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GEOLOGICAL REPORT ON THE COIMADAI ANTIMONY MINE

by

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DEPARTMENT OF SUPPLY AND SHIPPING

Mineral Resources Survey Branch

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THE COIMADAI ANTIMONY MINE

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SUMMARY

The country rock of the Coimadai antimony orebodies is Lower Ordovician slate and sandstone, with northerly strike and steep westerly dip. It is intruded by narrow east-west striking pre-mineral porphyry dykes, which dip north and are displaced by or in places form the walls of the lode channels. The antimony lodes are lenticular ore-shoots in fault zones which show signs of intense crushing and shearing, the shoots being usually associated with fault intersections or branches.

The workings are divided into two sections: No. 1, Draper's, in which the lode system strikes north-northwest and dips 45-55 degrees west, and No. 2, Bondison's, where the strike is east-northeast and the dip 60 degrees to the north.

In No. 1 section most of the ore above the adit level has been extracted, but possibly 400 tons of 5% Sb, ore have been developed below the level, and prospects of further ore are good. The ore zone pitches steeply north.

Two ore-shoots are being worked in No. 2 section. In the first, some 600 tons of very high-grade ore have been developed below the adit level. The second shoot is a lenticular formation associated with several porphyry dykes and is being worked above the adit, but has not yet been exposed on the 45' level. Gold values are much higher in No. 2 than in No. 1 section, but few assay data are available with regard to either antimony or gold content. Proved ore reserves at close of operations were calculated at 870 tons in No. 1 Section averaging 5.3 per cent antimony and 5.6 dwts of gold per ton and 260 tons in No. 2 Section with an average value of 3.9 per cent antimony and 4.6 dwts of gold per ton. A.G.S.L. Letter.

INTRODUCTION

The Coimadai antimony mine is 9 miles northerly from Coimadai village, which is 9 miles north-northeasterly from Bacchus Marsh and ½ mile east of the main road from Bacchus Marsh to Gisborne. A reasonably good road has been put in from Coimadai to the mine, partly following the course of Pyrete Creek, on which the mine is situated. Pyrete Creek and its tributaries have cut steep-sided valleys between low ridges, which rise 200 to 300 feet above the creek bed. This dissected topography is in sharp contrast to that of the flat fertile basalt plateaus to the south. Another such isolated plateau lies not far northwest of the mine. Water supply is obtained by pumping from a dam on the creek below the mine. Timber for mining purposes is abundent. Production from the mine during 1943 and 1944 when it was worked by the Commonwealth Government, was 3672 tons with an average assay value of 5.5 per cent antimony and approximately 5.2 dwts of gold per ton. From this ore, 290 tons of antimony concentrates assaying 50.61 per cent antimony and about 25 dwts of gold per tonw were obtained.

MAPPING

Three days, from September 9th to the 12th, were spent at the mine. The geology of the underground workings was plotted largely onto plans on the scale of 20 feet to an inch, supplied by the Minerals Production Directorate. These were subsequently reduced to 40 feet to an inch. The surface was mapped by plane-table, but insufficient time was available to work out fully the exact details of the structure, particularly of the faulting which has taken place, and the surface plan submitted with this report must be regarded as of a preliminary nature only, being subject to revision when an opportunity occurs to map the geology in more detail.

The help accorded by the Mine Manager, Mr. K.T. Heinse, in explaining the work done and in providing an assistant for surface mapping, is gratefully acknowledged.

The plans which accompany this report comprise:-

Plate 1 - Preliminary geological plan of the surface on a scale of 100 feet to an inch.

Plate 2 - Plan of the adit level, No. 1 (Draper's) section, and of the stope above, and the two sub-levels below the adit level; also three cross-sections through these workings.

Plate 3 - Longitudinal projection, No. 1 section.

Plate 4 - Plan and longitudinal projection of the workings in No. 2 (Bondison's) section.

Plates 2, 3 and 4 are on a scale of 40 feet to an inch.

HISTORY

A report on the Coimadai antimony mine, dated May 5th, 1942, by J.F.L. Kenny, B.C.E. of the Geological Survey, Victorian Mines Department, summarises the history of the property to that date, and these details will not be repeated here. Apparently about "400 tons of stibnite and ochre were mined and marketed" from the mine prior to 1915, when it was inspected by Mr. J. Easton of the Victorian Mines Department. Mr. Easton's report is included in Mr. Kenney's summary. Since that date only a little work was done until it was decided early in 1942 to develop the mine as a Commonwealth Government enterprise.

