

another lens to have commenced just east of the first one. This second lens is said to have been driven on for 76 feet from the bottom of the shaft.

*Marjorie B.* (G.M.L. 3090), *Snake Hole* (old Kingfisher Proprietary, G.M.L. 1837).—These are now both held as P.As. A certain amount of prospecting work has been done on short, narrow, lenticular quartz reefs.

*Southern Cross United Gold Mines.*—Southern Cross United Gold Mines control a fairly extensive reserve in the neighbourhood of Southern Cross. Attention has been turned to the old workings of the Central, Fraser's and Fraser's South leases. Portions of these workings have been unwatered, cleaned out, and extended, and active development work is being continued. To the end of 1912 the total production from this group of leases was 174,131.7 ozs. of gold from 335,753.75 tons of ore, giving an average grade of just over 10 dwts. gold per ton. After 1912 major production ceased, and in subsequent years production has been small and intermittent, generally not exceeding a few hundred tons of ore for any one period.

Work was commenced from No. 1 shaft, which has been deepened to 391 feet. No. 2 level has been continued northward to within approximately 110 feet of the old Central shaft, and southwards to connect to an old level off the old No. 2 shaft. At No. 3 level driving both north and south has been done, and going south it has connected with some stoping above the old 366 ft. level.

Towards the end of 1936, No. 3 shaft was equipped with winding gear, and a commencement made with the unwatering and reconditioning of the workings off this shaft.

The ore bodies in the workings so far examined are a series of lenticular quartz reefs, often containing an appreciable proportion of country rock, striking N. 30°-35° W., dipping 50°-55° W., and pitching southwards at angles varying from 25°-45°. The strike and dip of the ore bodies are everywhere parallel to the strike and dip of the schistose greenstones forming the country. Deposition appears to have occurred by metasomatic replacement, along zones of shearing which are parallel to the schistosity. The strike of the country is variable, and has generally been followed in driving. Deposition has occurred at various horizons, in varying amounts and with varying gold content, across 500-600 feet at least of country. Generally the mine is free from faulting.

Unfortunately the geological examination of the workings has not so far yielded any controlling factor, and it is therefore not possible to predict the position of likely new ore bodies. The southerly pitch of the ore bodies at a comparatively flat angle is an important feature to consider when looking for the extension of known ore bodies at greater depth. It is also important when drilling from the surface. With lenticular ore bodies it is quite possible for an incorrectly placed drill hole to pass through the blank between the ore bodies. Due allowance should be made for the southerly pitch. The policy of the present management in putting out frequent drill holes at right angles to the drives seems very sound.

## NOTES ON SOME MINING GROUPS IN THE YILGARN GOLDFIELD

(South of the Great Eastern Railway).

(R. S. Matheson, B.Sc.)

### PALMER'S FIND.

Palmer's Find is situated on the western shore of a salt lake approximately 8¾ miles south-south-east of Yellowdine Siding, and approximately 2½ miles east of the 8-mile peg on the Yellowdine-Parker's Range road. Gold was first discovered here by a prospector early in September, 1934, and it has since proved to be one of the most important discoveries in recent years. The find was made in a belt of greenstone country half a mile wide, which has a general strike N. 15° E. and dip vertical. The greenstone belt is bounded on the west by what is thought to be a contact gneiss, on the east the outcrops cease at the lake shore. Pillow lavas, amygdaloidal lavas, and tuffs have been recognised in the greenstone series, interbedded with which are two beds of ferruginous quartzite. The pillow lavas occur in rather peculiar circumstances, resembling augen structure on a large scale. The pillows form the eyes and these are set in a matrix of tuffaceous or basic sedimentary material which appears to stream around them. A doubtful facing on the pillow lavas, indicating that the beds face east, was obtained 26 chains south-south-east of the main mine. The area is riddled by post-gold pegmatite dykes which are often garnetiferous and sometimes contain large flakes of mica.

Large quartz reefs are scattered abundantly throughout the area and there appear to be two different types. The auriferous quartz is sugary and vitreous, and the other quartz is milky white and probably associated with the pegmatite intrusions.

The Yellowdine Gold Development, Ltd., was the only company operating at the time of inspection, and there were a few men still working the alluvial patch. The alluvial\* patch is an area of 5 acres situated between the Whinfield reef and the lake shore, and it is almost worked out.

A considerable amount of prospecting by costeaning, diamond drilling, etc., has been done throughout the group, but that which has been done outside the property of the Yellowdine Gold Development, Ltd., has apparently been fruitless.

### YELLOWDINE GOLD DEVELOPMENT, LTD.

*Whinfield Reef.*—Due to folding, this reef outcrops at the surface as two parallel reefs, 40-50 feet apart, which join at the north end. The enclosing greenstone country has a general strike of N. 10° E. and dips steeply. The east reef is 340 feet long and the west reef 385 feet long. The width, however, cannot be measured with any degree of certainty as it shows considerable variation due to changes in elevation and the encroaching of the overburden. Opencutting has been commenced at the north end and the broken ore is being dropped down passes to the 50 ft. level.

*50 ft. Level.*—On the 50 ft. level in the main east crosscut, the east reef appears to split into two reefs. The west leg joins the west reef 75 feet north and

\* This is in accordance with the Mining Act, 1904, which states:—("Alluvial"—(1) When applied to gold: Any earth containing or supposed to contain gold, and not being a lode, dyke, reef or vein.)

Speaking in geological language, however, this gold is eluvial.

