

thickness. The surface portion of the deposit is fairly white and pure, but the lower portion contains a proportion of fine clay, increasing with the depth. As a rule, only the top two inches is taken off, and this is roughly washed before bagging for transit.

The lowest portions of the clay pans are usually covered by a thin film of salt.

The water level in the dry season is approximately one to two feet below the surface. The water is extremely salt, and in places contains gypsum in solution, as may be seen by the growth of gypsum on grass tufts blown into the potholes.

The extent of the gypsum deposits is said to vary from year to year. One portion of the southeastern channel which was said to be covered by a salt film the previous year was, at the time of my visit, covered by a layer of coarse seed gypsum.

A few shallow potholes near the northwest corner of the claim, in a low bank forming the western edge of the southeastern channel, disclosed a layer, at a depth of about  $1\frac{1}{2}$  to 2 feet, containing, in some of the potholes, fairly well developed, usually single, crystals of clear gypsum up to  $2\frac{1}{2}$  inches in length and  $1\frac{1}{2}$  inches in diameter. Some of the crystals are markedly elongated, one, two inches in length, having a diameter of not less than one-fifth of an inch. In other potholes the gypsum is of a rounded flake-like form.

In places, on the southeastern edge of the lake, are irregular narrow banks of seed gypsum, evidently wind-blown. These banks are probably several feet thick in places. The gypsum composing them is cleaner than that on the floor of the clay pans, but the presence of numerous small bushes, the roots of which penetrate the gypsum, would interfere with the working of this deposit to some extent.

In a few places, for example near the northwest and southwest corners of Lot 124, there are fairly high dunes on or near the edge of the lake. Unlike the dune fringing the southeastern portions of the gypsum lakes at Hine's Hill, where the composing material consists largely of seed gypsum, these dunes are composed mainly of kopai, that composing the dune near the southwest corner of Lot 124 being almost pure. A shallow pothole near the bottom of the western slope of this dune shows the kopai, at this point, to be underlain by discoloured seed gypsum, apparently to a depth of several feet.

As at Hine's Hill, the position of the dunes and of the low banks of seed gypsum indicates that the prevailing wind is from the northwest.

About  $1\frac{1}{2}$  miles SW. of Mineral Claim 29H and 24 chains WNW. of the southwest corner of Lot 125, a deposit characterised by unusually large gypsum crystals has been cut in a shallow trench at the foot of a low bank on the lake. The gypsum is distributed as large crystals of arrowhead or of elongated spearhead form, or as irregular aggregates of these forms, mostly arranged with their longer axes nearly vertical, in a band of very puggy grey clay. This band is from  $1\frac{1}{2}$  to 2 feet thick and is covered by an overburden, from a few inches to about 2 feet thick, of fine, dusty clay. The base of the gypsum deposit is at about water-level in the dry season. The deposit is underlain by dense, puggy clay. The largest mass of gypsum seen in this deposit was about  $2\frac{1}{2}$  feet in length, and was composed of two

imperfect crystals, joined irregularly. The crystals are mostly imperfect, but one nearly perfect arrowhead measuring about  $11\frac{1}{2}$  inches in length by  $5\frac{1}{4}$  inches in maximum width was obtained, and also a crystal of the spearhead type measuring  $16\frac{3}{4}$  inches by a little more than one inch. The crystals are fairly clear, but some are stained slightly brownish, probably by organic matter, and contain small inclusions of clay, arranged parallel to the re-entrant angle of the crystals.

Owing to the difficulty of working this last deposit, and particularly of separating the crystals from the dense, puggy clay, it is unlikely that it will prove payable.

## 5.—RECENT DISCOVERIES AND DEVELOPMENTS AT THE NORTH END, KALGOORLIE.

INCLUDING THE SURPRISE NORTH CROSS LODGE AND THE PAYMASTER LODGE.

(F. R. FELDTMANN.)

During the recommencement of the Kalgoorlie survey, it was considered advisable to examine some of the work done at the North End since the survey by myself of that area, the results of which were given in Bulletins 51 and 69 of the Geological Survey, and since my brief visit in 1917. It was hoped that an examination of the recent work, in particular that in the vicinity of the largest albite porphyrite dyke (*vide* Bulletin 69, page 39), which runs through the middle of the Younger Greenstone belt, would supply information that was not available at the time of my original survey. The area occupied by, and that for some distance east of, this dyke, particularly to the north of the Transcontinental Railway, is almost completely obscured by superficial deposits, and at the time of the original survey but few shafts in that area were of sufficient depth to give any indication as to the nature and relative positions of the rocks. From the appearance of the material on some of the dumps north of the Kanowna railway, the presence of a second albite porphyrite dyke, east of the main dyke, was suspected, but no data were available as to its strike and extent. The mining work done since my survey affords a considerable amount of information, still unfortunately incomplete, as to the occurrence of this dyke, as well as of the main dyke and associated lodes.

The leases examined in most detail were the Surprise North G.M.L. 5193E and the Paymaster and Paymaster Proprietary G.M.Ls. 5333E and 5167E, adjoining the Surprise North on the northeast and southeast respectively. The northwestern boundary of the Kanowna Railway Reserve forms the southeastern boundary of G.M.L. 5193E, and that of the Transcontinental Railway Reserve, the southeastern boundary of G.M.L. 5333E. The southeastern boundary of G.M.L. 5167E runs a few feet northwest of the Transcontinental Railway Reserve.

