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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

REPORT No. 1947/1.
Plates Nos. 1443-45, 1447, 15~~4~~1, 1453-54, 1456-58.

GEOLOGICAL REPORT ON THE ALEXANDER MINE, HALLEY'S COMET MINE AND MANOLIS' WORKINGS, MARBLE BAR, PILBARA GOLDFIELD.

by

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CANBERRA.

DEPARTMENT OF SUPPLY AND SHIPPING

BUREAU OF MINERAL RESOURCES

GEOLOGICAL REPORT ON THE ALEXANDER MINE, HALLEY'S COMET MINE, AND MANOLIS' WORKINGS, MARBLE BAR, PILBARA GOLDFIELD.

Report No. 1947/1
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INTRODUCTION.

Comet Gold Mines Ltd. have been operating two mines in the vicinity of Marble Bar - "Halley's Comet" and "Alexander" - and have produced a small tonnage of ore from another mine - "Manolis' Workings". The Alexander Mine on G.M.L. 930, is three-quarters of a mile south-east of the Halley's Comet Mine on G.M.L.s 927 and 934. Manolis' Workings are approximately half a mile south westerly from the Alexander. The group is some six miles south of the township of Marble Bar, Pilbara Goldfield.

Halley's Comet and Alexander were operated under one management. A mill to test ore from both mines was erected at the Comet Mine. Ore from the Comet is trucked direct to the bin, and Diesal trucks haul ore from the Alexander Mine to the Mill over a good level road less than a mile long.

HISTORY AND PREVIOUS LITERATURE.

The Halley's Comet Orebody was discovered in May 1936 and leases acquired by Comet Gold Mines Ltd. later in the year. The Alexander Lode was discovered in the same year, but during 1936, 1937, and 1938, work was confined mainly to surface pitting and shallow open cutting. Altogether 640 tons of ore were taken from the lease before it was taken over by Comet Gold Mines in 1939.

Two reports on the area have been furnished by the Aerial Geological and Geophysical Survey of Northern Australia, and they have been published as Western Australia Reports Nos. 10 and 28. The Reports cover field work carried out during 1936 and 1937 respectively. Report No. 10 contains geological maps of the Comet mining centre, while both No. 10 and No. 28 contain assay plans of the mines. These reports should be consulted for adescription of the general geology of the area.

A. ALEXANDER MINE.

PRODUCTION AND GRADE.

The company has not kept separate statistics on gold yield and tonnage of ore treated for the Alexander mine and the Comet mine. Official figures supplied by the Department of Mines Western Australia, for the two mines are as follows:-

Prior to transfer of leases to Comet Gold Mines Ltd.		
Alexander Mine	-	640 tons for 114.59 fine ozs. gold
Halley's Comet Mine	-	331 tons for 996.37 fine ozs. gold
Operations by Comet Gold Mines Ltd. to 31/7/46	-	98,075 tons for 90,002.37 fine oz gold

An attempt has been made to allocate this production to the two mines by making use of the company's survey and assay plans as a basis for calculations. Three level plans were available for the Alexander, each showing sampling results, and a surface plan also showing sampling results. The levels are 130 feet apart and the assay data must be regarded as quite inadequate especially as no winze sampling is shown. The company stope sections indicate stope widths measured when the stopes were surveyed. The data is somewhat meagre but it serves to give an approximate figure for tonnage of ore taken from the mine. Stope areas were measured by planimeter and multiplied by averaged widths for each stope, giving a total of 44,700 long tons. Similar calculations for the Comet mine gave a total of 51,200 tons. The official total, calculated from the number of trucks hauled, is 99,046 tons, which is in reasonable agreement with the above.

By weighting the various stope tonnages by available assay data, it was calculated that the average head value of the 44,700 long tons of ore taken from the Alexander mine was 16.6. dwt. per ton. However, the average width sampled was 39 inches whereas the average stope width was close to 60 inches. The values appear to have been largely concentrated in narrow veins along shears. The lode for the most part lacked good walls, and in mining dilution in stopes was probably heavy. If it is assumed that dilution amounted to 25% the estimate for average grade drops to 12.4 dwt. per ton and the total gold content to 27,800 fine oz. On the assumption of a mill recovery of 90%, the gold output from the mine would be 25,000 fine oz. Although this is an estimate on inadequate data, it is believed to represent in a general way the part played by the Alexander Mine in Comet Gold Mines activities. Although the tonnage mined was somewhat less than that from the Comet, and the grade of the ore considerably lower, the mine was operated by the same management as the Comet, and the only additional staff required was an underground foreman. With such low overhead the mine must have been a very profitable asset.

GEOLOGY.

General: The rocks within the mine workings are greenstones derived apparently from Pre-Cambrian basic lavas. They are schisted to a varying degree from place to place along the levels and this may be a reflection of variation in character of the rock.

Structure: The country rock has been strongly schisted and detailed level mapping has revealed a systemic variation in the strike of the schistosity along each level. (see Plate 6) The strike line shows minor small open flexures throughout the length of the workings, but between co-ordinates 2100E and 2200E at the No. 1 and No. 2 levels there is a major swing from an easterly to a northerly and northeasterly trend which persists for about 100 feet before the easterly trend is resumed. The fold at the No. 2 level is a little to the east of the position at the No. 1 level indicating a steep easterly pitch to the structure. Dip of schistosity varies between 65 degrees N and vertical and is normally about 80 degrees.

Ore-bearing shears cut across the schistosity at a fairly consistent acute angle of 25 degrees (see Plate 6) even where the schistosity is involved in the main fold. The undoubted sympathy between shears and schistosity indicates either common causal stresses or folding after the rocks had failed by fracturing. The fold, which has a vertical axis, is interpreted as a drag fold with the northern area moving laterlally westward. Consistent horizontal or sub-horizontal grooving on shear planes is also indicative of horizontal stresses as the cause of fracture, and stronly suggests that the set of stresses which caused folding and fracturing were identical.

The rocks have failed under shearing stress in a weak and far from regular manner. It is true that the main shear system is practically continuous from one end of the workings to the other - a distance of 700 feet on No. 1 level. But far from comprising one main shear, it is composed of quite a number of individual shears, which frequently branch or run off into the schistosity. No single shear exceeds a length of 150 feet and the majority are considerably shorter. A feature commonly seen is the playing out of one shear by turning acutely into a schistosity plane, and the making of another shear in another schistosity plane some 4 to 8 feet away, which parallels the former shear for six feet or so and then resumes the more normal course of the system. The shears favour two conjugate strike directions inclined to one another at about 20 degrees. A shear will commonly branch in the conjugate direction, or change from one course to the other without branching.

A glance at plate 6 will show that the fracture system is equally irregular in depth. In a system such as this the lateral movement must have been small. All the evidence indicates a weak fracture system which would not be expected to persist far laterally or in depth.

There is a series of cross faults also with horizontal movement, which cut obliquely across the shear system and displace individual shears.

MINERALISATION.

Ore solutions have followed the shears. There was little opportunity to examine typical reef cross-sections as most of the stopes had been worked out. Where ore has been left here and there in stope pillars, it consists of hard quartzose or calcitic reef up to 12 inches wide occupying the shear, and the adjacent country is mineralised and replaced, and carries gold. The associated sulphides are arsenopyrite and pyrite.

A study of assay plans in conjunction with geological plans shows that although there maybe a mere inch or so of reef along a shear mineralisation of the schist is sufficient to raise the value over a three foot width to 15 or 20 dwt. gold per ton. The country between overlapping ends of two shears is commonly mineralised and this accounts for local bulges up to 13 feet thick.

ORE SHOOTS AND ORE RESERVES.

Ore has come mainly from two large shoots and three small ones. The main shoot outcropped and persisted at full length to No. 1 level, but extended below it for only a very short distance over most of its length. A narrow tongue continued down to the No. 3 level in the vicinity of the Main Shaft, though the ore did not keep to the one shear for the whole of this depth; there has been a stepping over to the south and back again to the north.

The ore above No. 1 level in this shoot was reasonably high grade, particularly near the surface where 406 tons of ore, with an average head value of 23.2 dwt per ton (A.G.G.S.N.A.W.Aust. Bull. No. 28) were open cut in the early stages of development. The grade has decreased with depth and at the No. 3 level is down to 6 dwt. Sinking of a winze below No. 3 level did not disclose any further ore.

The second shoot was disclosed by driving at the No. 1 level. It extended from 50 feet above No. 1 level through to No. 2 level, a winze put down below No. 2 level was in ore for 40 feet, assaying less than 10 dwt. and below this point passed through very low values. A diamond drillhole from the surface located ore assaying less than 10 dwt. over 3 feet at a point 50 feet east of the winze and 90 feet below No. 2 level. It seems that the downward limit of the shoot has been reached.

Two small shoots were mined above the No. 2 level but did not persist to the No. 1 level, and a winze below the level passed out of ore on the larger one at 20 feet.

All known shoots have been practically mined out, and the tonnage of economically available probable ore left in the mine is very small.

