/58	13,000
	138H	15/9/58	13,000
	139H	15/9/58	13,000
	140H	15/9/58	13,240

LIST OF LICENCES TO PROSPECT

The following Licences to Prospect were held during 1958 (See Plate 1).

Company or Syndicate	Number of Licence to Prospect	Area Sq. miles approx.
Associated Freney N.L.	16H	225
	17H	225
	47H	120
West Australian Petroleum Pty. Ltd.	18H	120
	19H	195
	20H	175
	21H	193
	22H	187
	23H	195
	24H	187
	25H	186
	26H	191
	27H	193
	28H	196
	29H	190
	30H	199
	31H	190
	32H	193
	33H	198
	34H	193
	35H	187
	36H	187
	37H	189
	39H	192
	40H	166
	41H	142
	42H	192
	44H	196
	45H	187
	46H	194
	51H	191
	52H	190
	53H	195
	54H	196
	55H	197
	56H	200

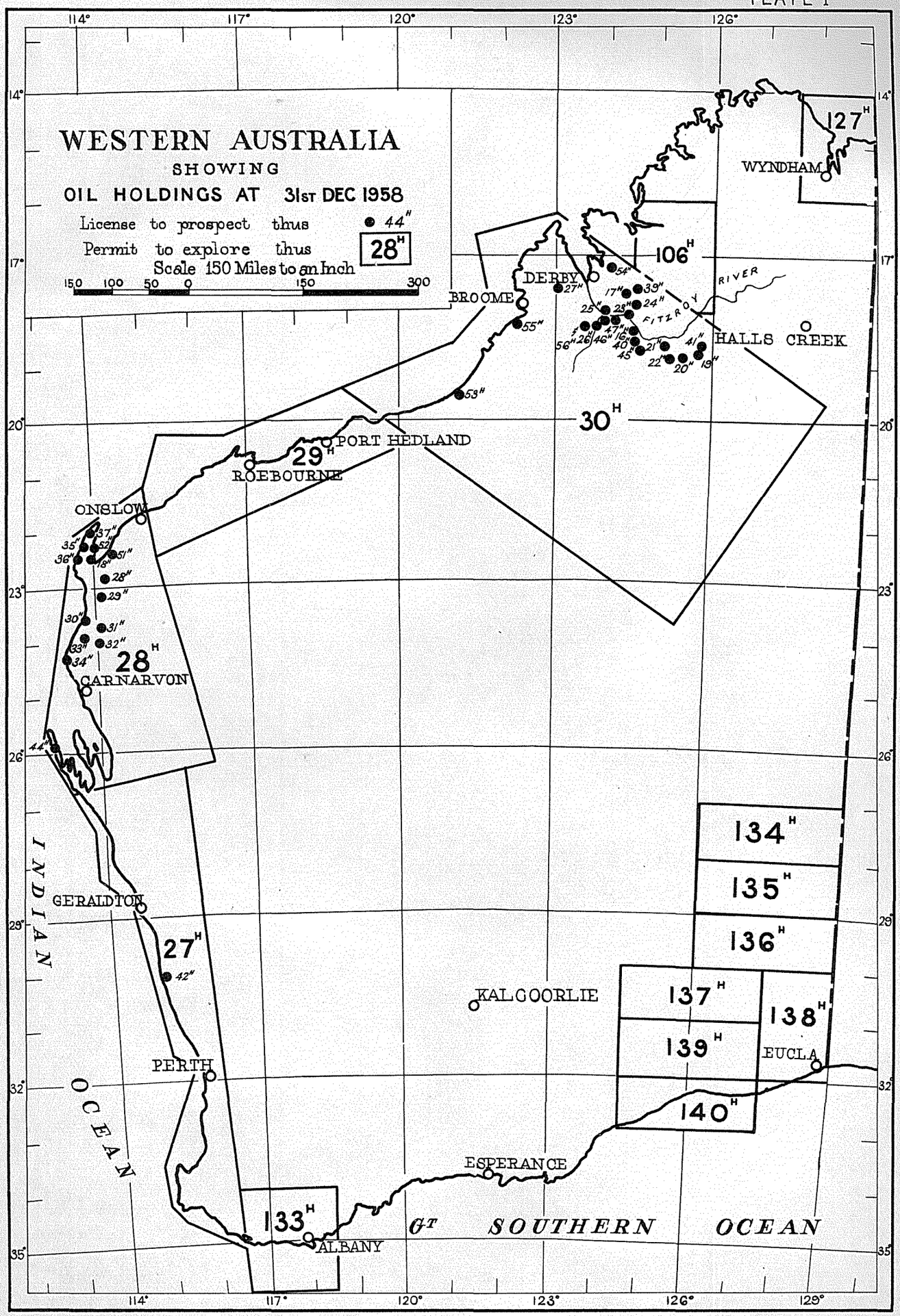
Other Activities:

West Australian Petroleum Pty. Ltd. continued geological and geophysical studies of their Permit Areas, particularly those lying in the Canning and Fitzroy Basins.

During the latter half of the year it was announced that the Shell Company had joined with West Australian Petroleum Pty. Ltd. in the search for oil in Western Australia.

The Bureau of Mineral Resources conducted aerial geophysical surveys near the Western Australian-Northern Territory border in the Joseph Bonaparte Gulf area.

PLATE I


WESTERN AUSTRALIA
SHOWING
OIL HOLDINGS AT 31ST DEC 1958
License to prospect thus 44H
Permit to explore thus 28H
Scale 150 Miles to an Inch
150 100 50 0 150 300
114° 117° 120° 123° 126° 129°
14° 17° 20° 23° 26° 29° 32° 35°
127H
WYNDHAM
106H
DERBY
BROOME
RIVER
FITZROY
HALLS CREEK
30H
29H
PORT HEDLAND
ROEBOURNE
ONSLOW
28H
CARNARVON
GERALDTON
27H
INDIAN OCEAN
PERTH
KALGOORLIE
134H
135H
136H
137H
138H
139H
140H
EUCLA
ESPERANCE
133H
ALBANY
GT SOUTHERN OCEAN

It is expected that Oil Drilling and Exploration (W.A.) Pty Ltd. will initiate general search activities early in 1959.

REPORT ON A GOLD FIND ON WILDARA STATION, LAWLERS DISTRICT, EAST MURCHISON GOLDFIELD.

Approx. Lat. 121° 00′ E.
Approx. Long. 28° 08′ S.

By G. H. Low, B.Sc.,
Geological Survey of W.A.

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INTRODUCTION.

On 2nd August, 1958, applications were lodged at the Mining Registrar's Office in Leonora for seven Prospecting Areas (P.A. 1505-1511 inclusive), and on 15th August, for two Prospecting Areas (P.A. 1512, 1513), each of 24 acres, by native stockmen usually employed on either Stuart Meadows or Weebo-Wildara sheep stations. A further application, (P.A. 1514) was made on 22nd August.

Consequent upon considerable quantities of gold being lodged in the Leonora Branch of the National Bank, the find was visited by the Senior Inspector of Mines, representatives of the Native Welfare Department and law enforcement officers from Kalgoorlie. Reporters for local newspapers were soon on the scene and considerable publicity was given to the find, the area concerned being dubbed the "Goanna Patch" by the press because the first nugget was said to have been found by a native when engaged in digging out a goanna hole.

On 13th August, the author was instructed to investigate and report on the geology of the find.

PRODUCTION.

The total recorded gold production from this area up to 31st August, 1958, is as follows:—

GOLD FROM WILDARA STATION.

July, 1958.

Bullion:

75 oz. 0 dwts. 12 grs. = 65.09 fine oz.

August, 1958.

Bullion:

23 oz. 7 dwts. 0 grs.—assay not yet available.

Total Gross Weight Lodged:

98 oz. 7 dwts. 12 grs.

LOCATION AND ACCESS.

Location:

The Wildara Gold find area is located on Wildara Station, Lawlers District, East Murchison Goldfield. The centre of the area is approximately 31 miles S. 85° E. from Lawlers townsite, in approximate latitude, 121° 00 E.; approximate longitude, 28° 08′ S.

Maps:

Reference may be made to the following:—

1. Lands Department Lithograph 170/80 (Loc. 3197-97).
2. Lands Department 10 mile Topographic Series, Sheet 8 (Wiluna).
3. Geological Sketch Map of W.A., G.S.W.A. 1956.
4. Figure 1 of this Report.

Access:

The author reached the area via Wilsons Patch and Weebo Homestead. There is a more direct but less well marked track running north-westerly from Wilsons Patch, and a similar one running east-north-easterly from the Leonora-Lawlers Road, from about 15 miles south of Lawlers.

TOPOGRAPHY.

Excepting for a low range of hills lying some five to six miles to the west, the country in the vicinity of the Wildara gold find, which will be referred to subsequently as "The Patch," is flat to slightly undulating. There are no water courses worthy of the name, and neither are there any regular depressions such as might have been at one time occupied by intermittent swamps or lakes.

The soil is for the most part a rich reddish-brown loam, generously sprinkled with quartz and ironstone particles with a size range from sand to small boulder. It is a typical "in situ" soil derived from the decomposition of underlying basic igneous and sedimentary rocks.

Westwards of "The Patch," the surface rises very gradually towards the range of low hills. These trend north-north-west, and have a length of some 16 to 18 miles. The highest points are some 300 feet (estimated only) above the general level of the plain. There are some intermittent, poorly developed water courses, the most significant of which are the so called Cody Creek, a tributary of Marshall Creek, and Marshall Creek itself, which rises on the south-eastern slopes of the range (subsequently herein called Ryan Range), and runs southward and then south-westwards to eventually lose itself on the sand covered terrain west of Doyle Well.

GENERAL GEOLOGY.

General references to the geology of the country between Lawlers, Darlot and Wilsons Patch can be found in G.S.W.A. Bulletins Nos. 28 (C. G. Gibson) and 84 (E. de C. Clarke).

Briefly, the country at and around "The Patch" is part of a narrow strip (up to 20 miles in width) of greenstone country, which extends from the Leonora-Malcolm area to about 25 miles north-east of Wiluna, a distance of some 230 miles. (See the Geological Sketch Map of W.A.). The country surrounding this greenstone is a granitic complex which, though usually itself devoid of auriferous formations, is now generally acknowledged to be responsible for the gold mineralisation in the greenstones.

The greenstone complex which originally consisted of nearly horizontal interbedded basic lava flows, tuffs, and sediments, has been very strongly folded, sheared and fractured by a variety of forces, not necessarily contemporaneous, the most important of which apparently was compressional from practically east and west, so that the outstanding character of these metamorphosed greenstones as we see them now, is folding and schistosity along axes trending a few degrees west of north, and shearing and fracturing at various angles to this.

Subsequent to the regional metamorphism, late stage acid emanations (quartz veins, both auriferous and non auriferous, porphyry dykes and pegmatites) penetrated the ruptured greenstones to an extent dependant upon a number of variable factors including source-pressure, temperature and accessibility of channels. In this respect it is important to remember that the feeding channel of an auriferous quartz vein could have been of limited width and breadth and could have been entirely removed by subsequent erosion, and that any quartz vein we prospect today could be only the "keel" or bottom part of the original formation.

Ryan Range is separated from the greenstone of "The Patch" by a narrow intrusive tongue of granitic rock. The sedimentary character of many of the rocks in the range is obvious at many places, but there are also present serpentinous rocks, felspathic amphibolites and dense fine grained zoisitic epidiorities derived from igneous rocks of basic composition.

All the rocks in the range are highly folded (many small anticlines and synclines were observed), but over-all the beds strike 340°-350° and dip to the *west* at about 60°-80°. This could be the highly folded western limb of a major anticline.

These folded beds are intruded in places by prominent quartz reefs which follow the country strike and appear to be vertical (they cross gullies and ridges in a practically undeviating line).

THE GOLD DEPOSIT.

General:

As noted previously "The Patch" carries a mantle of residual soil which effectively covers about 95 per cent. of the geology in this area. Whatever readings the author was able to take, showed that the schistosity (corresponding to the trend of the two longer dimensions of platy or flaky minerals), was inclined to the *east* at steep angles (65°-80°) while the strike was about 350°. It is suspected that the bedding has the same attitude. (See Fig. 2.)

Country rock, as far as could be seen, consists of strongly metamorphosed doleritic lavas and agglomerates in which schistosity and mineral alteration has been developed to varying degrees.

Some small patches of soil have a lighter appearance than the remainder, and these were pointed out to the author and his attention was drawn to the fact that the original find of a 20 oz. nugget and numerous smaller pieces, was on one of these patches (on P.A. 1505, eight chains N.W. of the S.E. corner peg). The question asked was: did the light coloured patches reflect an underlying area of unusual mineral composition, and if so, was this responsible for the concentration of gold?

The clue to the answer of this query was in the number of goanna holes found in these patches. Soil on the surface is always apt to be more strongly coloured than the lower layers, and the goannas, in the course of their excavations had brought up quantities of lighter coloured underlying soil and scattered it haphazardly in the neighbourhood of their front doors. The question of favourable mineral environment for gold accumulation does not enter into it except that the goannas would presumably, all things being equal, burrow in the softest ground available. Such ground might be found bordering the lines of most intense shearing and fracturing, and such lines might, during the period of auriferous emplacement, have been more easily traversed by gold bearing solutions.

Two kinds of quartz veins were observed on "The Patch." These were all in the vicinity of P.A. 1505 (covering the original find). Elsewhere the soil cover was too extensive to permit of more than an occasional reading of the schistosity. The first type of vein varies in width up to a possible maximum width of three feet, and lies in the plane of the schistosity. One such vein was partially exposed by a five feet pit and six shallow (one foot) trenches for about 30 yards northwards from the S.E. corner peg of P.A. 1505. About 20 oz. of specks and slugs of gold had been recovered along this 30 yards, by turning over the soil and "specking" and by panning. Not all of the soil in this 30 yards had been treated in this manner, there were some sections over a yard in length which remained untouched. The vein as exposed in the pit was about six inches wide and according to the prospector was yielding free gold after dollying and panning.

Another vein of this type had been exposed in an eight feet shaft, some seven chains to the north-west. Another parallel one, about one chain further west, appeared on extension of line, to pass very close to the original find, the ground in the vicinity of which presented a very confused appearance, having been dug and panned over a considerable area.

A 10 feet shaft had been sunk near the western boundary of P.A. 1505, five chains south of the N.W. corner peg. This shaft was being carried down on a thin quartz vein. The soil around the collar of the shaft had yielded a nugget of approximately 19 oz., and several smaller specks.

The second type of quartz vein was wider, up to 12 feet, and its strike was 30° to 40° east of north. These veins were receiving very little attention from the prospectors, although one said he had got gold from one of them after dollying and panning, and the author found a small patch of pyrite at one locality (4.3 chains west of the N.E. corner peg of P.A. 1505).

Both types of vein were considerably iron-enriched (limonite) at the surface and carried both translucent glassy quartz, and sugary quartz. The author was told that the best "colours" were usually found in the iron-enriched sugary portions.

The Gold and its Occurrence:

By the courtesy of the Deputy Master of the Royal Mint, the author was able to see some of the Wildara gold before leaving for the field. This gold (gross weight 21.79 troy oz.), consisted of pieces, mostly with two long dimensions, ranging in length up to 1.5 inches. A few of the larger pieces were of the order of 1.5 by 1.0 by 0.5 inches, and some of these pieces showed the effects of hammering. Although some pieces were smooth and worn, the majority were quite irregular in shape. No "wire" or crystalline gold was seen. Some small pieces of ironstone and some quartz were seen enwrapped in the gold.

A 19 oz. nugget (this was weighed on ordinary office scales, and the troy equivalent calculated, so the result is approximate) was examined by the author in Leonora. This nugget, in which no foreign matter could be seen with the naked eye, was shaped somewhat like a small automatic pistol, its maximum measurements being approximately 4.5 by 2.5 by 1.5 inches. This nugget was found in the vicinity of the 10 feet deep shaft near the western boundary of P.A. 1505 described above.

It had no angular prominences and was in fact, within the shape of its overall dimensions, quite rounded and smooth. A number of smaller pieces collected in the same vicinity were very irregular, and looked like much of the gold viewed at the Mint.

Despite the rounding of this nugget, and some of the smaller pieces, the author is convinced that the richness of "The Patch" is due to a concentration of gold relatively in situ. There is nothing in the present topography to suggest "The Patch" area is the base of any ancient drainage system. There are no waterworn sand, gravel or conglomerate particles and in fact all rock pieces of these dimensions seen in or on the soil were angular decaying fragments of the underlying country.

This gold is *not* alluvial gold contained in an ancient stream bed, but is *eluvial* gold, representing the concentration of gold from the superficial portions of the rock by removal of the light material by rains and winds. It is evident that there has been much secondary enrichment resulting from solution and reprecipitation of pre-existing primary and detrital gold.

THE GOLD PROSPECTS

From the foregoing remarks it can be seen that all of the gold so far recovered has been found in the detrital soil of "The Patch" area, mostly on or near P.A. 1505. A number of thin auriferous quartz veins, running with the country, traverse the area, and the eroded portions of these were, presumably, the immediate source of the gold.

The extent and number of these auriferous veins is not known at present, but as far as they persist along the strike there is a chance of soil in their vicinity carrying eluvial gold.

Four pits were being sunk on four of these veins at the time of the author's visit. The deepest was only 10 feet down, so that the condition of the veins at depth is not known at present.

Costeaning in an east-west direction north and south of P.A. 1505 might disclose other auriferous quartz veins worthy of detailed attention. Because of the flat topography, the dip of the veins, and the width of the zone in which these occur, loaming on its own would give confusing results.

REPORT ON DIAMOND DRILLING FOR GOLD G.M.L. 924—TRUE BLUE—BAMBOO CREEK CENTRE, PILBARA GOLDFIELD

By G. H. Low, B.Sc.
Geological Survey of W.A.

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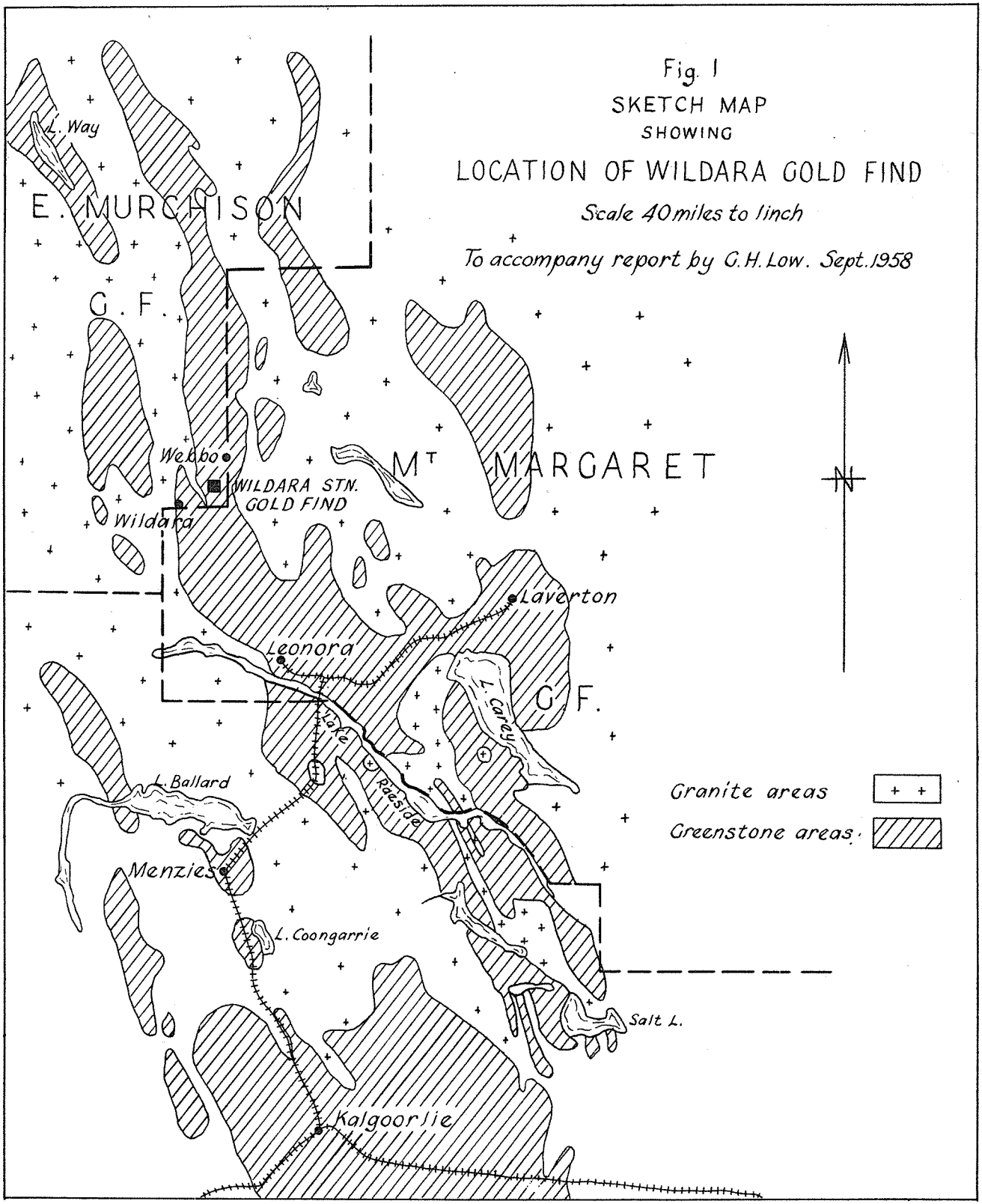


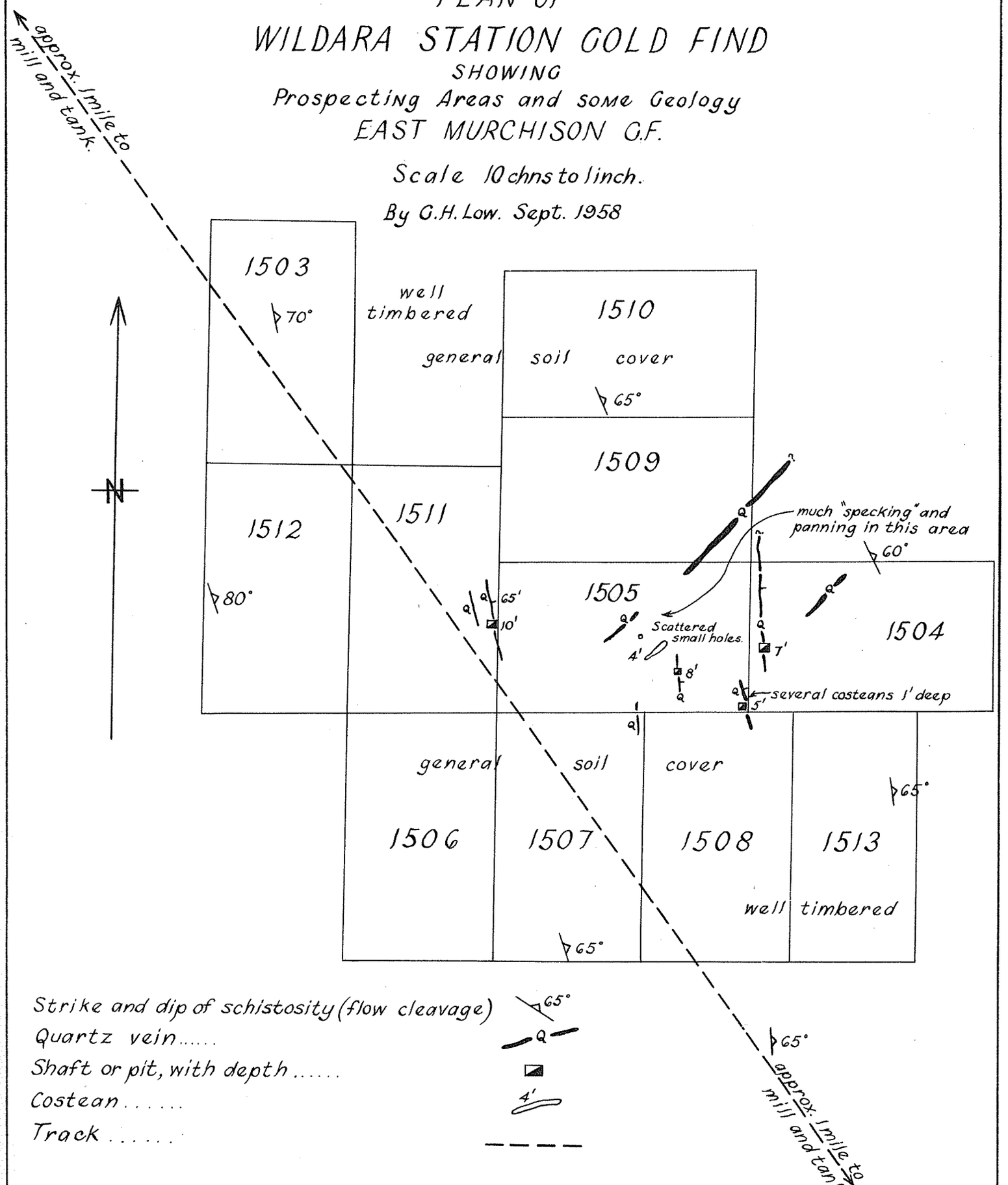
Fig. 1
SKETCH MAP
SHOWING
LOCATION OF WILDARA GOLD FIND
Scale 40 miles to 1 inch
To accompany report by C.H. Low. Sept. 1958
L. Way
E. MURCHISON
G. F.
Webbo
WILDARA STN.
GOLD FIND
Wildara
MT MARGARET
Laverton
Leonora
L. Carey
G. F.
Lake Raeside
L. Ballard
Menzies
L. Coongarrie
Salt L.
Kalgoorlie
Granite areas
Greenstone areas
N

Fig. 2

PLAN OF
WILDARA STATION GOLD FIND
SHOWING
Prospecting Areas and some Geology
EAST MURCHISON G.F.

Scale 10 chns to 1 inch.

By G.H. Low. Sept. 1958



Introduction:

The True Blue Gold Mine, G.M.L. 924, is located at Bamboo Creek Mining Centre, some 40 miles north-east of Marble Bar in the Pilbara Goldfield.

Up to 31st December, 1956, 93.76 fine ounces of gold have been recovered over the plates from 2,378.75 tons of ore, and the sands treatment has recovered an average of one ounce per long ton.

An application was made to the Mines Department by a syndicate of option holders for assistance to prove ore ahead of the workings by diamond drilling. The mine was geologically examined by officers of the Survey and subsequently recommended by the Government Geologist as suitable for diamond drilling. An agreement on drilling on a pound-for-pound basis was finalised in July, 1957 but it was not until December, 1957 that a drill became available and work was commenced on the first hole.

Geology:

The country rock on G.M.L. 924 is a talc chlorite carbonate schist which is a low grade dynamothermal metamorphic derivative of basic lavas of the Warrawoona Series. The planes of schistosity strike 310° to 315° and dip either vertically or at steep angles to the east. Felspar porphyry also crops out at places on the surface.

The north-west by south-east shear pattern dominates the structure, but there are a number of complementary tension fractures, striking at about 255° and dipping northwards at about 35° to 45°, which are the main ore carriers. This ore bearing structure pattern differs markedly from that of the "main" line of ore bodies at Bamboo Creek which conforms with the schistosity.

Typical ore from the True Blue consists of blue grey quartz carrying pyrite and variable amounts of galena, wolframite, scheelite and gold.

The main shaft of the present True Blue workings has been sunk to 80 feet on the eastern side of a main central shear which strikes 310° and dips vertically. The ore body is stoped upwards for 30 feet from the 80 feet level. A narrow quartz vein (up to two feet thickness) follows the central shear and the prospector drove along this for some 10 feet at the 50 feet level before striking the cross quartz reef, the well defined hanging wall of which strikes 255° and dips 35° to the north, which constituted the ore in the 30 feet stope now opened up.

Selection of Drill Sites:

Because of the paucity of significant outcrops and the limited (and apparently haphazard) development in the mine, the selection of drill hole sites was a particularly onerous task. However, the type of ore (similar in many respects to the Bonnie Doone and Nil Desperandum ores), and the general structure pattern suggested that the main ore carriers would be cross reef structures, which are notoriously discontinuous except in the en echelon sense, and accordingly the first hole was planned to intersect the dip projection 80 feet ahead of the workings and some 20 feet east of the central shear. The second hole was planned to check a deeper continuation, again some 20 feet from the central shear which was regarded as a limiting structure, and the third hole was planned to intersect the ore body some 30 feet lower than in the second hole, but about 80 feet eastwards along the strike. The second and third sites were selected as earlier results became available. The limited distances between the target areas was due to the necessity of feeling the way, in uncertain structural conditions.

Drilling Results:

The bulk of the core is identified as talc chlorite carbonate schist carrying both regular and irregular carbonate and quartz carbonate veins. Felspar porphyry was found in the core of the first hole from 392 feet to the total depth of 405 feet, and also in the second hole from 236 feet to 276 feet. The third hole was planned to avoid cutting the porphyry. Pyrite in massive-crystalline and fine-granular form is common in all the core.

The mineralised portions are on the whole much better defined than those in the "main" line of lodes (which latter includes the Prophecy-Perseverance and Kitchener line). *Bedding adjacent to the more important mineralised portions is distinctly transverse to the schistosity, but some mineralisation along the schistosity is not entirely excluded.* Summarised core logs and the results of sample assays for each of the three holes, are given in the following tables:—

PILBARA DIAMOND DRILLING.

Locality: Bamboo Creek, G.M.L. 924 ("True Blue").
D.D.H. No. 20, Site B16 (True Blue No. 1). Machine Used: A2000.
Angle of Depression: 30°. Core Size: AXT.
Azimuth of Hole at Surface: S.47°E. Contractor: K. McCallum.
Date Commenced: 7/12/57. Date Completed: 23/12/57.
Location of Site B16: 265 ft. N.47°W. from centre of "True Blue" Main Shaft.

Core Log.

Depth From	Depth To	Width	Core Recovered	Description
ft.	ft.	ft.	ft. in.	
0	30	30	*Nil*	
30	154	124	81 6	Talc chlorite schist—dark grey or green, with some bright green serpentine developments. Some sedimentary remnants bedded at 70° to axis. Irregular quartz carbonate veinlets. Some pyrite. Schistosity at 35° to axis of core.
154	173	19	19 0	Irregular quartz veins in silicified schist. Some pyrite. Some irregular carbonate veinlets.
173	292	119	118 0	Talc chlorite schist—dark grey and green, with irregular quartz carbonate veins. Some light grey sheared rock at end.
292	303	11	11 0	Silicified talc chlorite schist carrying quartz and quartz carbonate veins with pyrite.
303	392	89	78 7	Talc chlorite schist—green to dark green. Irregular quartz carbonate veins. Some quartz carbonate veins carrying pyrite at 318 ft., 328 ft., 389 ft. Schistosity at 15° to core axis.
392	405	13	8 0	Felspar porphyry — grey-green with white felspar phenocrysts.
				END OF HOLE.

Assay Results.

Sample No.	Borehole Depth From		Borehole Depth To		Core Length	Assay/ long ton
	ft.	in.	ft.	in.	in.	dwts.
T.B. 1	154	0	157	0	36	Less than 0·1
T.B. 2	157	0	160	0	36	do.
T.B. 3	167	0	170	0	36	do.
T.B. 4	170	0	173	0	36	27·75
T.B. 5	292	0	295	0	36	2·80
T.B. 6	295	0	298	0	36	13·64
T.B. 7	298	0	301	0	36	2·35
T.B. 8	301	0	303	0	36	0·27
T.B. 9	318	0	321	0	36	0·92
T.B. 35	160	0	163	6	42	Less than 0·1
T.B. 36	163	6	167	0	42	do.
T.B. 37	173	0	176	0	36	do.
T.B. 38	176	0	179	0	36	do.
T.B. 39	179	0	182	0	36	do.
T.B. 40	182	0	185	0	36	1·64
T.B. 41	185	0	188	0	36	1·14
T.B. 42	188	0	191	0	36	Less than 0·1
T.B. 43	191	0	194	0	36	do.
T.B. 44	194	0	197	0	36	do.
T.B. 45	197	0	200	0	36	do.
T.B. 46	200	0	204	0	48	2·60
T.B. 47	204	0	207	0	36	10·01
T.B. 48	207	0	210	0	36	0·94
T.B. 49	210	0	213	0	36	Less than 0·1

PILBARA DIAMOND DRILLING.

Locality: Bamboo Creek, G.M.L. 924 ("True Blue"). D.D.H. No. 21, Site B16 (True Blue No. 2). Machine Used: A2000.

Angle of Depression: 59°. Core Size: AXT.

Azimuth of Hole at Surface: S.42°E. Contractor: K. McCallum.

Date Commenced: 27/12/57. Date Completed: 17/1/58.

Location of Site B16: 265 ft. N.47°W. from centre of "True Blue" Main Shaft.

Core Log.

Depth From	Depth To	Width	Core Recovered	Description
ft.	ft.	ft.	in.	
0	40	40	*Nil*	
40	150	110	107 3	Talc chlorite schist, grey-green with some green serpentine in places. Some pyrite with quartz carbonate veins. Schistosity at 30° to core axis. Some slight folding at 139 ft.
150	162	12	12 0	Silicified talc schist and blue-grey quartz veins carrying fine pyrite and arsenopyrite.
162	236	74	70 0	Talc chlorite schist—grey-green with irregular quartz carbonate veins. Some pyrite mineralisation at 171 ft., 177 ft., 224 ft. Schistosity at 30° to core axis.
236	276	40	38 6	Felspar porphyry—grey-green with white felspar phenocryst.
276	349	73	72 0	Talc chlorite carbonate schist, dark grey-green, with some pyrite with quartz carbonate at 286 ft. END OF HOLE.

Assay Results.

Sample No.	Borehole Depth From	Borehole Depth To	Core Length	Assay/ long ton
	ft. in.	ft. in.	in.	dwts.
T.B. 50	103 0	106 0	36	Less than 0·1
T.B. 51	106 0	109 0	36	do.
T.B. 10	150 0	153 0	36	0·34
T.B. 11	153 0	156 0	36	15·41
T.B. 12	156 0	159 0	36	4·82
T.B. 13	159 0	162 0	36	Less than 0·1
T.B. 14	171 0	174 0	36	do.
T.B. 15	177 0	180 0	36	3·27
T.B. 17	224 0	227 0	36	5·89
T.B. 16	286 0	289 0	36	1·86

PILBARA DIAMOND DRILLING.

Locality: Bamboo Creek G.M.L. 924 ("True Blue"). D.D.H. No. 22, Site B17 (True Blue No. 3). Machine Used: A2000

Angle of Depression: 35°. Core Size: AXT.

Azimuth of Hole at Surface: S.17°E. Contractor: K. McCallum.

Date Commenced: 28/1/58. Date Completed: 1/2/58.

Location of Site B17: 380 ft. N.25°W. of "True Blue" Main Shaft.

Core Log.

Depth From	Depth To	Width	Core Recovered	Description
ft.	ft.	ft.	ft. in.	
0	22	22	*Nil*	
22	187	165	131 0	Talc chlorite schist, serpentinous in places, light to dark green. Carbonate veins mainly in schistosity at 20° to 30° to core core axis.
187	188½	1½	1 6	Quartz carbonate vein in talc chlorite schist. Carrying pyrite.
188½	207	18½	6 6	Talc chlorite schist—green to dark green.
207	217	10	10 0	Quartz veins and silicified schist. Quartz dark blue grey. Carries pyrite and arsenopyrite. Bedding at 75° to 80° to core axis.
217	240	23	23 0	Talc chlorite schist—dark green with carbonate veins.
240	251	11	11 0	Quartz veins and silicified schist. Quartz—dark blue grey at 85° to core axis, carrying pyrite and arsenopyrite.
251	256	5	5 0	Talc chlorite schist. Some pyrite; partly silicified.
256	274	18	18 0	Quartz veins and silicified schist. As at 240 ft. to 251 ft.
274	306	32	32 0	Talc chlorite schist—dark grey green with irregular carbonate veins. Schistosity at 30° to core axis. END OF HOLE.

Assay Results.

Sample No.	Borehole Depth From	Borehole Depth To	Core Length	Assay/ long ton
	ft. in.	ft. in.	in.	dwts.
T.B. 18	187 0	188 6	18	Trace
T.B. 19	207 0	210 0	36	Trace
T.B. 20	210 0	212 0	24	Trace
T.B. 21	212 0	215 0	36	Trace
T.B. 22	215 0	217 0	24	1·1
T.B. 23	240 0	241 0	12	Trace
T.B. 24	241 0	244 0	36	10·93
T.B. 25	244 0	247 0	36	Trace
T.B. 26	247 0	250 0	36	Trace
T.B. 27	250 0	253 0	36	Trace
T.B. 28	253 0	256 0	36	Trace
T.B. 29	256 0	259 0	36	Trace
T.B. 30	259 0	262 0	36	Trace
T.B. 31	262 0	265 0	36	Trace
T.B. 32	265 0	268 0	36	1·93
T.B. 33	268 0	272 0	48	3·45
T.B. 34	272 0	274 0	24	16·89

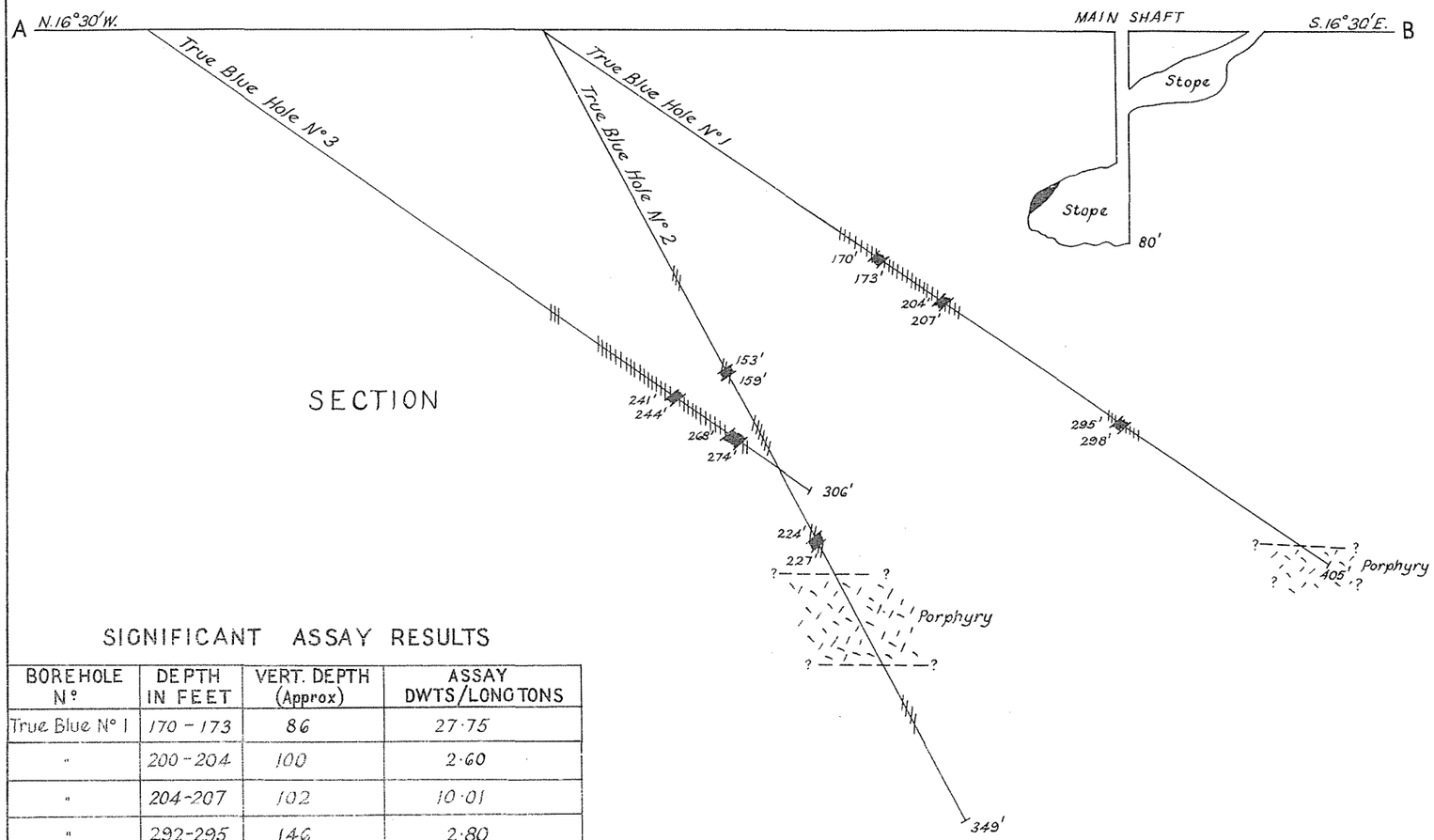
Interpretations of Results:

The drilling has confirmed that there are a number of parallel mineralised quartz veins with an average strike of 255° and dipping at about 35° to 40° to the north-north-east. A vertical central shear, striking 310°, also carries some gold. The True Blue main shaft has been sunk on the eastern side of this shear.

The structure pattern, viewed broadly, suggests that the main True Blue ore carriers are tension cracks developed as a result of earth movement, with the block on the northern side of the main shear, having moved westward relative to the block on the southern side.

The writers opinion is that the ore bodies, though rich in places, are small and discontinuous (in the mining sense). They could probably provide a good livelihood for a small active syndicate of workers, but in no way constitute a company mining proposition.

PLATE II



SECTION

SIGNIFICANT ASSAY RESULTS

BOREHOLE N°	DEPTH IN FEET	VERT. DEPTH (Approx)	ASSAY DWTS/LONG TONS
True Blue N° 1	170 - 173	86	27·75
"	200 - 204	100	2·60
"	204-207	102	10·01
"	292-295	146	2·80
"	295-298	148	13·64
"	298-301	150	2·35
True Blue N°2	153 - 156	131	15·41
"	156 - 159	135	4·82
"	177-180	153	3·27
"	224-227	195	5·89
True Blue N° 3	241-244	139	10·93
"	265-268	153	1·93
"	268-272	155	3·45
"	272-274	157	16·89

LEGEND

Assay in excess of 5dwts per long ton.....

Assayed Sections

Fault Line

G.S.W.A.

PLAN AND SECTION

OF

BOREHOLES N^os 1-3

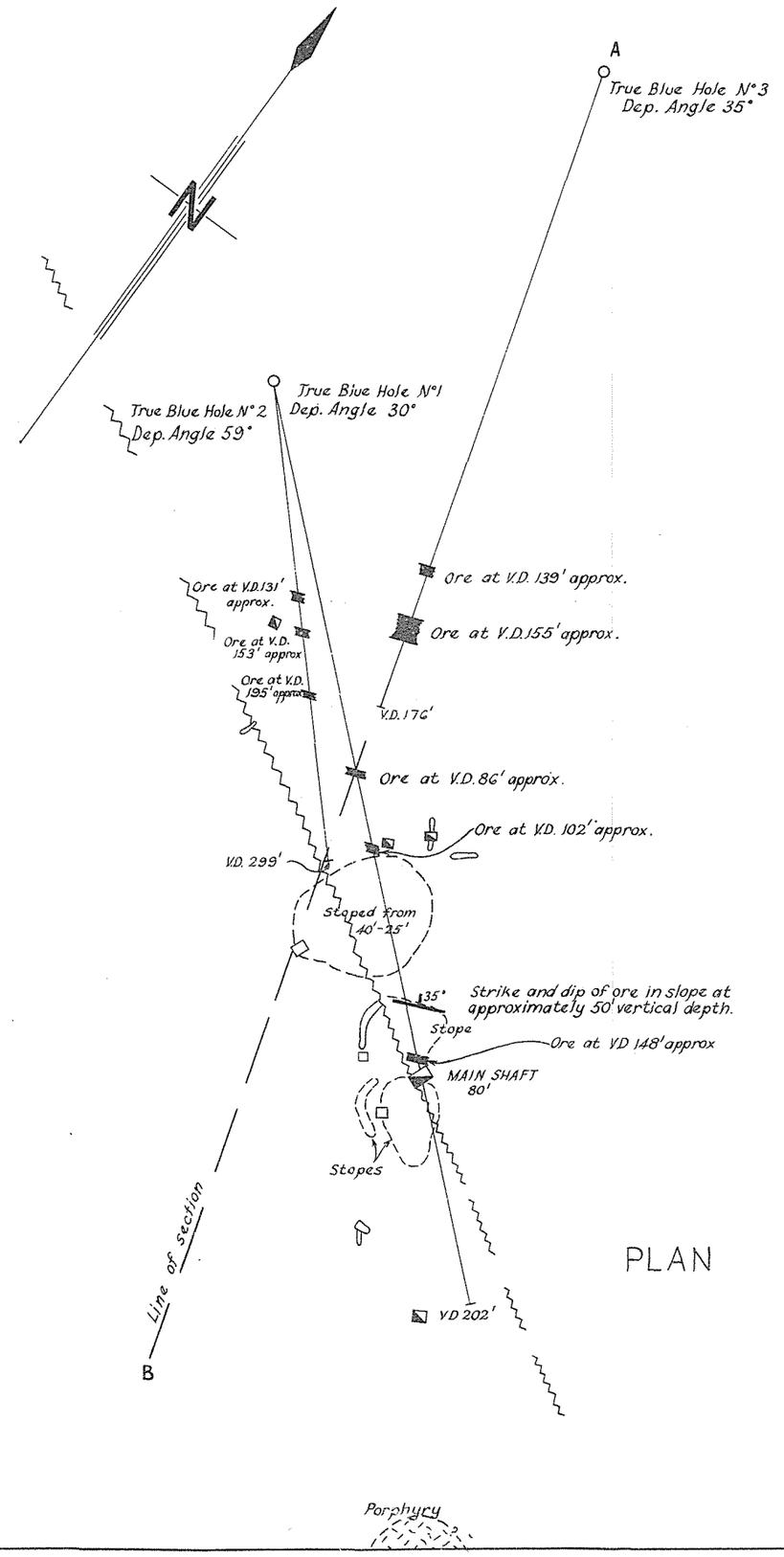
"TRUE BLUE" GML 924

BAMBOO CK – PILBARA G.F.

Scale: 60 feet = 1 inch

Survey and Geology by G.H. Low May 1958

N.B: Vertical Section plane is along azimuth of Hole N°3. Other details have been projected onto plane.



PLAN

MT. MORGANS DRILLING.

D.D.H. No. M1.

Hole No.: M1, Site No. 1. Machine Used: Mindrill A2000.

Position of Collar: On a bearing of 237° True from southern corner of G.M.L. 505F, distance 225 feet.

Angle of Depression: 45°. Core Size: AXT.

Azimuth: 241° (True). Contractor: L. C. Honey.

Depth: 756 feet.

Date Commenced: 2/12/57. Date Completed: 17/1/58.

Object: To test downward continuation of mineralisation and explore structure of lode system of main Mt. Morgans mine.

Logged by: J. W. Duggan.

Assays by: Kalgoorlie School of Mines.

Core Log.

From	To	Description
ft. ins.	ft. ins.	
0 0	67 0	Massive, medium to coarse grained greenstone.
67 0	108 0	Sheared medium to coarse grained greenstone—shearing at 50° to core axis.
108 0	176 6	Dense, massive fine grained greenstone.
176 6	184 0	Felspar porphyry.
184 0	198 0	Dense, massive fine grained greenstone.
198 0	207 6	Felspar porphyry.
207 6	313 10	Dense, massive fine grained greenstone.
313 10	322 0	Felspar porphyry.
322 0	382 6	Fine to medium grained massive greenstone.
382 6	394 3	Sheared fine grained greenstone—shearing at 45° to core axis.
394 3	411 10	Folded and faulted B.I.F. with some silicification and weak to fair mineralisation—bedding angle at 45° to core axis.
411 10	416 6	Mineralised porphyry.
416 6	418 3	Strongly folded, faulted B.I.F. with fair mineralisation—bedding angle averages 45° to core axis.
418 3	444 2	Mineralised porphyry.
444 2	477 7	Folded and faulted B.I.F. with some silicification and carbonation, fairly well mineralised. Bedding angle averages 45° to core axis.
477 7	478 9	Sheared fine grained greentone.
478 9	489 0	Massive fine grained greentone.
489 0	490 3	Siliceous, densely mineralised lode material, traversed by fine quartz veinlets.
490 3	501 10	Felspar porphyry.
501 10	504 5	Siliceous, densely mineralised carbonated lode material with bedding angle at 45° to core axis.
504 5	506 1	Sheared fine grained greenstone with a little mineralisation. Shearing at 45° to core axis.
506 1	509 6	Folded carbonated fine grained greenstone.
509 6	513 4	Felspar porphyry.
513 4	565 3	Well sheared fine grained greenstone—shearing at 60° to core axis.
565 3	575 9	Felspar porphyry.
575 9	610 7	Strongly sheared fine grained greenstone; possibly represents a strong fault. Angles of shearing to core axis at 580 ft. to 80° at 590 ft. to 80° at 600 ft. to 65°
610 7	611 11	Barren quartz vein.
611 11	624 0	Folded, fine grained greentone, bedding at 35° to core axis.
624 0	626 9	Felspar porphyry.
626 9	636 2	Folded, fine grained greenstone, bedding at 45° to core axis.
636 2	756 0	Dense massive fine grained greenstone.
		END OF HOLE.

Assay Results.

D.D.H. No. M1.

Mount Morgans.

From	To	Core Length	True Width	Assay
ft. ins.	ft. ins.	ins.	ins.	dwts./ton
394 3	396 3	24	17	Trace
396 3	398 3	24	17	3·29
398 3	400 3	24	17	2·75
400 3	402 3	24	17	Trace
402 3	404 3	24	17	Trace
404 3	406 3	24	17	Trace
406 3	408 3	24	17	0·45
408 3	410 3	24	17	1·63
410 3	411 10	19	13	5·40
411 10	411 2	24	17	Trace
414 2	416 6	24	17	1·63
416 6	418 3	24	17	Trace
418 3	420 3	24	17	Trace
420 3	422 3	24	17	Trace
422 3	424 3	24	17	Trace
424 3	426 3	24	17	Trace
426 3	428 3	24	17	Trace
428 3	430 3	24	17	Trace
430 3	432 3	24	17	Trace
432 3	434 3	24	17	Trace
434 3	436 3	24	17	Trace
436 3	438 3	24	17	Trace
438 3	440 3	24	17	Trace
440 3	442 3	24	17	Trace
442 3	444 2	23	16	Trace
444 2	446 2	24	17	3·80
446 2	448 2	24	17	Trace
448 2	450 2	24	17	0·25
450 2	452 2	24	17	1·72
452 2	454 2	24	17	Trace
454 2	456 2	24	17	Trace
456 2	458 2	24	17	Trace
458 2	460 2	24	17	Trace
460 2	462 2	24	17	Trace
462 2	464 2	24	17	3·94
464 2	466 2	24	17	1·40
466 2	468 2	24	17	4·28
468 2	470 2	24	17	0·20
470 2	472 2	24	17	Trace
472 2	474 2	24	17	Trace
474 2	476 2	24	17	Trace
476 2	477 7	17	12	0·70
477 7	478 9	14	10	Trace
489 0	490 3	15	11	Trace
501 10	502 8	10	7	Trace
502 8	503 6	10	7	Trace
503 6	504 5	11	8	Trace
504 5	506 1	20	14	Trace
610 7	611 11	16	11	Trace

MT. MORGANS DRILLING.

D.D.H. No. M2.

Hole No.: M2, Site No. 1. Machine Used: Mindrill A.2000.

Position of Collar: On a bearing 237° True from southern corner of G.M.L. 505F, distance 225 feet.

Angle of Depression: 60°. Core Size: AXT.

Azimuth: 241°T. Contractor: L. C. Honey.

Date Commenced: 18/1/57. Depth at 27/2/58: 908 feet.

Object: To test downward continuation of mineralisation and explore structure of main Mt. Morgans mine.

Logged by: J. W. Duggan.

Assays by: School of Mines, Kalgoorlie.

Core Log.

From	To	Description
ft. ins.	ft. ins.	
0 0	92 0	Massive, coarse grained greenstone.
92 0	111 2	Bedded, fine grained sandstone, bedding angle at 60° to core axis
111 2	215 2	Massive, medium grained greenstone.
215 2	286 0	Dense, massive fine grained greenstone.
286 0	307 9	Porphyry.
307 9	423 6	Dense, massive fine grained greenstone.
423 6	458 0	Massive, medium grained greenstone.
458 0	460 5	Porphyry.
460 5	487 3	Dense, massive fine to medium grained greenstone.
487 3	498 6	Dense, massive fine grained greenstone.
498 6	500 11	Porphyry.
500 11	512 0	Dense, massive fine grained greenstone.
512 0	527 5	Porphyry.
527 5	537 2	Sheared, fine grained greenstone, shearing at 40° to core axis.
537 2	539 0	Sheared, mineralised, fine grained greenstone.
539 0	557 9	Mineralised, silicified B.I.F., bedding angle 35° to 45° to core axis.
557 9	565 0	Porphyry.
565 0	569 6	Sheared, fine grained greenstone, shearing at 50° to core axis.
569 6	577 8	Massive, medium grained greenstone.
577 8	588 0	Porphyry.
588 0	607 2	Silicified, mineralised B.I.F., bedding angle 50° to core axis.
607 2	620 10	Porphyry.
620 10	635 2	Silicified, mineralised B.I.F., bedding angle 50° to core axis.
635 2	643 6	Sheared, fine grained greenstone, with some mineralisation.
643 6	648 9	Porphyry.
648 9	653 6	Sheared, fine grained greenstone, shearing at 60° to core axis.
653 6	657 0	Porphyry.
657 0	711 11	Sheared, fine grained greenstone, shearing at 60° to core axis.
711 11	721 0	Porphyry.
721 0	751 7	Sheared, fine grained greenstone, shearing angles 50° to 60° to core axis.
751 7	753 6	Sheared, mineralised fine grained greenstone.
753 6	761 3	Porphyry.
761 3	766 0	Silicified, mineralised B.I.F., bedding angles 30° to 60° to core axis.
766 0	848 5	Sheared, fine grained greenstone.
848 5	908 6	Dense, massive, fine grained greenstone.

Hole in progress, will continue to at least 1,000 feet.

Assay Results.
D.D.H. No. M2.
Mount Morgans.

From	To	Core Length	True Width	Assay	
				dwts./	
ft. ins.	ft. ins.	ins.	ins.	ton	
537 2	539 0	22	15	Trace	
539 0	541 0	24	17	1·49	
541 0	543 0	24	17	2·08	
543 0	545 0	24	17	3·25	
545 0	547 0	24	17	1·20	225 in. at
547 0	549 0	24	17	1·12	3·5 dwts.
549 0	551 0	24	17	Trace	
551 0	553 0	24	17	Trace	
553 0	555 0	24	17	1·20	
555 0	557 9	33	23	16·31	
588 0	590 0	24	18	2·06	
590 0	592 0	24	18	Trace	
592 0	594 0	24	18	1·02	
594 0	596 0	24	18	0·86	230 in. at
596 0	598 0	24	18	Trace	0·45 dwts.
598 0	600 0	24	18	Trace	
600 0	602 0	24	18	0·60	
602 0	604 0	24	18	Trace	
604 0	606 0	24	18	Trace	
606 0	607 2	14	10	Trace	
620 10	622 10	24	18	Trace	
622 10	624 10	24	18	Trace	
624 10	626 10	24	18	Trace	172 in. at
626 10	628 10	24	18	Trace	Trace
628 10	630 10	24	18	Trace	
630 10	632 10	24	18	Trace	
632 10	635 2	28	21	Trace	
635 2	636 7	17	Unknown	Trace	12 in. Recovered
636 7	638 6	23	Unknown	Trace	16 in. Recovered
638 6	639 6	12	Unknown	Trace	9 in. Recovered
639 6	640 4	10	Unknown	Trace	2 in. Recovered
640 4	642 0	20	Unknown	Trace	10 in. Recovered
642 0	643 6	18	Unknown	Trace	
751 7	753 6	23	20	Trace	
761 3	763 7	28	22	Trace	57 in. at
763 7	766 0	29	23	0·49	0·25 dwts.

MT. MORGANS DRILLING

D.D.H. No. M3

Hole No.: M3, Site No. 2.

Position of Collar: On a bearing 228½° True from southern corner of G.M.L. 505F, distant 80 feet.

Angle of Depression: 60°. Machine Used: Mindrill A2000.

Azimuth: 241° T. Core Size: AXT.

Date Commenced: 18/3/58. Contractor: L. Honey.

Object: To test the downward continuation of mineralisation and explore the structure at depth of the main Mt. Morgans mine.

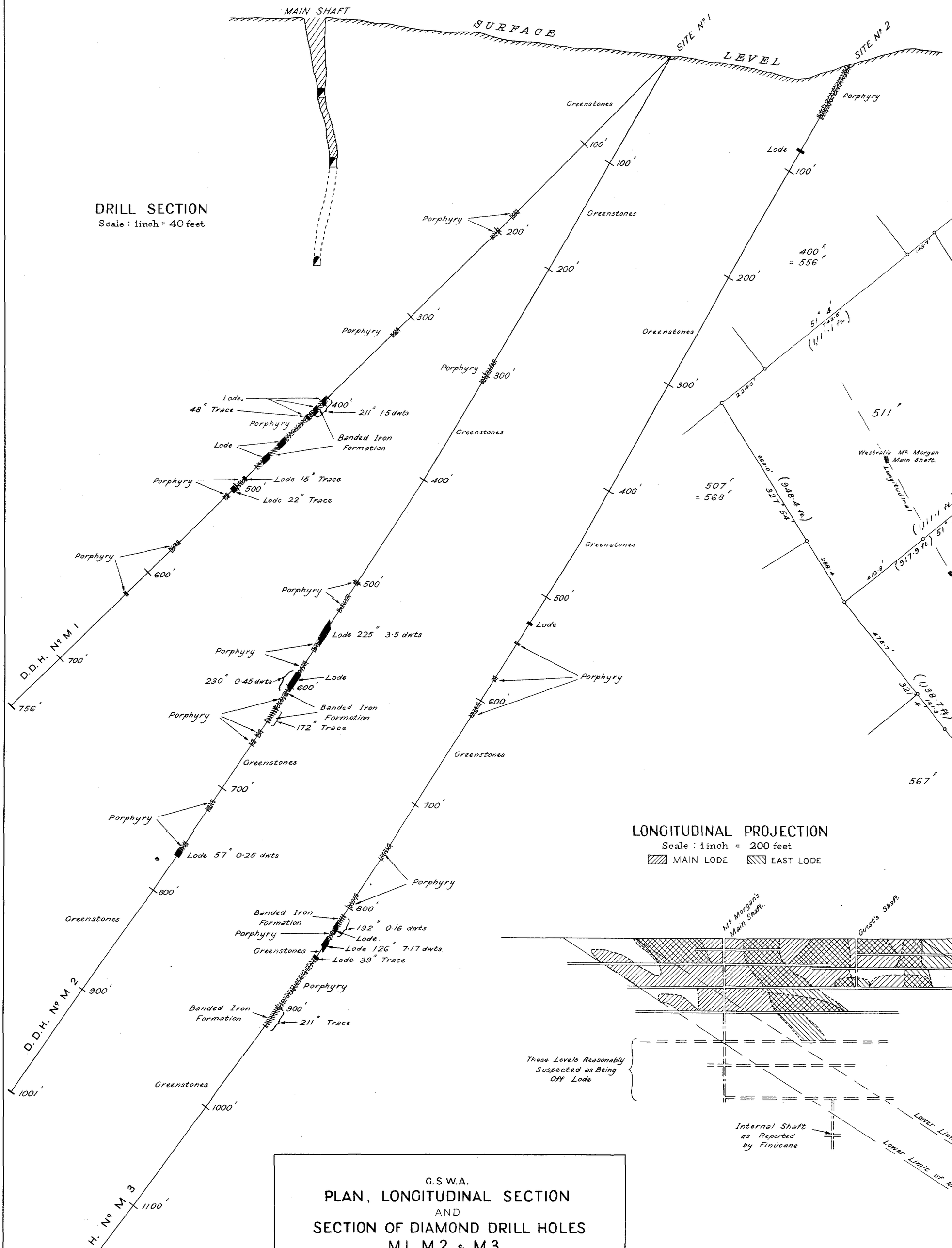
Logged by: A. J. Noldart. Completed depth: 1206 feet.

Assays by: School of Mines, Kalgoorlie. Date of Completion: 3/5/58.

Summarised Core Log

From	To	Description
ft. in.	ft. in.	
0 0	50 0	Weathered and kaolinised porphyry.
50 0	73 6	Medium grained greenstone with blebs of ferro-magnesian minerals —porphyritic in texture.
73 6	77 6	Fine grained greenstones.
77 6	80 10	Medium grained blebby greenstone as above.
80 10	82 4	Highly siliceous with coarse pyritic mineralisation.
82 4	121 3	Medium grained blebby greenstone as above.
121 3	130 0	Fine grained dark (volcanic ?) greenstone—very sharp contact with rocks above and below bedding 52° to core axis. Cleavage 60°–70°.
130 0	294 5	Medium grained green blebby greenstone as above with occasional fine grained bands.
294 5	358 0	Actinolite schist—gradation from above.
358 0	388 6	Sheared actinolite schist.
388 6	518 0	Fine-medium grained greenstones.
518 0	524 6	Dark grey, fine grained (volcanic ?) greenstone.
524 6	526 0	Highly siliceous with coarse pyrite.
526 0	527 6	Ditto, grading to fine grained greenstones.
527 6	542 10	Fine-medium grained greenstones.
542 10	544 4	Black felspar porphyry.

DRILL SECTION
Scale : 1 inch = 40 feet



PLAN
Scale : 1 inch = 200 feet.

LONGITUDINAL PROJECTION
Scale : 1 inch = 200 feet

▨ MAIN LODE ▨ EAST LODE

G.S.W.A.

PLAN, LONGITUDINAL SECTION AND SECTION OF DIAMOND DRILL HOLES M1, M2 & M3

Westralia Mt. Morgans G.M.
Mt. Margaret G.F.

By A.J. Noldart and J. Duggan 1958

From	To	Description
ft. in.	ft. in.	
544 4	577 8	Fine grained siliceous greenstone.
577 8	580 6	Black siliceous felspar porphyry.
580 6	582 9	Sheared greenstone.
582 9	602 3	Porphyritic greenstone.
602 3	615 3	Black felspar porphyry—sharp contact with rocks above and below bedding 45° to core axis.
615 3	738 3	Medium-fine grained greenstone with occasional small shears.
738 3	751 9	Black felspar porphyry.
751 9	787 0	Medium-fine grained greenstone.
787 0	799 3	Sheared greyish felspar porphyry—quartz schist like.
799 3	807 6	Medium-fine grained greenstone becoming sheared.
807 6	823 6	Contorted greenish B.I.F. with pyrite.
823 6	829 9	Sheared greyish felspar porphyry—quartz schist like.
829 9	840 3	Black B.I.F. contorted in part.
840 3	847 0	Highly sheared greenstone.
847 0	850 3	Quartz lode with pyrite.
850 3	882 0	Sheared greyish felspar porphyry—quartz schist.
882 0	900 0	Felspar porphyry.
900 0	919 0	Sheared and contorted green B.I.F. 2 inches, quartz 918 feet 11 inches.
919 0	988 0	Highly sheared greenstone.
988 0	1,010 0	Tuffaceous greenstone sheared in places.
1,010 0	1,057 6	Sheared medium grained greenstone. (Tuffaceous ?).
1,057 6	1,065 0	Greyish sheared medium grained greenstone.
1,065 0	1,066 0	Sheared pale green greenstone.
1,066 0	1,206 0	Footwall country rock.
		END OF HOLE.

Assay Results

D.D.H. No. M3, Site 2

Mt. Morgans

Sample	From	To	Core	Assay	
No.	ft. in.	ft. in.	in.	dwts./ton	
M89	80 10	82 4	18	Trace	
M90	358 0	361 6	42	Trace	
M91	521 6	524 6	36	Trace	
M92	524 6	526 0	18	Trace	
M93	580 6	582 9	27	Trace	
M94	807 6	810 6	36	Trace	Average
M95	810 6	813 6	36	Trace	0·16 inches
M96	813 6	816 6	36	Trace	dwt./ton
M97	816 6	820 0	42	0·45	over
M98	820 0	823 6	42	2·06	192 inches.
M99	823 6	826 6	36	Trace	
M100	826 6	829 9	39	Trace	
M101	829 9	832 6	33	2·53	Average 7·17
M102	832 6	835 0	30	21·17	dwt./ton
M103	835 0	837 6	30	Trace	over
M104	837 6	840 3	33	5·60	126 inches.
M105	840 3	843 9	42	Trace	
M106	843 9	847 0	39	Trace	
M107	847 0	850 3	39	Trace	
M108	850 3	853 10	43	Trace	
M109	900 0	903 3	39	Trace	
M110	903 3	906 6	39	Trace	
M111	906 6	909 9	39	Trace	
M112	909 9	913 0	39	Trace	
M113	913 0	916 3	39	Trace	
M114	916 3	919 3	36	Trace	
M115	919 3	922 3	36	Trace	
M116	922 3	925 3	36	Trace	
M117	925 3	928 3	36	Trace	
M118	928 3	931 3	36	Trace	
M119	1,054 6	1,057 6	36	Trace	
M120	1,057 6	1,061 0	42	Trace	
M121	1,061 0	1,065 0	48	Trace	
M122	1,065 0	1,066 0	12	Trace	

NOTES ON THE SUPPLY OF ARTESIAN AND SUB-ARTESIAN WATER IN THE FITZROY BASIN

J. Wyatt—Geologist, G.S.W.A.

Introduction:

The successful exploitation of artesian and sub-artesian water supplies in the Fitzroy Basin presents a far greater problem than that of the Canning Basin, south of Broome.

Therefore, whilst it is believed that the Fitzroy Basin is more suited to irrigation as regards both water supplies and soil types, the recovery of this water will require a more specialised approach under geological supervision.

It is for this purpose that three maps have been produced to accompany this report, they are as follows:—

Plate 1.—Shows the generalised geology of the basin.

Plate 2.—Outlines the areas most suitable for the location of bores to tap the Poole Sandstone aquifer and includes topographic contours at 100' intervals.

Plate 3.—Is a structure contour map of the top of the Poole Sandstone, the most important aquifer in the area.

This appraisal and the accompanying maps have been prepared by the writer from information supplied by W.A. Petroleum Ltd., and from data contained in the Bureau of Mineral Resources "Preliminary Report on the Geology of the Fitzroy Basin" by D. J. Guppy, 1953.

Explanation of Accompanying Plates 1, 2 and 3:

Plate 1.—This is a genaralised geological map of the area showing the main age groups and some of their more important formations:—

Pre-Cambrian.—Oldest rocks in the area consisting of meta-igneous and meta-sedimentary types. Contain surface water only and are not source beds for artesian water.

Devonian ((1)and (2)).—The Devonian formations are characterised by a rapidly changing facies and rough topography which limits the areas suitable for bore locations.

The Devonian succession is divided into two broad subdivisions numbered 1 and 2 on Plate 1:—

(1) Conglomeratic formations which are excellent sources of water when found interfingering with impervious rocks of division 2. The choice of location of sites in these rocks is difficult and should only be attempted under geological supervision.

(2) Poor source beds, in which drilling should only be carried out with the aim to intersecting an aquifer at a lower horizon, either within the formation or below it.

Permian ((3), (4), (5) and (6)).—This age group contains the most reliable source beds in the area, namely the Poole Sandstone, Grant and Liveringa formations, a high percentage of successes having been gained with holes drilled into aquifers of this age. Only one formation, the Noonkanbah has been classed as unsatisfactory, as it consists mainly of shales of low permeability.

(3) and (4) The Grant Formation and the Poole Sandstone respectively, are primarily sandstones with numerous horizons from which supplies of water can be expected. As the Poole Sandstone is younger and overlies the Grant Formation, therefore presenting a shallower drilling target, it has been chosen as the most useful aquifer in the basin.

(5) The Noonganbah Formation for the most part is impermeable and unreliable.

(6) The Liveringa Formation is classed as a successful aquifer, but not always as a source of potable water. Therefore, although a shallower drilling prospect, it is not favoured over the Poole Sandstone.

Mesozoic ((7), (8), (9) and (10)).—Usually a reliable source of water but contains several saline beds.

That portion of the Mesozoic which outcrops in the south-western corner of Plate 1, also is prone to sand up in artesian bores, due to insufficient hydrostatic head. A more attractive prospect in this area would be to intersect the Poole Sandstone below, where in the Jurgurra Creek region its top is only from 0 to 1000' below sea level.

Those beds of Mesozoic which overlie the Permain in the Derby region are, however, the main source beds of the Derby town supply, and could be exploited if necessary.

Plate 2.—Having decided on the Poole Sandstone as the most favourable aquifer to exploit, Plate 2 was prepared, outlining those areas most suitable for drilling.

In choosing locations within this area, several factors must be taken into consideration:—

(1) Sites must be chosen topographically below the intake beds of the aquifer in question, (i.e. below points where the aquifer outcrops at the surface). Otherwise there will be insufficient hydrostatic head to make the well flow.

(2) Sites should be chosen, if possible, in structural lows within the aquifer, that is, synclinal structures would be more suitable than anticlinal.

(3) The aquifer must be sealed by some impermeable rock type overlying it.

Therefore, bearing these points in mind, it is possible to eliminate various sections of Plate 2.

The north-eastern third of Plate 2 has been classed as unsuitable, due either to the non-artesian nature of the Pre-Cambrian rock types, or to the fact that we have Poole Sandstone outcropping in topographically high areas.

The south-western third of Plate 2 has been classed as unsuitable, due to the fact that the greater part of the area is overlain by Mesozoic rock types in topographic highs, therefore, holes tapping the Mesozoic aquifers would no doubt sand up. As mentioned previously, holes could tap the Poole Sandstone below the Mesozoic cover. This leaves a broad area in the centre of Plate 2, which extends in a south-easterly direction from Derby to Christmas Creek, and has been classed as suitable for the location of drill sites.

Plate 3.—This Plate shows the subsurface structure contour of the top of the Poole Sandstone, outlining areas of synclinal or anticlinal folding within the Poole. It also outlines areas where the Poole Sandstone approaches closest to the surface.

Conclusions:

It is important to note that the above statements refer to exploiting of the Poole Sandstone. Boring into the Grant, which underlies the Poole, could be carried out if necessary, although the holes would be deeper.

Shallower holes on the fringes of the basin, along a line extending through Gogo Homestead, Laurel Downs and possibly Kimberley Downs, could be drilled to tap the Grant instead of the Poole and anywhere within the basin selected sites could possibly be chosen to tap other younger or older aquifers.

Further, it must be noted that this report is based on drilling information available to date, as this information is by no means comprehensive. The areas indicated on the accompanying maps are not to be considered as certainties for the striking of ample water supplies.

This report and maps should be used as a guide to likely drill locations, the actual sites chosen being subject to geological approval.

REPORT ON THE SANDSTONE DEPOSITS OF DONNYBROOK

By J. D. WYATT, B.A.
Geological Survey of W.A.

Summary:

In an effort to map the various sandstone outcrops in the Donnybrook area and to arrive at some conclusions as to the future of the sandstone industry, the author was instructed to spend some time in the Donnybrook district carrying out field work.

The Donnybrook sandstone and its various associated sedimentary members extend over a distance of some 23 miles in a line running north and south. The beds dip generally in a westerly direction at 10 degrees and overlie the granite basement to the east.

The outcrops are visible across strike for an average width of ¼ mile before they dip below a thick cover of sand and laterite.

The outcrops are not continuous, but occur as isolated patches of massive stone, some of which have a quarry situated to exploit the best of the outcrop.

Both gold mining and sandstone quarrying have been carried out in the area. The gold mining lasting only a few years after the turn of the century, and the quarrying, on a small scale being carried out up until the present time.

Several hundred million tons of stone has been shown to be available in three localities in the immediate vicinity of Donnybrook, and if a good, steady demand for the stone can be brought about, then the industry should be assured of a bright future.

Location:

Donnybrook is situated on the Bunbury and Bridgetown railway and is 26 miles south-east of Bunbury, and 143 miles by rail from Fremantle.

In addition to its rail facilities, the town is also well served by sealed all-weather highways.

The most important deposits of sandstone are located within five miles of the railway station and are either adjacent to good gravel or sealed roads, or easily accessible by bush tracks.

Donnybrook townsite is situated on the eastern edge of the coastal plain amongst the foothills of the Darling Scarp, some 200 feet above sea level, and is the centre of a prosperous fruit growing and stock raising industry.

History:

The mining activities associated with Donnybrook, both for gold and the quarrying of building stone, appear to have become established around the turn of the century.

It is recorded that gold was first discovered by a party of prospectors in 1897, but the date of the first major quarrying venture is less certain.

It is most likely that the quarrying was at first carried out to supply local needs and as the sandstone's usefulness became known, the industry grew.

Several prominent Perth buildings were either faced with or built of Donnybrook Sandstone, the earliest of note being the Police Courts in 1905. Amongst others since then were the Post Office and the Houses of Parliament.

Quarrying was never carried out on a large scale however, only select areas of stone being removed one at a time, from various localities throughout the district.

Physiography:

(1) Topography.

Situated amongst the foothills of the Darling Scarp, the country in the vicinity of Donnybrook consists essentially of a highly dissected plateau between 1,000 feet to 1,500 feet above sea level.

FITZROY BASIN

WESTERN AUSTRALIA

GENERALISED GEOLOGICAL MAP

P€		PRE-CAMBRIAN
1	Conglomeratic Facies	DEVONIAN
2	Other formations	
3	Grant formation	PERMIAN
4	Poole Sandstone	
5	Noonkanbah formation	
6	Liveringa formation	
7	Blina Shale	TRIASSIC
8	Erskine Sandstone	
9	Other formation	JURASSIC
10	Meda formation	CRETACEOUS

Known Artesian Bore [S.A. Sub Artesian]

8 0 8 16 24

Scale of Miles

Compiled by J.D. Wyatt geologist G.S.W.A from B.M.R Map of Fitzroy Basin 1956 and report by D.J. Guppy (1953).

PLAN I

123° 124° 125° 126°

17° 18° 19°

KING SOUND

DERBY

MAYHALL'S 1056'
69,400 gpd

MEDA No1 1686'
50,000 gpd [S.A]

MEDA

MEDA R.

MAY R.

LENNARD R.

OLD NAPIER

NEW NAPIER DOWNS

KIMBERLY DOWNS

67 MILE BORE 3012'
124,000 g.p.d.

PRE-CAMBRIAN ROCKS

NOT SOURCE BEDS FOR ARTESIAN WATER

YEEDA

GREAT NORTHERN HIGHWAY

To Broome

BLINA

ELLENDALE

CAMBALLIN

LIVERINGA

FITZROY RIVER

MYROODAH

LAUREL DOWNS

FOSSIL DOWNS

FITZROY CROSSING

GOGO

MARGARET RIVER

McHUGH No1 140
7200 gpd 2·6 gpg [S.A]

Jurgurra Creek

NERRIMA

LITTLE FLOW

GREEN SPRING

BARNES BIG FLOW

JUBILEE DOWNS

NOONKANBAH

Christmas Creek

PRICES CK W.W. 108
AMPLE POTABLE [S.A]

CHRISTMAS CREEK

BOHEMIA DOWNS

PLATE V

FITZROY BASIN

WESTERN AUSTRALIA

Showing most likely areas for location of water within the Poole Sandstone aquifer.

P€ — *Areas of Pre-Cambrian Rocks or areas outside scope of the Report.*

Outcropping Rocks of Poole-Sandstone or older.

Areas underlain by Poole Sandstone [Most suitable for drilling]

100′ — *Topographic contours 100′ intervals WAPET Geophysical control.*

B.M.R Geological map interpolated from 250′ contour intervals

Established fault position approx.

1 0 1 2 3

Scale of Miles

See accompanying notes regarding other aquifers within these areas.

Compiled by J.D. Wyatt Geologist GSWA July 1958 from information supplied by WAPET. Pty Ltd.

XING SOUND

P€

FRASER R.

DERBY

MEDA

LENNARD RIVER

KIMBERLEY DOWNS

Alexander Creek

Blackwater R.

BLINA

ELLENDALE

LIVERINGA

FITZROY RIVER

MYROODAH

Mc Hardman Creek

LAUREL DOWNS

FOSSIL DOWNS

MARGARET RIVER

6060

JUBILEE DOWNS

Chunderloo River

NERRIMA

NOONKANBAH

FENTON FAULT

Jurgurra Creek

Oobagooma Creek

CHRISTMAS CREEK

100′ 200′ 300′ 400′ 500′ +500′ 200′–1000′

PLAN 2

PLATE VI

FITZROY BASIN

WESTERN AUSTRALIA

STRUCTURE CONTOUR MAP OF TOP OF POOLE SANDSTONE

REFERENCE

Outcrop line of top of Poole Sandstone.

-1000' *Structure contours of top of Poole Sandstone related to sea level 1000' intervals (500 ft intervals where necessary)*

MEDA Nº1 −2125' *Bore site showing height of top of Poole Sandstone above or below sea level.*

8 0 8 16 24
Scale of Miles

Compiled by J.D. Wyatt Geologist G.S.W.A. July 1958 from information supplied by WADET Pty Ltd

KING SOUND
DERBY
Alexander Creek
LENNARD RIVER
BARKER RIVER
MEDA Nº1 −2125
67 MILE +190
A.F.O. SISTERS −1533
A.F.O. MYROODAH −2293
B.M.R Nº 487
A.F.O. Nº1 −600'
F.K.O. NERRIMA −418'
FITZROY RIVER
Mo Hamilman Creek
Jurgurra Creek
FENTON FAULT
Ontwebmous Creek
MARGARET RIVER
F.O. Nº3 +800'

123° 124° 125° 126°
17° 18° 19°

PLAN 3

Rugged, soil covered and laterite capped hills abound throughout the district; these are drained by short actively eroding streams which flow only in winter.