# YELLOWDINE GOLD DEVELOPMENT LTD.

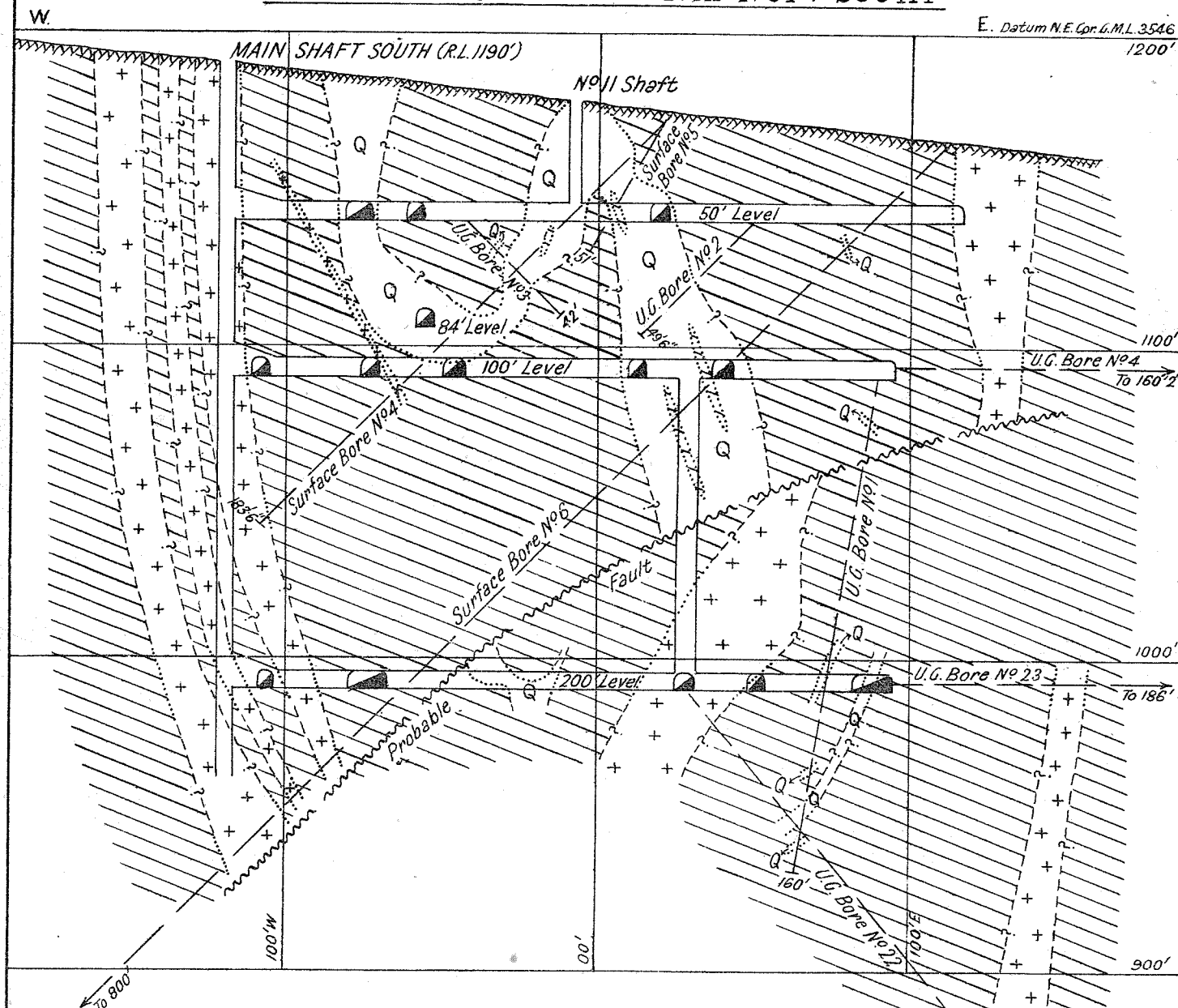
PLATE NO VII

## PALMER'S FIND

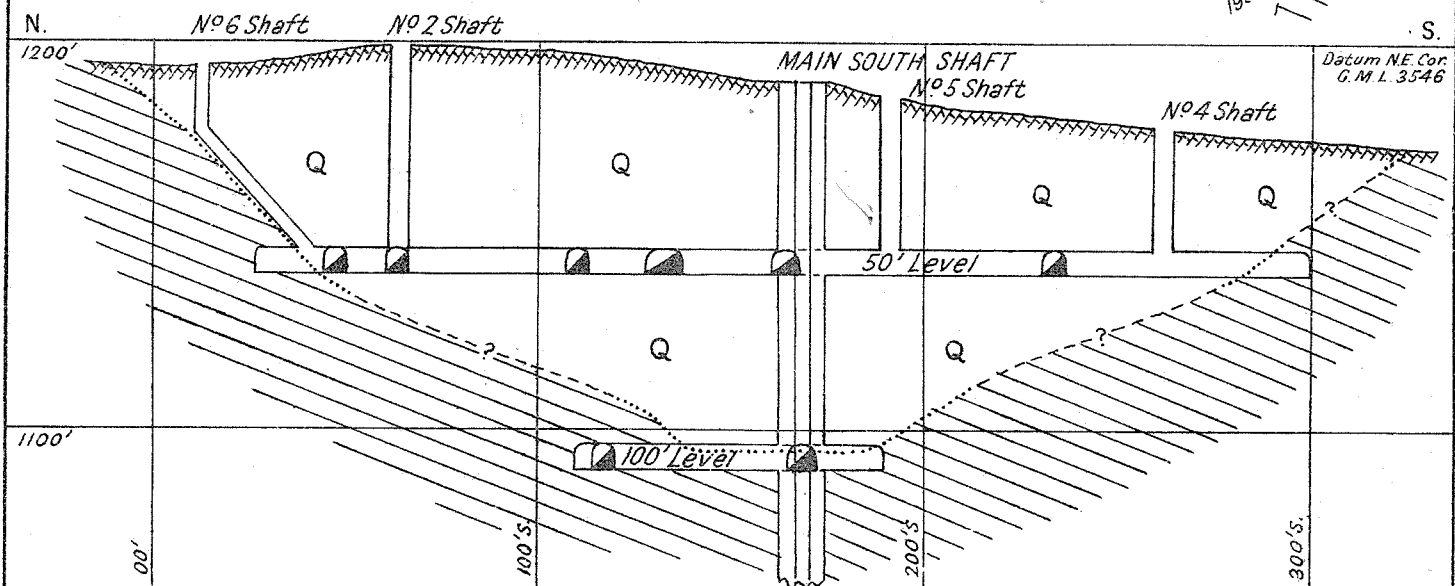
Scale 50 feet to an inch

50 0 50 100

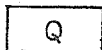
### TRANSVERSE SECTION AT 170FT SOUTH



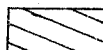
### LONGITUDINAL SECTION AT 50FT WEST



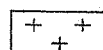
Quartz



Greenstone



Pegmatite



83 feet south of the Main East crosscut, forming a closed body of quartz. At the south end of the quartz mass the pitch is  $35^{\circ}$  N. and at the north end the pitch is  $40^{\circ}$  S., and this is accounted for by folding on an east-west axis. A careful study of the dips at the quartz boundary proves the quartz to be in a closed syncline. On the 50 ft. level the average width of quartz in this synclinal mass is 20 feet.

The east leg is the east leg of an anticline, the crest of which outcropped at the surface, and it is 357 feet long and has an average width of 10 feet. It is cut off sharply by a pegmatite dyke 220 feet north of the Main East crosscut, and it narrows away to a stringer southwards.

*100 ft. level.*—The trough of the syncline is at the 100 ft. level where it is showing in the roof of a drive for a length of 60 feet. The true width of the quartz here is 23 feet, measuring vertically. Arsenical pyrites is showing in the quartz, and also in the quartz at the 84 ft. intermediate level. Stripping 45 feet wide, measured horizontally, is being carried out at the 84 ft. intermediate level, but this is not the true width of the quartz but across the trough of the syncline.

At the 100 ft. level, the east leg has an average width of 20 feet and is exposed for a length of 515 feet. It is cut off by a pegmatite dyke 340 feet north of the Main East crosscut, and narrows away to a stringer southwards. Stripping of the quartz in the north drive has commenced.

Approximately 45 feet below the 100 ft. level the east leg cuts off on a fault, striking approximately N.  $55^{\circ}$  W. and dipping  $35^{\circ}$  S.W., as seen in the main east crosscut at the 200 ft. level. The evidence that normal faulting has taken place is conclusive, but the actual position of the fault is doubtful. The footwall has been displaced approximately 70 feet west with respect to the hanging wall.

There is an irregular quartz reef exposed on the 100 ft. level, 80 feet south-south-west of the Main South Shaft, and it is probably portion of a structure parallel to that of the Whinfield Reef. The reef contains arsenopyrites, has an average width of 8 feet, and is driven on for 90 feet. The reef is assimilated in places by a pegmatite dyke and consequently the structure is not preserved. Exploratory work on the 50 ft. and 200 ft. levels has failed to disclose this reef.

*200 ft. level.*—On the 200 ft. level, 80 feet from the Main South Shaft in the Main East crosscut, an irregular body of quartz is exposed which is very likely the continuation of the east leg which underwent faulting between the 100 ft. and 200 ft. levels. Values are reported to be very low in this quartz and it is not being worked.