THE SURPRISE NORTH G.M.L. 5193E. (Plate I.)  
*General Geology.*—This lease, which is held by Mr. M. Hartigan, covers part of the southern portion of former G.M.L. 4461E (4419E), Lone Hand No. 2 (Bulletin 51, pages 42 and 43; Bulletin 69, Plate XIII, sheet 10), and part of the western portion of former G.M.L. 4146E (1121E), Devon Con-

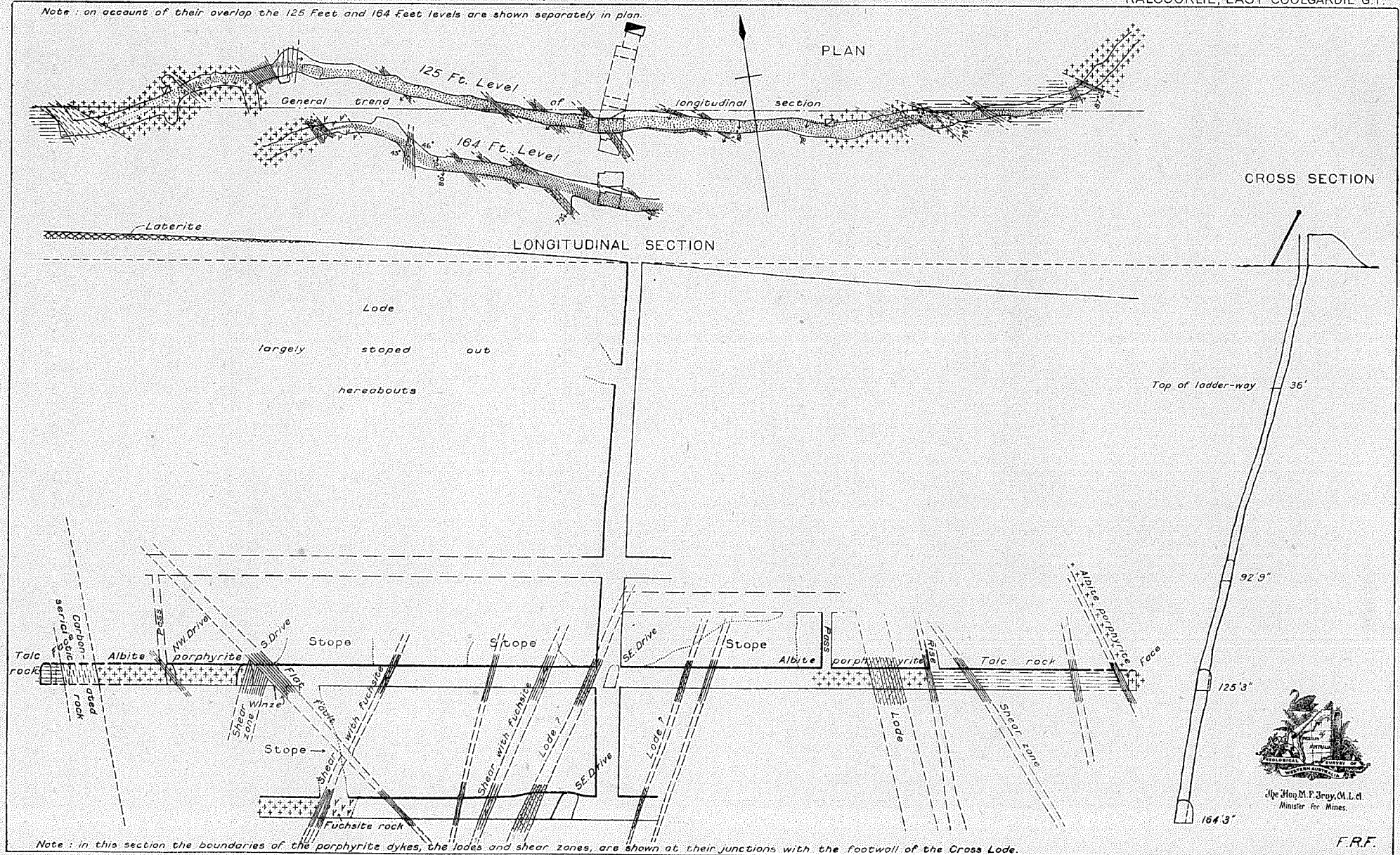
# PLAN AND SECTIONS OF THE WORKINGS ON THE SURPRISE NORTH CROSS LODGE.

PLATE I

Feet 0 20 40 60 80 100

KALGOORLIE, EAST COOLGARDIE G.F.

Note: on account of their overlap the 125 Feet and 164 Feet levels are shown separately in plan.



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sols Consolidated. The main albite porphyrite dyke runs through the middle of the lease. That portion of the lease west of the dyke is partly in talc-chlorite-carbonate rock—derived by incipient vein alteration from hornblende—partly in quartz dolerite greenstone. The boundary between these two rocks, which both represent portions of the great dyke of Younger Greenstone, is indefinite. That portion of the lease east of the main porphyrite dyke is in talc rock, but an undetermined area of albite porphyrite which may represent a cross band joining the main dyke with the dyke to the east, or be a faulted portion of the eastern dyke, occurs near the northeastern boundary of the lease, a short distance northwest of the Kanowna Railway Reserve.