ORE CONTROLS.

Bedding may have had some influence on ore deposition but the question is quite indeterminate as there is a complete absence of data on the attitude of bedding planes.

A critical examination of level plans shows that neither of the conjugate shear directions is particularly favoured by ore.

Attitude of the shear with respect to a vertical plane may have some influence, although one would not expect this in shears produced by horizontal movement. The main westerly stope dips steeply to the north and to the south in different sections.

The cross faults have an obvious influence. Both main stopes terminate on the east against or near cross faults, both of which intersect the shear planes on lines pitching east at 60 degrees. The chief one of the small stopes does the same.

A cross fault which runs almost vertically between the No. 2 and No. 3 levels may be the reason for the tongue of ore that extends vertically downwards from the bottom of the main stope in this area.

PROSPECTING FOR FURTHER ORE SHOOTS.

The pattern of ore-bearing shears is quite a complex one and very difficult to prospect. The underground workings have not tested the ground adequately and, realising this, the management drilled several drill holes. Two of these, No. 2 and No. 3, have corroborated information already obtained from the workings, i.e. that more than one productive shear may be present at one place in the mine. Systematic boring at intervals along the drives while development work was being pushed ahead would have been the best method of ensuring that no ore was missed.

No. 3 bore tested ground to the west and above the eastern ore shoot. It disclosed values over 10 dwts. per 36 inches width on the ore-bearing shear being stoped. Lower values were disclosed in a shear farther to the north - probably the northern branch at No. 1 level. Values over 20 dwt. per 36 inches were located higher up on a shear which has not been worked elsewhere. The company was putting in an adit to test this at the time of the inspection. In view of the en echelon attitude of shears in depth elsewhere in the mine, it is considered that there is a possibility of locating further ore above the east shoot by drilling from the surface.

Above No. 2 level, No. 2 Bore located payable values in the main ore-bearing shear, 20 feet above the level. A winze sunk near the point apparently did not find ore as it has not been stoped. Payable ore was also located on another more southerly shear at this point. Further testing by short underground holes is warranted here.

The low grade of the ore encountered everywhere below No. 2 level is not an inducement to prospect in depth. Drives at No. 3 level have been developed from three separate winzes. The drives from the two western winzes are being connected by a cross-cut which should test the ground there. It would be advisable to connect to the drive from eastern winze as well, and to continue the drive to the fault. Cross cutting or drilling from the level would test any possible downward continuation of the east shoot near the fault and would pick up any en echelon shoot. Alternatively, drilling could be undertaken from the surface.

No work has been done beyond the east fault. The lack of outcropping shoots and the failure of No. 9 bore to strike payable ore are not encouraging.

In general it is considered that there is a prospect of locating further ore within the mine workings, but that the weak nature of the shear system, short length of outcropping ore and low grade of ore in depth are not favourable to the finding of further large shoots of payable ore.

B. HALLEY'S COMET MINE.

PRODUCTION AND GRADE.

The main ore shoots, which has furnished 86 per cent of the total gold won from the Comet, was pipe like in habit, with a cross section measuring on the average sixty feet by eight to thirty feet. The shoot pitched 30 degrees to the east and the pitch length was 500 feet. The shoot has been completely mined out and the stope is open and accessible from the bottom to the surface. A reconstruction of this shoot is illustrated on Plate 9, on which outlines are depicted by means of contour lines drawn at intervals of 20 feet vertically.

The volume of ore mined from the shoot has been calculated from plate 9 and a factor of 12 cubic feet per ton has been assumed for converting to tons. The total arrived at in this way is 43,900 long tons. The small shoots located on and below the No. 5 level provided 7,300 tons. The grand total is 51,200 tons.

It is very difficult to arrive at the average grade of the ore from the assay data. The shoot was by no means homogeneously mineralised. The underground foreman described the shoot as consisting of two narrow bands of heavy sulphide ore on the hanging and footwall sides with lower grade ore in between. Judging from assay plans the picture is not as simple as this, but at each level there was at least one rich seam, which the prospecting drives almost invariably followed. Drive sampling is therefore of little use for calculating average grades, and usually only one crosscut across the orebody was systematically sampled. If we consider the levels one by one commencing at the lowest level in the shoot we have the following information.

(a) Intermediate level between No. 4 and No. 5:-

Drive	-	71 dwt. over 4 ft.
Crosscut	-	38 dwt. over 9 ft.

(b) No. 4 Level

Drive	-	112 dwt. over 4 ft.
Crosscut	-	53 dwt. over15 ft.

(c) Intermediate level above No. 4

Drive	-	86 dwt. over 4 ft.
Crosscut	-	21 dwt. over26 ft.

(d) No. 3 level

Crosscut	-	15 dwt. over26 ft.
"	-	40 dwt. over34 ft.
"	-	4 dwt. over12 ft.

(e) No. 2 level

Crosscut	-	16 dwt. over 34 ft.

(f) No. 1 level -

Drive	-	35 dwt. (excluding rich east end)
		215 dwt. (including rich east end)

(g) Surface X

Western Section of shoot	199 dwt.
Central section of shoot	133 dwt.
Eastern section of shoot	157 dwt.

(X This surface enrichment persisted to about 20 feet depth)

Sampling has been limited generally to one crosscut at each level apart from the drive on rich ore, and will not serve, of course, to give the average grade of the shoot. It can be seen however, that the grade was consistently high at all levels. The average of (a) to (e), for what it is worth, is 36 dwt.

In mining the shoot, lowgrade wall material was taken out on both walls, and although the dilution factor is not known, it must have been quite appreciable.

If the tentative estimate of the total output from the Alexander Mine is taken as 27,800 fine ozs (see Alexander Mine) the gold won from the Comet would be 66,113 ozs. equivalent to 26 dwt recovered per long ton, and the head value of the ore would be 29 dwts. per ton.

GEOLOGY.

General: The country rock is greenstone, probably derived from basic volcanics, It is everywhere schisted and carbonated to a varying degree. Alteration has almost completely masked any original structures in the rock.

The only indications of probably original bedding or flow planes were found on the surface. In two places in the country above the ore shoots curved surfaces were found which almost certainly represented a break between two lavas or bedding planes.

Structure: The curved surfaces referred to above indicate sharp folding of the original lavas and the pitch readings at both places were 30 degrees along the line of the orebody.

As at the Alexander Mine, the greenstones are strongly though not uniformly schisted. The schisting is not a local feature, confined to the environs of the mine, but is regional in character and determined by forces operating over a considerable area. It predates mineralisation.

The area has been affected by folding about more or less vertical axes. In the vicinity of the open cut strike is north of east and the dip very steep to the north. Going eastward from the open cut on the surface there is a gradual swing of strike to the south, and at the same time the dip passes through the vertical over to the south and flattens slightly. The strike then swings round fairly abruptly about a fold axis to nearly south, and the dip flattens to 55 degrees. In the underground workings the same swing in trend is seen and the position of the fold axis indicates a very steep easterly pitch to this structure.

Shears along which the solutions have travelled have followed the schistosity planes. In the main stope many of these in the vicinity of the orebody are polished and grooved.

Numerous other shears have been formed. The most important is a south dipping shear which angles into the southern side of the ore-body at an acute angle. This is usually referred to as "the main shear." Several others have been detected in the workings. They are usually grooved indicating movement, but the amount of movement is believed to be small in all cases.

Numerous "heads" in the workings probably represent tension fractures.

A fault of different character limits the workings at the No. 5, No. 6 and No. 5 sub levels, at the southern end. This is a plane fault which cuts at right angles across the trend of the orebody, and dips northerly at 45 degrees. It is occupied by a strong breccia formation three feet thick. This fault is pre-mineralisation.

MINERALISATION.

Mineralisation consisted of part replacement of schisted and sheared greenstone by arsenopyrite, pyrite, gold and some quartz and carbonate. None of the higher grade ore was available for examination at the time of inspection. Stillwell (1938, C.S.I.R. Mineragraphic Investigations No. 130) reported on a sample of sulphide ore. It consisted of "a sericitic schist with myriad of very minute crystals of arsenopyrite, and is cut by veins of quartz. The soft schist consists chiefly of sericite with an occasional needle of tourmaline, and the impregnation of arsenopyrite is variable, being sparse in places. . . occasional crystals of pyrite occur among the arsenopyrite, but most of the pyrite is confined either to the quartz veins or to sericitic laminae in larger areas of quartz. Pyrite mostly forms much large individuals than arsenopyrite, and as it is sometimes moulded on the arsenopyrite it has crystallised later. Traces of galena, sphalerite, and chalcopyrite occur in association with both pyrite and arsenopyrite". The mineral assemblage indicates high temprature conditions. Some bands were heavily impregnated with coarse arsenopyrite, while the pyrite appears to have been always very finely disseminated.

ORE SHOOTS AND ORE RESERVES.