At the end of the Main East crosscut, 205 feet from the Main South Shaft, a quartz reef average width 3 feet has been driven on 125 feet north and 144 feet south. In this drive payable values are reported to extend 50 feet north and 50 feet south of the Main East crosscut. The reef dips  $65^{\circ}$  W. and is probably a portion of a structure parallel to that occupied by the Whinfield Reef. The extent

of the quartz above the level is not known, but underground bore No. 22 intersects the reef 40 feet V.D. below the 200 ft. level. Pegmatite is showing in the face of the north drive and the quartz has pinched to a stringer. Crosscutting is in progress from the end of the south drive to intersect good values which were located by surface bore No. 15 at approximately the same reduced level as this drive.

The reported estimate of the ore available in the Whinfield reef from the surface to the 100 ft. level is 100,000 to 135,000 tons of ore, with an average value of 15 dwts. to 1 oz. gold per ton.

*Structure.*—The two sections accompanying this report (Plate No. VII.) illustrate the structure of the Whinfield reef. In transverse section the reef has the appearance of a large dragfold, the axial plane of which has been seen from examination of smaller dragfolds to strike N.  $5^{\circ}$  E. and dip  $55^{\circ}$  W. The reef has no pitch on the line of section. The quartz occupies a dragfold in greenstone country and is on the east limb of a major anticline. The reef is the result of a metasomatic replacement of the country, and the presence of large isolated "horses of mullock" within the quartz supports this view.

The longitudinal section is drawn through the centre of the syncline, and it shows clearly the opposing pitches at the north and south ends. This is due to a synclinal crossfolding on an east-west axis and crossfolding has undoubtedly been an important factor in gold deposition.

#### EGAN'S REEF.

Egan's reef outcrops approximately 300 feet north of the Whinfield reef, and it appears to be an offshoot from a large body of quartz which contains only traces of gold. The reef has an average width of 10 feet, and is being opencut from the surface over a length of 135 feet. The average value of the quartz is reported to be 12 dwts. gold per ton. The quartz is parallel to the enclosing greenstone country, and megascopically it is similar to the quartz composing the Whinfield reef.

*50 ft. level.*—The quartz is exposed at this level for a length of 152 feet, and the width changes from 16 feet at the south end to 1 foot at the north end. At the south end the quartz is in the roof and pitching  $40^{\circ}$  N., meeting the floor of the drive 23 feet from the south face. A pegmatite dyke encroaches on the east boundary of the quartz going north, and the quartz has been partly assimilated. Crossfolding has been associated with the occurrence of this shoot and, if the shoot is not entirely assimilated going north, the pitch will likely change to south, fixing the shoot in a synclinal crossfold. The opposing pitches at the north end of the Whinfield reef and the south end of the Egan reef suggest an anticlinal crossfold between the two reefs.

*Production.*—The following table shows the official production to the end of October, 1936. Ore from both the Whinfield and Egan reefs is included in the tonnages stated, but the majority has been from the Whinfield reef. So far only battery treatment of the ore has been carried out, and the tailings are being stacked for treatment in the cyanidation plant, which is expected to be in operation by January, 1937.

Month,	Tonnage. long tons.	Gold therefrom. fine ozs.
May .. ..	881	379.38
June .. ..	2,776	1,446.84
July .. ..	3,311	1,609.61
August .. ..	4,095	1,888.77
September ..	4,469	2,270.49
October .. ..	4,381	2,114.92
Totals .. ..	19,913	9,710.01

The average value of the tailings on hand is reported to be 8 dwts. gold per ton.

#### Conclusions:

1. The large "horse of mullock" occupying the syncline of the Whinfield reef is being mined along with the quartz, and this will increase the tonnage and lower the grade of the ore.

2. There is, at the most, three years' ore reserves in sight. Encouraging results have recently been obtained in surface bore No. 15, but whether or not this is a large ore body has yet to be investigated.

3. Structure is an important factor controlling gold deposition, the presence of a synclinal crossfold appearing to be an essential condition. Prospecting could be done to the best advantage in the known synclinal crossfolds. Other crossfolds are likely to occur, but it is impossible to infer their location. The ferruginous quartzite, due east of the Whinfield reef, should be investigated for the presence of lode material. The bed is in the lake floor at this point, but this should be no obstacle to diamond drilling.

The Whinfield reef is a type of "saddle reef," and this should be borne in mind when prospecting for other ore bodies. New ore bodies may be located in the same horizon in the greenstone series as the Whinfield reef, or stratigraphically above or below it. The best results will be obtained by prospecting within the synclinal crossfold.

Actual sites for boring and more information concerning recommendations for prospecting will be published at a later date.

#### NEVORIA GROUP.

This group is situated about 6 miles east-south-east of Marvel Loch in an area of interbedded ferruginous quartzite and greenstone, which is traversed by numerous flatly dipping pegmatite dykes. The general strike of the country is east-south-east, and the dip varies from 50° S.S.W. to vertical, but at the east end of the group there is a sudden change in strike and, west from the 15-mile peg on the Yellow-dine-Parker's Range road, the ferruginous quartzite is striking N. 15° E. Areal mapping\* has shown that the Nevoria Group is located on the nose of a major anticline which pitches to the south-east at approximately 55°. The ferruginous quartzite is fractured and contorted into dragfolds, the noses of which are favourable structures for the deposition of gold. Ore shoots are found in both anticlinal and synclinal noses which shows that the major structure is overriding the minor structures. Quartz veins are everywhere associated with the lode material, and the primary gold is probably confined to them. The lode material is the result of secondary enrichment of the ferruginous quartzite by circulating waters, and the

values in it may be expected to decrease below ground water level, and probably become unpayable. It may not be the present ground water level which will limit the depth of the lode material, but the deepest level to which the ground water level has fallen in the past. For instance, if the ground water level in the past was 50 feet below the present ground water level, one may expect the enriched zone to extend 50 feet below the present ground water level. Whether the ore body will, or will not, live with depth depends on the quartz content.

There are, at least, four beds of ferruginous quartzite, and it is thought that these are the same bed repeated by folding. There is a lack of evidence for this view at Nevoria, but it is definitely the case at Mt. Rankin and Southern Cross, where the geology is less obscured. The composition of the ferruginous quartzite indicates that it must have been laid down under very peculiar conditions, and one finds it difficult to believe these peculiar conditions existed more than once. This supports the idea that there is only one horizon of ferruginous quartzite. The contortion of the ferruginous quartzite and the presence of numerous flatly dipping pegmatite dykes hamper mining operations.

*Nevoria Gold Mining Company.*—The company holds an almost continuous line of leases extending in an east-west direction for approximately 2½ miles; the only break in the line is the Kurrajong G.M.L. 3454. Included in the company's property are the old Never Never workings. The official production figures for the Nevoria Group to 1933 show that 44,069.5 tons yielded 10,620.15 fine ozs. of gold, and specimens totalled 14.90 fine ozs. of gold.

During the first examination of the property in February, 1936, work was being done on Just in Time G.M.L. 3390 (old Never Never) and Iron Channel G.M.L. 3394, the remainder of the leases being under exemption. Three main shafts were being sunk with the intention of investigating the lodes at three levels to a depth of 300 feet.

Isolated shoots of ferruginous quartzite lode have been worked in the past, and while there seems good evidence for the existence of four beds of ferruginous quartzite, only two beds have been worked to any extent. To facilitate the description these two beds will be designated the Main lode and the North lode.

A considerable tonnage of ore has been mined from the main open cut which has an average depth of 60 feet, average width 25 feet, and length 325 feet. Below the east end of the open cut the ore body has been stoped to ground water level at 153 feet, V.D., over a length of 110 feet and an average width of 20 feet. The 153 ft. level was inaccessible, but a winze is reported to have been sunk from this level to 205 feet, V.D., from the surface, and sulphides with good values were encountered in the winze.