At the surface, the higher ground in the northern portion of the lease is covered by a deposit of dense laterite. In the lower-lying ground, the rocks near the surface, in addition to ordinary weathering, are largely obscured by detrital material.

*The Lodes.*—The southerly continuation of the Mystery-Lone Hand line of lode, at or near the northeastern boundary of the main porphyrite dyke, runs through the lease. This lode, which is usually at the junction, but in places is entirely in the porphyrite, is on the whole ill-defined and variable in width and gold content. The workings on this lode in the northern portion of the lease were described in Bulletin 51 (page 43 and figure 23).

A lode of unusual type, discovered since the previous survey, is the Cross Lode, worked from a hauling shaft, approximately 200 feet WNW. of the east corner of the lease. This shaft follows the lode on the underlay—the general dip being approximately  $78^\circ$ —to a vertical depth of 164 feet from the surface, levels being driven at depths of 93 feet, 125 feet, and 164 feet.

A total length of 107 feet of driving—the last 9 feet trending NNW.—has been done west of the shaft at the 164 feet level, and 15 feet east of the shaft. At the 125 feet level, drives have been put in west for 175 feet and east for 163 feet. At the 93 feet level the east drive has a length of 17 feet. The west drive at this level was examined, but, as the stoping between it and the 125 feet level rendered it difficult to survey this drive single-handed, was not surveyed; it is, however, probably fully 140 feet in length. In addition, an intermediate level between the 93 feet and 125 feet levels has been driven east for a considerable distance.

A very considerable amount of stoping has been done between the 125 feet level and the surface west of the shaft, and between the 125 feet level and the intermediate level east of the shaft.

The Surprise North Cross Lode differs from the other lodes yet found at the North End in its strike, direction of dip, and enclosing rock. Although lines of weakness striking nearly east and west are common at the North end, these, with the exception of this lode, are seldom more than one or two inches in width, are filled by typical vein quartz of the fissure type, and, with few exceptions, dip north, and occur mainly in the greenstones. The strike of the cross lode is, on the average, a few degrees north of west. The dip south at angles ranging, so far as determined, from  $70^\circ$  to nearly vertical, the western portion of the lode appearing on the whole to be somewhat steeper than the eastern. The average dip is

probably about  $78^\circ$ . The lode extends from the western edge of the main albite porphyrite dyke—cutting completely through that dyke—to the western edge of the more easterly dyke, the total length being approximately 400 feet. The lode has been formed by intense shearing followed by vein alteration, now consisting of a shear zone of more or less schistose rock with veins and lenses of metasomatic quartz, of a brownish grey colour in the oxidised zone, the middle of the lode being, as a rule, occupied by a main quartz vein.

The lode, where examined, ranges approximately from 1 foot 3 inches to 4 feet 6 inches in width, averaging probably between 2 feet 6 inches and 3 feet, but in places near the surface the lode has been stoped over a greater width, this being probably due to secondary impregnation in the zone of oxidation. The main quartz vein ranges from a thread to 1 foot 3 inches, the greatest width seen being in the shaft about 10 feet above the 125 feet level.

Although the lode occupies a zone of intense shearing, faulting of the porphyrite dyke along it is not noticeable. Striae on the footwall of the lode, in the talc rock immediately east of the main dyke, pitch east at about  $50^\circ$ , and apparently the hanging-wall portion has moved in this direction relatively to the footwall.

The lode itself is completely oxidised even at the 164 feet level, but from 17 to  $18\frac{1}{2}$  feet, and also from  $20\frac{1}{2}$  to 28 feet, from the face of the west drive at this level, hard compact fuchsite-carbonate rock, associated with a shear zone striking NNW. is noticeable on the south side of the drive, and from 19 to 27 feet on the north side. At the 125 feet level, the wall rock, to about 110 feet west of the shaft is too completely decomposed for determination, but west of this point the rock is distinctly fine-grained albite porphyrite, the porphyrite continuing to a point about 156 feet west of the shaft. West of the point where the porphyrite is first determinable, the lode shear gradually dies out, and near the western edge of the dyke is represented only by the hanging-wall and footwall planes, about 2 feet apart, a vein of oily white quartz up to 3 inches in width occupying the hanging-wall plane. West of the porphyrite is a band—about 10 feet wide in the drive—of weathered carbonated sericitic rock, evidently derived from the talc rock, which, in a partly oxidised form, adjoins it on the west. At the 164 feet level the lode does not appear to extend so far west, and is very narrow for the last 30 feet of the drive, being represented near the face only by a single plane, which at the face is practically vertical. In the east drive at the 164 feet level, the lode is in the porphyrite, which, however, is indeterminable for the most part, for about 97 feet, at which point it enters the talc rock. In the talc rock it consists of a somewhat ill-defined shear zone without quartz. The drive starts to bend north about 24 feet east of the junction of the two rocks and leaves the lode at 30 feet east. At about 46 feet east of the edge of the main dyke the drive again enters porphyrite in which it continues to the face—a distance of about 20 feet. This porphyrite, which is hard and compact and comparatively unweathered, may either represent a faulted portion of the Paymaster dyke or be a tongue joining that dyke with the main one. The boundary strikes northwest and dips southeast at  $87^\circ$ .