One continuous shoot supplied the bulk of ore. This was pipelike in habit with the long axis pitching southeast at 30 degrees. The cross-section was fairly uniform from top to bottom except for pinching at the bottom end, and irregular expansion at the top due probably to spreading of the solutions during the process of secondary enrichment. The shoot measured 500 feet long and the cross section 60 feet by 8 to 30 feet. The shoot was vertically disposed (in cross section) near the surface, but dipped south at an average of 65 degrees in the lower workings, reflecting the dip of schistosity. At the bottom the shoot ends against a steeply dipping shear, which may be "the main shear" or a branch from it.

Prospecting work was carried out down the dip of the shear and a small shoot was picked up on the opposite side of the shear, some 40 feet lower, which terminated at the north-western end against the shear, followed the schistosity southeast for 70 feet and then cut out. The tonnage of ore won from the shoot amounted to 1200 tons; drive sampling averaged 62 dwt.

Another small shoot was located a short distance to the northeast and some 1000 to 1500 tons of ore were won of average grade 41 dwt.

Another shoot was located further to the southeast at the No. 5 level. Ore stoped above the level assayed only about 6 dwts. However, prospecting below the level by diamond drilling disclosed richer ore and a shoot mined out by a sublevel 27 feet below the No. 5 yielded 2700 tons of ore of grade 26 dwt.

At the time of inspection mining from the bottom levels had ceased, all accessible payable ore having been mined. Intensive exploratory drilling from the No. 5 and No. 6 levels had failed to locate further shoots.

Some remnant of ore was being mined from the main shoot at No. 4 level and there was a prospect of obtaining a small tonnage from this source. There were no proved reserves at all.

ORE CONTROLS.

(a) SCHISTOSITY: has been an obvious major control and probably operated by determining the planes along which later shearing took place. Everywhere in all shoots, mineralisation took place along schistosity planes, strike and dip of shoot and schistosity agree at all points, except perhaps very locally adjacent the "main shear".

(b) Shearing, paralleling schistosity, has apparently been the immediate control and it is impossible to consider the two separately. There is definite evidence of shearing paralleling the schistosity within the orebody, but whether the shearing extends beyond the limits of the orebody or not has not been definitely established. Probably it does not.

It is a rather remarkable fact that a particular schistosity plane located within the limits of the main shoot at the surface, is still within the limits of the shoot at the bottom. In other words, the mineralisation has been confined to a definite structural band within the schist, and this is interpreted as implying that shearing has been confined to this band.

As schistosity is disposed vertically or inclined at steep angles to the south, varying down to 55 degrees, the effect of the control is evident in plan and cross-section (see plates 7 and 8). It should be noted that even beyond the point where the main shoot terminates, the smaller shoots are aligned along and contained within the same structural band as the main shoot.

(c) Folding. One effect of the folding has been to bend the structural band containing the ore shoots into an open arc.

But there is a far more important effect. It has been established by observation that shearing-cum-schistosity is very strongly developed throughout the length of the main ore shoot, but is much less prominent east of co-ordinate 1600E. The rocks on the No. 5 level are much more massive and schisting is only sporadically developed. The lack of strong schisting seems to be one very important factor militating against the development of important orebodies hereabouts.

It is probably significant that the change from strongly to weakly schisted rocks should take place across a major crossfold, and the two are probably causally related.

(d) Cross shears and Fractures: The "main shear" which angles in from the south across the path of the orebody in the main stope, seems to be an important shear when viewed in the stope. In places there is grooving but from the tightness of the shear and the warped nature of the shear surface, movement is considered to be small. The shear has several branches. From No. 4 level to the surface a pitch distance of 300 feet, the shear is exposed as a continuous smooth face. In many places ore did not extend right up to the shear, but the ground had to be removed to make the workings safe. As a feature controlling ore distribution it centainly looks importan when viewed in the stope.

Another shear which has had an obvious influence on ore is the steeply dipping shear against which the main shoot terminated, and against which a small shoot made in at a lower level. Grooving on this shear pitches west at 55 degrees. It is regarded as pre-mineralisation in age. The amount of movement is not known. From a general consideration of the apparent lack of displacement of the ore bearing zone, it is thought to have been small.

Quite a number of other heads and shears have had a local influence on ore distribution. This is particularly so at the No. 5 level, where heads have determined the lateral extent of the ore in many places.

The major fault with strong breccia formation which cuts off the ore shoot at the No. 5 and No. 5 Sub-level is a most important one. Sampling at the No. 5 showed that values extended for several feet beyond the fault in one place but drilling ahead failed to locate ore. The fault cuts cleanly across all the main ore controlli features.

POSSIBILITY OF FURTHER ORE.

From a general consideration of all known ore controlling features the most likely explanation of the origin of the shoots is that they were formed along the locus of intersection of shear zone (following schistosity planes) with a particular folded lava flow or sill which pitched at thirty degrees to the south east.

The most likely directions in which to look for further shoots would be along the line of prolongation of the known shoots. However, there are two factors against a successful outcome to prospecting here. In the first place the shoots in this general area are small. In the second place a major fault cuts across all the structures, and the heave and throw of the fault, and its effect on mineralisation are quite unknown. Diamond drilling up and down beyond the fault and ahead along the direction of prolongation of the ore shoots has failed to locate ore.

Two other possibilities are worth testing before the mine is abandoned.

(a) A zone of shearing paralleling the schistosity has been a dominating control. Exploration of this zone underneath the main shoot by diamond drilling may locate another shoot which does not outcrop.
(b) The "main shear" looks an important feature in the stope. Exploration down the footwall side of the shear by drilling is worth carrying out.

A diamond drilling scheme to test these possibilities was set out on plans at the mine. It comprised drilling holes in a plane at right angles to the axis of the main shoot, the first hole following the dip of schistosity, the second on a line bearing 18 degrees farther north, and two bearing 18 degrees and 36 degrees farther to the south.

MANOLIS' WORKINGS.

Manoli's Workings are located 2300 feet southwest from the main shaft on the Alexander. Between the two are numerous shafts and costeans on ore-bearing shears.

At Manolis' two shoots outcropped. One with an outcrop length of 23 feet cut out at 20 feet from the surface. The other, with a length of 29 feet pitched north east at 54 degrees. A shaft was sunk in the shear ten feet ahead of the shoot and intersected it between 10 feet and 45 feet. The shoot cut out at a depth of 54 feet.

The shaft followed shears down to 130 feet and drives put out at this level failed to locate a payable shoot.

Production from the mine amounted to approximately 600 tons of average head value 6 dwt. The gold was apparently contained in narrow quartz-carbonate-sulphide veins along shears, which have the same characteristics as those of the Alexander mine.

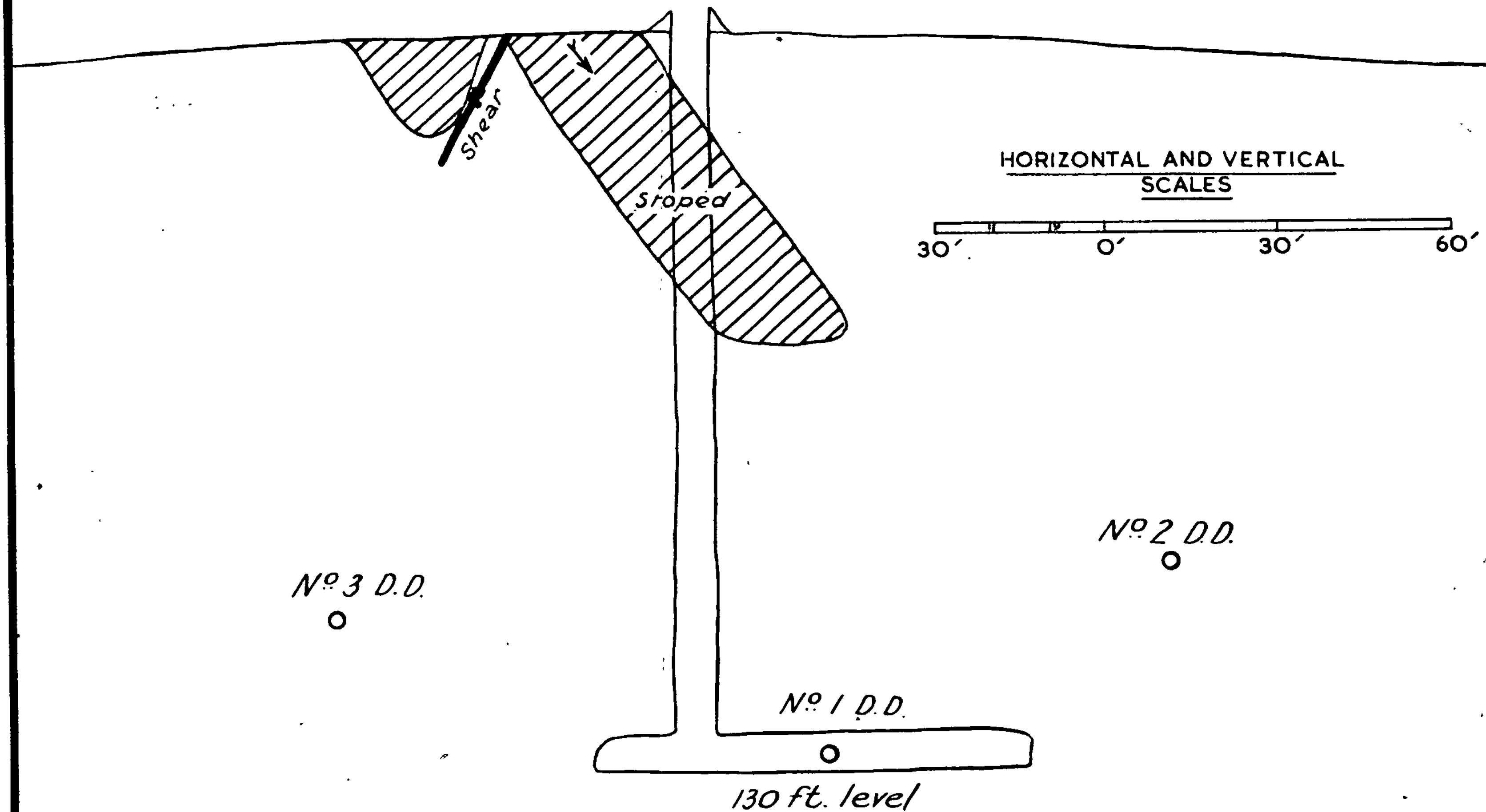
Failure of surface costeaning, underground development and diamond drilling to locate further shoots indicates that these are probably very small. The prospect of locating a large tonnage of ore on the property seems to be small.