The Main lode has also been worked from the Hamilton shaft. On the 50 ft. level the footwall of the ferruginous quartzite bed has been overhand stoped for 13 feet over an average width of 8 feet and a length of 180 feet. It is underhand-stopod over the same average width to 25 feet, V.D., the length of the stoping being unknown.

From the Whip shaft the main lode has been worked by open cutting and stoping to 68 feet, V.D., the average stope width being 4 feet 6 inches and stope length 50 feet. The North lode has also been

\* Refer to Plate No. VI.

worked from the Whip shaft, and is stoped erratically from 24 feet, V.D., to 85 feet, V.D., for a maximum length of 85 feet, the stope width varying from 20 feet to 4 feet. The maximum stope width and stope length is at the 53 ft. level.

The workings on the Main lode on G.M.L. 3394 were inaccessible. Occasional shafts, shallow open cuts and potholes are scattered over the remainder of the company's holdings.

The ferruginous quartzite throughout is fractured and contorted, and there is a definite relationship between geological structure and position of ore shoots. The shoots are situated at the noses of the dragfolds, and pitch with them to the south-east. The lode is generally ferruginous at the surface but, at depth, it changes to a laminated rock with alternate bands of quartz and actinolite. Secondary enrichment has undoubtedly taken place, the evidence being the occurrence of good values in flat floors in the lode, the presence of paint gold, and the occurrence of values in some of the flat pegmatite dykes.

Numerous flat pegmatite dykes are encountered in the underground workings which have changing strikes and dips. Some of the dykes are garnetiferous.

#### *Recommendations.*

As explained previously, structure is a controlling factor in the gold deposition at Nevoria. There are other important factors whose influence will not be discussed at present, and still others whose influence is yet to be understood. Similar structures can be located, however, and provided the other essential conditions exist, these structures will contain shoots of ore. Only two beds of ferruginous quartzite have been mined to any extent, and these only disjointedly. Systematic prospecting should disclose further dragfolds, and with them shoots of ore.

The other ferruginous quartzite beds could be advantageously prospected north-west and south-east from the known ore shoots. Prospecting of the lodes underground is proving difficult because of the intense drag-folding and the resulting isolation of the ore shoots. It is essential, however, to ascertain the attitude of the lode on at least one level, and where the ore shoots lie. When this is known, taking into account the dip of the ferruginous quartzite and the pitch of the ore shoots (*i.e.*, the pitch of the dragfolds), the mining exploitation could be more systematic and less costly. It may be possible in time to arrive at a measurement of what might be called the wavelength of the dragfolds (*i.e.*, the distance from one anticlinal nose to the next), and if this distance is constant then prospecting could be reduced to a minimum.

The management expects the sulphide zone to be the mainstay of the mine, as values are improving where it has been encountered. It is well not to be too optimistic, because ground water level and the commencement of the sulphide zone almost coincide, and in a secondary enriched area such as Nevoria, an enrichment is likely to occur at ground water level.

At the extreme east end of the company's property, on the ground formerly occupied by G.M.L. 3108, there are some favourable structures outcropping which warrant prospecting.

In October, 1936, another examination of this property was made, and the following work had been carried out by the company.

Crosscuts had been extended from No. 1 Main shaft at the 150 ft. and 250 ft. levels. On the 150 ft. level the Main lode was encountered 83 feet south-west from the shaft and the North lode 11 feet north-east of the shaft. The crosscuts at the 250 ft. level (93 feet in all) are entirely in pegmatite. The strike of the pegmatite dyke, as near as can be ascertained, is east-north-east, and crosscutting has been done almost along the strike. To avoid the pegmatite dyke in order to investigate the lodes, it would be advisable to drive in a south-easterly direction from the end of the south-west crosscut.

There are crosscuts off the No. 2 main shaft at 250 feet, V.D., and the shaft at this level is in the North lode. The lode is contorted, and contains sulphides of which pyrrhotite appears to be the most abundant. A west drive has just been commenced on this lode. Values are proving to be best at the noses of the dragfolds. The south-west crosscut is in progress to intersect the Main lode at this level.

At the 132 ft. level off No. 3 main shaft, three lodes have been disclosed; the North lode, the Main lode and a South lode. If the north-east crosscut is continued a fourth lode should be found.

A ferruginous quartzite lode is being examined by the company at the 50ft. level off No. 4 main shaft on the Newry G.M.L. 3456. As the workings are still in the oxidised zone the geology is obscure.

*Kurrajong, G.M.L. 3454.*—Lode material in ferruginous quartzite has been mined on this lease from the surface to 45 feet, V.D., over a maximum width of 8 feet and a maximum length 40 feet. The ore body is in the nose of a dragfold pitching to the south-east, and what has been said concerning the Nevoria Gold Mining Company is applicable here. In February, 1936, a small parcel of ore was crushed yielding 6 dwts. of bullion per ton by amalgamation, and 9 dwts. of bullion per ton by cyanidation.

*P.A. 4392.*—This prospecting area is situated approximately a quarter of a mile west of the 15-mile peg on the Yellowdine-Parker's Range road. A prominent ridge of ferruginous quartzite, which is highly contorted, having a general strike of N. 15° E., runs through this holding. Numerous quartz stringers can be seen filling fractures in the ferruginous quartzite. Prospecting is being carried out and good values are being obtained in noses of the dragfolds. The dragfolds here are small and do not approach the dimensions of the dragfolds in the ferruginous quartzite where the strike is east-west, and consequently no appreciable ore shoots are likely to be found.

#### FOUNDATION FIND.

This find is situated on the Yellowdine-Parker's Range road 45 chains north of the 15-mile peg. The place was abandoned at the time of inspection and there were no accessible workings. The workings, which are not extensive, are prospecting efforts on ferruginous quartzite lode.

### HARRIS' FIND.

Harris' Find is situated approximately 5 miles north-east of Toomey Hills. There is a paucity of outcrops, but the geology that can be seen indicates that the country is highly contorted. The strike of the country varies from N. 70° E. to N. 60° W. and the dip varies from 70° W. to vertical. The best outcrops are in the vicinity of the leases, and whitestones, mainly grey garnetiferous and chiascolite schists, predominate. Interbedded with the whitestones are greenstones which are thought to be mainly of tuffaceous origin, but some flow rocks also occur. Most of the greenstone outcrops are in an advanced stage of weathering, and it is only by applying knowledge obtained elsewhere in the district that these outcrops can be recognised as greenstones.

Only two leases were being worked at the time of inspection; viz., New Hope, G.M.L. 3702, and Mundy Hills 1, G.M.L. 3671, where quartz reefs and lode material associated with quartz stringers constitute the ore bodies. Because of the lack of evidence one is unable to form any reliable opinion concerning the relationship of ore bodies to the geological structure.

A quartz reef with graphite outcrops approximately 11 chains north-east of the north peg of Mundy Hills 4, G.M.L. 3674.

Approximately 35 chains north of the north peg of Mundy Hills 1, G.M.L. 3671, is a shaft which has recently been worked, and arsenical pyrites is showing in the quartz on the dump.

A quartz reef, reported to assay 3 dwts. gold per ton, has been prospected from this shaft.

*New Hope, G.M.L. 3702.*—The ore body has been exploited between Shafts B and C which are adjacent to the south-east boundary of the lease. The underground workings were accessible from Shaft B, the north-western of these two shafts. Lode material with quartz veins, striking N. 45° W. and dipping 80° S.W. with the enclosing whitenstone country, has been stoped from 92 feet V.D. from ground level, to the surface. The average stope length is 23 feet and the average stope width is 2 feet. No idea of the pitch of the shoot could be obtained. The ore body is along a line of weakness near the centre of a grey schist bed which is 38 feet wide, measured in the crosscuts at the 129 ft. level. The grey schist bed is bounded by greenstone.