The lode cuts and is cut by numerous shear zones or lodes striking in the normal northwesterly direction. Two of these have been driven on—one, consisting of a narrow shear zone with stringers of milky quartz, about 40 feet west of the shaft, has been driven on north for a fair distance at the 93 feet level. The shear zone is apparently younger than the cross lode as its planes cut those of the latter, and if auriferous at all is evidently of low grade. The other shear zone, which is at the shaft at the 125 feet level and about 20 feet west at the 164 feet level, is from  $1\frac{1}{2}$  to 2 feet in width, and strikes between NW. and NNW. The dip is steep, ranging from about  $70^\circ$  SW. to nearly vertical. At both levels this lode or shear zone has been driven on southeast for a few feet. The shearing is more marked than in the first shear zone and the lode is apparently cut by, and is older than, the cross lode, but the gold content, if any, is low.

A few feet west of the eastern margin of the main dyke at the 125 feet level is a lode or shear zone, about 5 feet wide, striking northwest and dipping southwest at a steep angle. This lode contains stringers of quartz similar to those of the cross lode and apparently formed at the same time. Some of the planes of the cross lode cut through those of this lode. This lode is very probably the southerly continuation of the Mystery-Lone Hand lode, but appears to carry little or no gold at this point.

Mention should be made of a flat fault or shear zone, striking almost due north or slightly east of north and dipping east at about  $45^\circ$ , from about 103 feet to 110 feet west of the shaft at the 125 feet level and from 59 feet to 62 feet west at the 164 feet level, at which level it is better defined. It cuts through and faults the cross lode slightly. It probably belongs to the same period as the flat fault in the Paymaster hauling shaft at the roof of the 80 feet level.

Official returns for the lease to the end of March, 1925, give a total of 937.93 tons of ore treated for a return of 1,359.36 fine ounces of gold, but the amount of stoping done indicates that a somewhat greater tonnage has been taken out, returns for portion of which may be included in those for earlier leases. The rate per ton—1.45 fine ounces—is unusually high for a lode at this end of the field, particularly considering the nature of the enclosing rock. The gold content is probably patchy, but in the absence of work below the oxidised zone it is impossible to determine what influenced its distribution. The well-defined character of the lode and the high gold content shown by the returns give promise of payability at depth, despite the usually unfavourable nature of the enclosing porphyrite.

#### THE PAYMASTER G.M.L. 5333E AND PAYMASTER PROPRIETARY G.M.L. 5167E. (Plate II.)

The rocks within these two leases are almost entirely obscured at the surface by superficial deposits, and below these are weathered to a considerable depth—about 170 feet in the Paymaster main workings. In addition to normal weathering, incipient laterisation appears to have taken place to a considerable depth in places.

The second albite porphyrite dyke, the western boundary of which is in the vicinity of the main working, situated from about 100 to 140 feet NE.

of the main dyke, runs through the western portion of the Paymaster lease. The general strike of this dyke appears to be about  $N. 30^\circ W.$ , and the dip probably about  $85^\circ$  WSW. The maximum width is probably about 180 feet. The remainder of the lease is in the talc rock.

The only places where the western boundary of this porphyrite dyke can be determined with any certainty are the Paymaster main workings and those from a shaft—known as the "Green Shaft" from the pale emerald-green colour of the dump—situated 120 feet SE. of the Kanowna railway line and about 190 feet SE. of the Paymaster hauling shaft. In the Transcontinental railway cutting the rocks along the line of the dyke are too completely weathered for determination. From an old shaft on the Paymaster southwestern boundary, 220 feet from the west corner of the lease, a crosscut, now inaccessible, was driven east for 50 feet. This crosscut, which is in completely weathered rock, does not appear to have cut the porphyrite, but from the material on the dump it is probable that the face is very near the western boundary of the dyke.

The position of the eastern boundary is even more uncertain. In a shallow shaft 200 feet ENE. of the Paymaster hauling shaft the rocks are too decomposed for determination, but it is possible that a shear zone, striking about  $N. 25^\circ E.$ , on which the shaft has been sunk, marks the eastern boundary of the dyke. The only point where this boundary is definitely determinable is in a crosscut driven SW. for 77 feet from an old shaft 300 feet N. of the west corner of the Paymaster lease. This shaft was recently reopened by Messrs. Baudinette and Cousins, and continued to a depth of 58 feet. The crosscut was driven from the bottom of the shaft in the hopes of cutting the northerly continuation of the Paymaster lode. The eastern boundary of the dyke was cut 68 feet west of the shaft, and the crosscut continued in the albite porphyrite for a further 9 feet. About 250 WNW. and 340 feet NW. of this last shaft, and about 50 feet and 40 feet, respectively, east of the Broadarrow Road are two old shafts, both in the talc rock. The dyke should, on its strike from Baudinette and Cousin's shaft, pass between these two shafts, if it continues so far north, but must be narrower than to the south.