C. L. Knight

C.L. KNIGHT
Geologist.

MANOLI'S WORKINGS

LONGITUDINAL PROJECTION



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Dec 1948

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PLATE I.
PLAN OF ALEXANDER MINE
G.M.L. 930 PILBARA GOLDFIELD W.A.
SHOWING SURFACE WORKINGS & DIAMOND DRILLHOLES
0 50 100 FT.
31·22 - 22·8" - Assay 31·22 dwt per short ton over true width 22·8 inches
T.N.
G.M.L. 930
G.M.L. 979
G.M.L. 955
G.M.L. 956
Bore No 9 Depressed 43° R.L. 1064'
Bore No 8 Depressed 60° R.L. 1080'
Bore No 7 Depressed 37° R.L. 1095'
Bore No 3 Depressed 55° R.L. 1151'
Bore No 5 Depressed 45° R.L. 1091
Bore No 6 Dep. 45° R.L. 1091
Bore No 4 Depressed 50° R.L. 1091
Bore No 2 Depressed 61° R.L. 1051'
Bore No 1 Depressed 59° R.L. 1103
22·2 - 12"
0·5 - 59"
31·2 - 22·8"
9·88 - 13·07"
13·09 - 29·4"
1·4 - 26·1"
0·6 - 45·7"
20·91 - 57·36"
25·23 - 44·15
12·2 - 18"
Main Shaft
No 2 Shaft
Vein at Surface
No 2 Winze
No 1 Winze
Main Vein at Surface
Alexander Lode
Top Adit
No 1 Shaft
Manoli's Shaft
2100 S
2200 S
2300 S
2400 S
2500 S
1400 E
1500 E
1600 E
1700 E
1800 E
1900 E
2000 E
2100 E
2200 E
2300 E
2400 E
2500 E
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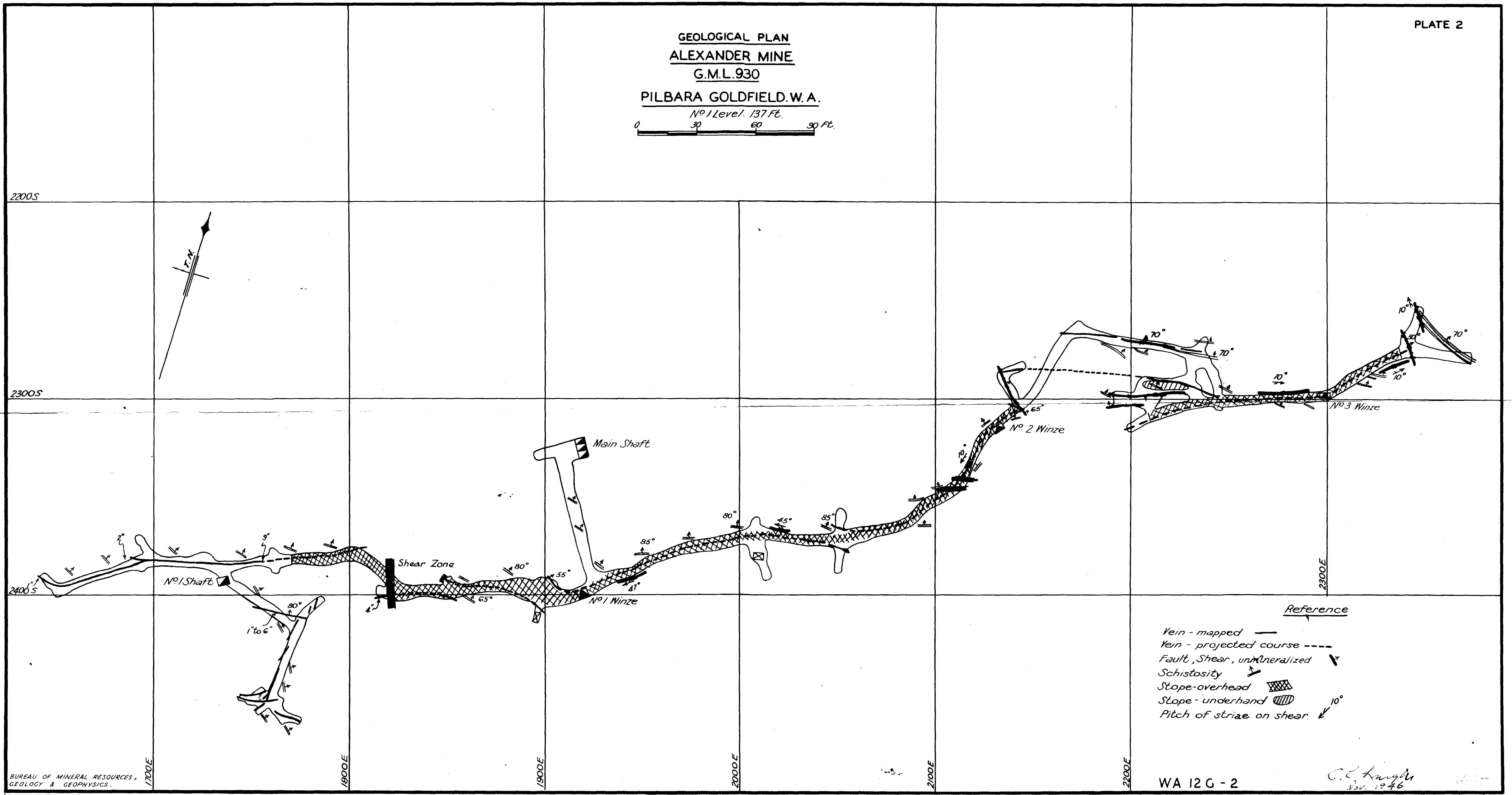
WA 12G-1