Between these hills and in the vicinity of the main water courses and their tributaries, small rich alluvial flats exist; these are used both for orchards and where water-logged, for grazing.

On the slopes of the steeper hills the sand and laterite cover has been eroded away to expose granite gneiss basement rocks.

Access is only made possible by the use of timber tracks which traverse the more inaccessible portions of the district.

(2) Drainage.

The area is drained by two main streams, namely the Capel and the Preston rivers and their numerous tributaries.

Both these rivers flow off the escarpment in a general westerly direction to the coast some 15 to 20 miles distant.

The rivers are permanent and in their lower reaches on the coastal plain, are used for irrigation.

(3) Vegetation.

The district supports a heavy growth of Jarrah, Red Gum and Blackboy, especially on the well drained slopes and summits of the laterite and sand covered hills.

Towards the base of these slopes on the richer alluvial soils and swampier portions of the water courses, a heavy growth of ferns, grasses and swamp vegetation flourishes.

On many properties, thick stands of pines have been planted in past years, and in some cases these are now being cut and sold to local mills.

On all cleared ground, orchards have been established for the growth of apples, citrus and stone fruits.

High level grazing is carried out on the cleared, stonier slopes which support a heavy grass growth during winter. This enables the flatter, richer ground on the lower slopes and alluvial flats to be used for orchards.

GEOLOGY.

The geology of the area is not complex and can be divided into three recognisable units:—

1. *Kainozoic.*
   - (a) Residual Soils.
   - (b) Recent Sands.
   - (c) Laterites.
   - (d) Pebble and Boulder Beds.
2. *Jurassic (?)*
   - (a) Donnybrook Sandstones.
   - (b) Blackwood Shale (?)
3. *Pre-Cambrian.*
   Granite gneisses (with associated dykes of younger age).

1. Kainozoic.

(a) Residual Soils.—These are deposited as alluvial flats adjacent to the main water courses of the district. In many places these become low-level swamps throughout the winter, drying out only during the summer.

In various localities heavy clay soils are common, these being the result of disintegration of the more basic members of the Pre-Cambrian basement rocks.

It is these well drained clay soils that are most suitable for the establishment of citrus groves and apple orchards.

(b) Recent Sands.—The occurrence of a thick sand cover on most of the hills in the area and in various low lying areas adjacent to outcrops of Donnybrook sandstone, is presumed to be a reflection of the underlying rock types even though the different sand members observed are not always so easily differentiated.

In some localities, a thick cover of pure white sand in the vicinity of sandstone outcrops has no doubt originated from a breakdown of this rock type, whilst the yellow sand encountered east of the main sandstone deposits, and overlying granite gneiss, is also likely to have its origin in those rocks.

However, some ten miles north of Donnybrook in the vicinity of Maxicar, several outcrops of a highly ferruginous sandstone were observed, the sand in their vicinity being yellow in direct contrast to the white sand of the less ferruginous Donnybrook building stone.

Therefore there is no hard and fast rule with which to tell the underlying rock type from superficial cover.

It is also possible that this sand cover is of a lacustrine or estuarine origin and is related in age to the obviously more recent sandy, pebble and boulder beds which have been observed in the Capeldene area south of Donnybrook.

(c) Laterites.—Practically all the hills in the district of any considerable height are covered with a massive laterite cover.

Both east and west of the known sandstone outcrops, laterites are prominent.

The western boundary of the Donnybrook sandstone in all cases dips beneath a thick cover of sand or laterite.

As mentioned previously, in the vicinity of Maxicar and north as far as Brunswick Junction, there are several outcrops of a highly ferruginous sandstone which in places has been almost completely lateritised.

(d) Pebble Beds.—South of Donnybrook in the Capeldene area, numerous large waterworn pebbles of quartzite are associated with thick, white to grey sand deposits.

These deposits extend in a north-west trending belt across the strike of the Donnybrook sandstones.

Various ideas as to their origin can be advanced as follows:—

(1) That the pebble beds mark the old course of the Blackwood River prior to the formation of the Darling Scarp.

(2) That these beds are deposits of estuarine or lacustrine origin.

(3) That the deposits are the result of a change in the conditions of sedimentation, at the close of the period during which the sandstones were deposited.

The first two theories would place these pebble beds in the Kainozoic, whilst the latter theory would place the beds with the Donnybrook sandstone, that is Jurassic or Cretaceous.

It is the author's opinion that the beds are of a more recent origin and therefore, theories one and two are favoured.

A further possibility is that the various outcrops of pebble beds cannot be correlated and that all three theories are correct. There is no doubt that the Capeldene deposits and the deposits outcropping in the railway cutting west of Donnybrook are entirely dissimilar in character.

2. Jurassic (?)

(a) Donnybrook Sandstone.—The Donnybrook sandstone occurs as a series of isolated outcrops extending in a northerly direction over a distance of some 23 miles.

Due to the thick sand and laterite cover, the sandstones can rarely be traced for more than a hundred yards down dip before they disappear below this cover.

Several outliers occur east of these main outcrops and these undoubtedly overlie the granite basement rocks.

These outliers can be observed at Brookhampton on Location 567, at Newlands immediately adjacent to the railway bridge, and over a fairly large area between Thompson's Hill and the Torrindon track on properties variously owned by Messrs. Jarvis, Mitchell and Langridge.

The Donnybrook sandstone is described by Simpson E. S. *(Misc. Rep. 61-70 G.S.W.A. 1917)* as "a felspathic sandstone whose principal bonding is kaolin or halloysite. Its colour varies from pure

white to deep buff or exceptionally deep pink, the paler coloured stone invariably darkening evenly on exposure to the air. Its grain size varies from very fine to moderately coarse. The stone is available in large blocks of even quality, current bedding and sandballs being rarely seen, and flinty patches, never. (However, it was noted by the author that siliceous sandstone is fairly common in the vicinity of the gold workings where it is shot with numerous small quartz veins).

"The stone is easily worked by machine or hand when freshly quarried, but hardens distinctly on exposure to dry air."

The average dip of these beds is 10°W and the strike is generally north, or a few degrees east or west of this direction.

The sequence is variable in thickness, but sections of several hill slopes show exposures of at least 200 feet, whilst drill holes in the Donnybrook townsite record 441 feet of interbedded sandstones and shales.

Several instances of ripple marking were observed, all of which indicated the beds to be right side up. The outlier at Brookhampton varied in character from most other outcrops of sandstone, in that the massive sandstone was interbedded with numerous thinly bedded shale bands showing strong ripple marking. It was from this outcrop that footprints of a four legged mammal were first observed some years previously.

Although a careful examination was made of each deposit no fossils were observed, however, mollusc fossils have recently been discovered in the ferruginous grits near Maxicar.

Several miles north of Donnybrook after a break of some two miles in the general continuity of the main sandstone outcrops, there occur isolated instances of an extremely ferruginous coarse grained sandstone.

These isolated outcrops occur on strike with the main deposits around Donnybrook and have therefore been correlated with them.

Several fossils of comparable age have also been discovered in recent years which further confirms the correlation, even though the two sandstones differ so greatly in character.

(b) Blackwood Shale.—In two or three instances, namely in gold mining shafts, bore cores and in one creek bed a black shale was observed underlying the Donnybrook sandstone.

In places, namely from debris surrounding old gold mining shafts, this shale is highly carbonaceous and burns feebly with a smoky flame.

This shale has been correlated with the Blackwood shale of Fairbridge (1953).

It is most probable that the shale encountered in bore holes in the Donnybrook townsite can be correlated with this Blackwood Shale.

Both the Donnybrook sandstone and the Blackwood shale are members of the Capel River Group of Fairbridge (1953).

3. Pre-Cambrian.

Granite-gneiss and associated intrusives.—Along the eastern boundary of the Donnybrook sandstone there occur several outcrops of granite gneiss which have been intruded by basic hornblende dykes and numerous parallel quartz veins.

A careful examination of the granite gneiss-sandstone boundary shows that the sandstone overlies the granite unconformably with a gentle dip to the west.

Several outliers of sandstone, east of the main sandstone outcrops also lie unconformably on the granite basement at an angle of approximately 24 degrees.

In one instance an inlier of granite was observed surrounded by gently dipping sandstones.

STRUCTURAL GEOLOGY.

Faulting.

During the gravity survey of the Perth basin carried out by the Bureau of Mineral Resources in 1953, the recorded anomaly placed the Darling Fault as passing immediately west of Donnybrook townsite.

This could account for the fact that no sandstone outcrops have been reported west of a north-south line through Donnybrook, although as stated earlier, heavy sand and laterite cover obscures all outcrops to the west.

As it is believed that several movements have occurred along the Darling Fault Line, then this last movement would have been in Jurassic or early Cretaceous times.

ECONOMIC GEOLOGY.

Freestone Quarrying.

From 1900 up until the present time, with the exception of some spasmodic activity which accompanied the building of various prominent Perth buildings, the quarrying of sandstone in the district has been of a minor nature.

Throughout the length of the survey eight quarries were examined, varying in size from that of Messrs. A. T. Brine's Quarry at Irishtown, which consists of two adjacent workings 200 feet by 120 feet by 20 feet deep and 85 feet by 90 feet by 15 feet deep respectively, to that of the Pink Quarry which consists of no more than a small excavation in the side of a hill.

The colour of the sandstone varied from pure white to deep brown. Iron staining being common, consisting of both darker patches and rhythmic streaking.

The grain size varied from fine to coarse with no definite increase in grain size with depth.

Overburden varied from nil to ten feet, with five feet being an average for all localities.

The quarrying has never been carried out on a large scale, therefore no consideration has been given to completely working out any one area.

In all cases, waste material has been indiscriminately dumped in the vicinity of the workings, making the reopening of these quarries a very tedious and expensive business.

The limiting factors which govern both the quarrying of the freestone and its suitability in relation to Donnybrook sandstone are as follows:—

(a) Availability and Accessibility.

In this respect the working of Donnybrook sandstone is not controlled by this factor.

For the most part all the important deposits are easily accessible, if not by sealed main highways then by well formed roads or tracks. Nowhere is an economic prospect more than five miles from Donnybrook.

Whilst the actual terrain may be rugged, the access roads are always immediately adjacent.

(b) Depth of Overburden.

The thickness of overburden in areas of deep weathering and associated laterite cover, is always a problem. However, in the quarries examined overburden did not exceed ten feet and usually averaged five feet in thickness.

(c) Jointing.

The spacing of joints within the sandstone is extremely important, although the close spacing of joints is not so detrimental now, as most sandstone is being used for facing purposes so that large massive blocks are not required. Nowadays, the use of massive blocks is restricted, the majority of blocks being used as facework. These facing blocks are much thinner, usually two feet by two feet by four inches. Therefore, it is possible to work a sandstone with a closer joint pattern.

On the whole, the Donnybrook stone is fairly massive, the more fissile members being restricted to isolated outcrops of no value.

The occurrence of hair line cracks, has however, proved to be a problem. These occur as zones of weakness in an otherwise massive sandstone.

These zones only show up whilst actually quarrying and are not usually visible in surface outcrops.

(d) Grainsize and Porosity.

Variation in grainsize, coupled with the type of cementing material is important in building stones, as this controls the porosity.

PLATE VII

G.S.W.A.
GEOLOGICAL MAP
IN
VICINITY OF DONNYBROOK
Showing Sandstone Deposits

Geology by J.D. Wyatt Sept. 1958

Scale of chains

60 40 0 80 160

LEGEND

- Lateritic, sand and soil cover overlaying Donnybrook Sandstone
- Donnybrook sandstone outcrop and sandstone rubble
- Foliated granite/gneiss.
- Basic Dyke
- Quarry
- Pits

Numerous Timber Tracks

Sandstone Fragments

Basic Dyke

Old Workings

Silicified Sandstone

DONNYBROOK TOWNSITE

NEWLANDS TOWNSITE

KIRUP TOWNSITE

S.W. HIGHWAY RAILWAY

HIGHWAY

RAILWAY

WESTERN HIGHWAY LINE

Of all the quarries examined only one was condemned as being too porous for exterior work; that was the Pink Quarry on Location 3795.

Simpson, in G.S.W.A. Bulletin No. 74, 1917, states that stone from this quarry "on soaking with water loses the greater part of its coherence."

Although the porosity varies greatly from quarry to quarry, no other sample was condemned on these grounds.

(e) Foreign Bodies within the Sandstone.

(1) Pyrite.—The occurrence of pyrite in sandstone is always detrimental, mainly due to the oxidation and subsequent staining. Donnybrook stone is not affected in any major way by this fault.

Rhythmic iron staining however, is sometimes highly desirable especially in ornamental facework. Portions of Brine's Irishtown Quarry show excellent examples of rhythmic iron staining.

(2) Mica.—The occurrence of mica flakes which may cause the stone to split when placed on end is also detrimental, although at no time was mica in evidence in any of the quarries examined.

(3) Sandballs.—Sandballs are fairly rare, but can be observed in some quarries. As long as they are not too numerous, blocks containing sandballs can be used in work other than facing.

Location and Description of Quarries:

(a) Goldfields Quarry (Location 17665).—Situated approximately 2½ miles south of Donnybrook on the western side of Crendon Road, this quarry is to date little more than a small opening in the side of a hill some 150 feet long by 50 feet wide, with overburden averaging from four feet to five feet in thickness.

The stone is buff coloured and is the heaviest and coarsest grained of all the quarries, it is also the least porous. (Simpson, G.S.W.A. Bull. 74, 1917.)

Stone from this quarry has been used in the lower portion of the Government Stores Building, Perth.

(b) Pink Quarry. (Location 3795).—An excellent outcrop of stone on the side of a steep hill, although practically no work has been carried out on the site.

Jointing approximately 10 feet apart strikes N8OE and dips 85°S.

The sandstone is red to pink in colour and extremely soft. It is fairly fine grained and shows ripple marking.

The overburden varies from three feet to five feet in thickness.

It is extremely porous and upon absorption of water loses its coherence. It is therefore suitable for internal work only.

Of all the quarries, access to this location is poorest.

(c) A. T. Brine's Quarry. (Location 3124).—This quarry is by far the largest in the district and presents the best exposures of sandstone in the area.

The quarry is divided into two workings, southern and northern, which are approximately 200 feet apart.

The southern quarry is 200′ by 120′ by 20′ deep and has an overburden of from eight feet to ten feet in thickness, the northern quarry is 85′ by 90′ by 15′ deep and has an overburden of from 7 feet to 10 feet in thickness. It is also partially filled with water to a depth of eight feet.

The sandstone in this locality is particularly massive with irregular jointing some five feet apart. Its colour varies from white to buff, with rhythmic iron staining being common.

Grain size is variable and has a tendency to increase with depth. However, sudden changes in grain size are common in bands.

Stone from this site has been used in the Police Courts, A.M.P. Buildings and St. George's House, Perth.

Access is excellent, although the site chosen limits the amount of stone which can be extracted without quarrying too far below access road level. No use has been made of gravity by excavating into a hill-side face.

(d) Government Quarry. (Reserve 2720).—This is a large quarry 180′ by 150′ by 20′ deep. Overburden varies from five feet to ten feet in thickness.

Access is excellent, with a well formed gravel road leading right to the quarry.

The workings consist of a main quarry, with several further excavations extending for about ½ mile north along a small permanent stream.

This quarry furnished the stone for the General Post Office, Perth.

The stone is white to creamy brown in colour, fine grained, tough, dense and hard.

Some rhythmic iron staining is evident, but only in a minor way.

Joints are spaced about five feet apart at right angles to each other. The thickness of the section exposed is at least 30 feet.

The quarry is situated right on the edge of the granite/sandstone boundary, within two hundred feet of the contact.

(e) Vincent's Quarry. (South end of Location 1244).—Only a small amount of quarrying has been carried out, several excavations being evident, the largest some 20′ by 30′ by 10′ deep.

Overburden is for the most part negligible.

The stone is from white to buff in colour and the grain size varies from extremely fine grained to fairly coarse in texture.

It is a hard, dense stone and should be capable of taking a fine finish.

(f) Arnott's No. 1 Quarry. (Location 4058).—This is a small quarry, situated some ¾ mile south of A. T. Brine's Quarry.

Its dimensions are 40′ by 20′ by 10′ deep with an overburden of four feet.

The stone is light buff in colour and of medium grain size.

Access is fair to within ¼ mile of the site.

(g) No. 1 Quarry (Alexander's). (Location 1244 North).—Although reported in G.S.W.A. Bulletin 74, by E. S. Simpson, this quarry was not found by the author.

However, it is considered to contain excellent even grained, light brown stone which has been used in both the Art Gallery and the Technical School in Perth.

It is superior in both hardness and durability to the stone contained in other quarries, and was therefore rather more expensive to work.

Access could be rather more difficult, but a fair bush track goes to within ¼ mile of the recorded site.

(h) No. 2 Quarry (Alexander's). (Centre of Location 1244).—This quarry is some 150′ by 60′ by 10′ deep and is partially filled with water to a depth of five feet. Overburden is uniformly six feet to eight feet thick.

The stone is white in colour and fine grained in texture.

Three sets of joints were noted, namely N30E and dipping vertically, N50W and dipping vertically, and N2OE and dipping flatly to the west.

Economically Suitable Quarrying Sites.

Taking into consideration all the factors relating to access, tresspass on private property and availability of suitable quantities of stone, the following sites can be considered worthy of further investigation for suitable quarry location.

(a) Location 17665 (Goldfields Quarry) and extending some 800 yards north of this location.

This location is situated only 2½ miles south of Donnybrook along the Upper Capel Road and can be considered the most attractive site in the area.

The location covers the eastern slope of a fairly steep, laterite covered hill. Sandstone outcrops consisting of boulders, some in situ and loose rubble occur up the hillside for some 300 yards.

Towards the top of the hill several pits have been dug, probably whilst prospecting for gold. It was towards the northern limits of the area on Location 2088 that the sandstone rubble adjacent to these pits showed numerous quartz veinlets, which if persistent would probably mark the western limits of commercially useful stone.

Using the results of laboratory tests carried out on this stone and as contained in G.S.W.A. Bull. 74, 1917 which states that 1 cubic foot of stone weighs 144 lbs., a conservative estimate of the tonnage contained in this location after stripping the overburden would be 100 million tons.

(b) This area extends from Location 4058 to Location 1256, a distance of some 3 miles and covers a strip some ¾ mile wide.

The observed exposures of sandstone are fairly continuous and in practically all instances are situated on land not utilized for farming purposes, and well supplied by established tracks and roads in varying states of repair.

Several old abandoned quarries are situated within the area and with careful examination it should not be difficult to pick new sites.

No estimate of available tonnage is possible, due to lack of detailed information between observed outcrops, but it would not be less than twice the tonnage of Location 17665.

(c) One further area where excellent white, fine grained stone is available is situated approximately ¾ mile north-west of Newlands, immediately adjacent to the railway bridge and between the railway and the main road.

Access is excellent and whilst no tonnage was estimated, a short exploratory programme would most likely uncover an economic prospect.

Gold Mining.

As already stated, gold as discovered in the Donnybrook district some time during 1897.

An examination by State Government geologists revealed that the gold occurred in quartz veins both within the sandstone and the adjoining granite.

In 1899, the Assistant Government Geologist, Mr. T. Blatchford stated that a quartz lode existed in the sandstone at Jackson's Claim, which extended to a depth of 70 feet, and it was his belief that these reefs were fissure veins.

However, in G.S.W.A. Bulletin 16, Mr. Gibb Maitland reported that "gold of an aborescent variety" occurred in samples from the Donnybrook Goldfield which would point to a secondary origin.

Other authors have indicated that the quartz lodes were a secondary infilling of joints and openings within the sandstone.

Forman (Ann. Prog. Rep. G.S.W.A. 1935), stated that the lode material was a chalcedonic quartz which would further indicate a cold solution of circulating waters.

All workings are now filled in and access is impossible. Therefore, the only evidence now available for inspection is that of quartz veinlets in the sandstone outcropping at the surface and the spoil from various shafts throughout the area.

No conclusions could be gained from an examination of this evidence.

Further, as the survey was primarily an economic appraisal of the sandstone deposits of the area, no great attention was given to the abandoned gold mines or the original of the gold, other than that given whilst mapping the granite/sandstone contacts, or abandoned shafts within the sandstone boundaries.

Conclusions.

An examination of the area has shown that many old quarries were sited in low lying areas over outcropping stone, which although free of overburden did not utilize the natural land slopes and accompanying gravity advantages which were elsewhere available. Subsequently, quarrying became uneconomical below a certain depth and the quarries were abandoned.

Furthermore, the small scale of operations in numerous localities and the accompanying selection of the best stone available with no consideration to the future, has also contributed largely to the dwindling of the industry.

The cost of reopening abandoned quarries has further been made more difficult due to the indiscriminate dumping of waste stone in the immediate vicinity of the quarry workings. It was noticed however, that in quarries now being worked this practice was no longer in force.

Whilst it is imperative that the future exploitation of sandstone resources at Donnybrook be placed on a sounder basis, the problems peculiar to any such small scale operation must be considered.

Firstly, without the expenditure of a considerable sum of money, no new quarry site could be adequately examined as to its areal extent, depth and quality of the stone it contains.

Secondly, no operator would be prepared to expend this money unless firm orders guaranteeing a reasonable term of life for the industry could be secured.

Until such orders are forthcoming, it is unlikely that the industry will grow beyond the present small scale intermittent quarrying of the most easily accessible stone. In which case as soon as operating costs rise to an uneconomical level, then that site will be abandoned and a new area opend up.

It is the author's opinion that ideally, any new deposit should be fully explored both by vertical and horizontal diamond drilling in the initial phases, to assess the extent and depth of the deposit (to an economical level), including the thickness of overburden.

Once a site has been chosen on this basis, then drilling should be continued ahead of the working face, in order to anticipate joint spacing, changes in grain size or other factors which could be detrimental to the quality of the stone produced.

The above method is believed to have been employed on a minor scale by Messrs. A. T. Brine and Son, without much success, but it is believed that with careful supervision, drilling could be an extremely useful adjunct to sandstone quarrying.

The selection of sites is also an important factor in the development of a new quarry. It has been previously noted that old quarry sites did not make full use of sloping ground and its accompanying gravity advantages.

Previous operators have been forced to abandon quarries containing good stone, due to uneconomical working at depths below access road level.

A more detailed examination of surface indications would pay dividends in the selection of a quarry site.

Areas immediately adjacent to zones of possible weakness and flexuring, should be avoided.

These zones are not so evident in the Donnybrook area, but certain areas adjacent to the granite/sandstone contact with numerous quartz veinlets in both rock types with an accompanying silification of the sandstone would be a poor site for a new quarry.

From the foregoing observations it will be seen that no easy solution to future quarrying problems is envisaged. The economic factors which will control any future successful exploitation of Donnybrook Sandstone, will depend on the following:—

(1) Adequate finance.
(2) An assurance of orders to warrant expenditure of this finance.
(3) A detailed initial examination of any new site.

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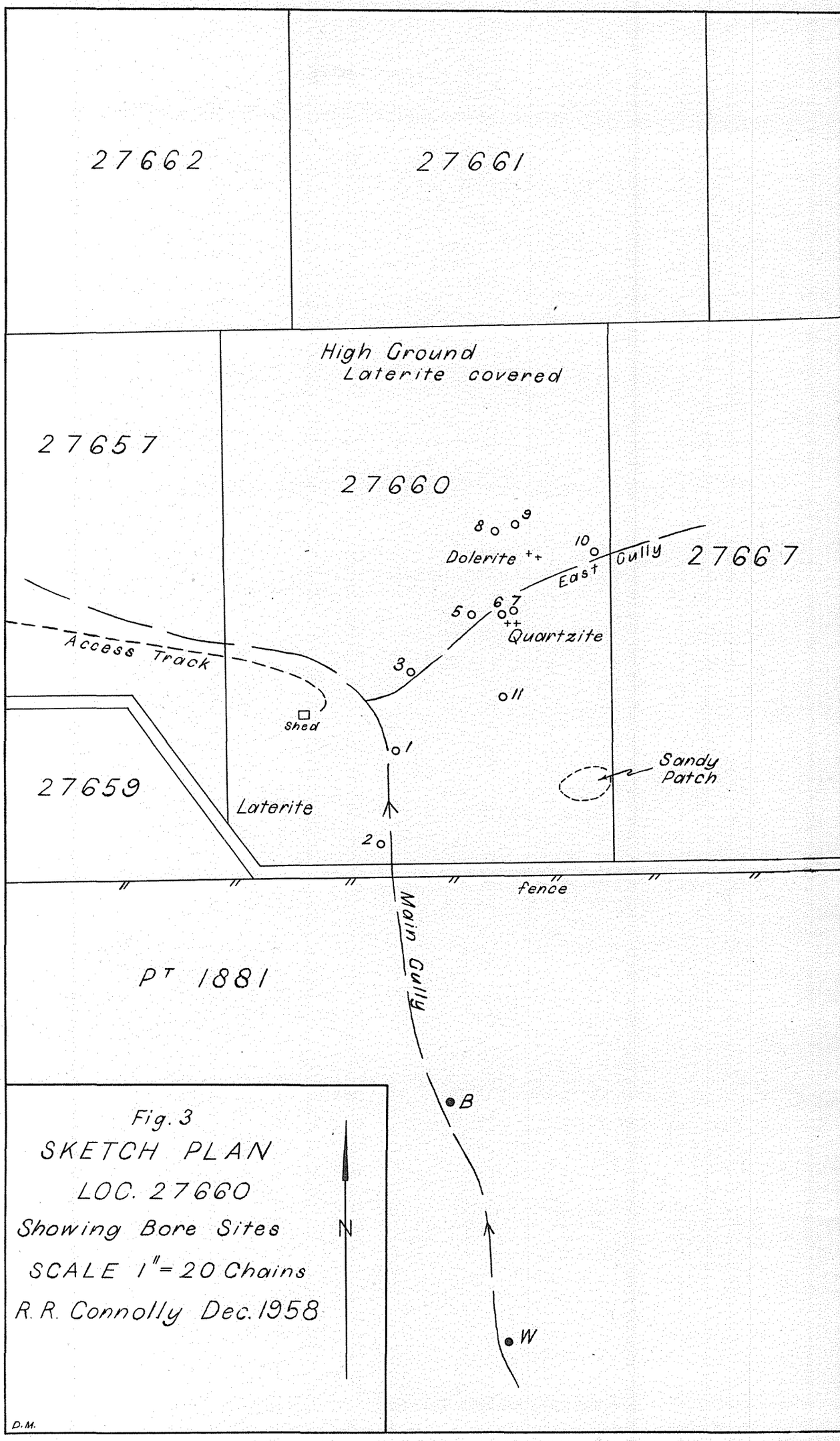

Fig. 3
SKETCH PLAN
LOC. 27660
Showing Bore Sites
SCALE 1" = 20 Chains
R. R. Connolly Dec. 1958

D.M.

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REPORT ON INSPECTION OF AVON LOCATION 27660 FOR WATER SUPPLY.

by R. R. Connolly, Geological Survey of W.A.

Introduction:

Location 27660 is reached via the main Perth-York Road to the 35 mile peg, thence north for 1½ miles along a graded link road, thence 1¼ miles easterly along a track, the turn off being signposted with the owner's name. The block is held under conditional purchase agreement by Mr. R. Foyel. Some clearing and pasturing has been undertaken by the owner on the 600 acre block and he is desirous of establishing a water supply of approximately 3,000 gallons per day, before proceeding to fencing. To this end he requested assistance from the Mines Department and the author was instructed to inspect the block and advise the applicant on the water potentialities.

The inspection was made on 18th December, 1958, in the company of the owner.

Water Potentialities:

Mr. Foyel had already had 11 bores put down on the property without success in locating a suitable supply of water. The positions of these bores are shown approximately on the accompanying sketch plan. The plant used was reported to be a very light one, drilling a two inch hole. Brief details of this drilling are set out in the following table:—

Hole No.	Depth	Water Supply	Salinity grains per gall.	Cuttings	Remarks
	ft.				
1	56	good	1,000	White clay with coarse quartz and mica	In decomposed, coarse grained granite
2	66	good	820	do. do. do.	Sandy top soil
3	66	good	greater than 1,000	White clay with quartz and mica	In decomposed, medium grained granite
4	102	good	750	White to pink clay	In decomposed, fine grained granite
5	30	dry	....	Pink clay with rounded quartz grains	In weathered grainte and alluvium. Bottomed on hard rock.
6	32	dry	....	White clay with fine quartz grains	In weathered grainte. Bottomed on hard rock
7	7	dry	....	....	Commenced in quartzite outcrop and unable to penetrate to any depth
8	40	dry	....	Light brown clay with some quartz fragments	Bottomed on hard rock
9	40	dry	....	do. do. do.	Bottomed on hard rock. In fairly close proximity to dolerite outcrop
10	58	dry	....	White-pink clay	Bottomed on hard rock in fine grained, weathered granite
11	45	dry	....	Not sighted	Bottomed on hard rock

Bores Nos. 1 to 3 are located in the lower portions of a well defined valley, the head of which lies 1½ miles to the south of the south boundary of Location 27660. These three bores show a very steady increase in salinity going downstream. Bores No. 5 to 10 are located in an east-west tributary valley and all except Nos. 6 and 7 are well sited to obtain water. Conditions in this area are identical with those to be found in the main valley to the south, where the adjoining holder has two successful water points of low salinity. It is difficult to understand how bores Nos. 5 to 10 failed to produce water, as the potential is good. It is the author's opinion that the light plant used was incapable of penetrating the full depth of decomposition, and thus obtain water.

Bore No. 4 is on higher ground and struck saline (750 grains/gallon) water at 102 feet. This bore as located, should have struck fresher water than this, and the only reason that can be advanced for the salinity is penetration of a basement trough of stagnant water.

Bore No. 11 sited in a shallow gully on higher ground failed to obtain water, although the potential was good. The same remarks apply here as to bores 5 to 10.

General:

With a rainfall in excess of 30 inches and a well defined drainage pattern in the southern half of the location, a sufficient supply of ground water should exist to satisfy the holder's requirements. The rock types are generally granites, or granite gneiss, with some dolerite dykes, and in one locality a quartzite (Whitestone Phase?) outcropped. Fresh rock exposures are poor, the block for the most part presenting a laterite cover over a fair depth of weathered rock. The extent of the dolerite dykes is not thought to be great, as the laterite is poor in iron and the soil generally light in colour.

From cuttings from existing bores, the weathered zone consists of light brown to white clay, with muscovite mica plates and quartz fragments. This would not be a very porous aquifer, and this lack of porosity resulting in slow ground water movement would account for the steady increase in salinity moving downstream in the main gully.

Recommendations:

Mr. Foyel was advised to confine his future efforts at obtaining ground water to the east gully. A heavier plant in the hands of an operator prepared to tackle up to 20 feet of fractured hard rock boring would be needed to deepen existing holes Nos. 5, 10, 8 and 9, in that order. In the event of the supply from bores being inadequate, wells in the vicinity of bore No. 10 would have to be considered.

REPORT ON INSPECTION OF TEMPORARY RESERVE 1632H AND OTHERS FOR GYPSUM, BOOLOGOORO, N.W. DIVISION.

By R. R. Connolly.
Geological Survey of W.A.

INTRODUCTION.

Three areas, the southernmost commencing at the 35 mile post on the Carnarvon-Onslow telegraph line and extending along this line to the 47 mile post, have been pegged on the ground as temporary reserves for gypsum. Of these, the northernmost, centred about the 47 mile peg was applied for and subsequently granted as Temporary Reserve 1632H for a period of three months as from 24th September, 1958. The southernmost area was applied for as a temporary reserve, but at the time of inspection had not been granted. The central area about the 42 mile peg has apparently not been registered with the Mines Department.

All three areas have been claimed with the declared intention (if granted) of selling the rights to an American plaster manufacturing company, provided that the company establishes a treatment plant in this State.

ACCESS.

The deposits are located approximately 50 miles north of Carnarvon by vehicle track, which passes close by Boolathana homestead. This track would be negotiable by heavy transport in dry weather, but impassable in wet weather, and slow at any time. The main Carnarvon-Onslow road is approximately 15 miles to the east of the deposits and if heavy haulage from the gypsum deposits to Carnarvon were ever contemplated, a link to the main road would be desirable.

THE DEPOSITS.

The area was inspected in November, 1958 by the author, assisted by Mr. K. Grimbly. It had been the intention to sample any deposits in a grid pattern using a two inch auger with extension handle, capable of boring to a depth of 12 feet, this implement having been successfully used by Messrs. de la Hunty and Low in the course of a gypsum survey in the southern part of the State[1].

It was very soon found however, that the gypsum deposits of this area are of such a nature that penetration using an auger bit was not possible, and accordingly the sampling was severely restricted.

The three areas were mapped by pace and compass along a base line provided by the telegraph line which has 26 posts to the mile, the mile posts being marked. The results of the survey have been plotted at a scale of 40 chains to an inch on the accompanying plan which shows the lateral limits of the gypsum deposits and the location of test points. For convenience, the deposits have been numbered from 1 to 3, commencing at the northern deposit, and hereafter the individual deposits will be referred to be these numbers.

No. 1 DEPOSIT.

The temporary reserve surrounding this deposit is centred approximately about the 47 mile peg on the Carnarvon-Onslow telegraph line and covers an area of approximately 600 acres. The country is gently undulating with numerous claypans, one of which lies immediately to the north-west of the reserve. Vegetation consists of saltbush, samphire and occasional stunted mulga. Some fixed red sand dunes occur on the eastern edge of the reserve, the dune pattern trending north in conformity with the general dune pattern for the whole of the area in the vicinity of Salt Marsh salt lake.

No dune deposits of seed gypsum or kopi were observed in this reserve, the gypsum occurring as a hard bedded crystalline deposit overlain by a thin layer of kopi in some places, and in other parts by clayey soil. Rabbit warrens and sink holes have exposed the gysum beds in the southern part of the area, elsewhere the gypsum being poorly exposed. The total area mapped as bedded gypsum either at or near the surface is approximately 850,000 square yards.

Eleven test points were selected in this area and three samples taken. The positions of the test points are shown on the accompanying plan and the results obtained are as follows:—

Test Point. Results.

1. In slight depression.
   0′-6′—Deep brown to red clay.
2. On small hummock.
   0′-5′—Clay.
3. Alongside telegraph line.
   0′-2′ 6″—Sandy clay.
   2′ 6″-4′ 0″—Red sand.
   4′ 0″-6′ 0″—Red sandy clay.
4. On flat ground with powdery soil.
   0′-2′ 0″—Gypseous clay soil.
   2′-2′ 3″—Crystalline Gypsum.
   2′ 3″-2′ 9″—Solution cavity.
   2′ 9″- ? —Hard crystalline gypsum. Unable to penetrate with auger.
5. On small hummock.
   0′-2′ 6″—Fine gypseous lime sand with some shell fragments.
6. On claypan.
   0′-0′ 4″—Gypseous sand with shell fragments.
   0′ 4″-6′ 0″—Yellow clay with no gypsum apparent. Wet at 3′ 6″.
7. On sand dune with very fine powdery surface.
   0′-6′ 0″—Fine to medium grained red sand.
8. Flat ground alongside telegraph line. Trench in hard picking ground as auger unable to penetrate.
   0′-0′ 6″—Gypseous sand.
   0′ 6″-2′ 0″—Bedded crystalline gypsum with some clayey bands.
9. On flat ground.
   0′-1′ 0″—Gypseous sand.
   1′ 0″- ? —Hard bedded crystalline gypsum. Unable to pene- with auger.
10. On edge of sink hole.
    0′-0′ 4″—Gypseous soil.
    0′ 4″-2′ 0″—Bedded crystalline gypsum with some clay seams.
11. In sink hole area.
    0′-1′ 6″—Bedded crystalline gypsum.

Samples were taken from test points 7, 8 and 10, the results of analyses as supplied by the Government Chemical Laboratories being shown in the appended table.

The total thickness of this deposit was not measured due to the tough nature of the bedded gypsum, but over the area outlined on the accompanying plan the thickness would not be less than two feet and is probably more. For the purpose of a preliminary tonnage estimate however, a thickness of two feet has been taken and a conversion factor of 16 cubic feet per ton for the gypsum in situ has been used.

Using these figures, a total of 956,250 tons is obtained. It is considered that this would be an available tonnage as the depth is certainly greater than the two feet used, which would more than offset cavities and surface irregularities.

The grade of this deposit would be of the order of 85 per cent. gypsum, similar to sample No. 4 which was taken by channel sampling the side of a trench put down in bedded gypsum in situ, whereas sample No. 5 was taken from the edge of a sink hole and exposed material from this point may have been cleaned by weathering effects.

Sample No. 3 was taken to ascertain the gypsum content of a typical lake edge sand dune.

No. 2 DEPOSIT.

This deposit is centred about the 42 mile post on the telegraph line and is similar in mode of occurrence to the No. 1 deposit. At the No. 2 deposit, vegetation is thicker and a large part of the gypsum would be lost in cleaning off the scrub. Some gypsum has already been removed from the vicinity of test point 14 to satisfy a small demand for Kopi by the plantations at Carnarvon. In this locality, hummocks of kopi overlie the bedded crystalline gypsum, previous production having been confined to these small kopi mounds.

Three test points were selected and two samples taken from this deposit, results of the examination being as follows:—

Test Point. Results.

12. Scattered outcrops of kopi overlain by red sand.
    0′-2′—Kopi.
    2′-?—Red sand.
13. Sink holes in bedded gypsum with kopi infilling.
    0′-3′—Kopi and small crystalline gypsum.
    3′-?—Red sand.

[1]L. E. de la HUNTY and G. H. LOW: The Gypsum Deposits of Western Australia. Mineral Resources of W.A. Bulletin No, 6, Department of Mines 1958.

PLAN SHOWING

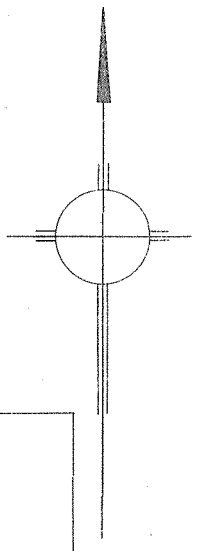
SURFACE FEATURES AND TEST POINTS ON GYPSUM DEPOSITS

BOOLOGOORO

N.W. DIVISION

Scale: 1 inch = 1 mile

R. R. Connolly
November, 1958.



TELEGRAPH LINE

CLAY PAN

Datum peg

N° 1. DEPOSIT

BEDDED GYPSUM AND CLAY

Sand Dunes

TEMPORARY RESERVE 1632H
(24-9-58 for 3 months)
Approx 600 acres

CLAY PAN

Samphire and saltbush flats

To Miniliya

N° 2. DEPOSIT

Claypans

BEDDED GYPSUM

Sand Dunes

Datum peg pole marked 'b'

TRACK (Old Miniliya Road)

As described on datum peg Sketch.

SAND DUNES

Sand Dune

Datum Post marked 'X'

BEDDED GYPSUM

N° 3. DEPOSIT

As Recorded at Mines Surveys

LINE MAINTENANCE TRACK

Vegetated Sand Dunes

Boundary gate

BOOLOGOORO
BOOLATHANA

To Carnarvon Via Boolathana

14. Kopi hummock.
0'-3'—Clean kopi.
3'- ?—Hard bedded crystalline gypsum.

Samples were taken from points 13 and 14, the results of analyses being appended.

The areal extent of this deposit is approximately 3½ million square yards. The thickness, ascertained at points 12 and 13 varies between two and three feet, and at point 14 is greater than three feet. For the purposes of a tonnage estimate, an overall thickness of 2 feet will be taken, upon which a quantity of four million tons is calculated as possible reserves.

The grade of this deposit would be of the order of sample No. 8 (78.8 per cent. gypsum) with higher grade kopi available in small quantities.

No. 3 DEPOSIT.

This is the best of the three deposits and the greater part of the outcrop lies within an area pegged and applied for as a temporary reserve (1659H), but subsequently refused. The applicants were advised to apply for smaller areas as mineral claims, but at the time of writing they had taken no further action.

The deposit lies immediately to the south-west of the 38 mile post on the telegraph line, the outcrop appearing to be confined to a former drainage depression trending north. Five test points were selected and two samples taken, results of the examination at the test points being as follows:—

Test Point. Results.

15. 0'-1'—Kopi.
1'-7'—Granular gypsum, variable grain size with some thin clayey bands.
7'-12'—Stiff red clay with some coarse gypsum crystals.

16. Edge of sink hole.
0'-1' 6"—Hard consolidated Kopi crust.
1' 6"-3' 0"—Hard bedded crystalline gypsum.

17. On hummocky ground.
0'-2'—Kopi.
2'-? —Hard bedded crystalline gypsum, unable to penetrate with auger.

18. Trench 3' deep put down with pick and shovel in hummocky ground.
0'-0' 3"—Gypseous soil.
0' 3"-1' 6"—Kopi with hard cemented bands.
1' 6"-3' 0"—Hard bedded crystalline gypsum.

19. As for 17.

Sample No. 7 was a channel sample down the side of the trench at point 18, and is considered to be representative of the bedded crystalline gypsum of this deposit. The bottom of this trench was still showing bedded gypsum when further work on this trench was abandoned due to the extremely tough nature of the ground. Sample No. 6 consisted of auger cuttings from one foot to seven feet at point 15. This gypsum was not the bedded type and is thought to be a small dune type deposit near the southern edge of the original lake. It was easily penetrated with the auger in comparison to the bedded deposits which proved incapable of penetration by this means.

The areal extent of the deposit is approximately 2¾ million square yards with a thickness of at least three feet, giving a possible reserve total of 4½ million tons.

GENERAL.

All three deposits consist essentially of hard bedded coarsely crystalline gypsum forming parts of a previously developed lake pattern now re-exposed. The present lake system appears to be quite unfavourable towards the deposition of gypsum in commercial quantities, and no seed dunes of the type commonly found in the southern inland part of the State were seen.

Substantial quantities of gypsum of reasonable purity exist on each of the deposits, although the grade is below that at present demanded by the local trade. Exploitation of these deposits would appear to be dependent on the finding of a new and large market for gypsum, and interested parties have this requirement in mind. A considerable amount of testing with suitable equipment would be needed to prove the possible reserves arrived at in this present investigation, although dimensions as outlined are thought to be conservative.

TABLE OF ANALYSES

Government Chemical Laboratories

Lab. No.	G.S.W.A. Sample No.	Gypsum $CaSO_4 \cdot 2H_2O$ %	Total Lime CaO %	Sodium Chloride NaCl %	Acid Insoluble %	Iron Fe %	Test Point No.	Remarks
15306	3	6·0	12·4	0·93	59·0	2·33	7	1' 0" to 6' 0" Red sand typical of local dunes
15307	4	84·2	30·2	0·14	6·30	0·63	8	0' 6" to 2' 0" Bedded crystalline gypsum
15308	5	90·5	31·4	0·03	3·60	0·33	10	0' 4" to 2' 0" Down side of sink hole
15309	6	95·0	32·6	0·07	0·75	n.d.	15	1' 0" to 7' 0" Auger cuttings—dune type ?
15310	7	97·9	32·2	0·06	0·56	n.d.	18	1' 6" to 3' 0" Hard bedded gypsum—sample downside of trench
15311	8	78·8	29·1	0·08	11·3	n.d.	13	0' 0" to 3' 0" Mixed kopi and small crystalline gypsum
15312	9	94·7	32·0	0·29	0·94	n.d.	14	0' 0" to 3' 0" Kopi hummock

All analyses made on air dried samples. n.d. = not determined.

NOTES ON A RECONNAISSANCE FOR GYPSUM TO THE WEST AND NORTH OF SALT MARSH SALT LAKE N.W. DIVISION.

By R. R. Connolly,

Geological Survey of W.A.

In conjunction with an examination of temporary reserves for gypsum on Boologooroo station, a reconnaissance on the coastal strip to the west of Salt Marsh salt lake was made. The assistance of local pastoralists by way of track and fence information was sought and freely given.

Generally the area is very poor in gypsum, no dune type deposits being sighted, and the lake beds consisting of clay with some coarse gypsum crystals and shell beds, made up of reconsolidated shell fragments from underlying sedimentary rocks. Fixed sand dunes with a north-south orientation make vehicle access difficult and mask most of the underlying rocks.

Two deposits were noted and a sample taken from each one. Both deposits were poorly exposed at the surface, but could be extensive under cover.

The first deposit on Quobba station is situated 10 miles at N27°E from Quobba homestead, and is reached from the old Gnaraloo road, which runs along the western edge of Salt Marsh lake. From this road a rough fence track proceeds west along the nine mile fence to the gypsum outcrop, a distance of three miles. The track is only suited for four wheel drive vehicles, as several loose sand dunes are crossed, two of which are very steep. The gypsum outcrops in a large sink hole approximately 500 yards long and 30 yards wide, and averaging eight feet deep. This sink hole is in the centre of a wide (½ mile) valley which is mainly sand covered and is between two north-south dunes.

The sides of the sink hole show a hard packed granular gypsum with no apparent bedding topped by three feet of consolidated kopi. Some edges of the sink hole are extensively undermined by solution cavities, one going back 30 feet beneath the gypsum. Highly saline water in encountered 4 feet below the bottom of the sink hole.

A channel sample taken from the side of the sink hole (eight feet vertical) and extended to water level by auger (four feet vertical) gave the following results on analysis by the Government Chemical Laboratories.

Lab. No.	G.S.W.A. Sample No.	Gypsum $CaSO_4$-$2H_2O$ per cent.	Total Lime CaO per cent.	Sodium Chloride NaCl per cent.	Acid Insol. per cent.	Iron Fe	Remarks
15304	1	91·1	32·4	1·60	1·17	n.d.	On air dried sample

n.d. = not determined.

Sand cover prevented the areal extent of this deposit from being ascertained, but there is possibly a large quantity of this grade within the valley.

The second deposit is located on Warroora Station on the Minilya-Warroora Road three miles west of the Lyndon River crossing. To the north of the road and plainly visible therefrom, a six foot deep pit roughly 30 yards square has been put down to obtain gypsum for road surfacing across a clay flat. On the sides of this pit underlying one foot of gypseous clay, 3½ feet of mixed kopi and crystalline gypsum is exposed. The deposit is bedded and overlies a dark red clay. There are no seed dunes associated with the bedded deposit.

A channel sample gave the following results on analysis by the Government Chemical Laboratories.

Lab. No.	G.S.W.A. Sample No.	Gypsum $CaSO_4$-$2H_2O$ per cent.	Total Lime CaO per cent.	Sodium Chloride NaCl per cent.	Acid Insol. per cent.	Iron Fe	Remarks
15305	2	95·5	31·4	1·15	1·33	n.d.	On air dried sample

n.d. = not determined.

The areal extent of this deposit is large, the flats extending several miles to the north and a similar distance to the south of the road. The flats are 2½ miles wide in an east-west direction and they form the northern limit of the large Salt Marsh salt lake.

A very large quantity of bedded crystalline gypsum would be available from this deposit, but as the exact boundaries of the deposit were not mapped, no possible reserve figure is presented.

Conclusions:

Both of these deposits are large and of good grade, but that on Quobba is very difficult of access and the other is a considerable distance from Carnarvon, the nearest port. It is doubtful if either deposit will be used in the foreseeable future.

REPORT ON EXAMINATION OF M.C. 31 FOR BUILDING STONE 9 MILES W.N.W. OF NORTHAMPTON.

By R. R. Connolly,
Geological Survey of W.A.

Location and Access:

M.C. 31 is identical with the ground shown as Reserve 9106 on Mines Litho N5 and is accessible from Northampton via the Lynton station road for 10 miles thence southerly for 1.2 miles, thus arriving at the north-west corner of the claim.

The Reserve which was gazetted in 1904 for the purpose of recreation has apparently never been used as such and, with the exception of the north-west corner which is under cultivation, the ground is in its virgin state and unfrequented.

Geology:

The claim lies within an area of sedimentary rocks consisting of sandstones, conglomerate and shales classed by West Australian Petroleum Pty. Ltd., following extensive field work in the locality, as Jurassic in age. The sediments strike to the north and dip to the west at a very low angle (one or two degrees). Granite outcrops less than a mile to the east, but the actual contact between the Jurassic and the rock beneath was obscured in this locality.

The sandstone member of the succession was well exposed in several small gorges incised into a plateau formed at the top of a thin (five feet) pebble conglomerate bed immediately overlying the sandstone. The sandstone, which constitutes the proposed building stone, varies in colour from pink through white and cream to buff. It is made up of subangular to rounded quartz grains with a rather weak siliceous cement. Grain size varies from ¼ mm. to 3 mm. and some unfilled intergranular spaces are evident under a hand lens. The lack of a complete cement and the rather poor sorting of the grains leads to slight friability on a sharp edge of the stone, but on a flat face this is not evident.

The bedding thickness of the sandstone varies from two inches to three feet with thin bedding predominating over the 40 feet total thickness exposed. In the thin bedded sections exposed, current bedding as the result of an east to west current, is evident. This, plus the presence of the conformable overlying pebble conglomerate bed indicates a fairly shallow water depositional environment and the possibility of variation in texture of the rock both laterally and in depth, must not be overlooked in the utilization of this stone.

Examination of the Claim:

The writer was guided to the claim by Mr. J. Maver, who also indicated the main features of the area. Mapping of the area and sampling took two days (4th and 5th October). Mapping was confined to a pace and compass survey, the results being plotted on the accompanying map at a scale of five chains to an inch. Bulk samples were taken in the vicinity of a small pit from which had been taken sufficient stone to construct two houses in Northampton township. Every attempt was made to secure samples of fresh rock, but as they were necessarily taken from close to the surface, freshness could not be guaranteed.

Samples were submitted to the Government Chemical Laboratories for testing of mineral and physical properties and the results of this work appear as an appendix to this report.

PLATE IX

To Lynton Northampton Rd

Most Accessible Future Quarry Site

Loc 40

Loc 6331

Under Cultivation

SAMPLE LOCALITY

Small pit

NORTH GULLY 20' DEEP

Track

Old peg found

Old Track

Sandstone outcrop

DAM

M.C. 31 (↑9106)

Outcrop of Pebble conglomerate

House

MAIN GULLY 40' Deep

Loc 39

stunted scrub

Old peg found ↑9106 Datum for M.C.31

Loc 6134

PLAN SHOWING SURFACE FEATURES ON MC 31 (↑9106) Northampton Mineral Field

Scale : 5 chains to an inch

Pace and Compass survey by R.R. Connolly. Oct. 1958

Identical material was sent to Wilson Gray & Co. Pty., for cutting into cubic blocks and then submitted to the Materials Testing Section, University of W.A. Engineering School for compression tests and the results of this work are also appended.

Economic Considerations:

The stone on M.C.31 is ideally exposed from the quarrying point of view and a good 20 feet vertical face could be easily opened in the north gully as shown on the accompanying plan. An access way through the adjoining lot 39 would need to be arranged.

Uniformity of colour would be difficult to attain so far as the pink variety is concerned, as this is confined to beds of only a few feet in thickness. There is however, a practically unlimited supply of cream and buff coloured sandstone available.

There is a possibility of improvement in the quality of the stone as fresher rock is exposed, but as mentioned earlier, some variations may be expected due to the manner of deposition of the sediments.

Several buildings in Northampton have already been constructed with this stone and present a quite attractive appearance. Fretting, particularly along the mortared joints, is evident in some cases, but here the stone blocks had been irregularly trimmed and it is considered that on an accurately sawn face, fretting would not occur.

Cracks filled with secondary silica (known to the stone trade as "shakes") do occur in this rock, these and a slight friability on a sharp edge, constituting the most serious disadvantages of the stone for dimension use. In cutting also, the stone was found to be highly abrasive.

A discussion of the marketability of this stone is outside the scope of this report, but it is the author's opinion that due to distance from Perth and the existing demand, which is small and irregular, no large production from this claim can be expected.

Conclusions:

On M.C.31 there exists a large quantity of sandstone which is only slightly inferior to the better known Donnybrook sandstone. A limited quantity of pink coloured stone could be quarried and this may find a special market. Generally, however, the stone would not compete with the more accessible Donnybrook sandstone under existing demands for building stone of this nature.

Appendix 1.

Building Stone—Northampton.

Sample of Sandstone from MC31, 9 miles W.N.W of Northampton Lab. No. 13645.

Mineral Description:

A pink porous rock containing quartz grains which were originally rounded but are now strongly interlocking due to later crystal growth.

Properties as a Building Stone:

1. Apparent density (a)—2.33 equivalent to—146 lb./c. ft.
2. Density of powdered material (b)—2.63.
3. Porosity $= \frac{\text{volume of pores}}{\text{volume of stone}} = \frac{b - a}{b} \times 100$ = 11.4 per cent.
4. Water absorbed—4.8 per cent.
5. Rate of absorption—1¼ c. in./sq. ft./24 hr. under 1 in. head.
6. Soundness—No significant disintegration was evident after treatment as specified in ASTM C88-55T. This test measures the resistance of the rock to disintegration after a series of immersions and dryings in saturated solutions of sodium sulphate or mangesium sulphate and is a form of accelerated weathering test.

Conclusions:

The above tests reveal no reason why this stone should not be suitable for building purposes.

G. H. PAYNE,
Deputy Government Mineralogist.

Appendix 2.

Test No. A14827.

Compression strength with bedding plane horizontal (load applied vertically).

66 tons/sq. ft. (large block); 95 tons/sq. ft. (small block).

Compression strength with bedding plane vertical (load applied vertically).

45 tons/sq. ft. (large block); 43 tons/sq. ft. (small block).

It has been found in a series of tests conducted some years ago that the compressive strength of Donnybrook Sandstone and Cottesloe Sandstone gives results as below:—

Donnybrook Sandstone—Compressive Strength 160-700 tons/sq.ft. Mean for 20 specimens 350 tons/sq. ft.

Cottesloe Sandstone—Compressive Strength 3-25 tons/sq. ft. Mean 20 tons/sq. ft.

K. L. COOPER,
Professor of Civil Engineering.

J. R. ESPIE,
Testing Officer.

REPORT ON ALLEGED DAMAGE FROM BLASTING AT LOCKYER HOUSING AREA, ALBANY, SOUTH-WEST DIVISION.

By R. R. Connolly,
Geological Survey of W.A.

Introduction:

The State Housing Commission surburb of Lockyer is situated approximately 1¾ miles to the north-west from Albany and consists of over 400 timber framed fibro and weatherboard dwellings, a school and small shopping centre.

Complaints have been received by the Commission's Building Supervisor at Albany of damage to certain dwellings allegedly as a result of quarrying operations being conducted by Australian Blue Metal Ltd., at their Maxwell Street quarry 1¼ miles to the south-east.

The Commission referred the matter to the Chief Inspector of Explosives, who stated that while complaints of this nature were usually innocently exaggerated due to personal factors, additional information by way of quarrying methods used, distance of dwellings from blasting operations and geology of the area would be required before any assessment of the problem could be undertaken.

The purpose of this examination was primarily to map the rock types of the area embracing both quarry and housing sites, and secondly to ascertain the blasting methods used.

The area was examined on September 18, 19, 1958. Lands Department plans of Albany townsite Sheets 1 and 3 (1 inch = 6 chains) give the required survey information and reference will be made to areas marked thereon.

Quarrying Operations:

The quarry, situated 15 chains due west of Mount Melville trig station, is six chains wide, three chains deep and 70 feet high at the eastern or working face. The rock is a coarse porphyritic granite with feldspar phenocrysts up to two inches in a groundmass of quartz (½ inch) and a little biotite. From five to ten feet of decomposed granite overburden exists above the working face, this being removed by pushing into the quarry and dumping over the western edge of the quarry floor prior to drilling and firing down the face. A very clean and level quarry floor is maintained.

Blasting of the face is done at three weekly intervals shortly after five p.m. on the appointed day. The method used is to bench a part of the face in a set of three 20 foot high steps each ten feet back from the existing face and approximately a chain wide. Commencing with a vertical face, the top bench is removed then the next lower bench and finally the foot bench when a new vertical face is obtained.

For the firing of each bench, eight to ten vertical holes approximately seven feet apart are drilled 10 feet back from the face to a depth of 18 feet. These holes are "bulled" then loaded with 300 to 350 lb. of 1⅛ in. x 8 in. monograin 60 or monograin 75 explosive. The charge is fired by short delay electric detonators and approximately 1,000 tons of rock is thus brought down. This method of firing is one which is generally accepted as being the best for reduction of ground vibration in addi-

tion to giving better fragmentation and thus decreasing the necessity for subsequent secondary blasting.[1]

Secondary blasting, that is the breaking up of larger rock fragments with explosives, is done by drilling to the centre of the fragment loading with a half stick of explosive and detonating with ordinary fuse. Twenty or thirty of these "pops" may be fired at the same time resulting in a series of loud explosions, but practically no ground vibrations are experienced with this type of blasting.

From the quarry, rock is carted to the crusher immediately to the south and thence by truck transported to various road metal dumps in the district.

At the time of inspection, the quarry manager stated that contracts for supply of stone in the district had almost been fulfilled and that quarrying operations would cease in approximately one month. The quarry would then be unused for some years.

Geology of the Area:

Only three types of outcrop have been noted in the area, viz. granite, white sand (mostly overlying clay) and clay sometimes capped with laterite.

The granite is a coarse porphyritic variety, the feldspar phenocrysts having a north-south lineation where observed at Mt. Melville and at the quarry. Reserves 2681 and 21300 surrounding Mt. Melville contain many bare granite outcrops, but elsewhere exposures are poor. The whole area under consideration is almost certainly underlain by granite but based on soil, vegetation and to some extent topography, granite at the surface has been limited for the purposes of this examination to an area bounded to the west by McKeown Road, to the north by Mawson Street and to the east by Albany Highway. No joint pattern was noticed and at the quarry the working face is quite massive and free from flaws of any kind.

In the lower lying areas the granite is overlain at the surface by a fine grained clay-free sand of maximum observed thickness 8 feet, and at a slightly greater depth by an unknown thickness of clay. In the flat, marshy area adjoining Hanrahan Road, the sand is often coloured black with decayed vegetable matter, but on higher ground, where relatively uncontaminated, it is white. The thickness of this sand varies considerably and on the south sloping, built up area of Lockyer, it is absent in some places, exposing laterite overlying clay.

That the suburb is underlain by clay at a comparatively shallow depth is evidenced by the fact that early attempts at dry well drainage were unsuccessful and a deep sewerage system was found necessary. Clay is apparently closest to the surface in a strip of land running slightly south of east through lots 344, 337, 350, 114, 138, 219 and 253 as surface seepage of water from higher ground is evident along this line. Significantly, the most consistent reports of damage emanate from dwellings in close proximity to this line. The appearance of clay at or near the surface along this line, may suggest that the granite (from which the clay is derived) may here be found at a comparatively shallow depth, although only one small granite fragment was found along this line and it may have been transported.

Briefly then, the geology of the area may be outlined as follows: A prominent granite ridge with a northerly trend is flanked at its northern extremity by a predominantly clayey southerly sloping (2½°) dwelling area, which in some places has a thin veneer of fine sand. A small subsurface offshoot granite ridge with a westerly trend, may run through the middle of the housing area.

Damage Reports:

A complete assessment of complaints had not been made at the time of examination and this will need to be done in the event of resumption of quarrying operations in the future. The Housing Commission Building Supervisor reported one instance of partial ceiling collapse due to clout heads pulling through the plaster board, allegedly as a result of blasting vibrations. Other damage was mainly cracking of plasterboard walls at joins over doorways or above and below windows. Some brick chimneys had settled slightly, but the Supervisor did not attribute this to quarrying activities.

In short, no damage has occurred that could not be as well attributed to foundation movement in wet clay on a slope.

Conclusions and Recommendations:

It is considered most unlikely, based on calculation by a recognised formula, that ground vibrations resulting from face firing at the Maxwell Street quarry are of an amplitude greater than one thousandth of an inch at any part of the Lockyer housing area compared with a maximum of eight thousandths generally permissible in the vicinity of quarries in other parts of Australia.

The surface and immediate subsurface geology of the housing area is such that some distortion in timber framed dwellings is almost inevitable, particularly in a seepage zone, and the effect of blasting in the vicinity would only be that of very slight acceleration of a natural phenomenon.

It is recommended that in the event of resumption of quarrying operations, actual measurement of ground vibrations at the housing site be made before any further action is undertaken. Meanwhile, following the closure of the quarry for some years, it would be interesting to keep a close measure of existing wall cracks to check on possible variations with seasonal climatic changes or other natural variables.

REPORT ON APPLICATION FOR THREE PROSPECTING AREAS FOR MANGANESE, IRON, AND URANIUM, NORSEMAN.

By G. D. Bartram, B.Sc.,
Geological Survey of W.A.

Introduction:

In December 1957, Mr. F. H. Baker of Norseman submitted an application for three prospecting areas, P.A. 2382, P.A. 2383 and P.A. 2384, for iron, manganese and minerals of uranium. These areas were examined by the author on 21st January 1958.

Location:

The prospecting areas are situated roughly 13 miles N.W. of Norseman. Access is by way of a rough bush track which leaves the main highway at a point opposite the 448 mile peg on the railway line. The track runs roughly due west for one mile. From that point the prospecting areas are reached by walking a further 1½ miles west along the bed of a creek.

Geology:

The areas are situated in an elevated hilly region which lies about 2 miles west of Lake Cowan and about two miles S.W. of Mt. Thirsty. The drainage is to the north-east into Lake Cowan.

The country rocks are basic lavas which have been strongly sheared in a general direction 10° west of north. These lavas outcrop mainly on the higher ground, the valleys being either covered by soil and rubble or in places by a ferruginous laterite.

The prospecting areas are mainly soil covered except for one hill, which lies on the boundary of P.A. 2382 and P.A. 2383, and which is capped by the ferruginous laterite mentioned above. The rubble covering the remainder of the area consists of basic lava, ferruginous laterite and quartz pebbles. Below the laterite level there are minor outcrops of country rock.

Manganese:

Manganese was observed in two areas on P.A.2383. The first is near the southern boundary of this area, and consists of a small outcrop of kaolinised country rock containing a low percentage of manganese.

The main body occurs at the foot of the laterite capped hill mentioned above, the manganese outcropping irregularly over an area of about 30 yds x 15 yds.

[1] Reid, A. G.: Some aspects of blasting in built up areas with particular reference to ground vibrations. Proceedings, Australasian Institute of Mining and Metallurgy No. 186, June, 1958.

The manganese shows a rapid lessening of quality with depth. On the surface it is of a moderate grade, the main impurity being iron. However, at a depth of one to two ft. below the surface kaolinised country rock is present in which the percentage of manganese is very low.

Iron:

The hill that lies on the boundary of P.A. 2382 and P.A. 2383 is capped by a ferruginous laterite. This varies from a massive hematitic rock to a pisolitic limonite. The areal extent of this capping would not exceed one acre and the thickness, although hard to estimate, probably would not be more than 10-15 ft. at the most.

Minerals of Uranium:

Using an Austronic Geiger Counter, a background count was obtained at a suitable distance from the prospecting areas. On testing the area in question thoroughly with the Geiger, no variation from this background count was noted. No uranium mineralisation was observed.

Conclusions:

(1) The manganese is present in far too small a quantity and the average quality is too low for the deposit to be of any economic value.

(2) The quantity of iron present is negligible compared to the amount required for an economic deposit in this area.

(3) The prospects for finding uranium on these prospecting areas are nil.

REPORT ON PHOSPHATE DEPOSITS, LOWER MURCHISON RIVER AREA.

Approx. lat. 27° 35′ S.
Approx. long 114° 10′ E.

By G. H. LOW, B.Sc.,
Geological Survey of W.A.

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INTRODUCTION.

In September, 1958, a request was made to the Mines Department by the Northampton Road Board, through Mr. W. H. Sewell, M.L.A., for a geological examination of phosphate rock occurrences in the Lower Murchison River Area. The request was agreed to by the Mines Department and accordingly the writer was instructed by the Government Geologist to examine all known occurrences and prospect the area for further concentrations.

The writer spent seven days, from 14th October to 20th October in this area, operating from a base camp at Tutula Well on the north side of the Murchison River about six miles from the mouth.

GENERAL INFORMATION.

Interest in the phosphate rock occurrences in this area was initiated in 1932, when the late Dr. E. S. Simpson, Mineralogist, visited the Murchison River and inspected sections of Cretaceous rocks exposed at Thirindine Point and Alinga Point (see map). A Mr. Pepper, who had accompanied Mr. Simpson, subsequently suggested to the secretary of the Northampton Road Board that the phosphate deposit indicated to him by Dr. Simpson might be economically useful.

Mr. Simpson recorded his observations in an article published in the Journal of the Royal Society of Western Austraila, in 1934. He does not suggest in his report that the deposits might be of economic importance.

In 1943, when, because of the war, the problem of importation of phosphate rock became acute, the Northampton Road Board referred the matter of the Murchison River deposits to the Department of Supply and Shipping, who passed the query on to the Mines Department.

Subsequently Mr. F. G. Forman, the Government Geologist at that time, Dr. K. Teichert, Paleontologist with the University of Western Australia, and Mr. J. C. Dulfer, a representative of the British Phosphate Commission, visited the area specifically to report on the economic aspect of the Phosphate occurrence. Mr. Dulfer expressed his opinion in a report to the W.A. Mines Department, a copy of which was subsequently made available to the Northampton Road Board, and his findings (in part) were: "The deposits of phosphate are so scattered that they offer no immediate help in the present shortage of phosphate rock . . . ." This report is dated 27th July, 1943, a time when the general shipping position, and particularly that available for carrying phosphate rock, was acute.

Mr. Forman's comments included the following: "A few nodules, possibly phosphatic, were discovered and their source located. As a result of the recent inspection I am more convinced than ever of the absence of any phosphatic bed in the series which might be of possible economic importance. The nodules seen by us were very scarce and do not form a continuous bed, as is the case at Dandaragan. In my opinion, the Cretaceous Strata in the Murchison River District are not worthy of further examination for commercial phosphate deposits . . . ." (Mines Dept. sub-file 119/43).

Since 1943, the Murchison River area has been examined by geologists of the Commonwealth Bureau of Mineral Resources, of West Australian Petroleum Pty. Ltd., and others; and the Cretaceous Stratigraphy has been resolved and the area geologically mapped in detail. These findings and the maps were available to the writer at the time of his investigation.

In its latest request to have the area examined geologically for phosphate rock, the Northampton Road Board, upon request by the Government Geologist, indicated White Cliff, Toolonga Bluff, Thirindine North, and an area four miles from Murchison House Station as the most important localities of occurrence. All of these are mentioned in Mr. Dulfer's report.

SITUATION AND ACCESS.

Reference may be made to the following maps:—

1. Lands Department Lithograph, 56/300;
2. 4 Mile Strategic Series of Australia, Ajana;
3. Geological Sketch Map of W.A. 1 inch = 40 miles, G.S.W.A. 1957.

The Murchison River enters Gantheaume Bay, on the west coast of W.A., 80 miles N.N.W. of the port of Geraldton. Approximate latitude 27° 30′ S., approximate longitude 114° E.

The area considered in this report is roughly rectangular. The southern boundary runs east and west two miles south of the Murchison River mouth; the northern boundary is parallel to this 34 miles to the north; the eastern boundary is 18 miles east of the mouth; and the western boundary is the coastline. This is subsequently referred to simply as the Area.

Access to the southern part of the Area is by the North West Coastal Highway to Ajana, thence 37 miles by poor sand track to the Murchison House river ford. Alternative access, to the north-eastern port of the Area is northwards for 28 miles along the Highway from Ajana, thence 30 miles by poor sand track to the Weerinoogudda Dam area. General vehicular movement within the Area is impossible without four wheel drive.

GEOLOGY.

The following reports contain references to the geology of the Lower Murchison River Area:—

1907—Maitland, A. G.: Possibility of the Occurrence of Artesian Water in the Northampton and Geraldine Districts. *G.S.W.A. Bull. 26,* pp. 7-9.

1934—Simpson, E. S.: Contributions to the Mineralogy of W.A., Series VIII. *J. Roy. Soc. W.A. 20,* pp. 49-51.

1936—Hobson, R. A.: Summary of Petroleum in W.A., to January, 1935. *G.S.W.A. Ann. Rept. 1935,* pp. 22-30.

1936—Raggatt, H. G.: Geology of the North West Basin of W.A. *J. Roy. Soc. N.S.W. 70(1),* pp. 100-174.

1937—Forman, F. G.: Artesian and Sub-Artesian Water Possibilities, Woodleigh Station, Murchison District. *G.S.W.A. Ann. Rept. 1936,* pp. 9-11.
1943—Young, C. P.: Rept. on Murchison River and Pt. Hedland Phosphate Deposits, W.A. Unpublished Rept. to W.A. Mines Dept.
1943—Dulfer, J. C.: Phosphate Deposits Near the Mouth of the Murchison River, W.A. Unpublished Rept. to W.A. Mines Dept.
1943—Forman, F. G.: Phosphate Deposits Near the Mouth of the Murchison River, W.A. W.A. Mines Dept. Sub-file 119/43.
1944—Teichert, C. and Matheson, R. S.: Upper Cretaceous Icthysaurian and Plesiosaurian from W.A. *Aust. Jour. Sci. 6,* pp. 167-170.
1948—Clarke, E. de C. and Teichert, C.—Cretaceous Stratigraphy of the Lower Murchison River Area. *J. Roy. Soc. W.A., 32,* pp. 19-47.
1952—Brunnschweiller, R. O.: Notes on the Cretaceous-Tertiary Megafauna of the North West Basin of W.A. Bur. Min. Resources Records, 1952/28.
1953—Fairbridge, R. W.: Australian Stratigraphy. Uni. of W.A., Text Books Brd., Chap. 7 and 10.
1954—Condon, M. A.: Progress Rept. on the Geology of the Carnarvon Basin. Bur. Min. Resources Rept. No. 15, pp. 103-116.
1955H—Belford, D. J.: Cretaceous Micropaleontology, Murchison River Area, W.A. Bur. Min. Resources. Records 1955/27.
1955—Condon, M.A. and Henderson, S.D.: Cretaceous Formations, Murchison House Area, W.A. Bur. Min. Resources Records, 1955/40.
1958—Johnstone, D., Condon, M. A. and Playford, P. E.: Stratigraphy of the Lower Murchison River Area and Yaringa North Station, W.A. *Jour. Roy. Soc. W.A.,* Vol. 41, Pt. 1, pp. 13-16.

The oldest formation known to outcrop in the Area is a medium to coarse grained quartz sandstone which dips at about three degrees to the north-west. This formation, called the Tumblagooda Sandstone by Clarke and Teichert, is unconformably overlain by Cretaceous rocks, and may be evonian or Silurian in age.

The Birdrong Formation, lying at the base of the Cretaceous, is a poorly bedded, fine to medium grained quartz sandstone, containing in places some siltstone, glauconite and conglomerate.

The Birdrong is conformably overlain by the Thirindine Formation which consists mainly of bedded radiolarite with some bentonitic shales.

A siltstone and greensand formation, called the Alinga Formation, conformably overlies the Thirindine. It contains a thin bed with phosphatic nodules in the top few inches.

The Toolonga Calcilutite disconformably overlies the Alinga. The Calcilutite has a chalk bed at its base, about 25 feet thick, immediately overlying the band of phosphatic nodules. The upper part of the Toolonga contains flint nodules and the fossils Gryphaea, Ostrea, Echinoid Spines, and fragments of Inoceramics and Marsupites.

The top of the Toolonga Calcilutite is travertinised at the Tertiary erosion surface.

Over the biggest portion of the Area these Cretaceous rocks are overlain by variable thicknesses of Coastal Limestone, duricrust or laterite, and red and white sands. The maximum exposure of the Cretaceous rocks is in a narrow strip along an escarpment on the north-west side of the Murchison River Valley. These exposures form the dissected south-eastern edge of a plateau which extends to the northern boundary of the Area, and slowly rises from south-west to north-east. It has an elevation of about 300 feet near Alinga Point.

For a more detailed account of the geology and physiography, readers are referred to the report by Condon and Henderson (1955).

THE PHOSPHATE OCCURRENCES.

Phosphate nodules were found either in situ at the top of the Alinga Formation or occasionally amongst the rubble on the slopes of the hills. Some apatised wood was also found at Alinga Point and Second Gully.

The phosphate nodules, of variable shape and up to 3 lb. in weight, occur in a greensand matrix in a band which varies in thickness up to an observed maximum (in the Second Gully) of eight inches. A six inch band was seen at Alinga Point, and a similar one at Toolonga Point. Most of the nodules are grey to black in colour on the exposed surface, and a pale yellow grey on a fresh fracture.

North-eastwards of Toolonga Point, along the line of Cretaceous outcrops as far as Weerinoogudda, traces of phosphatic material were noticed in different localities on rubble on the hill slopes. This generally occurred as a thin white coating of amorphous collophanite on a lime rich centre.

These traces and phosphatic material were detected by the application of a few drops of 50 per cent nitric acid to powdered ammonium molybdate on the rock. The bright yellow of ammonium phospho-molybdate indicated the presence of phosphorus.

A search for possible "placer" concentrations of the phosphatic nodules along present or ancient water courses, or along fossil beach lines, proved fruitless.

Four hand picked samples from the better parts of the nodule bed were collected for analysis by the Government Chemical Laboratories. The localities and the results are shown in the Appendix. These are not representative of the deposit as a whole.

SUMMARY.

A detailed examination of the Cretaceous Formations in the Lower Murchison River Area was made to assess the economic potential of the phosphorite deposits. The writer had the use of aerial photographs (60 chain), line compilations (20 chain) stratigraphical analyses by various geologists of the Bureau of Mineral Resources.

Numerous field tests on suspected phosphatic material were made with powdered ammonium molybdate and nitric acid.

It was found that phosphatic material (in the form of nodular concretions and apatised wood) was restricted to a thin (maximum observed, eight inches) band at the top of the Upper Cretaceous Alinga Greensand, and to the talus slopes below the Greensand. The Greensand can be traced (discontinuously) from Alinga Point to the Weerinoogudda Dam, but only traces of phosphatic material could be detected north-eastwards from Toolonga Point to Weerinoogudda. No gravel or conglomerate concentrations of the nodular material could be found.

CONCLUSIONS.

As far as can be seen, no economic concentration of phosphatic material occurs in the Lower Murchison River Area, and there is no valid reason for supposing that further investigation, by boring or any other means, would disclose such a concentration.

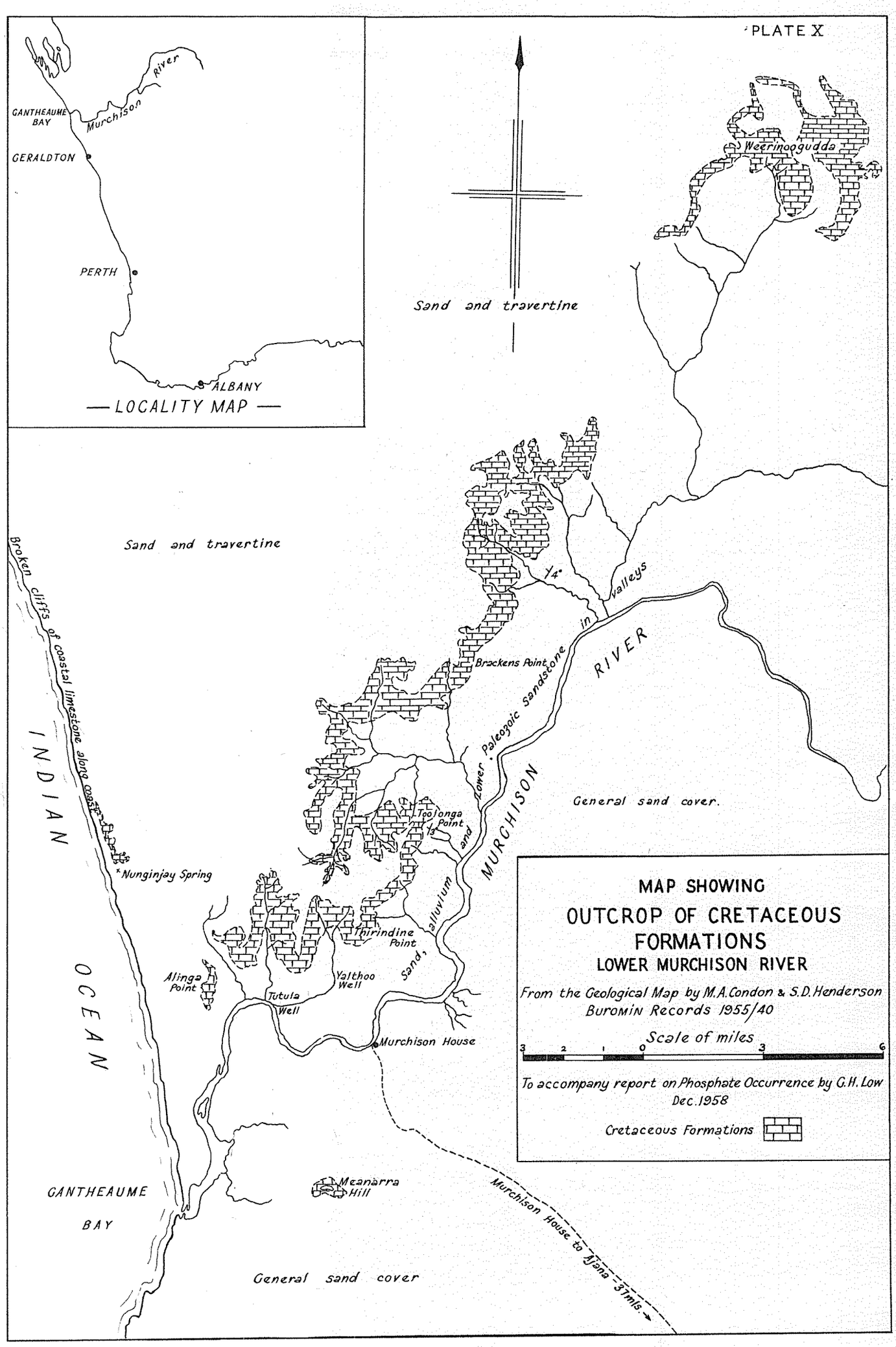
Appendix to the Report on Phosphate Deposits, Lower Murchison River Area.