The mine consists of two sections, No. 1, known as Draper's, and No. 2 as Bondison's. In Draper's, the more southerly section, an adit has been driven 200 feet to cut the lode system and drives put in on the adit level and 55 feet below the adit level.

In Bondison's section, which is 600 feet north of Draper's, an adit has followed the lode channel for 150 feet. Near the mouth of the adit a winze was sunk 57 feet and a sub-level driven at 45 feet vertical depth below the adit.

GENERAL GEOLOGY

The country rock is sandstone and slate of Lower Ordovician age. The sandstone occurs as wide, very massive bands, or as narrower beds alternating with slate. The slate in places is finely bedded, in others more massive. Strike of the rocks is usually north to north-northeast, though in places slightly west of north. Dip is steep, generally to the west at 65 to 85 degrees. Gentle folding is noticeable on the surface just south of

Bendison's section and severe minor crumpling is in evidence in several places both in the mine and on the surface, particularly near faults and lode fissures. Faulting and shearing have been severe and the lodes occupy zones of strong movement.

The only igneous rocks in the immediate vicinity of the mine are lenticular porphyry dykes. These are exposed in the workings in both Draper's and Bendison's sections, and strike roughly east-west and dip steeply to the south. They are somewhat irregular in occurrence, lensing out suddenly and pitching at various angles. The dyke rock is weathered to a soft brownish material in which the remnants of entirely altered felspar phenocrysts can be seen. On account of this extreme weathering, the dykes do not outcrop, but are seen only in the mine workings. They are earlier than the mineralisation and are cut through and even displaced by the lode channels. They were apparently injected first, and at a later stage the intense fissuring with which the lodes are associated was developed, in Draper's section at right angles to the dykes, and in Bendison's parallel to and in part following the dyke walls.

ECONOMIC GEOLOGY

The lodes occupy strong fault zones in intensely sheared rock and considerable evidence of movement is apparent. The walls are strongly slickensided and even show movement in different directions on successive layers of highly polished slickensided material. The lode channels consist of a few inches to several feet of sheared and shattered slate and fault gouge. Shoots of ore are lenticular in shape and vary rapidly in width. They tend to be connected with fault or shear junctions. The presence of quartz in the lode channel is sometimes, but not always, associated with the ore shoots. Barren quartz occurs on the walls of the veins in many places.

The ore consists of quartz and crushed slate carrying stibnite with a varying portion of arsenopyrite, a little pyrite and a rare grain of galena; Gold content ranges up to ½ oz. per ton. In the upper levels the ore is partly oxidised, but the earlier reports all refer to antimony sulphide as the dominant mineral either at or very close to the surface and it seems that the shoots of solid ore were probably oxidised to a small extent only. The proportions of gold, antimony, and arsenic in the ore are irregularly variable.

NO. 1 (DRAPER'S) SECTION

On the adit level several lode channels are exposed which branch and come together again and cut each other with or without displacement (see Plate 2). The lode formation gives the impression that the beds have been subject to intense shearing and crushing against a resistant barrier which is probably the massive band of sandstone exposed on the surface just to the south (see Plate 1). The strike generally is north-northeast and the dip to the west at 49 to 55 degrees. In both strike and dip, the lode channels cut obliquely across the country rock, which strikes north-northwest to northeast and dips steeply west. Between the various branches of the veins and also for some distance on either side, the country has been intensely sheared and a strong cleavage has been developed in the slate. This cleavage strikes consistently northeast and dips vertically or 80 to 85 degrees to the northwest. Weathered felspar porphyry dykes are exposed in the adit and in the north drive where the lode track cuts across and displaces the dyke. The shale and sandstone near the dyke are silicified and the walls of the dyke carry a little quartz and gouge.

Several lenticular shoots or ore have been stoped above the level and little antimony ore is now to be seen in the drives except occasional small patches of insignificant size. The shoots worked have all been at the junction of two lode fissures or at the junction of a main fissure with a lesser branching shear plane.

Above the level an old stope exposes the lode for a length of 145 feet. The principal shoot of ore seems to have been stoped right through to surface and there is little ore in the stope at present. Near the centre of the stope a flat fault carrying some antimony dips north at 15 degrees. At the south end of the stope a silicified lode formation 2 to 3 feet wide strikes at right angles to the main lode channel- which cuts it off - and dips north-northeast at 45 degrees. This has previously been mapped as a dyke.

In the north drive on the level, a winze was sunk 20 feet on the lode and a short cross-cut put in at the bottom without exposing any ore.