PLATE 2


GEOLOGICAL PLAN
ALEXANDER MINE
G.M.L. 930
PILBARA GOLDFIELD. W. A.
No 1 Level. 137 Ft.
0 30 60 90 Ft.
T.N.
2200 S
2300 S
2400 S
1700 E
1800 E
1900 E
2000 E
2100 E
2200 E
2300 E
Main Shaft
No 1 Shaft
Shear Zone
No 1 Winze
No 2 Winze
No 3 Winze
1" to 6"
Reference
Vein - mapped
Vein - projected course
Fault, Shear, unmineralized
Schistosity
Stope - overhead
Stope - underhand
Pitch of striae on shear.
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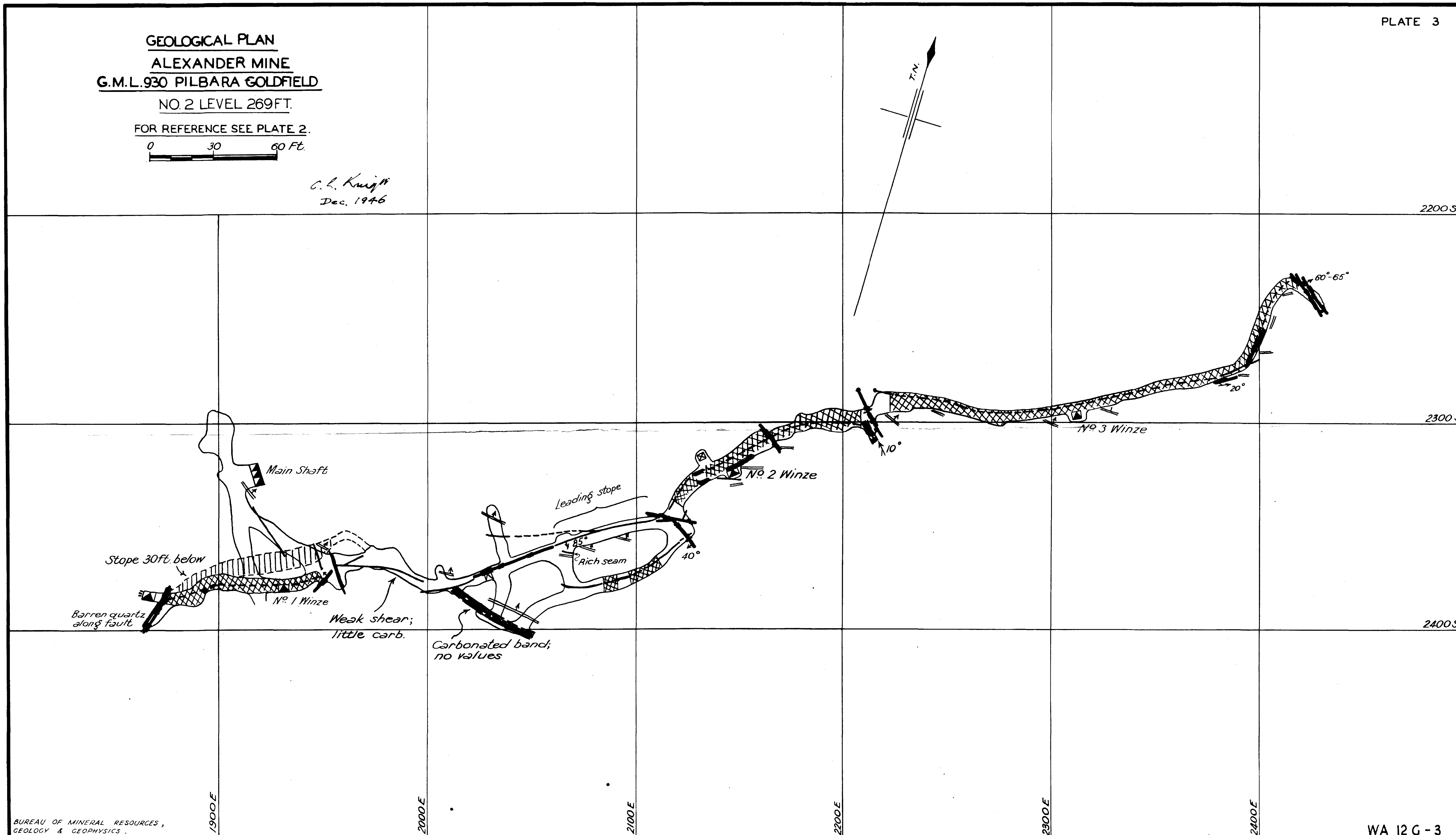
WA 12 G - 2
Nov. 1946

PLATE 3

GEOLOGICAL PLAN
ALEXANDER MINE
G.M.L. 930 PILBARA GOLDFIELD

NO. 2 LEVEL 269 FT.

FOR REFERENCE SEE PLATE 2.



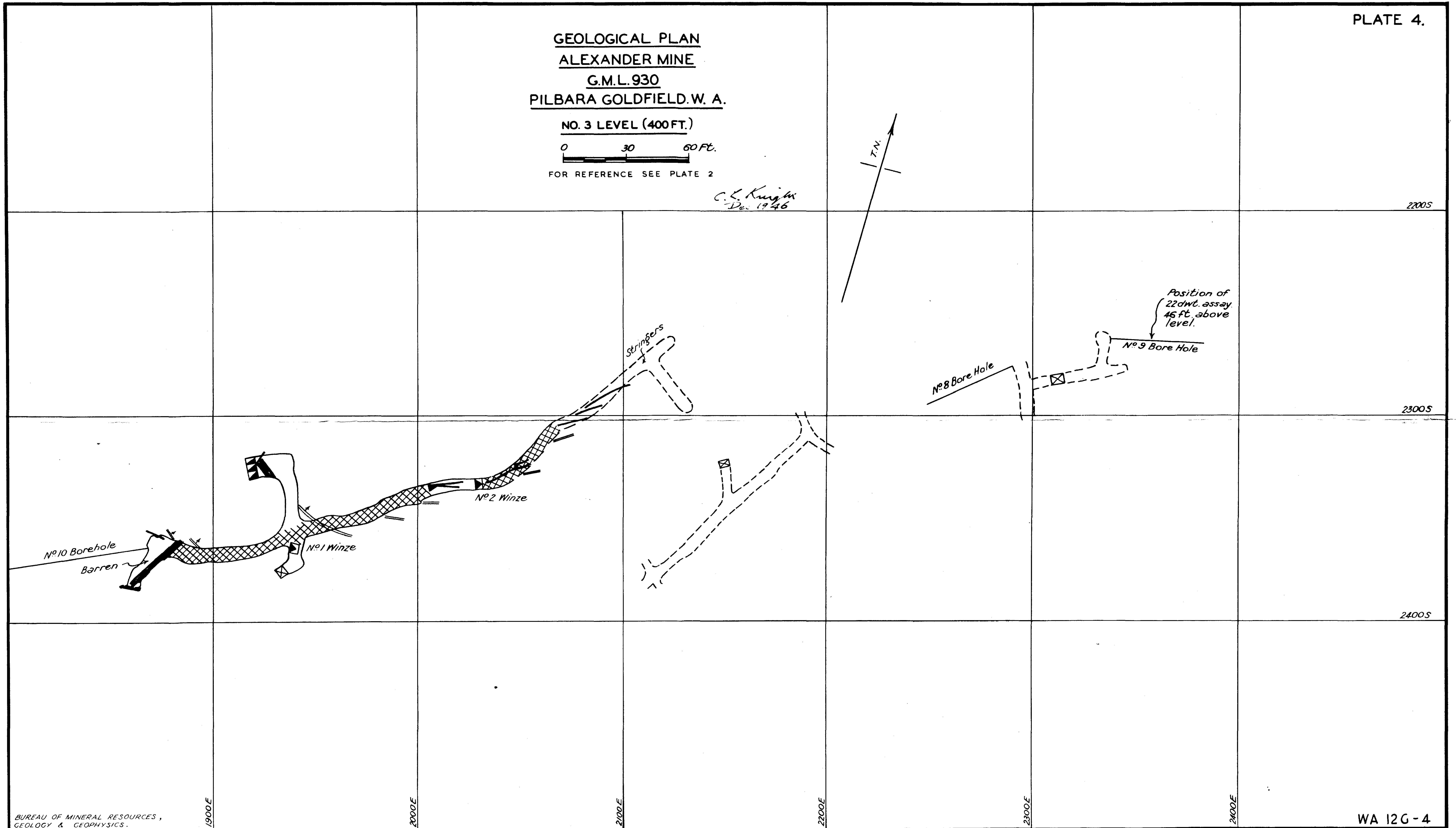


PLATE 4.
GEOLOGICAL PLAN
ALEXANDER MINE
G.M.L. 930
PILBARA GOLDFIELD. W. A.
NO. 3 LEVEL (400 FT.)
0 30 60 Ft.
FOR REFERENCE SEE PLATE 2
C. L. Knight
Dec. 1946
T.N.
2200S
2300S
2400S
Position of 22 dwt. assay 46 ft. above level.
No 9 Bore Hole
No 8 Bore Hole
Stringers
No 2 Winze
No 1 Winze
No 10 Borehole
Barren
1900E
2000E
2100E
2200E
2300E
2400E
BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS.
WA 12G-4


PLATE 5
LONGITUDINAL PROJECTION
ALEXANDER MINE
M.L. 930 PILBARA GOLDFIELD
SHOWING
STOPE LIMITS AND APPROXIMATE LIMITS OF ORE
0 30 60 90 FT.
>20 DWT. OVER 36"
15-20 DWT. OVER 36"
10-15 " " "
5-10 " " "
< 5 DWT. " "
Stoped Areas.
Width of Stope in Feet
Boreholes plotted at intersection with veins.
1600E
1700E
1800E
1900E
2000E
2100E
2200E
2300E
2400E
2500E
1200
1100
1000
900
800
700
Main Shaft
No 2 Shaft
Open Cut
Shaft
No 1
No 1 Winze
No 2 Winze
No 4 Winze
No 3 Winze
No 1 Level
No 2 Level
No 3 Level
Fault
No 3 Bore [> 20 dwt.]
No 3 Bore [5-10 dwt.]
[10-15 dwt.] No 3 Bore (Probably on shear in stope)
No 7 Bore (did not cut main shears)
No 4 Bore
No 5 Bore
No 6 Bore
No 8 Bore [5-10 dwt.]
No 9 Bore
No 1 Bore [> 20 dwt.]
No 2 (On shear in main north drive) [> 20 dwt.]
No 2. [15-20 dwt.] (On probable continuation of shear in south drive)
Ore does not reach surface
Adit
Probable Ore
Stope on North Shear
Wide make of ore between shears
Stope on South Shear
Values end on head
Ore makes to north
37 dwt. over 6" in N. wall
X-Cut N. for 6' Av. 6 dwt.
Winze on vein in X-Cut
X-Cuts 3'N & 8'S
Geologist
Mineral Resources Survey
Dec. 1946
BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS.
WA 12G-5