Report on 4 Samples of Phosphate Rock from Lower Murchison River Area. Received 1/12/1958

Lab. Nos. (1958)	16312	16313	16314	16315
Marks	MR1	MR2	MR3	MR4
	(Alinga Point)	(Toolonga Point)	(1·5 miles N.W. of Yalthoo Well)	(2·0 miles N.N.W. of Tutula Well)
P_2O_5—total	18·8	9·64	28·0	27·8
P_2O_5—sol. in 2E. HNO_3	18·8	9·29	27·6	27·7
P_2O_5—insol. in 2E. HNO_3, sol. in HCl	Trace	0·05	0·08	0·11
P_2O_5—insol. in 2E. HNO_3 and HCl	*Nil*	0·30	0·36	Trace
K_2O—sol. in HCl	0·12	0·20	0·13	0·18
CaO—total	44·0	37·2	45·5	46·0
CO_2—	15·0	20·5	5·33	5·56
H_2O—combined	2·63	2·58	3·15	3·13
H_2O—moisture	0·95	2·10	1·11	1·07

All results are expressed as percentages on the samples as received.

PLATE X



MAP SHOWING
OUTCROP OF CRETACEOUS FORMATIONS
LOWER MURCHISON RIVER

From the Geological Map by M.A. Condon & S.D. Henderson
Buromin Records 1955/40

Scale of miles
3 2 1 0 3 6

To accompany report on Phosphate Occurrence by G.H. Low
Dec. 1958

Cretaceous Formations

DIVISION V

School of Mines, Western Australia

Annual Report — 1958

The Under Secretary for Mines,

I have the honour to submit for the information of the Honourable the Minister for Mines my report for the year 1958. The activities of the main School at Kalgoorlie, and the Branch Schools at Norseman and at Bullfinch are covered.

KALGOORLIE.

Enrolments.

The total number of enrolments received during 1958 was 380—a decrease of seven by comparison with 1957. Table I gives the individual and class enrolments for 1958 and for the two previous years; and Table II, the enrolments in individual subjects for 1958. Table III sets out the numbers of students enrolled for the various courses. The number of students enrolled for the Associateship and for Certificate Courses has increased slightly by comparison with 1957, but the increase is not particularly significant.

TABLE I.
Enrolments, Kalgoorlie.
1956, 1957, 1958.

Year	First Term		Second Term		Third Term	
	Individual	Class	Individual	Class	Individual	Class
1956	365	839	331	734	288	613
1957	363	940	315	767	264	653
1958	370	871	314	757	278	673

TABLE II.
Class Enrolments, Kalgoorlie, 1958.

Subject	First Term	Second Term	Third Term
Preparatory Chemistry	43	35	28
Chemistry IA	25	25	20
Chemistry IB	5	4	4
Chemistry II	3	3	3
Analytical Chemistry I	2	2	1
Analytical Chemistry II	4	4	4
Chemical Metallurgy I	2	2	1
Chemical Metallurgy II	2	2	2
Mineral Dressing I	13	10	9
Mineral Dressing II	7	6	6
Mineral Dressing III	4	3	3
Physical Metallurgy I	5	5	5
Assaying	8	8	8
Trade Metallurgy	11	8	18
Preparatory Mathematics	57	35	20
Mathematics I	36	32	27
Mathematics II	34	30	27
Mathematics IIM	6	5	5
Mathematics III	12	9	9
Applied Mathematics I	23	19	17
Applied Mathematics II	6	7	6
Preparatory Physics	36	26	12
Physics I	22	17	17
Physics II	20	22	22
Physics III	6	4	4
Trade Mathematics I	34	25	18
Preparatory Engineering Drawing	27	23	16
Engineering Drawing I	46	36	34
Engineering Drawing and Design IIA	18	14	11
Engineering Drawing and Design IIB	6	3	3
Engineering Drawing and Design IIC	....	1	....
Engineering Drawing and Design IID	3	3	....
Surveying Drawing II	7	4	4
Mechanical Engineering I	10	9	9
Mechanical Engineering II	4	5	4
Practical Electricity	5	4	4
Electrical Engineering I	31	24	24
Electrical Engineering II	2	2	2
Internal Combustion Engines	8	6	6
Workshop Practice I	32	32	12
Workshop Practice II	10	9	5
Workshop Practice IIIA	5	4	6
Workshop Practice IIIB	2	2	2
Engineering Workshop Practice	6	6	6
Welding I	22	22	22
Welding II	15	15	15
Steam Engine Driving	7	10	9
Structural Engineering I	9	9	10
Structural Engineering II	2	2	2
Machine Design	7	7	7
Materials of Construction	7	7	7
Hydraulics	6	6	6
Preparatory Geology	17	23	22
Geology IA	7	7	8
Geology IB	13	10	10
Geology IIA	5	5	5
Geology IIB	7	7	8
Geology IIC	6	6	6
Geology IIIB	3	3	3
Geology IIIC	2	2	2
Mining I	17	17	26
Mining II	7	7	6
Mining III	5	5	4
Mining IIIB	....	....	5
Mine Ventilation	2	2	2
Surveying I	21	21	17
Surveying II	7	5	5
Preparatory English	6	4	3
English I	10	9	9
English IA	13	11	10
Totals	871	757	673
Totals, 1957	940	767	653

TABLE III.

Number of Students Enrolled for Various Courses at Kalgoorlie.

Course	Number Enrolled		
	1956	1957	1958
Associateship Courses—			
Mining	30	27	29
Metallurgy	23	26	21
Engineering	40	37	43
Mining Geology	9	10	13
Total	102	100	106
Certificate Courses—			
Assayer's	2	2	2
Surveyor's	15	10	18
Mine Manager's	2	1	....
Engineering Draughtsman's	11	8	8
Electrical Engineer's	5	2	4
Mechanical Engineer's	1	3	....
Total	36	26	32
Technicians' Courses—			
Engine Operation and Maintenance	2	3	3
Workshop Foreman's	9	8	8
Welding	13	16	14
Total	24	27	25
No Set Course—			
Preparatory Subjects	54	50	52
Others	149	184	165
Total	203	234	217
Total for Year	365	387	380

Revenue.

The following moneys have been received at the School during the year:

	£	s.	d.
Students' fees	623	16	6
Sale of publications	7	11	6
Board of Examiners (Mine Managers and Underground Supervisors)	56	10	6
Kalgoorlie Metallurgical Laboratory	468	10	6
Laboratory deposits	39	0	0
Supplementary examinations	44	0	0
Apparatus and Equipment Trust Account	1,000	0	0
C/W Grants, Research Laboratory Trust Account	3,736	8	6
Sundry amounts	76	6	5
TOTAL	6,052	3	11

The amount received from students fees and the sale of publications is just about the same as in the previous year, but there has been an increase in the amount of fees received for work done in the Metallurgical Laboratory. Information about the numbers of students paying fees is given in Table IV.

TABLE IV.

Numbers of Students Paying Fees at Kalgoorlie.

Group No.	Description	Full Time	Part Time	Ext.	Total
1	Students who pay class fees—				
	Age 21 and over	....	107	4	
	Under age 21	....	10	....	
		....	117	4	121
2	Students nominated by Repatriation Department. Class fees paid (C.R.T.S. and others)	....	....	....	....
3	Students under 21 who pay registration fees	5	130	....	135
4	Students under 21 who do not pay registration fees	9	72	....	81
5	Students aged 21 and over who do not pay class fees	....	37	....	
	Returned Servicemen	....	4	....	
	Staff	....	2	....	
	Scholarship holders (Y.F.S.)	....	2	....	
		....	43	....	43
	Total	....	....	....	380

During the year the financial arrangement between the Laboratory and the Commonwealth Scientific and Industrial Research Organization was changed. Under the new arrangement a grant is to be made each year to the Laboratory and a trust fund has been opened in the Treasury—C/W Grants, Research Laboratory, Kalgoorlie School of Mines.

Staff.

The following staff changes occurred during the year:

Name	Position	Date	Notes
Cruickshank, A.C.	Cadet	18/2/58	Appointed
Field, R. V.	Lecturer	10/2/58	Transferred to Norseman as Officer-in-Charge
Miles, A. T.	Research Metallurgist	10/2/58	Transferred to teaching staff
Ostwald, J.	Lecturer	21/4/58	Appointed
Wilkinson, E. A.	Lecturer	14/4/58	Appointed

Courses of Study.

The number of Courses offered remained the same as in the previous year. Some changes were made in the subject matter and in nomenclature for some of the subjects taught in the Department of Mathematics and Physics. Generally the total number of hours of study required to complete courses remained about the same as in the previous year. For some of the Associateship Courses there was a small increase and for the engineering certificates a decrease. These latter courses were simplified a little, but were still retained at a satisfactory standard. The following subjects were introduced to replace the subjects shown in brackets: Mathematics II (Mathematics IIA and IIB), Mathematics III (Mathematics IIE), Physics II (Physics IIA), Physics III (Physics IIB). Details of Courses are in the Prospectus for 1959.

Annual and Supplementary Examinations.

The results of these examinations are summarised in Tables V and VI—Table V is based on class enrolments and Table VI on individual enrolments. Table V shows that there was a small general improvement in the examination results by comparison with the previous year, but the change is small and not particularly significant. Table VI shows that the small decrease in the number of students enrolled for Associateship Courses has not continued, but otherwise there are no significant changes by comparison with the previous year.

The results for individual subjects are given in Appendix I.

TABLE V.

Results of Annual and of Supplementary Examinations Based on Class Enrolments, 1954-1958, Kalgoorlie.

	1954	1955	1956	1957	1958
Class enrolments = A	901	802	878	951	928
Number of entries for Annual Examinations = B	521	495	557	577	577
B/A per cent.	58	62	63	61	62
Number of passes at Annual Examinations, as a per cent. of A	47	51	53	48	52
Number of passes at Annual Examinations, as a per cent. of B	82	82	83	79	84
Number of passes at Annual and Supplementary Examinations, as a per cent. of A	49	52	55	52	53
Number of passes at Annual and Supplementary Examinations, as a per cent. of B	85	85	86	83	85

TABLE VI.

Students Sitting for Annual Examinations 1956, 1957, 1958, Kalgoorlie.

Course	1956		1957		1958	
	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting
Associateship	102	81	100	89	106	91
Certificate	36	86	26	85	32	81
Technicians'	24	75	27	67	25	88
No Set Course	203	48	234	59	217	47
Total	365	63	387	69	380	64

Scholarships and Prizes.

S. T. Hunter continued to hold a Mines Department Entrance Scholarship, and again completed a good year's work. His Scholarship was again renewed at the end of the year.

Twelve students held Chamber of Mines Scholarships during the year, and all except one completed a satisfactory year's work. One Scholarship was cancelled at the end of the year.

The usual scholarships and prizes were awarded at the end of the year, and a list of awards is given in Appendix 2.

Diplomas and Certificates.

During the year 12 students completed Associateship Courses; 14, Certificate Courses; and 7, Technicians' Courses. These figures are about the same as those for the previous year. The numbers of students completing courses during the last five years are given in Table VII.

TABLE VII.

Diplomas and Certificates Awarded, 1954-1958.

	1954	1955	1956	1957	1958
Associateship Courses—					
Mining	7	1	6	3	6
Metallurgy	6	2	4	5	2
Engineering	3	2	8	3	3
Mechanical and Electrical Engineering (pre 1947 Course)	1	....	....	....	....
Mining Geology	2	....	1	....	1
	19	5	19	11	12
Certificate Courses—					
Assayer's	4	3	2	4	3
Industrial Chemist's	1	....	....	....	....
Mine Manager's	2	4	3	1	....
Mine Surveyor's	9	8	4	2	9
Engineering Draughtsman's	....	1	....	2	....
Electrical Engineer's	2	....	....	....	1
Mechanical Engineer's	....	1	....	....	1
	18	17	9	9	14
Technicians' Courses—					
Engine Operation and Maintenance	3	3	....	2	2
Workshop Foreman's	....	....	2	1	1
Welding	....	....	3	2	3
	3	3	5	4	6

Students Nominated by Repatriation Department:

During 1958 no students were studying under the Repatriation Department training schemes.

Library:

Work has continued on the library throughout the year. At the 1st December 5,288 items had been catalogued under author and shelf list entries. Subject entries and the placing of loan cards in lending stock have been completed for one department in the School. New books and bound periodicals added to the library during 1958 totalled 264.

A start has been made on sorting out and cataloguing pamphlets and unbound serials. This has resulted in the weeding out of duplicates and the exchange of some of these with other Australian libraries.

Shortage of space is still a difficulty. The purchase of some additional shelving during the year relieved the congestion a little, but the School stock is still shelved in 21 different parts of the School and no central administrative or work section is available. During next year it is hoped that the library of the Department of Metallurgy and Chemistry will be extended and that an administrative and work building will be provided.

Services to the Public:

The School continued to provide the same services (in addition to its teaching activities) as in previous years. During the year 261 samples were received for assay and/or mineral determination from prospectors and others. This work is done without cost and is summarised in Table VIII. The number of samples received was 137 less than in the previous year. The majority of samples were for gold assay or mineral determination.

TABLE VIII.

Work done on Samples Received from Prospectors and others—Kalgoorlie.

	1956	1957	1958
Assay—gold	147	106	105
Assay—gold and other constituents	23	6	....
Assay—metals other than gold	20	42	18
Assays plus mineral determination	11	11	3
Mineral examination	150	223	130
Rejected or transferred to Met. Lab. pay	42	10	5
Total	393	398	261

Buildings:

One new building was commenced during 1958—a mineral dressing laboratory for student use. This building was almost completed at the end of the year, and will be ready for use during 1959. Alterations to the Kalgoorlie Metallurgical Laboratory were also almost completed by the end of the year. Completion of these is held up until exhaust fans of the required type are obtained from England. The buildings generally are in fair condition, but do need painting. Provision has been made for this to be done during 1959.

Requirements of the School:

Two of the major requirements of the School which were last listed in the 1954 Annual Report, have been satisfied or partly satisfied. The mineral dressing laboratory for student use has been completed and some alterations have been made to the Kalgoorlie Metallurgical Laboratory. The additional bay asked for has not been provided, and present indications are that this will not, even if provided in the near future, completely meet the needs of the Laboratory. No provision has been made to provide office and work room accommodation for the Librarian. One or two additional small lecture rooms are needed and provision should be made during 1959 for an extension to the Metallurgy and Chemistry library and for the lecture room on the end of the mineral dressing laboratory as discussed during the year.

During 1959 it will also be desirable to complete the following minor requirements: a room for blue and white printing, a new front fence, a shed for wood, and an incinerator.

Advisory Committee:

During the year the Committee met on 9 occasions and attendance was as follows: Mr. Harwood, 7; Mr. Blown, 8; Mr. Collard, 2; Mr. Hobson, 9; Mr. Kleeman, 8; Mr. Mundle, 4; Mr. Warman, 5 (max. 7); Mr. Warman moved to Sydney during the year and resigned from the Committee. The Associates Association has been asked to nominate a representative to replace Mr. Warman. Mr. Warman has been a member of the Committee since 1947 and the Committee and the Department have valued his co-operation and advice.

An additional £2,000 was paid in to the Trust Fund during the year—£1,000 from the Chamber and £1,000 from the Department—and equipment to the value of approximately £3,300 was ordered.

Kalgoorlie Metallurgical Laboratory:

Eleven reports and 106 certificates were issued during the year (Table IX). Eight of the reports had reference to gold ores, two to the ores of other metals, and one to non-metallics. The increase in the number of certificates issued is due mainly to an increase in the number of assays received following the closing down of a firm of Public Assayers towards the end of the year. In addition to the assays reported on the 106 certificates referred to above a number of assays were made without charge for prospectors as part of the free service which the School provides for prospectors.

For most of the year the Laboratory has been short of one research metallurgist, but it is expected that this will be remedied early in 1959. This shortage of staff has reduced the amount of work done during the year.

Reference has already been made to the grant to be received each year from C.S. & I.R.O. Subject to certain conditions a sum of money will be paid by C.S. & I.R.O. each year into a trust fund to cover agreed expenditure. For the 1958-59 financial year the amount provided was £2,700.

More information is given in Appendix 3 about the work of the Laboratory.

TABLE IX.

Kalgoorlie Metallurgical Laboratory Summary of Work.

	1956	1957	1958
Investigations outstanding (1st January)	5	8	7
Investigations asked for (703 to 709, inclusive)	14	13	7
Total	19	21	14
Investigations completed	10	11	11
Investigations outstanding (31st December)	8	7	3
Investigations cancelled	1	3	....
Total	19	21	14
Certificates issued (assays, analyses etc.)	71	70	106

Students' Association:

The Students' Association was not very active during the year, but did organise the School of Mines Ball on 11th July, 1958, and did provide four scholarships each valued at £10.

NORSEMAN.

Enrolments.

The number of students enrolled during the year was 67—seven more than in the previous year. Table X sets out the individual and class enrolments for the year and for the two previous years; and Table XI, the enrolments for individual subjects. Table XII gives the numbers of students enrolled for the various courses.

TABLE X.

Enrolments, Norseman, 1956, 1957, 1958.

Year	First Term		Second Term		Third Term	
	Individual	Class	Individual	Class	Individual	Class
1956	60	159	59	156	58	135
1957	58	160	55	144	51	134
1958	65	168	58	143	50	115

TABLE XI.

Class Enrolments, Norseman, 1958.

Subjects	First Term	Second Term	Third Term
Preparatory Chemistry	13	10	7
Chemistry IA	5	5	4
Preparatory Mathematics	11	6	5
Mathematics I	10	7	6
Physics I	7	7	8
Trade Mathematics I	....	6	6
Trade Mathematics II	6	5	5
Preparatory Engineering Drawing	16	15	11
Engineering Drawing I	20	17	5
Engineering Drawing and Design IIA	3	2	2
Surveying Drawing II	3	3	3
Internal Combustion Engines	11	8	8
Workshop Practice I	15	12	12
Welding I	10	8	5
Welding II	7	7	5
Materials of Construction	7	6	5
Mine Ventilation	6	5	5
Surveying II	9	8	8
English IA	9	6	5
Total	168	143	115
Totals, 1957	160	144	134

TABLE XII.

Number of Students Enrolled for Various Courses at Norseman.

Course	Number Enrolled		
	1956	1957	1958
Associateship Courses—			
Mining	6	3	6
Metallurgy	....	....	....
Engineering	....	....	2
Mining Geology	....	....	1
Total	6	3	9
Certificate Courses—			
Assayer's	1	....	....
Surveyor's	5	8	7
Mine Manager's	1	1	....
Engineering Draughtsman's	....	1	....
Electrical Engineer's	....	....	1
Mechanical Engineer's	....	....	....
Total	7	10	8
Technicians' Courses—			
Engine Operation and Maintenance	27	22	18
Workshop Foreman's	2	2	4
Welding	1	4	6
Total	30	28	28
No Set Course—			
Preparatory Subjects	5	11	13
Others	12	8	9
Total	17	19	22
Total for Year	60	60	67

Revenue.

The revenue received was £75.

Staff.

Mr. R. V. Field commenced duty as Officer-in-Charge at the start of the School year. The position of lecturer was again advertised, but no suitable applications were received and no appointment was made. Twelve part-time instructors were employed during the year. Of these two were employed only for a short period at the start of the year.

Subjects Taught.

Nineteen subjects were taught—one less than in 1957. Use was made, as in previous years, of the workshops of Central Norseman Gold Corporation for practical instruction.

Examinations.

The results of the Annual Examinations are summarized in Tables XIII and XIV—Table XIII is based on class enrolments and Table XIV on individual enrolments. Table XV makes a comparison with Kalgoorlie results and is based on class enrolments. Table XIII shows that the loss of students during the year was appreciably greater than usual. An inspection of the information on which this table is based showed that the loss was greatest in the Preparatory subjects and in the various drawing subjects. Table XIV shows that the loss was greatest among students not enrolled for any set course.

TABLE XIII.

Results of Annual and of Supplementary Examinations based on Class Enrolments, 1954-1958, Norseman.

	1954	1955	1956	1957	1958
Class enrolments = A	157	167	163	178	180
Number of entries for Annual Examinations = B	100	90	111	116	95
B/A per cent.	64	54	68	65	52
Number of passes at Annual Examinations, as a per cent. of A	48	43	58	52	37
Number of passes at Annual Examinations, as a per cent. of B	76	79	86	79	70
Number of passes at Annual and Supplementary Examinations, as a per cent. of A	49	43	61	53	38
Number of passes at Annual and Supplementary Examinations, as a per cent. of B	77	80	89	81	73

TABLE XIV.

Students Sitting at Annual Examinations Norseman, 1956-1958.

Courses	1956		1957		1958	
	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting
Associateship	6	100	3	100	9	89
Certificate	7	86	10	90	8	86
'Technicians'	30	83	28	86	22	79
No Set Course	17	81	19	84	22	31
Totals	60	83	60	87	67	66
Kalgoorlie for comparison	365	63	387	69	380	64

TABLE XV.

Examination Results, Norseman and Kalgoorlie.

Notes: (i) Information based on class enrolments.

(ii) The letters "A" and "B" have the same meaning as in Table XIII.

	Norseman			Kalgoorlie		
	1956	1957	1958	1956	1957	1958
B/A per cent.	68	65	52	63	61	62
Total passed as a per cent. of A	61	53	38	55	52	53
Total passed as a per cent. of B	89	81	73	86	83	85

The results for individual subjects are given in Appendix 1.

Scholarships and Prizes.

The two students to whom Reg Dowson Scholarships were awarded at the end of 1957—W. K. Hedley and N. E. Wilson—both completed a satisfactory year's work. Reg Dowson Scholarships based on work done during 1958 were awarded to R. J. Lea and to C. F. May.

The Institute of Mine Surveyors £5 prize was awarded at the end of the year to S. R. Baker of Norseman. This prize is open to students of the Kalgoorlie, the Norseman, or the Bullfinch Schools.

A list of awards is given in Appendix 2.

Buildings.

The buildings are in good condition and only minor maintenance was done on these during the year. A start was made at the end of the year with the installation of septic sewerage.

Advisory Committee.

This Committee continued to meet and to take an interest in the affairs of the School.

BULLFINCH.

Enrolments.

The number of students enrolled was 47—a decrease of 10 by comparison with the previous year. Table XVI gives the individual and class enrolments for 1958 and for the two previous years; Table XVII, the enrolments in individual subjects for 1958; and Table XVIII the numbers of students enrolled for the various courses.

TABLE XVI.

Enrolments, Bullfinch, 1956, 1957, 1958.

Year	First Term		Second Term		Third Term	
	Individual	Class	Individual	Class	Individual	Class
1956	33	64	33	59	27	54
1957	56	113	41	78	41	77
1958	40	75	35	62	33	58

TABLE XVII.

Class Enrolments, Bullfinch, 1958.

Subjects	First Term	Second Term	Third Term
Mineral Dressing I	1	1	1
Physical Metallurgy I	1	1	1
Preparatory Mathematics	7	5	5
Mathematics I	5	4	4
Mathematics II	1	1	1
Preparatory Physics	9	7	7
Preparatory Engineering Drawing	6	5	5
Engineering Drawing I	4	7	4
Engineering Drawing and Design IIA	....	....	2
Surveying Drawing II	4	4	4
Workshop Practice II	4	2	2
Welding I	14	10	8
Welding II	4	3	4
Preparatory Geology	1	1	1
Geology IA	4	2	2
Mining IIA	2	....	....
Surveying I	5	5	4
Surveying II	3	3	3
Surveying IIA	....	1	....
Totals	75	62	58
Totals, 1957	113	78	77

TABLE XVIII.

Number of Students Enrolled for Various Courses at Bullfinch.

Course	Number Enrolled		
	1956	1957	1958
Associateship Courses—			
Mining	....	....	....
Metallurgy	....	1	2
Engineering	....	....	....
Mining Geology	2	1	2
Total	2	2	4
Certificate Courses—			
Assayer's	....	....	....
Surveyor's	3	4	7
Mine Manager's	....	....	....
Engineering Draughtsman's	....	....	....
Electrical Engineer's	1	2	....
Mechanical Engineer's	....	....	....
Total	4	6	7
Technicians' Courses—			
Engine Operation and Maintenance	....	....	....
Workshop Foreman's	....	1	4
Welding	....	....	....
Total	....	1	4
No Set Course—			
Preparatory Subjects	10	7	4
Others	17	41	28
Total	27	48	32
Total for Year	33	57	47

Revenue.

The revenue received was £50 15s. 6d.

Staff.

Towards the end of the year Mr. M. H. Lloyd was appointed as Officer-in-Charge at Bullfinch, and will commence duties in 1959. During the year Mr. Browne continued as Registrar, and was responsible for the proper working of the School. Mr. Browne has at all times taken a keen interest in the affairs of the School and will continue to

(6)—25646

assist Mr. Lloyd. All instructors were part-time and in all ten were employed—one for only part of the year.

Subjects Taught.

Classes were held in 14 subjects and in addition three students were assisted to do four subjects by individual study with help from Kalgoorlie.

Examinations.

The results of the Annual Examinations are summarised in Tables XIX to XXI. These tables show that there has been a considerable improvement in the examination results at Bullfinch this year, and that the results generally are comparable with those at the other two centres. This is the first year that this has been so.

It is pleasing to record that one Bullfinch student—Mr. K. C. Gray—completed all the requirements of the Mine Surveyor's Certificate Course at the Annual Examinations, and thus became the first Bullfinch student to obtain a qualification.

TABLE XIX.

Results of Annual and of Supplementary Examinations Based on Class Enrolments, Bullfinch, 1956-1958.

	1956	1957	1958
Class enrolments = A	77	114	87
Number of entries for Annual Examinations = B	45	64	55
B/A per cent.	58	56	63
Number of passes at Annual Examinations as a per cent. of A	39	33	54
Number of passes at Annual Examinations as a per cent. of B	67	59	85
Number of passes at Annual and Supplementary Examinations as a per cent. of A	39	35	54
Number of passes at Annual and Supplementary Examinations as a per cent. of B	67	62	85

TABLE XX.

Students Sitting for Annual Examinations, Bullfinch.

Courses	1956		1957		1958	
	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting	Number enrolled	Per cent. sitting
Associateship	2	50	2	100	4	75
Certificate	4	75	6	100	7	100
Technician's	....	....	1	....	4	25
No Set Course	27	59	48	48	32	47
Totals	33	67	57	54	47	55
Totals—						
Kalgoorlie	365	63	387	69	380	64
Norseman	60	83	60	87	67	66

TABLE XXI.

Examination Results—Bullfinch, Norseman and Kalgoorlie.

Notes: (i) Based on class enrolments. (ii) The letters "A" and "B" have the same meaning as in Table XIX.

	1956	1957	1958
B/A per cent.—			
Bullfinch	58	56	63
Norseman	68	65	52
Kalgoorlie	63	61	62
Total passes as a per cent. of A.—			
Bullfinch	39	35	54
Norseman	61	53	38
Kalgoorlie	55	52	53
Total passes as a per cent. of B.—			
Bullfinch	67	62	85
Norseman	89	81	73
Kalgoorlie	86	83	85

The results for individual subjects are given in Appendix 1.

Scholarships and Prizes.

A Bullfinch student—M. T. Blackley—was awarded the Institute of Mine Surveyors £10 prize in competition with students from both Kalgoorlie and Norseman.

Buildings.

The buildings were painted externally during the year, and except for a few minor things are in satisfactory condition.

ACKNOWLEDGMENTS.

All members of the Staff have worked well during the year, and have endeavoured to give the maximum assistance to students and to the public. Thanks are due to members of the part-time staff for co-operation and assistance, which has been generously given. The information given in the various tables in this report has been compiled by the Registrar and members of the office staff.

Members of the Advisory Committee at Kalgoorlie and elsewhere have assisted the School, and thanks are due to them.

Mining companies in Norseman and in Bullfinch have continued to make workshops available for practical classes.

Co-operation and assistance have been received from Head Office staff, and from members of other sections of the Mines Department.

R. A. HOBSON,
Director, School of Mines.

APPENDIX 1.

School of Mines of Western Australia.

ANNUAL EXAMINATIONS.

1958.

PASS LIST.

Passes are in order of merit.

(E) denotes equal.

(*) denotes year fee scholarship.

Preparatory Chemistry.

Credit:

Coumbe, J. T. (*)
Erceg, S. G.

Pass:

Robinson, J. P.
Blurton, L. N.
Cuneen, P. J. (E)
Thompson, B. M. (E)
Cruickshank, A. C. (E)
Sheehy, F. M. (E)
Rodgers, B. D.
Maguire, D. W.
Brajcich, J. (E)
Coffey, J. T. (E)
Harrison, D. R. (E)
Robinson, G. J. (E)
Graham, P. R.
Flanagan, K. J.
Leslie, W. E. (E)
Unkovich, N. J. (E)

Supp. Exam. granted:

Bona, J.
Hall, S. F.
Sharpe, W. Mc.

Chemistry 1A.

Credit:

Mitchell, P. N. (*)
Travis, G. A.
Hurley, B. J.

Pass:

Sullivan, J. P.
Jordan, A. F.
Willis, J. S.
Bright, A. F.
Veale, I. L.
Scott, S. J.

Supp. Exam. granted:

Radge, J. A.
Tolj, I. J.
White, R.
Wills, M. F.

Chemistry IB.

Credit:

Bourne, R. W. (*)

Supp. Exam. granted:

Henderson, G.
Sceresini, B. J. S.

Chemistry II.

Pass:

Dowson, J. W.
Neve, H. D.
Hooker, L. F.

Analytical Chemistry II.

Credit:

Buckett, L. N. (*)

Pass:

Gray, D. J.
Bracanin, B. F.

Chemical Metallurgy I.

Pass:

Neve, H. D.

Chemical Metallurgy II.

Credit:

Garrigan, J. S. (*)

Pass:

Dunstan, H. R.

Mineral Dressing I.

Credit:

Mitchell, P. N. (*)

Pass:

Buckett, G. A. (E)
Campbell, A. D. (E)
Jordan, A. F.
Klose, W. F.
Sceresini, B. J. S.
Simmons, M. R.
Mahalingham, S. S.

Mineral Dressing II.

Credit:

Buckett, L. N. (*)

Pass:

Bracanin, B. F. (E)
George, T. J. F. (E)
Kops, J. N. (E)
Zani, D. A.
Canning, D. G.

Mineral Dressing III.

Credit:

Garrigan, J. S. (*)
Hooker, L. F.

Pass:

Canning, D. G.

Physical Metallurgy I.

Credit:

Dowson, J. W. (*)
Wallis, F. A.

Hooker, L. F.
Rowe, D. M.
Canning, D. G.

Assaying.

Credit:
Campbell, A. D. (*)
Bourne, R. W.
Kops, J.
Shenton, E. F.

Pass:
Jordan, A. F.
Antulov, V.
Poole, R. H.
Connelly, M. A.

Trade Metallurgy.

Credit:
Thompson, F. (*)

Pass:
Vanek, V.
Douglas, D. C.
Martin, S. T.
Gowdie, B. A.
Evans, V.
Gould, G. A.

Supp. Exam. Granted:
Blair, R. E.

Preparatory Mathematics.

Credit:
Tonkin, D. (*)

Pass:
McDowell, J.
Pilkington, W. J.
Darroch, D.
Colgrove, J. E. (E)
Crocker, F. R. (E)
Andrews, D. N. M.
Weir, B. A.

Supp. Exam. Granted:
Brooks, R. G.
Jordan, R. F.
Peden, R. W. P.
Russell, C. W.

Mathematics I.

Credit:
Travis, G. A. (*)
McIntyre, A. T.

Pass:
Cooper, G. H.
Cruickshank, A. C.
Gray, D. J. (E)
Leslie, W. E. (E)
Fiegert, J.
Wills, M. F.
Loxton, I. W.
Yates, V. R.
Mackay, I. D.
Marshall, D. A.
Keogh, C. E.

Supp. Exam. Granted:
Comparolo, T. G.
Kilderry, T. J.

Mathematics II.

Credit:
Buckett, G. A. (*)
Murray, B. F.
Hunter, S. T.
Bourne, R. W.

Pass:
Muncaster, I. M.
Forrest, R. N.
McGushin, P. J.
White, R.
Brownrigg, N. J.
George, T. J. F.
Weir, D. J.

Supp. Exam. Granted:
van der Hoek, B. J. D.

Mathematics II—Section A.

Supp. Exam. granted:
Slocomb, J. H.

Mathematics II—Section B.

Pass:
Duncan, H. F.
Kew, J. A.

Supp. Exam. granted:
Oliver, B. C.

Mathematics IIM

Credit:
Dunstan, H. R. (*)

Pass:
Smith, A. McD.
Campbell, A. D.
Dowson, J. W.
Zani, D. A.

Mathematics III.

Credit:
Mitchell, P. N. (*)
Bagworth, B. A.
Duncan, H. F.

Pass:
Rasmussen, G. C. R.
Cameron, J. W.
Sullivan, A. D.
Terrell, R. J. H.

Applied Mathematics I.

Credit:
Buckett, G. A. (*)
Murray, B. F.
Travis, G. A.
Muncaster, I. M.

Pass:
McIntyre, A. T.
Jordan, A. F.
Forrest, R. N. (E)
Veale, I. L. (E)
Slocomb, J. H.
Goddard, R. L. (E)
Shugg, P. J. (E)
Oliver, B. C.
Chamberlain, H. I.
Sceresini, B. J. S.
Jongen, P. J. F. G.

Applied Mathematics II.

Credit:
Mitchell, P. N. (*)
Bagworth, B. A.
Ruvidini, A.

Pass:
Duncan, H. F.
Sullivan, A. D.
White, R.

Preparatory Physics.

Credit:
Tonkin, D. (*)
Cruickshank, A. C.
Crew, W. J. (E)
McGushin, P. J. (E)
McGushin, G. (E)
McDowell, J. (E)
Colgrove, J. E.

Pass:
Attrill, D. M.
Nowland, L. G.

Supp. Exam. granted:
Macgregor, B. R.
Morocz, G.

Exemption from attendance at practical work granted for 1959:
Irving, G. H.

Physics I.

Credit:
Travis, G. A. (*)
Parry, K. F.

Pass:
Cooper, G. H.
Gatti, F. V.
Bain, W. B.
Chamberlain, H. I. (E).
Dykstra, F. D. (E)
Sloan, R. (E)
Marshall, D. A.
Chisholm, M. R.
Keogh, C. E.

Supp. Exam. Granted:
Fraser, P. G.
Kilderry, T. J.

Exemption from attendance at practical work granted for 1959.
Fraser, P. G.
Kilderry, T. J.
Comparolo, T. G.

Physics II.

Credit:
Buckett, G. A. (*)
Bourne, R. W.
Bagworth, B. A.
Ruvidini, A. (E)
Murray, B. F. (E)
Hunter, S. T.
Dunstan, H. R.

Pass:
Muncaster, I. M.
Zani, D. A.
Duncan, H. F.
Smith, A. M.
George, T. J. F.
Kops, J. N.
Bennett, V. G.
Thompson, B. M.
Shenton, E. F.
White, R.
Miller, E. G.
Maguire, D. W.

Physics III.

Credit:
Bagworth, B. A. (*)
Ruvidini, A.

Pass:
Thompson, B. M.
Terrell, R. J. H.

Trade Mathematics I.

Credit:
McGushin, G. (E)
Neve, F. G. (E)
Goldner, H.
Martin, N. A. (E)
Harvey, J. (E)
Joyce, M. J.

Pass:
Cartner, S.
Kirkby, G. P.
Lamont, E. G.
Tie, C. S.
Livingstone, N. R.

Supp. Exam. granted:
Thomas, G. N.
Irving, G. H.
Reid, R. H. J.

Preparatory Drawing.

Credit:
Eaton, R. E. (*)
Sceresini, B. J. S.
Livingstone, R. A.
Bennett, K. W.
Joyce, J. P. M.

Pass:
Blair, R. E.
Cooper, G. H.
Pilkington, W. J.
Dibbs, H. P.
Colgrove, J. E.
Smurthwaite, A. J. N.
Brealey, D. J.
Hook, K. G.
McDowell, J.

Engineering Drawing I.

Credit:
Douglas, D. C. (*)
Eaton, R. E.
Travis, G. A.
Marshall, D. A.
De Passey, I. R.
Pivac, A. M.
Cartner, S.
Cruickshank, A. C.
Muncaster, I. M.
Crew, W. J.

Pass:
Nowland, L. G.
Bostleman, L. E.
Duval, J. D.
Tindall, E. R.
Greenfield, J. W.
Colgrove, J. E.
Frank, P. H.
Attrill, D. M.
Kilderry, T. J.
Jongen, P. J. F. G.
Martin, N. A.
Dykstra, F. D.
Bain, W. B.
Nowland, D. C.
Miller, J. W.
Crocker, F. R.

Engineering Drawing and Design IIA.

Credit:
Buckett, G. A. (*)
Murray, B. F.
Bagworth, B. A.
van der Hoek, B. J. D.
Cameron, J. W.
Hunter, S. T.

Pass:
Oliver, B. C.
Forrest, R. N.
Wolff, D. L.
Miller, J. J.
Keogh, J. T.

Engineering Drawing and Design IIB.

Credit:
Mitchell, P. N. (*)
Sullivan, A. D.
Cameron, J. W.

Engineering Drawing and Design IIC

Credit:
Cameron, J. W. (*)

Engineering Drawing and Design IID.

Credit:
Marsh, F. E. (*)
Rasmussen, G. C. R.
Cameron, J. W.

Survey Drawing II.

Credit:
McNally, R. T. (*)
van der Hoek, B. J. D.

Pass:
Wolff, D. L.
Meiklejohn, G.

Mechanical Engineering I.

Credit:
Buckett, G. A. (*)
Bagworth, B. A.
Smith, C. L.
Ruvidini, A.

Pass:
Oliver, J. B.
Sullivan, A. D.
Wolff, D. L.
Cedro, J. A.

Mechanical Engineering II.

Credit:
Marsh, F. E. (*)
Rasmussen, G. C. R.
Crocker, R. F.

Pass:
Cameron, J. W.

Practical Electricity.

Pass:
de Boer, H.
Duval, J. D.
Hatton, R.

Electrical Engineering I.

Credit:
Mitchell, P. N. (*)
Bagworth, B. A.
Bourne, R. W. (E)
Manners, R. B. (E)
Smith, C. L.
Ruvidini, A.

Pass:
Oliver, J. B.
Bracanin, B. F. (E)

Cugley, K. (E)
Hunter, S. T. (E)
Jasson, K. E.
Ganthavee, S. (E)
Smith, A. M. (E)
Miller, J. J.
White, R.
Parry, K. F.
Terrell, R. J. H.
Antulov, V.

Supp. Exam Granted:
Wolff, D. L.

Electrical Engineering II.
Credit:
Crocker, R. F. (*)
Pass:
Willis, J. S.

Internal Combustion Engines.
Credit:
Clifton, M. R. (*)
Pass:
Bridges, W. G. C.

Workshop Practice I.
Credit:
Thompson, F. (*)
Harvey, J. S.
Neve, F. G.
Pass:
Tindall, E. R.
Livingstone, N. R.
Exemption from attendance at lectures granted for 1959.
Vanek, V.
Mason, T. G.

Workshop Practice II.
Pass:
Goldner, H.
Hall, B. R.
Sutherland, G.

Workshop Practice IIIA.
Pass:
Duncan, A. M.
Joyce, M. J.

Workshop Practice IIIB.
Credit:
Bevans, E. T.
Douglas, D. C.

Engineering Workshop Practice.
Credit:
Buckett, G. A. (*)
Marsh, F. E.
Murray, B. F.
Pass:
Muncaster, I. M.
Bennett, V. G.
Scott, S. J.

Welding I.
Credit:
Bostleman, L. E. (*)
Neve, F. G.
Foote, N. W.
Martin, S. T.
Pass:
Graham, R. J. (E)
Larcombe, E. J. (E)
Baker, B. G.
Gould, G. A.
Anderson, K. M.

Welding II.
Credit:
Vanek, V (*)
Evans, V.
Thompson, F.
Pass:
Alexander, J. A.
Blair, R. E. (E)
Graham, R. J. (E)
Simms, B. F. (E)
Sutherland, G. W. (E)
Mackay, A.
Pianto, G. V.

Exemption from attendance at practical work granted for 1959:
Anderson, E. L.

Steam Engine Driving.
Credit:
Mills, W. J. (*)
Pass:
Lawford, G. M.
Carthew, A. E. H.
Adams, R. A.
Campbell, J. G.
Doyle, P. J.

Structural Engineering I.
Credit:
Gray, V. F. (*)
Mitchell, P. N.
Parry, K. F.
Jasson, K. E.
Jordan, A. F.
Pass:
Brownrigg, N. J.
Terrell, R. J. H.
Cedro, J. A.
Henderson, G. A.

Structural Engineering II.
Credit:
Cameron, J. W.
Pass:
Lawson, K. S.

Machine Design.
Credit:
Bennett, V. G. (*)
Bagworth, B. A.
Manners, R. B.
White, R.
Pass:
Ruvidini, A.
Slocomb, J. H.
Cliff, I. F.

Materials of Construction.
Credit:
Buckett, G. A. (*)
Duncan, H. F.
Murray, B. F.
Hunter, S. T.
Pass:
Mills, W. J.
Muncaster, I. M.
Thompson, B. M.

Hydraulics.
Credit:
Mitchell, P. N. (*)
Bagworth, B. A.
Ruvidini, A.
Pass:
Cameron, J. W.
Canning, D. G.
Jasson, K. E.

Preparatory Geology.
Credit:
Allen, T. R. (*)
Pass:
Cruickshank, A. C. (E)
Veale, I. L. (E)
Letts, I. R.
Pivac, A. M. (E)
Sceresini, B. J. S. (E)
Attrill, D. M.
Scott, T. G.
Van Mierlo, W.
Lithgow, J. R.
Peate, L. F.
Cooper, W. H.

Supp. Exam. granted:
Turner, B. C.

Geology IA.
Pass:
McNally, R. T.
Frank, P. H.
Argus, J. C.
Van der Hoek, B. J. D.
Suthisorn, V.

Geology IB.
Credit:
Travis, G. A. (*)
Bourne, R. W.
Pass:
Ingle, B.
Bain, W. B. (E)
McNally, R. T. (E)
Banks, F. R. (E)
Gatti, F. V. (E)
Argus, J. C.
Crew, W. J.

Geology IIA.
Credit:
Wheeler, H. W. (*)
Pass:
Antulov, V.
Simmons, M. R.
Hooker, N. R.
Mahalingham, S. S.

Geology IIB.
Pass:
Shenton, E. F.
Dodge, G. J. (E)
Hardy, R. J. (E)
Mahalingham, S. S.
Ganthavee, S. (E)
Poole, R. M. (E)
Meiklejohn, G.

Geology IIC.
Credit:
Buckett, L. N.
Bracanin, B. F.
Garrigan, J. S.
Zani, D. A.
Pass:
Smith, A. McD.
Hooker, L. F.

Geology IIIB.
Pass:
Henderson, G. A.
Brien, J. W.
Connelly, M. A.

Geology IIIC.
Pass:
Brien, J. W.
Henderson, G. A.

Mining I.
Pass:
Mitchell, P. N.
Banks, F. R.
Davey, C. R.
Flanagan, K. J.
Argus, J. C.
Van der Hoek, B. J. D. (E)
Frank, P. H. (E)
Baker, R. O. (E)
Van Mierlo, W. (E)
Letts, I. R.
Hopkins, G. M.
Allen, T. R.
Jongen, P. J. F. G.
Shugg, P. J.
McNee, W. Z.
Johnson, O. E.
Supp. Exam. granted:
Weir, D. J.

Mining II.
Pass:
McNally, R. T.
Meiklejohn, G.
Henderson, G. A.
Doran, R. R. H.
Morel, F.
Connelly, M. A.

Mining IIA.
Pass:
Darroch, D.

Mining IIB.
Pass:
Cedro, J. A.

Mining III.
Credit:
Oliver, J. B.
Pass:
Wolff, D. L.

Mining IIIA.
Pass:
Simmons, M. R.

Mining IIIB.
Pass:
Elliott, R. J.
Shenton, E. F.
Zuvich, J. J.

Mine Ventilation.
Pass:
Parry, K. F.
Antulov, V.

Surveying I.
Credit:
Letts, I. R. (*)
Buckett, G. A.
Murray, B. F.
Muncaster, I. M.
Hunter, S. T.
Pass:
Willis, J. S.
Banks, F. R.
Duncan, H. F.
Davey, C. R.
Van Mierlo, W.
Kew, J. A.
Gray, F. E.
Supp. Exam. granted:
Flanagan, K. J.
Exemption granted from attendance at lectures for 1959:
Allen, T. R.
Hopkins, G. M.
Scott, T. G.
White, R.

Surveying II.
Credit:
Van der Hoek, B. J. D. (*)
Pass:
Meiklejohn, G.
Dykstra, F. D.
McNally, R. T.
Suthisorn, V.

Preparatory English.
Credit:
Klose, H. F. (*)
Supp. Exam Granted.
Morocz, G.

English I.
Credit:
Mitchell, P. N. (*)
Pass:
Willis, J. S.
Bennett, V. G.
Radge, J. A.
Curnow, G. L.
White, R.
Scott, S. J.
Maguire, D. W.
Hunter, S. T.

English IA.
Pass:
Bourne, R. W.
Parry, K. F.
Miller, E. G.
Jasson, K. E.
Neve, H. D.
Cameron, J. W. (E)
Ganthavee, S. (E)
Rasmussen, G. C. R.
Henderson, G. A.
Supp. Exam. Granted:
Poole, R. H.

SCHOOL OF MINES—NORSEMAN.
ANNUAL EXAMINATIONS.
PASS LIST.

Preparatory Chemistry.
Supp. Exam. Granted.
Lea, R. J.

Chemistry IA.
Credit:
Baker, S. R. (*)
Hennessy, R. M.
Pass:
Hedley, W. K.
Supp. Exam. Granted.
Lea, E. J.

Preparatory Mathematics.
Pass:
Hufton, W. K.
Supp. Exam. Granted.
Morton, D. C.
Squance, K. D. W.

Mathematics I.
Pass:
Hedley, W. K.
Kerr, P. H.
Sainsbury, J. A.
Supp. Exam. Granted.
Daly, P. R.

Physics I.
Pass:
Hennessy, R. M.
Lea, E. J.
Basell, C. A.
Sainsbury, J. A.
Hug, R. L.
Supp. Exam. Granted.
Hedley, W. K.
Exemption from attendance at practical work granted for 1959.
Hedley, W. K.

Trade Mathematics I.
Credit:
Hide, B. (*)
Benoit, A. L.
May, C. F.
Supp. Exam. Granted.
Delamotte, R.

Trade Mathematics II.
Pass:
Hill, A. J.
Wilson, N. E.
Supp. Exam. Granted.
Perkin, R. E.
Moir, W. L.

Preparatory Drawing.
Credit:
Morton, P. W. (*)
Pass:
Hill, A. J.
Delamotte, R. (E)
Squance, K. D. W. (E)
Salmon, L. J.
Daly, P. R.

Engineering Drawing I.
Credit:
Basell. C. A. (*)
Pass:
Hide, B.
Lea, R. J.
Mahony, A. J.
Jones, W. B.

Engineering Drawing and Design IIA.
Pass:
Stewart, D. A.

Survey Drawing II.
Credit:
Moffatt, B. (*)
Hennessy, R. M.

Internal Combustion Engines.
Credit:
Young, P. A. (*)
Pass:
Jones, W. B.
Avery, A. E.
Wilson, N. E.
Perkin, R. E.
Supp. Exam. granted.
Bastow, S. J.
Moir, L. W.

Workshop Practice I.
Pass:
Benoit, A. L.
Bastow, S. J.
Hill, A. J.
May, C. F. (E)
Newman, E. J. (E)
Exemption from attendance at practical work granted for 1959:
Bingham, B. J.
Exemption from attendance at lectures granted for 1959:
Morton, N. R.

Welding I.
Credit:
Avery, A. E. (*)
May, C. F.
Pass:
Jones, W. B.
Supp. Exam. granted:
Moir, L. W.

Welding II.
Pass:
Newman, E. J.
Wilson, K. L.
Bingham, B. J.
Bassett, C. H.
Mahony, A. J.

Materials of Construction.
Pass:
Kerr, P. H.
Young, P. A.
Horne, L. C.
Mahoney, A. J.
Stewart, D. A.

Mine Ventilation.
Credit:
Baker, S. R. (*)
Pass:
Schulz, J. G.
Silvester, S. W.
Lea, E. J.

Surveying II.
Credit:
Baker, S. R. (*)
Pass:
Lea, R. J.
Bassell, C. A. (E)
Hennessy, R. M. (E)
Roberts, J. L. (E)
Moffatt, B. (E)
Supp. Exam. granted:
Burgess, R. J.

English IA.
Pass:
Baker, S. R.
Hennessy, R. M.
Supp. Exam. granted:
Silvester, S. W.

School of Mines—Bullfinch.
ANNUAL EXAMINATIONS.
PASS LIST.

Physical Metallurgy I.
Pass:
Rich, H. J.

Preparatory Mathematics.
Pass:
Campbell, F. C.

Mathematics I.
Credit:
Blackley, T. (*)
Pass:
Swain, G.
Harken, R.
Sawyer, G.

Mathematics II.
Pass:
Leyland, E. C.

Preparatory Physics.
Credit:
Campbell. F. C. (*)
Swain, G.
Sawyer, M. E.
Pass:
Harken, R. M.
Harris, B. H.
Exemption from attendance at practical work granted for 1959:
Ryan, T. E.

Preparatory Drawing.
Credit:
Lanfranchi, J. J. (*)
Pass:
Rendell, T. S.
Smith, T. K.
McGregor, G. R.
Ryan, W. B.
Ding, R.

Engineering Drawing I.
Credit:
Bokros, D. (*)
Pass:
McGregor, G. R.
Knowler, B.
Basten, L.

Engineering Drawing and Design IIA.
Credit:
Swain, G. B. (*)
Bokros, D.

Survey Drawing II.
Credit:
Leyland, E. C.(*)
Harris, B.
Pass:
Powell, P.
Gray, K. C.

Workshop Practice II.
Pass:
Martain, R. A.
Exemption from attendance at practical work granted for 1959:
Montgomery, B. W.

Welding I.
Credit:
Walton, W. A. (*)
Pass:
Dixon, W. R.
McGregor, G. R.
Basten, L.
West, A. G.

Welding II.
Pass:
Knowler, B.
Supp. Exam. granted:
Keogh, J.

Preparatory Geology.
Pass:
Stokes, M.

Geology IA.
Pass:
Gray, K.
Powell, P.

Mining IIA.
Credit:
Blackley, T. (*)
Pass:
Gray, K.

Surveying I.
Credit:
Harris, B. (*)
Pass:
Blackley, T.
Sawyer, M.
Harken, R.

Surveying IIA.
Pass:
Leyland, E. C.

Surveying II.
Pass:
Powell, P.
Gray, K. C.

SUPPLEMENTARY EXAMINATIONS.
February, 1958.

The following students passed in the subjects indicated below.

KALGOORLIE.

Electrical Engineering I.
Cedro, J. A.
McDermott, J. C.

Mechanical Engineering I.
Elliott, R. J.

Preparatory Mathematics.
Ballardie, G. F.

Mathematics I.
Flanagan, K. J.

Mathematics IIB.
Slocomb, J. H.
Terrell, R. J. H.

Applied Mathematics I.
Mitchell, J. A.
van der Hoek, B. J. D.

Physics I.
Morel, F. R.
Rourke, I. G.

Physics IIA.
McDermott, J. C.
Timoney, E. G.
Terrell, R. J. H.

Mineral Dressing I.
Chamberlain, H. I.
Sewell, H.

Preparatory Geology.
Klose, W. F.

Geology IA.
Hug, R. L.
Mahalingham, S. S.
Jordan, A. F.

Geology IIA.
Connelly, M. A.

Geology IIC.
Lennon, B. P.

Surveying I—Paper B.
Bird, C. R.

Surveying II—Paper A.
Dodge, G.

NORSEMAN.

Preparatory Chemistry.
Sainsbury, J. A.

Trade Metallurgy.
Bassett, C. H.

BULLFINCH.

Mathematics I.
Stokes, M. C.

Mining I.

APPENDIX 2.

SCHOLARSHIPS AND PRIZES.
MINES DEPARTMENT.

Entrance Scholarship: No award made.
Senior Scholarship: No award made.

COMMONWEALTH SCHOLARSHIPS.

No award.

CHAMBER OF MINES PRIZES.

Metallurgy: Neve, H. D.
Mining: van der Hoek, B. J. D.
Engineering: Hunter, S. T.
Mining Geology: Travis, G. A.

SCHOOL OF MINES STUDENTS' ASSOCIATION SCHOLARSHIPS.

Metallurgy: Campbell, A. D.
Mining: McNally, R. J.
Engineering: Duncan, H. F.
Mining Geology: Meiklejohn, G.

INSTITUTE OF MINING SURVEYORS' PRIZE.

£10: Blackley, T.
£5: Baker, S. R.

SOCIETY OF W.A. SCHOOL OF MINES ASSOCIATES' PRIZE.

Letts, I. R.

REG. DOWSON SCHOLARSHIPS.

Group A: Lea, R. J.
Group B: May, C. F.

ROBERT FALCONER PRIZES.

£5: Cruickshank, A. C.
£2 10s.: No award made.

C. A. HENDRY PRIZE.

Buckett, G. A.

"INDUSTRIAL AND MINING STANDARD" PRIZES.

Mining I: Banks, F. R.
Mineral Dressing I: Mitchell, P. N.

WESLEY LADIES GUILD PRIZE.

Douglas, D. C.

SOCIETY OF ENGINEERS PRIZES.

Bagworth, B. A.
Duncan, H. F.

APPENDIX 3.

KALGOORLIE METALLURGICAL LABORATORY.

By E. Tasker, A.W.A.S.M. (Met.), A.M. (Aust.), I.M.M., Senior Research Metallurgist.

INTRODUCTION.

Eleven reports and one hundred and six certificates were issued during the year. A brief description of the investigations is included in this report. The complete list of reports issued, senders, localities of samples, ore types, and scope of the investigations is contained in the table with this report.

For further information regarding these reports apply to:—

Research Secretary,
Industrial and Physical Sciences,
Commonwealth Scientific and Industrial Research Organisation,
314 Albert Street,
East Melbourne, C.2, Victoria,

from whom copies of reports can be obtained, usually six months after date of issue.

In addition to the reports issued three other investigations were approved and test work was in progress.

A number of inquiries dealing with the technical problems of people engaged in the mining industry were handled by the laboratory staff during the year.

COMPLETED INVESTIGATIONS.

Gold Ores and Products.

Reports Nos. 686 and 701.

Report No. 686.

Treatment tests for plant design purposes were carried out on a heavy sulphide gold ore from the Eclipse Gold Mine, Mt. Magnet, W.A. Amalgamation and agitation cyanidation of the ore when ground to all minus 120 mesh B.S.S. gave excellent gold recovery.

Report No. 701.

Ore which had been stockpiled awaiting the completion of the treatment plant had undergone superficial oxidation. Results of the test work showed that the ore could be successfully treated under conditions recommended in Report No. 686.

Report No. 698.

Tests were made to determine the reasons for high gold values in flotation tailings from the North Kalgurli (1912) Ltd. treatment plant. Free gold was not detected in the tailing but 65 per cent. of the gold was recoverable by cyanidation.

Report No. 702.

Gold recovery tests were made on a sample of ore from the Blue Spec Gold Mine, Nullagine, W.A. Amalgamation and cyanidation of the ore ground to all minus 100 mesh recovered 83 per cent. of the gold.

Report No. 709.

Pilot scale grinding and flotation tests were made on flotation products from the North Kalgurli (1912) Ltd. treatment plant to check results obtained by batch laboratory tests.

Ilmenite Sands.

Report No. 692.

Concentration and magnetic separation tests were made on a heavy mineral sand from near Capel, W.A. Ilmenite concentrates were produced containing more than 60 per cent. titanium dioxide.

Copper Ore.

Report No. 694.

Concentration tests were made on an oxidised copper ore from Marble Bar, W.A. Ninety eight per cent. of the copper in the ore was recovered in a flotation concentrate assaying about 40 per cent. copper.

Sillimanite Ore.

Report No. 703.

Beneficiation tests were made on a sillimanite ore from Mt. Ragged, via Esperance, W.A. The sillimanite occurred largely in the form of sheaves or bunches of fine needles, much of which penetrated quartz grains. Marketable grade sillimanite concentrates could not be produced.

INCOMPLETE INVESTIGATIONS.

Report No. 700.

Washing tests on low-grade gypsum deposits taken from various W.A. lakes were in progress.

Report No. 707.

Treatment tests were made on various ore types from the Sons of Gwalia Gold Mine, Gwalia, W.A. Test work was almost complete.

Report No. 708.

Treatment tests were made on ore and battery treatment products from the King Solomon Gold Mines, Edward's Find, W.A. Test work was almost complete.

CERTIFICATES.

The one hundred and six certificates issued covered the usual wide range of measurements. There was a reduction in the number of certificates issued covering gold assays of diamond drill cores for the Government Geologist. Sixty certificates, mainly covering gold assays, were issued during the last two months of the year. The increased rate of issue of certificates was primarily due to the laboratory accepting work which had previously been carried out by the local Public Assayer who has now gone out of business.

KALGOORLIE METALLURGICAL LABORATORY

Summary of Year's Work, 1958

Report No.	Owner	State	Locality	Ore Type	Type of Investigation	Confidential Until	Number of Metallurgical Tests	Number of Assays	
								Gold	Others
684	Eclipse Gold Mines N.L., Mt. Magnet	W.A.	Mt. Magnet	Gold	Treatment method	28/8/58	27	31	2
692	Warman Equipment Company, Kalgoorlie	W.A.	Capel	Titanium	Ilmenite recovery tests	30/12/58	5	....	4
694	S. H. Stubbs, Marble Bar....	W.A.	Marble Bar	Copper	Treatment method	28/8/58	13	....	50
698	North Kalgurli (1912) Ltd., Kalgoorlie	W.A.	Kalgoorlie	Gold	Investigation of flotation tailings	21/9/58	12	36	26
699	CANCELLED								
701	Eclipse Gold Mines N.L., Mt. Magnet	W.A.	Mt. Magnet	Gold	Treatment method	28/8/58	3	4	1
702	C. H. Warman, Kalgoorlie....	W.A.	Nullagine	Gold	Treatment method	9/12/58	19	34	19
703	T. Dimer, Kalgoorlie	W.A.	Mt. Ragged via Esperance	Sillimanite	Beneficiation method	9/4/59	4	....	31
704	C. H. Warman, Kalgoorlie	W.A.	Nullagine	Gold	Gold recovery tests	24/4/59	5	16	....
705	Northern Minerals Syndicate, Perth	W.A.	Mt. Monger	Gold	Treatment method	1/2/59	11	39	....
706	Ravensthorpe Copper Mines N.L., Ravensthorpe	W.A.	Ravensthorpe....	Gold	Treatment of strake concentrate	2/1/59	8	28	....
709	North Kalgurli (1912) Ltd., Kalgoorlie	W.A.	Kalgoorlie	Gold	Treatment of flotation concentrates (Pilot Scale)	8/3/59	2	3	16
	Totals	....	....	....	....	....	109	186	149
	Certificates Nos. 246-351 (inclusive)	....	....	....	....	....	....	408	735
	Free Assays	....	....	....	....	....	....	111	22
	School of Mines	....	....	....	....	....	....	5	3
	Totals	....	....	....	....	....	109	710	909
	THE FOLLOWING INVESTIGATIONS WERE INCOMPLETE OR PENDING AT 31st DECEMBER, 1958								
700	Government Geologist	W.A.	Various W.A. Lakes	Gypsum	Beneficiation tests	....	....	....	20
707	Sons of Gwalia G.M., Gwalia	W.A.	Gwalia	Gold	Treatment methods	....	35	90	45
708	King Solomon Gold Mines, Edwards Find	W.A.	Edwards Find	Gold	Treatment methods	....	18	89	18
	Totals	....	....	....	....	....	162	889	992

DIVISION VI

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1958

Operations under the Inspection of Machinery Act, 1921-1954

Annual Report of the Chief Inspector of Machinery and Chairman of the Board of Examiners for Engine-Drivers for the Year ended 31st December, 1958, 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 in the administration of the Inspection of Machinery Act, 1921-1956 for the year ended 1958.

E. E. BRISBANE,
Chief Inspector of Machinery.

Section 1.

INSPECTION OF BOILERS, MAINTENANCE, ETC.

(See returns Nos. 1, 2 and 3.)

Under the Act "Boiler" Means and includes—

(a) any boiler or vessel in which steam is generated above atmospheric pressure for working any kind of machinery, or for any manufacturing or other like purposes;

(b) any vessel used as a receiver for compressed air or gas, the pressure of which exceeds 30 lbs. to the square inch, and having a capacity exceeding five cubic feet; but does not include containers used for transport;

(c) any vessel used under steam pressure as a digester, and

(d) any steam jacketed vessel used under steam pressure for boiling, heating, or disinfection purposes.

It also includes the setting, smoke stack, and all fittings and mountings, steam or other pipes, feed pumps and injectors, and other equipments necessary to maintain the safety of the boiler.

Return No. 1.

The numbers of new boilers respective of the various types registered during the year are shown in this return. During the year now under review there were 33 boilers less in new registrations than for the previous year 1957.

It will be noted that of the total of new pressure vessels registered in 1958 the number manufactured in this state exceed by far the number of importations.

Return No. 2.

In this is recorded the number of useful boilers of each type contained in the register of this Branch at the end of the year, but of the total there were 57 boilers removed from our jurisdiction by exportation to other States and Countries, as may be noted in Return No. 3. It is certainly gratifying that manufacturers of boilers here have found such a good market outside this State for their products in addition to receiving orders for local supply.

Return No. 3

In this is a summary of the operations of the Branch for the year.

RETURN No. 1.—SHOWING THE NUMBER OF BOILERS OF EACH TYPE, AND COUNTRY OF ORIGIN OF NEW REGISTRATIONS FOR THE YEAR ENDED 31st DECEMBER, 1958.

	Countries of Origin					
	United Kingdom	Other Countries	East. States	West. Aus.	Unknown Sources	Total
Vert. Stationary	2	....	1	5	1	9
Return Multi. Stat. Underfired	....	....	....	2	....	2
Return Multi. Stat. Int. Fired	....	....	....	60	....	60
Water Tube	1	....	6	1	....	8
Cast Iron Sectional	....	....	1	....	....	1
Digester	....	....	2	6	....	8
Vulcaniser	....	....	17	3	5	25
Steam Jacketed Vessels	....	1* 1† 1‡	3	16	....	22
Sterilizer	....	1‡	36	15	....	52
Air Receiver	8	....	29	53	8	98
Gas Receiver	4	....	8	12	....	24
Steam Receiver	....	....	....	1	....	1
Cylindrical	1	....	....	....	....	1
	16	4	103	174	14	311

* Germany. † Holland. ‡ U.S.A.

RETURN No. 2.—SHOWING CLASSIFICATION OF VARIOUS TYPES OF USEFUL BOILERS IN PROCLAIMED DISTRICTS ON 31st DECEMBER, 1958.

Types of Boilers	Districts Worked from Perth	Districts Worked from Kalgoorlie	Totals 1958	Totals 1957
Lancashire	45	23	68	70
Cornish	151	61	212	216
Semi-Cornish	11	1	12	12
Vert. Stationary	414	37	451	447
Vert. Port.	60	10	70	71
Vert. Multi. Stat.	44	4	48	49
Vert. Multi. Port.	15	1	16	16
Vert. Pat. Tubular	47	....	47	47
Loco. Rect. F/Box Stat.	72	20	92	93
Loco. Rect. F/Box Port.	220	17	237	243
Loco. Circ. F/Box Port.	102	2	104	106
Locomotive	63	11	74	90
Water Tube	486	76	562	562
Ret. Multi. U/fired Stat.	268	8	276	276
Ret. Multi. U/fired Port.	1	5	6	6
Ret. Multi. Int. Fired Stat.	85	5	90	84
Ret. Multi. Int. Fired Port.	2	....	2	2
Egg ended and other types not elsewhere specified	658	25	683	645
Digesters	311	7	318	308
Air Receivers	1,655	570	2,225	2,136
Gas Receivers	249	....	249	224
Vulcanizers	458	8	466	477
Steam Jacketed Vessels	585	14	599	585
Total Registration Useful Boilers	6,002	905	6,907	6,734
Total Boilers out of Use, 13th December, 1958	1,854	546	2,400	2,264

RETURN No. 3.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31st DECEMBER, 1958.

Types of Boilers	Districts Worked from Perth	Districts Worked from Kalgoorlie	Totals	
			1958	1957
Total number of useful boilers registered	6,002	905	6,907	6,734
New Boilers registered during year	307	4	311	344
Boilers inspected thorough	3,428	358	3,786	3,785
Vessels exempt under Act constructed for export—Thorough	6	....	6	5
Boilers inspected—working	720	1	721	685
Boilers condemned during year temporarily	4	....	4	10
Boilers condemned during year permanently	74	12	86	1,040
Boilers sent to other States during the year	55	....	55	46
Boilers sent from other States during the year	120	3	123	130
Boilers sent to other countries during year	2	....	2	....
Transferred to other Departments	2	....	2	....
Transferred from other Departments	7	....	7	2
Number of notices of repairs issued during year	520	28	548	470
Number of Certificates issued including those issued under Section 30 during year	3,307	358	3,755	3,869

MAINTENANCE AND MISCELLANEOUS.

It has been observed that a larger number of boiler users are now giving the attention necessary to the care and maintenance of their plants than has previously been the case, but there still remain far too many who fail to appreciate how costly can be their neglect

In a number of instances owners have already experienced costs of repairs and interruption to production due to their neglect regarding routine maintenance but they do not appear to have profited by past experience.

I again repeat some comments contained in previous reports by referring to the operation of fully automatic controlled boilers.

Owners should not consider that such automatic equipment entirely replaces a boiler attendant whether or not a particular boiler is of the size or capacity requiring the attendant to be the holder of a certificate.

It is unreasonable of course to expect that the attendant of a boiler so equipped should have no other duties whatever, but it ought to be appreciated that any other duty should be considered as extraneous and of a character that does not require the attendant's absence from within visual and audible distance of the boiler nor his attention to work that precludes his unobstructed passage to the boiler

In this respect damage to a fully automatic controlled unit occurred during the year in circumstances that the attendant was carrying out a duty in a position elevated well above ground level and by the time he was able to reach the boiler much damage had been incurred.

Another factor which should be borne in mind is the necessity of comprehensive testing of all the automatic equipment at least twice each working shift: No less attention should be given to these appliances than to water gauges

With regard to new pressure vessels registered, a number of these form part of an additional plant—a catalytic reformer unit—installed by B.P. Refinery (Kwinana) Ltd.

The manufacture of boilers of the "package" type for export has continued to a slightly greater degree than during the previous year: 55 boilers were supplied to the Eastern States and New Zealand and two to Malaya in 1958.

Section 2.

EXPLOSIONS AND INTERESTING DEFECTS.

Case A.

NH3 REFRIGERATION HEADER.

This refers to the failure of a header 20ft. length by 8in. dia. 11/32 in. thickness in a large refrigeration plant when a flat (as manufactured) unflanged end plate ½ in. thickness inserted into the shell and attached by fillet welding completely parted from the shell resulting in two of three men in the vicinity receiving injuries from the effects of escaping ammonia One man was affected by minor burns only, but the other received serious injuries around his eyes—fortunately without permanent damage to his sight.

This header is situated in one of two large rooms which are cooled by air from fans passed around refrigerant coils surrounded by fins Five sets of such coils forming diffuser units are positioned immediately below the header which is placed close to the ceiling and the coolant is supplied to the coils from this overhead vessel.

The whole system was installed when the plant had previously been working as a direct expansion unit. The liquid supply line enters through the ceiling of the room to the 8 in. header and the liquid level was formerly controlled by a float valve.

Liquid is fed to the lower part of each coil and returned through risers from the top ends of the coils to the header, the risers projecting up through the shell to near the crown to prevent any liquid being carried over to the suction side.

The gas is then taken off through a 3in. suction header on top of, and directly connected to the 8 in. header. From the 3 in. header a suction line is conveyed through the ceiling. Shut down valves on the liquid inlet to the 8 in. header and on the suction from the 3 in. header are located in a loft above the room ceiling.

When the change over to liquid recirculation was effected the float valve on the 8 in. header was removed, the incoming liquid line was enlarged to 1½ in. dia. and after entering the room was branched off into three ½ in. lines to this vessel.

With the liquid recirculating process a pump delivers liquid from a surge tank to the system at 75 p.s.i. and the suctions from the room return to the surge tank, the suction pressure in this being from 5 to 10 p.s.i.: The system in the room therefore would be practically full of liquid NH_3.

It was found necessary with the forced air circulation to defrost the diffuser units each day and for this purpose water sprays are built into each unit above the coils.

Before defrosting it is first requisite to isolate the diffuser units by closing the suction and delivery valves in the loft above the room as, if not isolated, there would be a complete icing up of the coils when defrosting sprays were put into operation.

The instructions to drivers concerning this operation were—(1) go up to loft and shut the liquid valve after first stopping air fans; (2) after half hour interval shut suction valve in loft and, (3) return below and open up defrosting sprays.

The object of these instructions was to ensure that when the liquid valve was shut the pressure in the system would be immediately reduced to the suction pressure and after the half hour interval some of the liquid would have been dissipated and replaced by pockets of gas: This then could allow for some expansion of the remaining liquid when defrosting sprays were opened up.

It is stated that at the time of the accident preparation was in progress for defrosting: The driver had reduced the pressure on the liquid pump from 75 to approximately 50 p.s.i. by a manually operated bypass valve.

This first procedure was carried out because it was found that when a large room was isolated it caused a rise in pressure from the pump which was feeding also other rooms from the surge tank.

As men had already entered the room, now to be defrosted, to commence discharging meat the air fans were already stopped so the driver proceeded to the loft and closed the liquid valve: He then descended to effect some adjustments to the plant such as regulating the pump pressure etc. and after an interval of twenty to thirty minutes he again entered the loft to close the suction valve.

He stated that when he had half closed this he heard a noise like a wad being blown out of a pipe. Completing this operation of closing the valve he again descended from the loft and on gaining a corridor below saw volumes of gas coming from the room which had been isolated and knew something serious had happened.

He immediately returned to the loft and with a small wheel spanner checked both delivery and suction valves and found both hard shut: He further stated that he had not yet opened up the defrosting sprays.

The two men who sustained ammonia burns were included in the party engaged in discharging goods from this room.

Consequent upon investigation of the accident there can be no doubt that on some occasion or occasions the 8 in. header had been subjected either to much excessive pressure due to too great amount of liquid content and insufficient volumetric space for expansion when valves were closed and water spray then applied, or severe liquid hammer caused by valve on high pressure line being opened too quickly: I am rather of the opinion that the latter reasoning is nearer the mark.

As stated in the opening paragraph of this report the vessel was constructed with flat end plates inserted in the shell and fillet welded. These ends were a neat fit and inserted with the exterior surfaces ¼ in. inside shell ends, the edges of the end plates being levelled a full ⅛ in. deep: Fillet welding extended to shell extremities.

Failure occurred by complete peripheral rupture of the shell itself diametrically from the end plate and at a position mid-thickness of this plate and at the root of the weld.

A pronounced curvature from the periphery concave to pressure had been introduced into the end plate and a ring of the shell from the rupture remained adhered to the plate. This short section of shell plate was belled from the line of fracture by the action of bulging of the end plate: the weld itself revealed no indication of shearing from the shell wall.

The structure of metal around the rupture points very strongly to fatigue, and the suggestion that the header had been subjected to excessive pressure previously is supported by the fact that at the actual time of failure the defrosting sprays were not in operation; consequently, the drum would not at that instant have been under pressure much above that of suction—5 to 10 p.s.i.

No relief valves were provided on this particular system of refrigeration having blast cooled rooms and liquid recirculation, and it is understood that the Company's other plants in Australia also are not provided with such devices.

The Chief Engineer has subsequently fitted a special spring loaded NH_3 relief valve to each of the two room units of this description, and these are installed in a line added to the low pressure line in the loft to bypass the suction valve and set to 150 p.s.i.

This Department intends taking similar action also regarding other plants in this State having systems of this nature.

Case B.

SO_2 Receiver.

In this incident an SO_2 receiver which formed part of an automatic refrigeration unit in a Delicatessen situated in an arcade in Perth was involved.

This vessel was 33 in. length by 4 in. diameter by ¼ in. thickness shell: end plates 16 gauge thickness dished 3 in. radius convex to pressure and not subject to registration with this department. The refrigeration unit was powered by 1 horsepower electric motor 4-1 reduction: compressor twin cylinders 2 in. diameter by 2¼ in. stroke, 350 r.p.m. and the normal head pressure was stated to be 90 p.s.i.

The explosion occurred when an end plate of the receiver turned inside out, welding failed and end parted from shell: the receiver and condenser came adrift from the unit and fell to the floor of the shop. As this unit was mounted above the entrance it was very fortunate that no customers were entering or in the shop at the time.

The attachment of the ends to the shell was achieved by counter-boring the shell extremities to form internal step landings at 90° to the longitudinal axis of the shell to accommodate the end plates, the curvature of which was flattened to a diametrical plane around the edges to seat snugly into the stepped landings.

The plates seem to have been secured in position by the application of a torch around the edges of the plates to form a welding between the 16 gauge edge of each plate and the shell: there is no appearance of any welding rod being used.

The construction of the vessel, considering the purpose for which it was required, was certainly of a most inferior standard. It is understood receivers of this type of design incorporated with refrigeration units imported into Western Australia were a standard product several years ago and taken out of production because of repeated failure of the ends. This information came to our knowledge only on the occasion of this particular mishap.

We are also informed there still remain in service in this State a few receivers of similar design and they must be treated as suspect and should be replaced. An endeavour is being made to have action taken in this direction.

Case C.

Air Receiver.

This explosion relates to an air receiver 24 ft. overall length, 6 ft. diameter, 7/16 in. thickness shell with hemispherical ends 7/16 in thickness: all riveted construction, and working pressure 80 p.s.i., by calculations design working pressure 110 p.s.i.

Failure of this vessel developed from an obscured defect in the plate at the landing of the longitudinal chain riveted seam in an end course of the shell. As far as could be ascertained rupture of plate commenced between rivets of the inner row of this seam.

The explosion influence then communicated itself to the single riveted circumferential seam at the junction of this and the adjacent course in the shell for practically the whole circumference, to the end circumferential seam and to the segmental seams of the hemespherical end resulting in almost complete opening out of the end course of the shell and total destruction of the head: in addition the blast completely demolished the adjacent timber frame and corrugated iron wall of the compressor room.

Most fortunately no one was injured, but an engine driver who was inside the compressor room and another person about 50 feet from the end of the receiver were affected by shock.

This vessel was a component in a bank of four receivers side by side, all very similar in sizes. The other three receivers were forced from 2 to 4 feet off their beds but were not materially damaged: cast iron pipes connecting all vessels were, of course, shattered.

Reverting to the longitudinal seam in the ruptured shell course it could be seen, when the edges of the fracture were brushed, that the outer lap of the plate between nine consecutive rivet holes in the inner row toward mid-length of the seam had been cracked prior to the time of ultimate failure.

The edges of this section were dark, indicating that oil had been penetrating for some period: the remainder of the fracture in this joint was clean.

Although there was this indication by the discolouration that a crack had developed at some time prior to the day of the explosion, no penetra-

tion of oil to the exterior surface of the plate was in evidence to disclose any crack when the vessel was under annual survey by this department ten days before the accident and as this particular seam was in the crown of the shell it is inconceivable that, if there had been total penetration of oil then, the seepage would have escaped notice.

Consequent to inquiries there is nothing to suggest that the operating pressure exceeded the allowable working pressure at any time leading up to the mishap.

Notwithstanding this receiver being the first in the bank of four in which the delivery line from the compressors entered, the interior surfaces on close examination failed to reveal any residue from burning which may have pointed to ignition of oil vapour as being the source of an explosion. It is of course possible that on some occasion in the distant past that a minor detonation of vapour did occur unnoticed and such possibliity may have introduced a crack which did not completely penetrate the plate.

In the absence of anything obvious by which to determine the cause of initial cracking five test pieces were cut from the shell plating—four from the shell course affected (two in a circumferential and two in a longitudinal direction) and the fifth from the next shell course in a circumferential direction containing the longitudinal seam over one pitch of rivets.

By calculations the longitudinal joint efficiencies of the vessel when originally registered were Rt. 82 per cent. Rs. 59 per cent.

Results of tests on all pieces, however, showed quite satisfactory plate tensile and rivet shear characteristics. In one instance though a test piece, where rupture occurred under test, shows strong indications of there being present a lamination running through the plate in a plane at mid-thickness.

Subsequent to sighting this feature a further examination of the ruptured longitudinal seam itself on the premises where the receiver is located gave rise to the suspicion of a lamination extending along the rupture in a similar plane but until this portion is subjected to laboratory preparation it cannot be ascertained whether the suspected lamination rises to one or other or both of the plate surfaces. A report on this is still being awaited.