The main winze below the level was sunk on a sheet of ore at the junction of two veins. At the time of mapping it was down 104 feet, steepening from an angle of 45 degrees in the upper portion to 60 degrees near the bottom. The lode apparently carried stibnite throughout its depth, being especially good near the bottom of the winze. A drive south-southeast at 18 feet depth followed the lode formation for 30 feet, and then turned west and continued as a cross-cut for 25 feet without exposing any more ore. The lode in this sub-level drive was stoped below for 5 feet and above up to the adit.

At 55 feet vertical depth below the adit (80 feet on the incline) a drive has been put in along the lode, which at the time of mapping was 30 feet south and 10 feet northeast from the winze. This has since been extended to 82 feet south and a drive has also been put out west for 19 feet. The lode is lenticular, pinching in places to a narrow fault zone and bulging to 2 or 3 feet, averaging about 15 inches. A considerable width of sheared shale is associated with the lode, particularly on the hangingwall. Two samples were taken in the south face at 30 feet from the winze, one of the definite higher grade lode formation carrying visible antimony which returned 4.57% Sb. and 2.54% As., over 27 inches width; the other sample comprised 30 inches of the hangingwall material and assayed 0.57% Sb., and 1.57% As.

The principal fault intersections, which probably determine the pitch of the ore zone as a whole, have been plotted on the longitudinal section (see Plate 3) and all show a steep pitch to the north. Slickenside striations pitch usually north at angles from 0 to 90 degrees, commonly 50 to 60 degrees.

NO. 2 (BONDISON'S) SECTION

The lode in Bondison's section strikes east-northeast to just north of east and dips north at about 60 degrees. Two shoots of ore have been worked, one a normal fault-fissure lode near the mouth of the adit, and the other a large lenticular mass of shattered and mineralised country associated with several porphyry dykes. This second orebody is 80 to 100 feet from the mouth of the adit and some stoping has been done from a shaft which was put through to the surface. The first ore shoot seems to have been mainly stoped out above the level, which is close-timbered in this section. A winze has been sunk on ore 17 feet from the portal for a vertical depth of 56 feet and a level driven both ways on the lode at a vertical depth of 45 feet. When mapped, this level was 25 feet east and 20 feet west of the winze, but has since advanced to 68 feet east and 54 feet west, the west level being still in ore while the east at 50 feet struck the dyke exposed in the adit

level and is following the lode channel along the wall of the dyke. This section apparently carries little antimony. The position of the dyke suggests a slight easterly pitch to the ore-shoot (see Plate 4). The ore shoot on the 45' level consists of a varying width (21 inches in the east face and 12 inches in the west when examined) of high-grade antimony ore with a similar thickness of sheared and broken shale on the footwall carrying some quartz, and beneath that again, a vein of barren quartz which in places reaches a width of 4 feet. Shale striking east-northeast and dipping 85 degrees north forms the hangingwall. A sample taken in the east face at 25 feet from the winze, over 21 inches width, returned 38.05% Sb., and 0.79% As.

In the adit level the lode channel past the first ore-shoot is about 30 inches wide and follows the hangingwall of an 18-inch dyke which dips north at 60 degrees. Similar lode material occurs on the footwall of the dyke. This dyke lenses out at about 90 feet from the portal of the adit, but just before this the mineralised formation begins to bulge, on the hangingwall side particularly, and reaches a maximum width of about 15 feet. Several other lenticular dykes, striking generally east and dipping north, are found near the hangingwall of this bulged section, which undoubtedly owes its origin to shattering of the country by the intrusion of the various dykes, rendering it susceptible to mineralisation later. Peculiar fault breccias and seams of gouge were noticed along the walls of the dykes. Slickenside striations pitch east at a low angle. An east-pitching dyke is exposed in the end of the drive, but the main lode channel seams to have played out. (A shaft from the surface on this line about 90 feet ahead of the end of the drive apparently did not strike any ore.) In a drive to the northeast, north-south faulting and shearing, dipping steeply west and carrying a little mineralisation, is noticeable. The earlier part of this drive consists of massive silicified shale and sandstone containing irregular small quartz veins. Strike of the country rock here has swung round from east-northeast near the mouth of the adit to north or north-northwest, and the dip is steep to the east. A prominent feature on the surface just south of Bondison's lode is a wide bed of massive sandstone which swings from a north to a northeast strike 100 feet south of the lode fissure, and again swings northwards near the lode (Plate 1). As in Draper's section, though not to such an extreme degree, the appearance of the lode formation suggests that shearing has been intense and although the actual displacement may not have been great, the forces involved in the movement were very severe.