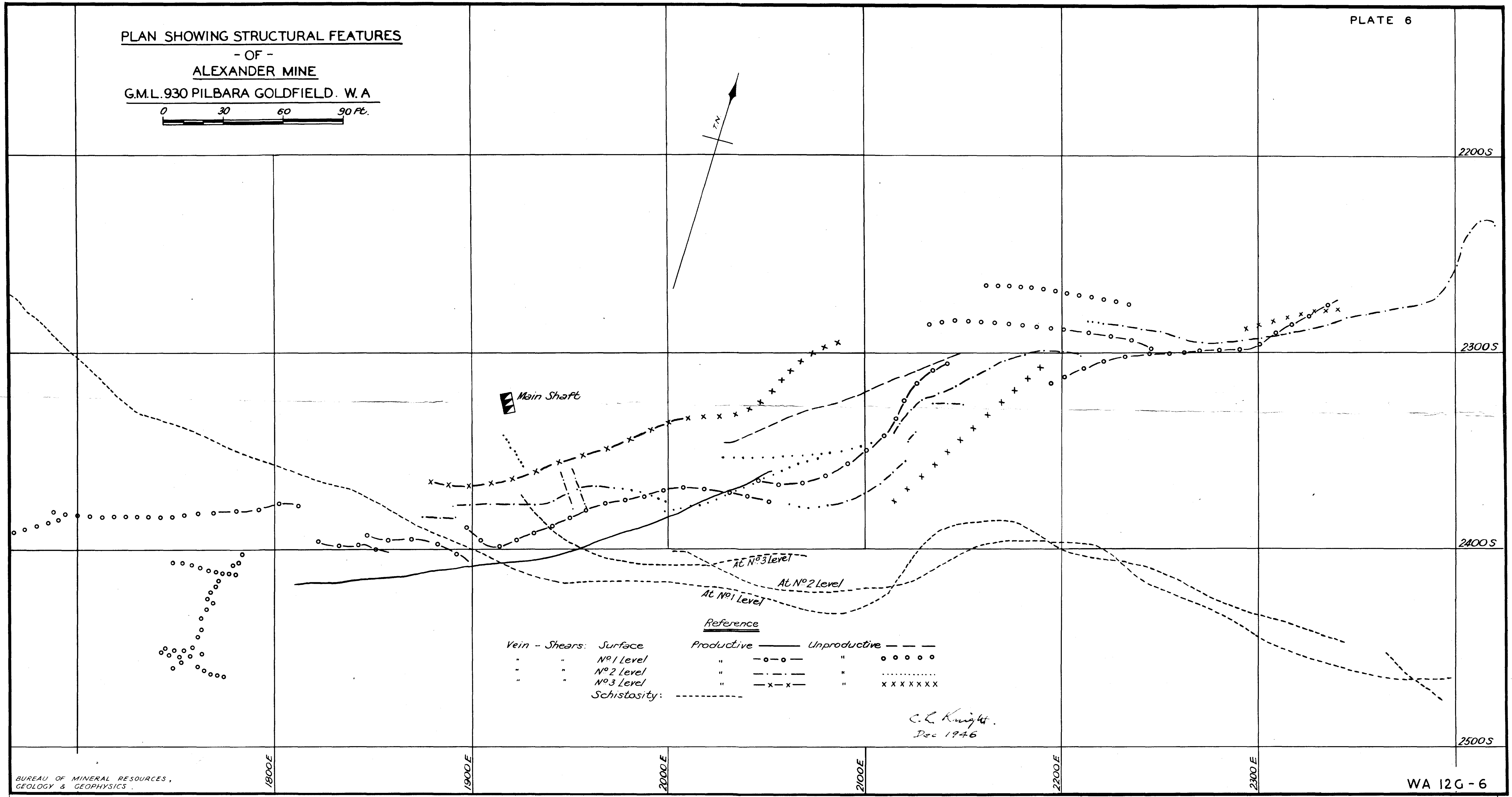
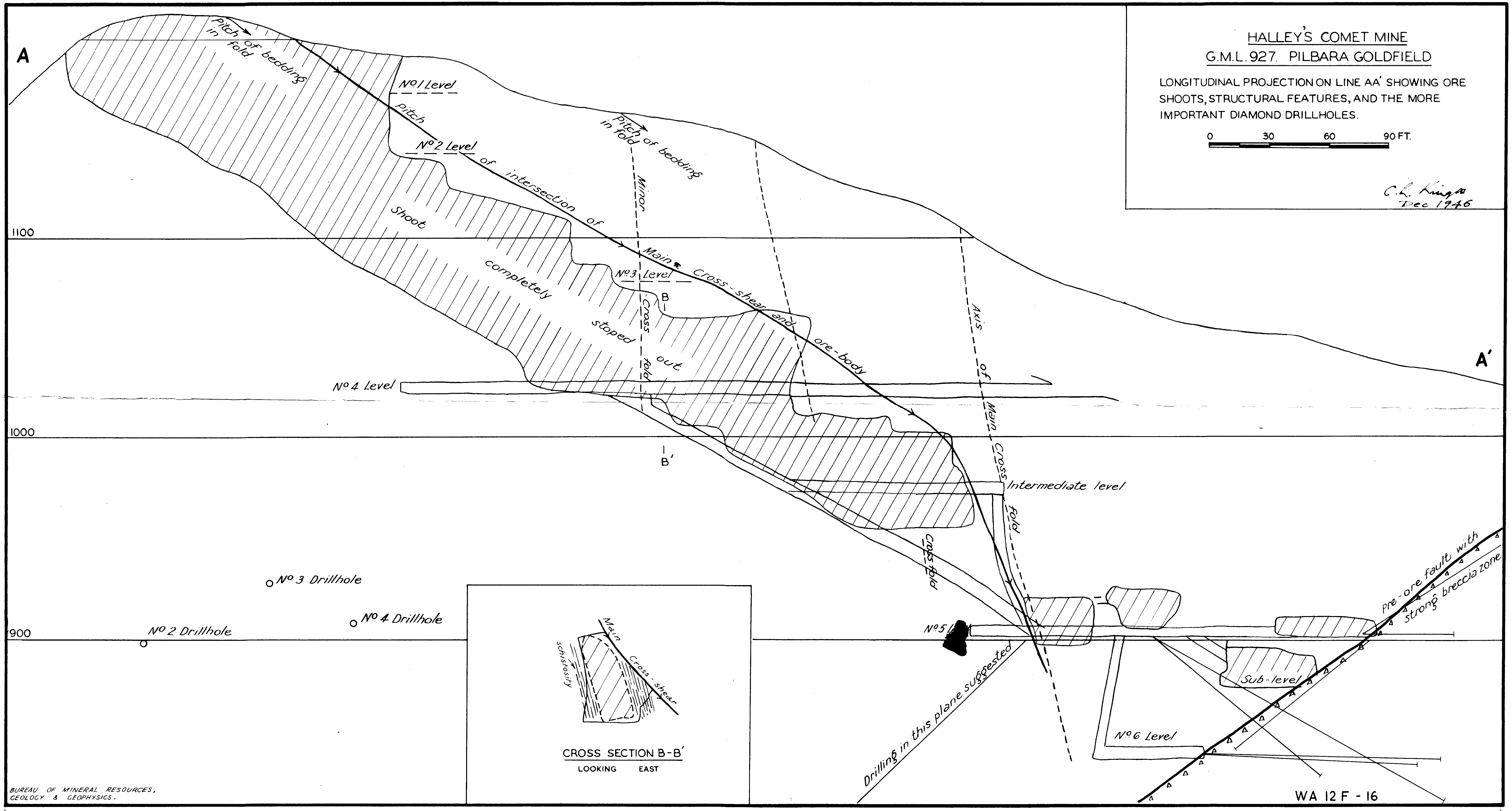


PLATE 6
PLAN SHOWING STRUCTURAL FEATURES
- OF -
ALEXANDER MINE
G.M.L. 930 PILBARA GOLDFIELD. W. A
0 30 60 90 Ft.
T.N.
Main Shaft
2200 S
2300 S
2400 S
2500 S
1800 E
1900 E
2000 E
2100 E
2200 E
2300 E
At No 3 Level
At No 2 Level
At No 1 Level
Reference
Vein - Shears: Surface Productive Unproductive
" " No 1 Level "
" " No 2 Level "
" " No 3 Level "
Schistosity:
C. L. Knight.
Dec 1946
BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS.
WA 12G - 6