This air receiver was registered with the department in 1922 but its age cannot be definitely placed because it was then stated as 21 years. Assuming that to be correct its age at time of falure would be in the vicinity of 57 years.

This vessel during very many if not for all years of its service has been subjected to air delivery pulsations from the effect of the large compressors and it appears quite feasible that the percussions on the receiver surfaces could have had an adverse effect on the lap longitudinal seams.

This influence would be more pronounced if in the case of the seam that failed a crack had developed due to some minor eruption of vapour and to which I have referred in the foregoing as having been a possible factor.

The metal structure in the line of that crack would have been subject to fatigue from pulsations and this fatigue would steadily increase in rate and result in ultimate extension of the extremities up to the stage of final rupture along the seam.

It is regretted that as yet the circumstances leading up to this explosion remain a matter of of suspicion only, but it is hoped that further laboratory investigation will eventually lead to definite conclusions.

Case D.

Steam Jacketed Pan.

In this case collapse of the inner shell of a stainless steel steam jacketed pan 18 in. diameter in a hospital occurred by reason of overpressure. No person received injuries.

The allowable working pressure was 15 p.s.i. and the vessel was supplied with steam through a reducing valve from boilers of working pressure 120 p.s.i.

As far as could be ascertained the reducing valve failed and neither of two safety valves fitted in the low pressure steam line operated. The safety valves had not been caused to operate by steam pressure for a considerable period and, after the mishap to the pan, it was found that the valves were obstructed from lifting by scale deposit which had accumulated between the valve guides and seating bush.

Instructions were issued by the department to the effect that the valves were to be cleaned and tested at intervals of three months.

Section 3.

INSPECTION OF MACHINERY.

(See Returns Nos. 4, 5 and 6.)

At the close of the year our records contained 40,356 groups of machinery, an increase of 1,840 compared with the previous year. Of this increase, 12 groups represent the installation of new lifts.

There were 3,797 less groups inspected than in the year 1957, but this was due to severe shortage of staff caused by the retirement of two officers and three others being absent on long service leave.

(Here follow returns Nos. 4, 5 and 6.)

RETURN No. 4.—SHOWING CLASSIFICATION ACCORDING TO MOTIVE POWER OF GROUPS OF MACHINERY IN USE OR LIKELY TO BE USED BY PROCLAIMED DISTRICTS AND WHICH WERE ON THE REGISTER DURING THE YEAR ENDED 31ST DECEMBER, 1958.

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1958.	1957.
No. of Groups driven by steam engines	153	377	530	600
No. of Groups driven by oil engines	2,853	738	3,591	3,557
No. of Groups driven by gas engines	23	149	172	178
No. of Groups driven by Compressed air	3	62	65	64
No. of Groups driven by Electric motors	33,041	2,917	35,958	34,093
No. of Groups driven by hydraulic pressure	9	....	9	4
No. of Groups driven by Hand	29	2	31	20
Totals	36,111	4,245	40,356	38,516

RETURN No. 5.—SHOWING OPERATIONS IN PROCLAIMED DISTRICTS DURING YEAR ENDED 31ST DECEMBER, 1958

(*Machinery Only.*)

Classification.	Districts Worked from PERTH.	Districts Worked from KALGOORLIE.	Totals.	
			1958.	1957.
Total registrations useful machinery	36,111	4,245	40,356	38,516
Total inspections made	26,022	4,045	30,067	33,864
Certificates (bearing fees)	9,441	568	10,009	7,465
No. of extension certificates issued under Sec. 42 of Act	....	....	....	....
Notices issued (Mach. dangerous)	506	10	516	584
Certificates (steam without fees)	24	....	24	29

RETURN No. 6.—SHOWING CLASSIFICATION OF LIFTS ON 31ST DECEMBER, 1958.

Types.	How Driven.	Totals.	
		1958.	1957.
Passenger	Electrically driven	245	242
Goods	Electrically driven	119	117
	Hydraulically driven	1	1
	Belt driven	4	4
Service	Electrically driven	79	72
	Hydraulically driven	1	1
Escalators	Electrically driven	19	19
		468	456

ACCIDENTS TO MACHINERY.

Case A.

Portable Emery Wheel.

This accident was in connection with an air driven portable emery wheel wherby the operator received a severe cut on his forehead when the wheel burst. Though the machine was not subject to registration under the Inspection of Machinery Act investigation of the circumstances was made in accordance with Section 50.

The grinding wheel was 6 in. diameter and 1 in. thickness labelled by makers as being tested at 8,595 r.p.m., safe speed 5,730 r.p.m.

The injured person was bevelling ends of short lengths of 1½ in. diameter piping. The grinder was being used as a pedestal unit by placing it on a low box and holding it in position with his foot. The operator would be almost directly over the wheel which was not protected by a guard.

The grinding wheel had just been installed on the machine and was the first of a new batch and of a type not previously used on this work. It burst immediately the machine had speeded up to the maximum revolutions it was capable of attaining at air supply 100 p.s.i. The unit was designed for 4,000 r.p.m. with air supply pressure 120 p.s.i.; therefore speed at the time of accident was considerably below the guaranteed maximum safe speed of 5,730 r.p.m.

It could only be concluded that the emery wheel was damaged during storage, transport or installation on the machine as the spindle and securing flanges were found in good condition.

Case B.

NH_3 Refrigeration Machine.

A head of a 30 ton compressor disintegrated due to a body of liquid ammonia being drawn over from the liquid receiver, and escaping ammonia caused injuries to two persons in circumstances as under—

The engine driver and a maintenance fitter had completed some repair work connected with the prime mover of another and larger refrigeration machine—60 tons capacity—and had started up this unit and were putting it into commission again when the smaller machine which had been running for about 30 hours began to knock heavily.

The driver thereupon rushed to trip the electric motor switch for this machine but before this could be done the compresor head fractured and he received a splash of ammonia on his eye. He escaped from the engine room and donning a gas mask handed to him by the fitter who received burns on arms and wrists, returned and managed to shut down the larger machine which had been placed in service and then, with the assistance of the fitter, he isolated the condenser. The driver and the fitter are to be commended for their action.

It would appear that the carry over of liquid to the smaller compressor was due to two factors: firstly, one line from the receiver served for suction to both machines branching off to each along its length; secondly, most probably the suction valve on the larger machine was opened too quickly, thus creating a surge of liquid in the receiver and drawing it into the suction line caused the smaller unit to suffer the initial impact.

Subsequent to the accident independent suction lines from the receiver to the machines have been provided.

Case C.

Quarry Crushing Plant.

This refers to destruction of the flywheel of a Primary Crusher in a quarry in extraordinary circumstances and resulting in serious injury to the crusher attendant who was standing on a timber platform in front of, and about four feet above the plant.

A large portion of diorite was projected out of the crusher bowl when the jaws closed and this fell between the body of the crusher and flywheel causing the wheel to disintegrate into several parts, large and small.

The platform on which the attendant was standing was extensively damaged by pieces of flywheel and he himself was struck by fragments with the result that he received a deep gashing of his throat and triple fracturing of the right leg. Fortunately, though so seriously injured he is recovering from the accident.

Action has been taken by the owners to guard flywheels from any repetition of a similar accident.

Section 4.

PROSECUTIONS FOR BREACHES OF THE ACT.

There were no prosecutions during the year but in a few instances strong consideration was given to taking legal action against owners of cranes and their drivers for tardiness in observing the provisions of the Act requiring such drivers to be holders of crane drivers' certificates.

Section 5.

ACCIDENTS TO PERSONS.

(See Returns Nos. 7 and 7A.)

Reported to the department were 82 accidents to persons in which boilers or machinery were involved: of these, 25 accidents were of minor nature but investigated. None of these accidents was attended by fatal results.

I wish however to refer to a shocking accident of fatal nature relating to milking machinery which was not reportable to the Department because it was not subject to registration or inspection under the Act as it was machinery on a dairy farm where the owner did not employ outside labour. Noting a Press report of the occurrence I directed that it be investigated in accordance with Section 50.

In this instance a boy age seven years, was killed when his clothing was caught by a revolving shaft extension.

It was ascertained that the father was not at home at the time of milking in the late afternoon and this operation was being carried out by the child's mother and his sister aged 14 years. When the last two animals were being milked the mother returned to the house to attend to the evening meal.

From what could be gathered deceased went to the switch to stop the motor but in doing so he slipped on a short length of conduit lying on the concrete floor. Consequent upon this his short pants became fouled with a 1½" diameter shaft extension revolving at approximately 150 r.p.m. and he was thrown to the floor.

The father stated that when the electric motor was installed he was informed the switch could not be fitted in the vacuum pump shed: however, it is now understood that this will be done and furthermore, the shaft extension will be removed as it had become redundant.

The practice of leaving young children to their own devices in the vicinity of moving machinery is far too prevalent.

The following are reports of those other accidents causing serious injuries which should also be brought to notice. Reports of persons injured by accidents to machinery are contained under sections 2 and 3.

Case A.

Power Press.

This accident whereby an operator received injuries necessitating amputation at the first and second joints of the middle and ring fingers respectively on his right hand was caused by a Power Press being used as an angle cutter.

Subsequent to the accident the injured man stated that on one or two occasions during the two years he had been operating this machine it had repeated a stroke but he had never reported this to his foreman. He had no knowledge of what happened with the machine in this instance when he was cropping 21 feet lengths of angle iron into 5 ft. pieces.

Apparently the press was tested immediately following the mishap but it was found in good order.

The foreman stated that in the operation the angles bounce back from the stopper plate and it was thought that the operator had tried to make a last minute adjustment with his right hand whilst retaining foot pressure on the activating pedal.

This press was not fitted with a guard as it had not been considered there would be any need for an operator to have a hand in the danger zone for the particular purpose the machine was used. This accident, however, reveals that though the execution of some operation in machines of this nature is thought to be hazard free a condition can arise in some circumstances that can present a danger. A fixed guard has now been fitted to this press.

Case B.

Power Press.

This also was an instance of injuries being inflicted by a Power Press, but in this case an interlock guard was fitted and it was necessary for the guard to be pulled down within ½ in. of the table before the clutch would engage.

It was found however that three of the cross bars near the bottom of the frame of the guard had been broken off and that instead of completely raising the guard to adjust the position of material on the anvil the operator simply inserted his hand through the gap in the fence. In doing so on this particular occasion he depressed the guard sufficiently to operate the machine.

As a result of this action the tips of two fingers of his right hand were crushed. This guard has subsequently been repaired.

Case C.

Power Press.

This was yet another case of an operator having the tip of a finger of his right hand being crushed whilst engaged on production of small components in a Power Press: this injured person had nine years experience on presses behind him.

The machine was not provided with a guard and it is of some irony that the foreman had already given him instructions to devise a suitable guarding arrangement for the small size work required of the press.

It has now been guarded by a wire mesh fence around the danger zone and the pieces of material pass down a chute through the fence to the die.

After fashioning, the material is lifted by the die head and when the head is close to its maximum height of stroke the pressing is ejected by a rod passing through the centre of the head: after ejection, the material is caught up in a stream of air and blown over the rear of the machine.

Case D.

Goods Lift.

Very serious injuries which could have had fatal results were received by a storeman when he fell from the ground floor landing of a goods lift shaft onto the floor of the car which was at the basement landing 12 ft. below: this is an old installation and the car was not roofed.

The lift was constructed for conveyance of motor vehicles and had a floor area 14 ft. x 9 ft. Operation is by car switch and the enclosure doors are designed to be opened only from within the car.

On investigation into the circumstances it was found that at the ground floor some person unknown had taken quite an appreciable amount of trouble to attach a length of cord to the door lock so that the door could be opened from outside the shaft.

From information received it appeared that the injured man thought the car was at the ground floor level and he opened the door using the cord attached to the lock and stepped into the shaft. The natural lighting at this floor level is very good and the car easily seen when it is at this position.

Had the locks of the enclosure door not been tampered with, the accident would not have occurred.

New doors and locks of foolproof design have been ordered.

Case E.

Driving Belt.

In this accident an employee suffered the loss of the tips of two fingers of his right hand in rather unusual circumstances when engaged in moving from one location to another an exhaust fan having unguarded vee belt drive. At the time of the accident though subject to the provisions of the Act this machinery had not been registered with the department.

The injured person had switched off the current to the motor and climbed up to the platform on which the machine was mounted. Proceeding to loosen the holding down bolts he reached for a spanner but his hand coming in contact with the belting which was still in motion due to the inertia of the fan was dragged into the pulleys.

This accident emphasises the extreme importance of vee belts and the pulleys on machines being enclosed in casing or wire mesh in all instances wherever exposed to possible contact by any person.

Case F.

Mines Shaft Repairs.

In this instance a man was seriously injured when struck by a descending skip during shaft repairs.

The accident was undoubtedly caused by misinterpretation of a confusing private arrangement of signalling for required movements of the winding engine which was a serious departure from the stipulated Code of Signals.

GENERAL.

The number of machinery accidents brought to the notice of this Branch during the year equals coincidentally the figure for the previous twelve months. Respective of this however it is to be borne in mind that, in general, industrial activities appreciably increased during 1958: therefore, this reflects some improvement regarding the percentage of accidents related to activities.

Analysis of accident figures concerning woodworking machinery discloses 59 per cent reduction from the 1957 figure.

The incidence of mishaps relative to power press machinery remains practically the same as during the previous year but as will be seen in Returns Nos. 7 and 7a the occurrences were not many, and there are several undertakings wherein such type of machinery is in use on a large scale.

By a process of constant approach to the matter of safeguards regarding presses the department is gradually meeting with success in prevailing upon those owners a little tardy in this direction to make the necessary effort in having guarding appliances devised to suit their machines and particular purposes for which they may be used.

SERIOUS ACCIDENTS

RETURN No. 7.—SHOWING NUMBER OF SERIOUS ACCIDENTS, BOTH FATAL AND NON-FATAL, WHICH OCCURRED IN PROCLAIMED DISTRICTS DURING THE YEAR ENDED 31st DECEMBER, 1958

"F" denotes "Fatal"

Industry	Circular Saw	Band Saw	Buzzer	Thicknesser	Spindle Moulder (Shaper)	Belt and Shafting	Gearing	Abrasive Wheels	Press (Metal)	Press (Other)	Wiredrawing and Working	Screwing Machine	Seaming Machine	Conveyor (Slat)	Elevator (Bale)	Chineal Mill	Clay Forcing Machine	Rolls	Mixer (Concrete and Other)	Dough Divider	Dough Break	Mincer	Cornering Machine	Lift	Ammonia Receiver Explosion	Tunnel Haulage Rope	Hoist	Chain Sling	Winch	Winding Engine	Overhead Electric Crane	Stone Crusher	Loom	Cement-Asbestos Sheet Former	Bottlemaking Machine	Wool Opening Machine	Totals per Industry
Woodworking and Furniture	2	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
Metalworking and Engineering	....	....	....	....	....	2	....	2	3	....	2	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	13
Leather Processing	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Printing and Allied Industries	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	2
Fertilizer Manufacture	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	1	....	1	....	....	....	....	1
Mining	....	....	....	1	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6
Food and Drink Processing	....	1	1	....	....	1	2	....	....	....	....	....	....	1	1	....	....	2	1	2	2	2	....	....	1	....	....	....	....	....	....	1	....	....	....	....	15
Wool Processing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	4
Building Materials and Building	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	....	5
Other	1	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	1	....	5
Totals per Type of Machine	5	1	2	1	1	4	3	2	3	1	2	1	1	1	1	1	1	3	2	2	2	2	1	1	1	2	1	1	1	1	1	1	1	1	....	....	57

MINOR ACCIDENTS

RETURN No. 7A.—SHOWING NUMBER OF ACCIDENTS NOT CLASSED AS SERIOUS UNDER THE ACT AND NOT INCLUDED IN RETURN No. 7 BUT WERE REPORTED AND INVESTIGATED DURING THE YEAR ENDED 31st DECEMBER, 1958

Industry	Circular Saw	Buzzer	Belt Drive	Gearing	Abrasive Wheels	Milling Machines	Press (Metal)	Shaping Machine	Wireworking	Punching Machine	Conveyor (Chain)	Elevator (Bucket)	Brushmaking Machine	Rolls	Biscuitmaking	Confectionery Machine	Ammonia Refrigerator Compressor	Woolscouring Machine	Totals per Industry
Woodworking and Furniture	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Metalworking and Engineering	....	....	....	....	1	2	....	1	1	1	....	....	....	....	....	....	....	....	6
Fertilizer Manufacture	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Mining	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Food and Drink Processing	....	....	1	....	....	....	....	....	....	....	2	1	....	1	2	2	1	....	10
Wool Processing	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2
Building Materials and Building	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1
Other	....	....	1	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	3
Totals per Type of Machine	1	2	2	1	1	2	1	1	1	1	2	1	1	1	2	2	1	2	25

Section 6.

EXAMINATION OF ENGINE DRIVERS, CRANE DRIVERS AND BOILER ATTENDANTS.

The Board of Examiners granted 139 engine drivers, 265 crane drivers and 95 boiler attendants' certificates.

Compared with the previous year these figures show decrease 38, increase 168 and increase 11 respectively in the numbers of certificates granted.

Section 7.

AMENDMENTS TO ACT.

Only one amendment to the Inspection of Machinery Act was submitted to, and passed by Parliament and this refers to subsection (3) of Section 6.

This amendment makes provision for inviting applications for appointment as Inspector of Machinery, also from persons having sound training in electrical, structural and mechanical engineering and subsequent practical experience in the erection and maintenance of lifts.

Section 8.

STAFF.

Mr. C. F. Buttle having reached the regulation age retired in mid-year after occupying the position of Senior Inspector of Machinery for 6½ years and giving long and meritorious service in the department. He proceeded into retirement with the good wishes of all with whom he became associated, that he would enjoy a long and happy future.

He was succeeded in the position by Mr. E. J. McManis who had been Inspector in Charge Kalgoorlie, a position now occupied by Mr. S. L. Harris.

During the year Mr. M. J. Smith was appointed to a position as Inspector of Machinery which had become vacant by the retirement of an officer late in the previous year.

Although the number in the inspectorial section of the staff was below the complement allowed all members gave of their utmost effort to cope with increasing activities in industry and the many trying problems associated therewith. Apart from retirements no small shortage of staff was caused by three inspectors having long service leave during the period under review.

Competition between manufacturers of boilers and unfired pressure vessels, also machinery, engendered by the country's economy has given impetus to creative activities in the matter of new and unprecedented designs and methods of construction of boilers and other types of pressure vessels, also cranes and lifts.

Indicative of this is the fact that 112 designs incorporating 188 drawings were submitted to us by manufacturers during the year for examination and criticism. This is a phase of departmental work which absorbs a tremendous amount of time apart from field duties relating to inspections and investigation of accidents.

Examination of designs for approval by the department involves exhaustive calculations being made by us, and in many instances we find ourselves obliged to redesign partly or completely for some contractors' guidance.

With a high sense of duty the clerical section has responded to the increasing volume of work placed upon all members and my thanks for their ready assistance on all occasions go out in that direction also.

We again extend to the Police Department our appreciation for the continued co-operation of its officers in advising this Branch of accidents involving machinery which have come to their notice: by such action on their part we have in so many instances been enabled to investigate the circumstances surrounding incidents without delay.

To all officers in other Branches of the Department of Mines with whom on many occasions over the year we have joined in transaction of official business or consultation I wish to express for myself and those other members of our staff concerned our thanks for assistance or consideration we have received.

J. F. WINZAR,
Deputy Chief Inspector of Machinery.

DIVISION VII

Government Chemical Laboratories Annual Report—1958

The Under Secretary for Mines:

I have the honour to present to the Honourable Minister for Mines a summarised Annual Report on the operations of the Government Chemical Laboratories for the year ending 31st December, 1958.

The staff of the Laboratories at 31st December, 1958, numbered 60, being 42 professional officers, 11 general and 7 clerical. During 1958 the staff position for professional officers improved somewhat compared with 1957 but we are still unable to obtain all of the professional staff required, especially for the Fuel Technology Division. Repeated advertisements have not been able to obtain sufficient staff for this Division. On the other hand 1958 was a very difficult year with clerical staff, there being seven resignations, principally for marriage. This resulted in considerable problems in typing, for the typing of our analytical reports is relatively specialised and is different from normal business and commercial typing, so that new staff require training.

Early in 1958 Mr. J. N. A. Grace, A.W.A.S.M., retired from the position of Deputy Goverment Mineralogist, after many years of sterling service to the Laboratories. Mr. Grace was first appointed in June, 1919, as a temporary chemist in the laboratory of the Geological Survey, before the amalgamation to form the present Laboratory organisation. He was appointed to the permanent staff in 1924, became Supervising Chemist in 1940, second-in-charge of the Mineral Division when this position was created in the 1954 Reclassification, and Deputy Government Mineralogist in 1956. Mr. Grace was an able and conscientious officer with a long and wide experience of minerals and their occurrence in this State.

It is with deep regret that I have to record the death of a former Director of these Laboratories, Mr. Harry Bowley, F.A.C.I., at the age of 75 years. Mr. Bowley commenced his long Government service when he was appointed a junior clerk in the Geological Survey Branch in 1898. In 1899 he was appointed a cadet, and thereafter progressed steadily, laboratory assistant, assistant assayer, assistant mineralogist and assayer. The then existing two chemical laboratories in the Government service were amalgamated in 1922, and in 1926 Mr. Bowley was appointed Senior Mineralogist and Chemist. On the death of Dr. Simpson, in 1939, Mr. Bowley became Government Mineralogist, Analyst and Chemist, the then title of the present position of Director. He was mainly responsible for the conception, design and equipment of our present modern laboratories and in 1946 following the reorganisation of these Laboratories Mr. Bowley became the first Director. During his long service to the State before he retired in 1947, Mr. Bowley contributed much to the development of chemistry and mineralogy in Western Australia. He was not a man to suffer fools gladly but he earned the respect of his colleagues and the esteem of a wide circle of friends.

ADMINISTRATION.

The Laboratories consist of five Divisions, a Physics Section, a central office and library, all under the control of the Director (Government Mineralogist, Analyst and Chemist) as follows:—

Director—L. W. Samuel, Ph.D. (Lond.), B.Sc. (Hons.), F.R.A.C.I., F.R.I.C., M.A.I.A.S.

Agriculture, Forestry and Water Supplies—R. C. Gorman, B.Sc., A.R.A.C.I., M.A.I.A.S., Deputy Government Agricultural Chemist.

Food, Drugs, Toxicology and Industrial Hygiene—N. R. Houghton, B.Sc., A.R.A.C.I., Deputy Government Analyst.

Fuel Technology—R. P. Donnelly, M.A., B.Sc. (Oxon.). M.I.Gas Eng., A.M.I. Chem. Eng., M.Inst. F., Fuel Technologist.

Industrial Chemistry—A. Reid, M.A., B.Sc. (Aberd.), A.R.I.C., Chief Industrial Chemist.

Mineralogy, Mineral Technology and Geochemistry—G. H. Payne, M.Sc., A.W.A.S.M., A.R.A.C.I., Deputy Government Mineralogist.

Physicist—N. L. Marsh, B.Sc.

Library—Miss C. R. Hammond, B.Sc.

Office—Miss D. E. Henderson.

The close association of these Laboratories with other Government Departments and with kindred Associations was maintained during 1958 and various members of the staff are members of the following Committees.

Atomic Energy Commission—Commonwealth States Committee.

Cereal Chemistry Group of the Royal Australian Chemical Institute.

Corrosion Committee.

C.S.I.R.O.—State Committee.

Food and Drug Advisory Committee.

Insecticides Committee.

Oils Committee—Government Tender Board.

Paints Advisory Committee.

Swan River Reference Committee.

Technological Standing Committee on hydrogen sulphide in sewerage installations.

Veterinary Medicines Committee.

Water Purity Advisory Committee.

EQUIPMENT.

A number of items of modern equipment have been added to our facilities during 1958, including:—

Swift Automatic Point Counter and accessories.

Gas Chromatograph with Sun-vic recorder.

M.S.E. super medium centrifuge.

Eel photo-extinction sedimentometer.

GENERAL.

The total number of samples received and registered during 1958 was 17,870 a decrease of about ten per cent compared with 1957. The major cause of this decrease was a reduction in the number of sewage samples analysed, a reduction due to the coming into operation at the Subiaco Treatment Works of a Pilot Plant using the activated sludge process. The analytical work associated with this pilot plant reduced the number of routine samples analysed in connection with the normal treatment plant.

The samples received were allocated to the various Divisions of the Laboratories according to the specialized work undertaken by each Division. In a few cases work was done on the same sample in more than one Division so that in the table below some samples occur more than once. This helps to foster the policy that we are one Government Chemical Laboratories not five separate Divisions and that the problems in one Division may be assisted by specialists from another Division. This was further assisted during 1958 by transfer of chemists between Divisions.

Division	No. of Samples.
Agriculture, Forestry and Water Supplies	6,026
Food, Drugs, Toxicology and Industrial Hygiene	10,209
Fuel Technology	442
Industrial Chemistry	51
Mineralogy, Mineral Technology and Geochemistry	1,270
	17,998

Table I shows the source of the samples as well as their allocation to various Divisions. Although there was a reduction in the number of sewage samples received in 1958 compared with 1957, this category was still the largest numerically.

The number of samples received each year does give an approximate measure of the activities of the Laboratories but does not completely describe our work not only because of the variable number of determinations per sample but also because it is not possible to give a statistical account of the time and effort devoted to for example the various Committees previously mentioned, advice to Government Departments and the public on the most varied problems, attendance in courts of law, visits to industrial establishments and so on.

Fees were charged for work undertaken for some Government Departments, for Commonwealth Government Departments, Hospitals, Milk Board and the general public but a considerable number of free examinations were made for the general public, mainly for mineral identification and assay. During 1958 the Regulations governing the operation of the Laboratories were reviewed, and revised Regulations came into operation on 1st January, 1959.

The summarised reports of the individual Divisions which follow show the wide field covered by the Laboratories and there are a few points therein which merit further mention.

The Department of Agriculture is now in receipt of substantial monies from Primary Industry Research Funds, the most recent one being the Wheat Industry Research Fund. This has resulted in an increase in investigational work by that Department and a consequential increase in the number of samples forwarded to us—1958 was a record year for samples received into our Agricultural Division. It is anticipated that further expansion of this work will occur and consideration should be given to an extension to our buildings to cope with this. Increased numbers of samples can be analysed by modernising equipment and using more rapid methods of analysis and so far this procedure has enabled us to handle the increased volume of work, but it is not expected that new equipment and methods can continue to offset the increase in work.

During 1958 the Department of Public Health decided that City Beach was polluted with pathogenic organisms from the ocean outfall of effluent from the Subiaco Sewage Treatment Works. In consequence City Beach was closed to swimmers until the conditions necessary for treating the effluent to avoid pollution had been determined.

TABLE I

Source and Allocation of Samples received during 1958

Source	Division					
	Agriculture	Food and Drug	Fuel Technology	Industrial Chemistry	Mineral	Total
Agriculture	3,844	947	....	....	1	4,792
Departmental	51	17	158	16	....	242
Government Geologist	....	....	....	....	124	124
Government Tender Board	....	41	....	....	....	41
Industrial Development	....	....	61	....	8	69
Lands Department	....	52	....	....	....	52
Metropolitan Water Supply	99	7,777	....	1	....	7,877
Police Department	....	583	....	....	....	583
Public Health Department	10	115	....	....	4	129
Public Works Department	431	316	28	23	11	809
State Batteries	....	....	....	....	143	143
War Service Land Settlement	69	....	....	....	....	69
Other Government Departments	58	26	74	....	15	173
Pay—						
Commonwealth Government Departments	6	27	....	....	10	43
Hospitals	....	67	....	4	....	71
Milk Board	....	188	....	....	....	188
Public	1,280	40	121	7	374	1,822
Western Australian Government Railways	....	22	....	....	....	22
Other Government Trading Concerns	....	23	....	....	....	23
Free—						
Public	8	4	....	....	580	592
University of Western Australia	170	....	....	....	....	170
Total	6,026	10,209	442	51	1,270	17,998

The effluent was chlorinated and because of the considerable cost involved the dosage of chlorine was adjusted in relation to the 'chlorine demand' of the effluent as determined by these Laboratories. During the year a large number of samples of effluent were analysed for chlorine demand both during the investigational period and the subsequent control period. This work is being continued and City Beach was opened for swimming for the 1958-59 summer.

Also in 1958 the Pilot Plant using the Activated Sludge process of sewage treatment came into operation at the Subiaco Treatment Works and this involved the testing of an appreciable number of samples, tests which could only be done by reducing the number of samples analysed for the normal treatment plant. However, when all of the Subiaco Treatment Works is operating on the activated sludge process it is expected that the chlorine demand of the effluent will be only about one-fifth of the present effluent demand and this will enable a marked decrease in the cost of chlorination of the effluent.

Other pollution work, of the Swan River, was undertaken in connection with the Swan River Reference Committee. This Committee will shortly cease to function, for, during 1958, Parliament passed the Swan River Conservation Act, an Act which establishes a Swan River Conservation Board and a Rivers and Waters Technical Advisory Committee.

In 1957 the Traffic Act was amended by inserting section 32A to provide for voluntary blood tests for drivers charged with driving while under the influence of liquor. This amendment was proclaimed in 1958 and it is much to be regretted that an amendemnt dealing with a chemical determination by these laboratories was drafted, passed by Parliament and proclaimed without our knowledge or advice. Further, it was proclaimed before any Regulations under section 32A had been framed. Further it was only by considerable persistence on my part that an amendment to section 32A in 1958 was correct and that the Regulations were satisfactory to us.

The Food and Drugs Advisory Committee met on several occasions during the year and gave particular attention to uniform Regulations under the Health Act. A new set of Food and Drug Regulations has been written and is at present under consideration.

AGRICULTURE, FORESTRY AND WATER SUPPLY DIVISION.

The main function of this Division has again been chemical analyses for the Department of Agriculture, the Public Works Department, the Metropolitan Water Supply Department and primary producers.

During 1958, 6,026 samples were received, an increase on 1957 of approximately 8 per cent. Over the last ten years the number of samples received per annum by this Division has trebled, while the number on the staff has remained the same. Although the number of samples received is not an exact measure of the work done, as some samples may require 12 estimations while others only one, it is a guide to the increased efficiency of the Division over the years. However if this trend of an annual increase of samples continues, an addition to the building in the very near future will be needed to accommodate more staff, to provide additional space for the storage and preparation of samples and to provide laboratory space to install equipment to handle large numbers of samples at a time.

Table 2 (see page 100) lists the type and numbers of samples for 1958 as well as their source.

Soils.

Over 300 soils were received during the year; they include:—

(1) Thirty soils from a cultural experiment at Avondale Research Station, analysed for organic carbon, in an experiment comparing the effects of disc, chisel and mouldboard ploughs. There were no significant differences in organic carbon between treatments.

(2) Eleven soils from along the Karridale-Nannup Road were analysed for pH, organic carbon, nitrogen and exchangeable cations to give some basic information about the soils of this area.

(3) Sixty-four soils from Wongan Hills Research Station were analysed for nitrogen, soils from eight replicates on four plots of two treatments. The results below show no difference between treatments, but the wide range within one treatment shows the difficulty in obtaining representative samples of soil and of comparing the results of soil treatments.

Treatment	Nitrogen Per Cent.	
	Range.	Average.
Virgin Fallow	0.025-0.066	0.032
After first wheat crop	0.021-0.048	0.032

(4) (a) From an experiment at Eneabba on a sandy soil 12 samples were taken in March, 1958, from a four inch auger hole on the drill run at three inch intervals of depth to a total depth of three feet. The total phosphorus was determined on these to locate the superphosphate which was drilled at the rate of 800 lb./acre in 1957. The first three inches of soil had 0.006 per cent. P and all the successive three inch intervals had 0.001 per cent. P, indicating that under these conditions all added P had remained in the surface three inches of soil.

(b) Thirty-six samples from the same area sampled in March 1958, being profiles of the same soil having nil, 200 and 800 lb./acre of superphosphate drilled in, in 1957, showed a similar effect.

(5) (a) Sixty samples of soil were examined for nitrogen from the commencement of an experiment by the Department of Agriculture into the interaction of variety, soil and climate upon wheat quality.

The 60 samples were taken as a check on sampling procedure. The samples were taken from three sites; ten samples from each site of half an acre were taken by two different samplers. The variation of nitrogen was from 0.029-0.061 per cent. on one plot and there were only slight differences in the range of nitrogen between the two operators on all plots.

(b) The problem of whether the greater than 2 mm fraction of soil organic matter should or should not be included in samples for analysis was investigated on the above soils. Of eight soils examined the nitrogen in the greater than 2 mm organic fraction of the soil ranged from 0.56-1.04 per cent. nitrogen and represented on the whole soil from 0.0015-0.0034 per cent. nitrogen, which was of the order of 5 per cent. of the total soil nitrogen.

Waters.

The total of 1,866 water samples received in 1958 is a decrease of 21 per cent. on the number received in 1957, this decrease could probably be attributed to the better seasonal conditions experienced in the farming areas in 1958, hence decreasing the need of farmers to find alternative water supplies.

(1) The routine examination of existing and proposed public water supplies was continued.

(2) The weekly sampling of streams in the Goldfields Water Supply Catchment area was continued during 1958. The same general pattern of the salinity of these streams, namely falling rapidly with the commencement of the winter rains and gradually increasing with the advent of spring, was repeated. This was particularly noticeable with streams that have a smaller flow of water, eg., Rushy Stream had 92 g.p.g. total salts on 4th July, was down to 20 g.p.g. by 25th July and by 18th November it was up to 78 g.p.g.

(3) An analysis of a sample of water from the Darwin supply for a W.A. firm about to open up in Darwin, showed the better quality of Darwin water over our own Metropolitan Water Supply. The total soluble salts in the Darwin water was only 5 g.p.g., compared with aproximately 20 g.p.g. for Perth.

(4) Further samples of water from an old mining shaft on the True Blue lease at Bamboo Creek were analysed for arsenic. A prospector had been

TABLE 2.

Agriculture, Forestry and Water Supply Division. 1958.

	Agriculture Department	Public Works Department	Metropolitan Water Supply	Public Health Department	War Service Land Settlement Scheme	Other Government Departments	Departmental	University of W.A.	Pay Commonwealth Government Departments	Public Pay	Free Public	Total
Cereals—												
Barley Grain	103	....	....	....	....	....	....	....	....	....	....	103
Barley Plant	12	....	....	....	....	....	....	....	....	....	....	12
Oat Grain	8	....	....	....	....	....	....	....	....	....	....	8
Oat Plant	372	....	....	....	....	....	1	....	....	....	....	373
Wheat Grain	1,367	....	....	....	....	....	....	....	....	....	....	1,367
Wheat Plant	28	....	....	....	....	....	....	....	....	....	....	28
Other	2	....	....	....	....	....	....	....	....	....	....	2
Fertiliser and Manure—												
Fertiliser Act	131	....	....	....	....	....	....	....	....	....	....	131
Organic	8	....	....	....	....	....	....	....	....	6	....	14
Rock Phosphate	15	....	....	....	....	....	....	....	....	....	....	15
Superphosphate	56	....	....	....	....	....	....	....	....	5	....	61
Other	5	....	....	....	....	....	....	....	....	11	1	17
Horticulture—												
Carrot	11	....	....	....	....	....	....	....	....	....	....	11
Currants	34	....	....	....	....	....	....	....	....	....	....	34
Cauliflower	13	....	....	....	....	....	....	....	....	....	....	13
Lettuce	32	....	....	....	....	....	....	....	....	....	....	32
Lupin	7	....	....	....	....	....	....	....	....	....	....	7
Tobacco	96	....	....	....	....	....	....	....	....	....	....	96
Tomato	26	....	....	....	....	....	....	....	....	....	....	26
Other	17	....	....	....	....	....	....	....	....	....	....	17
Miscellaneous—												
Clay	....	....	....	....	....	....	13	....	....	....	....	13
Faeces (Sheep)	35	....	....	....	....	....	....	....	....	....	....	35
Flour	84	....	....	....	....	....	....	....	....	2	....	86
Leaves, etc. (Fluorine)	19	....	....	....	....	....	18	....	....	....	....	37
Liver (Animal)	35	....	....	....	....	....	....	....	....	....	....	35
Urine	43	....	....	....	....	....	....	....	....	1	....	44
Other	8	3	9	....	....	3	13	5	5	29	....	75
Pasture and Fodders—												
Clover	569	....	....	....	....	....	....	....	....	....	....	569
Feeding Stuffs Act	92	....	....	....	....	....	....	....	....	....	....	92
Fodder	67	....	....	....	....	....	....	156	....	5	....	228
Hay	48	....	....	....	....	....	....	....	....	....	....	48
Lupin	10	....	....	....	....	....	....	....	....	....	....	10
Pasture	68	....	....	....	....	....	1	....	....	....	....	69
Poultry Meal	17	....	....	....	....	....	....	....	....	6	....	23
Silage	58	....	....	....	....	....	....	....	....	6	....	64
Other	40	....	....	6	....	....	....	....	....	8	....	54
Soils	284	3	....	....	....	....	3	....	....	20	1	311
Waters	24	425	90	4	69	55	2	9	1	1,181	6	1,866
Total	3,844	431	99	10	69	58	51	170	6	1,280	8	6,026

drinking this water for sometime and complained of feeling ill from it. As the water contained 6 p.p.m. of arsenic which is over 100 times the suggested safe upper limit, the illness is not surprising. However it does indicate that the safe upper limit is conservative.

(5) Samples of lake water from Lake Clifton and Lake Preston were analysed because of interest in their use for an alkali industry, particularly potassium. Analyses of these samples agreed with results found by this Department some 40 years ago. There is a seasonal variation in the total salts in the lakes and the potassium is a little less than 1 per cent. of the total salts, that is, about the same as sea water.

Fertilisers.

(1) Fertiliser Act.—This year 136 Fertiliser Act samples including five umpire samples were received. This is a far greater number than ever previously received, more than 3½ times the number received in 1957. These samples and Feeding Stuffs Act samples have taken up a large amount of the Division's time and because of it other branches of the Department of Agriculture have been forced to wait for their results, because of the priority that the Department of Agriculture requires to be given to these samples. It is debatable as to whether the analysis of so many samples somewhat randomly chosen without relation to the quantity of fertiliser or stock food involved, is the most efficient method of policing these two Acts.

Table 3 shows the number of main constituents analysed and whether or not they comply with the Act.

TABLE 3.

Fertiliser Act Samples.

Constituent	Samples analysed	Complied	Deficient
Nitrogen, N	61	50	11
Water soluble potash, K_2O	49	27	22
Phosphoric acid, P_2O_5—			
Water soluble	74	70	4
Citrate soluble	93	83	10
Acid soluble....	84	76	8
Total	98	95	3
Copper, Cu	14	5	9
Zinc, Zn	13	10	3

(2) Seven samples of copper ore were analysed for total, "available" and oxidised copper. The "available" copper as determined by extraction with 10 per cent. acetic acid agreed fairly well with the oxidised form as determined by extraction for one hour with a three per cent. solution of sulphur dioxide in water.

(3) Because of the repeated deficiency of copper in Fertiliser Act samples of superphosphate and copper ore mixtures, an investigation of sampling techniques was undertaken in co-operation with the Department of Agriculture and a fertiliser manufacturing firm. Six bags of super-copper ore were sampled by the Department of Agriculture spear method, the manufacturer's spear method and by passing each bag through a sample divider, thus giving 18 samples. Each sample was divided into two, one of each pair being analysed by us and the other by the manufacturer. The individual and average analyses of the six bags showed reasonable agreement between analysts when sampled by the same method. The manufacturer's sampling method gave a slightly higher result than the Departmental method, but these methods gave 15 per cent and 10 per cent. respectively higher results on the average than the theoretically more correct method using a sample divider.

(4) During the year a method for the determination of micro amounts of boron in phosphatic fertilisers was developed and some 20 samples of superphosphate and rock phosphate were analysed by this method. Previously the high phosphate and fluoride content of these materials had interfered with all other methods tried.

(5) Because of the difficulty in obtaining good duplicates on potash in mixed fertilisers containing potash, the need for greater care in the preparation of the sample was again noted. Unless the sample is finely ground and thoroughly mixed there is a tendency for the potash to segregate.

(6) The variability in the analyses of several samples of guano from a cave at Jurien Bay, showed the importance of good sampling necessary by anyone wishing to exploit these deposits for fertiliser.

(7) Samples from two unusual sources were analysed for their fertiliser value; two samples of leather dust had 6 per cent. nitrogen and a sample of ash from wool scourers residue had 6 per cent. potash, K_2O.

(8) Biuret in urea of over 0.25 per cent. when used for citrus sprays or over 2.5 per cent. when the urea is applied to the soil can cause leaf damage. A sample of commercial urea on the market had 0.5 per cent. biuret and it was also found that a sample of analytical grade urea had 0.9 per cent, biuret against a standard of 0.1 per cent. for this grade.

Pastures, Fodders and Stock Foods.

(1) Feeding Stuffs Act.—Ninety-two official samples of stock foods were received this year, more than a fourfold increase on 1957.

Table 4 shows the number of main constituents analysed in these samples and whether or not they comply with the Act.

TABLE 4

Feeding Stuffs Act Samples

Constituent	Samples analysed	Complied	Deficient	Excess
Protein	71	65	6	....
Fat	64	51	11	2
Fibre	69	65	....	4
Sodium chloride, NaCl	68	49	10	9
Phosphoric anhydride, P_2O_5	68	50	5	13
Calcium, Ca	70	42	8	20
Manganese, Mn	6	6	....	....
Cobalt, Co	7	2	5	....
Sulphur, S	4	3	1	....
Copper, Cu	1	....	....	1

(2) A further 120 samples of pasture and herbage were examined for the University Biology Department investigating quokka and euro nutrition on Rottnest Island, Woodstock Station and at Byford.

(3) A two year survey by the Animal Health and Nutrition Laboratories into pastures at the Kimberley Research Station was concluded with 51 samples analysed for proximate feeding stuff analysis. These samples were taken at monthly intervals and the following species were investigated, Acacia, Aristida, Astrebla, Bauhinia, Chrysopogon, Dicanthium and Iseilema.

(4) Of the 64 samples of silage analysed the majority were from the Dairying Division's Silage Competition. As only the protein figure was used in allotting marks in the contest, although a feeding stuff analysis was requested on them all, this class of samples will be analysed for protein only, in 1959, thus considerably reducing the work involved.

(5) Seventeen samples of hay were received for feeding stuffs analysis from a rate of seeding of vetch and oat trial at Esperance Research Station. Vetches were sown at the rate of 0, 15, 30 and 60 lbs. per acre with oats of the rate of 0, 15, 30, 60 and 90 lbs. per acre. The 60 lbs. rate of vetches with no oats produced hay with the highest protein and the 60 lbs. of oats with no vetches and the 90 lbs. of oats with 0, 15 and 30 lbs. vetches produced hay with the lowest protein.

(6) Analysis of six samples of pasture showed the benefit of cutting and roto baling or cutting and windrowing of pastures to preserve their protein and carotene value.

(7) A sample of sun dried fish-meal prepared from shark flesh was found to contain 97.5 per cent crude protein when calculated as N X 6.25. This figure is very anomalous as the sample also contained 15 per cent moisture, 9 per cent ash and 1 per cent fat i.e. a total of these four constituents of 122.5 per cent. This anomaly was checked on a fresh sample of shark flesh and found to be correct. The nitrate nitrogen, the ammonia nitrogen and the urea nitrogen in this sample were found to be only a small percentage of the non-true protein portion of the total nitrogen. It is clear that the factor 6.25 is not validly applicable to shark flesh.

Plant Nutrition.

Carrots.—(1) Manganese deficiency symptoms were confirmed by analysis of two samples of leaves from Spearwood.

(2) Carotene was determined on nine species of commercially grown carrot tubers. The carotene appears to be proportional to the depth of the pink colour of the prepared sample and within the same variety the carotene in mature carrots was found to be higher in the smaller tubers.

Cauliflowers.

(1) Six samples of leaves from Osborne Park and Spearwood were analysed for calcium, magnesium, nitrogen, phosphorus, boron, copper, man-

ganese, molybdenum and zinc and the cause of yellow and mottled affected leaves was shown to be a manganese deficiency.

(2) Six samples of leaves from Coogee were analysed for calcium, potassium, boron and molybdenum. The affected young inner leaves showed a marginal pale green mottling, some distortion and marginal scorch, suspected of being caused by boron deficiency. This was not confirmed by analysis.

Clover.

(1) From a glasshouse trial investigating the effect of sodium fertiliser on potassium deficient clover 96 samples consisting of 24 of leaves, of petioles, of stems and of roots were analysed for sodium and potassium.

Increasing amounts of added potassium in the presence or absence of added sodium, increased the potassium and decreased the sodium in all parts of the plant. Added sodium (i) decreased the uptake of potassium at all levels of added potassium and in all parts of the plants, (ii) increased sodium uptake in all parts of the plants.

(2) 30 samples of clover leaves and petioles from a residual zinc fertiliser experiment at the Esperance Plains Research Station were analysed for zinc. The average of replicates showed that the greatest uptake of zinc was from the 4 lbs. of zinc oxide every three years treatment; the 2 lbs. every 3 years and 4 lbs. every 6 years were the next highest and the 2 lbs. every 6 years treatment gave the lowest uptake of zinc.

(3) The average of replicate zinc figures in 28 samples of leaves and petioles from a zinc fertiliser experiment at Esperance are given below with their respective treatments.

ZnO lb./acre added	0	½	1	2	4	8	16
Zinc p.p.m.	13	16	17	17	18	24	28

(4) 9 samples of clover leaves and petioles from a copper fertiliser experiment at Esperance were analysed for copper, the average of replicates with respective treatments were:

$CuSO_45H_2O$ lb./acre added	0	2	4
Copper p.p.m.	1.0	4.0	4.5

(5) From a potash fertiliser experiment at Bramley Research Station and at Elgin 35 samples of clover leaves and petioles were analysed for potassium. The average of replicates showed that the uptake of potassium increased with application of potassium fertiliser.

(6) 76 samples of clover leaves and petioles from a phosphate experiment at Bramley and at Muchea were analysed for phosphorus.

(a) At Bramley there was an increase in uptake of phosphorus when added in the form of superphosphate at all levels up to 1792 lbs./acre but with equivalent amounts of phosphorus added as rock phosphate very little increase of uptake of phosphorus with added phosphatic fertiliser was shown.

(b) In another experiment at Bramley there was no increase in uptake of phosphorus over the nil treatment with 112, 168, 224 or 448 lbs./acre of superphosphate but 896 lbs./acre doubled the uptake.

(c) At Muchea increasing phosphorus in the form of either superphosphate or rock phosphate increased the uptake of phosphorus at all levels of fertiliser and more phosphorus was taken up from the rock phosphate than from equivalent amounts of superphosphate.

(7) Over 50 clover samples were analysed for confirmation of field diagnosis of deficiency symptoms, mainly for potassium.

(8) Of interest are the molybdenum figures in some red clover samples from a peaty swamp soil at Mandogalup, as high as 80 p.p.m. Mo against the usual for clover of less than 1 p.p.m.

Currant Grapes.

34 samples of currant fruit were examined for their moisture and total and reducing sugar content. Trouble was being experienced in pinning the dried fruit and it was thought that this was related to the moisture or sugar content; however there was no significant variation of these two factors in these samples.

Lettuce.

(1) From an experiment at Wembley Research Station comparing the relative fertiliser value of two rates of horse manure, fowl manure, nitrate of soda, sulphate of ammonia and urea, there were 36 samples of leaves analysed for nitrogen, phosphorus and potassium. Some of the leaves had over five per cent. nitrogen and nine per cent. potassium on dry basis which are particularly high figures for plants, but it must be remembered that lettuce contains about 96 per cent. moisture.

(2) Six samples of leaves from a foliage spray trial with trace elements at Wembley were analysed for calcium, magnesium, nitrogen, phosphorus, potassium, boron, copper, manganese, molybdenum and zinc. There was an increase in uptake of the respective elements from boron, manganese and molybdenum sprays but no increase was shown in magnesium by the use of an Epsom salt spray.

Tobacco.

96 samples of tobacco leaf from a glasshouse experiment testing the effect of various levels of potassium fertiliser on various levels of sodium chloride in the irrigation water, were analysed for chloride and potassium. The leaves were sampled in groups of four leaves starting from the bottom of the plants. These analyses showed:—

(a) Increasing amounts of potassium fertiliser increased the potassium and decreased the chloride in all leaf groups.

(b) Increasing amounts of sodium chloride in the irrigation water increased the amount of chloride in all leaf groups and generally decreased the potassium.

(c) Chloride increases from the top to the bottom of the plant at all levels of added sodium chloride, i.e. the older leaves are the highest in chloride.

(d) Potassium decreases from top to bottom of the plant at all levels except the highest of 4 m.eq. per litre of potassium sulphate, i.e. the younger, growing leaves are the highest in potassium.

Tomatoes.

(1) Fruit.

(a) Analysis of seven samples of ripe fruit from Osborne Park and Balcatta for nitrogen, potassium and boron failed to confirm a suspected boron deficiency.

(b) 15 samples from Geraldton were analysed for nitrogen and potassium in connection with symptoms of blotchiness on the fruit; no conclusions could be drawn from the results of the analysis.

(2) Leaves.

(a) Two samples from Osborne Park were analysed for calcium, magnesium, phosphorus, potassium, copper, iron, manganese and zinc in connection with iron deficiency symptoms in the affected sample. The iron in the affected sample was twice that in the healthy sample, but this is not inconsistent with the iron deficiency symptoms as either other deficiencies or toxicities (not present in these samples) can show similar symptoms or as probably is the case in these samples, the iron in the affected plant may be in a form not utilisable by the plant for growth. Treatment with a chelate could make it available.

(b) The roots and tops of seedlings from a seed bed that had had a heavy application of Cuprox, which produced damaged "stubbly" roots and leaf chlorosis similar to iron chlorosis, were found to contain 93 and 610 p.p.m. of copper respectively.

Miscellaneous Leaves.

Samples of bean, lemon, maize, orange, passion fruit vine, pumpkins and swede leaves were analysed for confirmation of visual symptoms of nutrient deficiences.

Cereals.

Barley.—(1) 160 samples of barley grain from lattice square variety yield trials at Avondale, Wongan Hills and Glen Lossie Research Stations were analysed for nitrogen to assess grain quality.

(2) 12 green barley plants, Atlas and Beecher varieties, were analysed for proximate feeding stuffs analysis from grazing and recovery trials at Avondale, Merredin and Wongan Hills Research Stations.

Oats.—(1) 30 green oat plants from grazing and recovery trials at Avondale, Merredin and Wongan Hills Research Stations were analysed for proximate feeding stuffs analysis.

(2) 180 samples of green oat leaves were analysed for manganese, from a glasshouse experiment growing oats on calcareous Yanchep sand and Calingiri gravelly loam-sand, to test the susceptibility of five varieties to manganese deficiency, at two levels of water treatment. There were no significant differences between varieties in uptake of manganese on either soil, though there was a general increase in uptake of manganese with applied manganese. Plant Research Branch Officers observations of the trial, which is not yet complete, were that Avon was the least affected variety and Fulghum was the most susceptible on both soil types. Manganese deficiency symptoms were more acute on the Yanchep sand and the high water treatment samples were visually better than the low water treatment on this soil; the reverse applied on the Calingiri soil.

Wheat.

(1) Protein determinations were done on 1,200 samples of wheat grain, including—

(a) 25 samples from Pasture Improvement Groups.

(b) 65 samples from wheat variety trials.

(c) 78 samples from export cargoes.

(d) Wheat Quality Survey, 1957-58 season.

This survey was continued again this year and 282 samples from individual sidings were analysed. These sidings are classified below according to the protein content and the 1956-57 season's figures are given for comparison.

Classification	A	B	C	D
Protein (13·5% moisture)	% 11·0 or more	% 10·0–10·9	% 9·0–9·9	% less than 9·0
Number of Sidings—				
1956–57 Season	23	44	83	132
1957–58 Season	46	67	109	60

The big increase in the number of A and B class sidings in 1957-58 may be attributed to the dry Spring of 1957, which while decreasing the yield, would tend to increase the grain protein.

Again as in 1956-57, if a line were drawn from Geraldton to Tammin to Lake Grace, all of the A class sidings would be east of this line and for the 1957-58 season all except seven of them are north of the Eastern Goldfields Railway.

Also from the Wheat Quality Survey 560 samples, representing a named variety sample from every 20th load received at 25 sidings spread throughout the wheatbelt, were analysed. As in the 1956-57 survey there was a wide range of protein values at any one siding even within the one variety e.g. at Yuna, the variety Bungulla varied from 6.7 per cent. to 12.6 per cent. as analysed and at Ardingly, the variety Gabo varied from 8.9 per cent. to 15.3 per cent. as analysed.

(2) Analysis of the 1957-58 F.A.Q. wheat and flour prepared from it on a Brabender Mill are given below with the 1956-57 figures for comparison.

	F.A.Q.			
	Wheat		Flour	
	1957–58	1956–57	1957–58	1956–57
	%	%	%	%
Moisture	10·1	9·3	12·0	11·2
Protein (as analysed)	10·4	9·9	9·6	8·9
Protein (at 13·5% moisture)	10·0	9·5	9·4	8·7
Ash (at 13·5% moisture)	1·21	1·10	0·59	0·55
Maltose figure (Kent Jones)	....	....	3·09	2·76

Miscellaneous.

Of the wide range of samples examined under this heading the following were of the most interest.

(1) *Corrosion and Deposits.*—(a) Three pieces of badly pitted copper hot water piping were examined to find the cause of corrosion. The type and position of the tubercules were suggestive of dissolved oxygen attack at temperatures exceeding 180°F. The copper piping passed A.S.T.M. standards for hot water systems and the water used was metropolitan scheme water. Suggestions were made to prevent a recurrence by controlling the temperature in the range 140°-160°F and to improve the circulation of the water, thus eliminating the need for high initial temperatures.

(b) A voluminous reddish brown deposit in the copper water tanks of an Army Fairmile Launch, which badly discoloured the drinking water, was found to be mainly hydrated iron oxide derived from the galvanised iron piping leading to and from the tank. Recommendations to prevent a further occurrence were made.

(c) A boiler scale from Mt. Henry Home for Aged Women was found to consist mainly of calcium and magnesium phosphates and silicates which normally should have been eliminated in the blow down. This scale was being unsuccessfully treated with Calgon solution and recommendations based on laboratory experiments were made; these were the use of an inhibited acid followed by a period of standing in hot two per cent. versene solution.

(2) *Spectrography.*—A wide variety of samples including corrosion products, brass fittings, minerals, ores, heavy metal concentrate and paint flakes were qualitatively and semi-quantitatively examined.

Identical spectrograms were obtained from two samples of paint flakes, one from the scene of a hit and run accident and the other from the suspected vehicle. These spectrograms were compared with the spectrograms of eight randomly chosen samples of paint flakes from other vehicles and in every case there were striking differences.

Considerable progress was made this year in the development of a semi-quantitative method suitable for the wide variety of samples received for spectrographic analysis. As further experience is built up from the comparison of spectrographic with chemical analyses this method should be of great help to all divisions of the Laboratories.

(3) *Industrial Fluorosis.*—An investigation, in co-operation with Dr. Snook of the Animal Health and Nutrition Laboratories was undertaken into the fluorine contamination of vegetation in the vicinity of brickworks.

Samples of vegetation from the vicinity of the following brickworks were examined for fluorine, Albany, Armadale, Byford, Cardup, Maylands, Midland Brick Co. and Waterloo. In all cases the fluorine content was higher than is normally found in the types of samples examined. The contamination was found to be most pronounced in the vicinity of the Armadale brickworks and this area was examined in more detail.

Pasture samples from a paddock opposite the brickworks, on which stock were grazing had as high as 380 p.p.m. of fluorine, which is well above the overseas figure of 25 p.p.m. said to induce fluorosis in stock grazing on such pasture. Symp-

toms of fluorosis were observed on some of these stock and these symptoms disappeared when the stock were taken away from the affected paddock. The soil on which these affected pastures were growing had approximately 100 p.p.m. of fluorine which is high for such sandy soils as these. English experiments have shown that high fluorine figures in plants is not due to uptake from the soil, except in certain species and it is therefore most probable that the high fluorine in the vegetation, and the soils ,is due to atmopheric pollution.

The fluorine in the vegetation and the soil was shown to decrease with distance from the brickworks. Mature acacia leaves 100 yards West of the brickworks had 3610 p.p.m. of fluorine; similar leaves ¾ mile W.S.W. had 57 p.p.m. and leaves 4 miles West had 7 p.p.m. Soil 100 yards West of the brickworks had 99 p.p.m. and soil 250 yards West had 48 p.p.m. of fluorine.

The degree of contamination was found to be greatest in the direction of the prevailing winds i.e. West to South-West and North-East of the brickworks.

Plant species were found to vary in their tolerance to fluorine, acacia leaves at 3610 p.p.m. were quite healthy and unaffected whereas gum tree leaves nearby had 900-1700 p.p.m. and were affected in varying degrees, showing the following symptoms:—marginal and tip scorch of the leaves and intravenal brown to black mottling.

The source of the fluorine apparently emanating from the brickworks seems to be the coal and clay used in the manufacture of the bricks. The figures for fluorine in the coal and clay used, 30 and 30-60 p.p.m. respectively, do not agree with overseas experience where coal containing more than 85 p.p.m. or clay containing 550 p.p.m. are known to cause industrial fluorosis. However it was noted that all the fluorine in the clay and coal used at Armadale was lost on ignition; this has not been indicated in overseas reports on their clay and coals, and therefore it is quite probable that the amounts of flourine volatilised from the clay and coal in question and overseas clay and coals known to cause industrial fluorosis, could be comparable.

FOODS, DRUGS, TOXICOLOGY AND INDUSTRIAL HYGIENE DIVISION.

Although this portion of the Laboratory was originally designed and built for a staff of eight the official strength of the Division during 1958 comprised thirteen permanent and two temporary officers. Three of these were located at the Sewage Annexe Laboratory, Lincoln Street, and the remainder at the main Government Chemical Laboratories, Adelaide Terrace.

Administratively the year was a very difficult one. Throughout the whole of the year this Division was without the services of an experienced senior analyst who had been loaned, originally for four months, to another Branch. The difficulties of the situation were increased by the absence on Long Service Leave of two senior officers, each for three months, and of one junior officer, for a period of six months. Some alleviation of the position was afforded by the appointment of a junior temporary analyst in April, 1958.

As in recent years the major activities of the Division have consisted of chemical work undertaken for the Departments of Public Health, Police, Agriculture, Public Works, the Metropolitan Water Supply, Sewerage and Drainage Department, and the Milk Board of W.A., but a wide variety of miscellaneous examinations were performed for other Government departments and the general public.

10,209 samples were received during the year, being a decrease of 2,136 as compared with 1957. This was due largely to a cessation of investigational work into sulphide corrosion in sewers, following the completion in May, 1958, of a Pilot Plant for the treatment of sewage effluent by the activated sludge process. Sulphide investigation samples for the year decreased by 5,235, but on the other hand samples received in other classifications showed appreciable variation, as indicated in the following table:—

Classification	1956	1957	1958
Milks	227	240	189
Other foods	172	350	201
Exhibits—alcohol	154	164	229
Human toxicology	146	162	284
Animal toxicology	31	46	64
Industrial hygiene	75	132	86
Criminal cases	33	15	61
Sewage—			
Routine	2,854	3,194	3,467
Investigational	7,012	6,696	1,461
Country	22	72	14
Trade wastes	4	18	44
Activated sludge	0	0	1,099
Pollution Surveys—			
Swan River	231	237	205
Bunbury	50	72	48
Ocean Beaches—waters	145	146	113
effluents	0	0	1,540
General Miscellaneous	418	715	1,086

Table 5 shows the source and description of samples received during 1958.

Foods.

A total of 390 samples of food materials were examined, compared with 590 in 1957. 186 of these were samples of cows milk submitted by the Milk Board of W.A. and consisted largely of milks which were suspected of being adulterated or of being under the standard required by the Milk Act. Of these samples only 3.3 per cent. contained less than the legal minimum amount of milk fat (3.2 per cent.) whereas 68 per cent. of the samples contained less than the legal minimum of solids not fat (8.5 per cent.), and 92 per cent. failed to comply with the legal standard for the freezing point of milk (0.540 degrees Centigrade below zero). The distribution of analytical figures is shown in the following tables:—

Milk Fat.

Per Cent in Sample.	Per Cent of Total Samples.
Less than 3.00	1.1
3.00 - 3.19	2.2
3.20 - 3.49	7.3
3.50 - 3.74	22.5
3.75 - 3.99	13.5
more than 3.99	53.4
	100.0

Milk Solids Not Fat.

Per Cent in Sample.	Per Cent of Total Samples.
Less than 8.00	6.7
8.00 - 8.24	28.1
8.25 - 8.49	33.2
8.50 - 8.74	15.2
8.75 - 8.99	15.7
More than 8.99	1.1
	100.0

Freezing-point.

Degrees C. below Zero.	Per Cent of Total Samples.
Less than 0.500	0.6
0.500 - 0.509	4.5
0.510 - 0.519	12.2
0.520 - 0.529	37.8
0.530 - 0.539	37.2
0.540 - 0.550	7.7
	100.0

In presenting this distribution of the analytical figures it is emphasised that these were samples of which there was prima facie evidence of their failure to comply with legal standards.

54 samples of cheese were analysed for the Dairy Branch of the Department of Agriculture for the purpose of control checks of the composition of the

TABLE 5.

FOOD AND DRUG DIVISION 1958

	Public Health Department	Agriculture Department	Metropolitan Water Supply	Public Works Department	Police Department	Tender Board	Lands Department	Swan River Reference Committee	Other Govt. Departments	Departmental	Pay—Public	Pay—Milk Board	Pay—Hospitals	Pay—W.A.G.R.	Pay—Other Govt. Trading Concerns	Pay—Commonwealth Govt. Depts.	Free Public	Total
Food—																		
Cheese		54							1									54
Fish	10																	11
Grapes		50																50
Milk											1	186				2		189
Pears		23																23
Tender Board Samples						28												28
Various	25	3			1				1	1	3	2						36
Industrial Hygiene—																		
Blood and Urine	18										8		22	22				70
Various	2								11	3								16
Miscellaneous—																		
Bones and Teeth		43																43
Cattle and Sheep Dip		51																51
Criminal Cases					61													61
Detergents and Cleaner	1					13												14
Drugs and Medicines	10								12		2							24
Fruit Storage Experiments		13																13
Leather Dye	12																	12
Natural Vegetable Products		573																573
Oxygen																18		18
Pesticide and Insecticide	5	29																34
Tallow															23			23
Toys	19																	19
Vermin Poison		9																9
Water		1	56	36	1						2							96
Wines and Spirits	1	33			5						1							40
Various	3	10	1		2				1	7	19		1			7	4	55
Pollution Survey—																		
Brunswick Junction				31														31
Bunbury				48														48
Ocean Beaches			1,651							2								1,653
Swan River				151			16	36		2								205
Sewage—																		
Activated Sludge			1,099															1,099
Country				14														14
Investigational			1,460							1								1,461
Trade Waste	1		43															44
Weekly Routine			3,467															3,467
Toxicology (Human)—																		
Exhibits (Toxicology)					279								5					284
Exhibits (Alcohol)	1				227					1								229
Specimens (Patients)	6										3		39					48
Toxicology (Animal)—																		
Specimens	1	55			7						1							64
TOTAL	115	947	7,777	280	583	41	16	36	26	17	40	188	67	22	23	27	4	10,209

cheese produced by the factories in this State. Of these, 32 samples, or 60 per cent of those examined, contained more than 50 per cent of fat calculated on the moisture-free basis.

28 food samples were examined for the Government Tender Board as a check on the quality of foodstuffs tendered for supply to Government institutions. These comprised tomato soups and purees, pickles, chutney, tinned peas, tomato sauces, vinegars, and custard powders. As in previous years it was found that there is apparently some confusion in the matter of types of vinegar, as imitation vinegars are consistently submitted to tenders calling for "genuine malt vinegar."

Varied food samples were examined for the Public Health Department. These included some confectionery which, it was thought, may have been contaminated by insecticide; canned fish and fruit which were examined for evidence of deterioration, food which was suspected of having been wilfully tampered with, and meat "additives" which could be used to alter the texture etc. of sausage meats. A large jar of "salt" was found to consist almost entirely of saltpetre (potassium nitrate) which had been added, accidentally, to a container normally used for common salt (sodium chloride).

Following a complaint of a "mineral oil" taste in fresh fish, an analysis was made, for the Fisheries Department, of a sample of fish taken from the ocean near an oil refinery. No evidence was found of any mineral oil on or in the flesh of the fish submitted.

Investigations of grapes were continued for the Department of Agriculture when 50 samples were analysed. Although the attempt to correlate the palatability of different varieties of early grapes with chemical criteria has now been carried out over three seasons the results are still quite indeterminate. It has not yet been found possible to assess degree of maturity in terms of a chemical standard suitable for "field" use.

Work for the Plant Pathology Branch of the Department of Agriculture was continued when 28 samples of pears were received in connection with mercury fungicide spraying experiments. Analysis indicated that even the lightest application of fungicide used still left a detectable residue of mercury in the fruit submitted for examination.

A sample of cooking margarine examined for the Dairy Branch of the Department of Agriculture proved to be normal although the appearance and consistency of the sample made its genuineness suspect.

Of some unusual interest were four bottles of pasteurised milk examined for the Milk Board of W.A. to test the effect of exposure to sunlight on the fat and therefore the flavour of the milk. Two of these had been exposed to sunlight, one for a short period and the other excessively, while the two control samples had been protected from sunlight. Analysis revealed that the peroxide value of the fat of the exposed samples was six and twenty times respectively that of the fat of the protected control samples. A corresponding difference in the flavour of the milks was observed.

Human Toxicology.

284 toxicological samples from 103 cases were examined in connection with death from suspected poisoning.

In 50 cases no poison or drug was detected, while in 53 cases a poisonous material or other physiologically active drug was identified on analysis. Details are listed in the following table:—

Poison or Drug.	No. of Cases
Barbiturates	11
Carbon monoxide	13
Arsenic	3
Lead	3
Phosphorus	2
Strychnine	2
Quinine	2
*Various (one only of each)	17
Negative	50
	103

* These comprised lysol, antimony, parathion, toluene, mercury, D.N.O.C., 2:4.D., petrol, ammonia, amphetamine, largactil, chloral hydrate, carbromal/bromvaletone, A.P.C./codeine, phenolphthalein, a chlorinated hydrocarbon and an unidentified alkaloid.

The number of negative cases was unusually large. This resulted in a disproportionate increase in the amount of toxicological work required of this Division, as very much more labour and time is necessary to examine such samples with the thoroughness needed to establish the absence of any poison or drug.

An unusually large number of samples of blood and urine were analysed for alcohol content. Of these, 157 were samples of blood submitted by the Police Department in connection with traffic accidents or sudden death from various causes. The distribution of analytical figures was:—

Blood Alcohol Analyses (Post mortem).

Per Cent Alcohol.	Number
negative	91
Less than 0.10	16
0.11 - 0.15	10
0.16 - 0.20	21
0.21 - 0.25	12
0.26 - 0.30	2
0.31 - 0.35	2
More than 0.35	3
	157

The number of negative samples is "inflated" by reason of a survey conducted by the Police Surgeon in which 50 post mortem specimens of blood were analysed from cases of sudden death from natural causes. In only a very small number of these samples was any alcohol detected.

Voluntary Blood-Alcohol Tests.

Following amendments to the Traffic Act which allowed persons charged with "driving while under the influence of alcohol" to submit a sample of blood for analysis of alcohol content, 63 such samples of blood were examined, during 1958 for the Police Department. The increasing interest in this voluntary blood test is shown by the fact that 20 samples were analysed in the first eight months of the year, and 43 in the last four months. Distribution of results is shown in the following table. Where practicable the figure used is the alcohol content of the blood at the time of the alleged offence, calculated by the formula prescribed in the Blood Alcohol Test Regulations, 1958. The Act states that if the blood alcohol content is 0.15 per cent or more at the time of the alleged offence it shall be prima facie evidence that the person was under the influence of intoxicating liquor at that time.

Blood-Alcohol Analyses (Sobriety test).

Per Cent Alcohol.	Number.
0.14	1
0.15 - 0.19	17
0.20 - 0.24	26
0.25 - 0.29	12
0.30 - 0.40	6
More than 0.40	1
	63

Animal Toxicology.

64 specimens from 35 cases of suspected accidental or malicious poisoning of animals were examined during the year. In 15 cases no poison could be detected, and in 20 cases a common poison was identified; details of these are shown in the table below:—

Poison.	No. of Cases.
Arsenic	1
Arsenic (traces only)	2
Lead	4
Lead (traces only)	3
Strychnine	5
Chlorinated hydrocarbons	5
Negative	15
	35

Of some interest was an experiment conducted by the Animal Health and Nutrition Laboratory of the Department of Agriculture in order to ascertain the distribution of a toxic metal in the body of an animal following continued ingestion of the metal. A pig was fed on 250 lb. of wheat which had been treated with a mercury fungicide so that it contained mercury in a concentration of 24.5 parts per million, equivalent to 45 grains of mercury in the whole sample of feed-wheat. After slaughter of the pig, specimens showed that while the kidney contained 300 parts per million of mercury and the liver 80 parts per million, the muscle contained only 1.1 part per million of mercury.

Industrial Hygiene.

86 samples were examined in connection with problems of industrial hygiene. These comprised 70 samples of blood or urine from persons exposed in actual or potential hazards, chiefly of lead, and included 22 samples of urine from workers at the West Australian Government Railways who were subject to a regular routine check.

Of 60 samples of urine examined for lead content, 46 contained 0.08 parts per million or less of lead, 7 contained from 0.09 to 0.15 parts per million, two from 0.16 to 0.20 parts per million, while five contained more than 0.20 parts per million of lead. It will be seen therefore that approximately three-quarters of the samples contained less than the normal upper limit for lead in urine, namely 0.08 parts per million.

Other specimens were examined for arsenic, thallium, and copper.

A number of samples of commercial materials, chiefly those containing a volatile solvent, were examined for the Department of Factories and Labour. Where necessary, advice has been given on reducing the possible hazard in the use of the materials.

Sewage Control.

The Annexe Laboratory situated at Lincoln Street, North Perth continued to undertake chemical sewage control work and other investigations for the Metropolitan Water Supply, Sewerage and Drainage Department and examined a total of 7,738 samples during the year. 3,467 samples represented routine chemical control in connection with the operation of the treatment plants at Subiaco, Swanbourne, and Fremantle.

Systematic testing in relation to the generation and content of hydrogen sulphide in sewage was carried out only during the first part of 1958. When a pilot plant for the treatment of sewage effluent by the "activated sludge" process commenced operation early in June increased chemical work was required and therefore the sulphide testing was discontinued.

Because of (1) the impending absence of the Sewage Chemist on Long Service Leave, and (2) the additional work required by the pilot plant, an extra temporary officer was appointed to the staff of the Annexe Laboratory. Even so it was often necessary, during the following months, to provide additional assistance for sewage work from an already depleted staff in the main Laboratory of the Division.

For the period of seven months from the beginning of June a total of 1,099 samples were examined from the activated sludge pilot plant, while an additional 1,540 samples were analysed in connection with problems of chlorination of the effluents from the existing treatment plants at Subiaco and Swanbourne.

Although the actual number of trade wastes examined was only 44, this was a considerable increase on the number examined in 1957, namely 18, and reflects the increasing interest taken in the composition of fluids being discharged into the sewerage system.

Pollution Surveys.

(1) Swan River: The collection and analysis of samples in monthly surveys of the Swan River was continued for the first six months of the year. As work of the past ten years has now shown where the main points of pollution may be expected it was agreed with the Swan River Reference Committee to alter the sampling programme so that the whole of the river would be examined once in three months, and on a different month in each successive year.

(2) Leschenault Inlet, Bunbury: Two surveys were made during the year, in March and September, when 48 samples were examined. No alteration of any significance was observed as compared with the pattern of recent surveys.

(3) Metropolitan Ocean Beaches: Regular examinations of sea water collected from metropolitan ocean beaches were made during the year with the exception of mid-winter, and 113 samples were analysed. Again the main points of pollution had been located in past surveys and no significant changes were recorded in 1958.

(4) Brunswick Junction: A further 31 samples of water were examined for Country Water Supplies Branch of the Public Works Department, in connection with their endeavours to trace the source of water which had caused an objectionable taint when used in a butter factory.

Miscellaneous.

(1) Deep water sampling of the waters of the Canning Dam and Mundaring Weir was continued for a period of seven months, when 56 samples were analysed. Observations made in the previous tests were confirmed, namely that there is always oxygen present in the water of these dams, and that there is a reasonable degree of uniformity, without any stratification with depth.

(2) Samples of animal bones, teeth and urine were again submitted by the Animal Health and Nutrition Laboratories, mainly in continuation of their investigations into the supplementary feeding of phosphate to stock. These were analysed variously for calcium, phosphorus and fluorine.

(3) 51 samples of cattle and sheep dips from the Stock Branch of the Department of Agriculture were analysed as a measure of control of the concentration of dipping fluids. Further difficulties experienced by stock officers in applying "field" tests for analyses of arsenical dips were also the subject of brief enquiry and suitable modifications suggested.

(4) A number of samples of detergents and soaps were again examined for the Government Tender Board and advice given as to those products which it was considered would be most suitable for use in Government institutions.

(5) Of the 61 samples classified as received in connection with criminal cases 38 were tins of strychnine which were examined on behalf of the Criminal Investigation Branch to aid their enquiries following the discovery of strychnine in a sample of chocolates. Four exhibits of clothing were examined in connection with an alleged hit and run case, while 18 samples of paint fragments from vehicles were received from the Criminal Investigation Branch and Traffic Department, also in connection with a number of hit-run cases.

(6) A large number of vegetable seeds, 573 in all, were received from various branches of the Department of Agriculture. The analysis of 356 of these was completed, but owing to shortage of staff and time, 217 samples had to be held over. Those completed during the year comprised 7 samples of lupin seed for alkaloid content, 66 samples of safflower seed for oil, and iodine value of the oil, and 283 samples of flax seed for oil content.

(7) Only a limited number of drugs and medicines as such were received. 11 samples were examined for the Government Stores Department comprising tincture of opium, vitamin tablets, codeine tablets and ether for checks for purity or compliance with the specifications of the British Pharmacopoeia. For the Public Health Department six samples of sodium para-amino salicylate tablets were analysed for evidence of deterioration, while other samples included the exhaustive and time consuming examination of two samples of pills suspected of having been used for abortifacient purposes.

(8) 34 samples of pesticides were received during the year. Most of these comprised concentrates of dieldrin, chlordane or D.D.T. which were examined for compliance with specifications to which they had been submitted. Others consisted of fluosilicates and plant hormones together with a mosquito repellant which did not comply with the labelling provisions of the Pesticides Regulations.

(9) Some of the inks and dye solutions examined for the Public Health Department were found to contain nitrobenzene, a toxic solvent whose hazardous nature is masked by its rather attractive odour.

(10) Fruit storage experiments were continued by the Department of Agriculture when (a) samples of air were submitted for analysis for carbon dioxide content as a check on the respiration of pears in sealed containers and (b) apple wraps were analysed for diphenylamine content.

(11) Only five samples were received from the Liquor Inspection Branch of the Police Department, mostly in connection with the addition of water to spirits, but 33 samples of wine were received from the Department of Agriculture in relation to problems of control of acidity, or of alcohol or sulphite content. Of interest was a home made wine of "low alcohol content" examined for the Public Health Department in connection with the treatment of a patient. Analysis revealed the presence of a considerable concentration of alcohol in the wine.

(12) 36 samples of water were examined for the Hydraulic Engineers Branch of the Public Works Department in connection with work designed to trace underground water flow at Wicherina. Attempts to detect added fluorescein with portable ultra violet equipment had proved unsatisfactory owing to the presence of other fluorescing substances in the water. Examination of the samples by means of an ultra violet spectrophotometer demonstrated that fluorescein could be differentiated from these interfering materials.

(13) At the request of the Aeronautical Inspection Directorate the examination was commenced, late in the year, of "high altitude" oxygen for use in jet aircraft training of the R.A.A.F. This oxygen is prepared to stringent specifications, particularly in regard to moisture content, and laboratory check analyses were required in addition to the normal factory inspection tests by hygrometer. 18 such samples were examined by the end of the year.

Acknowledgement is made of the valuable assistance rendered by the Director of the Aeronautical Inspection Directorate, Perth, in providing essential equipment to enable this work to be carried out expeditiously.

(14) Consequent upon the framing of regulations designed to control the conditions of sale of toys and other goods made from the inflammable material celluloid, 15 samples of toys were examined for the Public Health Department. Analysis disclosed that 6 of these toys were highly inflammable and were made from or contained celluloid, but were not marked with the warning label required by the regulations.

(15) As in previous years a variety of miscellaneous samples were examined in the course of the normal activities of the Division. These included tallows, dyes, suspected oil finds and ambergris, vermin poisons, toxic dusts, waters for suspected poisons, mallet bark, beeswaxes, drinking straws, chrome plating solutions, and a variety of unknown substances which were required to be identified.

Numerous enquiries were received during the year, usually by telephone, less frequently by personal application at the Laboratories. Endeavours were always made to give full assistance by way of information or advice, although the time involved on some occasions was considerable in order to answer an enquiry.

Expert evidence at Criminal, Coroners' or other Courts of Law was tendered as required by Messrs. Houghton, Southern, Sedgman, Wood, and Tulloch in connection with their official duties.