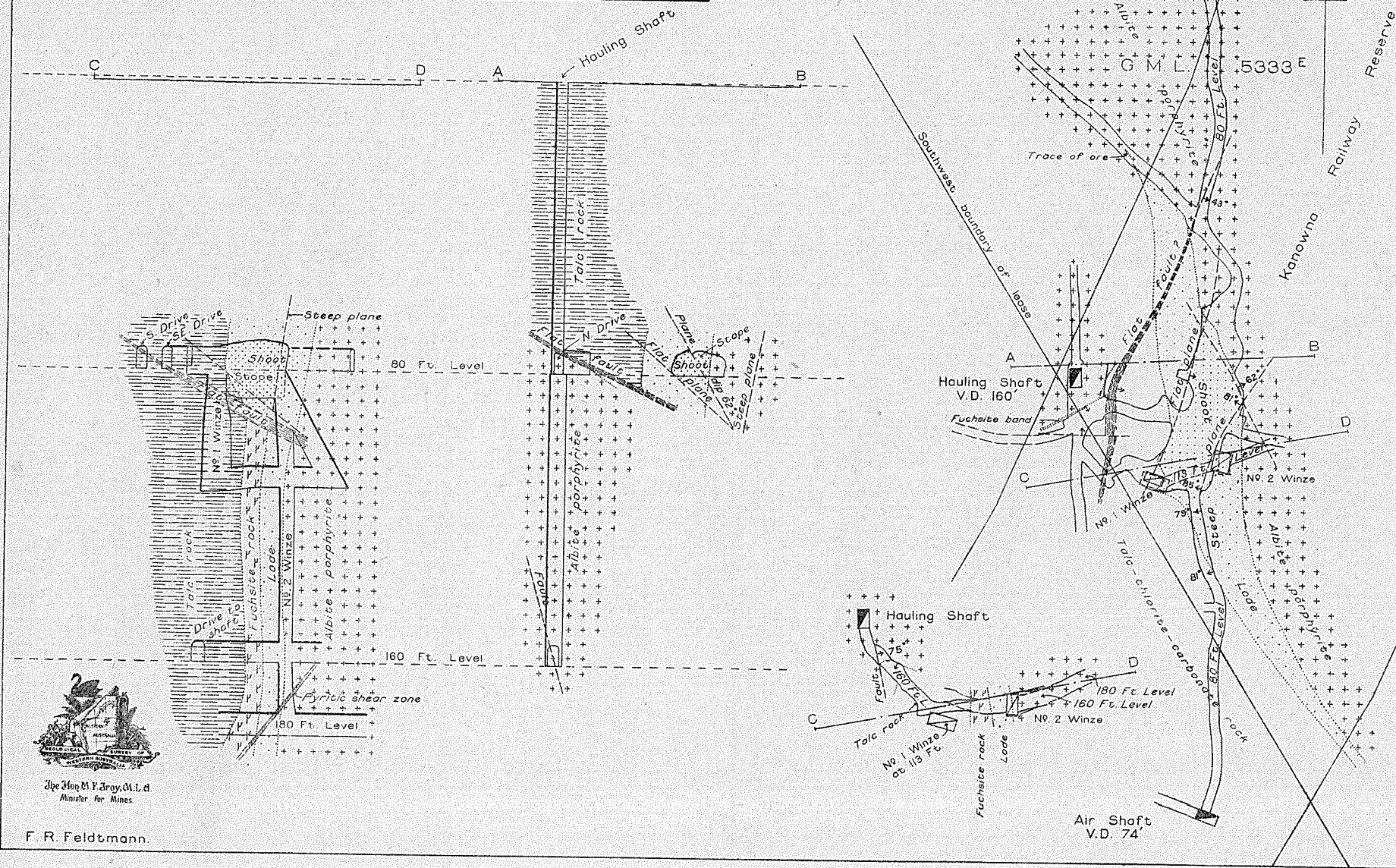
G.M.L. 5167E is almost entirely occupied by the main porphyrite dyke, except for a strip of talc rock along its northeastern boundary.

*The Ore Body and Workings.*—The Paymaster hauling shaft, which has a vertical depth of 160 feet, is situated just within the Kanowna Railway Reserve immediately east of the junction of its northwestern boundary with the southwestern boundary of G.M.L. 5333E. An air shaft and travelling way, 74 feet in depth, is situated 125 feet south of the hauling shaft, with the 80 feet level from which it is connected, and within G.M.L. 5167E and the southeastern portion of the Railway Reserve. The Green Shaft, already mentioned, is 100 feet ESE. of the Air Shaft; it has a vertical depth of 77 feet. In addition, there are a number of shallow shafts in the eastern portion of the Paymaster lease, mostly sunk in the early days of the field and now inaccessible.

The Old Thunderbolt main shaft, now covered by the Transcontinental railway embankment, is situated about 90 feet south of the south corner of the Paymaster. From this shaft crosscuts extend west

## PLAN AND SECTIONS OF THE PAYMASTER MAIN WORKINGS.

Feet 0 20 40 60 80 100

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Minister for Mines.

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for about 130 feet and east for 200 feet, at a vertical depth of 200 feet. These crosscuts, which must cut both porphyrite dykes and would have thrown much light on the geology of this area, were unfortunately inaccessible at the time of the original survey.

The main workings are those at the 80 ft. level of the hauling shaft. From this shaft drives extend north and south for about 30 feet and 45 feet respectively, both being now partly mullocked up. The north drive is in porphyrite, which extends for 9 feet south of the shaft, but the porphyrite ends on a flat shear or fault zone at the roof of the plat, above it being talc rock. The south drive is in talc rock. From a point in the south drive about 15 feet south of the shaft, a crosscut, now mullocked up, has been driven westward for about 35 feet, partly on what is probably the easterly extension of the Surprise North Cross Lode, here represented by a thin band of fuchsite-quartz rock, carrying pyrite, at the junction of the porphyrite and talc rock. The crosscut was started in the talc rock, but was said to pass into the porphyrite.