ORE RESERVES

The stage of development of the mine is too backward and the available sampling record insufficient to enable any accurate estimate of total ore reserves to be made at this stage.

In Draper's section, a block 50 feet inclined depth may be considered proved for a length of 80 feet and an average thickness of 15 inches, giving about 400 tons of ore. The only sample available is the 4.57% Sb, assay previously quoted. As ore seems to be going down well in the winze, prospects for further ore are good and other shoots may be developed on parallel or branch spurs.

Possible ore above the adit level has not been taken into account as the rich shoots have been worked out and there is little in the stope that looks encouraging on visual examination.

At Bondison's section, the ore above the adit level in the east shoot is difficult to calculate on account of poor exposure and the unknown factor of how much has been stoped. In the western shoot below the level, a block 120 feet long with about 40 feet of backs and an average width of perhaps 18 inches, equivalent to about 600 tons of very high-grade ore, has been developed, with the western end not yet established. Another 15 feet or so of driving should bring the east drive on the 45 foot level into the east ore-shoot.

VALUES

Up to the 24th November, 1943, a total of 717 tons of ore had been treated by the mill for a return which is estimated from the fortnightly reports to be about 50.5 tons of concentrates. At 40% Sb., this quantity of concentrates corresponds to an average recovered grade for the ore of 3% Sb. This ore came mostly from two dumps, the larger one on Draper's section and the smaller on Bondison's, but development ore has also been milled. It is not possible to make further deductions about the grade of each section from these figures, because in the fortnightly reports from the Mine Manager, little information is given as to the exact origin of the ore, whether from dump or development, or from Draper's or Bondison's sections. It is recommended that in all future reports the tonnages from each part of the mine be included, and it is also recommended that mine sampling be done on a systematic basis. The best method would probably be to sample the face after each firing.

The following information on values is taken from reports by the Melbourne University Ore-Dressing Laboratory.

Investigation No. 128. ½ cwt. sample of dump material from Draper's section, submitted by C.N. Ekberg in 1938.

Assay Value - Au. 2.70 dwts. per ton, Sb. 10.27%, S. 3.07%. 75% of the antimony content was stibnite, the remainder oxidised.

Investigation No. 111. No. 2 dump material from Bondison's section, submitted in 1939.

Assay Value - Au. 10.9 dwts. per ton, Ag. 0.7 dwts. per ton, Sb. 9.65%, As. 0.18%, S. 4.1%, Fe. 1.5%, Cu. nil.

It is obvious from the treatment returns shown above that these samples could not have been representative of the dump material as a whole.

Investigation No. 269. 1 cwt. bag of concentrates investigated in September, 1943.

Approximate composition - Sb. 40%, As. 4.8%, corresponding to a mineral composition: Stibnite (Sb_2S_3) 55.8%, Arsenopyrite (FeAsS) 10.4%, Gangue, Pyrite etc. 33.8%.

14th December, 1943

N. H. Fisher.

Plate I

SURFACE PLAN
COIMADAI ANTIMONY MINE

PARISH OF COIMADAI
COUNTY OF BURKE
VICTORIA

0 100 200 300'

LEGEND

- Massive sandstone
- Bedded shale
- Alternating shale & sandstone
- Porphyry dyke
- 70° Fault
- Lode fissure
- Adit
- Tramline

Datum for contours is rail level of adit in Drapers Section, taken as 1000

ROAD TO PUMPING STATION
PYRETE CK
Quarters
Change House
Quartz floaters
No2 (Bandison's) Section
Plane of Lode Section
Dump
Quartz veinlets
Winch House
MILL
MESS
BIN
DAM
Mock
No1 (Draper's) Section
Office
Garage & Store
Quartz floaters & veinlets
Plane of Lode Section
PYRETE CK