As the foregoing report indicates the work performed by this Division is varied in its scope. Many demands are being made which cannot be met unless a reasonable amount of research and investigation is possible apart from routine activities. Post-war developments have been extensive in fields such as drugs and medicines, food technology, pesticides of all types, detergents, plastics, paints and other materials which are now in common use. All of these present analytical problems the solution of which often demands a good deal of investigation. These demands cannot unfortunately, be undertaken by the present Staff while the volume and variety of "routine" work remains at its existing level.

FUEL TECHNOLOGY DIVISION.

442 examinations, analyses and longer investigations have been made, distributed over the range of subjects and materials shown in Table 6. 188 of these have related to coal survey work and coal utilisation.

Work on coal has emphasised difficulties created by the increasing ash content of hard coals from the North Western end of the Collie basin and the need to offset this by blending in low ash coals from the South Eastern end seams. The respective coals are almost complementary in character and a suitable blend of the two would increase combustion efficiency and reduce ash handling problems in the use of Collie coal.

Some private consumers are showing preference for the lower ash coals from the South East seams despite their higher moisture and lower calorific value.

Work on the protection of Collie coal from weathering in storage has been completed and it has been agreed with the Railway Department that coal can be stored for long periods without deterioration if it is kept wetted in the daytime by sprinklers. The method should be of value for coal stored through the summer at country sidings and will reduce spark danger through elimination of badly dried out and slacked coal.

Coked briquette production from Collie coal only provided 31 samples with related investigations. This continues the decline in activity in this project which was noted in the 1957 report. Work is in fact completed to a stage where the establishment of a manufacturing plant is required to obtain further development which might then call for fresh work.

Gasification of Collie coal, another major project for which the Division was established continues to offer no work. It is understood that two completely new carburetted water gas plants have been put to work recently based largely on gasification results with Collie coal obtained by us in 1948-49. There has been no opportunity to obtain comparative data on the performance of these plants either in towns' gas production or as a guide to the manufacture of synthesis gas from Collie coal.

The work of the Division has been handled by a staff which has continued to dwindle in numbers from an original seven officers, five of whom had degrees or equivalent qualifications to a staff of three, only one of whom has a degree. Those who have left the Division had acquired a sound training in Fuel Technology and related Chemical Engineering practice. The recruitment of fresh staff, even if available, could not therefore adequately replace them. So long as the staff position thus created continues, the volume of work handled by the Division will probably decline and long term investigations and research will become difficult. It is however fortunate that while the staff has been available and at full strength major problems for which solutions were required have been solved and disposed of and fuel users have been helped and made aware of the modern trends to obtain higher efficiencies in fuel consumption. A great deal of field work amongst these users remains undone and it is to the disadvantage of industry in the State that lack of staff and availability of services limit the usefulness and scope of the Division.

TABLE 6.

FUEL TECHNOLOGY DIVISION 1958.

	Departmental	Industrial Development	Public Works Department	Other Government Departments	Pay—Public	Total
Briquetting Experiments (Coal, Cupola, Gas, Tar, Char)	5	31	....	....	....	36
Building Materials	....	....	....	....	10	10
Coal—						
Anthracite	....	1	....	....	....	1
Boiler Trials	2	....	....	....	70	72
Railway Trials	61	....	....	....	....	61
Survey	21	....	....	....	....	21
Miscellaneous	8	....	....	....	6	14
Weathering	19	....	....	....	....	19
Firebricks and Refractories	9	....	....	1	4	14
Gypsum and Plaster	....	....	....	....	14	14
Heating Appliances	7	1	....	....	1	9
Petroleum Exploration (Gases)	....	....	....	....	5	5
Sawdust and Smuts—						
Chimney Gases	21	26	28	19	6	100
Miscellaneous	5	2	....	54	5	66
Total	158	61	28	74	121	442

Coal.

Coal Survey.—(1) Five visits have been made to Collie and samples have been taken from the Co-operative, Ewington and Western Mines and from the Hebe and Galatea seams in the Muja open cut. Results of the examination of these samples are given in Tables 7, 8, 9 and 10.

TABLE 7.

CO-OPERATIVE MINE.

Sampled 16/1/58.

Lab. No.	822	823	825–28
Position	41 Bord, 858 yds. in from Main Dip 0 ft.–8½ ft.	8½ ft. –12 ft.	Main Dip, 50 yds. below 2nd fault Whole 12 ft. face
	Per cent.		
Moisture	21·1	19·7	17·8
Ash	12·1	15·6	9·5
Volatile matter	21·0	20·8	20·9
Fixed carbon	45·8	43·9	48·2
Calorific value—		B.t.u. per lb.	
As received	8,960	8,680	9,800
Dry and ash free	13,410	13,420	13,480
		° Centigrade.	
Ash fusion point	1,400	1,200	1,250

TABLE 8.

EWINGTON MINE SAMPLES.

Lab. No.	14082	14084	15704	15705	15706
Position in mine	4 Panel West	2 Dip	2 Dip	4 Dip East Face	4 Dip East Face. 3 chains back
Date of sampling	16-10-58	16-10-58	20-11-58	20-11-58	20-11-58
			Per cent.		
Moisture	26·4	23·8	25·2	25·9	26·8
Ash	6·4	8·2	6·1	6·1	6·5
Volatile matter	20·2	21·2	21·1	20·6	20·7
Fixed carbon	47·0	46·8	47·6	47·4	46·0
Calorific value—			B.t.u. per lb.		
As received	9,000	9,050	9,200	9,140	8,940
Dry and ash free	13,390	13,310	13,390	13,440	13,400
			° Centigrade		
Ash fusion temp.	1,360	1,120	1,200	1,200	1,340

TABLE 9.

WESTERN COLLIERIES.

Date of Sampling 5/9/58.

Lab. No.	12067	12068	12069
Position in mine	Western 2, 4 Slant Dip	Western 2, 28 Bord Rise	Western 4, Haulage Tunnel 1 chain in
		Per cent.	
Moisture	26·2	27·8	28·7
Ash	2·2	2·6	6·8
Volative matter	29·4	27·2	20·2
Fixed carbon	42·2	42·4	44·3
Calorific value—		B.t.u. per lb.	
As received	9,250	8,840	8,590
Dry and ash free	12,920	12,700	13,320
		° Centigrade.	
Ash fusion temp.	1,330	1,200	1,390

TABLE 10.

MUJA OPEN CUT.

Sampled 16/5/58.

Position	Hebe Mine 22 chains down dip	Galatea Seam Near outcrop
Lab. No.	7030	7031
	Per cent.	
Moisture	28·7	31·6
Ash	1·8	1·9
Volatile matter	26·4	24·9
Fixed carbon	43·1	41·6
Calorific value—	B.t.u. per lb.	
As received	8,920	8,570
Dry and ash free	12,840	12,880
	° Centigrade	
Ash fusion point	1,480	1,500

Co-operative coal unfortunately continues to show a high ash content with an ash fusion point near to 1,200° C. The combination causes troublesome accumulations of ash and clinker in use by railway locomotives.

Ewington coal has in the past shown uniformly high ash fusion points and has therefore been recommended for use in carburetted water gas plant since the Black Diamond Open Cut and Mine were closed. Recent samples taken of the development down the Ewington main dip show that the ash fusion point in this area is falling and may reach a figure at which the coal will give clinker trouble and may no longer be suitable for gas plants.

Samples from Western and Muja seams show the normal lower ash content and higher moisture associated with the south-east seams from Collie. If their analyses are set against those of the Co-operative and Ewington it is seen that a blend of the coals could give a 6-8 per cent. ash coal of high ash fusion point and a calorific value of 9,000 B.t.u./lb. Such a standard coal of reliable constancy of quality would do a great deal to establish and maintain a good reputation for Collie coal with users.

(2) Weathering.

Work on weathering and storage of Collie coal was completed at the beginning of the year when four lots of coal which had been stored in open bins for almost twelve months were taken up and used. Two were Ewington coal stored, one lot under sprinklers which kept the coal wetted in the daytime during summer weather, the other stored comparatively dry under a tarpaulin. Two were Western Mine coal stored similarly.

Both coals stored under sprinklers showed little or no decrease in calorific value and no change in shatter index over the period of storage. The locomotive firing tests run with them were extremely good and were possibly better than with fresh coal. This accords with normal experience that wetted coal fires better than dry coal. The reason is never fully explained but is probably connected with the slower release, and therefore more complete combustion of volatile matter from wet coal.

The coals which were stored under tarpaulins deteriorated by the normal 200-500 B.t.u./lb. caused by air oxidation of Collie coal. They were very much broken up and had a reduced resistance to drop shatter. Locomotive firing tests were very bad indeed: with the Ewington coal it was just possible to complete the journey after very troublesome running; with the Western coal completion was not possible and the trial was abandoned.

It is evident from the outcome of this work which commenced in 1948 that storage of Collie coal on the ground at railway depots could be greatly improved by keeping the coal under water sprays during the day in dry weather. The performance of the coal is thereby likely to be improved to better than that of coal used straight out of trucks.

Information is being sought on practical applications of the foregoing findings.

(3) Railway Trials.

Railway running trials with Collie coal have also been made to get better results with Co-operative coal. It appears that ash and clinker from Co-operative accumulate in much greater amounts in the firebox than with other Collie coals. Locomotives can operate quite successfully on Co-operative coal but not with the same freedom from ash problems which characterises most other Collie coals. The Co-operative is however a hard coal of good calorific value and excellent steaming qualities. Blends of it with the soft, lower ash coals from the south-eastern end of the Collie basin should perform very well on locomotives. Use by blending in this way has been recommended.

(4) Boiler Trials.

Observations on boilers using Collie coal have been made. One set of chain grate fired boilers uses Muja coal exclusively by preference and obtains excellent results. The furnaces have a flared arch and controlled forced draught from front to back of the grates. In consequence the ignition of this rather high moisture coal gives no difficulties. The full fire is clean and very hot. Carbon in ash is low in percentage and very low in amount since the ash content of the coal is low.

Another operator with old style, flat arched chain grate boilers under natural draught, finds it impossible to get ignition with Muja coal unless the rate of feed is so low that the fuel bed burns out before it reaches the dump at the back of the grate. But operation with an underfired stoker is excellent.

It appears that low priced, low ash content open cut coal from the Muja seams can enable Collie coal to hold the industrial market in competition with other fuels.

Analyses of monthly samples of Muja coal from one user averaged moisture 26.6 per cent., ash 3.1 per cent. and calorific value 8,930 B.t.u. per lb.

(5) Anthracite.

A sample of imported anthracite as used in the manufacture of calcium carbide was submitted for comparison with Collie coal char. The requirement is to produce material of sufficient electrical conductivity to carry a direct heating current. It appeared that both materials became conducting by heating to the temperature of graphitisation—about 700° C to 800° C. The resistivity thereafter falls off progressively with rise of temperature to a figure approaching that of high temperature gasworks retort carbon of 0.07 ohm.cm. See Table 11.

TABLE 11.

(Lab. Nos. 16386/58, 9515/58.)

RESISTIVITY OF CHARS.

Temp. of preparation °C	Resistivity, ohm.cm.	
	Collie Char	Anthracite
600	$5{\cdot}9 \times 10^{-3}$	$3{\cdot}4 \times 10^{-3}$
700	71·3	....
800	0·83	....
900	0·6	0·1
1,100	0·1	0·1

The results indicated that Collie coal char would be a satisfactory substitute for anthracite char.

Coked Briquettes.

Abrasivity.—(1) the abrasive effect of Collie coal char was determined by measuring the rate of wear of the hammers of a laboratory grinding mill in grinding a definite weight of char under standardised conditions. Chars prepared by carbonisation at 600°, 700°, 800° and 900° C were used in dry condition as well as with water and with tar added as in briquetting. Determinations were also made comparatively with dry, hard foundry cokes and gasworks coke.

The dry chars showed a fourfold increase in abrasiveness over the range 600-900° C. Addition of either water or tar to the char before grinding increased the wear two fold. The abrasiveness of foundry and gasworks cokes is approximately twice that of 900° C Collie coal char. It was concluded that Collie coal chars will cause less wear in grinding and briquetting than coke from coking coals.

TABLE 12.

Abrasiveness of Chars and Cokes.

(Lab. Nos. 6239/58, 10301/58, 9682/58, 9683/58.)

Material	Abrasion. Lb. of hammer wear per 100 lb. dry material ground	
	Mild Steel Hammers	Hard Tipped Hammers
Collie Char—		
600° C.	0·014	0·0040
700° C.	0·026	0·0071
800° C.	0·048	....
900° C. Dry	0·059	0·0129
Wet	0·114	....
Tarry	0·107	....
Wet and Tarry	0·128	....
Dutch foundry coke	....	0·0211
Australian foundry coke	....	0·0177
Domestic coke	....	0·0201

(2) Work was also done on the use of finely ground marble as an additive to briquettes in the hope that this non elastic material would reduce

TABLE 13

PERFORMANCE OF COOKING STOVES USING WOOD FUEL

	High Oven Temperatures				Moderate Oven Temperatures				Low Oven Temperatures			
	Slow Combustion	Insulated Centre	Built In	Modified Insulated	Slow Combustion	Insulated Centre	Built In	Modified Insulated	Slow Combustion	Insulated Centre	Built In	Modified Insulated
Size of Wood Pieces—ozs.	8	6	7	7	8	7	7	7		$4\frac{1}{2}$	7	5
Equilibrium Wood Consumption rate—lb./hr.	3·0	3·5	4·7	4·5	2·0	2·6	3·5	2·7		2·2	2·6	2·0
Frequency of firing—hrs.	2	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	3	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$		$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Time for 2 pts. water to boil in ground base kettle—minutes—												
(1) Standard nickel plated hotplate	....	17	13	....	....	23	16	....		21	19	....
(2) Heavy machined hotplate	$2\frac{1}{2}$	8	6	2	$3\frac{1}{2}$	10	n.d.	$3\frac{1}{4}$		10	n.d.	4
Hot Water Output—B.t.u./hr.	6460	7390	9600	8200	5220	5890	7280	6020		5160	4640	4470
Gals./hr. through 60°F.	11	12	16	14	9	10	12	10		9	8	7
Oven Volume—Cub. ft.	1·55 and 1·02	1·39	1·39	1·77	1·55 and 1·02	1·39	1·39	1·77		1·39	1·39	1·77
Equilibrium Oven Temperatures—°F.—												
(1) Top	490	445	455	475	365	435	410	400		430	355	350
(2) Middle	480	n.d.	n.d.	385	365	390	375	350		365	330	285
(3) Bottom	455	355	365	375	320	310	310	340		285	255	275
(4) Average of above	475	400	410	410	350	380	365	365		360	315	300
Average oven temperature drop on insertion of 4 lb. loaf—°F.	80	50	35	(*a*) 70	....	....	....	....		....	....	....
Equilibrium Flue Gas Temperatures—°F.—												
(1) Side of oven	....	430	500	430	....	390	475	365		365	355	320
(2) Beneath oven	....	435	375	330	....	340	300	275		310	255	260
(3) At damper	365	340	365	330	285	355	310	285		320	265	230
Percentage CO_2 in flue gas	9·1	3·4	4·1	n.d.	7·3	2·8	3·2	....		2·6	2·3	....
Heat Distribution—B.t.u./lb.—												
(1) Flue losses	....	....	....	....	2810	8095	8885	....		....	....	....
(2) Hot Water Output	....	....	....	....	5220	5890	7280	....		....	....	....
(3) Radiation + cooking	....	....	....	....	6970	4705	10085	....		....	....	....
Time to reach high oven temperature with maximum firing rate—hrs.	$1\frac{1}{4}$	$\frac{1}{2}$–$\frac{3}{4}$	$\frac{3}{4}$–1	$\frac{3}{4}$	$1\frac{1}{4}$	$\frac{1}{2}$–$\frac{3}{4}$	$\frac{3}{4}$–1	$\frac{3}{4}$	This cooker has an auxiliary low temperature oven operating at 320°F. There is thus no need to operate the main oven at low temperatures.	$\frac{1}{2}$–$\frac{3}{4}$	$\frac{3}{4}$–1	$\frac{3}{4}$
Time to reach moderate oven temperature with equilibrium firing rate—hrs.	$2\frac{1}{2}$	1	$1\frac{1}{2}$	1–$1\frac{1}{2}$	$2\frac{1}{2}$	1	$1\frac{1}{2}$	1–$1\frac{1}{2}$		1	$1\frac{1}{2}$	1–$1\frac{1}{2}$

The oven temperatures reported with the modified stove were not measured identically to the " built in " and " insulated " types where a tray was positioned between the middle and bottom of oven thermocouples. With the modified unit there was no tray positioning. The tray positioning increases the difference between the top and bottom of oven temperatures.

(*a*) This oven temperature drop was with partially modified unit using wood consumption rate of 3·5 lb./hour. The modified hotplate was replaced by the standard nickel plated hotplate which was not insulated from the stove top and was not covered by insulation.

the re-expansion of briquettes on ejection from the pressing mould. No useful effect was, however, produced, but the material did not weaken the briquette and would be of use if it is desired to make briquettes self fluxing of their own ash.

(3) The true, and particle specific gravities and porosities of Collie coal heated to a series of temperatures from 100° to 1,000°C were determined. These show that the coal shrinks sharply to reduce its pore space when water is removed at 100°C. Pore space is filled up as the coal decomposes between 300° and 400°C. Thereafter porosity and true specific gravity both increase. At 1,000°C the porosity is close to an apparent maximum value of 29.5 per cent. but the true specific gravity (1.88) is still short of a maximum ultimate value of 1.9.

Sawdust and Woodwaste Fired Boilers.

(1) The work done on sawdust fired boilers has been mainly confined to determinations of smut emission and the design of dust catching systems to eliminate smuts. A large, low velocity, low pressure loss cyclone was designed for one boiler installation. This was installed and it has ended residential complaints of smut deposition.

Our own determinations suggest that the amount of smuts emitted of size large enough to cause complaints has dropped to 0.1 lb. per hour. The absence of complaints with this low figure of emission is understandable.

The actual amount of smuts brought down in the cyclone separator is about 6.0 lb. per hour and half of these are of size big enough to precipitate nearby and cause nuisance if their escape had occurred.

Another recent spreader-stoker fired sawdust boiler has been investigated and its smut emission measured. Here almost the whole smut emission is of coarse precipitable material amounting to about 5.0 lb. per hour. It is proposed to install a multiclone precipitator which is more compact although of slightly higher pressure loss than a single cyclone.

(2) In the course of this work considerable knowledge has been acquired in methods of handling and conveying sawdust and hogged fuel to boilers. Developments suggest that very satisfactory and trouble free systems have been worked out by users in this State.

Domestic Heating Appliances.

An investigation of cooking stoves was completed during the year and concluded for the time being work on domestic appliances using wood fuel.

The findings on cooking stoves are summarised in Table 13, for a 'Slow Combustion', heavily constructed, insulated, English, side-fire box type of cooker and three modifications of the top fired, wood fuel stove commonly used in Western Australia in which the fire box is on top of the oven. The modifications are referred to as 'Insulated' in which the cooker is arranged inside an insulated surround not 'Built In' in which the cooker is set in a brick surround to which it will lose some heat, and 'Modified Insulated' which is the first named insulated type increased in oven "height by 3½ in. to give it an overall" height of 14½ in. instead of 11 in.

The performance of the 'Modified Insulated' cooker was most satisfactory. The addition of 3½ in. to the height adds to the convenience of the oven, thus 2 lb. loaves of bread can be cooked in it without hitting the top of the oven and getting burnt as they rise. It also gives a larger zone of moderate cooking temperature between the very hot top under the fire box and the rather cool floor over the bottom flue of the stove. A little extra wood has to be burnt to get the larger oven to high oven temperatures but this has the advantage that a larger fire burning under the hot plate gives a better hot plate performance and, where a water heating coil is incorporated, the hot water output of the stove is improved.

The performance of a machined solid top hot plate with each of the three modifications of wood fuel stoves is also recorded in Table 13 comparatively with the standard type of hot plate which is broken up into removable sections and lids. With the machined hot plate a two pint kettle will boil in as little as two minutes; with the ordinary standard hot plate boiling times are 13 minutes and longer. To get very quick boiling from the machined hot plate, insulation is used at its junction with the rest of the stove top and it is preferably kept covered when utensils are not on it. But without any such precautions boiling times of five to six minutes are easily obtained and represent improvements which give the wood fuel stove accepted, modern, efficient standards of performance.

The improvements in both hot plate and oven effected in this work bring the performance of the ordinary wood fuel stove into line with that of heavier and more elaborate "Slow Combustion" type of cooker without, however, sacrificing the advantages of flexibility and quick heating up character of wood fuel stoves which they possess over cookers of heavy, insulated design. Unfortunately, as the production of wood fuel stoves is not very competitive in Western Australia, there is no present interest in marketing stoves improved along the lines suggested by this work.

Firebricks and Refractories.

(1) In connection with suitability of local firebricks for use in sawdust fired boiler furnaces a number of locally produced bricks were (1) analysed, (2) tested for refractoriness under load. The analysis showed that some local manufacturers are a little uncertain in the make up of their bricks since in two instances samples of bricks submitted as having differences of alumina and silica content, on analysis, showed very little variation in the amounts of these constituents. The bricks of a third manufacturer conformed in analysis to his characterisations of standard firebrick and higher alumina firebrick. See Table 14.

The refractoriness under load tests showed that all the bricks were good quality firebrick which would be satisfactory for use in boiler furnaces. Some of them were, however, rather soft and evidently underburnt. It is probably that a major immediate improvement in such bricks could be obtained if they had to pass a simple cold compression test.

Duplicate sample bricks to those tested in the laboratory are now undergoing exposure tests in the furnace of a sawdust fired boiler and will become available for inspection when the boiler is shut down for inspection.

TABLE 14.

Examination of Firebricks.

Lab. No. 1958	Alumina (Al_2O_3)	Silica (SiO_2)	Iron Oxide (Fe_2O_3)	*Collapsed under 25 lb. load at ° C.
		Per cent.		
9234	24·4	70·6	1·76	1,360
9235	28·8	66·5	1·67	1,415
9236	24·5	70·4	1·87	1,365
9237	29·2	67·9	1·26	1,443
9238	36·4	60·8	1·50	1,440
9239	47·1	50·6	0·97	1,510

* Collapse is determined as the value at which subsidence is greater than 2 per cent. per 50° C. for a heating rate of between 2° and 5° C. per minute.

(2) Calcium aluminate cements have been investigated for making laboratory refractories. These like all cements, give a hard hydrated bond which is however destroyed as water is lost at higher temperatures. With some of these materials a good refractory bond is formed subsequently which is good up to the point of refractory failure. But the very pure calcium aluminate material of this particular cement did not form a refractory bond at easily obtained, laboratory temperatures but would require kilning at about 1,400°C. It does not therefore offer any wide field of use in laboratory work. No doubt it has a number of exceptionally good industrial uses.

(3) Advice was given in the operation of a cupola melting iron for small chilled castings and the rate of burn out round the tuyere belt was very rapid. It was found that the rate of melting was controlled by using full blast for melting and shutting the blast off completely when too much metal accumulated. It was suggested that continuous operation with the blast controlled by a calibrated damper would give lower brick temperatures and reduced slag attack.

Flash Drying.

(1) A seven inch diameter flash drier capable of drying 4,000 lb. of heavy ilmenite sands per hour from 8 per cent. moisture down to completely dry conditions has been installed on a mineral sands pilot beneficiation plant. It has operated successfully and a larger plant to dry 12-15 tons per hour is now to be installed. The users are satisfied that flash drying gives better control of dry ilmenite temperature for the best operation of their subsequent stages of magnetic and electrostatic separation. The power cost, installation cost, and probably fuel costs are lower than with rotary kiln drying.

(2) A flash drier operating on gypsum to produce plaster of paris, discussed in previous reports, continues to operate successfully and the users report marked improvements in results over the past year associated probably with improvements in the automatic control of their plant. Prior to these improvements a batch of rather finely ground rock gypsum sent as a trial parcel from the Eastern States was put through the plant. The results were not completely satisfactory. It is hoped that the users will have opportunity to repeat on rock gypsum, ground perhaps less finely, since this material is more widely used than our dune, lake crystals and success with it would give the flash drying method opportunities in plaster production elsewhere in Australia and overseas.

Laboratory work on the investigation of flash drying has been prevented by lack of staff.

Gas Analysis.

Five samples of gas obtained from bores in drilling for oil were analysed. The main constituent of these was methane.

Dust Examination.

Sub sieve size analyses of dusts have been made and for this a sedimentation method has been perfected. A method by photo-electric optical density measurement of particles settling in water is also being investigated.

Some of the samples submitted have been from cyclone dust-catchers installed to our designs and the size analyses and quantities of materials collected show these cyclones to be operating satisfactorily.

INDUSTRIAL CHEMISTRY DIVISION.

Introduction.

The year 1958 was a very busy one for the Division and reflected the growing interest in, and development of, secondary industry within this State. In consultation work the number of technical enquiries received appears to be a sensitive barometer of industrial activity. During the year a record 3,009 technical enquiries were received.

Despite shortages in staff it was found possible to undertake a certain amount of development work, the results from which are in some cases of interest.

Classification of Work.

As in previous years the work may be considered under three headings:—

1. Consultation Work.
2. Short Term Experimental Work.
3. Developmental Work.

Consultation Work.

There was a significant increase in consultative work and the range if anything was even wider than before. It will be appreciated that the majority of these enquiries were either confidential or of a nature concerning the enquirer alone. It is, therefore, not possible to discuss these enquiries in particular, but a general survey will serve to indicate their nature.

The most interesting development, perhaps, was the increase in the number of enquiries on plastics. Local industry is handicapped in this field by the necessity for importing a very large proportion of the raw materials, by the lack of proper machinery to process plastics which involves a large amount of capital, and by the relatively small market which is available. Until the industrial atmosphere is such as will make possible the growth of a native plastics industry local manufacturers are thrown upon their own devices and it is to their credit that they are doing a remarkably good job. Two manufacturers are producing high grade thermal insulation boards from imported plastics. The manufacture of such unlikely plastic jobs as billiard balls is a future possibility. There have been a number of developments in the use of plastic sheeting, both for protective and decorative purposes. Cements gauged with P.V.A. plastics are being successfully used in the building industry and interest in their use is increasing. In one case a plastic cement floor was laid and a dance floor laid over it. After some initial difficulties the result was highly satisfactory.

Interest in this State in protective coatings is growing and there were a very large number of queries on the types of coatings to use in specific jobs, sources of supply and possibilities of manufacture of special products. Possibly most significant was the introduction of a metal sprayed aluminium coating. This coating has proved superior to conventional galvanising in certain circumstances and has possibly an interesting future in this State. Its use in construction in the United Kingdom, the continent of Europe and America indicates a wide field of application. From information so far gathered a sprayed metal coating of aluminium would afford ideal protection for smoke stacks and steel tubing.

Much interest has centred on the polyester type resins which are used in a number of ways, including decorative lacquers, rigid foamed products and as a cementing material in fibre glass boats. There is some doubt as to the suitability of polyester resin paints in painting local timbers for outdoors. Whilst the lacquer will withstand atmospheric conditions reasonably well it tends to fail at sharp edges, and moisture getting between the substrate and the paint film causes peeling. On the other hand, polyester resin paints have been used on yachts, dinghies and other craft with some success.

Epoxy resin paints have increased in use though the market is still relatively small. Whilst they have some remarkable properties, they require careful preparation of the surface and some care and skill in application. A number of failures have been examined and in practically every case failure was due to these causes. An interesting point was that epoxy resin paints could be used to colour articles such as toys made of polyester resins. Other work on paint is referred to later under developmental work.

Although there was somewhat of a recession of the building industry during the year, interest in building materials continued at a high level. A number of new building materials and additives made their appearance and the amount of cement additives manufactured in this State appeared to be increasing. We have been consulted from time to time on the manufacture and composition, but more especially on the correct utilisation of, a number of these substances.

Some complaints of cracking of cement toppings were received and examination showed that the faults were probably due either to an over-rich concrete or to incorrect preparation of the concrete surface. The importance of cleaning and scrabbling the concrete before adding the topping must be emphasized. In the U.S.A. vacuum cleaners are sometimes used to remove the dust formed in the course of scrabbling. One failure at least was due to laying the topping on cement which was over six months old.

There were a number of enquiries on the use of weather proofing and water proofing of cement and concrete. Increasing use is being made of silicones in this connnection and so far results appear to be good. There have been a number of successful applications of a locally made cement paint, which is being exported to an appreciable extent.

There were the usual queries on equipment in factories relating to performance, ability to meet specific conditions, protection against corrosion and the like. An interesting case concerning electric motor failures in refrigerators was traced to the attack of methanol in the refrigerant gas on nylon-clad wire.

A proposal to manufacture potash from salt lake deposits was found to be unsound because of the unexpectedly low potash content of the salt.

A polyester resin was used to make an inverted model of a human liver for the medical school. The resin was injected into the main blood vessels of the liver under vacuum, allowed to set hard and the flesh then removed by enzyme action Even minute blood vessels were successfully reproduced in the process.

Interest in royal jelly prompted some enquiries on the possibility of drying the material for export by deep freezing and the ban on import of royal jelly brought queries on the inclusion of that material in cosmetics.

The common process in making inscriptions on cemetery headstones is to chip out the letters and fill the cavities with lead which is hammered in to form the letters. The lead is now being replaced by polyester resins and we were consulted on the choice and manner of use of these resins. Epoxy resins have at times been substituted for the polyesters with success.

Some technical assistance was given to an intending manufacturer who proposed to make rubber soled shoes and who had trouble in the blending process. The difficulty was largely due to the failure of some of the raw materials to meet the exacting specifications required and to an incorrect use of the plastometer which was used as the control instrument in the process.

The use of silicones as release agents in bakeries appears now firmly established. We were privileged to see and to comment on the initial and successful experiments in this connection. In some instances silicones permit of as many as 200 releases for a single application.

A proposal to irradiate eggs with ultra violet light to kill bacteria was given a preliminary examination from the purely technical angle; the process did not appear to be economically sound.

Other enquiries related to polishes, cleaners, grinding pastes, rubber and moulding, floor tiles, lamp shades, etc., etc. There were several hundred enquiries on the properties or the sources of substances with proprietary names, the great majority of which it was found possible to answer.

Short Term Experimental Work.

Practically all of this work was done on behalf of Government Departments. A total of 51 samples was examined but of these 11 were of Darwinia citriodora, the work on which is discussed in the next section. Two were of Scaevola spinescens and one of Alyxia buxifolia, also discussed in the next section. Samples examined on behalf of the Public Works Department included floor tiles which were studied for wearing ability and resistance to a number of chemicals, a brine solution which was expected to have a high potash content, fibre glass intended for use as wash tubs, water taps for anti-corrosion treatment, plastic hand rails and wall panelling. Some work on metal coatings was also done, particularly on zinc-rich paint.

Used methyl benzoate was re-distilled and purified for the Royal Perth Hospital and a method worked out for the purification of commercial xylene, to meet the needs of the hospital.

From time to time in answering the queries of other Government Departments it was necessary to make short term checks in order to ensure that the advice given was to the best of our knowledge correct.

Developmental Work.

This term covers investigations which required some little time to complete and the objectives of which were rather more long-term than those of the work considered in the previous section. Briefly the following were investigated or are still under investigation:—

1. Scaevola spinescens.
2. Alyxia buxifolia.
3. Darwinia citriodora oil.
4. Painting of karri timber.
5. Baits.

Throughout the year extracts from the root of Scaevola spinescens according to the Monck formulation were made up and sent to the Public Health Department for clinical investigation. The number of patients receiving the extract increased slowly throughout the year until now 15 are being given the extract. Preparation of the quantity of extract involved was somewhat complicated by the fact that the volume is somewhat too much for ordinary laboratory preparation and not quite big enough for process plant preparation. Despite this no real difficulties are being met in making the extract and the various units in the process plant which have had to be employed have functioned adequately.

In the latter half of the year an investigation into the composition of the Scaevola extract and of the root itself was begun. It has been found that the root contains an alkaloid, possibly hydrastinine, which has not been previously reported as being found in a plant, the usual source of supply being by hydrolytic oxidation of hydrastine. It is by no means certain that this alkaloid is in fact the active principle of Scaevola spinescens and it is equally possible that other alkaloids are present. A sample of genuine hydrastinine has been called for, and on its receipt it will be possible to determine if the alkaloid is actually hydrastinine or a structurally closely related alkaloid. The presence of flavone glycosides in the root appears to have been established but much further work is necessary to confirm findings so far.

At the request of the Government Botanist an examination of the root of Alyxia buxifolia was undertaken. Alyxia buxifolia is botanically very closely related to Rauwolfia serpentina and in fact resembles it in general appearance. It was thought possible that Alyxia buxifolia might contain reserpine or related alkaloids found in Rauwolfia serpentina. Investigation showed that there was an appreciable alkaloid content in the roots but no positive tests for the reserpine group of alkaloids was obtained. On the other hand, it has been found that the roots definitely do contain nicotine, a somewhat surprising discovery and one of considerable interest to the botanist. Nicotine is almost entirely confined to the Nicotiana species, the most common exception being in West Australian Duboisia. Staff considerations have made it impossible for us to complete the work on Alyxia, but it is so evident that the plant contains much of chemical interest and perhaps something of economic value, that the investigation should not be left to remain as it is.

Work on the oil content of D. citriodora was continued through the year. It was found that the yield of oil could be almost doubled by crushing or macerating the leaves before distilling. Towards the end of the year it was accidentally discovered that some crystals could be separated from the oil under certain conditions. These crystals have been isolated, purified and their physical and chemical characteristics are being established. It is proposed to have the crystals and the fractions of the oil obtained by distillation examined for possible antibiotic properties.

As time permitted some work was carried out on the painting of karri timber. Staff shortage has prevented us from pushing on with this work as we should have liked but some conclusions on the experimental work so far done are beginning to emerge. When considering paints for West Australian conditions and particularly the metropolitan area and its immediate surroundings, it is generally thought that paints suitable for sub-tropical

conditions should be satisfactory. Some protective coatings, in fact, are tested by the manufacturers under climatic conditions more closely approaching those of Melbourne or Sydney. This, our experimental work tends to indicate, is a mistake. It would be better in considering the wearing properties of paints to rate Perth and its surroundings as tropical.

Another point emerging from the work is that there appeared to be upper and lower limits of moisture content in karri timber (and possibly other timbers) beyond which the successful painting of karri is impossible. The exact limits have yet to be established and the determination will require a considerable amount of experimental work.

There is evidence that certain substances present in karri timber react with paint in such a way as to prevent the paint forming a satisfactory coating. For example phenols may act as anti-skinning agents and prevent the layer of paint immediately in contact with the karri surface from setting. The sealing of karri timber, therefore, is a matter of prime importance for successful painting. A number of sealers are being investigated; so far none appear quite to approach red lead in efficiency. There is a possibility that the actual lead content of red lead primers may be a factor in their successful or unsuccessful application to karri timber.

Work was continued at intervals throughout the year on the formulation and manufacture of animal poison baits. Officers of the Agricultural Protection Board shared in this work and a very satisfactory degree of co-operation was achieved. At the year's close we were preparing to make a very large batch of poison baits for final field trial. The actual work of formulation was complicated by the many desiderata expected of the finished bait. The baits for example had to measure up to the following standards.

1. They had to be able to stand up to the high temperatures obtaining in the sun in the North-West of the State. Under such conditions they might soften but not melt.
2. The baits had to withstand temperatures down to freezing point without becoming over brittle or too hard.
3 Palatability to the animals concerned had to be high.
4. The baits had to withstand fungal attack over a lengthy period.

As a result of the experimental work and small scale trials with penned animals, it is believed these standards have been reached and the way is clear for the final field trial. The baits will be relatively inexpensive.

MINERALOGY, MINERAL TECHNOLOGY & GEOCHEMISTRY DIVISION.

One thousand two hundred and seventy (1,270) samples were received during 1958, representing a decrease of 362 on the previous year.

Much of the work, particularly in connection with building materials, petrological examinations and some mineral identifications, required detailed and prolonged investigation, and the staff was fully occupied throughout the year.

The main sources of samples were:—

General public (free 580, pay 374)	954
State Battery Branch	143
Geological Survey Branch	124

Table 15 details the nature and source of all samples received in the Division.

Alloys & Metals.

Following on salvage work commenced in 1957 on the wreck of S.S. "Pericles", a further batch of ingot lead was assayed for gold, silver, antimony and tin.

Metal samples, including spent bullet tips, zinc scrap and white metal were analysed for scrap-metal firms.

For the Department of Supply, mild steel was analysed for its carbon, manganese, sulphur and phosphorus content, also a hardened steel for manganese and carbon.

Two unusual specimens forwarded in the belief that they were minerals proved to be pieces of ferrosilicon (found in the West Kimberley) and metallic zinc (from the Stirling Ranges).

Building Materials.

A wide variety of work was carried out under this heading.

1.—Concrete & Cement.

A number of concrete and mortar samples were submitted, both from public and departmental sources, for determination of the original mix. Most of this work is based on the assumption that the lime content of the hardened cement is soluble in acid, while the siliceous portion of the original

TABLE 15.

MINERAL DIVISION—1958.

———	Pay	Free	Government Geologist	State Batteries	Other State Government Departments	Commonwealth of Australia	Total
Alloys and Metals	11	2	....	....	....	2	15
Building Materials	11	9	1	....	17	....	38
Burnt Lime	28	....	....	6	....	....	34
Ceramics	15	12	....	....	4	....	31
Mineral Identifications	13	270	....	....	2	....	285
Minerals—							
Gypsum	18	19	9	....	....	....	46
Heavy sands	3	11	....	....	....	....	14
Sulphur	2	4	....	....	4	....	10
Other	21	62	1	....	....	....	84
Ores—							
Copper	18	21	....	....	....	....	39
Gold—							
Ores	....	86	....	....	3	....	89
Tailings	....	....	....	79	....	3	82
Umpire	....	....	....	45	....	2	47
Iron	4	26	65	....	....	....	95
Manganese	20	10	....	....	....	....	30
Tantalum-Niobium	23	6	....	....	1	1	31
Titanium	151	3	....	....	....	....	154
Other	15	32	4	....	3	2	56
Petrological Examination....	....	....	44	....	....	....	44
Miscellaneous	21	7	....	13	5	....	46
Total	374	580	124	143	39	10	1,270

Portland cement goes into solution when treated with alkali. Procedure is straight-forward when neither fine nor coarse aggregate contains acid-soluble calcium or alkali-soluble silica, or when the ingredients of the original mix are separately available for determination of blanks. In the absence of these conditions, results can be obtained only after a less direct attack and by making fairly broad assumptions.

An investigation of interest in this respect was in connection with deterioration of marine concrete piles from the East Fremantle Power Station. These piles had been prepared using a high-alumina, low-silica cement, and some had shown signs of premature deterioration. The coarse aggregate was separated from concrete samples supplied and the concrete, aggregate and fresh cement were analysed for soluble—SiO_2, CaO, and Fe plus Al oxides (R_2O_3). The SiO_2 content of this type of cement was too low to allow any valid conclusions to be drawn from the distribution of soluble-silica between these materials but by using the CaO and R_2O_3 figures, the composition of the original mix was determined. It was thought possible that deterioration had been due to a too-lean mix originally but the chemical work showed that it had approximated the specified 1 cement: 2 sand: 4 aggregate.

An aggregate being used by Public Works Department for Geraldton Harbour works, giving concrete test cubes of low compression strength, was sent to these Laboratories for examination. The percentage of biotite and hornblende in the rock, suspected by the engineers as possible cause, was found to be insignificant. The presence in the aggregate of approximately 6 per cent of extremely weathered rock, consisting of weathered feldspar, quartz, mica, garnet, limonite and clay, was suggested as a much more likely reason for poor compression strengths of the concrete.

Examinations were carried out on coarse and fine aggregates to determine their suitability for use in concrete. This work consists in a physical and petrographic examination of the stone in addition to a determination of any deleterious constituents such as encrustations, clay and organic matter as well as minerals which are potentially reactive such as opal, chalcedony, pyrite etc. Apparatus has been obtained which allows of an accelerated test for the potential alkali-reactivity of the aggregate, a characteristic previously obtainable only after prolonged storage of test specimens.

An unusual sample submitted as a possible coarse aggregate was from the tailings dump at the blue asbestos mines at Wittenoom Gorge. It consisted of a banded jasper containing fine grain quartz, crocidolite, magnetite, limonite and a trace of sulphide. Sulphides such as marcasite, pyrrhotite and pyrite can be deleterious due to their liability to oxidation, but the sulphide in this case proved to be a non-reactive form of pyrite. Opal and chalcedony were absent and there seemed no chemical or petrographical reason against the use of this material as aggregate. However, as previous work has shown that opal did in fact occur in some of the ferruginous cherts associated with the blue asbestos deposits of the Hamersley ranges, it was recommended that it be used preferably with low-alkali cements, an accepted method of minimizing the danger of concrete deterioration due to potentially reactive aggregates.

An adverse opinion was expressed on the proposal to use Londonderry feldspar (essentially microcline) as aggregate in exposed-aggregate concrete. Perhaps the most serious objection is that microcline not only has a coefficient of thermal expansion differing appreciably from that of hardened cement but it also has different expansions in different directions. If present in large crystals on an exposed concrete surface this could cause rapid deterioration due to wide or rapid temperature changes. Other objections could be based on the perfect cleavage of the mineral resulting in planes of weakness, and, in the absence of some surfactant, poor adhesion.

In addition to coarse aggregates, a number of sands were examined to assess their value as fine aggregate. Five samples from pits close to Perth were examined at the request of the Department of Civil Engineering, University of W.A. to identify and measure the amount of the substance forming a yellow surface to the sand grains. The surface coating was found to consist of clay and limonite, the colour being entirely due to the latter. The whole coating consisted of minus 200 mesh minerals and by determining this size fraction and its iron content, the percentages of limonite and clay were calculated. Pit samples showed limonite encrustations varying from 0.15 per cent to 0.55 per cent and clay from 0.05 per cent to 1.90 per cent. As would be expected, a beach sand included with the same batch showed no clay and only a trace of limonite.

2.—Fly Ash.

Fly ash, the very fine dust produced from the combustion of finely pulverised coal in furnaces, is collected in considerable quantities from the precipitators of power station plants. The use of this material as an additive to Portland cement concrete to improve its physical properties has become accepted engineering practice and some years ago a number of analyses were made for Public Works Department on fly ash from the East Perth Power Station which it was intended to use in concrete for the raising of the wall of Mundaring Weir. In 1958 similar work was carried out on fly ash from the South Fremantle Power Station which was to be used in concrete work at the Wellington Dam.

A typical partial analysis of the South Fremantle Power Station product was as follows:—

	Per Cent.
Silica, SiO_2	50.6
Alumina, Al_2O_3	20.1
Ferric Oxide, Fe_2O_3	14.9
Phosphorus pentoxide, P_2O_5	0.4
Titanium Dioxide, T_iO_2	1.3
Lime, CaO	4.5
Magnesia, MgO	1.7
Potash, K_2O	0.2
Soda, Na_2O	0.1
Sulphur trioxide, SO_3	0.6
Iron sulphide, FeS_2	0.2
Carbon, C	3.3
Moisture, H_2O	0.8

Physical examination showed a specific gravity of 2.48, loss on ignition (excluding water) 5.3 per cent and a specific surface of 5910 sq.cm./g. The latter property was measured in an apparatus constructed along the lines suggested by Pecover (Commonwealth Engineer, March 1945) whereby the rate of flow of air is measured through an arbitrarily prepared bed of the sample under a chosen set of conditions as regards pressure and surface area. From this flow rate, or permeability, specific surface is calculated.

From a comparison of the above analysis with the following A.S.T.M. specification figures, it is apparent that the South Fremantle material is well suited for use in concrete.

Specific Surface	min	2800 sq.cm./g
		Per Cent.
$SiO_2 + Al_2O_3 + Fe_2O_3$	min	70.0
MgO	max	3.0
SO_3	max	3.0
Moisture	max	3.0
Loss on ignition	max	12.0
Available alkalies as Na_2O	max	1.5

3.—Other Building Materials.

Clay soils were tested regarding their suitability for production of adobe bricks, and sands for their application to the manufacture of sand-cement bricks.

Work was carried out at the request of the Department of Industrial Development on raw materials used in the manufacture of sand-lime bricks and, on behalf of the State Brickworks, porosity and absorption of burnt bricks were determined.

The carbon content was determined of raw clay bricks containing in the mix, cinders from the West Australian Government Railway sheds at Midland Junction. A method of determination applicable on the site of the brickworks, and conducted by relatively untrained personnel, was requested. It

was hoped that the organic carbon could be separated from the brick slurry simply by shaking with a flotation reagent such as cresol, but it was found that complete recovery was only obtained under the conditions of intense aeration and agitation which exist in a typical flotation machine. Under these conditions, a complete recovery of organic carbon was obtained, as checked by determinations by conventional methods of total carbon (by dry combustion) and carbonates.

Plaster from a wall of a new house which was already showing deterioration was found to contain less than 5 per cent lime, though specifications had called for 40 per cent.

Samples were also submitted from the limestone foundations of a house still under construction. The limestone was reported to be flaking and showing signs of disintegration. Examination of the sample showed that chemically it did not differ appreciably from that of satisfactory foundation stone. Working at the University of W.A., R. W. Fletcher (J. Roy. Soc. W.A. 20:17, 1933) has shown a rough correlation between the compression strength of West Australian Coastal limestones and their porosity and acid-insoluble content. Generally speaking, he found rock of high porosity and high insoluble content to have a low compressive strength. The porosity of a large number of limestones examined by him ranged from 20 to 55 per cent: that of the specimen submitted to these Laboratories was 51 per cent and is therefore in the extreme upper range of porosities, a fact which could contribute to its apparent weakness.

A sandstone from the Northampton area was examined at the request of the Government Geologist to assess its suitability as a building stone. It was a pink rock containing quartz grains which were originally rounded but which had become strongly interlocking due to later crystal growth. It had an apparent density of 146 lb/c.ft., porosity (defined as volume of pores divided by volume of stone) 11.4 per cent, water absorption 4.8 per cent and a low absorption rate. It withstood satisfactorily the accelerated weathering tests described in appropriate A.S.T.M. Specifications. No equipment is available at these Laboratories to measure the compression strength of materials, but subject to satisfactory figures in this respect, the stone should make an attractive building material.

Burnt Lime.

Considerably fewer burnt lime samples were received from the public than in the previous year (28 in 1958, 87 in 1957). Those received were for the determination of free lime, a figure which can be obtained accurately and reproducibly only by a careful and experienced operator.

There were occasions when wide differences were reported between figures obtained on the one batch by the producer, the buyer and these Laboratories. To assist the producers and buyers, an officer from the Division visited their plants, and drew attention to aspects of the determination which could lead to erroneous results; he also suggested improved sampling procedures. With operators lacking basic training and working without satisfactory laboratory facilities, figures reported from the plants can be expected to be approximate only.

Six samples received from the State Batteries Branch were examined for conformity to Tender Board Specifications, and were analysed for free lime, combined lime, carbon dioxide and loss on ignition. Of the six, two failed to comply with the specification, though one was borderline.

Ceramics.

Clays.—(1) A number of clays were examined regarding their properties as ceramic raw materials. This involved plasticity, colour, shrinkage, firing and porosity tests. Three such examinations were made on clays from Wooroloo, as a guide to their possible use in occupational therapy at the Sanatorium.

In the case of brick clays a new procedure has been adopted, designed to simulate more closely actual industrial conditions as regards mixing, wire-cutting and firing of bricks. Briquettes, scaled down to one-third normal brick size, are prepared in duplicate for each condition of firing, and one set is sent to the client with the final report. It is felt that actual visual examination of the results of firing his clay would considerably enhance the value of the report to an interested party.

Other work in connection with clay included the trial firing of experimental clay-flower-pots for a manufacturer, and a complete chemical analysis of a clay from Bakers Hill.

2.—Refractories.

Six specimens of refractory firebricks were subjected to a heat treatment cycle, involving a maximum temperature in excess of 1400° C. Temperatures in this range are obtained in a laboratory furnace with a hearth area of one square foot, and heated by both oil and coal gas. Temperatures can be controlled within reasonable limits and readings are automatically recorded. Maximum temperature attainable is in the vicinity of 1500° C.
To assist in work being carried out on firebricks in the Fuel Technology Division a number of bricks were anlaysed for silica, alumina, ferric oxide, titania and phosphorus. Apparent density, true density and porosity were also determined.

Corrosion.

Tests were made on corroded corrugated galvanised iron, which had been stacked horizontally in the country for over a year. Though the typical sheet submitted showed white corrosion product over most of the surface, tests showed that, after removal of this corrosion product, there still remained an average of 1.86 ounces of metallic zinc per square foot. This compared favourably with the figure of 1.93 ounces per square foot, obtained on uncorroded portions. Some pin-holes were present, and it was suggested that these were more significant as regards the future life of the sheet, than the overall loss in weight of metallic zinc.

Another corrosion problem of interest was in connection with the breakdown of corrugated aluminium sheets in the recently constructed roof of a grandstand. Significant corrosion had taken place only in isolated sheets comprising about 5 per cent. of the roof area. There were good reasons for discounting atmospheric attack and galvanic corrosion and after chemical and physical examination of affected and unaffected sheets it was concluded that breakdown was due to intergranular corrosion. At 2.07 per cent, the copper content of the damaged sheet was in considerable excess over that of the satisfactory sheets. Aluminium alloys containing copper are liable to intergranular corrosion unless chemical composition and heat treatment are closely controlled during manufacture.

Mineral Identifications.

General.—(1) Though many of the samples classified under this heading are of no value, the work involved is justified by those specimens which prove to be of economic or academic significance. Prospectors and the general public are encouraged to send in any mineral specimens which they think may be of interest; the majority qualify for free examination in accordance with the Departmental policy of encouraging prospecting. Examination of such specimens is carried out as opportunity permits, Departmental work, as well as investigations for which a fee is charged, being given priority over work undertaken at public expense. Nevertheless, delay is seldom longer than one month in reporting a normal free mineral identification, and is usually considerably less.

In mineral identification work generally, increasing use is being made of X-ray analyses (in co-operation with the Physics and Pyrometry Officer) and spectrographic techniques (in co-operation with Agriculture Division). These techniques have proved very useful in the study of some of the more complex minerals, particularly in the tantalum, niobium and rare-earth groups.

2.—New Localities.

A number of minerals were received from areas from which they had not previously been recorded. These new occurrences were added to the master map prepared by this Division to show the distribution of the more important minerals throughout the State. Minerals of interest in this respect included:—

Copper Minerals.—Malachite from New Landsdowne station in the Kimberley and from Dangin in the South-West; azurite and native copper from Dangin, and chrysocolla from New Landsdowne.

Manganese Minerals.—A low-grade manganese ore from Northam, and psilomelane from Melville in the Yalgoo Gold Field.

In the North-West district, *baryte* was reported for the first time from the vicinity of Mangaroon homestead, *bismutite* from 35 m. S.E. of Nullagine, *lepidolite* from 3m. E. of Murphy's Gap Well at Moolyella, *beryl* 15 m. W. of Bamboo Springs and *rutile* from 25 m. S.E. of Yinnietharra. The latter was a rather striking specimen of the massive mineral. *Emery* was recorded for the first time from Mt. Broome (Kimberley), and a medium grade deposit of *sillimanite* from 5 m. N.E. of Mt. Baring in the Eucla division.

Mineral Specimens.

Specimens from these new localities have been included in the Mineral Division Collection, together with any others of particular interest. The collection, now numbering 2,400 specimens, has proved of considerable assistance to visitors to the Division anxious to see and handle known specimens of minerals as an aid to their recognition in the field.

Specimen minerals have also been sent as a result of written requests from prospectors in the mining areas, and to country school teachers for instructional purposes.

A consignment of West Australian minerals was shipped to the Royal Ontario Museum, Toronto, Canada on an exchange basis with that Institution.

Minerals.

Non-Metallic.—(1) *Gypsum.*—Many of the gypsum samples received were in connection with the exploration of deposits in the Lake Cowan area. Tests showed the occurrence of large tonnages of high grade gypsum and the deposit is now being worked and the product shipped overseas.

A dozen samples were received from a prospector interested in the development of deposits near Boolan in the Gascoyne district. The product proved to be of good quality.

From the same district nine samples were subsequently examined for the Government Geologist and showed values ranging from 80 up to 98 per cent. gypsum, with generally low sodium chloride and iron contents.

Magnesite.—A sample of magnesite representative of a large deposite 18 miles east of Ravensthorpe, was received from the Government Geologist. As there is a potential market in Japan for caustic magnesite, tests were requested to assess the value of the magnesite as a source of this material.

Specifications for caustic magnesia, used particularly in the production of Sorel cements, vary quite considerably, but from the following figures it will be seen that the Ravensthorpe magnesite, when calcined at 1,150°C, readily conforms to a typical specification:—

	Ravensthorpe Calcine	Typical Specification
	Per Cent.	
Magnesia, MgO	98.5	87.0 min.
Lime, CaO	0.09	2.5 max.
Silica + R_2O_3	0.22	4.0 max.
Ignition loss	1.19	5.0 max.

Calcining at a lower temperature, but still keeping the ignition loss of the caustic magnesia below the maximum of 5 per cent., should result in a more reactive product and tests along these lines are in hand.

Quartz.—As in the past years, quartz crystals have been sent in in considerable numbers by prospectors, either in mistake for beryl or in the hope that they are of commercial quality. Though crystalline quartz is fairly widespread in its occurrence, large flawless crystals of optical quality are rare in this State. The electronic industry requires a minimum weight of 100 g., with at least one natural face, and freedom from bubbles, cracks or discoloration. No specimens meeting this specification were received during the year.

Sulphur.—A specimen from Long Island, Exmouth Gulf, consisted of a sandstone containing quartz, sulphur, and gypsum. The sulphur occurred in the orthorhombic crystalline form. A sample consisting almost entirely of elemental sulphur was received from the same locality during 1957, but the possibility of its originating as jetsam could not be overlooked. The 1958 sample, however, associated intimately with the local sandstone as it is, makes an artificial origin difficult to explain.

The Department of Industrial Development is investigating the possibility of recovering elemental sulphur from pyrities by hydrometallurgical processes. Some of the analytical work involved in this program has been done in this Division, and consists mainly in tracing the distribution of sulphur between pyrite, pyrrhotite and oxidised forms in the one sample. A text book method of determining pyrite-sulphur and pyrrhotite-sulphur when they occur together takes advantage of the fact that sulphur can be removed (and estimated) as sulphuretted hydrogen from pyrrhotite by treatment with hydrochloric acid, a treatment which leaves the sulphur combined as pyrite unaffected. It was found, however, on the samples examined that the gaseous sulphuretted hydrogen was not quantitatively removed but was oxidised in part to elemental sulphur which remained behind with (and would be estimated as) pyrite-sulphur. Similar difficulties had been experienced in other laboratories and the standard method has been modified to include a carbon bisulphide wash to remove this elemental sulphur before determination of pyrite-sulphur in the acid-treated residue.

2. *Metallic Ores.*

The interest currently taken in any particular metal is fairly accurately reflected in the number of specimens (compared with previous years) of the mineral or minerals concerned that are forwarded for examination to these Laboratories.

This was particularly emphasised by the marked drop in the number of ilmenite sands, and copper and lead ores on the one hand, and, on the other, by the appreciable increase in samples of tantalum, and to a lesser extent beryl.

Antimony.—Flotation work was carried out for the State Mining Engineer on a high-sulphide concentrate from the Blue Spec Gold Mine, Nullagine.

The sample as supplied was in a finely-ground condition (65 per cent. minus 230 mesh) and had been stored for a considerable period. It was believed to be a collection of miscellaneous bulk flotation concentrates of an antimonial sulphide ore.

It consisted of stibnite, pyrite, some arsenopyrite, oxidation products of these sulphides and gangue. The head sample assayed:—

Gold	56.3 dwt./long ton
Antimony	22.4 per cent.
Arsenic	0.5 per cent.
Total sulphur	16.7 per cent.

The object was to produce by differential flotation, two saleable products (1) an antimony concentrate assaying at least 60 per cent. antimony and (2) an auriferous pyritic concentrate free from antimony.

Due largely to the oxidation of the sulphide minerals, an appreciable amount of the antimony proved not amenable to flotation and it was not found practicable to obtain the required grade of concentrates. Gold recovered by direct cyanidation was approximately 50 per cent.

Beryl.—A number of samples suspected of being beryl were submitted but only eight proved to be that mineral. The numbers may be expected to increase following the announcement of the Atomic Energy Commission's interest in beryl, which has, in addition to atomic energy applications, a potential use as a source of rocket fuel.

Copper.—A metal to show a marked drop in the number of samples received was copper. Only 39 were sent in compared with 100 the previous year. One ore-buying firm reported large stockpiles of fertilizer-grade ore with a consequent temporary decline of interest in oxidised ores. The demand at one stage was for high grade ore only, to be used in boosting the low grade stock-piled material to better than 10 per cent. copper. Though a number of high-grade specimens from the Murchison and Nullagine areas assayed over 50 per cent. copper, no reliable information is available concerning the commercial significance of these occurrences.

A copper specimen of interest was received from near Dangin, in which veinlets of azurite, malachite and native copper occurred in a predominantly hornblende rock.

An assay of a ground copper ore was made to provide a standard for copper assaying being carried out in Marble Bar.

Gold.—Fewer check samples of gold tailings were forwarded from State Batteries than in the previous year (79 as against 153), though the number of umpire samples showed a slight increase.

Five assays were carried out on tailings from the Tennant Creek (N.T.) battery for the Director of Mines, Northern Territory Administration. This service is being made available pending the completion of laboratories in Darwin.

Iron.—As would be expected, many public samples suspected of being tantalite, columbite, chromite, manganese etc. are found to be iron minerals. Many such specimens are received annually and unless of particularly high grade are classified under mineral identifications rather than under iron ores.

Most of the iron samples of any significance were received from the Government Geologist. These included samples taken during an iron-ore survey from Bremer Range, Joyner's Find, Lake Barlee, Montague Range, Moyagee and Mt. Ida.

Of particular interest is a large number of bore core samples taken in connection with an exploratory diamond drilling campaign designed to test the nature in depth of the Tallering Range deposits. Sites for four holes have been laid out by the Geological Survey and during the year bore core samples from No. 1 hole, taken to a depth of 483 ft., were examined in this Division.

In the upper levels, limonite and hematite predominated but with increasing depth, magnetite and pyrite became the significant iron minerals, the chief gangue minerals being talc and quartz. All the samples were assayed for iron; those from the greater depths for sulphur and gold as well. Sulphur figures rose to a maximum of 8.3 per cent. at approximately 460 ft., but no gold was present in any of the samples. In addition partial analyses of a number of group samples were made for total and acid-soluble iron, silica, phosphorus, titania, magnesia, lime, manganese and sulphur.

Lead.—Lead ore samples dropped from 53 to 4, due mainly to the limited operations of the Northampton mines, resulting in the cessation of samples from the Northampton State Battery.

Manganese.—Interest in manganese was maintained. A number of high grade specimens were received from widely separated localities.

Partial analyses of 12 samples were made for firms interested in developing manganese deposits. Analyses were for manganese, alumina, silica, iron, sulphur and phosphorus.

Rare-earth Minerals.—Rare-earth minerals identified included euxenite, tanteuxenite, allanite, gadolinite and fergusonite. All these minerals showed more or less radioactivity due to minor replacements by thorium and/or uranium.

The fergusonite occurred as approximately 46 per cent. of a mixture of small pebbles sent in from the Marble Bar area. The remainder of the sample consisted of tanteuxenite (37 per cent.), cassiterite (8 per cent.), tantalite (5 per cent.). monazite (1 per cent.), with 3 per cent. of miscellaneous gangue minerals.

Fergusonite, a rare-earth columbo-tantalate, is a rare mineral. Its identity was confirmed by X-ray analysis. In this particular specimen, S.G. 6.26, spectrographic examination showed that yttrium was the predominating rare-earth with traces of seven other elements of this group also present. Tantalum was in greater amount than niobium; a small amount of titanium was also present.

Tantalum and Niobium.—A wide variety of tantalite-columbite concentrates was examined. These ranged from a clean mixture of 5 per cent. cassiterite with 95 per cent. columbite to a sample containing more hornblende and iron-oxide minerals than either columbite or tantalite. Though mixtures of the latter type usually call for time-consuming chemical analyses to determine their Ta_2O_5 and Nb_2O_5 contents, some success has been achieved in isolating the various constituents with sufficient accuracy to give satisfactory figures by the quicker and cheaper specific gravity method.

An interesting but complex sample from the Pilbara area was found to consist of fragments of tapiolite, tantalite, cassiterite, microlite, limonite, ilmenite, quartz and mica. All compounds could be isolated except the tantalite-tapiolite-microlite fraction, in which intergrowth had occurred between the first two, with the microlite as a minor constituent coating some of the tapiolite. This fraction was radioactive (from three to ten times background); some clean tapiolite fragments showed specific gravities up to 7.7 and contained Ta_2O_5 probably in excess of 80 per cent. Identity of these three tantalum minerals was confirmed by X-ray diffraction patterns.

A sample from Coogegong consisted of columbite and euxenite associated with small amounts of biotite, feldspar and quartz. As some of the fragments were of columbite-euxenite intergrowths, only a very approximate Ta_2O_5 content could be estimated by physical means; it was of the order of 10 per cent. Again the presence of euxenite in columbite-euxenite intergrowths was confirmed by X-ray analysis.

Tin.—Tin analyses were carried out in tin-tantalum concentrates from Greenbushes, also on ores, concentrates and tailings from an experimental treatment plant in the Marble Bar area. In the latter work, the distribution of the tin throughout various sizing fractions was also determined.

A tin ore and a tin concentrate from the Northern Territory were assayed for the Director of Mines, Darwin.

Titanium.—There was a striking drop in the number of heavy sands assayed for their ilmenite content: 323 in 1957, only 14 in 1958. On the other hand, there was a rise, from 91 to 155 in the number of ilmenite products received. This rise was due largely to the amount of chemical work done for producing plants still experimenting with their flow sheets. As these firms eliminate their production problems and establish their own laboratories, a sharp drop can be expected in the claims made on this Division for analytical work on their products.

Other Minerals.—Other minerals (both metallic and non-metallic) received during the year included allanite, amblygonite, bauxite, bismutite, bismuth, chromite, corundum, dolomite, epidote, euxenite, fergusonite, fuchsite, gadolinite, garnet, graphite, lepidolite, lithiophilite, microlite, monazite, nickeliferous galena, nontronite, opal, sillimanite, talc, tapiolite, tourmaline, vermiculite, wolframite, yttrotantalite and zircon.

Miscellaneous.

Calibrations.—(1) Calibrations were carried out of assay balance riders for the State Batteries Branch and of burettes for a private firm.

2. *Exhibit.*

This Division was responsible for the organisation of the Mines Department exhibit at the Homes Exhibition and Trade Fair held at the Zoological Gardens in connection with the Festival of Perth during February and March 1958.

The exhibit was designed to show in simplified outline the history of certain economic heavy minerals from their occurrence as minute inclusions in rock masses to their final separation as clean fractions of individual minerals.

Ilmenite (and its recovery from beach sands) was chosen as the most topical mineral because of the current activities of commercial interests in this field.

3. Fire Hazards.

At the request of the Inspector of Explosives, samples were examined in connection with a fire at a commercial ore-grinding mill. Suspended fines from the grinding process pass via a cyclone to a wooden precipitation chamber and it was in this chamber that the fire occurred. The material recently ground was an oxidised copper ore in a graphitic and kaolinised rock, reputedly free from sulphides.

Samples of the bulk ore, milled product and burnt-out fines were analysed for sulphide sulphur and graphitic carbon. The figures obtained for graphite were 4.52 per cent., 5.02 per cent. and 0.07 per cent. respectively, while those for sulphur indicated no contamination by pyrite from previous crushings.

A second fire subsequently broke out and further samples are in hand.

4. Fossils.

Fossils of interest received during the year consisted of (a) calcified Lithostrotion, a type of coral abundant during the Carboniferous Period, (b) calcified Productus, a shell fish abundant during the same period and (c) Spirifer, a shell-fish whose original substance had been replaced by limonite.

5. Petrological Examinations.

A detailed examination of 10 rock specimens from the Pilbara Goldfield was completed for the Government Geologist. The object of the work was to supply the Government Geologist with evidence that would help clarify some hitherto confused age-relationships between the granitic and porphyritic rocks of the area.

At the end of the year, work on a further suite of 44 rocks had reached an advanced stage. The specimens were of granite and granite gneiss occurrences in the Pilbara Goldfields and the work involved mineral identification and estimation of relative areal proportions, determination of order of crystallization and the nature of accessory minerals and inclusions. Chemical determinations required included total silica, iron plus alumina, and, in selected cases, tin. The Government Geologist hopes to correlate, from these results, various scattered granite outcrops with known tin-producing fields.

6. Rock Analyses.

Complete chemical analyses of a series of twelve rocks from the Kalgoorlie area have been commenced at the request of a gold-mining company.

DIVISION VIII

Annual Report of the Chief Inspector of Explosives for the Year 1958

The Under Secretary for Mines:

In compliance with Section 45 of the Explosives Act, 1895, I am honoured to inform the Hon. Minister for Mines on the functioning of the Explosives Branch in 1958.

Importation of Explosives.

Except for detonating fuse and millisecond delay detonators, the State's requirements of commercial explosives were supplied from Messrs. Nobels' factory in Victoria by nine consignments on small vessels able to berth alongside Woodman's Point Reserve jetty. These importations were supplemented to a very minor extent by railage and the usual direct delivery to Cockatoo Island by iron-ore ships returning from New South Wales. Interstate freighters brought most of the safety fuse which, having no mass explosion hazard, was unloaded at general cargo wharves.

Types of Explosives.

No fundamentally new compositions were introduced locally through the year. A sample consignment of the experimental explosive designated DP12, later authorised under the name of Beldyn, proved its worth in conditions demanding high resistance to moisture penetration and absorption. Increasing interest centered around ammonium nitrate-fuel oil mixtures, which showed promise of reduced blasting costs, freight advantages and enhanced safety because the components are separately non-explosive. So far this type of explosive has been applied only to large diameter holes, in quarrying and open-cut blasting. Mixing technique consisted originally in pouring the oil over prilled ammonium nitrate in the hole, but recently the practice of premixing is favoured as ensuring more uniform incorporation. Materials are on hand for trials intended early in 1959.

Quantities of Explosives Imported.

The doubtful value of publicising detail under this heading was confirmed when a recent review revealed a growing tendency toward suppression in other Australasian and overseas reports. The relevant information is, therefore, presented in a separate confidential report.

Use of Explosives.

As for many years past, gold mining accounted for more explosives than all other industry combined. The figure was 61.5 per cent., followed by a mere 9.4 per cent. and 9.1 per cent. for quarrying and geoseismic surveying, respectively. Collieries consumed 5.8 per cent. of total importation, asbestos 5.6 per cent., but lead, tin, copper, manganese and iron, including pyrite for sulphuric acid manufacture, together accounted only for 3.7 per cent. The remaining 5 per cent. went into public works, whaling, timber-getting and miscellaneous purposes.

Laboratory and Field Determinations.

Material.	Nature of Work.	No. of Samples.
Explosives:	Heat Test, Sensitivity, Velocity of Detonation, Chemical Analyses, etc.	2,350
Fuse:	Burning Rate, in compliance with Mines Regulation Act requirements	510
Fireworks:	Percussion and firing tests, analyses, etc.	600
General:	Police exhibits for determination of explosive or combustible qualities, etc.	

The Branch's technical activity cannot be assessed in terms of figures because apart from straight-out routine no two problems are identical. Systematic analyses, for example, may return columns of results, alongside which an equally important pronouncement as to keeping qualities and moisture resistance in explosive after prolonged observation requires but one word. Recently, too, a mounting interest in flammable and hazardous substances, most of them quite different from explosives ordinarily so-called, has expanded the work in various directions, of which some account will appear in later paragraphs.

Quality of Explosives.

On the results of wide visual inspection, conjoined with about 3,000 physical and chemical determinations, explosives imported during 1958 may fairly be pronounced as conforming with definition, factory standards and local requirements. No instance of exudation, or seepage of nitroglycerin, came under notice. With very few exceptions, heat test reaction times were more than threefold the prescribed minimum ten minutes. The almost monotonous regularity with which no reaction at 30 minutes was registered tended to revive a former suggestion that sampling be proportionately reduced. Further review, however, strengthened by opinions expressed at the 1957 Interstate Explosives Conference, indicated that no relaxation was justifiable. Even as matters stand, established Australasian practice by which we abide amounts to passing judgment on more than a ton of explosive from the results of heat-testing a few grams.

Inspection.

Thanks to additional staff, the Branch's primary function of inspecting explosives at various phases of existence from importation to consumption was performed this year on a hitherto unattainable scale. Apart from the specific determinations already mentioned, about 30 days were devoted to examination of explosives on discharge from ships' holds. Where possible, country inspections were

combined with other duties such as attendance at coronial inquiries, investigations of faulty material and discussions with mine and quarry management. Coverage of 63 magazines and 45 licensed resellers' stores revealed minor irregularities attributable to misunderstanding rather than indifference. This was often connected with change of ownership or staff since previous inspection, particularly at small dealers' premises, where matters could usually be adjusted by merely relocating the explosives and detonators and stressing the value of "good housekeeping". In the metropolitan industrial districts replacement of several old magazines by modern approved types was advised in the interests of security, capacity and adequate clearance from protected works. Public response to any such suggestion or injunction has been commendable. It is also gratifying to record increasingly frequent requests for inspectional or advisory service. Although these jobs mean time and mileage, an inspector on the spot can size up the situation and determine the explosives set-up with advantage to the Branch and licensee. Experience proves that this method of approach brings about mutually desirable results more effectively than by correspondence.

Due probably to a modified national training programme fewer ordnance movements across Fremantle wharves occurred. In each instance, except once or twice when trivial net weights of explosive were involved, an officer of our Branch attended and almost invariably found high regard for safety. An approach by naval authorities to use Woodmans' Point Reserve facilities for a special transhipment during repair to their own jetty a mile further south was fully investigated but unfortunately the project proved unworkable because of the size and weight of vehicles to be employed.

Explosives Act—Legislation.—In the latter part of the year a draft was prepared for an Explosives and Dangerous Goods Act. It is proposed by means of such legislation to correct anomalies of the old Explosives Act, 1895, and also to provide a basis for subsequent control of flammable liquids and any other specified dangerous goods should necessity arise. It has for some time been evident that existing statutes cannot adequately provide for public safety in respect of certain dangerous chemical goods under storage, use, or conveyance. Accidents so far have been few in number and there have been no major disasters but, with a steady growth of industry and increasing use of certain materials, the early provision of some general statutory control is desirable.

Sale of Explosives.—It is proposed that the new Act should provide for strict control over casual sales of explosives to the public through licensed stores. Any person who wishes to purchase from a store will first obtain a permit to do so from a police officer or other responsible authority. The permit must be presented to the store keeper who will be required to enter every sale in a book kept for the purpose. It is hoped that such a scheme will make for much better control of explosives sales than is possible at the present time. Its inauguration will inevitably require more inspectional work than usual, and it can be anticipated that country travelling will increase considerably during the next two years.

Alleged Faulty Explosives.—Several specific complaints of failure to function were investigated by examining samples of the suspected explosive, fuse or detonators and their manner of use. This procedure usually revealed faulty technique rather than sub-standard materials. Failure in electrical shot-firing, for example, was in one instance demonstratably due to an inadequate exploder, whilst other abortive results could be traced to incorrectly-positioned detonators, poor tamping and badly prepared primers. From the Eastern goldfields about mid-year came a report that miners, perturbed at the poor quality of fracteur, requested a comprehensive investigation. This was duly undertaken in September but beset with difficulty inasmuch that only one sample of allegedly defective explosive could be produced, and but few authentic accounts were forthcoming. Nevertheless, by conferring with the mine management and men, inquiring into current practices and examining any available material it became possible to suggest various remedial measures. Whilst virtually no evidence of poor quality could be found, one point which emerged was that miners once accustomed to blasting gelatin and gelatin dynamite sometimes failed to adjust themselves to the present day explosives. Another factor linked with sub-standard results was the positioning of the detonator which, instead of facing the charge from top or bottom, was found in a few instances to be skewed into a primer placed at some intermediate point. The freshness of explosive, when investigated, revealed a satisfactory state of affairs except that plugs surplus to immediate requirement were sometimes allowed to accumulate under poor storage conditions where deterioration might be expected. Strict rotational use was advised. The assertion that accidents with explosives had increased since the war could not be sustained statistically.

The Colour of Explosives.—The familiar pink or red due to acid magenta was threatened with extinction following the introduction of colourless anti-agglomerants. At first disliked, the red tint came to be regarded as a useful criterion in identifying explosive which had been spilt or bespattered by an exploding charge. Its retention or simulation by other dyestuffs was deemed necessary and agreed upon after representations to the manufacturer.

Explosives Reserves.

Kalgoorlie.—The magazines were found to be well maintained and correctly stocked. Some regrading within the area to divert stormwater from a low-lying part was advised. The road from Great Eastern Highway communicating with the Reserve and siding at Somerville passes through lucerne plots irrigated by sewage effluent, seepage of which has reduced the effective width to unsafe dimensions for two-way explosives traffic. Negotiations with municipal and road board authorities for construction of a suitable all-weather road were therefore commenced. From the railage viewpoint improved facilities were established by construction of a new spur joining the main line at an angle designed to minimize coupling difficulties.

Woodman's Point.—Additional bench space was provided in the laboratory, plumbing received attention and the building was duly connected with the four-inch water main supplying the jetty and fire hydrants. Maintenance of all rail tracks, including resleepering where necessary, was undertaken by the resident staff, and progress but not finality toward replacement of obsolete rolling stock may be reported. A fire originating outside the boundary fence in January caused alarm but no danger to explosives storage because of the long-established practice of isolating the magazines and cutting breaks.

Despite heavy security measures, including the fitting of new locks where required and replacement of the watchman's clock by a modern precision unit, several instances of intrusion and one minor theft occurred. Evidence suggested the machinations of someone familiar with the Reserve, and in due course the C.I.B. brought to book three youths, one of whom admitted previous unlawful entry. They were appropriately punished.

Stolen Explosives.

Thefts from private magazines, often unattended for considerable periods, are difficult to deal with. Although we advise flush fitting metal-clad doors in angle iron frames, secured with mortise locks instead of a hasp arrangement, a tunnel-type quarry magazine of this description but further protected by an outer linkmesh door was broken into during the year. Generally speaking, however, it is the makeshift magazine which proves most vulnerable.

Pyrotechnics.—Large consignments of fireworks arrived during the few months prior to November. Samples were inspected and when necessary critically examined for any unusual compositions. Certain new types of firework were also checked for

safety in burning. Numerous English, Chinese and Australian manufacturers were represented in this year's consignments, and one parcel of goods was also received from a South African source. No fireworks were rejected as unsuitable for distribution but in several instances minor defects in manufacture and wrapping were brought to the notice of manufacturers. The very co-operative and prompt responses indicated that the defects were due to oversight at the factories and that they would be corrected in future. It is satisfactory to note that fireworks of Australian manufacture compared very favourably in every respect with the best products from other sources.

**Experimental Rocket.*—During the last two years, explosives inspectors in the U.S.A. and in Britain have been plagued by attempts of enterprising youngsters to construct rockets and use various home-made explosives for propulsion. A similar instance was recorded here in the early part of the year when the Police Department took possession of a rocket and refused permission for its firing under supervision. About two pounds of explosive mixture was subsequently taken to Woodman's Point for destruction. It proved to be a sensitive mixture containing finely powdered aluminium, and its behaviour as a rocket propellant could well have produced serious damage or injury. It is unfortunate that experimental enterprise of this nature has to be discouraged but as such efforts could be attended by very serious injury, it is felt that there is adequate outlet for ingenuity along more conventional and safer lines.

Home-made "bombs"—No serious injuries were reported in 1958, but a young man who exploded an aluminium-redlead mixture on a neighbour's lawn was successfully prosecuted by the police. To determine the potency of these compositions and establish comparison with commercial explosives, experiments were conducted at the Explosives Reserve Laboratory. Mixtures of widely-varied proportions were found capable of detonation, and although explosion was of a low order, fracture of the container created a missile hazard.

Display Fireworks—Legal Action.—Brief mention was made last year of impending legal action by a lad injured in an explosion of a ground maroon picked up several weeks after a public display. The Court, finding negligence and declaring that fireworks in law must be regarded as dangerous, awarded the boy approximately £3,000. The defendant's appeal to the Full Court was unsuccessful.

Dangerous Goods Conference.—Meetings of interested bodies were convened in all States during 1957 to consider the U.N.O. proposals for classification, listing, labelling and shipping documentation of dangerous goods. Proceedings being duly reported, a conference was held at Melbourne on 18th and 19th February to collate information for submission to the parent organisation. The Chairman of the Commonwealth Explosives Transport Committee presided over an assembly of 18 comprising the heads of the six Australasian Explosives Branches and representatives of Shipping and Transport, Civil Aviation, Territories, Supply, Operational Safety Committee, Health, Customs, Railways, Port Authorities and Maritime Services. The keynote of discussions was the need for uniformity, and even concerns already committed to established systems evinced desire to align with the proposals as far as practicable. That certain difficulties would occur in practice rather than principle was not denied. Some of the problems peculiar to Civil Aviation, Railways and Public Health, for example, were shown to be divergent and not altogether capable of adjustment on a common basis. The pictorial labels suggested by U.N.O. were accepted by all delegates with a few reservations as to colouring and other detail. In conclusion, Conference commended the Committee of Experts on its report, acceptance of which was affirmed in principle. Hope was expressed for reconciliation of the International Air Transport Association regulations with the U.N. code. The Chairman said that when member nations' views were known he would again call delegates together to discuss further action.