From a point 6 feet south of the shaft a crosscut extends east for 58 feet. In the western portion of this crosscut, in talc rock, was an irregular thin seam, with quartz in places, carrying gold. This may be the continuation of the Cross Lode. The main ore body was cut in the crosscut from 25 to 56 feet east of the south drive. It consists at this level of fuchsite-bearing kaolinic material with, in places, ferruginous patches. East of the ore body the crosscut is in kaolinised porphyrite. From the crosscut drives were extended north and south on the ore body, which has been largely stoped out at this level, the stope extending for about 18 feet south and 40 feet north of the crosscut and for a maximum depth of 8 feet below the floor of the level, but only a short distance above the roof in places.

The south drive off the east crosscut connects with the air shaft. This drive leaves the ore body about 41 feet south of the crosscut, or 23 feet south of the stage, and continues in talc rock—the lode lying to the east of the drive.

The stope passed out of ore at about 30 feet, and 20 feet north of the crosscut on the west and east sides, respectively, and north of these points was in highly ferruginous matter. From a point 41 feet north of the crosscut the drive was continued northwest for 85 feet. This portion of the drive is entirely in weathered porphyrite, the only traces of ore occurring on the west side from 44 to 47 feet from the face, and in the roof of the drive at 40 feet from the face. As no payable body of ore was found in this drive, another drive was put in due north, from a point 18 feet northwest of the stope, for a distance of 85 feet and a crosscut driven east for 18 feet from the end of the drive. Both are entirely in weathered porphyrite.

Two winzes have been sunk in the southern portion of the stope. The No. 1 winze at the southwest corner of the stope has a vertical depth of 32 feet. It is entirely in talc rock. At the bottom a crosscut connects with the No. 2 winze. This crosscut is partly in decomposed fuchsite-carbonate rock, partly in decomposed porphyrite, the lode being at the junction of the two rocks. The crosscut extends east of the No. 2 winze for 15 feet, in porphyrite.

The No. 2 winze is on the east wall of the stope, from 6 to 12 feet south of the main east crosscut.

This winze was started with an easterly underlay, but passed out of the ore body and was restarted vertically and sunk to a depth of 180 feet from the surface, or 92 feet below the floor of the stope. It is partly in the porphyrite and partly in the lode which is very ill-defined. From this winze crosscuts have been driven at depths of 160 feet and 180 feet from the surface. At 160 feet the crosscut was driven west for 26 feet with the intention of connecting with the hauling shaft, but as a result of my survey was turned northwest from this point, and the shaft reached after driving a further 30 feet. Porphyrite was entered about 11 feet from the shaft, the margin striking approximately WNW. at this point. At the 180 feet level from the winze crosscuts extend west for 19 feet and east for 22 feet. The east crosscut is entirely in dense, hard, practically unweathered albite porphyrite, the west crosscut mainly in fuchsite-carbonate rock, carrying some porphyrite. The lode is particularly ill defined at this level, and the gold content low.

The geological structure in the vicinity of the hauling shaft at the 80 feet level is complicated. As stated, the north drive from the shaft is entirely in porphyrite, which extends to about nine feet south of the shaft, its junction with the talc rock striking approximately ENE. The west crosscut is also stated to be mainly in porphyrite. From about 5 feet and 8 feet above the floor of the level, however, the shaft passes into talc rock, the junction, which is marked by a shear zone about a foot wide, striking about NNE. and dipping ESE. at a very shallow angle, the dip ranging from about 30° to 40°. What is probably the same shear zone occurs at the junction of the northwest and north drives from the stope, the dip here being 43°. This remarkably flat junction marked by shearing is highly suggestive of a fault, particularly as what appears to be the southwest boundary of the same mass of porphyrite is cut in the east crosscut at the 125 feet level from the Surprise North hauling shaft. The position of the porphyrite in the crosscuts from No. 2 winze, below the possible fault, indicates, however, that the movement along this fault cannot have been more than two or three feet at most, unless block faulting has taken place, with another nearly vertical fault, along the southern boundary of the porphyrite south of the hauling shaft. Against this is the occurrence of traces of ore in the northwest drive from the stope, unless the lode is younger than the faulting, or the ore is of secondary origin. An alternative solution is that this body of porphyrite is an original tongue connecting the Paymaster porphyrite dyke with the main dyke. Against this last suggestion is the flat dip of the upper boundary which is most unusual for the Kalgoorlie field. Further evidence is necessary to solve this problem satisfactorily.

*Conclusions and Recommendations.*—There is little doubt that the lode or shear zone worked at the 38 feet and 77 feet levels from the Green Shaft is the southerly continuation of the Paymaster lode. At the 38 feet level it consists of a shear zone, about 3 feet in width, stained pale-green by fuchsite. It is nearly vertical, with a slight dip southwest. It appears to have contained little or no gold in these workings.

In the Transcontinental Railway cutting, immediately east of the projection of the line of the Paymaster southwest boundary, is a shear zone, about



12 feet in width, striking in the direction of the Green Shaft. This may be the southerly continuation of the same lode, in which case it does not follow the southwestern boundary of the porphyrite for any great distance, as is also suggested by the trace of ore in the northwest drive in the Paymaster main workings.