Quartz stringers are showing in the faces of all the drives except at the 129 ft. level, where one foot of quartz is showing in the face of the south-east drive. There is no quartz in the face of the north-west drive at the 129 ft. level, and there is a sporadic distribution of quartz along the roof of the drive. No stoping has yet been done on this level, but the lessees report that the payable shoot is still in the roof of the drive. It is reported that in the course of driving here, a parcel of 160 tons of ore was crushed at Howlett's battery for a return of 6 dwts. gold per ton by amalgamation. In the south-east drive at the 129 ft. level, 17 feet from Shaft B, is a winze 14 feet V.D., and ground water level has just been encountered.

Values are said to be improving in the winze and this is probably due to secondary enrichment by circulating waters. The depths of the levels have been measured from the top of the dump so that the depth to groundwater level from ground level is 134 feet.

Shaft A, 160 feet north-west of Shaft B, is being sunk with the intention of connecting with the north-west drive from Shaft B, at the 129 ft. level. This connection will surmount the ventilation problem, which has been hampering mining operations.

*Mundy Hills 1. G.M.L. 3671.*—This lease adjoins the New Hope lease on the south-east boundary.

Adjacent to the north-west boundary of G.M.L. 3671 a quartz reef has been stoped for an average length of 73 feet, and average width of 2 feet, from the 32 ft. level to the 59 ft. level. The stoping has been carried out between the shafts D and E, and 20 feet north-west of shaft D. Shaft D, the north-western of these two shafts, is 79 feet, V.D., from the top of the dump, but it was inaccessible below the 59 ft. level. On the 32 ft. level the quartz attains a width of 3 feet between the two shafts, but quartz is absent in the face of the north-west drive. A quartz stringer is showing in the face of the north-west drive at the 59 ft. level, and one foot of quartz is showing in the south-east wall of shaft E between the 32 ft. and 59 ft. levels. There is no quartz in the face of the 24 feet south-east drive off shaft E at the 54 ft. level.

The ore shoot is parallel to the enclosing whitenstone country, and is in the same line of weakness as the ore body in the New Hope lease.

Another ore body, composed of lode material and quartz, is being mined from shafts F and G, situated near the south-east boundary of the lease. The two shafts are connected at the 50 ft. level where the majority of the work has been carried out. The ore body has been prospected at the 100 ft. and 135 ft. levels off shaft F, the southern of these two shafts, but these workings were inaccessible.

At the 50 ft. level the greenstone country is in a highly oxidised condition, and there is an erratic distribution of quartz and of values in the lode material. The quartz is reported to carry values throughout, but there is only one defined reef which is situated 15 feet east of shaft F. This reef, which is parallel to the enclosing country, has a curving strike, but the general strike is N. 30° E. and the dip 70° N.W. The average width of the reef is 3 feet and it can be traced over a distance of 65 feet. Overhand stoping, 20 feet high and 20 feet south-west of the rise in the east crosscut off shaft F, has been done. A small amount of lode material, resulting from secondary enrichment, has been stoped in two places. The values in the lode material are erratic, and the limits ill-defined. The strike of the country varies from N. 20° W. near shaft F, to N. 35° E. near shaft G, and the dip is 70° W. A relationship between quartz deposition and geological structure is suspected, but, owing to a lack of evidence, the structural control could not be established.

A mining company recently held an option over this property, but it was not exercised.



The following production figures have been supplied by the lessees:—

CRUSHINGS AT HOWLETT'S BATTERY.

	Tonnage (long tons)	Gold therefrom (bullion)—		Month.
		by amal- gamation.	by cyan- idation.	
From the Northern Workings.	24½	dwts. grs. 7 0	dwts. grs. 2 15	Mar. 1934
	70	6 0	2 10	Aug. 1934
	49	5 0	1 18	Oct. 1934
From the Southern Workings.	60	5 0	2 21	Feb. 1935
	194	5 0	3 18	Oct. 1935
	42	6 0	2 21	Jan. 1936
60 tons at grass expected to yield 8 dwts gold per ton by amalgamation.				

PARKER'S RANGE GROUP.

This group embraces all mining tenements situated in a strip of country extending one mile west and 1½ miles south of the Parker's Range townsite. The group lies in an area of greenstone interbedded with some thin whitestone beds. The general strike of the country is north-north-east, and the dip varies from 35°-65° W. Three beds of ferruginous quartzite have been mapped along the eastern margin of the group and they are remarkably free from dragfolds. It is thought that these three beds are one bed repeated by folding on a north-south axis, but the supporting evidence is lacking.

A fault striking N. 73° E., which has displaced the southern portion a distance of one chain to the east, cuts through the group, crossing the main road about 6 chains south of the 15-mile peg. Numerous milky white quartz reefs are scattered along the line of the fault.

There are three distinct lines of workings on this group.

Shallow potholes and occasional shafts are scattered along the ferruginous quartzites, and these constitute the east line. Although prospecting is dormant on this line at present, the work done indicates that it must have been active in the past.

There are two existing prospecting areas on the central line. One occupies the ground formerly held by the Ell Ess Dee lease.

There is also a western line on which the most important shows were the late Searchlight, the late Piemonte, and the late McIntosh Deeps.

P.A. 3509 (late L.S.D. lease).—There are two lines of workings on this prospecting area. In the eastern line of workings, a granitic quartz reef of lenticular habit, striking and dipping with the enclosing greenstone country, has been mined. These workings were inaccessible at the time of examination.

Activity is confined to the workings accessible from Shaft B, on the western line, where mica schist lode with quartz stringers constitutes the ore body. The country strikes N. 15° E. and dips 50° W.

In Shaft B, 108 feet V.D., ground water was encountered at 50 feet V.D., and the installation of a pump was found necessary to cope with the water. At 104 feet V.D. there is a southerly drive along the hanging wall contact of the mica schist with the greenstone, for a distance of 53 feet from the shaft. At 28 feet in this drive, a crosscut 24 feet in length connects to Shaft A at this level. The face of the drive is in mica schist with quartz stringers. The owners report that the best values are at the contact of the mica schist with the greenstone. From Shaft B to the face, over a width of 10 feet, the mica schist is said to average 10 dwts. gold per ton. The extent of the values overhead and underfoot is unknown.

A trial crushing of 6 tons, in March 1936, is reported to have yielded 5 dwts. gold per ton by amalgamation and 4 dwts. gold per ton by cyanidation.

A two-head battery is being erected on the property.

Conclusions.—The lode is undoubtedly secondary because the mica schist is barren above ground water level. The 104 ft. level is in an enriched zone and there is little hope of the values living in the mica schist lode to any great depth. Primary gold exists, however, in the quartz stringers accompanying the lode material, and the owners have in their possession some very rich specimens, but unfortunately these are scarce. The chances of this show becoming a large producer depends on whether or not the stringers form a workable body of quartz at depth.

P.A. 4352.—A 1½ inch quartz stringer with a few inches of lode material, in greenstone country, has been worked in scattered potholes to a maximum depth of 30 feet. The present holders are obtaining some good prospects, showing coarse gold, from this seam and are cleaning out the old workings with the hope that the seam may be worth following down.

A quartz reef with tourmaline, striking with the country, outcrops 2 chains south of the workings and good prospects are reported to have been obtained.