Hazardous Goods.—Investigations of fires or explosions among substances not within the ordinarily understood definition of explosives and pyrotechnics have assumed increased frequency. No two problems are identical; some may be answered readily by technical advice, whilst others call for lengthy inquiry, experiment and attempted reconstruction. Following are several examples of the Branch's activities in this class of work.

Fire in a Grinding Mill.—Two minor fires occurred during the milling of cupriferous graphitic schist intended for incorporation with fertilizers. One ignition took place in a bucket elevator and the other in a dust settling chamber which was saved from damage by raking out the smouldering precipitate. Although the mishap appeared connected with residues from previously milled flotation concentrates, no clearly-defined cause could be assigned.

Spontaneous Combustion.—A warehouse fire was thought to have originated in bales of jute twine stored in a basement. There was evidence that the material could have been wetted by flooding about three weeks before the fire and a short report was issued on the possibilities of spontaneous ignition having occurred. Although no proof could be given that this was the case, there are numerous records that jute materials have been associated with fires for which there was no known cause. Opinion was given that when wet or damp and packed tightly in bales, jute can heat by bacterial action which under favourable conditions might lead to charring and ignition. When contaminated with vegetable oil matter the prospect of ignition is greater and in this warehouse the jute was stored near to the cleaners' working materials.

Acetylene Explosion:

At the request of the Coroner an investigation was made of an acetylene explosion which occurred in a banana ripening room at Geraldton on 6th February, 1958. An employee was killed by a very destructive blast which wrecked the rear premises and roused much speculation as to the cause. Thorough search by an inspector of the State Electricity Commission revealed no fault in the electrical installation and no evidence that the explosion was caused electrically. A report was prepared which embodied the results of considerable investigation and enquiry on all aspects of acetylene explosions.

Acetylene gas was generated within a ripening room of 250 cubic feet capacity by slow addition of water to about 7 lb. of carbide. From the amount of water added prior to the explosion it was calculated that about 3.25 per cent. of gas was present at the time, and ignition of this dangerous mixture could have been brought about by contact with very hot carbide. The concentration of gas had become dangerously high, the primitive type of generator allowed carbide to become grossly overheated and copper pipes were used to carry water to the carbide. With these facts established there was no difficulty in assigning a cause to the explosion. The interesting outcome was to show the lack of any inspection or control over such processes. As a direct result of the Coroner's enquiry the investigation of ripening rooms was taken up by the Factories Department and a survey made of all such premises. Necessary regulations will be drawn up and ripening rooms will then be supervised by factory inspectors.

GENERAL.

Library:

Several modern books on explosives technology and dangerous goods were purchased during the year, and many smaller publications such as those of the Fire Protection Association were either received or in transit. As these texts are expensive and seldom found in other libraries, the Branch's policy is to make such works available for reference by Government departments or individuals. Co-operation on the part of the W.A. Libraries Board is gratefully acknowledged, and similarly

the photo-copying services provided by the Mines Department Chief Draftsman and his staff have proven a valuable adjunct to our work.

Staff:

Watchman W. P. Nissen was promoted to fill the vacancy created by Assistant Magazine Keeper E. J. Rouse's retirement in January. At Head Office a most noteworthy development has been the retention of Mr. G. A. Greaves' services. It was he who late in 1957 was seconded from the Government Chemical Laboratories to continue the explosives work during my seven months' absence on accumulated leave. From our first association he showed zeal and enthusiasm which not only redounded to the Branch's credit but opened new avenues of service. Indeed, nearly half of this report is of Mr. Greaves' composition on his own work, or that in which we collaborated.

Appreciation:

Relationships with Government departments, the explosives importers and the host of licensees and others involved in explosives and fireworks have continued on a high plane. Gratitude is expressed to my colleague Mr. Greaves, to Mr. Calneggia and clerical staff, and to the magazine keeper and men at Woodman's Point Explosives Reserve for their faithful application to duty, particularly over the period of my absence.

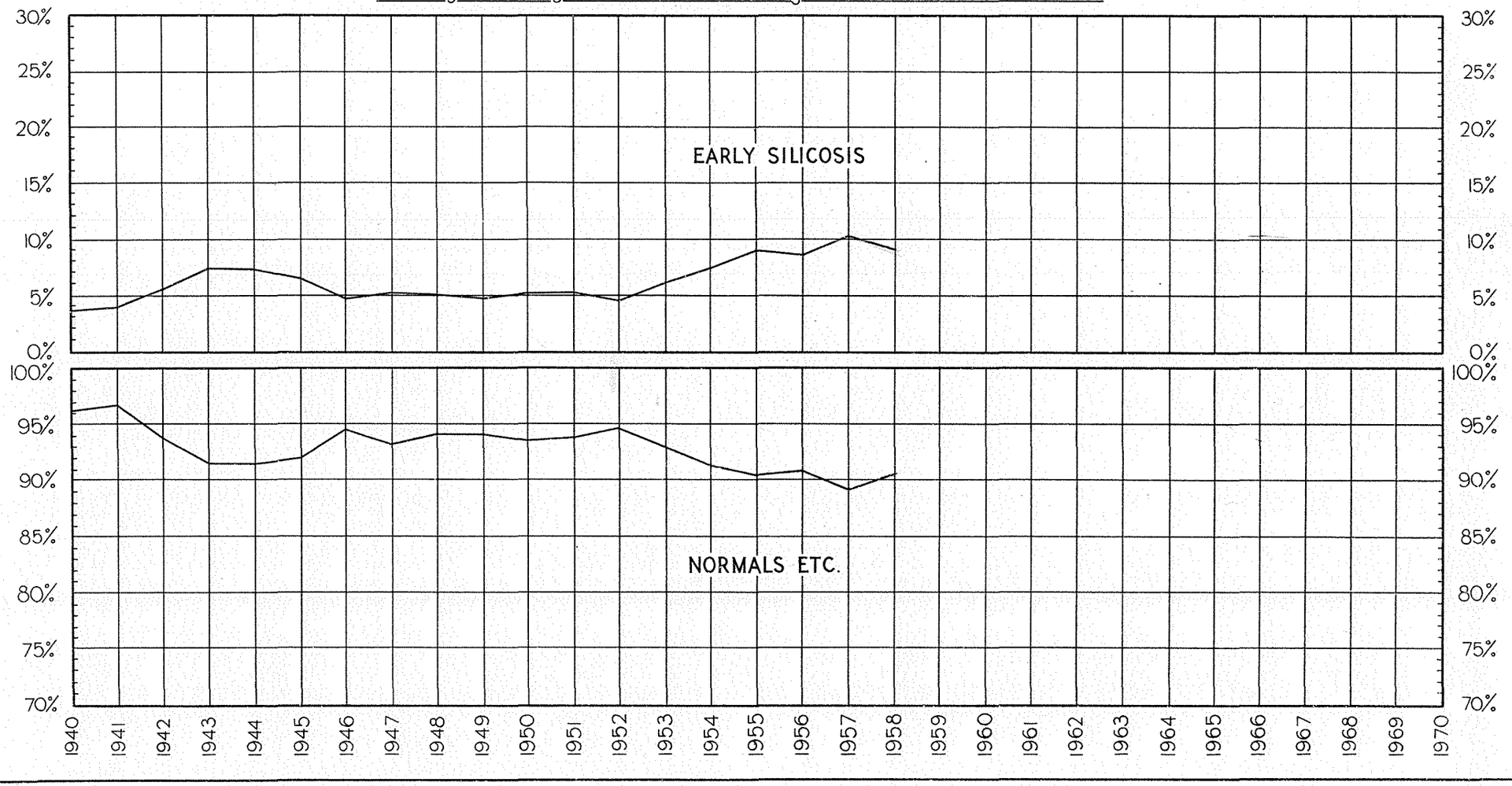
F. F. ALLSOP,
Chief Inspector of Explosives.

23rd April, 1959.

PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No 1

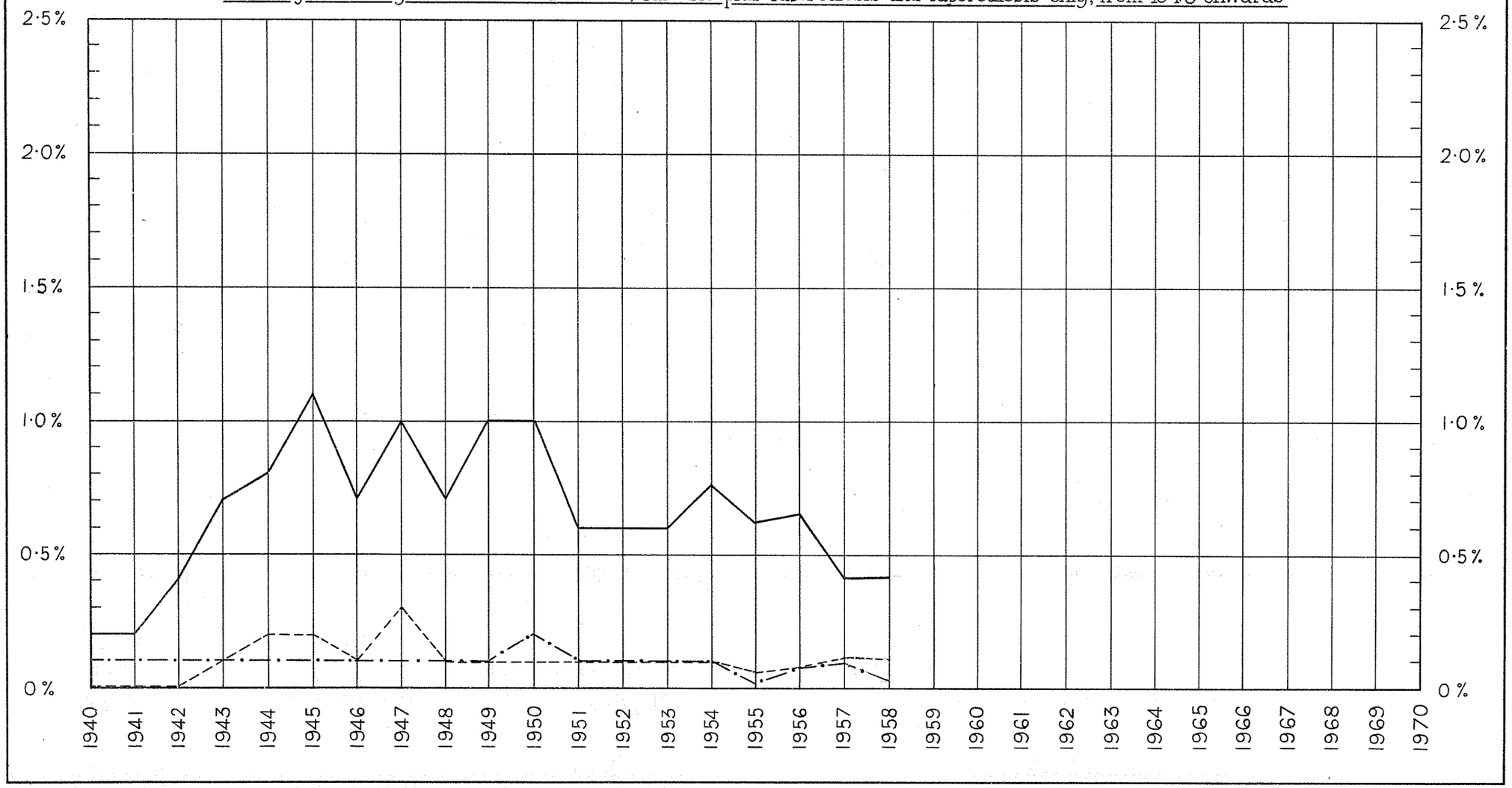
Showing Percentages of Normals and Early Silicotics from 1940 onwards



PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No. 2

Showing Percentages of Silicosis Advanced, Silicosis plus Tuberculosis and Tuberculosis only, from 1940 onwards



Silicosis Advanced ———— *Silicosis Plus Tuberculosis* – – – – – – *Tuberculosis Only* —·—·—·—

DIVISION IX

Report of Chairman, Miner's Phthisis Board and 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, 1958.

The State Public Health Department, under arrangements with this Department, continued the periodical examination of mine workers, the work being carried on throughout the year at the Kalgoorlie District Hospital and a mobile X-ray unit visited the North Coolgardie, Mount Margaret, East Murchison, Murchison, Yalgoo, Pilbara, West Pilbara, West Kimberley, Coolgardie, Dundas, Phillips River and Yilgarn Goldfields and the Northampton Mineral Field and also Bunbury and Capel, Outside Proclaimed Gold or Mineral Field.

Mine Workers' Relief Act:

The examinations under the Mine Workers' Relief Act during the year totalled 5,714 as compared with 4,406 for the previous year, an increase of 1,308, which, no doubt, is due to the wider coverage by the mobile X-ray unit. The results of the examinations for 1958, together with the figures 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 numbered 5,154 or 90.20 per cent of the men examined and include men having first class lives or suffering from pneumoconiosis only. The figures for the previous year being 3,925 or 89.08 per cent.

Early Silicosis: These numbered 529 of which 46 were new cases and 483 had been previously reported, the figures for 1957 being 30 and 424, respectively. Early Silicotics represent 9.26 per cent of the men examined, the percentage for the previous year being 10.30 per cent.

Advanced Silicosis: Of the 24 cases reported 15 were men who advanced from early Silicosis during the year, the other nine having been reported previously. Advanced silicotics represent 0.42 per cent of the men examined, the percentage for the previous year being 0.41 per cent.

Silicosis Plus Tuberculosis: Six cases were reported compared with five in 1957.

Tuberculosis Only: One case was reported compared with four in 1957.

MINES REGULATION ACT.

Examinations under the Mines Regulation Act totalled 1,519. These were in addition to the 5,714 examinations under the Mine Workers' Relief Act. There was an increase of 359 examinations under this Act in 1958 as compared with those in 1957. Of the total of 1,519 men examined 947 were new applicants and 572 were re-examinees.

Particulars of the examinations are as follows:—

New Applicants:

Normal	929
Pneumoconiosis	3
Silicosis Early	1
Silicosis Advanced	Nil
Query Tuberculosis	6
Tuberculosis	1
Tuberculosis with Silicosis	Nil
Other conditions	7
Total:	**947**

Of the above applicants for admission into the industry, 929 received the Initial Certificate (Form 2), eight received the Temporary Rejection Certificate (Form 3) and ten received the Rejection Certificate (Form 4). Thus of the 947 applicants. 929 or 98.10 per cent were eligible for employment anywhere on a mine.

Re-Examinations:

Normal	395
Pneumoconiosis	109
Silicosis Early	28
Silicosis Advanced	Nil
Query Tuberculosis	14
Tuberculosis	Nil
Pneumoconiosis plus Query Tuberculosis	5
Silicosis Early plus Query Tuberculosis	8
Silicosis Early plus Tuberculosis	1
Other conditions	12
Total:	**572**

These men had previously been examined and some were engaged in the industry prior to this examination. 428 received the Initial Certificate (Form 2), eight received the Temporary Rejection Certificate (Form 3), seven received the Rejection Certificate (Form 4), 50 received the Re-admission Certificate (Form 5), 34 received the Special Certificate (Form 9) and in 45 cases no certificate was issued. Thus of the 572 men examined, 478 were eligible for employment anywhere on a mine, 34 were eligible for surface work only and 60 were not eligible to work on a mine.

Grouping the two sets of figures discloses that the following certificates were issued under the Mines Regulation Act:—

Initial Certificates (Form 2)	1,357
Temporary Rejection Certificates (Form 3)	16
Rejection Certificates (Form 4)	17
Re-admission Certificates (Form 5)	50
Special Certificates (Form 9)	34
No Certificates	45
Total:	1,519

The percentage of men of normal health (Initial Certificates) to the number examined was 89.33 per cent compared with 88.62 per cent in 1957.

THE MINER'S PHTHISIS ACT.

The amount of compensation paid during the year totalled £14,969 15s. 0d., compared with £15,947 11s. 10d. for the previous year, a decrease of £977 16s. 10d. which can be attributed to the death of some of the beneficiaries.

The number of beneficiaries under the Act on the 31st December, 1958, was 137, being 12 exminers and 125 widows.

W. Y. R. GANNON,

Chairman Miner's Phthisis Board and Superintendent Mine Workers' Relief Act.

TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS FROM INCEPTION OF EXAMINATIONS (1925).

Year of Examination.	Normal, etc.				Silicosis Early.					Silicosis Advanced.						Silicosis Plus Tuberculosis.							Tuberculosis Only.				Total Number of Men Examined.
	Previously reported as Normal, etc.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	Previously reported as Silicosis Advanced.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	Previously reported as Silicosis Early.	Previously reported as Silicosis Advanced.	Previously reported as Silicosis plus Tuberculosis.	New Cases.	Total.	Per cent.	Previously reported as Normal, etc.	New Cases.	Total.	Per cent.	
1925 1926	....	....	3,239	80·5	....	....	....	459	11·4	....	....	....	....	183	4·5	....	....	....	....	....	131	3·3	....	....	11	0·3	4,023
1927	2,290	826	3,116	83·6	....	348	33	381	10·2	....	....	85	8	93	2·5	13	27	62	....	26	128	3·4	....	....	10	0·3	3,728
1928	2,738	239	2,977	85·5	47	303	12	362	10·4	1	16	79	2	98	2·8	10	14	10	....	8	42	1·2	3	1	4	0·1	3,483
1929	2,099	21	2,120	81·9	100	224	2	326	12·6	....	34	60	....	94	3·6	8	14	19	....	....	41	1·6	7	....	7	0·3	2,588
1930	2,751	34	2,785	81·9	133	247	3	383	11·3	....	22	43	2	67	2·0	6	60	46	....	2	114	3·3	47	3	50	1·5	3,399
1931	2,530	....	2,530	84·0	94	252	....	346	11·5	....	18	35	....	53	1·8	4	35	19	....	....	58	1·9	25	....	25	0·8	3,012
1932	3,835	....	3,835	89·5	35	338	....	373	8·7	....	6	47	....	53	1·2	3	9	4	....	....	16	0·4	8	....	8	0·2	4,285
1933	2,920	....	2,920	86·5	57	322	....	379	11·2	1	15	44	....	60	1·8	2	9	4	....	....	15	0·4	3	....	3	0·1	3,377
1934	5,140	....	5,140	92·4	54	315	....	369	6·6	1	24	12	....	37	0·7	6	6	....	....	....	12	0·2	5	....	5	0·1	5,563
1935	4,437	....	4,437	92·3	35	303	....	338	7·0	....	24	2	....	26	0·6	....	5	....	....	....	5	0·1	2	....	2	0·0	4,808
1936	6,972	....	6,972	94·7	29	323	....	352	4·8	1	15	4	....	20	0·3	3	8	....	....	....	11	0·1	8	....	8	0·1	7,363
1937	7,487	....	7,487	95·4	15	319	....	334	4·3	....	14	4	....	18	0·2	1	10	....	....	....	11	0·1	2	....	2	0·0	7,852
1938	6,833	....	6,833	95·7	13	266	....	279	3·9	....	15	2	....	17	0·2	1	8	....	....	....	9	0·1	3	....	3	0·0	7,141
1939	6,670	....	6,670	95·6	18	264	....	282	4·0	....	7	3	....	10	0·1	1	9	1	....	....	11	0·2	2	....	2	0·0	6,975
1940	7,023	....	7,023	96·2	12	245	....	257	3·5	....	10	1	....	11	0·2	....	4	....	....	....	4	0·0	4	....	4	0·0	7,299
1941	6,840	....	6,840	95·8	32	248	....	280	3·9	....	11	3	....	14	0·2	....	....	....	....	....	....	....	7	....	7	0·1	7,141
1942	5,469	....	5,469	93·9	61	264	....	325	5·6	....	20	5	....	25	0·4	....	2	....	....	....	2	0·0	3	....	3	0·1	5,824
1943	3,932	....	3,932	91·5	63	262	....	325	7·6	....	25	7	....	32	0·7	....	5	....	....	....	5	0·1	4	....	4	0·1	4,298
1944	4,079	....	4,079	91·5	70	270	....	340	7·5	....	21	14	....	35	0·8	1	7	....	....	....	8	0·2	6	....	6	0·1	4,468
1945	3,071	....	3,071	92·1	54	166	....	220	6·6	....	26	10	....	36	1·1	3	2	....	....	....	5	0·2	2	....	2	0·1	3,334
1946	5,294	....	5,294	94·4	89	172	....	261	4·7	1	36	2	....	39	0·7	3	1	2	....	....	6	0·1	6	....	6	0·1	5,606
1947	6,021	....	6,021	93·3	101	237	....	338	5·2	....	49	9	....	58	1·0	13	11	1	....	....	25	0·3	8	....	8	0·1	6,450
1948	4,827	....	4,827	94·0	24	239	....	263	5·1	....	18	17	....	35	0·7	1	3	....	....	....	4	0·1	5	....	5	0·1	5,134
1949	5,162	....	5,162	94·0	24	239	....	263	4·8	....	20	31	....	51	1·0	3	2	....	1	....	6	0·1	7	....	7	0·1	5,489
1950	5,077	....	5,077	93·6	14	269	....	283	5·2	....	14	41	....	55	1·0	....	1	....	2	....	3	0·1	8	....	8	0·2	5,426
1951	4,642	....	4,642	93·9	13	248	....	261	5·3	....	9	20	....	29	0·6	....	4	1	1	....	6	0·1	4	....	4	0·1	4,942
1952	5,073	....	5,073	94·6	8	234	....	242	4·5	....	4	31	....	35	0·6	....	2	....	....	....	2	0·1	7	....	7	0·1	5,359
1953	4,474	....	4,474	93·03	74	225	....	299	6·22	....	8	24	....	32	0·6	....	2	....	....	....	2	0·1	2	....	2	0·1	4,809
1954	5,142	....	5,142	91·33	154	275	....	429	7·62	....	22	21	....	43	0·76	1	6	2	....	....	9	0·1	7	....	7	0·1	5,630
1955	4,559	....	4,559	90·40	63	386	....	449	8·90	....	9	22	....	31	·62	1	1	1	....	....	3	·06	1	....	1	·02	5,043
1956	4,600	....	4,600	90·78	25	401	....	426	8·41	....	8	25	....	33	·65	1	3	....	....	....	4	·08	4	....	4	·08	5,067
1957	3,925	....	3,925	89·08	30	424	....	454	10·30	....	8	10	....	18	·41	1	4	....	....	....	5	·12	4	....	4	·09	4,406
1958	5,154	....	5,154	90·20	46	483	....	529	9·26	....	15	9	....	24	·42	....	6	....	....	....	6	·10	1	....	1	·02	5,714

DIVISION X

Report of the Chief Coal Mining Engineer for the Year 1958

The Under Secretary for Mines:

I have the honour to submit the Annual Report on the operations of the Collie Coalfield for the year ending December 1958.

The aggregate output of all mines was 870,882 tons, as compared with 838,660 tons for the previous year. This represents an increase of 32,222 tons.

The deep mines produced 779,395 tons or 89.5 per cent. and the open cuts produced 91,487 tons or 10.5 per cent. of the total. The deep mine output is once again a record for the fourth successive year.

The total value of coal sold was £2,280,649 at an average cost of 52s. 4d. per ton as compared with 60s. 10d. per ton for the previous year. The reduction of 8s. 6d. per ton is due to higher efficiencies in the deep mines and is reflected in the average O.M.S. which increased from 2.55 tons during 1957 to 3.04 tons for 1958.

Details of the outputs of the individual mines and the value are shown on Table "A".

It must be noted that the output for 1958 is not a true indication of the productive capacity of the deep mines, as during the year the deep mines of the Western and Griffin Companies did not, by any means, produce to their capacity due to lack of orders. If the mines referred to had produced to capacity, the requirements of the State would easily have been produced from the deep mines.

During the year output at most of the mines was concentrated to as few working places as possible, with a consequent improvement in efficiency, and an increase in the number of working places held in reserve in case of contingencies common to coal mining.

Consumption of Coal.

The largest consumers of coal were the State Electricity Commission who consumed 428,580 tons or 49.21 per cent. at the Metropolitan and Bunbury Power Stations and 62,918 tons or 7.22 per cent. at the Collie Power Station, a total of 491,498 tons or 56.43 per cent. of the total consumption. This is an increase of 20,511 tons or 4.35 per cent. on the previous year. As the capacity of the Bunbury Power Station is increased, so the consumption by the State Electricity Commission will increase accordingly.

The W.A. Government Railways were the next highest consumers with a consumption of 280,520 tons or 32.21 per cent. of the total. This compares with 269,712 tons for the previous year, an increase of 10,808 tons or approximately 4 per cent.

Private consumers showed little change and consumed a total of 98,860 tons compared with 97,954 tons the previous year.

As a matter of interest the consumption of coal for the past five years is shown on Table "D".

DEVELOPMENTS.

Co-operative Mine.

This mine produced 222,361 tons or 25.53 per cent. of the total output, or 28.5 per cent. of the deep mined output. This compares with 171,245 tons for the previous year or an increase of 51,116 tons or 30 per cent. on the previous year's output.

The increase in output is due chiefly, to an increase in the number of employees, which increased from an average of 212 during 1957 to an average of 258 during 1958, and an improved efficiency as reflected in the O.M.S. which improved from an average of 2.85 tons during 1957 to 3.37 tons during 1958.

The main dips continued to advance satisfactorily, but did not reach the position where some geological disturbance is anticipated. It is important for the main dips to reach this position as soon as possible as the geological disturbance may be of a serious nature causing delay in the developments.

A Continuous Miner was ordered for this mine and should be in operation early during 1959.

Neath Mine.

This mine produced 224,906 tons during the year or 25.82 per cent. of the total output, or 29 per cent. of the deep mined output. This output compares with 172,339 tons for the previous year and is an increase of 52,567 tons or 30.5 per cent.

Early during the year an earth movement occurred and production ceased until the movement was brought under control. Considerable tonnage was lost, but in spite of same the mine was one of the highest producers of all the deep mines.

Developments continued progressively but were interrupted by the earth movement previously mentioned.

It was realised by the Mines Department and the Management that it might become essential to permanently seal off the old workings in the Cardiff Seam, but prior to doing so the make of water in the old workings would have to be controlled and drained into the Neath Seam. Both workings were coupled up by boreholes at strategic points for drainage purposes and adequate pumping plant installed in the Neath Seam.

The sumpage capacity in the Neath Seam was entirely inadequate to deal with the make of water in both seams. It was therefore decided to provide adequate sumpage room by commencing new main slants further north and utilising the existing slants for sumpage room. The existing slants were then stopped and duplicate slants commenced in the new position.

Developments were therefore temporarily stopped. The position however was quickly retrieved and normal developments resumed, which have continued progressively to date.

Developments on the West side of the mine have continued, but at a reduced rate due to the poor physical conditions of the area prospected. The prospects of successful developments in this area are not good and if such proves to be so will have a considerable effect on the future life of the mine. The Management are fully conscious of the position and have obtained prospecting leases with a view to developing a new mine to replace the Neath.

Stockton Mine.

The output of this mine increased from 72,612 tons during 1957 to 78,689 tons during 1958, an increase of 6,077 tons or 8.4 per cent. It was thus the fourth largest producer of the deep mines.

The driving of the main slants ceased early during the year. This policy meant the end of developments at the mine and consequently the end of the mine was in sight. Later during the year the Company decided to close the mine and transfer the employees to the Company's other mines.

At the end of the year only ten pairs of miners were employed at the mine and production was confined to the splitting of pillars in the top seam. Production at this mine will cease during 1959.

Ewington Mine.

This mine is still in the development stage, but in spite of same it produced an output of 63,880 tons as compared with 34,349 tons during the previous year, or an increase of 25,531 tons or 67 per cent. on the previous year's output.

There are two seams of coal available in the lease and the management would be well advised to develop the upper seam and work both seams simultaneously as otherwise the mine will become unbalanced, involving the duplication of main haulage roads and machinery. The leases are not, in my opinion, adequately bored, and it would be prudent to provide some more surface boreholes.

Western No. 1 Mine.

At the latter end of the year the Company decided to close this mine for economic reasons.

A new mine, Western No. 4, was commenced, the tunnel mouths being in the Western No. 3 Open Cut, which had ceased production in September.

Most of the employees from Western No. 1 were transferred to Western No. 4, and many to Western No. 2.

The output from Western No. 1 was 44,222 tons as compared with 61,393 tons for the previous year, a decrease of 17,171 tons which occurred after the Company had decided to close the mine.

Western No. 2 Mine.

Developments at this mine continued to make excellent progress and the mine has now approximately five years' coal developed and in reserve. The developments continue satisfactorily, thus increasing the amount of coal in reserve.

The mine is developed for the Retreating System of work and during the year one panel was brought into production with excellent results.

In spite of a comprehensive development programme, with most employees on such work, the mine was the third largest producer at Collie, producing 79,766 tons as compared with 53,677 tons the previous year. This is an increase of 26,089 tons or 49 per cent. on the previous year's output. This is once again a phenomenal increase and all concerned are to be warmly congratulated, especially as it is the most efficient deep mine at Collie.

Western No. 4 Mine.

This mine was commenced during the latter part of the year. The lease does not allow the development of a large mine as it is narrow and intersected by faults which may prove to be of a major nature.

The potentiality and life of the mine are at present very obscure and one cannot visualise this mine taking a major part in the future of Collie.

During the year the mine produced 7,565 tons or 0.86 per cent. of the total output.

Wyvern Mine.

Production at this mine was confined to the stripping of pillars.

During the year the mine produced 37,574 tons as compared with 40,801 tons the previous year, a decrease of 3,227 tons.

It will be appreciated that the life of the mine is a comparatively short one.

The Hebe Mine is being developed to absorb the employees when this mine is closed down.

Phoenix Mine.

There was no production at this mine during the year and only salvaging operations took place. Much valuable material was recovered which will be extremely useful at other mines.

Hebe Mine.

Production at this mine was restricted due to the reduced demand for coal.

The mine produced an output of only 20,432 tons as compared with 36,418 tons the previous year. This represents a reduction of 15,986 tons or 44 per cent. on the previous year's output.

Considering the developments which have been completed at this mine, an output far in excess of the previous year's could easily have been produced. Taking into consideration the small number of men employed, the developments completed and ready for production are phenomenal for the Collie Coalfield. The mine possesses an enormous potentiality which is progressively increasing.

Although the majority of the employees are on development work the results are amongst the most efficient at Collie.

General.

The year under review was difficult for all concerned, probably one of the most difficult in the career of the Coalfield.

In spite of the difficulties encountered the deep mines produced by far the highest output on record. This is the fourth year in succession to achieve such a record.

If all the mines had been allowed to produce to capacity there is no doubt that the deep mines would have produced all the State's requirements. In fact, the requirements could have been exceeded. It is many years since the deep mines have been in such a position.

During 1959 when the Stockton Mine closes, the whole of the output will be produced by mechanical means, and Collie will thus retain its position as the most highly mechanised coalfield in Australia.

However, there are many matters requiring the attention of the management. For many years it has not been accepted that the Retreating System of work is eminently suitable for the Coalfield but it is now generally accepted as the most suitable system.

Two mines have been fully laid out accordingly and although both are still in the development stages they are amongst the most efficient mines at Collie. Such efficiency will be improved as the mines come into production.

One need not again labour the advantages of the system but it is to be hoped that in future planning developments the system will be given pride of place.

Another matter requiring attention is the drainage of working places and main roads. Efficient drainage will provide a good floor which is so important in the matter of roof control. Reference to same was made in a previous report and one can only reiterate the comments made on that occasion.

Unfortunately much output was lost due to inadequate ventilation. As mentioned in previous reports the application of a little science would prevent such losses. It is suggested that a monthly survey of the ventilation be made at each mine and excessive losses of quantities and pressure be attended to. Good airways usually mean good and efficient outputs.

Experiments should be made to establish a standard of the environmental warmth of mine air. As the mines increase in depth it will become increasingly difficult to meet the conditions imposed by the Regulations.

A commencement was made to establish the geothermic gradient for the Coalfield but the work was interrupted. This matter should be pursued and finalised as soon as possible.

During the year successful experiments were made with roof bolting and there is no doubt that the system offers considerable benefits in roof control. These experiments should be continued as I am of the opinion that roof bolting at Collie is still in its infancy, and we are a long way from achieving all the benefits the system offers.

Accidents.

The total number of accidents reported to the Department was 124 as compared with 107 the previous year. This is an increase of approximately 15 per cent. which is a formidable increase yet it is still a considerable improvement on years previous to 1957 which year was the lowest on record.

The majority of the increase was due to the surface accidents increasing from 9 during 1957 to 21 during the year under review. This is an increase of 133 per cent. in surface accidents which is difficult to account for. Considering that most of the accidents can be considered as avoidable there is no reason why a considerable decrease in accidents should not take place.

Increased vigilance by all concerned would, I am sure, result in a decrease.

It is once again pleasing to report that no fatal accidents occurred during the year.

G. MORGAN,
Chief Coal Mining Engineer.

TABLE "A."

TABULATED DATA SHOWING ESTIMATED TONNAGE AND VALUE OF COAL SOLD IN 1958 FROM INDIVIDUAL MINES AS COMPARED WITH 1957.

Mines	1957		1958		Increase on 1957	Decrease on 1957	Estimated Value, 1957	Estimated Value, 1958
	Output	Percentage of Total	Output	Percentage of Total				
Deep Mines—	Tons		Tons		Tons	Tons	£	£
Co-operative	171,245	20·45	222,361	25·53	51,116	....	511,796	588,771
Neath	172,339	20·65	224,906	25·82	52,567	....	512,682	595,881
Stockton	72,612	8·56	78,689	9·03	6,077	....	219,898	211,280
Ewington	38,349	4·57	63,880	7·34	25,531	....	114,027	170,348
Wyvern	40,801	4·87	37,574	4·32	....	3,227	127,703	89,238
Phoenix	20,766	2·47	....	....	....	20,766	69,327	....
Centaur	22,281	2·65	....	....	....	22,281	72,949	....
Hebe	36,418	4·34	20,432	2·33	....	15,986	114,847	48,525
Western No. 1	61,393	7·34	44,222	5·07	....	17,171	194,343	120,022
Western No. 2	53,677	6·30	79,766	9·16	26,089	....	166,664	209,114
Western No. 4	....	....	7,565	·86	7,565	....	....	19,858
Total	689,881	82·26	779,395	89·50	89,514	....	2,104,236	2,280,649
Open Cuts—								
Stockton	16,776	2·00	....	....	....	16,776	48,008	....
Ewington	31,351	3·73	5,078	·58	....	26,273	91,854	13,507
Muja	57,437	6·86	51,739	5·94	....	5,698	176,498	122,881
Western No. 3	43,215	5·15	34,670	3·98	....	8,545	132,060	91,223
Total	148,779	17·74	91,487	10·50	....	57,292	448,240	227,611
Deep Mines	689,881	82·26	779,395	89·50	89,514	....	2,104,236	2,053,038
Open Cuts	148,779	17·74	91,487	10·50	....	57,292	448,420	227,611
GRAND TOTAL	838,660	100·00	870,882	100·00	32,222	....	2,552,656	2,280,649

TABLE B.

COMPARISON OF OVERALL PRODUCTION LOSSES FOR 1957 AND 1958 SHOWING WHERE LOSSES OCCURRED.

Year	Pit Top Meetings	Railway Wagon Shortages	Strikes	Other Causes	Total
	Tons	Tons	Tons	Tons	Tons
1957	3,547	5,030	670	4,530	13,777
1958	4,115	450	2,600	18,115	25,280
Increase on 1957	568	....	1,930	13,585	11,503
Decrease on 1957	....	4,580	....	....	....

Note.—Approximately 12,455 tons lost through no orders.

(9)—25646

TABLE C.

TABULATION SHOWING ESTIMATED APPORTIONMENT OF COAL SOLD DURING 1958.

Colliery	Locos.	Per cent.	Trams Power	Per cent.	Private Large	Per cent.	Private Small	Per cent.	Kalgoorlie Electric and Power Corp.	Per cent.	Collie Power House	Per cent.	Total
	Tons		Tons		Tons		Tons		Tons		Tons		Tons
Co-operative	85,300	9·79	*75,472	8·66	986	·01	....	....	....	....	62,884	7·22	‡224,642
Ewington Open Cut } Ewington .... }	9,870	·11	†53,201	6·54	3,654	·41	133	....	....	....	....	....	66,678
Neath	67,681	7·77	157,148	18·04	63	....	....	....	....	....	12	....	224,904
Stockton	46,551	5·34	22,764	2·64	9,370	·10	....	....	....	....	8	....	78,693
Wyvern	188	....	11,111	1·27	3,045	·03	20,470	2·35	3,168	·03	....	....	§37,982
Hebe .... } Muja Open Cut .... }	7,272	·83	22,318	2·56	2,146	·24	12,581	1·44	27,430	3·14	9	....	71,756
Western No. 1	4,863	·55	23,809	2·73	7,985	·91	130	....	7,434	·85	2	....	44,223
Western No. 2 .... Western No. 4 .... Western No. 3 Open Cut }	58,795	6·75	62,937	7·22	265	....	....	....	....	....	3	....	122,000
Total	280,520	32·21	428,580	49·21	27,514	3·15	33,314	3·82	38,032	4·36	62,918	7·22	870,878

NOTE: * Includes 470 tons for S.E.C. Gas. † Includes 24,292 tons for S.E.C. Gas. ‡ Includes 2,281 tons from Ewington Group.
§ Includes 415 tons from Muja and Hebe.

TABLE D.

TABULATION SHOWING ESTIMATED APPORTIONMENT OF COLLIE COAL SOLD DURING THE FIVE YEARS 1954–1958.

Year	Railways	Per cent.	S.E.C.	Per cent.	Collie Power House	Per cent.	Cement Works	Per cent.	Kalgoorlie Electric and Power Corp.	Per cent.	Private Consumers	Per cent.	Total
	Tons		Tons		Tons		Tons		Tons		Tons		Tons
1954	375,148	36·87	349,634	34·37	51,603	5·07	81,617	8·02	42,374	4·17	117,080	11·50	1,017,456
1955	318,986	35·30	353,802	39·15	51,777	5·73	65,826	7·28	37,977	4·20	75,423	8·34	903,791
1956	298,276	35·94	378,185	45·57	55,742	6·72	....	....	36,197	4·36	61,585	7·42	829,985
1957	269,712	32·16	*408,464	48·70	62,523	7·46	....	....	36,661	4·37	61,293	7·31	838,653
1958	280,520	32·21	†428,580	49·21	62,918	7·22	....	....	38,032	4·36	60,828	6·98	870,878
Increase or Decrease since 1954	—94,628	....	+78,946	....	+11,315	....	—81,617	....	—4,342	....	—56,252	....	—146,578
Per cent. Increase or Decrease since 1954	—25·22	....	+18·42	....	+17·98	....	—100·00	....	—10·27	....	—48·04	....	—14·40

NOTE: * Includes 17,434 tons for S.E.C. Gas. † Includes 24,762 tons for S.E.C. Gas.

TABLE E.

COLLIE COAL PRODUCED 1949–1958 (AS OFFICIALLY REPORTED TO THE MINES DEPARTMENT BY THE PRODUCERS).

	1949.	1950.	1951.	1952.	1953.	1954.	1955.	1956.	1957.	1958.
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
Open Cuts	206,650	258,310	368,330	411,344	393,147	410,616	304,130	208,541	148,779	91,487
Deep Mines	543,944	556,042	480,145	419,117	493,035	607,727	599,662	621,464	689,881	779,395
Aggregate All Mines	750,594	814,352	848,475	830,461	886,182	1,018,343	903,792	830,005	838,660	870,882
Percentage Open Cuts to Aggregate	27·53	31·72	43·41	49·53	44·36	40·32	33·65	25·13	17·74	10·51
Percentage Deep Mines to Aggregate	72·47	68·28	56·59	50·47	55·64	59·68	63·35	74·87	82·26	89·49
Persons Employed	1,044	1,099	1,125	1,281	1,463	1,560	1,386	1,219	1,136	1,075

TABLE F.

SERIOUS ACCIDENTS—COLLIE COALFIELD, 1958.

	Month												Total
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Major Injuries—Exclusive of Fatal—													
Fractures :													
Head													
Shoulder												1	1
Arm					1								1
Hand													
Spine													
Rib	1				2	1							4
Pelvis					1				1				2
Thigh													
Leg													
Ankle													
Foot													
Amputations :													
Arm													
Hand													
Finger				1				1					2
Leg													
Foot													
Toe													
Loss of Eye													
Serious Internal													
Hernia											1		1
Dislocations													
Other Major			1					1			1		3
Total Major	1		1	1	4	1		2	1		2	1	14
Minor Injuries—													
Fractures :													
Finger	1									1			2
Toe		1											1
Head			1										1
Eyes		1		2		2					1		6
Shoulder					1								1
Arm				1		1	2			1	1		6
Hand		2	1	3		4		4	1		1	1	17
Back	1		3	4	5	4	3	7	2	3	2	1	35
Rib												1	1
Leg	3	3	2	2	1		1	2		1			15
Foot	1		1		3	1			1	1			8
Other Minor		2	1	3		2	1	1	1	3	1	2	17
Total Minor	6	9	9	15	10	14	7	14	5	10	6	5	110

TABLE G.

ACCIDENT RATE FOR INDIVIDUAL MINES, SHOWING COMPARISON WITH 1957 (NOT INCLUDING CENTRAL WORKSHOPS AND OPEN CUTS).

Serious Accidents.

Mine	Number of Accidents				Total Number of Accidents		Number Employed		Rate per 100 men Employed		Rate per 100,000 tons Produced		Rate per 10,000 man-shifts Worked	
	Surface		Underground											
	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958	1957	1958
Co-operative	4	9	27	24	31	33	212	258	14·60	12·79	18·10	14·84	5·13	5·05
Neath	1	3	17	32	18	35	216	265	8·33	13·21	10·44	15·56	2·88	5·14
Stockton	2	3	6	13	8	16	113	126	7·08	12·69	11·02	20·33	2·63	5·31
Ewington		2	4	7	4	9	58	85	6·88	10·59	10·43	14·10	2·35	4·10
Black Diamond*			1		1		5		20·00				10·41	
Westralia*							4							
Wyvern			10	6	10	6	83	59	12·05	10·17	24·51	15·97	5·12	4·34
Phoenix			3		3		36		8·33		14·45		3·65	
Centaur*		1	5		5	1	46		10·87		22·44		4·71	
Hebe			2		2		58	26	3·44		5·49		1·46	
Western No. 1	2		10	10	12	10	126	97	9·52	10·31	19·54	22·61	3·86	4·12
Western No. 2		3	13	11	13	14	71	91	18·40	15·38	24·22	17·55	7·37	6·16
Western No. 4†								13						
Total	9	21	98	103	107	124	1,028	1,020	10·31	12·15	15·51	15·79	3·93	4·79

* These mines not in operation, men employed in recovering machinery. † In operation during latter part of year only.

TABLE H.

TABLE SHOWING FATAL ACCIDENT RATE PER 1,000 PERSONS EMPLOYED FOR EACH YEAR AND PROGRESSIVELY SINCE 1929 TO DATE.

Year	Men Employed		Fatal Accidents		Death Rate per 1,000	
	Current	Progressive	Current	Progressive	Current	Progressive
1929	858	858	4	4	4·66	4·66
1930	896	1,754	....	....	....	2·28
1931	752	2,506	1	5	1·35	2·00
1932	604	3,110	....	5	....	1·61
1933	626	3,736	1	6	1·59	1·61
1934	624	4,360	....	6	....	1·38
1935	689	5,049	2	8	2·90	1·58
1936	768	5,817	....	8	....	1·37
1937	723	6,540	....	8	....	1·22
1938	765	7,305	1	9	1·31	1·23
1939	752	8,057	1	10	1·33	1·24
1940	713	8,770	3	13	4·21	1·48
1941	781	9,551	2	15	2·56	1·57
1942	822	10,373	2	17	2·43	1·64
1943	838	11,211	1	18	1·19	1·60
1944	880	12,091	1	19	1·13	1·57
1945	860	12,951	1	20	1·16	1·54
1946	955	13,096	1	21	1·05	1·51
1947	1,032	14,938	....	21	....	1·40
1948	1,064	16,002	....	21	....	1·31
1949	1,044	17,046	1	22	0·96	1·29
1950	1,099	18,145	1	23	0·91	1·27
1951	1,125	19,270	2	25	1·77	1·29
1952	1,281	20,551	2	27	1·56	1·31
1953	1,463	22,014	2	29	1·37	1·32
1954	1,560	23,574	....	29	....	1·23
1955	1,386	24,060	1	30	0·72	1·24
1956	1,219	25,279	1	31	0·82	1·23
1957	1,136	26,415	....	31	....	1·17
1958	1,075	27,490	....	31	....	1·13

COAL MINES REGULATION ACT, 1946-1951.
ANNUAL REPORT OF THE BOARD OF EXAMINERS FOR MINE MANAGERS, UNDER MANAGERS AND DEPUTIES.

The Under Secretary for Mines:

We submit herewith the Annual Report of the Board of Examiners for the year 1958.

At a meeting of the Board held on 16th January, 1958, it was decided that, due to a surplus of Managers, Under Managers and Deputies, a recommendation be made to the Hon. Minister that no further examinations be held until those persons holding Certificates had been absorbed. After consideration of this recommendation it was decided to hold examinations once a year in order to give those persons desiring to obtain such Certificates the opportunity to do so. The matter to be reviewed from time to time.

October Examinations.—There was only one applicant for this examination. This was Mr. L. J. Adams who sat for a Second Class Certificate of Competency but who was unsuccessful.

G. MORGAN, Chairman,
Chief Coal Mining Engineer.

H. A. ELLIS, Member,
Government Geologist.

C. K. SWEENEY, Member,
Senior Inspector of Mines.

DIVISION XI

Report of the Chief Draftsman for the Year 1958

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 operations of the Surveys and Mapping Branch for the year ended 31st December, 1958.

Staff.

The staff of the Branch numbers 22. During the year one of our Senior Draftsmen Mr. J. Wilkinson resigned, his position has been filled by Mr. D. T. Pearce formerly of the Lands Department.

With the transfer of the Machinery Branch to Adelaide Terrace, much needed space was obtained.

My thanks are due to all the staff who have worked well during the year coping with an increasing amount of work in all sections.

Summarised reports of the Surveys, Survey Examination and Mapping Sections follow.

Surveys.

Three Surveyors were attached to the Department on a contract basis and work was completed as follows:—

L. M. Norman	5 field books—	83 surveys.
F. G. Medcalf	3 field books—	65 surveys.
E. Brook	5 field books—	29 surveys.
Totals	13 field books—	177 surveys.

Instructions for survey with relevant survey information were prepared and issued as required.

In addition to surveys of mining tenements, the following projects were completed:—

(1) Location and fixing of surveys of Mineral Claims for Manganese at Mt. Niclolas, Mt. Fraser Station by L. M. Norman.

(2) The re-survey of much of Norseman Townsite, as was necessary in the survey of Gold Mining Leases covering that Townsite by F. G. Medcalf.

The following localities were visited during the year by our Surveyors and surveys completed:—

Outside Proclaimed Goldfield:—

Lake Cowcowing.
Tutenup.
Yoganup.
Ludlow.
Capel.
Mt. Kokeby.
Kellerberrin.
Woolundra.
Baandee.
Hines Hill.
Marchagee.

Pilbara Goldfield:—
Pilgangoora.
Elys.
Cooglegong.
Moolyella.
Mt. Fraser.

Yalgoo Goldfield:—
Paynes Find.

Dundas Goldfield:—
Norseman.

Coolgardie Goldfield:—
Coolgardie.
Widgiemoultha.
Paris.

East Coolgardie Goldfield:—
Kalgoorlie.
Mt. Monger.
Boulder.

Yilgarn Goldfield:—
Southern Cross.
Ghooli.
Manxman.
Bullfinch.
Withers Find.
Yellowdine

At our request the Lands Department commenced a first order geodetic traverse, using the Telluro-meter electronic distance measuring device, from Trig. M1 near Callawa Station southwards along the Oakover and Davis Rivers to the vicinity of Roy Hill. 15 Stations were established over a traverse distance of 170 miles.

The established stations of this survey to form the nucleus control for the fixing of the manganese claim surveys.

Survey Examination.

The necessary office checks were completed and each survey was examined and checked to ensure—

(a) Survey accuracy.

(b) Legal accuracy.

The former being accomplished by mathematical computation and visual comparison with all available information, and the latter by an examination of all abutting leases and surveys and surface encroachments and an investigation of protection's for underground workings required by way of conditions imposed upon approval of the tenement.

These conditions are imposed "subject to survey" and when the boundaries have been fixed by survey, the conditions required can be determined.

Field experience under a Licensed Surveyor was arranged for the following cadets:—

	Days.
P. C. Alver	22
D. W. Stewart	8
J. N. Clift	13
R. E. Black	23
A. J. Smith	7
B. F. Dawson	7
D. A. Maxwell	3
Total	83

Two weeks of the field time for P. C. Alver was spent attached to Mr. F. G. Medcalf at Coolgardie and Kalgoorlie, and two weeks was similarly spent by R. E. Black at Norseman and environs.

Of his time, J. N. Clift spent one week assisting Geologist, R. R. Connolly to locate drilling sites at the Lady Loch Lease, Coolgardie.

The remaining times for all cadets were spent attached to Mr. E. Brook.

Geodetic.

Computations and plotting control for ten sheets on the Transverse Mercator Projection were completed.

General.

Duplicate and original plans were prepared for 49 Lease Instruments and diagrams of surrender and resumption carried out as required.

Mapping.

The main mapping for Standard Plans and base maps and plans for reproduction were carried out as follows:—

(1) Mineral Map of W.A. drawn and published—(Scale: 40 miles to an inch).
(2) Goldfields Map of W.A. drawn and published—(Scale: 40 miles to an inch).
(3) 20 maps prepared on astrafoil (80 and 20 chain scale) of areas in Pilbara Goldfield.
(4) 13 Standard Plans completed on the Transverse Mercator Projection.
(5) 79 plans prepared for Geological Surveys, plus 359 prints.
(6) Five plans and 13 transparencies prepared for publication in Bulletin 105, part 2.
(7) Miscellaneous plans completed for the State Mining Engineer, Chemical Laboratories, Explosives Branch, Inspection of Machinery Branch, Kalgoorlie School of Mines and the Chief Coal Mining Engineer.
(8) Eight maps of Collie, at 20 chain scale, on astrafoil for reproduction in four colours were commenced.
(9) 96 surveys plotted on Standard Compilations.
(10) General air-photo interpretation carried out as required.
(11) Drawings, diagrams and cover for the Annual Report completed.

Public Plans.

Work carried out by this section is as follows, in addition all public enquiries re surveys, cadastral plans, underground plans and surveys, lease boundaries, etc., were attended to.

Number of applications dealt with	1,245
Number of Public plans in use and maintained	456
Number of existing mining tenements maintained on Public Plans	4,211
Number of Maps, Underground Plans, Sketches, etc., supplied to Outstations and the Public	285

General liaison work is carried out with various Government Departments, private companies and the public.

All questions of alienation in Goldfields, reserving of land, reports, field inspections and checks and the increasing complexities of titles and mining on private property in the South West Mining District were supervised.

(Sgd.) L. A. JONES,
Chief Draftsman.

MINING STATISTICS

to 31st December, 1958

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TABLE I.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1958, 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. † Denotes mainly derived from Silver Lead Ore. ‡ Denotes mainly derived from Copper Ore. § Concentrates. || Tantalum.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
Kimberley Goldfield.												
Brockman	....	Voided leases	....	....	....	....	....	....	....	1,545·75	1,455·34	....
		Sundry claims	....	....	....	....	....	7·62	7·62	2,484·00	1,871·92	....
Halls Creek	....	Voided leases	....	....	....	....	....	....	....	423·00	477·76	....
		Sundry claims	....	....	....	....	....	27·73	....	217·05	179·57	12·64
Mary	....	Voided leases	....	....	....	....	....	82·66	951·52	399·00	210·03	....
		Sundry claims	....	....	....	....	....	....	14·36	46·85	53·66	....
Mt. Dockrell	....	Voided leases	....	....	....	....	....	9·17	13·66	1,173·70	1,206·09	93·00
		Sundry claims	....	....	....	....	....	18·89	31·31	160·00	89·64	....
Panton	....	Voided leases	....	....	....	....	....	....	....	42·95	140·47	....
		Sundry claims	....	....	....	....	....	....	6·28	6·15	18·01	....
Ruby Creek	ML97	Ruby Queen	....	....	30·00	8·18	....	....	....	3,069·25	1,726·56	2·14
		Voided leases	....	....	....	....	....	....	16·05	12,902·20	9,619·82	....
		Sundry claims	....	....	....	....	....	12·71	....	281·25	183·30	....
		From Goldfield generally :—										
		Sundry claims	....	....	....	....	....	....	....	....	....	†20·98
		Reported by Banks and Gold Dealers	5·51	36·61	....	....	....	8,821·93	1,843·17	·75	2·53	....
		Total	**5·51**	**36·61**	**30·00**	**8·18**	....	**8,980·71**	**2,883·97**	**22,751·90**	**17,234·70**	**128·76**

West Kimberley Goldfield.

Napier Range	M.C. 29	Devonian Silver Lead Mine	....	....	....	....	....	....	....	....	....	....	....	†13,575·29
	From Goldfield generally :—													
		Sundry claims	....	....	....	....	....	1·30	24·68	1·00	2·49	....
		Total	....	....	....	....	....	**1·30**	**24·68**	**1·00**	**2·49**	**13.575·29**

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Bamboo Creek	1120	Bamboo Queen	....	....	18·00	7·43	....	....	....	88·50	30·99	·34
	1107	Bulletin	....	....	....	....	....	....	....	845·50	416·91	2·02
	850	Federation	....	....	....	....	....	....	8·22	3,026·00	2,203·86	6·35
	1118	Kitchener	....	....	....	....	....	....	....	100·00	40·03	1·05
	1096, 1095, 1097	Mt. Prophecy Leases	....	....	142·00	20·09	....	....	24·50	2,406·00	979·23	49·63
	817	Prince Charlie	....	....	823·25	389·16	....	....	3·68	5,719·25	4,670·20	79·42
	1072	Princess May	....	....	....	....	....	....	....	92·50	24·27	....
	924	True Blue	....	....	113·00	2·20	....	....	....	2,491·75	95·96	....
		Voided leases	....	....	....	....	....	13·54	560·19	46,237·85	53,505·43	2·62
		Sundry claims	....	....	....	....	....	8·97	307·83	5,174·85	3,022·97	7·21
Boodalyerrie	....	Voided leases	....	....	....	....	....	....	292·07	120·25	587·86	....
		Sundry claims	....	....	....	....	....	....	7·16	....	....	....
Braeside	....	Sundry claims and producers	....	....	....	....	†163·06	....	....	....	†25,853·75	....
Lalla Rookh	....	Voided leases	....	....	....	....	....	....	4·78	3,612·00	4,696·33	574·01
		Sundry claims	....	....	....	....	....	....	....	7,943·00	7,675·09	....
Marble Bar	930	Alexander Leases	....	....	....	....	....	....	....	345·50	120·94	·81
	1094	Blue Bar	....	....	189·00	26·93	....	....	....	944·50	130·14	....
	1111	Four Acres	....	....	7·00	4·37	....	....	....	24·00	9·11	....
	927, etc.	Halleys Comet	....	....	....	....	....	....	....	6,360·00	6,390·33	680·36
	1125	Laura Dawn	....	....	....	....	....	....	....	43·00	53·47	3·06
	1121	Little Portree	....	....	....	....	....	....	....	103·00	66·88	6·93
	1089	Repeater	....	....	....	....	....	....	....	548·20	123·83	6·26
		Voided leases	....	....	....	....	....	....	245·07	165,930·29	151,637·42	586·29
		Sundry claims	....	....	88·50	30·68	....	67·08	251·77	20,955·54	12,795·42	9·43
North Pole	1122 (1124)	Normay Leases	....	....	....	....	....	....	....	1,685·00	1,435·98	1,755·28
		Voided leases	....	....	....	....	....	....	....	4,339·00	1,930·51	260·08
		Sundry claims	....	....	....	....	....	....	....	669·75	298·62	15·82
North Shaw	....	Voided leases	....	....	....	....	....	7·53	....	1,072·45	996·29	....
		Sundry claims	....	....	....	....	....	2·84	579·91	179·75	121·72	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
PILBARA GOLDFIELD—continued.												
MARBLE BAR DISTRICT—*continued.*												
Pilrangoora	M.C. 291	Northern Territory Prospecting and Development Co. Ltd.			....	4·40	....	....	2·12	....	39·54	....
		Voided leases	....	....	....	....	....	16·65	....	2,255·00	403·60	....
		Sundry claims	....	....	2·00	3·76	....	161·08	45·64	483·60	150·15	....
Sharks	G. M. L. 108, 1081, etc.	Table Top Leases	....	....	....	....	....	....	....	1,082·75	594·97	17·28
		Voided leases	....	....	....	....	....	1·43	....	1,739·50	1,969·65	1·16
		Sundry claims	....	....	....	....	....	163·14	47·93	1,159·50	1,675·34	·97
Talga Talga	....	Voided leases	....	....	....	....	....	....	93·15	1,799·00	1,760·68	....
		Sundry claims	....	....	....	....	....	76·17	85·18	1,975·90	1,499·86	·70
Tambourah	....	Voided leases	....	....	....	....	....	....	73·90	1,603·50	1,886·22	....
		Sundry claims	....	....	....	....	....	89·52	294·75	3,742·25	2,689·78	....
Warrawoona	1013	Trump	....	....	295·00	23·96	....	....	....	4,700·05	687·03	10·36
		Voided leases	....	....	....	....	....	....	16·99	13,049·25	18,958·41	13·34
		Sundry claims	....	....	....	....	....	70·98	623·67	6,632·79	4,247·38	·08
Western Shaw	....	Voided leases	....	....	....	....	....	....	....	1,222·50	957·80	....
		Sundry claims	....	....	....	....	....	22·34	67·47	71·50	81·49	....
Wodgina	....	Sundry claims	....	....	....	....	....	....	43·37	·50	....	3·25
Wymans Well	1084	New Copenhagen	....	....	104·55	5·37	....	....	....	614·55	150·11	1·35
		Voided leases	....	....	....	....	....	....	42·86	2,977·29	1,258·44	....
		Sundry claims	....	....	11·50	8·61	....	4·47	51·52	2,707·46	1,322·28	1·47
Yandicoogina	....	Voided leases	....	....	....	....	....	....	140·76	3,159·20	6,218·83	....
		Sundry claims	....	....	....	....	....	4·32	239·89	574·50	642·82	40·96
		From District generally :—										
		Sundry Parcels treated at :										
		J. A. Copenhagen Plant (L.T.T. 1390H)	....	....	49·00	11·73	....	....	....	49·00	11·73	....
		State Battery, Bamboo Creek	....	....	....	272·07	....	....	....	40·00	11,511·65	190·95
		State Battery, Marble Bar	....	....	....	....	....	....	....	12·00	11,181·91	1·15
		Various Works	....	....	....	....	....	....	....	237·95	1,908·24	5·54
		Reported by Banks and Gold Dealers (Silver/Lead)	1·93	....	....	....	†48·54	14,496·78	456·67	....	15·41	†2,223·98
		Total	**1·93**	....	**1,842·80**	**810·76**	**211·60**	**15,252·82**	**4,565·07**	**332,955·97**	**325,883·11**	**32,413·26**

NULLAGINE DISTRICT.

Eastern Creek	....	Voided leases	....	....	....	....	....	8·96	8·19	5,594·00	9,854·21	14·76
		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	229L	Barton	....	....	394·00	110·72	....	1·22	....	7,410·00	4,093·65	35·28
	231L	Blue Spec Mining Co. N.L.	....	....	....	*6·12	....	....	....	53,391·41	32,004·76	10·99
		Voided leases	....	....	....	....	....	....	1·02	18,459·65	11,718·61	8·37
		Sundry claims	....	....	111·00	12·76	....	....	18·69	6,047·85	2,426·72	....
Mosquito Creek	331L	Ard Patrick	10·80	....	78·00	10·21	....	10·80	....	78·00	10·21	....
		Voided leases	....	....	....	....	....	1·07	30·12	8,392·30	12,839·13	....
		Sundry claims	....	....	....	....	....	....	181·64	3,707·44	3,789·21	....
Nullagine	292L	Alice	....	....	....	....	....	3·85	1,159·85	138·85	331·29	63·45
		Voided leases	....	....	....	....	....	....	599·59	9,192·75	13,376·46	36·92
		Sundry claims	....	....	90·00	9·82	....	315·53	681·09	6,562·05	10,515·93	15·22
Spinaway Well	314L	Copper Hills Copper Mine	....	....	....	‡15·44	....	....	....	....	‡15·44	‡483·78
Twenty Mile Sandy	M.C. 112L	J. C. & G. M. Baker	....	....	....	....	....	....	....	....	‡·93	‡51·20
		Voided leases	....	....	....	....	....	....	16·97	7,243·70	9,007·72	320·50
		Sundry claims	....	....	....	....	....	33·10	30·50	7,793·85	6,283·29	2·76
	From District generally :—											
	Sundry Parcels treated at :											
	Barton Battery (T.A. 9L)	....	....	....	....	....	....	....	....	....	*45·19	....
	McKinnons Sluicing Plant (D.C. 10L, 14L, 15L)	....	....	....	....	....	3·89	2·23	....	7·20	....
	Various Works	....	....	....	....	....	....	....	124·50	8,110·35	1·37
	Reported by Banks and Gold Dealers	....	15·09	....	....	....	10,004·47	130·64	....	29·81	5·80
	Total	**10·80**	**15·09**	**673·00**	**165·07**	....	**10,382·89**	**2,881·55**	**136,436·70**	**128,259·82**	**1,067·30**

West Pilbara Goldfield.

Croydon	....	Voided leases	....	....	....	....	....	....	....	8·00	5·44	....
Hong Kong	....	Voided leases	....	....	....	....	....	....	....	331·00	442·45	....
		Sundry claims	....	....	....	....	....	21·40	·02	9·00	3·15	....
Lower Nicol	....	Voided leases	....	....	....	....	....	....	1·10	653·20	402·22	....
		Sundry claims	....	....	41·00	9·12	·05	10·44	2·71	51·00	20·63	·05
Mallina	....	Voided leases	....	....	....	....	....	....	....	141·60	128·44	....

Table I.—*Production of Gold and Silver from all sources*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
WEST PILBARA GOLDFIELD—continued.												
Nicol	....	Voided leases	....	....	....	....	....	....	....	30·00	11·47	....
Pilbara	....	Voided leases	....	....	....	....	....	9·90	48·12	267·00	432·84	....
		Sundry claims	....	....	....	....	....	1·11	86·24	163·00	255·42	....
Roebourne	....	Voided leases	....	....	....	....	....	....	....	2,396·86	1,424·04	385·15
		Sundry claims	....	....	....	....	....	15·47	3·29	1,934·85	811·86	130·21
Station Peak	....	Voided leases	....	....	....	....	....	177·74	41·37	11,016·00	11,388·18	·08
		Sundry claims	....	....	....	....	....	·69	....	86·50	77·23	....
Towranna	....	Voided leases	....	....	....	....	....	....	2·62	3,965·80	5,187·51	....
		Sundry claims	....	....	....	....	....	....	....	22·00	12·35	....
Upper Nicol	....	Sundry claims	....	....	....	....	....	....	....	6·50	2·57	....
Weerianna	....	Voided leases	....	....	....	....	....	....	....	3,200·15	3,214·45	....
		Sundry claims	....	....	....	....	....	....	....	336·00	135·26	1·29
Whim Creek	....	Voided leases	....	....	....	....	....	....	....	....	....	‡883·80
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	Various Works		....	....	....	....	....	....	....	....	*102·39	4·90
	Sundry claims and leases		....	....	....	....	....	....	11·77	....	....	†503·36
	Reported by Banks and Gold Dealers		2·68	....	....	3·22	·06	6,100·71	177·50	103·50	231·54	·87
		Total	**2·68**	....	**41·00**	**12·34**	**·11**	**6,337·46**	**374·74**	**24,721·96**	**24,289·44**	**1,909·71**
Ashburton Goldfield.												
Belvedere	....	Voided leases	....	....	....	....	....	....	9·88	1,560·00	435·86	176·48
Dead Finish	....	Voided leases	....	....	....	....	....	....	....	1,699·00	874·60	·03
		Sundry claims	....	....	....	....	....	....	11·89	104·25	245·08	....
Linden Station	....	Sundry claims	....	....	....	....	....	....	....	128·35	203·51	....

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 Goldfield generally ;—												
Sundry claims		....	....	....	....	1,166·52	....	....	....	....	33,372·57
Reported by Banks and Gold Dealers		....	....	....	....	....	8,889·78	123·17	....	7·12	....
		Total	....	....	....	**1,166·52**	**9,266·82**	**482·46**	**6,807·10**	**2,913·43**	**41,556·28**

Gascoyne Goldfield.

Bangemall	....	Voided Leases	....	....	....	....	....	....	6·22	350·70	313·82	....
		Sundry claims	....	....	....	....	....	88·97	33·55	36·30	203·47	....
Carnarvon	M.C. 4	Allan McDonald	....	5·76	....	....	....	....	5·76	....	....	....
From Goldfield generally :—												
Reported by Banks and Gold Dealers		....	....	....	....	....	604·47	23·20	....	....	....
		Total	....	**5·76**	....	....	....	**693·44**	**68·73**	**387·00**	**517·29**	....

Peak Hill Goldfield.

Bulloo Downs	....	Voided leases	....	....	....	....	....	....	....	....	....	†50·09
Egerton	....	Voided leases	....	....	....	....	....	62·31	224·68	7,292·25	6,604·91	....
		Sundry claims	....	....	....	....	....	235·35	23·51	1,501·77	791·34	....
Horseshoe	G.M.L. 568P	Horseshoe	....	....	2,438·00	341·84	....	....	....	3,777·00	502·11	....
	568P, etc.	Anglo-Westralian Mining Co. Pty. Ltd.	....	....	....	....	....	....	....	135,872·00	22,870·80	1,407·05
		Prior to transfer	....	....	....	....	....	....	....	3,914·00	894·44	....
	575P	Labourchere Main Lode	....	....	282·00	33·05	....	....	....	1,022·00	103·08	....
		Voided leases	....	....	....	....	....	15·87	1,975·37	4,371·38	2,684·27	2·00
		Sundry claims	....	....	71·00	17·85	....	20·12	829·58	2,191·35	790·99	....
Jimblebar	....	Voided leases	....	....	....	....	....	....	172·75	7,526·25	2,561·95	·58
		Sundry claims	....	....	....	....	....	13·79	65·95	1,048·05	574·16	....
Mt. Fraser	....	Voided leases	....	....	....	....	....	....	....	389·50	320·96	....
		Sundry claims	....	....	80·00	118·98	....	88·28	40·61	480·75	460·12	....
Mt. Seabrook	....	Voided leases	....	....	....	....	....	....	5·05	620·25	428·26	....
		Sundry claims	....	....	....	....	....	....	....	1,089·35	803·12	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
PEAK HILL GOLDFIELD—continued.												
Peak Hill	G.M.L. 512P	Atlantic	....	....	....	....	....	1·69	2·87	4,703·75	589·15	....
	511P	Commercial	....	....	....	....	....	....	....	3,745·25	591·05	....
	584P	Dazzle Star	....	....	....	....	....	....	....	303·00	80·98	....
	567P	Miner Bird	....	....	350·00	110·79	....	....	....	2,000·00	886·91	....
	553P	Morning Star	....	....	....	....	....	....	4·43	P2,804·25	410·09	....
	587P	Murray Heath	....	....	....	....	....	....	....	41·00	6·17	....
	506P	No. 1, North	....	....	40·00	3·08	....	....	86·47	7,202·70	1,659·89	....
	492P	North Star	....	....	....	....	....	23·20	69·63	13,186·50	2,079·21	....
		Voided leases	....	....	....	....	....	7·39	920·21	521,841·33	247,054·04	2,285·63
		Sundry claims	....	....	6·50	9·38	....	61·51	306·63	34,406·35	8,955·54	....
Ravelstone	....	Voided leases	....	....	....	....	....	....	101·64	4,219·85	3,117·68	....
		Sundry claims	....	....	....	....	....	....	....	553·60	283·17	....
Wilgeena	....	Voided leases	....	....	....	....	....	....	23·54	230·50	156·25	....
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 Goldfields generally :—										
		Sundry Parcels treated at :										
		Australian Machinery and Investment Co.	....	....	....	....	....	....	....	....	*1,686·20	....
		State Battery, Peak Hill	....	....	....	*2·52	....	....	3·05	15·00	*7,171·41	....
		Various Works	....	....	....	....	....	....	....	30·00	*5,661·37	23·12
		Reported by Banks and Gold Dealers	....	....	....	....	....	2,847·65	444·36	....	12·51	....
		Total	....	....	3,267·50	637·49	....	3,376·86	5,300·33	766,651·73	321,078·39	3,768·47

East Murchison Goldfield.

LAWLERS DISTRICT.

Kathleen Valley	....	Voided leases	....	....	....	....	....	....	144·85	80,503·66	49,020·54	....
		Sundry claims	....	....	....	‡6·96	‡462·50	14·37	526·03	5,693·75	2,642·98	‡893·45

Lawlers	1236	Waroonga	....	....	....	....	....	....	....	....	....	*99·40	·50
		Voided leases	....	....	....	....	....	25·51	692·45	1,622,917·40	575,150·65	14,803·08	
		Sundry claims	....	....	....	....	....	400·21	451·61	17,347·48	9,568·69	268·34	
Sir Samuel	....	Voided leases	....	....	....	....	....	....	359·03	275,417·55	141,829·52	10,234·80	
		Sundry claims	....	....	....	....	....	57·64	64·96	7,728·00	4,571·48	·02	
Wildara Station	....	Sundry claims	103·51	....	....	....	....	103·51	....	....	....	....	
	From District generally :—												
	Sundry Parcels treated at :												
	State Battery, Sir Samuel	....	....	....	....	....	....	....	53·50	*2,356·81	....		
	Vanguard Cyanide Plant	....	....	....	....	....	....	....	4·00	*1,014·04	3·18		
	Western Machinery Co. Pty. Ltd.	....	....	....	....	....	....	....	5·00	*4,291·25	29·00		
	Prior to transfer to present holders	....	....	....	....	....	....	....	....	*1,371·33	15·64		
	Various Works	....	....	....	....	....	2·12	2·35	1,711·53	*30,788·76	936·21		
	Reported by Banks and Gold Dealers	14·81	....	....	....	....	6,423·01	101·91	·05	10·00	....		
	Total	**118·32**	....	....	**6·96**	**462·50**	**7,026·37**	**2,343·19**	**2,011,381·92**	**822,715·45**	**27,184·22**		

WILUNA DISTRICT.

Coles	....	Voided leases	....	....	....	....	....	....	....	2,765·50	1,240·40	....	
		Sundry claims	....	....	....	....	....	....	21·03	3,844·50	1,507·23	....	
Corboys	....	Voided leases	....	....	....	....	....	5·24	1·25	14,946·29	11,036·71	5·00	
		Sundry claims	....	....	....	....	....	21·58	....	9,082·35	5,210·79	....	
Gum Creek	....	Voided leases	....	....	....	....	....	20·75	....	1,380·00	595·73	....	
		Sundry claims	....	....	....	....	....	....	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	....	Voided leases	....	....	....	....	....	5·74	95·70	5,364·25	3,490·87	....	
		Sundry claims	....	....	....	....	....	9·31	5·78	4,534·75	3,111·97	....	
Wiluna	G·M.L. 280J	Lake Violet Consols Deeps	....	....	....	9·45	....	....	....	....	226·96	4·50	
	679J	Lone Hand	....	....	....	....	....	....	....	1,604·75	127·50	....	
		Voided leases	....	....	....	....	....	....	574·76	8,776,381·90	1,788,772·66	10,044·63	
		Sundry claims	....	....	....	....	....	105·39	225·82	27,419·40	10,885·40	·33	
	From District generally :—												
	Sundry Parcels treated at :												
	State Battery, Wiluna	....	....	....	....	....	....	....	637·00	*23,679·00	219·70		
	Various Works	....	....	....	....	....	....	....	139·00	*5,322·12	12·72		
	Reported by Banks and Gold Dealers	....	....	....	*90·86	11·75	52·03	56·58	....	155·97	11·75		
	Total	....	....	....	**100·31**	**11·75**	**224·85**	**1,254·11**	**8,873,554·94**	**1,872,170·42**	**10,298·63**		

Table I.—*Production of Gold and Silver from all sources, etc.*—**continued.**

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
EAST MURCHISON GOLDFIELD—continued.												
BLACK RANGE DISTRICT.												
Barrambie	1116B	Dingo	....	....	1·00	201·93	....	....	....	1·00	201·93	....
	1117B	Scheelite Leases	....	....	176·75	143·82	....	....	....	176·75	143·82	....
		Voided leases	....	....	....	....	....	....	22·49	18,443·92	17,355·15	125·60
		Sundry claims	....	....	....	....	....	5·07	170·20	978·55	1,062·22	216·73
Bellchambers	....	Voided leases	....	....	....	....	....	....	111·80	4,349·27	3,130·56	....
		Sundry claims	....	....	....	....	....	....	....	1,182·80	557·95	....
Birrigrin	....	Voided leases	....	....	....	....	....	....	820·68	12,042·93	15,086·09	....
		Sundry claims	....	....	....	....	....	....	179·92	2,487·55	1,238·22	....
Currans	....	Voided leases	....	....	....	....	....	18·24	222·89	7,252·25	3,116·68	....
		Sundry claims	....	....	....	....	....	....	29·38	2,158·75	827·18	....
Errolls	....	Voided leases	....	....	....	....	....	14·17	152·29	14,170·50	9,328·92	....
		Sundry claims	....	....	....	....	....	6·53	399·11	964·75	595·45	....
Hancocks	....	Voided leases	....	....	....	....	....	....	6,968·16	33,726·00	36,664·76	55·72
		Sundry claims	....	....	149·00	8·65	....	4·21	142·89	8,608·10	3,228·18	....
Maninga Marley	....	Voided leases	....	....	....	....	....	....	195·20	60,833·48	48,491·40	22·55
		Sundry claims	....	....	....	....	....	....	158·16	3,079·65	1,768·16	....
Montague	....	Voided leases	....	....	....	....	....	....	100·17	79,550·60	23,444·82	....
		Sundry claims	....	....	....	....	....	....	71·09	5,041·35	3,171·19	....
Nunngarra	....	Voided leases	....	....	....	....	....	25·94	952·34	9,509·00	3,655·49	....
		Sundry claims	....	....	....	....	....	50·27	1,458·98	7,636·40	2,953·69	....
Sandstone	1114B	Black Range Gold Mine	....	....	36·00	203·47	....	....	....	36·00	203·47	....
	958B	Lady Mary	....	....	....	....	....	....	383·35	7,165·75	7,119·35	2·35
		Voided leases	....	....	....	....	....	4·75	4,363·69	696,431·82	447,563·94	11,754·22
		Sundry claims	....	....	279·25	30·04	....	44·95	1,421·07	15,910·70	6,912·49	....
Youanmi	....	Voided leases	....	....	....	....	....	·36	126·92	731,497·55	273,884·97	10,474·10
		Sundry claims	....	....	....	....	....	1·07	18·79	6,258·55	1,814·66	....

From District generally :—													
Sundry Parcels treated at :													
State Battery, Sandstone	....	....	....	....	*3·07	....	....	....	....	290·50	*23,575·34	61·02
State Battery, Youanmi	....	....	....	....	....	....	....	....	....	40·00	*5,504·08	....
Various Works	....	....	....	....	....	....	....	....	....	104·50	11,496·73	....
Reported by Banks and Gold Dealers	....	....	....	....	....	....	1,494·84	52·23	....	....	20·38	....
Total	....	....	**642·00**	**590·98**	....	**1,670·40**	**18,521·80**	**1,729,928·97**	**954,120·27**	**22,712·29**

Murchison Goldfield.

CUE DISTRICT.