The comparatively short length of the ore body in the main workings, and the fact that the lode is unpayable in those of the Green Shaft suggest two alternatives. Either the supposed lode is a barren shear zone of later origin than the true lodes, and is of the same type as the barren shear zones of the Hannans Reward and other mines (*vide* Bulletin 69, pages 76 to 81 and pages 98 and 101), and the gold in the shoot at the Paymaster 80 feet level has been leached by surface solutions from the eastern portion of the Surprise North cross lode or parallel auriferous quartz leaders; or it is a true lode and the gold has been deposited from deep-seated solutions with concentration at the junction with the cross lode, the extent of the shoot being possibly later modified by surface solutions.

In the first case the shoot is not likely to extend below the zone of oxidation. In the second case the gold will extend to greater depths, but the shoot will most probably be restricted more closely to the junction of the two lodes. As the cross lode has a distinct southerly dip, the pitch of the shoot will be to the south at a steep angle. Short drives north and south might be put in at the 160 feet immediately west of No. 2 winze, to test whether a shoot occurs at this level.

As the shoot at the 80 feet level extends diagonally across the northern portion of the stope, and traces of ore occur in the northwest drive, a crosscut might be put in west from the northwest corner of the stope for a distance of 12 or 14 feet, to see whether payable ore extends in this direction.

As already stated, the south drive between the stope and the air shaft leaves the lode about 23 feet south of the stope. A drive put in in a southeasterly direction from a point about 20 feet south of the stope would test the lode south of this point. A crosscut or borehole might also be put in east for 10 or 12 feet from this point, to test the width of the lode and its gold content. The lode should lie from about 40 to 45 feet northeast of the air shaft, but it is doubtful whether it will be payable so far south. Should the lode prove payable in this direction a drive continued south would, if deepened 4 or 5 feet, connect with the workings from the green shaft.

Official returns for the Paymaster G.M.L. 5333E to the end of March, 1925, give a total of 393.80 tons of ore treated for a return of 161.01 fine ounces of gold—a rate of 0.41 fine ounces of gold per ton.

#### OTHER RECENT WORK AT THE NORTH END.

*Surprise South G.M.L. 5244E.*—During my visit work was being done at a shallow depth on a narrow steeply-dipping lode southwest of the Kanowna railway and near the southwest corner of G.M.L. 5244E, which adjoins G.M.L. 5167E on the southwest and covers part of the old Milanese G.M.L. 4293E (Golden Dream G.M. Company, No-Liability). This lode was being worked close to its junction with a Jasper which could be seen at the surface during my first examination of this area, but was later covered by the tailings from the Golden Dream treatment plant. The lode, which is fairly well defined, appears

to be the southerly continuation of the Golden Dream middle lode, worked from the old hauling shaft, north of the Kanowna railway, to a depth of 184 feet. At the time of my first survey the lode had been driven on at the 82 feet level from this shaft for a distance of about 80 feet, and at the 112 feet level for 120 feet. The Golden Dream lodes were all of low grade, but the oxidised ore was easily treated.

*Fair Play G.M.L. 4069E* (Bulletin 69, Plate XIII, Sheet 17, and Fig. 16).—Descriptions of the ore bodies and workings on this lease, formerly G.M.Ls. 4052E Fair Play, and 4063E Fair Play Extended, were given on pages 67 to 70 and 135 to 136 of Bulletin 69, and on page 14 of the Annual Report for 1917. Since the examination of this mine in 1917, some work has been done on a small cross shear zone, parallel to the "Green Shear Zone" and that to the south, at its junction with the main lode. The new cross shear zone is south of those previously worked, and a few feet north of the hauling shaft at the 107 feet level. It has been worked from a short crosscut north of the shaft, and followed in a winze for 10 or 12 feet below its junction with the lode. A small patch of good ore was obtained at the junction. The lower portion of the winze appears to be east of the main lode which is ill-defined south of the junction.

In addition to this work, about 40 feet of driving has been done south of the hauling shaft at the 197 feet level without, however, discovering payable ore. This drive appears to be on one of the barren shear zones of later origin than the lodes, and not on the true lode. This shear zone, which is highly carbonated, but contains practically no pyrite, is identical with the supposed northwest branch of the lode which cuts the true lode about 20 feet north of the shaft at this level. The true lode strikes approximately NNE. and, unless faulted, should lie a few feet west of the shaft. A short crosscut should therefore be driven west from the shaft. The Green Shear Zone, which forms the southern wall of most of the ore shoots and dips south at about 60° to 65°, passes through the shaft just above the 197 feet level, but is not well-marked at this level. Should the suggested crosscut locate the lode, a winze sunk on the lode with a southerly pitch of about 65° might locate another shoot.

*Lucell G.M.L. 5375E.*—This lease is situated southeast of Williamstown, and is entirely in the older fine-grained greenstones. It covers the greater portion of former G.M.L. 4499E, Williamstown (Bulletin 69, page 127), and the southern portion of G.M.L. 4550E, Marian Catherine, formerly G.M.L. 4450E, Great Secret (Bulletin 69, page 125). At the time of my visit work was being done near the northern end of the lease on the same lode as, but a short distance south of, that formerly worked by Barrass and Hamilton, with whose drive at a depth of 40 feet the work had been connected. The drives are on a lode which here strikes nearly northwest and dips southwest at about 65°. As is usual in the fine-grained greenstones the lode is of low grade.