P.A. 4397 (late Piemonte lease).—This is situated in a greenstone area having a general north-north-east strike and dipping 50° W. At the time of examination, work was being carried out in two shafts. Shaft A, the southern of these two shafts, has been sunk to 45 feet V.D. where a quartz reef, striking N. 25° E. and dipping 55° W. with the enclosing greenstone country, was intersected. At the 45 ft. level a mixture of quartz veins and reported lode material, 3 feet wide and said to be payable can be seen in the north wall of the shaft. There is a south drive at this level for 31 feet and the quartz gradually increases in width going south from the shaft, attaining a width of 3 feet in the face. The owners were preparing to stope this reef, in which the values are reported to be best on the hanging wall. A fault striking north-north-east and dipping 30° W. cuts through the face of the south drive. There has only been a small displacement of the footwall to the west, and no difficulties to the mining of the reef should result from the faulting. Shaft B underlies 50° W. On the

No. 1 level, at 42 feet linear depth, there is a south drive for 29 feet, showing 5 feet 6 inches of quartz, with interstitial lode material in the face. The quartz is stoped above the level 12 feet high and 5 feet 6 inches wide, over the length of the drive, and is reported to have averaged  $4\frac{1}{2}$  dwts. gold per ton by amalgamation, and  $2\frac{1}{2}$  dwts. gold per ton by cyanidation.

The quartz pinches out to stringers in the north drive at this level, 17 feet from the shaft. The drive continues and connects Shaft C and then Shaft D and the drive finishes at 120 feet from Shaft B. Quartz stringers are showing in the face. A short east crosscut off the north drive at 50 feet from Shaft B exposes a parallel quartz reef, 5 feet wide, in which the values have apparently been unpayable. This reef can also be seen on the footwall of Shaft D where it is 6 feet wide. Off the bottom of Shaft B, 65 feet linear depth, there is a short east crosscut which discloses a few quartz stringers.

#### WHITE HORSESHOE, G.M.L. 3540.

This lease is situated on the main road  $3\frac{3}{4}$  miles south of the Parker's Range townsite. The workings are in greenstone between two ferruginous quartzite beds. The country has a general north-north-west strike and the dip varies from  $35^{\circ}$ - $50^{\circ}$  W. Near the south boundary of the lease where the geology is obscured by a thick overburden of red sandy soil, the ferruginous quartzite beds have been displaced east by faulting or folding. A line of small lenticular quartz reefs has been mined here in the past.

Shaft A, the working shaft, is 51 feet V.D.; there is a 10 feet east crosscut from the bottom, off which there is a drive for 20 feet on a bearing of  $N. 10^{\circ} W.$  At the south end of the drive, 3 feet of quartz with "horses of mullock" is showing in the roof. The quartz has been overhand stoped to one foot from the north face, where the quartz has pinched to a few stringers, and back on the pitch to the surface. The stoping pitches approximately  $55^{\circ} S.$  and is reported to have averaged 9 dwts. bullion per ton. The quartz is lenticular and strikes  $N. 10^{\circ} W.$  and dips  $35^{\circ} W.$  with the country. The lessees are about to underhand stope this reef from the 51 ft. level drive.

Shaft B, the old main shaft, was inaccessible, but the ground water level was approximately 50 feet V.D. from the surface.

#### OLGA GROUP.

This group is situated in an area of greenstone with some interbedded whitestone on the main road to Ravensthorpe, approximately 6 miles south of Parker's Range townsite. Four beds of ferruginous quartzite traverse the centre of this group. The strike of the country changes from  $N. 10^{\circ} E.$  at the north end of the group, to  $N. 30^{\circ} W.$  at the south end, and the dip varies from  $35^{\circ}$ - $65^{\circ} W.$  The ferruginous quartzite beds are gently folded and are apparently non-auriferous in this area. Between the ferruginous quartzite beds, small quartz lenses with high values and parallel to the enclosing greenstone country, are being mined. In the Parker's Range and Spring Hills groups there is more than one "gold line," and other "gold lines"

should be discovered in the same relative positions at the Olga and Duleie groups. This group warrants prospecting approximately for 50 chains to the west, but the thick overburden may present difficulties. Future discoveries are expected to be of similar size and tenor to the existing shows in this vicinity.

Approximately 4 chains north of the north boundary of the Manita, G.M.L. 3717, a quartz diorite dyke cuts across the strike of the country.

*Black Cat G.M.L. 3716.*—The main shaft underlies  $45^{\circ}$ - $52^{\circ} S.S.W.$  to ground water level at 144 feet vertical depth (i.e., 200 feet linear depth). Two ore shoots which pitch steeply to the south-east are being mined, and the main shaft is sunk between them.

The south-eastern ore body has been stoped intermittently from the surface to water level. The average stope length is 17 feet, measured in the drives, and the average stope width 2 feet. Quartz, 1 foot 6 inches wide and reported to assay  $12\frac{1}{2}$  dwts. gold per ton, is showing in the face of the drive at the 52 ft. V.D. level and 2 feet of quartz with payable values is showing in the face of the drive at the 78 ft. V.D. level. On the 140 ft. V.D. level a quartz stringer is showing in the face of the south-east drive, and the quartz is reported 10 feet long in the floor.

On the north-west side of the shaft a lenticular quartz reef has been stoped out between the 140 ft. V.D. and 119 ft. V.D. levels, and the 119 ft. V.D. level is overhand stoped for approximately 20 feet. The average stope length is 23 feet and the average stope width is one foot. Quartz, 10 inches wide, is showing in the face of the north-west drive at the 119 ft. V.D. level, and at the 140 ft. V.D. level there is a quartz stringer in the face of the north-west drive. In the floor of the north-west drive at the 140 ft. V.D. level are two quartz lenses, 5 feet long and 8 inches wide, which are reported to assay 5 ozs. gold per ton.

Along the roof of the north-west drive, at the 92 ft. V.D. level, the average width of quartz is approximately one foot, and there is 2 feet of quartz showing in the face. The quartz on this level is reported to average 3 ozs. gold per ton. Some specimens containing coarse gold were seen on this level and paint gold is said to occur.

The main shaft underlies at  $45^{\circ}$  to 93 feet linear depth, where the dip steepens to  $52^{\circ}$  and this dip is retained to 143 feet linear depth when the shaft resumes its initial dip. This local steepening in dip has influenced the quartz deposition and probably the values. The greatest width of quartz is attained in this section and the values begin to improve, but being in a secondary enriched zone, nothing definite concerning the influence of the steepening in dip on the values could be ascertained.

Gradual changes in strike resulting from gentle folding were observed in the underground workings. The folds pitch steeply to the south-east, ore shoots occupying the synclines and only stringers of quartz are present on the anticlines. Briefly, the quartz ore bodies appear to be associated with favourable strikes and dips which are a reflection of the major structure. The shoots have pinched on their strike because anticlines are being approached.



A continuation of the drives north-west and south-east is recommended, as new shoots will probably be disclosed. The driving could be done to the best advantage off the section of the main shaft dipping at 52°.

Changes of dip have resulted from folding on a horizontal N.W.-S.E. axis. The quartz is pinching and shortening with depth, and a gentle anticline belonging to this set of folding is being approached. When the anticline is passed the dip will steepen once more, and the shoots will probably regain their width and length. Bearing in mind the pitch of the shoots, prospecting should be done in this direction. The installation of a pump will be necessary, however, to cope with the water.

There is a pronounced fold in the ferruginous quartzites on this lease, and the nose should be investigated.