Big Bell	2282	Orange Bell	....	....	....	....	....	....	....	373·25	84·41	2·34
	2274	Silver City	....	....	43·50	11·68	....	....	....	80·25	30·13	....
		Voided leases	....	....	....	....	....	....	4·49	5,539,857·75	730,970·13	251,813·67
		Sundry claims	....	....	....	....	....	·39	6·32	553·25	479·76	6·61
Cuddingwarra	....	Voided leases	....	....	....	....	....	10·59	132·46	102,115·91	56,152·11	100·71
		Sundry claims	....	....	98·25	8·60	....	18·46	384·38	10,307·89	5,717·12	16·85
Cue	2279	New Light	....	....	8·00	3·95	....	....	....	8·00	3·95	....
	2247	Victory	....	....	....	....	....	....	....	226·75	125·38	....
		Voided leases	....	....	....	....	....	202·71	911·60	290,134·49	222,197·86	73·03
		Sundry claims	....	....	238·30	21·15	....	252·92	894·70	46,740·49	20,471·13	4·24
Eelya	2241	Eagle Hawk	....	....	....	....	....	....	....	1,408·75	417·30	....
		Voided leases	....	....	....	....	....	....	8·78	1,069·00	1,811·26	....
		Sundry claims	....	....	....	....	....	6·20	143·81	2,309·90	1,099·24	1·31
Mindoolah	....	Voided leases	....	....	....	....	....	3·07	2·54	9,380·28	5,672·31	42·97
		Sundry claims	....	....	....	....	....	....	29·30	3,299·60	2,345·43	....
Reedy	2253	Rand No. 3	....	....	....	....	....	....	....	4,152·25	1,356·56	....
	2261	West Rand	1·36	2·98	53·75	67·95	....	1·36	2·98	53·75	67·95	....
		Voided leases	....	....	....	....	....	1·46	216·72	725,487·43	238,924·59	20,467·28
		Sundry claims	....	....	145·00	13·49	....	170·71	137·16	7,229·00	2,680·84	·62
Tuckabianna	2237	Gidgee	....	....	....	....	....	....	297·73	2,789·90	2,108·79	33·57
	2244	Winston	....	....	40·20	7·00	....	....	671·45	791·00	362·49	4·05
		Voided leases	....	....	....	....	....	649·70	324·77	13,152·23	7,465·12	....
		Sundry claims	....	....	146·75	28·06	....	154·26	489·40	5,315·35	2,760·81	·20
Tuckanarra	....	Voided leases	....	....	....	....	....	85·37	3,511·10	19,490·00	22,828·99	172·77
		Sundry claims	....	....	....	....	....	115·23	792·07	10,190·80	10,307·86	....
Weld Range	....	Voided leases	....	....	....	....	....	....	23·64	2,169·75	1,137·11	....
		Sundry claims	....	....	....	....	....	....	3·90	1,438·50	1,136·41	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
		MURCHISON GOLDFIELD—continued.										
		CUE DISTRICT—*continued.*										
		From District generally :—										
		Sundry Parcels treated at :										
		F. Hill (L.T.T. 2/58)	....	....	....	*10·12	....	....	....	....	*10·12	....
		J. A. Gill (L.T.T. 2/56)	....	....	....	....	....	....	....	53·00	*58·30	6·54
		John C. Zadow (L.T.T. 1386H)	....	....	....	*135·84	....	....	....	....	*135·84	....
		H. Bradbrook (L.T.T. 4/57)	....	....	4·00	26·53	....	....	....	4·00	*148·40	14·82
		J. Hamilton (L.T.T. 1385H)	....	....	17·75	*145·86	22·31	....	....	17·75	*185·99	22·31
		B. Woinar (L.T.T. 5/57)	....	....	....	*18·35	....	....	....	....	*93·04	15·06
		F. W. Turner (L.T.T. 1/57)	....	....	....	....	....	....	....	....	*5·95	....
		D. Oliver (L.T.T. 10/57)	....	....	....	*8·02	....	....	....	....	*8·02	....
		State Battery, Cue	....	....	....	*71·00	....	....	....	76·25	*26,418·75	123·99
		State Battery, Tuckanarra	....	....	....	....	....	....	....	518·50	*5,535·57	....
		Various Works	....	....	....	....	....	....	....	8,022·27	*29,521·58	1,147·77
		Reported by Banks and Gold Dealers	·17	....	....	....	....	3,421·57	109·87	....	22·62	·07
		Total	**1·53**	**2·98**	**795·50**	**577·60**	**22·31**	**5,094·00**	**9,099·17**	**6,808,817·29**	**1,400,859·22**	**274,070·78**
		MEEKATHARRA DISTRICT.										
Abbott's		Voided leases	....	....	....	....	....	....	26·45	36,841·35	38,775·28	....
		Sundry claims	....	....	132·00	9·65	....	....	5·29	3,951·57	2,357·54	....
Burnakura		Voided leases	....	....	....	....	....	....	3,247·59	39,172·70	30,890·16	26·90
		Sundry claims	....	....	....	....	....	17·03	129·24	2,486·55	1,310·84	1·54
Chesterfield	C.M.L. 1942N, 1946N	Margueritta Leases	....	....	190·00	47·27	6·65	....	....	2,230·00	578·16	6·65
	1946N	(Margueritta, East)	....	....	....	....	....	....	....	1,420·00	250·09	10·65
	1942N	(Margueritta)	....	....	....	....	....	....	....	732·00	197·73	7·74
		Voided leases	....	....	....	....	....	29·02	420·32	6,875·26	7,500·57	·80
		Sundry claims	....	....	....	....	....	....	42·19	960·55	740·97	....
Gabanintha	(1948N)	Fortuna	....	....	....	....	....	....	....	3,181·75	915·97	....
		Voided leases	....	....	....	....	....	11·79	38·14	29,809·60	21,272·91	815·57
		Sundry claims	....	....	166·25	36·43	....	16·78	159·05	5,184·50	2,954·40	....
Garden Gully		Voided leases	....	....	....	....	....	26·36	74·91	30,272·07	21,864·74	1,102·59
		Sundry claims	....	....	....	....	....	....	18·74	2,914·69	1,719·14	....
Gum Creek		Voided leases	....	....	....	....	....	25·27	91·96	3,893·08	3,819·91	....
		Sundry claims	....	....	....	....	....	4·37	84·86	727·25	636·85	....

Holdens	1551N	New Waterloo	....	....	....	....	....	....	·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	....	Voided leases	....	....	....	....	....	....	1,263·53	1,999·80	3,565·40	....
		Sundry claims	....	....	....	....	....	173·02	150·04	440·75	403·14	....
Meeka pools	....	Voided leases	....	....	....	....	....	....	....	111·58	82·27	....
		Sundry claims	....	....	....	....	....	....	2·84	233·57	205·38	....
Meekatharra	1922N	Albury Heath	....	....	....	....	....	....	13·16	1,406·75	1,927·19	....
	1974N	Commodore	....	....	719·00	41·55	....	....	....	719·00	41·55	....
	1976N	Dusty Galah	....	....	56·25	14·44	....	....	....	56·25	14·44	....
	1975N	Fortune Teller	....	....	38·00	4·84	....	....	....	38·00	4·84	....
	1977N	Haveluck	....	....	367·00	35·64	....	....	....	367·00	35·64	....
	1559N	Ingliston	....	....	819·00	39·22	....	....	498·32	2,806·85	1,863·19	....
	1967N	Lady Central	....	....	431·75	106·90	....	....	....	2,051·25	425·70	....
	1577N	Mo Poke	....	....	....	....	....	....	12·47	1,361·50	827·50	....
	1529N	Prohibition	....	....	208·75	19·16	....	....	....	4,200·25	1,959·89	4·25
	1529N	(Prohibition Gold Mining Co. N.L.)	....	....	....	....	....	....	....	24,844·25	4,978·31	11·83
	1529N	Prior to transfer	....	....	....	....	....	....	....	29,422·00	4,971·30	....
	R.C. 75N	C. J. S. White and W. E. Fisher	....	....	....	....	....	173·82	43·80	372·50	131·88	....
		Voided leases	....	....	....	....	....	7·57	1,627·93	1,708,142·37	925,444·49	2,455·04
		Sundry claims	....	26·98	719·50	109·29	....	279·84	1,009·74	29,091·35	11,252·45	....
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	....
Munaro Gully	....	Voided leases	....	....	....	....	....	....	....	13,283·50	6,559·93	....
		Sundry claims	....	....	....	....	....	....	34·23	1,009·75	373·74	....
Nannine	1872N	Blue Pedro	....	....	....	....	....	4·06	15·26	9,566·40	2,021·11	....
	1941N	Caledonia GoldMine	....	....	....	....	....	....	....	3,747·00	1,047·71	....
	1958N	Mt. Hall	....	....	....	....	....	....	....	36·00	3·08	....
		Voided leases	....	....	....	....	....	43·25	828·76	116,140·48	73,408·98	167·45
		Sundry claims	....	34·10	208·25	30·26	....	138·95	1,282·86	6,377·68	4,699·27	....
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	....

Table I.—*Production of Gold and Silver from all sources, etc.*—**continued.**

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
		MURCHISON GOLDFIELD—continued.										
		MEEKATHARRA DISTRICT—*continued.*										
Yaloginda	1853N	Bluebird	....	....	60·00	83·25	....	....	....	9,013·50	2,835·75	....
		Voided leases	....	....	....	....	....	19·03	1,972·23	28,175·54	14,609·36	8·68
		Sundry claims	....	....	18·50	3·09	....	61·89	647·51	11,100·42	5,031·70	....
		From District generally :—										
		Sundry Parcels treated at :										
		G. H. Sparrowhawk (L.T.T. 3N/57)	....	....	....	....	....	....	....	206·05	10·45	....
		State Battery, Meekatharra	....	....	....	*201·88	....	....	....	130·00	*27,694·18	24·34
		Various Works	....	....	....	....	....	....	....	3,367·75	*13,931·67	391·20
		Reported by Banks and Gold Dealers	·56	....	....	....	....	12,225·11	179·70	13·50	65·31	·60
		Total	**·56**	**61·08**	**4,134·25**	**782·87**	**6·65**	**14,615·55**	**18,225·12**	**2,294,834·21**	**1,306,031·03**	**5,126·53**
		DAY DAWN DISTRICT.										
Day Dawn	573D, etc.	Mountain View Gold N.L.	....	....	....	....	....	....	....	13,612·10	17,376·85	217·60
		Prior to transfer to present holders	....	....	....	....	....	....	94·05	10,060·78	32,623·97	....
	576D	(New Fingall)	....	....	....	....	....	6·12	6·84	3,230·00	1,226·01	....
		Voided leases	....	....	....	....	....	160·64	826·65	1,922,088·36	1,225,599·75	169,210·44
		Sundry claims	....	....	12·00	5·05	....	96·42	523·56	13,641·26	6,746·69	1·55
Lake Austin	....	Voided leases	....	....	....	....	....	613·00	3,079·62	36,872·20	51,050·49	....
		Sundry claims	....	....	166·75	13·19	....	59·07	965·49	3,466·19	1,332·81	4·60
Mainland	....	Voided leases	....	....	....	....	....	·41	3,296·77	7,575·62	25,026·07	....
		Sundry claims	....	....	....	....	....	17·85	771·56	1,337·95	701·31	....
Pinnacles	664D	Eclipse	....	....	133·50	15·88	....	....	....	282·75	29·73	....
	676D	Eclipse Amalgamated North	....	....	28·50	2·10	....	....	....	187·50	17·68	....
	670D	Eclipse North	....	....	684·75	36·04	....	....	....	826·00	47·22	....
		Voided leases	....	....	....	....	....	4·90	1,213·68	18,280·00	9,915·71	....
		Sundry claims	....	....	61·25	13·30	....	62·93	509·50	4,678·17	1,801·29	....
		From District generally :—										
		Various Parcels treated at :										
		Various Works	....	....	....	....	....	....	16·61	988·00	1,988·33	....
		Reported by Banks and Gold Dealers	....	....	....	....	....	2,220·42	37·30	....	12·57	·01
		Total	....	....	**1,086·75**	**85·56**	....	**3,241·76**	**11,341·63**	**2,037,126·88**	**1,375,496·48**	**169,434·20**

MOUNT MAGNET DISTRICT.

Jumbulyer	1410M	Gold Bug	....	....	....	....	....	....	2·20	927·355	277·15	....
		Voided leases	....	....	....	....	....	....	13·37	680·10	361·74	....
		Sundry claims	....	....	....	....	....	20·32	116·27	1,216·70	886·47	....
Lennonville	1566M	Empress	....	....	....	....	....	....	....	....	*9·51	....
	1596M	Wheel of Fortune South	....	....	18·00	51·37	....	....	....	18·00	51·37	....
		Voided leases	....	....	....	....	....	....	3,226·91	151,502·55	128,568·28	459·62
		Sundry claims	2·56	....	104·80	46·05	....	25·86	108·82	14,580·87	5,615·40	....
Mt. Magnet	1476M	Cascade	....	....	....	....	....	....	....	10·50	7·14	....
	1456M	Corona	....	....	31·25	1·97	....	....	....	31·25	1·97	....
	1527M	Eclipse	....	....	2,840·00	2,942·30	8·48	....	....	3,112·10	3,083·71	9·82
	1255M, etc.	Edward Carson Leases	....	....	....	....	....	1·82	....	18,042·75	12,895·28	7·76
	1455M	Evening Star	....	....	22·00	1·64	....	....	....	967·75	110·67	....
	1480M	George M.	....	....	....	....	....	....	....	20·00	1·37	....
	1287M	Havelock	....	....	....	....	....	....	11·05	4,332·50	840·14	....
	1479M	Hill 50 Consolidated N.L.	....	....	....	....	....	....	....	68·00	5·10	....
	1282M, etc.	Hill 50 Gold Mine N.L.	....	....	133,081·00	77,209·50	1,849·73	....	....	1,222,314·40	609,003·94	13,906·76
	1246M	(Neptune)	....	....	....	....	....	....	829·41	8,787·65	4,122·61	·21
	1361M	Jupiter	....	....	....	....	....	....	·83	658·05	261·71	....
	1444M	Late Comer	....	....	....	....	....	....	2·53	511·00	391·31	....
	1597M	Mayflower	....	....	37·00	6·43	....	....	....	37·00	6·43	....
	1447M	Morning Star	....	....	....	....	....	....	....	2,092·65	458·61	....
	1536M	Pat O'Meara	....	....	....	....	....	....	....	34·00	·68	....
	1505M	Perseverance	....	....	....	....	....	....	....	107·25	11·40	....
	1588M	Three Boys	....	....	....	....	....	....	....	48·00	2·47	....
		Voided leases	....	....	....	....	....	29·26	9,811·54	834,262·31	312,761·69	851·39
		Sundry claims	....	....	27·00	8·94	....	123·08	2,626·24	60,887·65	29,883·12	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	1538M	Moyagee	....	....	....	*·86	....	....	....	33·75	34·88	....
		Voided leases	....	....	....	....	....	....	23·59	12,439·10	18,299·16	757·77
		Sundry claims	....	....	....	....	....	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	....
Winjangoo	....	Voided leases	....	....	....	....	....	·99	191·88	72·00	69·98	....
		Sundry claims	....	....	....	....	....	....	223·32	237·53	71·58	....
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Boogardie	....	....	....	*198·72	....	....	....	....	348·26	*35,102·45	15·62
	Various Works	....	....	....	....	....	....	....	....	56·06	18,949·24	10·04
	Reported by Banks and Gold Dealers	1·64	·30	....	....	....	2,292·48	114·69	8·00	113·15	·22
	Total	**4·20**	**·30**	**136,161·05**	**80,467·78**	**1,858·21**	**2,574·90**	**20,434·16**	**2,347,234·20**	**1,189,734·32**	**16,023·70**

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
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	....
Fields Find	G.M.L. 1119	Fields Find Central West	....	....	....	....	....	....	....	156·75	39·26	·80
	(1114), 1119	Fields Find Central West Leases	....	....	....	....	....	....	....	4,625·00	1,074·53	56·69
	1207	Rose Marie	....	....	....	....	....	....	....	418·67	254·46	1·59
		Voided leases	....	....	....	....	....	....	226·72	45,534·96	32,578·72	·59
		Sundry claims	....	....	....	....	....	5·77	188·67	5,458·85	1,777·91	....
Goodingnow	1063	Ark	....	....	....	....	....	....	12·49	2,270·50	1,927·29	....
	1025	Carnation	....	....	....	....	....	....	....	19,096·05	14,016·94	....
	1145	Oversight	....	....	....	....	....	....	10·62	2,338·35	875·92	....
		Voided leases	....	....	....	....	....	146·70	288·66	60,077·31	51,418·40	....
		Sundry claims	....	....	....	....	....	152·96	169·70	10,282·30	5,114·70	....
Gullewa	....	Voided leases	....	....	....	....	....	....	19·05	39,913·60	20,966·51	113·70
		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	....
Messengers Patch....	....	Voided leases	....	....	....	....	....	8·64	349·71	39,836·51	28,564·95	1,083·01
		Sundry claims	....	....	....	....	....	463·12	333·98	1,595·10	588·36	·07
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	....	....	....	....	....	1·66	44·72	1,152·60	502·15	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	....	....	....	....	....	....	....	80·00	132·93	4·04
		Voided leases	....	....	....	....	....	7·88	31·96	11,069·75	5,526·90	....
		Sundry claims	....	....	....	....	....	39·32	310·31	8,499·05	3,561·25	....
Nyounda	....	Voided leases	....	....	....	....	....	....	217·63	416·00	183·91	....
		Sundry claims	....	....	....	....	....	....	30·88	955·00	223·90	....
Pinyalling	....	Voided leases	....	....	....	....	....	....	313·79	2,318·90	1,146·19	....
		Sundry claims	....	....	....	....	....	3·13	134·09	1,500·00	959·31	....
Retaliation	....	Voided leases	....	....	....	....	....	....	....	5,089·25	1,872·98	....
		Sundry claims	....	....	....	....	....	....	....	913·25	321·52	....
Rothsay	....	Voided leases	....	....	....	....	....	....	24·06	40,680·75	10,777·98	....
		Sundry claims	....	....	....	....	....	....	·73	6,469·50	2,562·03	....
Wadgingarra	....	Voided leases	....	....	....	....	....	....	....	691·11	650·63	....
		Sundry claims	....	....	....	....	....	....	....	2,131·30	559·83	....
Warda Warra	....	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	2,622·75	1,010·02	....
Yuin	....	Voided leases	....	....	....	....	....	....	127·12	68,139·50	27,908·57	130·13
		Sundry claims	....	....	....	....	....	....	4·70	335·50	67·53	....
	From Goldfield generally :—											
	Sundry Parcels treated at :											
		State Battery, Payne's Find	....	....	....	....	....	....	....	156·50	*4,548·42	....
		State Battery, Warriedar	....	....	....	*8·83	·53	....	....	....	*6,545·96	·90
		State Battery, Yalgoo	....	....	....	....	....	....	....	....	*1,200·51	....
		B. Sher-Ali & F. Sherif (L.T.T. 1/57)	....	....	....	....	....	....	....	201·00	12·19	....
		Various Works	....	....	....	....	....	9·42	....	664·00	3,325·00	99·84
		Reported by Banks and Gold Dealers	....	....	....	....	....	948·13	58·32	....	48·90	·20
		Total	....	....	....	**8·83**	**·53**	**1,789·28**	**3,223·19**	**442,239·33**	**263,653·80**	**1,503·16**

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	....	....	....	....	....	....	591·62	2,160·30	2,011·78	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
MOUNT MARGARET GOLDFIELD—continued.												
MOUNT MORGANS DISTRICT—*continued.*												
Linden		Voided leases	....	....	....	....	....	7·53	566·97	72,919·81	66,208·35	·68
		Sundry claims	....	....	....	....	....	132·11	244·96	19,272·35	13,768·96	....
Mt. Margaret		Voided leases	....	....	....	....	....	12·13	1·89	8,900·39	5,291·51	12·55
		Sundry claims	....	....	....	....	....	25·22	111·18	1,790·10	661·42	....
Mt. Morgans	399F, etc.	Morgans Gold Mines Ltd.	....	....	....	....	....	....	....	4,941·05	13,911·46	....
		Prior to transfer to present holders	....	....	....	....	....	....	16·66	779,578·43	354,225·86	5,552·63
		Voided leases	....	....	....	....	....	17·95	148 79	61,354·50	34,786·53	77·86
		Sundry claims	....	....	....	....	....	36·41	398·78	5,104·07	3,396·77	....
Murrin Murrin		Voided leases	....	....	....	....	....	10·43	231·35	136,940·22	104,029·97	29·60
		Sundry claims	....	....	76·00	5·63	....	51·15	557·24	6,561·68	4,562·63	....
Red Castle	557F	Trixie	....	9·05	....	....	....	....	46·14	177·75	68·44	....
		Voided leases	....	....	....	....	....	4·49	436·54	4,107·20	4,043·41	....
		Sundry claims	....	....	....	....	....	....	113·84	1,183·57	642·45	....
Yundamindra	560F	Queen of the May	....	....	1,811·00	369·34	....	....	....	1,811·00	369·34	....
	560F	(Linden (W.A.) Gold N.L.)	....	....	....	....	....	....	....	4,077·00	1,756·80	30·68
		Voided leases	....	....	....	....	....	....	110·93	78,485·85	49,894·35	5·82
		Sundry claims	....	....	....	....	....	3·01	271·93	6,674·35	4,789·46	....
		From District generally :—										
		Sundry Parcels treated at :										
		C. C. Crocker Anniversary Battery (M.A. 14F)	....	....	....	....	....	....	....	10·00	26·96	....
		The United Aborigines Mission (M.A. 12F)	....	....	....	....	....	113·08	18·87	403·00	135·50	·09
		State Battery, Linden	....	....	....	....	....	....	9·16	299·54	*15,502·97	....
		Various Works	....	....	....	....	....	....	....	1,257·81	*8,561·39	99·97
		Reported by Banks and Gold Dealers	6·11	....	....	....	....	3,084·26	141·84	10·30	95·75	·68
		Total	**6·11**	**9·05**	**1,887·00**	**374·97**	....	**3,497·77**	**9,389·86**	**1,216,845·31**	**717,526·48**	**5,812·32**
MOUNT MALCOLM DISTRICT.												
Cardinia	1795C	Rangoon	....	....	....	....	....	....	6·49	330·00	178·07	....
		Voided leases	....	....	....	....	....	13·87	1,591·66	5,201·74	4,049·91	....
		Sundry claims	....	....	....	....	....	4·25	121·91	1,865·25	575·01	·66

Diorite	....	Voided leases	....	....	....	....	....	....	945·65	38,879·03	35,144·28	33·18
		Sundry claims	....	....	....	*1·25	....	11·21	332·13	4,626·85	4,471·16	....
Dodgers Well	....	Voided leases	....	....	....	....	....	....	57·90	1,373·30	1,936·52	....
		Sundry claims	....	....	....	....	....	·95	28·32	1,440·25	904·23	....
Lake Darlot	....	Voided leases	....	....	....	....	....	....	4,482·18	74,717·46	52,293·77	7·56
		Sundry claims	....	....	981·75	118·72	....	129·92	906·52	9,827·62	6,025·92	2·60
Leonora	1829C	Jessie Alma	....	....	7·75	6·39	....	....	578·11	714·25	1,917·97	....
	1579C, etc.	Sons of Gwalia Ltd.	....	....	137,377·00	30,269·21	2,663·02	....	....	6,338,771·53	2,423,717·45	174,127·68
		Prior to transfer to present holders	....	....	....	....	....	....	....	109,081·00	55,989·21	8·66
		Voided leases	....	....	....	....	....	....	1,866·86	176,575·00	91,197·84	94·57
		Sundry claims	....	1·96	245·50	115·55	....	37·73	369·22	18,994·45	11,996·04	·21
Malcolm	....	Voided leases	....	....	....	....	....	11·65	47·07	62,656·53	47,563·43	....
		Sundry claims	....	....	....	....	....	5·75	33·39	4,576·47	2,711·34	·12
Mertondale	....	Voided leases	....	....	....	....	....	....	....	89,024·75	60,935·32	1,497·58
		Sundry claims	....	....	....	....	....	5·42	85·74	3,216·41	2,295·52	....
Mt. Clifford	....	Voided leases	....	....	....	....	....	....	1,786·51	9,588·96	16,640·81	....
		Sundry claims	....	....	....	....	....	53·98	1,860·00	5,569·70	3,485·47	....
Pigwell	....	Voided leases	....	....	....	....	....	....	....	13,587·32	14,676·58	63·68
		Sundry claims	....	....	....	....	....	....	34·61	2,896·65	1,225·46	....
Randwick	....	Voided leases	....	....	....	....	....	....	246·76	10,912·65	9,736·57	....
		Sundry claims	....	....	....	....	....	66·57	164·02	2,488·64	1,307·45	....
Websters Find	....	Voided leases	....	....	....	....	....	30·30	....	22,167·50	14,377·65	....
		Sundry claims	....	....	....	....	....	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	54·46	1,612·16	1,416·41	....
	From District generally :											
	Sundry Parcels treated at :											
	State Battery, Darlot	....	....	....	....	....	....	....	....	18·00	*786·34	....
	Reefer Cyanide Plant	....	....	....	....	....	....	....	....	20·00	*3,125·37	22·38
	Various Works	....	....	....	....	....	....	....	....	789·50	*22,175·93	135·97
	Reported by Banks and Gold Dealers	28·83	....	....	....	....	3,538·31	252·83	21·50	51·57	....
	Total	**28·83**	**1·96**	**138,612·00**	**30,511·12**	**2,663·02**	**3,952·13**	**16,651·64**	**7,043,413·47**	**2,907,918·74**	**175,995·90**

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
MOUNT MARGARET GOLDFIELD—continued.												
MOUNT MARGARET DISTRICT.												
Burtville	G.M.L. 2138T	Nil Desperandum	....	....	....	....	....	....	5·30	1,940·47	4,523·90	....
		Voided leases	....	....	....	....	....	4·89	413·80	72,327·98	117,930·32	948·27
		Sundry claims	....	....	....	....	....	2·65	208·27	7,516·16	5,572·28	....
Duketon	....	Voided leases	....	....	....	....	....	5·35	3,216·10	31,889·42	22,542·63	....
		Sundry claims	19·05	....	....	....	....	80·50	528·26	2,442·65	2,196·49	29·76
Eagle's Nest	....	Voided leases	....	....	....	....	....	....	145·34	534·50	1,238·22	....
		Sundry claims	....	....	....	....	....	24·07	487·05	1,046·35	360·11	....
Erlistoun	2500T	Westralia	....	....	....	....	....	....	....	....	*122·50	....
		Voided leases	....	....	....	....	....	10·07	393·41	156,730·90	101,512·60	4,327·81
		Sundry claims	....	....	....	....	....	1,181·65	165·05	5,716·59	3,888·89	....
Euro	....	Voided leases	....	....	....	....	....	....	65·14	91,821·50	37,678·25	....
		Sundry claims	....	....	....	....	....	4·87	73·04	1,507·00	835·30	....
Laverton	2514T	Gladiator	....	....	....	12·11	....	....	....	2,551·50	414·97	....
	2245T, etc.	Lancefield Leases	....	....	1,311·50	24·36	....	....	....	49,290·25	5,133·59	22·62
	2245T	Lancefield Extended West	....	....	....	....	....	....	....	881·25	846·77	....
	2489T	Wedge	....	....	....	....	....	....	....	222·00	21·19	....
	2478T	Lancefield North	....	....	....	....	....	....	....	2,235·25	438·99	....
	2541T	Mary Mack	....	....	....	....	....	....	....	92·00	11·21	....
		Voided leases	....	....	....	....	....	28·59	2,028·85	2,075,761·37	813,246·90	56,923·16
		Sundry claims	....	....	....	....	....	215·58	1,492·90	17,547·50	9,250·60	....
Mt. Barnicoat	....	Voided leases	....	....	....	....	....	....	23·08	2,370·00	2,251·99	....
		Sundry claims	....	....	....	....	....	....	·68	1,309·75	1,087·77	....
Mt. Shenton	....	Voided leases	....	....	....	....	....	....	....	15·00	26·65	....
		Sundry claims	....	....	....	....	....	....	....	279·25	209·67	....
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Laverton	....	....	....	*7·72	....	....	....	97·50	*19,354·28	561·11
		United Gold Recoveries Pty. Ltd.	....	....	....	....	....	....	....	·25	*3,786·44	3,374·06
		Various Works	....	....	....	....	....	....	....	214·75	*19,403·68	·24
		Reported by Banks and Gold Dealers	14·90	....	....	....	....	2,546·43	108·08	....	26·76	....
		Total	**33·95**	....	**1,311·50**	**44·19**	....	**4,104·65**	**9,354·35**	**2,526,341·14**	**1,173,912·95**	**66,187·03**

North Coolgardie Goldfield.

MENZIES DISTRICT.

	5766Z	Coonega Extended	....	....	28·00	4·10	....	....	....	82·75	27·91	....
Comet Vale	G.M.L. 5778Z....	Meteor	....	....	52·25	5·35	....	....	....	52·25	5·35	....
		Voided leases	....	....	....	....	....	....	419·74	267,385·72	193,243·62	5,355·33
		Sundry claims	....	....	98·05	18·83	....	....	40·19	2,041·21	1,022·83	....
Goongarrie	5777Z	New Goongarrie Gold Mine	....	....	....	....	....	....	....	49·75	29·48	....
	5740Z	Gulls Blow	....	....	....	....	....	....	164·75	348·75	221·44	....
		Voided leases	....	....	....	....	....	·94	1,385·26	29,848·04	18,095·35	....
		Sundry claims	....	....	....	....	....	46·46	2,109·79	2,835·85	3,342·42	....
Menzies	5543Z	Black Swan	....	....	....	....	....	....	....	1,135·63	1,658·49	9·08
	5736Z	Bodington	....	....	50·00	26·68	....	....	134·83	150·50	181·15	....
	5511Z	First Hit	....	....	282·25	119·28	....	....	....	3,916·75	6,838·95	21·25
	5511Z, etc.	First Hit G.Ms. (1934) Ltd.	....	....	....	....	....	....	....	68,473·70	49,060·96	6,676·23
	5542Z	Good Block Lease	....	....	....	....	....	....	7·32	2,524·50	2,905·07	....
	5520Z	Mignonette	....	....	245·75	17·39	....	....	....	789·25	396·31	....
		Voided leases	....	....	....	....	....	45·42	1,125·41	937,698·50	727,099·60	13,586·39
		Sundry claims	....	....	234·50	51·73	....	49·50	623·61	34,901·94	25,405·77	776·49
Mt. Ida	5701Z, etc.	Moonlight Wiluna G.Ms. Ltd.	....	....	31,838·00	15,746·04	....	....	40·77	230,084·86	121,023·63	787·54
		Prior to transfer to present holders	....	....	....	....	....	....	....	31,833·25	16,021·98	891·37
		Voided leases	....	....	....	....	....	....	92·21	68,748·92	72,681·44	106·63
		Sundry claims	....	....	12·25	21·93	....	48·14	436·08	16,089·66	8,262·67	·12
Twin Hills	....	Voided leases	....	....	....	....	....	....	....	582·30	574·93	....
		Sundry claims	....	....	....	....	....	....	....	97·80	86·69	....
	From District generally :—											
	Sundry Parcels treated at :											
	B. Bracegirdle & R. Bennetts (L.T.T. 1Z/57)		....	....	126·75	3·98	....	....	....	328·75	12·62	....
	Mt. Ida State Battery		....	....	....	*45·49	....	....	....	1,866·25	*7,543·85	·05
	State Battery, Menzies		....	....	....	*773·89	....	....	....	....	*854·02	....
	Various Works		....	....	....	....	....	....	....	2,807·80	*58,744·47	3,062·11
	Reported by Banks and Gold Dealers		·93	....	....	18·12	....	1,485·79	403·04	100·00	48·49	....
	Total		**·93**	....	**32,967·80**	**16,852·81**	....	**1,676·25**	**6,983·00**	**1,704,774·68**	**1,315,389·49**	**31,272 ·59**

ULARRING DISTRICT.

Davyhurst	G.M.L. 1016U, etc.	New Coolgardie G.Ms. N.L.	....	....	....	....	....	....	....	132,198·00	67,724·52	15,808·01
	1016U, 1085U	(New Callion)	....	....	....	....	....	....	....	5,293·30	2,002·37	119·67
		Voided leases	....	....	....	....	....	2·93	152·64	166,783·32	126,011·36	5,408·47
		Sundry claims	....	....	....	....	....	....	208·48	13,773·19	5,719·76	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
NORTH COOLGARDIE GOLDFIELD—*continued.*												
ULARRING DISTRICT—*continued.*												
Morleys	1101U	Emerald	....	....	319·25	41·14	....	....	26·24	4,310·25	2,426·78	....
	1094U	First Hit	....	....	975·75	255·15	....	....	....	4,205·00	6,586·97	....
	1169U	First Hit North	....	....	....	....	....	....	....	3·50	5·79	....
	1168U	Hazel Dawn	....	....	8·00	11·58	....	....	....	51·25	104·97	....
	1081U	Mabel Gertrude	....	....	32·00	16·00	....	....	17·19	1,598·50	1,932·51	....
	1089U	Paramount	....	....	191·50	88·91	....	....	1·49	4,136·50	3,721·45	....
	1163U	Two Chinamen	....	....	....	....	....	....	....	9·25	15·28	....
		Voided leases	....	....	....	....	....	....	3,854·94	2,956·50	5,944·69	10·54
		Sundry claims	....	....	7·50	·98	....	2·16	932·23	1,888·75	2,608·75	....
Mulline	1107U	Ajax West	....	....	956·75	308·95	....	....	1·37	7,767·75	6,262·29	....
	1172U	Dolly's Grave	....	....	46·00	5·79	....	....	....	46·00	5·79	....
	1170U	Golden Wonder	....	....	89·75	461·67	....	....	....	132·00	668·23	....
	1070U	Riverina	....	....	....	....	....	....	....	283·00	75·30	....
	1070U, etc.	(Riverina Gold Mines Pty. Ltd.)	....	....	....	....	....	....	....	32,085·50	11,669·35	·07
		Voided leases	....	....	....	....	....	....	274·09	102,637·22	103,360·32	530·75
		Sundry claims	....	....	83·00	161·81	....	10·82	296·42	11,024·64	9,554·98	1·10
Mulwarrie	1153U	Fourmile	....	....	8·00	33·87	....	....	....	77·00	436·96	....
	1113U	Oakley	....	....	300·00	283·21	....	....	....	3,514·00	5,023·40	....
		Voided leases	....	....	....	....	....	....	165·29	19,480·68	26,369·21	38·47
		Sundry claims	....	....	....	....	....	·80	282·29	3,106·33	2,722·13	....
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	....
	A. Scott-Linnett & A. N. Hawkins (L.T.T. 1252H)		....	....	....	162·19	....	....	....	....	*162·19	....
	Riverina South Battery		....	....	....	....	....	....	....	....	*900·46	....
	Various Works		....	....	....	....	....	....	15·82	268·15	*9,639·15	11·15
	Reported by Banks and Gold Dealers		....	....	....	34·79	....	112·81	411·29	100·00	106·34	....
	TOTAL				3,017·50	1,866·04	....	129·52	7,203·12	529,425·85	439,002·69	21,928·23

NIAGARA DISTRICT.

Desdomena	....	Voided leases	....	....	....	....	....	....	7·12	9,809·00	7,555·81	12·04
		Sundry claims	....	....	....	....	....	....	10·35	2,225·45	892·48	....
Kookynie	928G	Altona	....	....	2,391·50	855·63	....	....	....	9,058·00	6,162·60	·44
	911G	Cosmopolitan South	....	....	80·00	34·91	....	....	....	2,370·00	1,247·87	....
	933G	Nein Gladstone	....	....	225·00	58·25	....	....	....	898·25	323·72	....
	937G	Victory	....	....	....	....	....	....	....	10·00	13·54	....
		Voided leases	....	....	....	....	....	3·35	347·30	744,917·21	394,601·81	5,375·97
		Sundry claims	....	....	47·25	18·62	....	60·92	106·60	9,108·80	6,794·13	3·02
Niagara	....	Voided leases	....	....	....	....	....	....	104·54	85,876·50	52,365·05	....
		Sundry claims	....	....	14·00	3·83	....	28·10	97·22	14,659·16	8,261·61	....
Tampa	....	Voided leases	....	....	....	....	....	....	41·58	50,477·57	23,287·71	174·24
		Sundry claims	....	....	....	....	....	32·60	283·40	8,041·33	4,113·02	....
	From District generally :—											
	Sundry Parcels treated at :											
	Various Works		....	....	....	....	....	....	....	1,220·50	*20,884·22	120·98
	Reported by Banks and Gold Dealers		....	....	....	....	....	1,593·39	823·66	....	63·53	....
	Total		....	....	**2,757·75**	**971·24**	....	**1,718·36**	**1,821·77**	**938,671·77**	**526,567·10**	**5,686·69**

YERILLA DISTRICT.

Edjudina	....	Voided leases	....	....	....	....	....	....	18·44	35,523·70	43,374·79	37·79
		Sundry claims	....	....	....	....	....	....	28·52	6,948·58	4,827·25	·69
Patricia	....	Voided leases	....	....	....	....	....	....	....	4,158·50	5,396·40	25·40
		Sundry claims	....	....	....	....	....	....	....	47·00	20·78	....
Pingin	....	Voided leases	....	....	....	....	....	....	48·34	17,463·30	10,742·77	....
		Sundry claims	....	....	....	....	....	....	154·86	5,642·59	3,475·75	....
Yarri	G.M.L. 1320R....	Margaret	....	....	14·00	11·37	....	....	....	3,874·00	1,219·54	....
	1327R	Nil Desperandum	....	....	....	....	....	....	....	328·00	76·26	....
	1126R, etc.	Porphyry (1939) Gold Mine, N.L.	....	....	....	....	....	....	....	66,939·00	9,893·51	261·95
	1126R, etc.	(Edjudina Gold Mining Co. N.L.)	....	....	....	....	....	....	....	30,220·00	5,409·93	507·51
		Prior to Transfer	....	....	....	....	....	....	....	124·50	38·89	....
		Voided leases	....	....	....	....	....	6·30	87·08	44,584·75	21,248·26	2·00
		Sundry claims	....	....	153·00	23·66	....	·87	5·93	17,300·55	6,150·79	·98
Yerilla	....	Voided leases	....	....	....	....	....	....	3,107·25	16,481·43	12,925·74	13·93
		Sundry claims	....	....	....	....	....	19·30	97·63	2,752·83	1,590·03	....
Yilgangie	1176R, etc.	Western Mining Corporation	....	....	2,944·00	1,280·70	226·01	....	....	22,016·75	20,562·41	2,965·72
		Prior to transfer to present holders	....	....	....	....	....	....	·85	1,244·75	1,830·28	....
		Voided leases	....	....	....	....	....	....	9·94	2,432·75	1,500·80	....
		Sundry claims	....	....	14·00	20·50	....	121·67	98·20	3,316·30	2,040·88	·63

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
NORTH COOLGARDIE GOLDFIELD—continued.												
YERILLA DISTRICT—*(continued)*.												
From District Generally :—												
Sundry Parcels treated at :												
State Battery, Yarri			....	....	....	....	....	....	....	276·50	*9,060·18	11·65
State Battery, Yerilla			....	....	....	....	....	....	....	....	* 43·52	....
Various Works			....	....	....	....	....	2·17	....	642·25	*6,049·24	....
Reported by Banks and Gold Dealers			....	....	....	....	....	1,161·60	160·08	....	27·36	....
Total			....	....	**3,125·00**	**1,336·23**	**226·01**	**1,311·91**	**3,817·12**	**282,318·03**	**167,505·36**	**3,828·25**

Broad Arrow Goldfield.

Bardoc	....	Voided leases	....	....	....	....	....	....	....	2,335·41	85,370·59	55,699·50	203·60
	....	Sundry claims	....	....	270·25	42·32	....	54·95	1,218·09	17,562·28	8,304·07	....	
Black Flag	2229W	Bellevue	....	....	394·25	76·83	....	....	212·68	2,735·50	2,943·82	....	
		Voided leases	....	....	....	....	....	27·81	405·90	48,277·79	28,175·08	....	
		Sundry claims	....	....	17·00	7·81	....	712·92	251·59	8,098·51	4,988·46	....	
Broad Arrow	....	Voided leases	....	....	....	....	....	70·32	10,453·81	155,895·94	120,088·05	20·23	
		Sundry claims	....	....	396·25	34·70	....	1,007·72	3,046·17	34,466·14	16,947·29	·11	
Cane Grass	....	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	2,340·33	921·90	....	
Cashmans	....	Voided leases	....	....	....	....	....	67·51	813·76	8,172·15	7,090·91	....	
		Sundry claims	....	....	....	....	....	....	40·31	1,205·12	361·74	·05	

Christmas Reef	2279W	New Mexico	....	....	305·50	96·01	....	....	....	357·00	243·20	....
	2253W	New Mexico, South	....	....	1,051·50	757·77	....	....	....	2,432·50	3,186·00	....
		Voided leases	....	....	....	....	....	....	55·49	1,865·12	3,606·65	....
		Sundry claims	....	....	193·50	250·13	....	....	441·85	3,290·14	3,228·02	....
Fenbark	...	Voided leases	....	....	....	....	....	....	4·42	6,771·00	2,711·68	....
		Sundry claims	....	....	....	....	....	....	51·96	3,031·52	1,000·47	....
Grants Patch	2277W	Coronation	....	....	80·75	85·56	....	....	....	460·00	372·41	....
	2278W	Prince of Wales Syndicate	....	....	135·25	160·94	....	....	....	399·00	707·27	....
	2277W, 2278W	(Ora Banda Amalgamated Gold Mines, N.L.)	....	....	....	....	....	....	....	961·00	1,146·17	....
		Voided leases	....	....	....	....	....	....	274·13	203,675·74	80,047·31	175·00
		Sundry claims	....	....	....	....	....	....	356·66	6,514·79	3,099·64	....
Ora Banda	T.A. 42W, M.A. 41W	Associated Northern Ora Banda N.L.	....	....	....	....	....	....	....	2,786·50	464·53	21·07
		Prior to transfer to present holders	....	....	....	....	....	....	....	315,958·95	123,252·22	1,664·70
	2270W	Gimlet South Leases	....	....	1,120·00	250·67	....	....	....	6,983·75	1,419·74	....
		Voided leases	....	....	....	....	....	....	846·13	104,719·32	27,471·80	....
		Sundry claims	....	....	636·20	88·31	....	....	467·18	14,416·30	4,659·57	....
Paddington	2294W....	Shirley Lorna	....	....	89·00	43·57	....	....	....	131·25	47·58	....
		Voided leases	....	....	....	....	....	5,566·30	463·31	196,298·56	86,432·73	32·15
		Sundry claims	....	....	161·75	46·24	....	1,714·16	291·43	17,140·73	9,258·86	....
Riches Find	....	Voided leases	....	....	....	....	....	....	21·64	7,643·09	6,095·69	71·36
		Sundry claims	....	....	....	....	....	....	296·26	1,943·75	2,289·23	·13
Siberia	2293W....	Cave Hill	....	....	....	....	....	....	....	66·50	24·72	....
		Voided leases	....	....	....	....	....	1·07	2,649·28	28,928·97	31,751·34	....
		Sundry claims	....	....	50·50	6·53	....	289·06	1,261·72	21,308·29	12,887·07	....
Smithfield	2264W....	King of Kings	....	....	....	....	....	....	19·19	7,017·00	893·89	....
		Voided leases	....	....	....	....	....	....	....	4,700·71	1,174·69	....
		Sundry claims	....	....	109·25	19·88	....	....	124·29	3,365·09	1,295·77	....
	From Goldfield generally :											
	Sundry Parcels treated at :											
	State Battery, Ora Banda	....	....	....	*415·28	....	....	....	....	128·05	*25,147·99	11·56
	Golden Arrow Battery	....	....	....	....	....	....	....	....	80·75	4,333·07	2·30
	Various Works	....	....	....	....	....	....	2,275·66	1·24	16,967·02	49,504·77	3,103·45
	Reported by Banks and Gold Dealers	2·40	....	....	....	....	....	10,018·00	150·16	61·68	91·05	....
	Total	**2·40**	....	**5,010·95**	**2,382·55**	....	**21,981·52**	**27,475·30**	**1,348,327·69**	**736,502·40**	**5,305·71**

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
North-East Coolgardie Goldfield.												
KANOWNA DISTRICT.												
Gindalbie	G.M.L. 1583X	S.H.E.	....	....	116·00	101·07	....	....	....	116·00	101·07	....
		Voided leases	....	....	....	....	....	....	1,151·99	46,180·53	41,748·13	38·31
		Sundry claims	....	....	86·00	21·33	....	....	716·52	5,620·02	3,213·55	....
Gordon	....	Voided leases	....	....	....	....	....	....	682·54	53,900·58	20,072·51	517·61
		Sundry claims	....	....	75·75	27·38	....	....	177·38	2,231·45	1,222·09	....
Kalpini	....	Voided leases	....	....	....	....	....	....	38·73	13,543·50	6,753·78	·07
		Sundry claims	....	....	....	....	....	24·70	269·72	1,492·50	1,026·37	....
Kanowna	1572X	Kanowna Red Hill	....	....	209·00	101·40	....	....	2·38	2,514·25	784·46	....
		Voided leases	....	....	....	....	....	24·94	4,526·76	685,557·10	380,497·36	2,482·24
		Sundry claims	....	5·77	220·50	43·57	....	125·32	2,169·07	27,239·77	11,941·67	1·50
Mulgarrie	....	Voided leases	....	....	....	....	....	....	1,216·63	6,902·26	4,197·98	....
		Sundry claims	....	....	....	....	....	....	16·78	1,290·00	646·60	....
Six Mile	....	Voided leases	....	....	....	....	....	....	1,603·72	559·00	767·72	....
		Sundry claims	....	....	....	....	....	....	56·51	764·50	231·13	....
		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	·62	....	....	....	....	106,020·92	40·42	·50	109·73	....
		Total	**·62**	**5·77**	**707·25**	**294·75**	....	**106,526·30**	**13,526·67**	**1,006,847·01**	**626,520·04**	**3,039·73**
KURNALPI DISTRICT.												
Jubilee	....	Voided leases	....	....	....	....	....	....	145·13	2,122·50	1,465·16	....
		Sundry claims	....	....	....	....	....	25·57	13·52	1,234·00	520·15	....
Kurnalpi	....	Voided leases	....	....	....	....	....	371·18	3,166·80	4,052·51	3,957·71	6·27
		Sundry claims	....	....	46·75	19·59	....	324·12	727·39	4,452·86	2,317·72	....
Mulgabbie	....	Voided leases	....	....	....	....	....	....	1,402·66	226·75	7,845·87	4·95
		Sundry claims	....	....	....	....	....	8·06	2,772·71	1,327·45	2,241·18	....

From District generally :												
Sundry Parcels treated at :												
Various Works	....	1·04	....	....	....	....	....	....	101·50	*388·63	....	
Reported by Banks and Gold Dealers	1·04	....	....	....	....	12,106·56	70·70	....	2·35	1·49		
Total	**1·04**	....	**46·75**	**19·59**	....	**12,835·49**	**8,298·91**	**13,517·57**	**18,738·77**	**12·71**		

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Binduli	6582E	Royal Standard	....	....	42·00	3·86	....	....	....	42·00	3·86	....
		Voided leases	....	....	....	....	....	....	....	1,640·35	475·81	....
		Sundry claims	....	....	196·25	8·22	....	....	13·01	5,374·02	1,691·20	....
Boorara	....	Voided leases	....	....	....	....	....	....	459·07	309,467·82	172,861·95	411·37
		Sundry claims	....	....	651·00	38·47	·05	·49	145·56	4,186·34	1,562·62	·05
Boulder	6145E	Boomerang	....	....	....	....	....	....	....	77·00	8·00	....
	5531E	Cassidy's Hill	....	....	....	....	....	....	....	75·50	7·77	....
	5964E	Croesus Extended	....	....	....	....	....	....	....	192·75	16·57	....
	6537E	Golden Key	....	....	180·50	199·71	....	....	47·90	500·00	481·29	....
	5692E, etc.	Gold Mines of Kalgoorlie (Aust.) Ltd.	....	....	492,328·00	134,193·28	27,524·32	....	....	980,258·00	263,854·82	52,410·45
		Prior to transfer to present holders	....	....	....	....	....	....	791·73	15916155·97	6,415,881·49	819,123·27
	5696E, etc.	Great Boulder Pty. Gold Mines Ltd.	....	....	488,761·00	134,307·43	40,192·48	....	1·53	12771405·97	6,022,719·07	1,453,685·17
	5845E	Happy Returns	....	....	....	....	....	....	....	7,928·00	1,462·92	....
	5478E, etc.	Lake View and Star Ltd.	....	....	665,998·00	170,888·40	22,141·05	....	....	14463941·30	4,304,706·17	469,617·75
		Prior to transfer to present holders	....	....	....	....	....	....	8·49	15792500·38	9,149,223·80	1,348,055·28
	6230E	New Look	....	....	....	....	....	....	....	256·75	22·68	....
	5431E, etc.	North Kalgurli (1912) Ltd.	....	....	345,983·00	84,198·59	15,797·15	....	127·55	4,984,551·24	1,384,718·02	286,443·25
	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	Prior to transfer to present holders	....	....	....	....	....	43·99	....	4,018,436·01	2,815,911·21	97,625·03
		Voided leases	....	....	....	....	....	129·24	12,023·37	1,814,371·31	760,447·86	24,046·96
		Sundry claims	....	....	....	....	....	24·58	212·32	11,649·99	4,300·62	....
Cutters Luck	....	Voided leases	....	....	....	....	....	45·87	133·58	74·50	239·19	....
		Sundry claims	....	....	....	....	....	8·11	501·65	922·90	384·71	....
Feysville	....	Voided leases	....	....	....	....	....	....	110·93	863·30	425·16	....
		Sundry claims	....	....	....	....	....	....	199·00	1,237·10	645·88	....
Hampton Plains	P.P.L.1, etc.	Consolidated Gold Areas N.L.	....	....	....	....	....	....	....	142,565·73	37,249·15	5,835·85
	P.P.L.86	Golden Hope N.L.	....	....	....	....	....	....	....	5,965·00	2,006·14	....
	P.P.L.192	Golden Hope, North	....	....	....	....	....	....	....	353·00	201·02	....
	P.P.L.252	Hampton Properties Ltd.—Mt. Martin	....	....	....	....	....	....	....	14,953·75	5,574·11	....
	P.P.L.460	Hampton Xmas Gift	....	....	....	....	....	6·72	37·57	107·00	89·44	....
	P.P.L.12	Junction Extended	....	....	....	....	....	....	....	3,581·75	527·74	....
	P.P.L.277	Pernatty	....	....	599·50	93·30	·01	....	....	7,247·75	866·88	·01
	P.P.L.277	New Hope	....	....	....	....	....	....	17·23	61,468·55	11,175·94	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
		EAST COOLGARDIE GOLDFIELD—continued.										
		EAST COOLGARDIE DISTRICT—*continued.*										
	H.P.23	Scherini & Rowe (Mutooroo)	....	....	....	....	....	....	....	1,747·50	134·82	....
	P.P.L.10	F. C. Schoppe	....	....	....	....	....	....	....	888·75	37·82	....
	P.P.L.175	Jubilee	....	....	....	....	....	....	....	6,708·00	906·81	....
		Cancelled leases	....	....	....	....	....	4,578·52	203·94	126,877·34	39,711·84	69·83
		Sundry claims and leases	....	....	....	....	....	2·68	70·85	46,439·41	8,509·67	....
Kalgoorlie	6048E	Auld Acquaintance	....	....	....	....	....	....	....	7·50	2·36	....
	6562E	Bretvic	....	....	....	....	....	....	....	326·50	26·09	....
	6563, 6564	Champagne Syndicate N.L.	....	....	....	....	....	....	....	12,287·75	1,348·10	61·41
	4547E	(Mt. Charlotte (Kalgoorlie) Gold Mines Ltd.)	....	....	....	....	....	....	....	25,143·25	2,888·32	110·15
		Prior to transfer to present holders	....	....	....	....	....	....	5·72	48,292·60	13,930·79	....
	6503E	Coronation	....	....	....	....	....	....	....	20·50	2·52	....
	5913E	Devon Consols	....	....	91·75	6·81	....	....	93·19	2,390·21	706·47	....
	5915E	Edna Derby	....	....	....	....	....	....	....	400·00	91·18	....
	5647E	Golden Cross	....	....	....	....	....	....	....	156·25	19·77	....
	5510E	Golden Dream	....	....	70·25	4·95	....	....	....	149·25	11·48	....
	5774E	Golden Goose	....	....	....	....	....	....	....	215·50	53·07	....
	5739E	Golden Star	....	....	....	....	....	....	....	918·50	85·96	....
	6502E	Western Mining Corporation (Hannans North)	....	....	....	....	....	....	....	256·00	65·07	4·28
	6504E	Historic	....	....	....	....	....	....	....	257·00	17·27	....
	5460E	Kalgoorlie Star	....	....	....	....	....	....	....	290·25	56·54	....
	5878E	Lady May	....	....	....	....	....	....	62·05	4,740·50	1,177·07	....
	6091E	Lesanben	....	....	109·50	33·46	....	....	193·96	822·50	416·74	....
	6485E	Maritana Hill	....	....	....	....	....	....	....	2,951·75	388·02	....
	6535E	Mary A.	....	....	605·25	70·78	....	....	....	3,331·75	288·58	....
	6321E	North End Extended	....	....	164·00	86·80	....	....	69·28	1,975·00	503·52	....
	5852E (6024E)	Pedestal leases	....	....	....	....	....	....	....	1,828·50	490·37	....
	5852E	(Pedestal)	....	....	....	....	....	....	....	1,608·75	444·93	....
	(6024E)	Trident	....	....	....	....	....	....	....	58·75	36·67	....
	5468E	Phar Lap	....	....	....	....	....	....	....	2,083·25	750·82	2·50
	5415E, 5803E	Return Leases	....	....	....	....	....	....	5·64	3,831·75	656·15	....
		Voided leases	....	....	....	....	....	242·48	10,572·12	1,457,335·80	578,523·61	45,973·47
		Sundry claims	....	....	87·00	16·23	....	232·41	1,124·61	61,398·88	23,201·45	....
Wombola	6051E	Big Bull	....	....	....	....	....	....	....	595·50	432·86	....
	5688E, (5967E)	Caledonian Leases	....	....	....	....	....	....	....	970·00	659·67	....
	5688E	(Caledonian)	....	....	....	....	....	....	....	4,275·00	3,632·98	....
	(5967E)	North Caledonian	....	....	....	....	....	....	1·27	22·25	8·15	....
	5497E, 5500E	Daisy Leases	....	....	2,696·75	1,896·49	9·81	....	....	14,426·45	10,437·49	62·11
	5497E	(Daisy)	....	....	....	....	....	....	...	6,282·25	5,031·93	....

5500E	(Happy-Go-Lucky)	....	....	....	....	....	....	....	....	2,075·25	1,675·85	....
6032E	Dry Mount	....	....	....	58·00	8·50	....	....	....	1,264·75	1,149·60	·60
6325E	Great Hope	....	....	26·66	185·25	51·11	....	....	26·66	335·25	115·77	....
5689E, etc.	Mt. Monger Mining Syndicate	....	....	....	2,455·25	1,307·40	26·18	....	....	2,455·25	1,307·40	26·18
5689E	(Haoma Gold Mines N.L.)	....	....	....	304·00	294·33	12·66	....	....	9,233·00	7,239·42	269·03
5689E, etc.	(Haoma Leases)	....	....	....	....	....	....	....	....	27,396·50	25,445·40	79·15
5689E	(Haoma)	....	....	....	....	....	....	....	....	2,168·00	1,948·36	....
5525E	(Xmas Flat)	....	....	....	....	....	....	....	....	330·25	264·74	....
5798E	(Maranoa)	....	....	....	....	....	....	....	32·17	3,183·50	1,633·27	....
5493E	(Nein Milano N.L.)	....	....	....	....	....	....	....	·25	17,390·75	11,622·24	479·00
5493E	(Milano)	....	....	....	....	....	....	....	....	4,012·75	11,676·72	....
(5616E)	(Leslie)	....	....	....	....	....	....	....	....	602·00	939·10	....
6312E	Inverness	....	....	413·00	55·77	....	....	....	....	2,614·75	459·89	....
6540E	Launa Doone	....	....	283·75	71·77	....	....	....	....	426·50	103·42	....
6487E	Leslie	....	....	118·75	109·45	....	....	....	....	268·50	256·66	....
6213E	Pauline	....	....	40·50	6·91	....	....	....	....	282·50	229·08	....
6570E	Rock-and-Roll	....	....	302·00	20·12	....	....	....	....	851·00	64·22	....
6533E	Rosemary	....	....	285·75	648·49	....	....	....	....	2,063·00	3,833·40	....
6568E	Vanezia	....	....	72·75	30·40	....	....	....	....	72·75	30·40	....
	Voided leases	....	....	....	....	....	3·80	2,464·78	29,227·09	41,054·88	....
	Sundry claims	....	....	351·50	47·84	....	....	711·10	24,263·18	14,298·99	....
From District Generally :—												
Sundry Parcels treated at :—												
Golden Horseshoe (New) Ltd.	....	....	....	....	....	....	....	....	....	*350,028·15	354,192·20
State Battery, Kalgoorlie	....	....	....	*580·56	....	....	....	....	390·70	*33,590·57	66·68
Sundry claims	....	....	....	....	....	....	11,014·57	465·61	5,440·46	2,541·10	....
Various Works	....	....	....	....	....	....	384·36	64·70	41,135·02	*270,756·33	14,114·46
Northern Mineral Sands	....	40·50	*138·77	....	....	....	....	40·50	*138·77	....
Reported by Banks and Gold Dealers	9·25	9·54	5·25	124·88	....	16,926·87	10,023·15	377·43	7,430·31	....
Total	**9·25**	**36·20**	**2,003,480·00**	**529,543·08**	**105,703·71**	**33,644·69**	**41,072·74**	**73,432,913·35**	**32,864,529·05**	**4,972,765·49**

BULONG DISTRICT

Balagundi	....	Voided leases	....	....	....	....	....	....	2,408·98	1,115·93	1,488·91	12·92
		Sundry claims	....	....	....	....	....	3·51	293·52	806·01	505·93	....
Bulong	1311Y	Blue Quartz	....	....	412·25	93·89	....	....	....	2,031·25	701·61	....
		Voided leases	....	....	....	....	....	107·54	8,526·12	108,330·55	85,785·57	....
		Sundry claims	....	....	424·00	85·06	....	1,655·86	1,611·58	17,483·73	17,904·16	....
Majestic	....	Voided leases	....	....	....	....	....	19·45	63·91	1,317·94	647·62	....
		Sundry claims	....	....	....	....	....	42·88	154·58	1,926·55	948·06	....
Morelands	....	Sundry claims	....	....	....	....	....	....	·13	308·75	81·84	....
Mount 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	....	....	....	....	....	20·70	9·79	4,842·56	1,216·07	....
Taurus	....	Voided leases	....	....	....	....	....	2·06	3·70	1,765·10	909·84	....
		Sundry claims	....	....	....	....	....	112·69	51·88	2,656·60	1,049·81	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
EAST COOLGARDIE GOLDFIELD—continued												
BULONG DISTRICT—*continued.*												
Hampton Plains (Trans Find)	P.P.L.308A	Dawn of Hope	....	....	....	....	....	....	2·87	1,145·75	330·33	....
		Voided leases	....	....	....	....	....	....	....	1,098·42	876·22	....
		Sundry claims	....	....	....	....	....	....	5·93	808·25	335·33	....
		From District Generally :—										
		Sundry Parcels treated at :										
		Various Works	....	....	....	....	....	....	....	6,102·15	*6,675·38	....
		Reported by Banks and Gold Dealers	....	....	....	....	....	25,224·93	70·15	·01	28·44	....
		Total	....	....	**836·25**	**178·95**	....	**27,405·22**	**16,034·57**	**186,736·80**	**132,150·16**	**12·92**
Coolgardie Goldfield												
COOLGARDIE DISTRICT												
Bonnievale	G.M.L. 5986	Jenny Wren	....	....	56·75	27·62	....	....	....	79·00	35·10	....
	5622	Lucky Hit	....	....	24·25	18·70	....	....	3·28	1,022·85	529·97	....
	4600	Melva Maie	....	....	25·25	8·99	....	....	....	3,785·15	3,847·66	2·35
		Prior to transfer to present holders	....	....	....	....	....	....	....	614·50	1,099·21	11·63
	5977	Mystery	....	....	....	....	....	....	....	463·75	177·96	....
	5890	Rayjax	....	....	70·50	134·54	....	....	....	327·00	688·34	....
		Voided leases	....	....	....	....	....	....	212·48	357,741·97	191,281·36	5·88
		Sundry claims	....	....	52·50	8·41	....	....	163·19	8,117·13	5,364·73	·04
Bulla Bulling	5996	Pakaha's Son	....	....	272·50	118·83	....	....	....	272·50	118·83	....
		Voided leases	....	....	....	....	....	....	....	953·31	719·78	....
		Sundry claims	....	....	156·00	64·33	....	5·21	15·98	2,049·01	817·68	....
Burbanks	5605	Burbanks Deeps	....	....	....	....	....	....	....	103·00	53·46	....
		Voided leases	....	....	....	....	....	14·90	376·98	420,488·86	306,392·85	521·06
		Sundry claims	....	....	109·50	19·72	....	55·05	497·55	16,239·35	9,008·39	....
Cave Rocks	....	Voided leases	....	....	....	....	....	....	....	8,223·16	1,941·42	....
		Sundry claims	....	....	....	....	....	....	50·00	4,473·65	1,082·79	....
Coolgardie	5679	Ada	....	....	232·25	13·66	....	....	....	1,834·95	167·23	....
	5935, etc.	Goldmines of Kalgoorlie (Aust.) Ltd. (Bayleys)	....	....	25,019·00	11,814·70	....	....	....	77,008·00	328,82·49	907·43
	5876	(Bayleys, West)	....	....	....	....	....	....	....	6·25	2·22	....

	5868	El Dorado	....	....	....	....	....	....	....	....	498·20	175·45	1,034·94	....
	5997	Ellen Jean	....	....	....	....	20·01	232·50	63·99	....	....	20·01	232·50	63·99	....
	5844	Jackpot	....	....	....	....	....	....	....	....	....	....	7,212·75	2,763·83	....
	5884	Lone Hand	....	....	....	....	....	....	....	....	....	19·85	475·25	77·30	....
	5992	Prejudice	....	....	....	....	....	532·25	60·42	....	....	....	532·25	60·42	....
		Voided leases	....	....	....	....	....	....	....	....	1,301·71	4,764·07	1,108,559·54	44,926·49	4,819·59
		Sundry claims	....	....	....	·39	·74	1,639·25	318·54	....	219·08	2,718·46	76,621·69	27,989·57	....
Eundynie	....	Voided leases	....	....	....	....	....	....	....	....	3·70	16·09	31,772·98	16,531·34	1·75
		Sundry claims	....	....	....	....	....	4·00	23·45	....	....	229·32	698·12	521·20	....
Gibraltar	....	5990	Eleventh Hour	....	....	....	....	....	....	....	....	....	104·00	3·05	....
		5723	Lloyd George	....	....	....	....	....	....	....	....	....	763·00	176·78	....
			Voided leases	....	....	....	....	....	....	....	....	33·97	38,658·63	20,111·22	....
			Sundry claims	....	....	....	....	....	....	....	1·39	50·76	3,270·10	1,390·47	....
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.462	Bobby Dazzler	....	....	....	....	....	....	....	....	28·55	31·37	301·45	....
		P.P.L.419	Chatanooka	....	....	....	....	....	....	....	....	....	1,267·75	295·73	1·10
		P.P.L.335	D. & C. P. Clews	....	....	....	....	....	....	....	....	....	149·75	119·66	....
		P.P.L.338	Dry Hill	....	....	....	....	....	....	....	....	....	43·00	58·42	....
		P.P.L. 465	G. Dugan and Party	....	....	....	....	....	....	....	....	....	53·75	17·54	....
		P.P.L. 454	Golden Dollar	....	....	....	....	....	....	....	....	....	105·50	13·66	....
		P.P.L. 319	Lady May (G.M.K. under license)	....	....	....	....	109·75	49·92	....	....	....	122·25	101·29	....
		P.P.L. 319	Lady May	....	....	....	....	....	....	....	....	....	1,742·25	981·39	....
		P.P.L. 334	Gold Mines of Kalgoorlie (Aust.) Ltd.	....	....	....	....	190·75	78·33	....	....	....	190·75	78·33	....
		P.P.L. 468	J. P. Nichols & F. Hacket	....	....	....	....	24·25	5·30	....	....	....	24·25	5·30	....
		P.P.L. 469	D. P. Cullen & Frank	....	....	....	6·46	3·75	2·34	....	....	6·46	3·75	2·34	....
		P.P.L. 316, 330	Gold Mines of Kalgoorlie (Aust.) Ltd.	....	....	....	....	1,821·50	1,302·34	....	....	....	261,552·50	134,026·06	29,871·18
		P.P.L. 316	(Surprise G.M.)	....	....	....	....	....	....	....	....	....	7,189·00	3,425·59	....
		P.P.L. 330	(Barbara)	....	....	....	....	....	....	....	....	....	2,157·75	1,655·63	....
			Voided leases	....	....	....	....	....	....	....	....	451·32	13,950·84	11,118·69	....
			Sundry claims	....	....	....	....	....	....	....	1·63	132·06	1,948·00	856·51	....
Higginsville	....	G.M.L. 5647	Fair Play Gold Mine	....	....	....	....	116·00	29·00	....	....	....	28,392·00	3,152·82	·02
		5985	New Hope	....	....	....	....	....	....	....	....	....	54·00	4·80	....
		5877	Sons of Erin	....	....	....	....	48·33	13·25	60·90	....	74·73	57·25	94·50	1·21
		5293	Two Boys	....	....	....	....	....	42·00	4·75	....	....	402·00	1,265·18	·01
		5293	(Two Boys)	....	....	....	....	....	....	....	....	....	6,888·00	3,193·95	....
			Voided leases	....	....	....	....	....	....	....	....	407·74	38,185·35	17,471·78	159·50
			Sundry claims	....	....	....	....	....	....	....	....	187·25	3,664·76	1,957·50	....
Larkinville	....		Voided leases	....	....	....	....	....	....	....	22·77	54·55	2,335·16	3,256·49	....
			Sundry claims	....	....	....	....	42·00	4·16	....	....	147·20	490·53	1,033·19	....
Logans	....	5324. etc.	Spargos Reward Gold Mine (1935) N.L.	....	....	....	....	....	....	....	....	....	105,397·50	26,324·42	....
			Voided leases	....	....	....	....	....	....	....	....	....	1,263·31	607·26	....
			Sundry claims	....	....	....	....	24·75	3·35	....	6·88	128·95	2,021·85	914·78	....
Londonderry	....		Voided leases	....	....	....	....	....	....	....	....	95·04	34,155·35	22,238·37	·35
			Sundry claims	....	....	....	....	27·50	8·64	....	16·68	78·66	4,191·67	2,680·35	22·42

Table I.—*Production of Gold and Silver from all sources, etc.*—continued

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
COOLGARDIE GOLDFIELD—continued												
COOLGARDIE DISTRICT—*continued*												
Mungari		Voided leases	....	....	....	....	....	....	17·71	1,872·50	458·43	....
		Sundry claims	....	....	....	....	....	1·77	153·24	2,828·94	752·60	....
Paris	5873	Paris West	....	....	....	....	....	....	....	19·00	11·03	....
		Voided leases	....	....	....	....	....	·88	4·30	15,497·00	8,625·37	79·19
		Sundry claims	....	....	....	....	....	....	....	2,104·25	518·98	....
Red Hill		Voided leases	....	....	....	....	....	14·87	1,551·81	40,797·40	31,070·65	....
		Sundry claims	....	5·39	8·25	31·10	....	15·29	95·72	1,425·39	1,065·13	....
Ryans Find		Voided leases	....	....	....	....	....	....	....	54·16	151·69	....
		Sundry claims	....	....	....	....	....	....	·44	116·44	355·83	....
St. Ives		Voided leases	....	....	....	....	....	63·34	146·87	39,318·46	16,208·86	....
		Sundry claims	....	....	....	....	....	211·25	950·23	4,177·56	1,459·39	....
Wannaway		Voided leases	....	....	....	....	....	....	28·61	1,831·95	1,465·70	....
		Sundry claims	....	....	11·25	3·54	....	....	193·79	1,336·12	1,310·57	....
Widgiemooltha	5663	Bobs	....	....	....	....	....	....	....	16·00	4·94	....
	5834	Harpers	....	....	....	....	....	....	9·54	40·00	93·06	....
	5451	Host Group	....	....	....	....	....	....	12·75	1,604·15	565·02	....
		Voided leases	....	....	....	....	....	17·95	1,252·70	22,727·81	11,965·35	·17
		Sundry claims	....	....	33·50	27·34	....	46·49	470·06	16,219·66	6,891·03	·07
		From District generally :—										
		Sundry Parcels treated at :										
		State Battery, Coolgardie	....	....	....	*347·01	....	....	....	771·01	*38,792·37	17·00
		Australian Machinery & Investment Coy. Ltd. Cyanide Plant	....	....	....	....	....	....	....	....	*3,044·44	86·31
		T. A. James (T.A. 201)	....	....	....	....	....	....	....	361·00	*373·02	....
		Various Works	....	....	....	....	....	7·75	....	4,014·61	29,780·07	223·06
		Reported by Banks and Gold Dealers	17·11	....	....	1·39	....	14,981·33	725·51	48·25	129·72	·65
		Total	**17·50**	**80·93**	**30,895·00**	**14,655·31**	....	**17,009·92**	**17,094·72**	**2,852,010·35**	**1,470,389·08**	**36,731·97**

KUNANALLING DISTRICT.

Carbine	1048S	Carbine	....	....	21·75	9·56	....	....	....	13,841·75	7,057·52	....
	33S	Carbine Leases	....	....	....	....	....	....	687·98	51,991·86	39,862·25	....
		Voided leases	....	....	....	....	....	....	....	20,116·00	5,470·81	....
		Sundry claims	....	....	184·50	15·45	....	136·08	96·96	6,430·13	2,270·71	....
Chadwin	1047S	Resolute	....	....	4·50	9·71	....	....	....	56·25	66·44	....
		Voided leases	....	....	....	....	....	....	....	4,781·55	5,232·25	2·50
		Sundry claims	....	....	....	....	....	14·28	82·36	5,972·55	2,945·14	·25
Dunnsville	....	Voided leases	....	....	....	....	....	....	828·58	17,548·85	8,657·45	....
		Sundry claims	....	....	....	....	....	21·00	1,034·08	2,990·71	2,084·70	....
Jourdie Hills	....	Voided leases	....	....	....	....	....	....	18·00	28,009·74	19,601·09	28·45
		Sundry claims	....	....	34·00	15·65	....	1·86	49·81	1,965·75	890·80	1·05
Kintore	....	Voided leases	....	....	....	....	....	18·70	169·33	56,822·89	40,044·61	677·88
		Sundry claims	....	....	148·50	17·87	....	111·91	102·70	4,709·53	2,548·75	....
Kunanalling	....	Voided leases	....	....	....	....	....	86·13	1,734·92	130,303·61	100,812·73	40·77
		Sundry claims	....	....	195·50	42·93	....	216·53	815·72	15,281·77	9,709·82	....
Kundana	....	Voided leases	....	....	....	....	....	....	....	465·00	68·12	....
		Sundry claims	....	....	....	....	....	....	....	475·25	60·38	....
		From District generally :—										
		Sundry Parcels treated at :										
		Goldfields Australian Development Cyanide Plant	....	....	....	....	....	....	....	....	*548·07	....
		Various Works	....	....	....	....	....	42·23	....	1,782·26	5,063·55	....
		Reported by Banks and Gold Dealers	2·16	....	....	....	....	870·56	17·93	....	5·85	·49
		Total	**2·16**	....	**588·75**	**111·17**	....	**1,519·28**	**5,638·37**	**363,545·45**	**252,801·04**	**751·39**

Yilgarn Goldfield.

Blackbornes	....	Voided leases	....	....	....	....	....	....	....	1,282·50	341·37	....
		Sundry claims	....	....	....	....	....	....	....	392·50	81·15	....
Bullfinch	3350, etc.	Great Western Consolidated N.L. (Copperhead Group)	....	....	343,379·00	48,766·45	12,344·67	....	....	2,429,710·00	333,497·98	101,976·51
		Prior to transfer to present holders	....	....	....	....	....	....	64·80	78,404·34	24,644·88	....
	4287	Volcano	....	....	....	....	....	....	....	175·00	166·03	....
		Voided leases	....	....	....	....	....	....	10·14	490,361·07	185,489·03	27,958·41
		Sundry claims	....	....	16·00	5·60	1·25	8·47	37·04	7,500·75	4,073·60	1·25
Corinthian	3398, etc.	Great Western Consolidated N.L. (Corinthian Group)	....	....	37,498·00	4,258·05	1,062·85	....	....	70,366·00	10,603·31	2,604·56
		Prior to transfer to present holders	....	....	....	....	....	....	....	14,416·58	6,248·03	....
	4180	Deliverance	....	....	....	....	....	....	....	480·00	167·55	....
		Voided leases	....	....	....	....	....	....	23·46	138,241·40	33,293·21	....
		Sundry claims	....	....	....	....	....	....	2·68	1,088·35	640·61	....

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
YILGARN GOLDFIELD—continued.												
Eenuin	4414	Birthday	....	....	....	....	....	....	15·00	160·00	183·37	....
	4425	Patricia Lea	....	....	....	....	....	....	....	10·00	19·36	....
		Voided leases	....	....	....	....	....	....	181·74	10,038·06	10,457·92	·01
		Sundry claims	....	....	....	....	....	2·50	73·97	2,750·60	1,964·56	....
Evanston	....	Voided leases	....	....	....	....	....	....	79·27	64,533·06	33,191·88	10·14
		Sundry claims	....	....	....	....	....	4·98	....	638·35	159·55	....
Forrestonia		Voided leases	....	....	....	....	....	....	....	1,185·00	298·15	....
		Sundry claims	....	....	....	....	....	....	....	378·00	144·01	....
Golden Valley	4247	Lily of the Valley	....	....	....	....	....	....	....	709·00	177·73	....
	4220	Manxman South	....	....	....	....	....	....	....	19·00	4·42	....
	3266, etc.	Radio Leases	....	....	1,930·00	2,343·58	174·96	....	2·70	33,582·80	57,347·00	946·82
		Voided leases	....	....	....	....	....	....	36·34	36,835·92	28,969·41	10·99
		Sundry claims	....	....	....	....	....	4·58	241·60	6,641·27	4,922·56	1·02
Greenmount		Voided leases	....	....	....	....	....	45·99	21·62	125,127·64	31,585·45	944·50
		Sundry claims	....	....	....	....	....	·46	4·27	3,099·58	816·65	....
Holleton	P.P. 37	Brittania	....	....	50·00	14·67	....	....	....	2,200·00	1,726·15	....
		Voided leases	....	....	....	....	....	....	9·33	45,003·25	13,147·88	36·69
		Sundry claims	....	....	....	....	....	....	3·75	3,464·05	923·78	·20
Hope's Hill	3414	Pilot	....	....	2,188·00	324·80	70·50	....	....	21,634·12	3,273·48	70·50
		Voided leases	....	....	....	....	....	....	74·78	132,660·55	36,462·02	1·00
		Sundry claims	....	....	....	....	....	18·67	44·35	4,600·52	1,417·83	....
Kennyville	3875	Victoria	....	....	36·00	9·05	....	....	....	5,320·00	1,173·81	·63
		Voided leases	....	....	....	....	....	....	18·76	55,876·63	21,625·66	·59
		Sundry claims	....	....	....	....	....	....	5·06	8,700·50	2,337·49	....
Koolyanobbing		Voided leases	....	....	....	....	....	....	·99	1,768·05	972·77	....
		Sundry claims	....	....	48·25	7·80	....	·26	17·33	714·35	337·88	....
Marvel Loch	4243	Christmas Gift	....	....	45·00	12·01	....	....	32·56	120·60	64·96	....
	P.P. 13	Cricket	....	....	....	....	....	....	....	1,671·00	932·04	....
	4039	Cromwell	....	....	174·50	32·98	....	....	....	995·50	159·91	....