PLATE 7
1100 E
1200 E
1300 E
1400 E
1500 E
1600 E
1700 E
1800 E
1900 E
1400N
1300N
1200N
1100N
1000N
900N
NO. 3 LEVEL
1083'
A
OPEN CUT
1200'
NO. 2
LEVEL
1144'
NO. 2
EAST ADIT
1080'
NO. 3 EAST ADIT
1021'
NO. 3 LEVEL
Main Shear
NO. 4 LEVEL
Main Shear
Traverse on Surface
NULLAGINE SERIES
WARRAWOONA SERIES
972' SUB-LEVEL
954' SUB-LEVEL
Inclined Shaft
Stope over drive
Stope
NO. 5 LEVEL
902'
NO. 6 LEVEL
840'
SUB-LEVEL
877'
NO. 5 LEVEL
902'
A'
GML
928
GML
1051
GML
927
GML
945
GML
934
T.N.
HALLEY'S COMET MINE
PILBARA GOLDFIELD, W.A.
COMPOSITE PLAN SHOWING MAIN GEOLOGICAL
FEATURES & DIAMOND DRILL HOLES.
C.L.KNIGHT, GEOLOGIST.
ft. 30 0 30 60 90 ft.
Datum approximate Sea Level.
Reference
Schistosity - Surface
Underground
Shears
Pitch
Drill Holes
Section Line
BUREAU OF MINERAL RESOURCES,
GEOLOGY & GEOPHYSICS.
Oct. '49
WA 12 F - 18

PLATE 8


HALLEY'S COMET MINE
G.M.L. 927. PILBARA GOLDFIELD
LONGITUDINAL PROJECTION ON LINE AA' SHOWING ORE SHOOTS, STRUCTURAL FEATURES, AND THE MORE IMPORTANT DIAMOND DRILLHOLES.
0 30 60 90 FT.
Dec 1946
A
A'
1100
1000
900
Pitch of bedding in fold
No 1 Level
pitch
No 2 Level
of intersection of
Main Cross-shear and ore-body
Pitch of bedding in fold
Minor Cross fold
Shoot completely stoped out
No 3 Level
B
B'
No 4 Level
Axis of Main Cross fold
Intermediate level
Cross fold
No 3 Drillhole
No 4 Drillhole
No 2 Drillhole
No 5 Level
Drilling in this plane suggested
No 6 Level
Sub-level
Pre-ore fault with strong breccia zone
Main Cross-shear
schistosity
CROSS SECTION B-B'
LOOKING EAST
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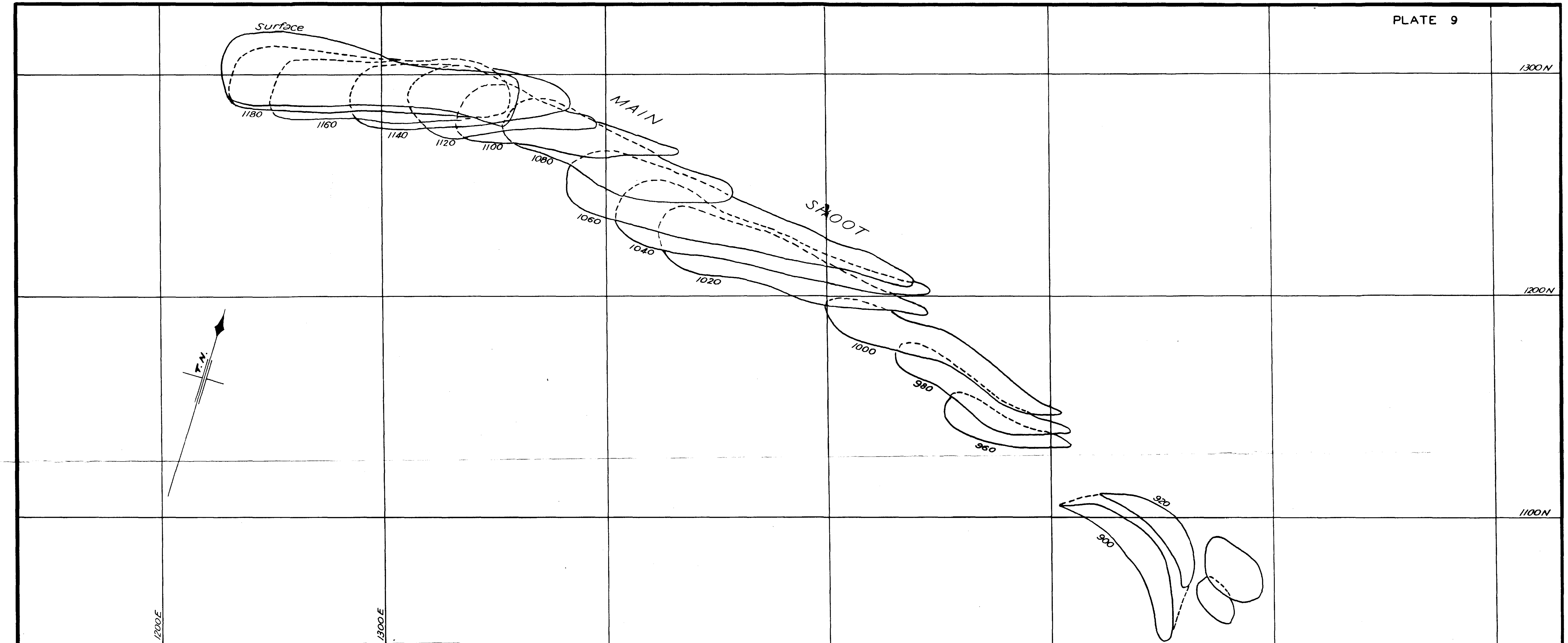
WA 12 F - 16



- CONTOUR PLAN -
- OF -
ORE SHOOTS
HALLEY'S COMET MINE
PILBARA GOLDFIELD. W.A.

0 30 60 90 Ft.

Contour Interval 20 ft.

Datum approx. Sea Level.

C. L. Knight
Dec 1948

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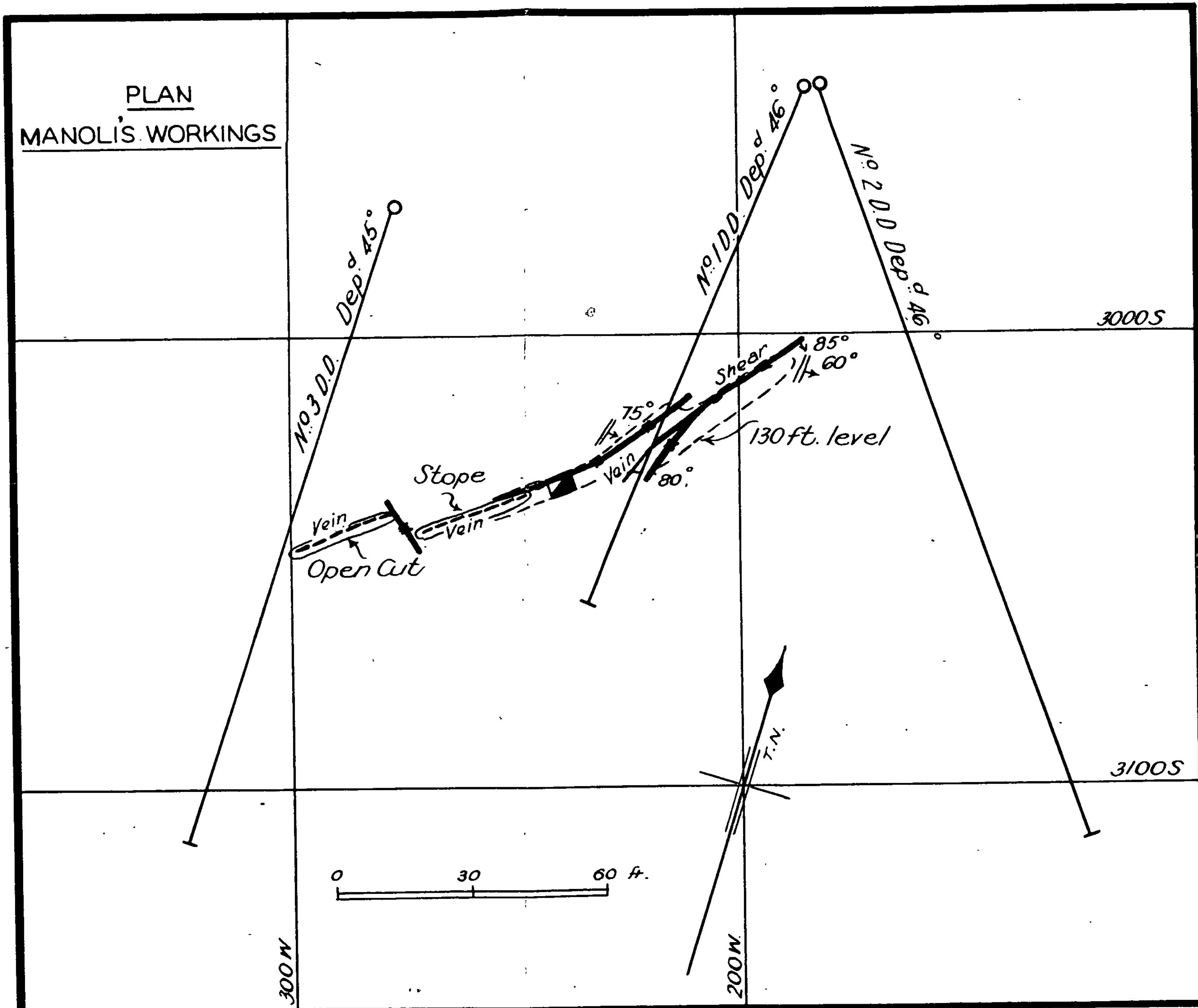
GEOLOGY & GEOPHYSICS.