*Manita G.M.L. 3717.*—The main shaft on this lease underlies at 40° S.W. to 46 feet, V.D., and then the dip steepens to 45° to ground water level at 118 feet, V.D., from the surface. On the south-east side of the main shaft a lenticular quartz reef, pitching steeply to the south-east, has been stoped sporadically from 37 feet linear depth to water level. A block of ore which is reported to have averaged 30 dwts. gold per ton, has been stoped out between the 117 ft. V.D., and 84 ft. V.D., levels over an average length of 14 feet and an average width of 3 feet. Overhand stoping has been carried out on the 84 ft. V.D. level to 32 feet from the shaft over a width of 4 feet and 8 feet high. The average value for this block is reported to be 27 dwts. gold per ton. The 48 ft. V.D. level is overhand stoped to 18 feet from the shaft over a width of 3 feet and height 38 feet, and underhand stoped 23 feet over the same average width to 8 feet from the shaft.

Quartz stringers are showing in the faces of the drives.

Prospecting should be carried out on the same lines as recommended for the Black Cat G.M.L. 3716.

A new shaft is being sunk half a chain to the west of the north-east lease peg on two 4-inch quartz stringers, which are reported to contain good values.

*Miner's Dream G.M.L. 3757.*—Mining operations had just ceased on this lease when the examination was made.

The main shaft underlies at 35° S.W. to 100 feet linear depth, and then steepens to 45° to ground water level at 193 feet, V.D. The ore body, which is reported to have been a mass of quartz kidneys pitching as a whole steeply to the south-east, has been stoped out to water level. It is reported that the maximum width of quartz stoped was 2 feet, and the average width of the quartz was one foot. There is a gradual diminishing in stope length with depth. On the 56 ft. V.D. level the stope length is 66 feet, and on the 195 ft. V.D. level the stope length is reported to be 15 feet.

Immediately below the stoping on the 195 ft. V.D. level, a winze 44 feet linear depth is reported by the lessees, and at the bottom of the winze the ore shoot is 12 feet long and 2 inches wide; the values are unpayable. Prospecting should be carried out on the same lines as recommended for the Black Cat G.M.L. 3716.

*P.A. (late King of the Range lease).*—A prospecting area embracing the main workings of the late King of the Range and Range Queen leases has recently been pegged.

The workings off the old main shaft on the late King of the Range lease were accessible to ground water level at 104 feet V.D. A quartz reef of lenticular habit, striking N. 15° W. and dipping 40° W., has been stoped out from 23 feet V.D. to ground water level. The stoping pitches steeply to the south-east, and the average width of the quartz stoped is reported to be one foot. On the 81 ft. V.D. level the stope length is 82 feet, and on the 106 ft. V.D. level the stope length is 50 feet, showing a shortening in length of the shoot with depth. The shoot is reported to be underhand stoped to 20 feet below the 106 ft. V.D. level. Quartz stringers are showing in the faces of the drives.

The holders say they have reliable information that the shoot is worth working below water level, and they are about to unwater the shaft. It seems unlikely that work would have ceased here with ore in sight, and judging from the occurrence of other ore bodies in this vicinity the shoot should soon diminish to a stringer. Prospecting on the same lines as recommended for the Black Cat G.M.L. 3716, however, may disclose new shoots of ore.

There is a new shaft, shaft B, approximately 2 chains north-west of the old main shaft, being sunk on a 4-inch quartz stringer which is reported to assay 2 oz. 13 dwts. gold per ton. The shaft is vertical for 10 feet, and then underlies 45° W. for 30 feet.

#### CHERITON'S FIND.

Cheriton's Find is situated on the main road to Ravensthorpe, approximately 9 miles south from the Olga Group.

The place was abandoned, and there were no accessible workings. The geology is obscured by ferruginous laterite and red soil, the only outcrops being greenstones in an area of about 40 acres to the south of late G.M.L. 3032. Amygdaloidal lavas and tuffs striking N. 50° W. and dipping 50° S.W., constitute the major portion of the greenstones. Lenticular quartz-reefs, parallel with the enclosing greenstone country, have been mined here, but no extensive work has been done. The strike of the country is becoming more westerly, and one gains the impression that another major anticlinal nose is being approached, though no evidence can be produced to establish the idea. The paucity of outcrops makes it impossible to elucidate the geological structure. All efforts to locate the ferruginous quartzite beds in this vicinity have failed.

#### SOUTHERN CROSS.

*Three Boys, G.M.L. 3444.*—The company holds two leases, viz., Three Boys G.M.L. 3444 and the Messina G.M.L. 3526, but the latter was under exemption and not being worked. There is a 10-head battery operating and a cyanidation plant is under construction. On the Three Boys lease, lode material in ferruginous quartzite beds constitutes the ore bodies. The ferruginous quartzites are interbedded with greenstones which strike N. 35° W. and dip 55°-70° S.W.

The main shaft has been sunk to ground water level at 96 feet V.D. and the main north-east crosscut at this level intersects three lodes; the West lode, the Central lode, and the East lode.

*West Lode.*—This lode, which has an average width of 2 feet 6 inches, was intersected in the main north-east crosscut, 28 feet from the main shaft, where it has been driven on for 67 feet. The values are reported to be unpayable, averaging only 2 dwts. gold per ton.

*Central Lode.*—This lode was encountered 122 feet from the Main Shaft and it is the main ore body. Driving has been carried out 143 feet north-west and 185 feet south-east of the main north-east crosscut, and the average width of the lode material is 9 feet. Stopping has been done in the north-west drive north-west from the main north-east crosscut, over a length of 70 feet. From the crosscut to 43 feet in the drive the stopping extends overhead to 50 feet V.D. from the surface, and from 43 feet to 70 feet the overhand stopping is 16 feet 6 inches high. There is a gradual increase in stope length upwards from the 96 ft. level, and at the 64 ft. level the stope length is 81 feet.

It is reported that a parcel of 817 tons stoped from here averaged 11 dwts. 9 grs. of bullion per ton, of which 5 dwts. 13 grs. are still in the sands.

The width of the lode is variable, and this is due to the presence of dragfolds which pitch flatly to the north-west.

*East Lode.*—The main north-east crosscut intersects this lode at 150 feet from the main shaft. The ore body is 18 feet wide and is exposed for a length of 66 feet. The lode material is in the nose of a tightly compressed anticline pitching 40° N.W., and this accounts for the values pitching into the floor at the north-west end of the drive. The average value of the ore is reported to be 6 dwts. gold per ton.

At the 75 ft. level off Shaft No. 6, which is situated 290 feet from the main shaft on a bearing of 125°, a ferruginous quartzite lode, said to average 6 dwts. gold per ton, is being opened up. The width is 22 feet and the exposed length is 50 feet.

#### Conclusions.

1. The different beds of ferruginous quartzite are repetitions of the one bed by folding. Dragfolds occur on the limbs of these folds and it is in these structures that the best values are likely to be obtained. The appearance of new lines of lode or the disappearance of some of the present ones is likely, and it is expected since the dragfolds have a flat northerly pitch. For example, if we are on the limb of a north pitching anticline and proceed southwards, dragfolds well down on the limb will gradually emerge at the surface.

Quartz stringers are present in the ore shoots, and this is the case in all mines working ferruginous quartzite lode material.

2. The recommendations for prospecting of the Nevoria Group are applicable here, but it should be noted that in the vicinity of the Three Boys lease the pitch of the dragfolds is along the strike and not across it.

3. A considerable amount of secondary enrichment has occurred and there will probably be a decrease in values below ground water level.