	3942, etc.	Edwards Reward Leases	....	....	1,901·00	544·26	....	....	....	66,681·50	29,016·82	....
	3942	(Edwards Reward)	....	....	....	....	....	....	....	2,080·00	2,016·32	....
	3943	(Sunshine)	....	....	....	....	....	....	....	3,866·00	2,384·79	....
	4034	Firelight	....	....	....	....	....	....	2·68	6,653·75	940·03	....
	3724	Francis Furness	....	....	....	....	....	....	....	14,189·75	6,852·71	....
	4375	Great Western Consolidated N.L. (Nevoria)	....	....	39,572·00	10,250·45	2,604·28	....	....	54,671·00	12,710·29	3,200·24
	3718	Kurrajong	....	....	....	....	....	....	....	9,221·00	3,271·73	....
	3914	May	....	....	....	....	....	....	....	145·00	45·86	....
	4230	May Queen	....	....	....	....	....	....	....	286·00	43·42	....
	3970	Mountain Queen	....	....	....	....	....	....	....	1,231·00	455·65	....
	4384	Newry	....	....	108·00	18·48	....	....	....	326·00	79·22	....
	4362	North Star	....	....	....	....	....	....	....	104·00	18·60	....
	4035	Undaunted	....	....	....	....	....	....	....	865·00	113·59	....
		Voided leases	....	....	....	....	....	....	1,504·26	860,034·48	206,859·69	2,474·95
		Sundry claims	....	....	16·50	2·74	....	11·35	809·31	36,360·11	13,439·64	·04
Mount Jackson	....	Voided leases	....	....	....	....	....	....	180·85	55,166·78	39,927·52	2,313·77
		Sundry claims	....	....	....	....	....	6·44	52·87	10,935·95	4,879·54	70·74
Mount Palmer	4250	Palmerston	....	....	....	....	....	2·03	....	583·00	97·60	....
	4345	Speedie	....	....	....	....	....	....	....	90·00	38·03	....
	M.L. 4	Yellowdine Gold Development Pty. Ltd.	....	....	....	....	....	....	....	93·00	*136·46	....
		Voided leases	....	....	....	....	....	....	....	306,408·40	158,486·81	....
		Sundry claims	....	....	....	....	....	1,643·48	18·19	450·25	387·14	....
Mt. Rankin	P.P. 81	Golden View	....	....	....	....	....	....	72·16	50·00	87·03	....
	P.P. 88	Lynette	....	....	31·00	8·46	....	....	....	691·00	213·74	....
	P.P. 76	Marjorie Glen Reward	....	....	428·55	486·40	....	....	191·46	2,586·55	3,598·01	....
	G.M.L. 3555	No Trumps	....	....	....	....	....	....	....	5,562·37	853·06	....
		Voided leases	....	....	....	....	....	3·84	5·20	496·00	122·17	....
		Sundry claims	....	....	22·00	4·56	....	....	1·85	771·00	956·57	....
Parkers Range	4423	Spring Hill	....	....	24·50	18·63	....	....	....	76·50	27·36	....
		Voided leases	....	....	....	....	....	·42	270·76	63,642·10	32,711·48	26·46
		Sundry claims	....	....	100·75	28·63	....	6·59	303·93	12,613·05	5,453·86	·98
Southern Cross	4002, etc.	Great Western Consolidated N.L. (Frasers)	....	....	36,482·00	12,154·49	3,063·90	....	....	100,695·00	35,276·20	9,448·16
		Prior to transfer to present holders	....	....	....	....	....	....	....	13,720·50	1,876·00	1·26
	3444	(Three Boys)	....	....	....	....	....	....	....	4,180·00	727·75	....
	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	....
		Voided leases	....	....	....	....	....	4·89	261·35	454,906·68	215,351·50	364·41
		Sundry claims	....	....	....	....	....	95·90	648·49	8,183·66	2,626·86	....
Westonia	4326	Consols	....	....	....	....	....	....	....	999·50	518·70	....
		Voided leases	....	....	....	....	....	....	4·06	596,118·64	380,916·67	5,104·07
		Sundry claims	....	....	....	....	....	9·51	64·96	4,310·76	2,823·33	·72

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
YILGARN GOLDFIELDS—continued.												
		From Goldfield generally :—										
		Sundry Parcels treated at :										
		W. B. Ridge Plant Evanston Leases	....	....	....	*1,512·65	373·15	....	....	....	*1,973·98	492·80
		Great Western Consolidated N.L. (N.G.M. Dump)	....	....	....	....	....	....	....	....	*276·58	....
		T. Satterthwaite (L.T.T.1401H)	....	....	13·50	2·77	....	....	....	13·50	2·77	....
		C. V. Davies (L.T.T.1344H)	....	....	....	....	....	....	....	....	*15·19	....
		Great Western Consolidated N.L. (Fraser's Dump)	....	....	....	*200·30	51·11	....	....	....	*1,332·06	78·74
		Great Western Consolidated N.L. (Copperhead)	....	....	....	*686·40	174·77	....	....	....	*5,770·90	458·63
		Kurrajong Battery	....	....	....	....	....	....	....	....	*409·57	....
		Pilot Cyanide Plant	....	....	....	....	....	....	....	30·00	*3,753·59	....
		J. E. Read (L.T.T.1375H)	....	....	....	*44·05	12·03	....	....	....	*44·05	12·03
		R. R. Robinson (L.T.T.1315H)	....	....	....	....	....	....	....	....	*1,408·40	....
		Three Boys Cyanide Plant	....	....	....	....	....	....	....	7·00	*3,846·33	....
		E. Coward (L.T.T.1366H)	....	....	....	....	....	....	....	10·00	4·89	....
		Westonia Cyanide Plant	....	....	....	....	....	....	....	....	*82·38	....
		State Battery, Marvel Loch	....	....	....	*2·13	....	....	....	29·00	*1,283·32	....
		Various Works	....	....	....	....	....	....	....	341·48	99,101·07	107·98
		Reported by Banks and Gold Dealers	....	....	....	....	....	323·20	81·41	·60	120·60	....
		Total	....	....	**464,064·55**	**81,740·39**	**19,933·47**	**2,193·56**	**5,475·33**	**6,511,617·00**	**2,141,836·82**	**158,719·80**
Dundas Goldfield.												
Beete	....	Sundry claims	....	....	19·25	34·83	....	....	....	19·25	34·83	....
Buldania	....	Voided leases	....	....	....	....	....	....	3·02	846·05	708·99	....
		Sundry claims	....	....	....	....	....	....	39·25	1,324·27	861·36	·72
Dundas	(1860)	Coronation	....	....	....	....	....	....	....	138·50	15·15	....
		Voided leases	....	....	....	....	....	1·88	28·02	6,103·48	2,545·38	155·02
		Sundry claims	....	....	9·50	1·80	....	·76	413·85	2,158·25	1,115·96	19·64
Norseman	1288, etc.	Central Norseman Gold Corporation N.L.	....	....	182,822·00	108,175·69	53,504·69	....	....	2,676,454·20	1,144,600·32	821,344·65
		Prior to transfer to present holders	....	....	....	....	....	....	1,663·32	69,819·83	47,892·08	16,508·85
	1859	Mt. Barker	....	....	....	....	....	....	....	30·50	4·51	·19
	1315, etc.	Norseman Gold Mines N.L.	....	....	....	....	....	....	....	964,099·00	241,009·50	353,206·54
		Prior to transfer to present holders	....	....	....	....	....	....	....	20,657·00	3,909·60	4,981·00
		Voided leases	....	....	....	....	....	14·27	10,601·15	915,759·17	601,761·91	39,001·04
		Sundry claims	....	....	200·25	112·45	....	1,052·09	3,402·99	47,823·45	22,394·33	208·06

Peninsular	....	Voided leases	....	....	....	....	....	....	....	24·29	9,603·39	6,102·61	12·20
		Sundry claims	....	....	....	....	....	....	....	....	217·25	119·32	·97
		From Goldfield generally :—											
		Sundry Parcels treated at :											
		State Battery, Norseman	....	....	....	....	....	....	....	....	417·89	*25,351·51	1,051·13
		W. J. Briggs (L.T.T. 1-58)	....	....	20·25	6·57	....	....	....	....	20·25	6·57	....
		Various Works	....	....	....	....	....	....	54·52	760·64	15,104·14	2,588·35
		Reported by Banks and Gold Dealers	....	....	....	....	....	1,181·77	49·59	47·50	21·37	·70
		Total	....	....	**183,071·25**	**108,331·34**	**53,504·69**	**2,250·77**	**16,280·00**	**4,716,299·87**	**2,113,559·44**	**1,239,079·06**

Phillips River Goldfield.

Hatter's Hill	....	Voided leases	....	....	....	....	....	....	4·38	1,599·55	1,222·72	....
		Sundry claims	....	....	....	....	....	74·91	24·26	5,225·60	2,720·90	26·09
Kundip	G.M.L. 263	Hillsborough	....	....	....	....	....	....	....	258·00	65·75	19·33
		Voided leases	....	....	....	....	....	113·28	556·17	84,866·58	60,584·54	4,008·81
		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	....	....	....	....	....	....	....	80·00	41·96	51·01
Ravensthorpe	M.L.411	Wehr Bros.	....	....	....	....	....	....	....	....	1·99	....
	M.C.35, 50, M.L.419	Ravensthorpe Copper Mines N.L.	....	....	‡811·37	3,012·36	....	....	....	....	‡1,168·11	‡3,751·33
	M.L.421	Big Surprise	....	....	....	....	....	....	....	‡6·46	3·03	‡116·48
		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 :										
		F. E. Daw (T.A.11)	....	....	....	....	....	....	....	....	*128·45	....
		Various Works	....	....	....	....	....	....	....	27·00	*4,118·73	515·43
		Reported by Banks and Gold Dealers	....	....	1·08	....	164·69	12·31	....	5·84	....
		Total	....	....	....	**812·45**	**3,012·36**	**607·11**	**821·02**	**130,491·99**	**105,202·90**	**19,894·41**

Table I.—*Production of Gold and Silver from all sources, etc.*—continued.

Mining Centre	Number of Lease	Registered Name of Company or Lease	Total for 1958					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.
Outside Proclaimed Goldfield.												
Burracoppin	....	Voided leases	....	....	....	....	....	....	....	710·85	706·38	....
		Sundry claims	....	....	....	....	....	....	·98	372·75	213·97	....
Donnybrook	....	Voided leases	....	....	....	....	....	23·24	....	1,613·30	816·23	....
		Sundry claims	....	....	....	....	....	44·01	43·03	119·50	15·71	15·18
Jimperding	P.P.45 (P.P.1 Avon)	Hillsdale	....	....	....	....	....	....	....	1,261·75	308·00	....
Lake Grace	....	Sundry claims	....	....	19·00	5·71	....	....	....	19·00	5·71	....
Northampton	....	Sundry leases and claims	....	....	....	....	....	....	....	....	....	†2,624·03
Ongerup	103H	Hornblende	....	....	....	....	....	....	....	24·50	2·85	....
		Sundry claims	....	....	....	....	....	....	1·58	·33	1·74	....
		From State generally :—										
		Sundry Parcels treated at :										
		Miscellaneous voided leases and sundry claims	....	....	....	....	....	245·83	3·07	210·35	45·19	....
		Sundry specimens	....	....	....	....	....	4·24	56·85	....	....	....
		Various Works	....	....	....	....	....	....	....	27·00	9,009·75	31,521·73
		Reported by Banks and Gold Dealers	18·63	9·65	....	....	591·82	1,143·21	951·86	....	458·10	1.140·93
		Total	**18·63**	**9·65**	**19·00**	**5·71**	**591·82**	**1,460·53**	**1,057·37**	**4,359·33**	**11,583·63**	**35,301·87**

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 1958.

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	....	....	....	....	....	....	....	5·51	36·61	30·00	8·18	50·30	....
West Kimberley	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara	Marble Bar	1·93	....	1,842·80	810·76	812·69	211·60	12·73	15·09	2,515·80	975·83	1,003·65	211·60
	Nullagine	10·80	15·09	673·00	165·07	190·96	....	....	....	....	....	....	....
West Pilbara	....	....	....	....	....	....	....	2·68	....	41·00	12·34	15·02	·11
Ashburton	....	....	....	....	....	....	....	....	....	....	....	....	1,166·52
Gascoyne	....	....	....	....	....	....	....	....	5·76	....	....	5·76	....
Peak Hill	....	....	....	....	....	....	....	....	....	3,267·50	637·49	637·49	....
East Murchison	Lawlers	118·32	....	....	6·96	125·28	462·50	....	....	....	....	....	....
	Wiluna	....	....	....	100·31	100·31	11·75	118·32	....	642·00	698·25	816·57	474·25
	Black Range	....	....	642·00	590·98	590·98	....	....	....	....	....	....	....
Murchison	Cue	1·53	2·98	795·50	577·60	582·11	22·31	....	....	....	....	....	....
	Meekatharra	·56	61·08	4,134·25	782·87	844·51	6·65	6·29	64·36	142,177·55	81,913·81	81,984·46	1,887·17
	Day Dawn	....	....	1,086·75	85·56	85·56	....	....	....	....	....	....	....
	Mt. Magnet	4·20	·30	136,161·05	80,467·78	80,472·28	1,858·21	....	....	....	8·83	8·83	·53
Yalgoo	....	....	....	....	....	....	....	2·40	....	5,010·95	2,382·55	2,384·95	....
Mt. Margaret	Mt. Morgans	6·11	9·05	1,887·00	374·97	390·13	....	1·66	5·77	754·00	314·34	321·77	....
	Mt. Malcolm	28·83	1·96	138,612·00	30,511·12	30,541·91	2,663·02	68·89	11·01	141,810·50	30,930·28	31,010·18	2,663·02
	Mt. Margaret	33·95	....	1,311·50	44·19	78·14	....	....	....	....	....	....	....
North Coolgardie	Menzies	·93	....	32,967·80	16,852·81	16,853·74	....	9·25	36·20	2,004,316·25	529,722·03	529,767·48	105,703·71
	Ularring	....	....	3,017·50	1,866·04	1,866·04	....	....	....	....	....	....	....
	Niagara	....	....	2,757·75	971·24	971·24	....	....	....	....	....	....	....
	Yerilla	....	....	3,125·00	1,336·23	1,336·23	226·01	19·66	80·93	31,483·75	14,766·48	14,867·07	....
Broad Arrow	....	....	....	....	....	....	....	....	....	464,064·55	81,740·39	81,740·39	19,933·47
North-East Coolgardie	Kanowna	·62	5·77	707·25	294·75	301·14	....	....	....	183,071·25	108,331·34	108,331·34	53,504·69
	Kurnalpi	1·04	....	46·75	19·59	20·63	....	....	....	....	812·45	812·45	3,012·36
East Coolgardie	East Coolgardie	9·25	36·20	2,003,480·00	529,543·08	529,588·53	105,703·71	....	....	....	....	....	....
	Bulong	....	....	836·25	178·95	178·95	....	18·63	9·65	19·00	5·71	33·99	591·82
Coolgardie	Coolgardie	17·50	80·93	30,895·00	14,655·31	14,753·74	....						
	Kunanalling	2·16	....	588·75	111·17	113·33	....						
Yilgarn	....	....	....	....	....	....	....						
Dundas	....	....	....	....	....	....	....						
Phillips River	....	....	....	....	....	....	....						
Outside Proclaimed Goldfields		....	....	....	....	....	....						
	Total	....	....	....	....	....	....	266·95	265·38	3,021,072·15	874,286·62	874,818·95	189,375·26

TABLE III.

Return showing total production reported to the Mines Department, and respective Districts and Goldfields from whence derived, to 31st December, 1958.

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	....	....	....	....	....	....	....	8,980·71	2,883·97	22,751·90	17,234·70	29,099·38	128·76
West Kimberley	....	....	....	....	....	....	....	1·30	24·68	1·00	2·49	28·47	13,575·29
Pilbara	Marble Bar	15,252·82	4,565·07	332,955·97	325,883·11	345,701·00	32,413·26	25,635·71	7,446·62	469,392·67	454,142·93	487,225·26	33,480·56
	Nullagine	10,382·89	2,881·55	136,436·70	128,259·82	141,524·26	1,067·30						
West Pilbara	....	....	....	....	....	....	....	6,337·46	374·74	24,721·96	24,289·44	31,001·64	1,909·71
Ashburton	....	....	....	....	....	....	....	9,266·82	482·46	6,807·10	2,913·43	12,662·71	41,556·28
Gascoyne	....	....	....	....	....	....	....	693·44	68·73	387·00	517·29	1,279·46	....
Peak Hill	....	....	....	....	....	....	....	3,376·86	5,300·33	766,651·73	321,078·39	329,755·58	3,768·47
East Murchison	Lawlers	7,026·37	2,343·19	2,011,381·92	822,715·45	832,085·01	27,184·22	8,921·62	22,119·10	12,614,865·83	3,649,006·14	3,680,046·86	60,195·14
	Wiluna	224·85	1,254·11	8,873,554·94	1,872,170·42	1,873,649·38	10,298·63						
	Black Range	1,670·40	18,521·80	1,729,928·97	954,120·27	974,312·47	22,712·29						
Murchison	Cue	5,094·00	9,099·17	6,808,817·29	1,400,859·22	1,415,052·39	274,070·78	25,526·21	59,100·08	13,488,012·58	5,272,121·05	5,356,747·34	464,655·21
	Meekatharra	14,615·55	18,225·12	2,294,834·21	1,306,031·03	1,338,871·70	5,126·53						
	Day Dawn	3,241·76	11,341·63	2,037,126·88	1,375,496·48	1,390,079·87	169,434·20						
	Mt. Magnet	2,574·90	20,434·16	2,347,234·20	1,189,734·32	1,212,743·38	16,023·70						
Yalgoo	....	....	....	....	....	....	....	1,789·28	3,223·19	442,239·33	263,653·80	268,666·27	1,503·16
Mt. Margaret	Mt. Morgans	3,497·77	9,389·86	1,216,845·31	717,526·48	730,414·11	5,812·32	11,554·55	35,395·85	10,786,599·92	4,799,358·17	4,846,308·57	247,995·25
	Mt. Malcolm	3,952·13	16,651·64	7,043,413·47	2,907,918·74	2,928,522·51	175,995·90						
	Mt. Margaret	4,104·65	9,354·35	2,526,341·14	1,173,912·95	1,173,912·95	66,187·03						
North Coolgardie	Menzies	1,676·25	6,983·00	1,704,774·68	1,315,389·49	1,324,048·74	31,272·59	4,836·04	19,825·01	3,455,190·33	2,448,464·64	2,473,125·69	62,715·76
	Ularring	129·52	7,203·12	529,425·85	439,002·69	446,335·30	21,928·23						
	Niagara	1,718·36	1,821·77	938,671·77	526,567·10	530,107·23	5,686·69						
	Yerilla	1,311·91	3,817·12	282,318·03	167,505·36	172,634·39	3,828·25						
Broad Arrow	....	....	....	....	....	....	....	21,981·52	27,475·30	1,348,327·69	736,502·40	785,959·22	5,305·71
North-East Coolgardie	Kanowna	106,526·30	13,526·67	1,006,847·01	626,520·04	746,573·01	3,039·73	119,361·79	21,825·58	1,020,364·58	645,258·81	786,446·18	3,052·44
	Kurnalpi	12,835·49	8,298·91	13,517·57	18,738·77	39,873·17	12·71						
East Coolgardie	East Coolgardie	33,644·69	41,072·74	73,432,913·35	32,864,529·05	32,939,246·48	4,972,765·49	61,049·91	57,107·31	73,619,650·15	32,996,679·21	33,114,836·43	4,972,778·41
	Bulong	27,405·22	16,034·57	186,736·80	132,150·16	175,589·95	12·92						
Coolgardie	Coolgardie	17,009·92	17,094·72	2,852,010·35	1,470,389·08	1,504,493·72	36,731·97	18,529·20	22,733·09	3,215,555·80	1,723,190·12	1,764,452·41	37,483·36
	Kunanalling	1,519·28	5,638·37	363,545·45	252,801·04	259,958·69	751·39						
Yilgarn	....	....	....	....	....	....	....	2,193·56	5,475·33	6,511,617·00	2,141,836·82	2,149,505·71	158,719·80
Dundas	....	....	....	....	....	....	....	2,250·77	16,280·00	4,716,299·87	2,113,559·44	2,132,090·21	1,239,079·06
Phillips River	....	....	....	....	....	....	....	607·11	821·02	130,491·99	105,202·90	106,631·03	19,894·41
Outside Proclaimed Goldfield		....	....	....	....	....	....	1,460·53	1,057·37	4,359·33	11,583·63	14,101·53	35,301·87
Total		....	....	....	....	....	....	334,354·39	309,019·76	132,644,287·76	57,726,595·80	58,369,969·95	7,403,098·65

TABLE IV.

Total output of Gold (Bullion and Concentrates entered for Export and Gold reviewed at the Perth Branch of the Royal Mint) from 1st January, 1886, to 31st December, 1958; Showing in Fine Ounces the quantity credited to 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 1955	22,422·06	16,853·76	39,275·82	174,791·15	387,098·46	561,889·61
1955	....	178·81	178·81	2,335·70	1,937·80	4,273·50
1956	....	172·97	172·97	673·60	913·63	1,587·23
1957	....	69·13	69·13	13·28	787·95	1,801·23
1958	....	91·82	91·82	21·41	965·91	987·32
Total	22,422·06	17,187·68	39,609·74	175,599·44	389,765·95	565,265·39
		(*a*) West Pilbara			**Ashburton**	
Prior to 1955	4,351·11	26,908·43	31,259·54	4,104·96	6,365·22	10,470·18
1955	....	2·29	2·29	....	13·60	13·60
1956	....	7·59	7·59	....	1·01	1·01
1957	56·96	....	56·96	....	0·91	0·91
1958	....	15·71	15·71	....	....	....
Total	4,408·07	26,931·73	31,339·80	4,104·96	6,367·14	10,472·10
		(*b*) Gascoyne			**(*c*) Peak Hill**	
Prior to 1955	304·55	1,089·57	1,394·12	41,102·76	229,120·74	270,223·50
1955	....	....	....	....	103·50	103·50
1956	....	....	....	....	22·03	22·03
1957	....	0·60	0·60	....	272·50	272·50
1958	....	5·81	5·81	....	491·05	491·05
Total	304·55	1,095·98	1,400·53	41,102·76	229,906·32	271,009·08
		East Murchison			**Murchison**	
Prior to 1955	259,456·25	3,024,582·07	3,284,038·32	1,577,344·02	3,784,787·32	5,362,131·34
1955	63·89	46·68	110·57	93·85	81,903·93	81,997·78
1956	270·74	69·32	340·06	174·62	81,083·19	81,257·81
1957	13·40	228·44	241·84	25·02	81,012·11	89,037·13
1958	6·96	386·84	393·80	31·40	81,793·32	81,824·72
Total	259,747·35	3,025,266·67	3,285,014·02	1,577,575·06	4,036,675·94	5,614,251·00
		(*d*) Yalgoo			**(*e*) Mt. Margaret**	
Prior to 1955	13,650·56	197,325·51	210,886·07	694,955·23	3,891,606·12	4,586,561·35
1955	....	1·68	1·68	112·70	26,285·21	26,397·91
1956	....	0·48	0·48	64·85	25,986·30	25,051·15
1957	....	108·58	108·58	124·30	32,622·75	32,747·05
1958	....	9·89	9·89	63·50	30,487·16	30,550·66
Total	13,650·56	197,354·46	211,005·02	695,207·88	3,980,702·33	4,675,910·21
		(*f*) North Coolgardie			**(*g*) Broad Arrow**	
Prior to 1955	263,653·17	2,100,311·73	2,363,964·90	122,916·00	445,651·61	568,567·61
1955	117·56	19,410·57	19,538·13	75·50	1,559·24	1,634·74
1956	14·67	21,752·28	21,766·95	3·72	1,802·30	1,806·02
1957	....	24,178·72	24,178·72	....	2,548·36	2,548·36
1958	67·08	20,335·49	20,402·57	....	2,203·97	2,203·97
Total	263,734·92	2,166,578·22	2,430,313·14	122,919·72	452,206·24	575,125·96
		(*f*) North-East Coolgardie			**(*f*) East Coolgardie**	
Prior to 1955	235,893·69	459,722·72	695,616·41	7,034,905·09	26,201,999·50	33,236,904·59
1955	....	108·96	108·96	1,248·39	512,527·52	513,775·91
1956	....	128·27	128·27	946·39	491,466·14	492,412·53
1957	....	105·58	105·58	1,529·11	542,866·97	544,396·08
1958	....	143·84	143·84	688·12	522,852·26	523,540·38
Total	235,893·69	460,100·41	695,994·10	7,038,068·71	27,759,184·87	34,797,253·58
		(*h*) Coolgardie			**Yilgarn**	
Prior to 1955	663,560·46	1,416,733·79	2,080,294·25	220,547·29	1,739,608·42	1,960,155·71
1955	17·11	35,091·85	35,108·96	26·81	70,003·36	70,030·17
1956	22·72	10,828·17	10,850·89	70·98	86,353·75	86,424·73
1957	1·05	20,344·33	20,345·38	12·40	84,765·72	84,778·12
1958	21·36	14,512·28	14,533·64	8·63	81,832·96	81,841·59
Total	663,605·59	1,462,418·57	2,126,024·16	220,639·30	1,992,560·85	2,213,200·15
		(*i*) Dundas			**(*j*) Phillips River**	
Prior to 1955	170,787·39	1,730,730·54	1,901,517·93	40,650·82	64,373·65	105,024·47
1955	....	88,031·33	88,031·33	....	3·06	3·06
1956	....	88,670·54	88,670·54	0·52	....	0·52
1957	....	95,726·05	95,726·05	266·75	92·49	359·24
1958	....	108,365·64	108,365·64	811·37	1·09	812·46
Total	170,787·39	2,023,492·77	2,194,280·16	41,462·71	64,374·74	105,837·45
		¶ Donnybrook			**Outside Proclaimed Goldfields**	
Prior to 1955	282·21	557·53	839·74	22,769·12	42,869·23	65,638·35
1955	....	....	....	....	704·33	704·33
1956	....	....	....	88·29	790·71	879·00
1957	....	....	....	....	907·52	907·52
1958	....	....	....	90·86	881·76	972·62
Total	282·21	557·53	839·74	22,948·27	44,541·70	67,489·97

(*a*) Prior to 1st May, 1898, included with Pilbara, and from 12th July, 1929, to 16th September, 1949, included in Outside Proclaimed Goldfields. (*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	923,698·96	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	1,874,920
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	661,338·35	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	540,057·08	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
1948	4,653·72	660,332·07	664,985·79	7,156,909
1949	4,173·14	644,252·48	648,425·62	7,962,808
1950	4,161·53	606,171·88	610,333·41	9,466,270
1951	5,589·45	622,189·64	627,779·09	9,725,343
1952	9,608·62	720,366·44	729,975·06	11,847,917
1953	5,396·30	818,515·65	823,911·95	13,299,092
1954	3,089·08	847,451·09	850,540·17	13,313,618
1955	4,091·55	837,913·72	842,005·23	13,175,559
1956	2,331·10	810,048·68	812,379·78	12,705,581
1957	2,042·27	894,638·71	896,680·98	14,038,185
1958	1,810·69	865,376·80	867,187·49	13,554,934
Total	11,574,631·95	48,338,270·11	59,912,902·06	416,758,534

	1957. £A.	1958. £A.
Estimated total par value of above production	250,809,968	254,493,545
Overseas Gold Sales Premium distributed by Gold Producers Association, 1920-1924	2,589,602	2,589,602
Overseas Gold Sales Premium distributed by Gold Producers Association from 1952	1,197,460	1,202,606
Exchange Premium paid by Mint above par value, 1930-1957 (approximate)	148,606,570	158,482,781
Estimated Total	£A403,203,600	£A416,758,534
Bonus paid by Commonwealth Government under Commonwealth Bounty Act, 1930	161,448	161,448
Subsidy paid by Commonwealth Government under Gold Mining Industry Assistance Act, 1954	496,784	623,441
Gross estimated value of gold won	£A403,861,832	£A417,543,423

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 1958, and previous years.

Period.	Abrasive Silica Stone.		Alunite (Crude Potash).		Arsenic.*		Antimony.†		
	Murchison Goldfield. (Mt. Magnet District.)		Yilgarn Goldfield.		East Murchison Goldfield. (Wiluna District.)		East Murchison Goldfield.		
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Conc.	Metal.	Value.
	tons	£	tons	£	tons	£	tons	tons	£
Prior to 1955	1·50	9	9,073·05	215,865	‡38,674·08	747,205	7,883·66	3,870·93	157,298
1955	....	....	....	....	....	....	....	....	....
1956	....	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....	....
Total	1·50	9	9,073·05	215,865	38,674·08	747,205	7,883·66	3,870·93	157,298

* By-product by Wiluna G.M.'s, Ltd. † By-product of Gold Mining. ‡ Includes 1·13 tons Arsenic valued at £24 from Yilgarn Goldfield.

Period	Antimony.*						Asbestos.	
	Pilbara Goldfield.			Total.			Ashburton Goldfield	
	Conc.	Metal.	Value.	Conc.	Metal.	Value.	Quantity.	Value.
	tons	tons	£	tons	tons	£	tons	£
Prior to 1955	1,637·48	713·77	83,627	19,547·37	4,598·26	241,525	10·10	959
1955	203·88	59·11	230	203·88	59·11	230	....	....
1956	78·44	23·26	742	78·44	23·26	742	....	....
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	1,919·80	796·14	84,599	9,819·69	4,680·63	242,497	10·10	959

* By-product of Gold Mining. † Includes 26·23 tons Conc. containing 13·56 tons metal valued at £600 from West Pilbara.

Period.	Asbestos—*continued.*							
	Pilbara Goldfield.		West Pilbara Goldfield.		Outside Proclaimed Goldfield.		Total	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1,996·11	70,665	21,327·56	2,552,923	501·10	6,732	23,843·12	2,631,321
1955	16·45	346	4,602·55	501,683	....	....	4,619·00	502,028
1956	267·25	5,612	7,779·82	820,464	....	....	8,047·07	826,076
1957	360·52	8,031	12,133·66	1,229,670	....	....	12,494·18	1,237,701
1958	170·02	3,743	13,094·89	1,339,633	....	....	13,264·91	1,343,376
Total	2,810·35	88,398	58,938·48	6,444,372	501·10	6,732	62,268·28	6,540,504

Period.	Barytes.							
	Murchison Goldfield.		North-East Coolgardie Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	120·74	665	52·22	430	1,122·65	8,500	1,295·61	9,594
1955	....	....	....	....	10·00	70	10·00	70
1956	426·10	2,031	....	....	501·00	3,156	927·10	5,187
1957	....	....	....	....	140·00	910	140·00	910
1958	....	....	....	....	....	....	....	....
Total	546·84	2,696	52·22	430	1,773·65	12,636	2,372·71	15,761

Period.	Bentonite		Beryl Ore.					
	Outside Proclaimed Goldfield.		Pilbara Goldfield.		Ashburton Goldfield.		Gascoyne Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	3,760·43	11,976	1,198·17	82,750	0·14	25	130·38	8,330
1955	646·94	2,591	197·32	29,712	....	....	11·08	1,995
1956	1,403·54	5,658	239·27	43,753	....	....	50·11	9,603
1957	741·79	2,981	284·05	52,129	....	....	22·73	4,399
1958	37·00	153	130·40	23,942	....	....	18·34	3,827
Total	6,589·70	23,360	2,049·21	232,286	0·14	25	232·64	28,254

Table VI.—*Minerals other than Gold*—continued.

Period.	Beryl Ore—*continued.*						Bismuth.	
	Yalgoo Goldfield.		Coolgardie Goldfield.		Total.		Gascoyne Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	lb.	£
Prior to 1955	11·48	1,937	132·85	11,541	1,511·05	105,836	7,982	1,884
1955	2·33	439	11·47	2,185	198·63	34,430	....	....
1956	....	....	20·81	3,757	310·19	57,113	....	....
1957	·58	109	42·40	7,469	350·37	64,233	....	....
1958	1·06	197	20·23	3,834	170·03	31,801	3,310	1,475
Total	15·45	2,682	227·76	28,786	2,540·27	293,414	11,292	3,359

* Includes 3·50 tons valued at £297 from West Kimberley Goldfield, 25·14 tons valued at £1,027 from Murchison Goldfield, 10·61 tons valued at £219 from Outside Proclaimed Goldfield, and 0·58 tons valued at £109 from Yalgoo Goldfield.

Period.	Calcite.		Chromite.		Clays (Cement, Fire and White Clays).			
	Mt. Margaret Goldfield.		Peak Hill Goldfield.		Murchison Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons	£	Tons	£	Tons	£	Tons	£
Prior to 1955	5·00	25	7,010·55	89,744	41·75	207	162,365·18	121,549
1955	....	....	....	....	....	....	41,912·32	32,693
1956	....	....	6,096·20	97,526	....	....	29,841·00	33,507
1957	....	....	1,312·30	20,996	....	....	17,849·70	21,831
1958	....	....	....	....	....	....	33,796·96	39,269
Total	5·00	25	14,409·05	207,296	41·75	207	275,765·16	248,949

Period.	Clays (Cement, etc.)—*continued.*		Coal.		Copper Ore.			
	Total.		Collie Coalfield.		Pilbara Goldfield.		West Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	*163,457·73	122,594	24,999,372·69	27,913,068	108·61	4,461	82,758·77	749,156
1955	41,912·32	32,693	903,792·22	3,132,074	0·53	134	....	....
1956	29,841·00	33,507	830,006·65	2,797,506	22·71	1,058	....	....
1957	29,400·70	34,171	838,660·53	2,552,656	459·10	21,013	381·75	8,967
1958	33,796·96	39,269	870,882·45	2,280,649	....	....	6·75	210
Total	298,408·71	270,235	28,442,714·54	38,559,665	590·95	26,666	83,147·27	758,332

* Includes 1,050·80 tons valued at £738 from Collie Mineral Field.

Period.	Copper Ore—*continued.*							
	Ashburton Goldfield.		Mt. Margaret Goldfield.		Phillips River Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	378·07	6,937	47,861·82	231,003	95,929·47	589,467	180·70	2,046
1955	....	....	....	....	....	....	....	....
1956	....	....	....	....	6·46	770	3·39	340
1957	4·59	325	19·92	404	558·83	13,189	....	....
1958	....	....	....	....	1,726·71	53,265	....	....
Total	382·66	7,262	47,881·74	231,407	98,251·47	656,691	184·09	2,486

Period.	Copper Ore—*continued.*		Corundum.		Cupreous Ore (Fertiliser).			
	Total.		East Murchison Goldfield.		West Pilbara Goldfield.		Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	253,709·67	1,753,177	54·00	380	6,607·87	50,124	310·58	9,200
1955	12·12	1,001	‡9·15	275	3,327·36	23,981	857·17	23,868
1956	212·23	12,742	....	....	2,331·23	18,418	1,853·17	42,971
1957	1,803·97	58,563	....	....	629·86	5,380	1,859·93	41,814
1958	* 1,801·95	54,424	....	....	225·25	4,985	1,713·98	37,892
Total	†257,710·96	1,881,663	63·15	655	13,121·57	103,888	6,594·78	155,746

* Including 264·83 tons valued at £6,906 from East Murchison Goldfield, 68·49 tons valued at £949 from Peak Hill Goldfield, 9·35 tons valued at £193 from Yalgoo Goldfield, and 9·44 tons valued at £201 from Northampton Mineral Field. † Including 109·52 tons valued at £1,709 from West Kimberley Goldfield, 649·76 tons valued at £14,089 from East Murchison Goldfield, 91·70 tons valued at £1,004 from Yalgoo Goldfield, 6·12 tons valued at £51 from North Coolgardie Goldfield, 50·67 tons valued at £379 from East Coolgardie Goldfield, 16·00 tons valued at £77 from Yilgarn Goldfield, 1,295·27 tons valued at £49,888 from Peak Hill Goldfield, 24,035·69 tons valued at £119,698 from Northampton Mineral Field, 1,053·61 tons valued at £12,157 from Murchison Goldfield, and 3·39 tons valued at £339 from State generally. ‡ From West Kimberley Goldfield.

Table VI.—*Minerals other than Gold*—continued.

Period.	Cupreous Ore (Fertiliser)—*continued.*							
	Ashburton Goldfield.		Peak Hill Goldfield.		East Murchison Goldfield.		Murchison Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	51·95	646	2,125·46	26,302	2,054·12	31,290	311·69	3,114
1955	13·95	141	1,797·85	30,059	695·58	14,084	801·84	7,372
1956	2·00	53	2,443·12	37,839	411·43	7,261	524·93	4,589
1957	....	....	1,464·37	20,352	575·54	10,504	....	....
1958	....	....	4,624·54	51,875	737·79	9,161	85·80	1,768
Total	**67·90**	**840**	**12,455·34**	**166,426**	**4,474·45**	**72,300**	**1,724·23**	**16,843**

Period.	Cupreous Ore (Fertiliser)—*continued.*							
	Yalgoo Goldfield.		Mt. Margaret Goldfield.		Broad Arrow Goldfield.		East Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	47·00	288	110·97	1,016	22·00	368	29·00	100
1955	10·29	102	133·00	599	7·05	....	....	....
1956	....	....	81·67	807	5·54	11	....	....
1957	....	....	9·60	163	....	....	....	....
1958	43·09	636	....	....	....	....	....	....
Total	**100·38**	**1,026**	**335·24**	**2,585**	**34·59**	**379**	**29·00**	**100**

Period.	Cupreous Ore (Fertiliser)—*continued.*							
	Dundas Goldfield.		Phillips River Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	12·69	117	283·49	6,017	39·94	331	12,237·84	129,048
1955	....	....	52·50	1,146	17·85	193	7,736·23	101,731
1956	....	....	32·48	1,259	1·19	22	7,713·31	113,442
1957	....	....	99·39	3,913	....	....	4,638·69	82,126
1958	....	....	211·17	8,337	....	....	7,643·72	114,670
Total	**12·69**	**117**	**679·03**	**20,672**	**58·98**	**546**	***39,969·79**	**541,018**

* Includes 64·97 tons valued at £345 from Yilgarn Goldfield; 21·79 tons valued at £186 from Northampton Mineral Field; and 2·10 tons valued at £16 from Gascoyne Goldfield.

Period.	Diamonds.		Diatomaceous Earth.		Dolomite.		Emerald.	
	Pilbara Goldfield.		Outside Proclaimed Goldfield.		Murchison Goldfield.		Murchison Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	carats	£	tons	£	tons	£	carats (cut and rough)	£
Prior to 1955	....	24	978·00	6,089	1,574·90	7,146	18,373·00	1,609
1955	....	....	....	....	81·00	324	....	....
1956	....	....	....	....	352·00	1,414	....	....
1957	....	....	....	....	60·00	239	....	....
1958	....	....	....	....	196·00	786	....	....
Total	....	**24**	**978·00**	**6,089**	**2,263·90**	**9,909**	**18,373·00**	**1,609**

Period.	Emerald—*continued.*				Emery.		Felspar.	
	Pilbara Goldfield.		Total.		West Kimberley Goldfield.		Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	carats (cut and rough)	£	carats (cut and rough)	£	tons	£	tons	£
Prior to 1955	8·68	313	18,381·68	1,922	13·00	130	49,567·80	145,279
1955	....	....	....	....	8·15	245	3,565·00	16,660
1956	....	....	....	....	....	....	2,773·00	17,686
1957	....	....	....	....	....	....	995·00	4,611
1958	....	....	....	....	....	....	673·00	3,062
Total	**8·68**	**313**	**18,381·68**	**1,922**	**21·15**	**375**	**57,573·80**	**187,298**

Table VI.—*Minerals other than Gold*—continued.

Period.	Felspar—*continued.*				Fergusonite.		Fuller's Earth.	
	Outside Proclaimed Goldfield.		Total.		Pilbara Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	628·41	1,426	50,196·21	146,706	0·17	165	*70·75	290
1955	....	....	3,565·00	16,660	0·13	226	10·76	54
1956	8·00	32	2,781·00	17,718	....	....	40·13	201
1957	....	....	995·00	4,611	....	....	....	....
1958	7·60	30	680·60	3,092	....	....	....	....
Total	**644·01**	**1,488**	**58,217·81**	**188,787**	**0·30**	**391**	**121·64**	**545**

* Including 30 tons valued at £86 from Broad Arrow Goldfield.

Period.	Gadolinite.		Glass Sand.		Glauconite.		Graphite.	
	Pilbara Goldfield.		Outside Proclaimed Goldfield.		Outside Proclaimed Goldfield.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1·00	112	36,566·21	27,131	5,705·50	117,174	38·10	277
1955	....	....	6,758·98	4,801	196·50	7,407	110·00	990
1956	....	....	7,343·17	5,153	114·00	4,520	5·10	37
1957	....	....	5,692·86	3,914	126·00	5,040	....	....
1958	....	....	6,420·41	4,267	112·00	5,590	....	....
Total	**1·00**	**112**	**62,781·63**	**45,266**	**6,254·00**	**139,731**	**153·20**	**1,304**

Period.	Gypsum.							
	Yilgarn Goldfield.		Dundas Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	235,315·00	184,463	2,069·00	1,331	217,796·00	230,208	455,380·00	....
1955	38,807·00	29,411	9·00	4	1,130·00	920	39,946·00	30,335
1956	21,389·00	16,163	....	....	5,732·00	4,764	27,121·00	20,928
1957	27,842·00	21,234	....	....	5,510·40	4,732	33,353·00	25,966
1958	21,953·00	16,544	4,984·00	14,894	8,578·00	8,578	35,515·00	40,134
Total	**347,539·00**	**269,490**	**7,062·00**	**16,230**	**236,513·00**	**247,647**	**591,315·00**	**533,368**

Period.	Ilmenite Concentrates.		* Iron Ore (for Pig Iron).					
	Outside Proclaimed †Goldfield		Yilgarn Goldfield.		Outside Proclaimed Goldfield.		Total	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantiy.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	....	....	59,534·83	720,208	47,082·51	292,947	106,617·34	1,013,156
1955	....	....	16,876·82	216,772	426·06	3,786	17,302·88	220,558
1956	3,293·40	15,150	19,853·60	278,846	....	....	19,853·60	278,846
1957	40,931·99	233,475	21,838·50	324,646	....	....	21,838·50	324,646
1958	82,926·27	448,218	30,075·00	458,561	....	....	30,075·00	458,561
Total	**127,151·66**	**696,843**	**148,178·75**	**1,999,033**	**47,508·57**	**296,733**	**195,687·32**	**2,295,767**

* Excludes Iron Ore used as Flux :—Yilgarn Goldfield, 84·35 tons valued at £128 ; West Pilbara Goldfield, 100·00 tons valued at £300 ; East Coolgardie Goldfield, 450·00 tons valued at £247 ; West Kimberley Goldfield, 10·50 tons valued at £12 ; Greenbushes Mineral Field, 7,481·00 tons valued at £4,629 ; and Outside Proclaimed Goldfields, 49,938·50 tons valued at £31,732. † Excluding 155·95 tons of mixed concentrates, valued at £776.

Period.	Iron Ore (exported.)		Jarosite.		Kyanite.		Lead Ore and Concentrates.	
	West Kimberley Goldfield.		Phillips River Goldfield.		Outside Proclaimed Goldfield.		Northampton Mineral Field.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1,537,738·00	1,525,022	9·45	37	4,215·69	21,781	435,558·78	2,828,629
1955	496,882·00	492,741	....	....	....	....	1,069·04	68,529
1956	327,815·00	323,923	....	....	....	....	6,330·75	552,564
1957	389,686·00	386,440	....	....	....	....	3,322·51	256,214
1958	536,713·00	532,355	....	....	....	....	2,312·92	131,612
Total	**3,288,834·00**	**3,260,481**	**9·45**	**37**	**4,215·69**	**21,781**	**448,594·00**	**3,837,548**

Table VI.—*Minerals other than Gold*—continued.

Period	Tin					
	Greenbushes Mineral Field		Kimberley Goldfield		West Kimberley Goldfield	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons	£	tons	£	tons	£
Prior to 1955	11,555·83	1,113,767	0·83	302	0·30	235
1955	119·57	61,577	....	....	0·13	79
1956	131·17	71,273	....	....	....	....
1957	49·09	29,749	....	....	....	....
1958	14·24	6,434	....	....	....	....
Total	**11,969·90**	**1,282,800**	**0·83**	**302**	**0·43**	**314**

Period.	Tin—*continued.*							
	Pilbara Goldfield.		West Pilbara Goldfield.		East Murchison Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	6,303·00	737,971	2·48	1,605	0·69	225	17,868·60	1,854,537
1955	60·02	33,256	....	....	....	....	179·72	94,913
1956	227·12	136,965	....	....	....	....	358·35	208,273
1957	221·16	125,330	....	....	....	....	270·25	155,079
1958	123·96	70,886	....	....	....	....	138·20	77,319
Total	**6,935·26**	**1,104,408**	**2·48**	**1,615**	**0·69**	**225**	***18,815·12**	**2,390,121**

* Includes 4·78 tons valued at £395, 0·15 tons valued at £15, and 0·60 tons valued at £46 from Murchison, Coolgardie and Yilgarn Goldfields, respectively.

Period.	Tungsten (Scheelite).							
	Pilbara Goldfield.		East Murchison Goldfield.		Yalgoo Goldfield.		Mt. Margaret Goldfield.	
	Conc.	Value.	Conc.	Value.	Conc.	Value.	Conc.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1·69	1,867	0·06	52	3·02	1,093	2·12	3,148
1955	....	....	....	....	....	....	0·83	582
1956	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	**1·69**	**1,867**	**0·06**	**52**	**3·02**	**1,093**	**2·95**	**3,730**

Period.	Tungsten (Scheelite)—*continued.*							
	North Coolgardie Goldfield.		Coolgardie Goldfield.		Yilgarn Goldfield.		Total.	
	Conc.	Value.	Conc.	Value.	Conc.	Value.	Conc.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	9·77	4,095	23·10	7,643	106·79	39,125	*147·78	57,286
1955	5·71	6,009	1·21	826	....	....	7·75	7,417
1956	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	**15·48**	**10,104**	**24·31**	**8,469**	**106·79**	**39,125**	**155·53**	**64,703**

* Includes 0·16 tons valued at £59 from Murchison Goldfield, 1·01 tons valued at £175 from Board Arrow Goldfield and 0·08 tons valued at £19 from Dundas Goldfield.

Period.	Tungsten (Wolfram).							
	Pilbara Goldfield.		Murchison Goldfield.		Yalgoo Goldfield.		Total.	
	Ore and Conc.	Value.	Ore and Conc.	Value.	Ore and Conc.	Value.	Ore and Conc.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	24·61	45,078	248·82	14,740	1·74	1,522	*303·93	61,759
1955	....	....	....	....	....	....	....	....
1956	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	**24·61**	**45,078**	**248·82**	**14,740**	**1·74**	**1,522**	**303·93**	**61,759**

* Includes 28·48 tons valued at £331 from West Kimberley Goldfield and 0·28 tons valued at £88 from Broad Arrow Goldfield.

Table VI.—*Minerals other than Gold*—continued.

Period.	Silver Lead Ore and Concentrates.				Silver Lead Zinc Ore and Concentrates.			
	Ashburton Goldfield.		Total.		West Kimberley Goldfield.		Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	6,900·22	330,117	9,256·65	471,420	1,844·14	42,289	94·42	5,488
1955	16·32	992	346·92	25,878	....	....	....	....
1956	156·60	11,751	1,282·14	90,931	....	....	....	....
1957	197·43	15,362	856·68	58,420	....	....	....	....
1958	109·45	7,553	179·51	8,286	....	....	....	....
Total	**7,380·02**	**366,877**	**11,921·90**	**661,255**	**1,844·14**	**42,289**	**94·42**	**5,488**

Period.	Silver Lead Zinc Ore and Concentrates—*continued.*				Soapstone.			
	Northampton Mineral Field.		Total.		Greenbushes Mineral Field.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	105·36	3,983	2,043·92	51,760	517·00	1,778	*565·40	1,928
1955	....	....	....	....	....	....	....	....
1956	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	**105·36**	**3,983**	**2,043·92**	**51,760**	**517·00**	**1,778**	**565·40**	**1,928**

* Including 48·40 tons valued at £150 from Outside Proclaimed Goldfields.

Period.	Spodumene.		Talc.					
	Phillips River Goldfield.		East Coolgardie Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	....	....	1,109·61	4,639	7,126·23	102,826	8,244·81	107,475
1955	3·89	57	26·83	120	2,559·98	37,647	2,586·81	37,767
1956	....	....	77·12	388	4,378·45	54,050	4,455·57	54,438
1957	....	....	175·45	877	3,478·20	49,029	3,653·65	49,906
1958	....	....	....	....	2,500·67	35,304	2,500·67	35,304
Total	**3·89**	**57**	**1,389·01**	**6,024**	**20,042·53**	**278,866**	**21,441·54**	**284,890**

Period	Tanto/Columbite					
	Pilbara Goldfield		Greenbushes Mineral Field		Gascoyne Goldfield	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons	£	tons	£	tons	£
Prior to 1955	312·19	207,874	34·44	34,473	0·80	1,038
1955	11·21	22,767	1·06	2,747	....	....
1956	38·58	86,601	30·20	33,667	....	....
1957	5·55	4,661	16·50	6,546	....	....
1958	4·03	6,923	2·00	1,628	....	....
Total	**371·53**	**328,825**	**84·20**	**79,101**	**0·80**	**1,038**

Period	Tanto/Columbite—*continued*					
	Coolgardie Goldfield		Phillips River Goldfield		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons	£	tons	£	tons	£
Prior to 1955	6·46	9,374	0·22	390	354·11	353,199
1955	0·10	251	0·28	1,556	12·65	27,321
1956	1·47	4,389	0·34	1,473	70·59	126,130
1957	....	....	0·23	622	22·28	11,829
1958	....	....	....	....	6·03	8,550
Total	**8·03**	**14,014**	**1·07**	**4,041**	**465·66**	**427,019**

Table VI.—*Minerals other than Gold*—continued.

Period.	Magnesite.							
	East Coolgardie Goldfield.		Coolgardie Goldfield.		Outside Proclaimed Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1,452·96	2,413	2,329·67	6,308	4,269·82	9,718	8,052·45	18,439
1955	....	....	....	....	....	....	....	....
1956	378·30	855	459·70	1,226	....	....	838·00	2,081
1957	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	....	....
Total	**1,831·26**	**3,268**	**2,789·37**	**7,534**	**4,269·82**	**9,718**	**8,890·45**	**20,521**

Period.	Manganese. (Metallurgical and Battery Grades)						Mica.	
	Pilbara Goldfield.		Peak Hill Goldfield.		Total.		Outside Proclaimed Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	lb.	£
Prior to 1955	8,982·00	163,473	81,283·01	797,489	90,309·86	961,254	†32,930·00	3,984
1955	7,594·00	95,146	29,896·66	328,684	37,490·66	423,830	....	....
1956	7,525·25	102,159	49,596·00	542,706	57,323·14	648,956	....	....
1957	13,496·14	227,329	50,440·92	702,491	63,937·06	929,820	....	....
1958	22,372·52	389,482	39,400·91	570,834	61,809·43	960,474	....	....
Total	**59,969·91**	**977,589**	**250,819·39**	**2,946,296**	***310,870·15**	**3,924,334**	**32,930·00**	**3,984**

* Includes 20 tons valued at £180 from Mt. Margaret Goldfield and 24·85 tons, valued at £112 from Outside Proclaimed Goldfield, and 36 tons valued at £158 from East Coolgardie Goldfield. †Includes 7,868 lb. crude Mica. Also includes 31·25 lb. Mica valued at £5 from West Kimberley Goldfield.

Period.	Ochre.						Petalite.	
	West Pilbara Goldfield.		Murchison Goldfield.		Total.		Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	3,758·85	47,014	3,692·33	36,841	7,942·33	88,678	20·19	121
1955	41·60	917	303·59	2,996	345·19	3,913	....	....
1956	....	....	444·38	4,349	444·38	4,349	....	....
1957	....	....	27·30	273	27·30	273	....	....
1958	....	....	189·30	1,893	189·30	1,893	67·77	293
Total	**3,800·45**	**47,931**	**4,656·91**	**46,352**	***8,603·31**	**95,193**	**87·96**	**414**

* Includes 20·61 tons valued at £330 from Kimberley Goldfield, 65·85 tons valued at £308 from East Coolgardie Goldfield, 2·10 tons valued at £15 from Pilbara Goldfield, 11·00 tons valued at £66 from Yalgoo Goldfield, 10·40 tons valued at £83 from North-East Coolgardie Goldfield, and 36·00 tons valued at £108 from Outside Proclaimed Goldfields.

Period.	Phosphatic Guano.		Pyrites.					
	Outside Proclaimed Goldfield.		Dundas Goldfield.		East Coolgardie Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	10,799·73	59,174	469,888·00	2,588,991	....	....	†593,420·56	3,031,756
1955	....	....	49,485·00	397,269	....	....	49,485·00	397,269
1956	....	....	48,426·00	362,949	12,542·98	57,103	60,968·98	420,052
1957	586·89	8,974	45,342·00	327,761	12,575·72	54,806	57,917·72	382,567
1958	169·65	1,827	38,915·00	303,340	10,474·64	48,507	49,338·64	351,847
Total	**11,556·27**	**69,975**	**652,056·00**	**3,980,310**	**35,592·34**	**160,417**	**761,695·90**	**4,186,222**

* Includes 2·10 tons valued at £15 ton from Pilbara Goldfield, 11 tons valued at £66 from Yalgoo Goldfield, 10·40 tons valued at £83 from North-East Coolgardie Goldfield and 36 tons valued at £108 from Outside Proclaimed Goldfield. † Includes 74,047·56 tons valued at £45,496 from Mt. Margaret Goldfield.

Period.	Sillimanite.		Silver Lead Ore and Concentrates.					
	Outside Proclaimed Goldfield.		Kimberley Goldfield.		Pilbara Goldfield.		West Pilbara Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons	£	tons	£	tons	£	tons	£
Prior to 1955	2·00	13	9·26	648	2,163·25	132,602	178·42	7,754
1955	....	....	....	....	330·60	24,887	....	....
1956	....	....	....	....	1,117·94	78,549	....	....
1957	....	....	....	....	657·62	42,937	1·63	126
1958	....	....	....	....	70·06	734	....	....
Total	**2·00**	**13**	**9·26**	**648**	**4,339·56**	**284,892**	**180·05**	**7,880**

Table VI.—*Minerals other than Gold*—continued.

Period	Vermiculite		Zinc Ore (Fertiliser)		Zinc.†					
	Outside Proclaimed Goldfield		Pilbara Goldfield		West Kimberley Goldfield		Pilbara Goldfield		Total	
	Quantity	Value	Quantity	Value	Metallic Content	Value	Metallic Content	Value	Metallic Content	Value
	tons	£	tons	£	tons	£	tons	£	tons	£
Prior to 1955	1,831·92	11,822	20·00	100	183·63	1,376	4·38	*Nil*	187·91	1,376
1955	....	....	....	....	....	....	....	....	....	....
1956	....	....	....	....	....	....	....	....	....	....
1957	....	....	....	....	....	....	....	....	....	....
1958	....	....	....	....	....	....	20·06	511	20·06	511
Total	***1,831·92**	**11,822**	**20·00**	**100**	**183·63**	**1,376**	**24·44**	**511**	**208·07**	**1,887**

* Includes 127·16 tons valued at £881 from East Coolgardie Goldfield and 20 tons valued at £60 from Yilgarn Goldfield.
† By-product from Silver-Lead-Zinc Mining.

TABLE VII.

Quantity and Value of Minerals, other than Gold, reported during year 1958.

Number of Lease, Claim, Or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		ASBESTOS (Chrysotile)			
			Tons		£A
M.C. 48, etc.	West Pilbara	Hancock, L. G.	1,207·79	....	34,908·15
L.T.T. 1226H	Pilbara	Hancock, L. G.	170·02	....	3,743·50
			1,377·81	....	(*b*) 38,651·65
		ASBESTOS (Crocidolite)			
M.C. 22, etc.	West Pilbara	Australian Blue Asbestos Ltd.	11,887·10	....	1,304,724·51 (*b*)
		BENTONITE			
M.L. 437H, etc.	O.P.G. (Marchagee)	Noonan, E. J.	37·00	....	(*a*) 153·00
		BISMUTH (*f*) (*g*)			
			Lb.	Assay % Bismuth	
M.C. 17	Gascoyne	Kempton Bros.	2,156·00	72·95	1,054·25
P.A. 32	do.	Wilhelm, C. H., and Pederick, R. C.	1,154·00	65·45	421·00
			3,310·00	70·33	(*b*) 1,475·25
		BERYL (*f*) (*g*)			
			Tons	BeO Units	
Crown Lands	Pilbara	Sundry Persons	100·64	1,171·65	18,564·96
M.C. 340, etc.	do.	Sherlock and Parker	1·15	14·44	223·75
M.C. 304	do.	White, A. L.	1·96	22·19	342·85
M.L. 370	do.	Stein, L. C., and S. K.	18·12	208·40	3,271·65
P.A. 2559	do.	Otway, R. H.	2·81	32·77	506·40
P.A. 2575	do.	Seigne, M.	1·73	20·16	311·55
M.C. 107	do.	Wilson, L. J.	0·91	7·36	113·70
P.A. 790L	do.	Howard, T. A. L.	2·49	31·33	515·00
P.A. 785L	do.	Witherall, A.	0·59	5·99	92·50
Crown Lands	Gascoyne	Sundry Persons	18·34	233·65	3,827·15
M.L. 80, etc.	Coolgardie	Austn. Glass Mfrs. Pty. Ltd.	17·85	217·85	3,365·75
P.A. 7160	do.	Rule, G.	2·38	28·46	467·75
Crown Lands	Yalgoo	Sundry Persons	1·06	12·01	197·55
			170·03	2,006·26	(*b*) 31,800·56
		CLAY (Cement Clay)			
Freehold Land	O.P.G. (Maida Vale)	D. F. D. Rhodes	6,315·00	....	3,552·00
M.C. 492H, etc.	O.P.G. (Gosnells)	Cockram Cement Ltd.	7,191·00	....	9,887·25
			13,506·00	....	(*c*) 13,439·25
		CLAY (Fireclay)			
Loc. 84	O.P.G. (Glen Forrest)	Darling Range Firebrick Co. Pty. Ltd.	774·96	....	737·05
M.C. 522H, etc.	do. (Byford)	Bridge, J. S.	14,233·00	....	20,044·85
M.C. 585H	do. (Glen Forrest)	Le Vaux, M. L.	2,204·00	....	1,653·00
M.C. 304H, etc.	do. (Clackline)	Clackline Refractories Ltd.	3,000·00	....	3,000·00
			20,211·96	....	(*c*) 25,434·90
		CLAY (Ball Clay-Ceramic)			
M.C. 247H	Mt. Kokeby	Linton, J. B.	79·00	....	(*c*) 395·00
		COPPER ORE AND CONCENTRATES (*f*) (*g*)			
				Copper Units	
M.C. 35, etc.	Phillips River....	Ravensthorpe Copper Mines N.L.	1,726·71	40,823·00	53,265·05
M.L. 259	West Pilbara	Yannery Hill Copper Mine	6·75	121·67	210·00
M.C. 65P	Peak Hill	Bettineschi and Ricci	68·49	989·76	949·25
			1,801·95	41,934·53	(*b*) 54,424·30

Silver and Gold content transferred to respective items.

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1958.

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		COAL	Tons		£A
M.L. 250, etc.	Collie	Amalgamated Collieries of W.A. Ltd.	594,915·00	....	1,579,787·10
M.L. 314, etc.	do.	Griffin Coal Mining Co.	109,744·95	....	260,644·15
M.L. 418, etc.	do.	Western Collieries Ltd.	166,222·50	....	440,217·80
			870,882·45	....	2,280,649·05 (*e*)
		CUPREOUS ORE AND CONCENTRATES (Fertilizer) (*f*)		Av. Assay Cu %	
G.M.L. 1141	Pilbara	Todd and Stein	8·95	8·12	105·40
M.C. 363L	do.	Kalgoorlie Goldfields Petroleum N.L.	23·48	21·67	1,176·00
G.M.L. 314L	do.	Copper Hills Copper Mine	1,681·55	11·85	36,610·55
M.L. 259	West Pilbara	Yannery Hill Copper Mine	183·47	13·85	4,705·70
Loc. 71	do.	Cuming Smith and Mount Lyell	41·78	3·50	279·00
M.C. 4	Gascoyne	McDonald, A.	2·10	6·65	16·05
P.A. 1491	East Murchison	Sawyer, H. A.	16·18	7·00	151·55
M.C. 2B	do.	Rinaldi, Motter and Motter	673·76	8·39	8,310·95
P.A. 1493	do.	Delich, T.	47·85	9·23	698·65
M.C. 63P	Peak Hill	Parkinson, L. T.	161·87	21·03	8,191·10
M.L. 68P	do.	Thaduna Copper Mining Co.	4,054·40	6·95	38,894·10
M.C. 65P	do.	Ricci, A.	408·27	8·13	4,789·35
M.C. 14	Yalgoo	O'Callaghan and Howlett	43·09	9·13	636·70
P.A. 3459N	Murchison	Alac, M.	85·80	11·15	1,768·10
M.C. 35, etc.	Phillips River	Ravensthorpe Copper Mines N.L.	44·35	24·12	2,677·25
M.L. 413, etc.	do.	H. Wehr and Party	74·12	8·43	1,787·06
M.L. 411	do.	Wehr and O'Dea	43·15	9·05	1,137·79
M.L. 410	do.	New Surprise Copper Mine	49·55	19·13	2,734·90
			7,643·72	8·99	114,670·20 (*a*) (*b*)
		DOLOMITE			
M.L. 9M, etc.	Murchison	Westralian Ores Pty. Ltd.	196·00	....	(*a*) 785·75
		FELSPAR			
M.L. 80, etc.	Coolgardie	Austn. Glass Mnfrs. Co. Pty. Ltd.	673·00	....	3,062·15
M.C. 111H	O.P.G. (Balingup)	Oma, V. C.	7·60	....	30·40
			680·60	....	(*a*) 3,092·55
		GLASS SAND			
M.C. 417H, etc.	O.P.G. (Lake Gnangara)	Austn. Glass Mnfrs. Co. Pty. Ltd.	6,307·91	....	4,100·14
M.C. 365H	O.P.G. (Lake Gnangara)	Leach, R. J.	112·50	....	167·25
			6,420·41	....	(*c*) 4,267·39
		GLAUCONITE	Greensand Treated	Glauconite Recovered	
Private Property	O.P.G. (Gingin)	Brook, G. E.	560·00	112·00	(*b*)(*d*)5,590·00
		GYPSUM	Tons		
M.C. 612H, etc.	O.P.G. (Lake Cowcowing)	Hewitt, B.	4,813·00	....	5,413·85
M.C. 485H	do. (Nukarni)	Fitzgerald, E. J.	1,495·25	....	1,234·70
M.C. 126H, etc.	do. (Baandee)	Perth Modelling Works	2,270·00	....	2,048·20
M.C. 9, etc.	Yilgarn	Perth Modelling Works	10,026·00	....	7,266·45
M.C. 30, etc.	do.	Ajax Plaster Co. Pty. Ltd.	4,016·00	....	3,344·00
M.C. 51, etc.	do.	H. B. Brady and Co. Ltd.	7,911·00	....	5,933·25
M.C. 25, etc.	Dundas	Garrick Agnew Pty. Ltd.	4,961·72	....	14,887·00
M.C. 12	do.	McDonald and Whitfield	22·00	....	6·50
			35,514·97	....	40,133·95 (*a*) (*b*)

Includes 4,961·72 tons for export.

Plaster of Paris reported as manufactured during the year being 16,819·00 tons from 23,673·50 tons of Gypsum.

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1958.

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		IRON ORE (for Pig)			
			Tons	Pig Iron Recovered	£A
Temp. Res. 1258H	Yilgarn	Charcoal Iron and Steel Industry	30,075·00	19,307·00	458,561·00 (c) (d)
		Average Assay of Ore used = 60·54% Fe.			
		IRON ORE (for Export)			
				Av. Assay Fe %	
M.L. 10, etc.	West Kimberley	Australian Iron and Steel Ltd.	536,713·00	63·98	532,355·00 (b)

No. of Lease, Claim or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Ore and Conc. Tons	Lead.		Silver.	
				Tons.	Value £A.	Fine oz.	Value £A.
		LEAD ORE AND CONCENTRATES (*f*) (*g*)					
P.A. 257	Northampton	A.G.M. Syndicate	6·24	3·09	210·41	53·07	21·34
M.L. 71P.P.	do.	Roger Malray Copper Mine	11·74	4·67	273·05	22·21	8·95
Vic. Loc. 436	do.	Wheel of Fortune Extended	392·54	284·72	20,180·50	176·21	69·70
M.L. 263	do.	Kathleen Hope Lead Mine	7·13	4·57	365·10	5·58	2·25
M.L. 265	do.	Chequero Lead Mine	6·35	4·19	342·00	....	....
Vic. Loc. 1	do.	Geraldine Lead Mine	29·66	19·73	870·00	....	....
Imp. Grant Loc. 833	do.	Anglo-Westralian Mining Pty. Ltd.	245·02	193·74	13,609·30	....	....
M.L. 205, etc.	do.	Surprise Mine 1955	156·06	102·44	9,065·00	....	....
M.L. 234	do.	Mary Springs Lead Mine	24·30	17·85	1,606·05	14·25	5·55
M.L. 59P.P.	do.	McGuires Lead Mine	69·32	51·98	4,552·65	....	....
M.L. 256, etc.	do.	Gurkha Lead Mine	1,364·56	1,056·61	80,174·98	655·21	254·92
			2,312·92	1,743·59	131,249·04 (b)	926·53	362·71
		Silver :—Quantity and Value transferred to Silver Item.					
		SILVER/LEAD ORE AND CONCENTRATES (*f*) (*g*)					
M.L. 143	Ashburton	Dingo Lead Mine	98·35	77·32	6,580·68	794·72	307·02
M.L. 163	do.	Redcraze Lead Mine	5·57	4·11	355·39	47·41	19·06
P.A. 316	do.	Griffiths, F. A.	5·53	4·00	290·60	....	....
M.C. 450	Pilbara	Engstrom, O.	11·06	6·37	343·35	48·54	18·45
M.L. 189	do.	Ragged Hills Lead Mine	*59·00	17·70	372·00	....	....
			179·51	109·50	(b) 7,942·02	890·67	344·53
		* Zinc content transferred to Zinc Item.					
		Silver :—Quantity and Value transferred to Silver Item.					

Number of Lease, Claim, or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		MANGANESE (METALLURGICAL GRADE) (*f*)			
			Tons	Av. Assay Mn %	£A
M.C. 24P, etc.	Peak Hill	Westralian Ores Pty. Ltd.	39,042·49	45·36	563,806·70
M.C. 244L, etc.	Pilbara	Westralian Ores Pty. Ltd.	3,620·00	42·71	40,312·00
M.C. 268, etc.	do.	Northern Minerals Syndicate	6,853·67	48·12	93,970·00
M.C. 194L, etc.	do.	D. F. D. Rhodes Pty. Ltd.	11,898·85	52·26	255,200·50
			61,415·01	46·85	(b) 953,289·20
		MANGANESE (LOW GRADE) (*f*)			
				Av. Assay Mn %	
M.L. 61P	Peak Hill	Westralian Ores Pty. Ltd.	24·97	not known	203·75
P.A. 5118E	East Coolgardie	McCarthy, M. D.	36·00	31·33	158·00
			60·97	....	(a) 361·75

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1958.

Number of Lease, Claim, Or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
		MANGANESE (BATTERY GRADE) (*f*)	Tons		£A
				Av. Assay MnO_2	
M.L. 61P	Peak Hill	Westralian Ores Pty. Ltd.	333·45	76·28	(*b*) 6,823·50
		MINERAL BEACH SANDS (ILMENITE) (*f*)			
				Av. Assay TiO_2	
M.C. 516H, etc.	O.P.G. (Capel)	Western Titanium, N.L.	64,807·70	54·90	357,426·10
D.C. 56H	do. (Bunbury)	Cable (1956) Ltd.	17,921·89	54·46	88,271·10
M.C. 169H, etc.	do. (Yoganup)	Westralian Oil Ltd.	196·68	63·00	2,521·00
			82,926·27	54·82	(*b*) 448,218·20
		OCHRE—RED			
M.C. 26, etc.	Murchison	Zadow, J. C.	171·00	....	(*a*) 1,710·00
		OCHRE—YELLOW			
M.C. 30	Murchison	Zadow and Ball	18·30	....	(*a*) 183·00
		PETALITE			
				Equivalent Units Li_2O	
M.L. 80, etc.	Coolgardie	Australian Glass Manufacturers Co. Pty. Ltd.	67·77	284·63	(*b*) 292·80
		PHOSPHATIC GUANO			
M.C. 486H	O.P.G. (Jurien Bay)	Smith, B. D.	169·65	....	(*a*) 1,827·50
		PYRITES ORE AND CONCENTRATES			
				Sulphur Content Tons	
G.M.L. 5345E, etc.	East Coolgardie	Gold Mines of Kalgoorlie (Aust.) Ltd.	(*j*)10,473·64	3,880·55	48,506·85
G.M.L. 1460, etc.	Dundas	Norseman Gold Mines, N.L.	38,915·00	18,430·81	303,340·00
			49,388·64	22,311·36	*a*351,846·85
		QUARTZ GRIT			
Q.A. 2	Collie	Rowden, E.	90·00	....	75·00
		SEMI-PRECIOUS STONES (CHRYSOPRASE)			
			lb.		
P.A. 1433Y	East Coolgardie	Mason, T. L.	5·00	....	(*a*) 5·00
		SEMI-PRECIOUS STONES (OPALINE)			
P.A. 1433Y	East Coolgardie	Mason, T. L.	25·00	....	(*a*) 3·75
		SILVER			
			Fine ozs.		
	By product from	Gold Mining	195,975·15	....	77,771·00
	By product from	Lead Mining	926·53	....	362·71
	By product from	Silver/Lead Mining	890·67	....	344·53
	By product from	Copper Mining	2,975·13	....	1,172·95
			200,767·48	....	79,651·19
		TALC			
			Tons		
Loc. 839	O.P.G. (Three Springs)	Universal Milling Co. Pty. Ltd.	2,500·67	....	(*c*)35,304·30

Table VII.—*Minerals other than Gold*—continued.

Quantity and Value of Minerals, other than Gold, reported during year 1958.

Number of Lease, Claim, Or Area.	Goldfield or Mineral Field.	Registered Name of Producer.	Quantity.	Metallic Content.	Value.
TANTO/COLUMBITE ORE AND CONCENTRATES (*f*) (*g*)					
				Assayed Ta_2O_5 Content—Units	
M.C. 56, etc.	Greenbushes	South West Tin Pty. Ltd.	2·00	77·84	1,627·60
M.C. 69L, etc.	Pilbara	Dorrington and Pty.	0·40	25·31	218·10
M.C. 260	do.	Northern Minerals Syndicate	0·16	7·27	62·15
M.C. 421, etc.	do.	Pilbara Native Society	0·60	38·30	323·85
M.C. 291, etc.	do.	Pilbara Exploration, N.L.	1·67	69·64	2,828·10
M.C. 116	do.	Tabba Tabba Syndicate	1·20	82·32	3,490·55
			6·03	300·68	(*b*) 8,550·35
Sold variously on assayed Ta and TaNb basis.					
TIN (*f*) (*g*)					
				Tons	
M.C. 58, etc.	Greenbushes	Auston and Sweeney	5·41	2·42	1,804·00
L.T.T. 1399H	do.	Coghlan, R. J.	4·66	3·21	2,674·40
Crown Lands	do.	Sundry Persons	4·17	2·46	1,955·25
Crown Lands	Pilbara	Sundry Persons	13·18	9·43	7,862·95
M.C. 449	do.	Johnston, J. A.	22·03	14·71	12,081·30
D.C. 201	do.	Mineral Concentrates Pty. Ltd.	11·43	7·86	6,716·55
D.C. 49, etc.	do.	Pilbara Exploration, N.L.	15·38	9·83	8,548·95
D.C. 54, etc.	do.	Northern Minerals Syndicate	35·27	25·08	20,659·55
D.C. 25, etc.	do.	Johnston and Sons	26·67	18·53	15,016·30
			138·20	93·53	(*b*)77,319·25
ZINC (METALLIC) (*g*)					
				Assayed Zinc Content Tons	
	By product from	Silver/Lead Ore and Concentrates	....	20·06	(*b*) 511·00

REFERENCES

XX Denotes Outside Proclaimed Gold or Mineral Field.
(*a*) Value F.O.R.
(*b*) Value F.O.B.
(*c*) Value at Works.
(*d*) Value of Mineral recovered.
(*e*) Value at Pit Head.
(*f*) Only results from Shipments finalised during period under review.
(*g*) Metallic Content calculated on Assay Basis.
(*h*) Value subject to revision.
(*i*) Concentrates.
(*j*) By-Products from Gold Mining.

TABLE VIII.

SHOWING AVERAGE NUMBER OF MEN EMPLOYED ABOVE AND UNDER GROUND IN THE LARGER GOLDMINING COMPANIES OPERATING IN WESTERN AUSTRALIA DURING THE YEARS FROM 1949 to 1958 INCLUSIVE.

COMPANY.	1949.			1950.			1951.			1952.			1953.			1954.			1955.			1956.			1957.			1958.		
	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.	Above.	Under.	Total.
Anglo-Westralian Mng. Pty.	....	....	....	....	....	....	....	....	....	47	4	51	37	5	42	28	6	34	....	....	....	....	....	....	....	....	....	....	....	....
†Boulder Perseverance, Ltd.	171	135	306	173	138	311	115	119	274	151	115	266	155	112	267	152	114	266	171	114	285	181	113	294	....	....	....	....	....	....
Broken Hill Pty. Co., Ltd.	36	73	109	34	68	102	13	12	25	6	....	6	4	....	4	2	....	2	....	....	....	....	....	....	....	....	....	....	....	....
Blue Spec Gold Mines, Ltd.	1	....	1	20	6	26	33	21	54	36	21	57	33	15	48	30	15	45	17	9	26	....	....	....	....	....	....	....	....	....
Big Bell Mines, Ltd.	197	210	407	219	246	465	230	240	470	203	205	408	200	215	415	179	167	346	44	16	60	....	....	....	....	....	....	....	....	....
Burbidge Gold Mines, N.L.	18	4	22	16	4	20	2	....	2	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Consolidated Gold Area, N.L.	1	....	1	1	....	1	3	1	4	1	....	1	1	1	2	1	2	3	....	....	....	....	....	....	....	....	....	....	....	....
Comet Gold Mines, Ltd	9	13	22	11	12	23	13	11	24	10	8	18	10	6	16	4	2	6	3	....	3	....	....	....	....	....	....	....	....	....
Central Norseman Gold Corporation, N.L.	133	246	379	163	236	399	148	226	374	151	212	363	155	228	383	158	227	385	166	225	391	159	209	368	165	226	391	166	232	398
Dundas Gold Mines, N.L.	11	15	26	3	9	12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Eclipse Gold Mines, N.L.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	27	8	35
Evanston Gold, N.L.	2	....	2	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
First Hit Gold Mine	1	1	2	1	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Golden Horseshoe (New), Ltd.	43	....	43	41	....	41	39	....	39	38	....	38	42	....	42	42	....	42	39	....	39	35	....	35	6	....	6	....	....	....
Gold Mines of Kalgoorlie, Ltd.	175	179	354	187	180	367	181	191	372	185	182	367	184	182	366	199	186	385	257	192	449	228	223	451	417	500	917	392	538	930
Great Boulder Pty., Ltd.	312	392	704	327	404	731	311	354	665	344	339	683	349	359	708	342	372	714	350	379	729	349	380	729	330	400	730	323	387	710
*Great Western Consolidated	....	....	....	....	....	....	125	72	197	148	60	208	186	113	299	191	150	341	224	271	441	232	270	502	220	223	443	220	241	461
Hill 50 Gold Mine, N.L.	68	78	146	74	66	140	62	41	103	59	48	107	68	63	131	73	63	136	82	73	155	98	85	183	108	94	202	103	103	206
†Kalgoorlie Enterprise, Ltd.	7	103	110	7	95	102	8	85	93	8	93	101	8	98	106	8	89	97	7	101	108	8	100	108	....	....	....	....	....	....
Kalgurli Ore Treatment Co., Ltd.	74	....	74	74	....	74	77	....	77	81	....	81	77	....	77	78	....	78	65	....	65	40	....	40	33	....	33	28	....	28
Lake View and Star, Ltd.	454	441	895	471	476	947	492	517	1,009	486	529	1,015	494	519	1,013	488	498	986	482	487	969	471	523	994	460	517	977	433	525	958
Moonlight Wiluna Gold Mines, Ltd. (Timoni)	18	18	36	33	32	65	42	42	84	42	41	83	39	37	76	42	34	76	39	33	72	37	32	69	36	31	67	35	31	66
Mountain View Gold, N.L.	10	14	24	11	11	22	13	7	20	5	3	8	4	6	10	3	6	9	3	1	4	....	....	....	....	....	....	....	....	....
Mt. Charlotte (Kalgoorlie) Gold Mines, N.L.	24	28	52	10	8	18	2	....	2	2	3	5	3	6	9	3	2	5	....	....	....	....	....	....	....	....	....	....	....	....
North Kalgurli (1912), Ltd.	79	304	383	90	316	406	133	348	481	112	293	405	76	207	283	83	193	276	95	236	331	156	239	395	158	250	408	163	263	426
New Milano, N.L.	1	....	1	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Gold Mines of Kalg. (Aust.) Ltd. (Barbara and Bayleys Leases)	78	64	142	73	125	198	73	120	193	65	109	174	68	108	176	77	95	172	79	95	174	37	73	110	34	61	95	23	48	71
New Coolgardie Gold Mines, N.L. (Callion Leases)	....	....	....	....	...	....	6	21	27	6	29	35	7	34	41	9	42	51	8	35	43	3	11	14	....	....	....	....	....	....
Ora Banda Amalgamated, Ltd.	3	1	4	2	....	2	1	....	1	1	....	1	3	2	5	1	2	3	....	2	2	....	....	....	....	....	....	....	....	....
Paringa Mining and Exploration Co., Ltd.	79	134	213	92	138	230	47	46	93	10	6	16	2	2	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Porphyry (1939) Gold Mines, Ltd.	24	28	52	10	8	18	6 5	1	7	1	....	1	3	3	6	2	2	4	....	....	....	....	....	....	....	....	....	....	....	....
Radio Gold Mines	....	....	....	....	....	....	....	3	8	4	4	8	5	5	10	5	5	10	6	6	12	6	6	12	7	7	14	6	6	12
†South Kalgurli Consolidated	110	105	215	120	107	227	124	110	234	67	102	169	67	107	174	64	106	170	53	99	152	13	84	97	....	....	....	....	....	....
Sons of Gwalia, Ltd.	92	143	235	104	151	255	121	129	250	121	118	239	102	157	259	102	138	240	102	146	248	105	156	261	107	146	253	109	142	251
Sunshine Reward Amalgamated Leases	9	14	23	10	9	19	10	7	17	9	7	16	8	7	15	8	7	15	7	4	11	8	7	15	2	....	2	8	3	11
Triton Gold Mine	7	....	7	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Wiluna Gold Mines, Ltd.	49	....	49	29	....	29	20	....	20	13	....	13	2	1	3	1	1	2	....	....	....	....	....	....	....	....	....	....	....	....
Yellowdine Gold Development, Ltd.	2	....	2	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	544	....	....	....	....	....	....	....	....
All other Operators	966	825	1791	986	837	1,823	883	664	1,547	851	598	1,449	846	523	1,369	734	495	1,229	634	388	1,022	....	407	951	498	349	847	476	413	789
State Average (incl. Diggers)	3,260	3,540	6,800	3,404	3,676	7,080	3,378	3,388	6,766	3,265	3,129	6,394	3,238	3,121	6,359	3,109	3,019	6,128	2,933	2,912	5,845	2,710	2,918	5,628	2,581	2,804	5,385	2,512	2,840	5,352

* Including Copperhead, Frasers, Nevoria, Corinthian and Pilot Groups.

† Absorbed by Gold Mines of Kalgoorlie (Aust.) Ltd. from 1957.

By Authority: ALEX. B. DAVIES, Government Printer