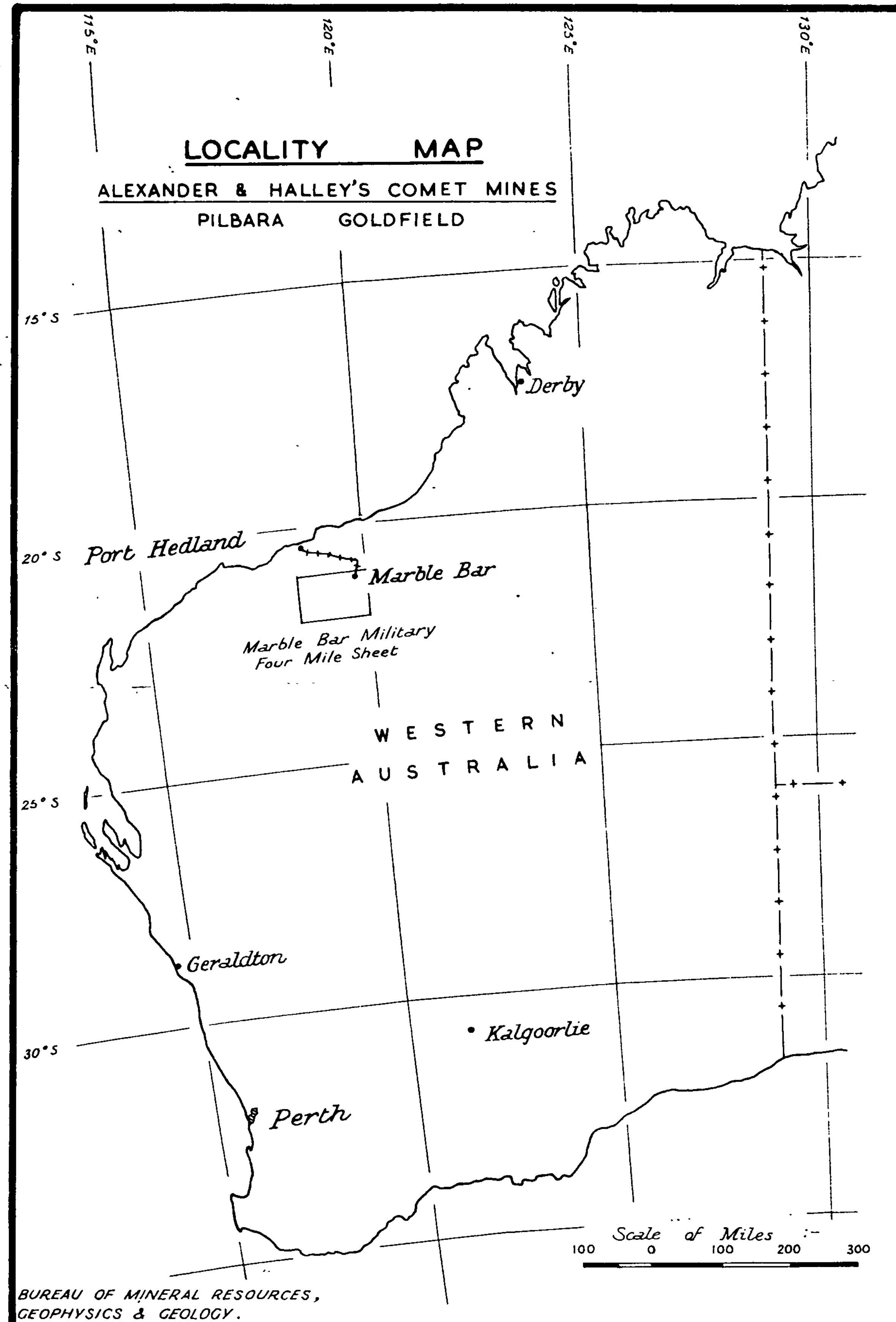
WA 12 F - 17

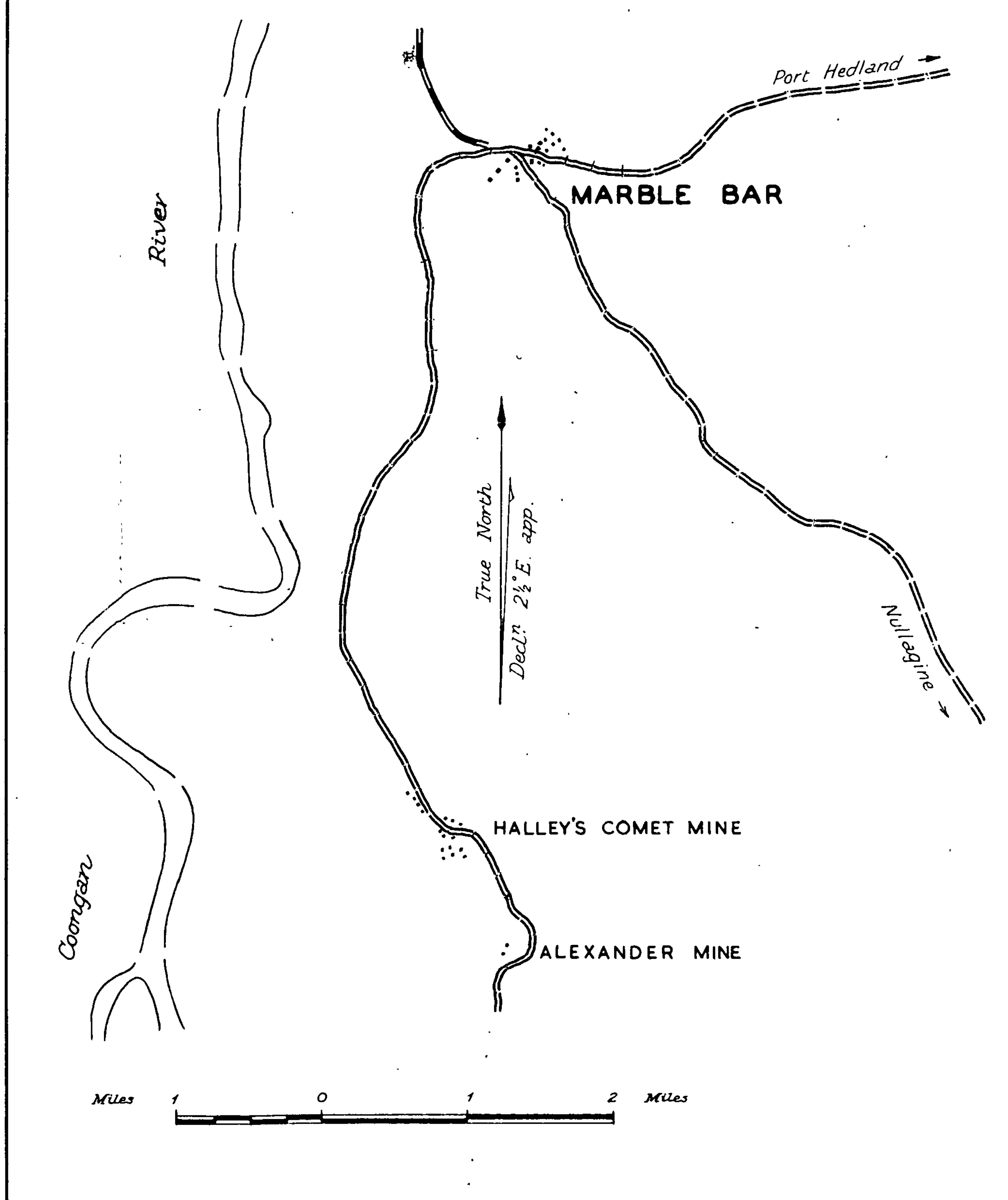
PLATE 10



PLAN
MANOLI'S WORKINGS
No 3 D.D. Depd 45°
No 1 D.D. Depd 46°
No 2 D.D Depd 46°
3000 S
3100 S
300 W
200 W
Shear
85°
60°
75°
130 ft. level
Vein
80°
Stope
Vein
Vein
Open Cut
T.N.
0
30
60 ft.

PLATE II





WA 12 - 5