#### NEW ZEALAND GULLY GROUP.

This group is situated near the source of New Zealand Gully 1½ miles south-west of Southern Cross. The country is mainly greenstone but a grey schist

bed, 6 chains wide, has been recognised along the east margin of the group. There are discontinuous outcrops of anthophyllite rock (an aluminous amphibole) to the east of the grey schist bed. The general strike of the country is N. 30° W. and the dip varies from 70° N.E. to 70° S.W. Quartz reefs, and lode material with quartz stringers, parallel to the enclosing country, have been mined in this group. The ore bodies appear to be arranged *en echelon*; stepping to the east going north.

*Queen Ann*, G.M.L. 3473.—There is a 5-head battery on this lease but an insufficient water supply impedes its operation. Two "gold lines" are present on the lease.

*West Line.*—Lode material associated with quartz stringers in greenstone country is being mined at the 22ft. level over a width of 6 feet and a length of 100 feet. There is an insufficient amount of work done to establish the pitch of the shoot. The primary gold is probably confined to the quartz stringers and the lode material is the result of secondary enrichment. The average value of the ore is reported to be 3 to 4 dwts. gold per ton by amalgamation, and 3 dwts. gold per ton by cyanidation.

*East Line.*—A quartz reef of lenticular habit, situated at the western contact of the grey schist with the greenstone, is being mined. Several shafts have been sunk on this reef but the only accessible shaft was that adjacent to the battery. The quartz varies in width from a stringer to 8 feet, and the values are reported to vary from 4 dwts. gold per ton to 14½ dwts. gold per ton. Stopping has been carried out sporadically from the surface to 70 feet V.D. over a length of 110 feet. Ground water, which is reported to be encountered in this shaft at 90 feet V.D., is being used in the battery. The quartz is underfoot on the 70ft. level, and sulphides are reported in the quartz at depth.

Prospecting is recommended along the whitestone-greenstone contact, and also at the eastern contact of the grey schist.

*Tarcoola North*, G.M.L. 3637.—The greenstone country on this lease strikes N. 25° W. and dips 70° S.W. The working shaft was inaccessible at the time of inspection and the following information is reported.

The shaft is 45 feet V.D., and from the bottom there is 35 feet of driving on lode material with quartz stringers. Stopping has been carried out 25 feet overhead, and the average width is 4 feet. The values throughout have been low, and the lode material is unpayable in both faces of the 45ft. level drive.

*Tarcoola*, G.M.L. 3802.—The greenstone country on this lease strikes N. 40° W. and the dip varies from 70° S.W. to 70° N.E. There are three working shafts on this lease, and lode material with quartz stringers constitutes the ore bodies.

*Main Shaft.*—This shaft is situated near the north boundary of the lease and is vertical to 43 feet, where it underlies at 70° N.E. to 120 feet V.D. from the surface. Quartz and lode material have been stoped between 32 feet V.D. and ground water level at 110 feet V.D., over an average length of 40 feet and an average width of 4 feet. The average value of the ore stoped is reported to be 8 dwts. gold per

ton. The quartz attains a width of 1 foot in places, and sulphides were seen in some of the quartz on the dump.

*Shaft A.*—Shaft A. is situated approximately 145 feet south-east of the Main Shaft. Opencutting, of lode material with quartz stringers, has been carried out 36 feet north-west and 38 feet south-east of the shaft, over a width of 3 feet 6 inches and to a depth of 6 feet. The shaft is 30 feet V.D. and the lessees are preparing to drive on the ore body. It is reported that a crushing of 15 tons of ore taken from the opencut on the south-east side of the shaft yielded 8 dwts. gold per ton by amalgamation and 8 dwts. gold per ton by cyanidation.

*Shaft B.*—Shaft B is situated 250 feet from Shaft A on a bearing of 120°. The shaft is 47 feet V.D. and there is a north-east crosscut for 34 feet, in which 4 feet of reported payable lode material was encountered.

As mentioned previously, the ore bodies in this group are arranged *en echelon* and this should be borne in mind when prospecting for new shoots. When driving north-west from known ore shoots offset to the east, and when driving south-east offset to the west.

Also, lateral prospecting may be done to advantage, north-east and south-west from the known ore shoots.

#### BLACKBOURNE'S FIND.

This find is situated in greenstone country approximately 5 miles south-south-west of Southern Cross. There are three "gold lines," and vuggy, ironstained quartz reefs with lenticular habit have been mined. The reefs are parallel to the enclosing greenstone country, which has a general north-south strike and dips 65° E. The ore shoots pitch 60° S., and are arranged *en echelon*; the shoots stepping to the east going north. There is a dryblown patch here from which a small amount of eluvial gold has been won.

The official production figures for this find to 1933 show that 1,467.90 tons of ore were crushed yielding 383.53 fine ozs. of gold.

One prospecting area, embracing the ground formerly occupied by G.M.L. 887, was in existence at the time of inspection. At the north end of the property some old workings were being cleaned out with a hope that, owing to the enhanced price of gold, further stoping of the shoot could be carried out. The ore shoot occurs within a quartz reef, and the reef as a whole is not payable. The shoot has been stoped out from the surface to 140 feet V.D. over an average width of 4 feet and an average length of 95 feet. Ground water was encountered at 188 feet V.D. from the surface.

*Conclusions.*—It is unlikely that any appreciable quantity of ore will be mined from the old workings, and the prospectors should apply their efforts to

prospecting for entirely new ore shoots. Lateral prospecting eastwards may disclose other "gold lines." Also, new shoots may be found by prospecting to the north of the old workings, remembering that they will be *en echelon* with the old shoots. At the north end of the driving at the 95 ft. V.D. level the reef is swinging eastwards, and if it resumes the favourable strike further north another ore shoot should exist.

#### MT. RANKIN.

*No Trumps G.M.L. 3555.*—Two beds of ferruginous quartzite striking N. 55° W. and with a general dip 70° E. form a prominent ridge traversing the centre of this lease. At least two other ferruginous quartzite beds exist, but their outcrops are discontinuous. Greenstones are interbedded with the ferruginous quartzites and the country is contorted. Areal mapping\* has shown that Mt. Rankin is situated on the west limb of a syncline pitching 50° S.E. It is believed that there is only one horizon of ferruginous quartzite, and the existence of other beds may be explained by drag-folding.

Mining operations have been confined to the western of the two prominent ferruginous quartzite beds. Four isolated shoots of ferruginous quartzite lode material with quartz stringers, situated in the noses of dragfolds and pitching with them 50° S.E., have been worked in the past.

The official production figures for this lease from 1909-1910 show that 244 tons of ore were crushed, yielding 52.67 fine ozs. of gold.

The lessees are mining patches of ore from the old workings, and a crushing of 16 tons taken from the open cut near Shaft No. 1 (the northern shaft) is reported to have yielded 13 dwts. bullion per ton by amalgamation, and 4 dwts. bullion per ton by cyanidation. Secondary enrichment by circulating waters has undoubtedly played an important role in the formation of the ore shoots, and values may be expected to decrease below ground water level. The best values are obtained in the white coarser-grained patches in the ferruginous quartzite, provided these patches are in a favourable structure. There are more pore spaces available for the deposition of secondary gold in the coarser-grained patches, and this accounts for the improvement in values.

It is reported that Shaft No. 2 is 230 feet V.D., and ground water level has not yet been encountered.

Prospecting is recommended in the noses of dragfolds, which occur along the strike of the main ferruginous quartzite bed. Also, shoots of ore are likely to be found in the other ferruginous quartzite beds, and these should be prospected. The greenstones warrant exploratory work north-east and south-west from the Mt. Rankin line because auriferous quartz reefs may exist.

\* See Plate No. VI.