It was stated on page 125 of Bulletin 69 that this lode should meet the main north and south line, which farther north closely follows the boundary between the Older and Younger Greenstones, at a point approximately 210 feet NNW. of the south corner of the old A.W.A. lease—approximately 34 feet due west of the east corner of G.M.L. 5338E,

Central South, and about 320 feet northwest of the more northerly of Barrass and Hamilton shafts. The ore shoots on the former Creswick and Isabel leases farther north have mainly occurred at the junction of the lodes striking northwest or northnorthwest with the main north and south line and the junction in the Central South is the most likely place along this line for the occurrence of another payable shoot. The surface round this point has been largely obscured by the tailings from the old A.W.A. United plant, and, so far as I know, has never been prospected.

#### 6.—FIELD NOTES UPON THE RESULT OF VARIOUS RECONNAISSANCES AND OTHER EXAMINATIONS.

ALEXANDER G. D. ESSON, M.A. (Aberd.),

Field Geologist.

(a) *The country east, northeast and southeast of Mr. G. A. Moses' "Windsor" Station Homestead, Paynesville, Murchison Goldfield.*

"Windsor" Station, owned by Mr. G. A. Moses, adjoins on its western boundary Paynesville Commonage, and extends eastwards to Rabbit-proof Fence No. 1. Four and a half miles eastwards along the railway line from Paynesville Siding is situated the homestead close to the old abandoned "Windsor" Group of gold mining leases.

Near to this point and slightly east of it, a line running roughly north and south would divide the station into two portions, the eastern portion being mainly granite and the western portion greenstone. A number of prospecting areas and gold mining leases are to be found in the greenstone portion, and these will be fully dealt with in the final report upon Paynesville. It is sufficient to say, meantime, that this greenstone has been examined by the Acting Petrologist, Dr. Larcombe, who has determined it as epidiorite, and believes it to be *contemporaneous with the Kalgoorlie auriferous greenstone*. It is sheared in a north and south direction, a circumstance that is probably attributable to the granite. Reefs follow this main shear direction.

Whilst the writer was engaged in the examination of this portion of the Paynesville greenstone belt, opportunity was taken to examine some more or less new country in the northeast of the granite portion of Windsor Station. In the main this was found to consist of granite with, in places, small inclusions of very much sheared and altered greenstone which could be referred to the Paynesville belt of greenstones. The granite, upon examination by the Acting Petrologist, was found to consist of a large amount of orthoclase felspar, with muscovite, biotite and quartz, and with small quantities of plagioclase felspar. In short, it is a normal granite. There are numerous local variations of composition and form, giving muscovite granite and muscovite gneiss, biotite granite, pegmatite granite, graphitic granite, etc.

Near the junction of the greenstone, the granite becomes more pegmatitic and contains numerous veins with large plates of white clear muscovite mica. This is particularly the case also south of and close to the Government Well, "Woodley's Soak," where there is a small sheared greenstone inclusion in the main granite mass. It is possible that, if the mica be found

sufficiently large in size, a marketable deposit may be found. Some specimens found by the writer were very promising and prospectors might be on the outlook for such a deposit. Considering the cost of transport, etc., small mica lodes are not meantime worth prospecting but, from the indications, it is concluded that some very large mica may be found.

Further to the north and to the east of Woodley's Soak, the granite outcrops as large breakaways whose rugged outlines form a prominent feature in the landscape. They form suitable holding ground for the retention and storage of rain water in the form of large gnamma-holes, and evidently these have been used for that purpose by the aborigines as is evidenced by the signs of native occupation around them. One such gnamma hole was about 30 feet or more deep, and even in very dry seasons was reputed by the aborigines to hold water.

The country between lines of breakaways consists of sandy flats derived from the denudation and weathering of the granite. In suitable basins or catchments it will be found that sand soaks can be obtained in this sandy detrital country. In places the aboriginal has utilised some of these as native wells.

It is not to be expected that gold will be found in this area, but minerals other than gold may be looked for, e.g., tin (cassiterite), molybdenite, hematite, mica, etc.

In one place a small bar of hematite was encountered. The hematite was fairly pure but, from a cursory examination, did not seem to be extensive. Other deposits of the same kind may, however, be found.

Further to the south, particularly below the railway line, the granite becomes more solid and outcrops in the characteristic "tor" and poised boulder form. In places shearing has taken place. There are also many coarse muscovite mica veins, which, also, may be worth prospecting. Only good veins of large mica will be worth while, and they ought to be in fairly soft sheared ground, as overhead expenses will cut down values greatly.

The scrub in the northeast portion of the granite area, near to Rabbit-proof Fence No. 1, consists of mulga, needlebush, occasional belts of sandalwood and solitary kurrajongs. It is particularly thick, and on account of its impenetrability, has been designated "The Dismal Scrub"—a very appropriate name in places where light has difficulty in filtering through. Few people, if any, until recently have been able to penetrate it for any distance. In one place near the Dismal Scrub, a small man-built stone mound was observed, but no identification marks could be found in or near it.

(b) *Two mining areas at Mount Magnet, Murchison Goldfield.*

(1) Richardson and Vidilini's P.A. 970M.

(2) J. A. Combe's "Royal Consols" G.M.L. 1029M.

While the writer was passing through Mount Magnet on 13th February, 1924, he was met by various miners and prospectors, and was asked for advice as well as to make a rough examination of the above-named shows. Only a very cursory examination could be made on account of the fact that the writer was proceeding to Paynesville in order to resume his field work there.