1600'N 1400'N 1200'N 1000'N 800'N 600'N

2000W 1800W 1600W 1400W 1200W 1000'W 800'W 600'W 400'W

A.A. Fiddes.
Chief Geologist.
Mineral Resources Survey Branch
Dec. 1943

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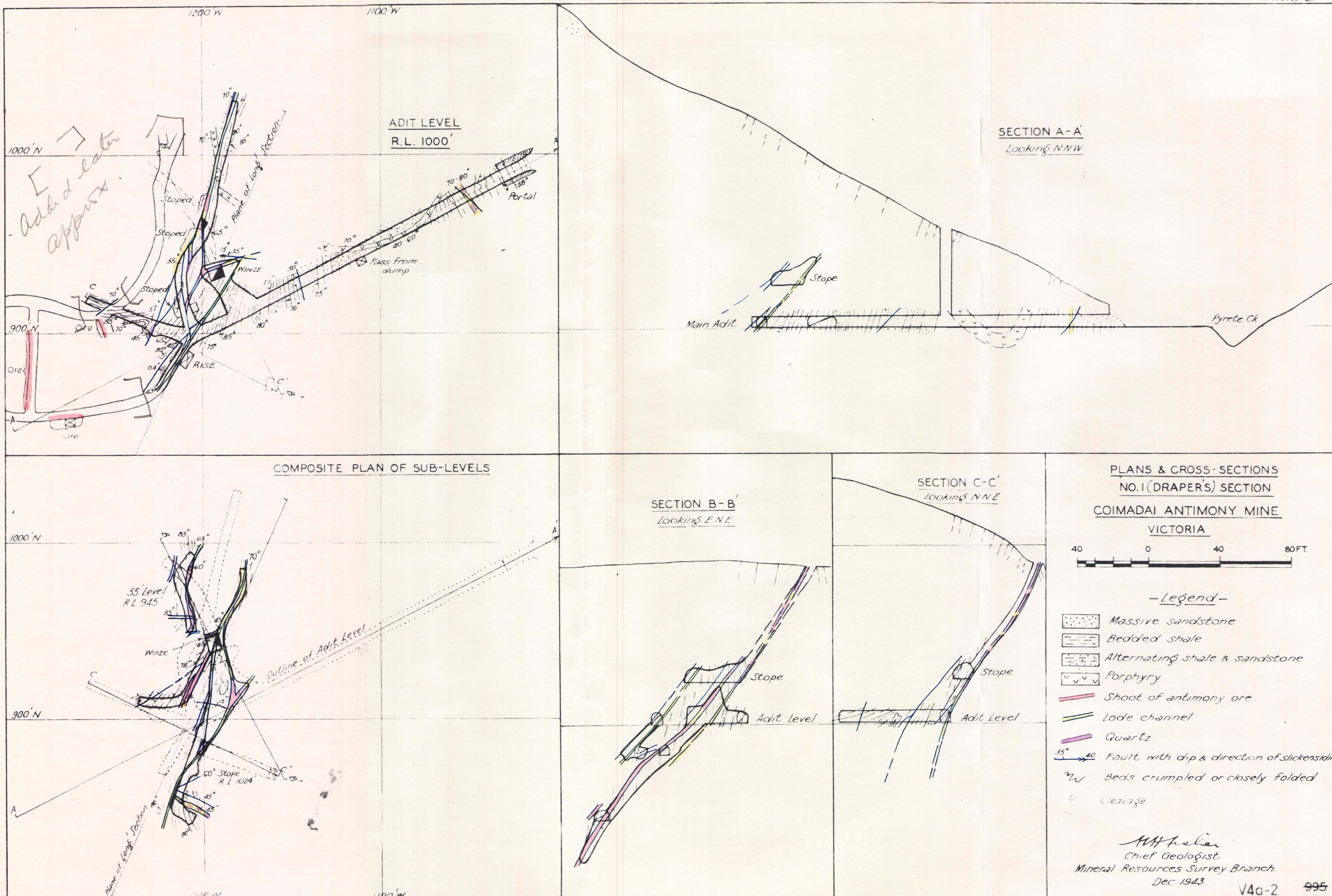
ADIT LEVEL
R.L. 1000'
1200'W
1100'W
1000'N
900'N
Stoped
Stoped
Stoped
Plane of Long' Section
Portal
Pass from dump
WINZE
RISE
Ore
Ore
Ore
Added later approx
SECTION A-A'
Looking NNW
Stope
Main Adit
Pyrete Ck
COMPOSITE PLAN OF SUB-LEVELS
55' Level
R L 945'
Winze
Outline of Adit Level
Stope
R L 1024'
Plane of Long' Section
SECTION B-B'
Looking ENE
Stope
Adit Level
SECTION C-C'
Looking NNE
Stope
Adit Level
PLANS & CROSS-SECTIONS
NO. 1 (DRAPER'S) SECTION
COIMADAI ANTIMONY MINE
VICTORIA
40 0 40 80 FT.
-Legend-
Massive sandstone
Bedded shale
Alternating shale & sandstone
Porphyry
Shoot of antimony ore
Lode channel
Quartz
Fault with dip & direction of slickensiding
Beds crumpled or closely folded
Cleavage
Chief Geologist
Mineral Resources Survey Branch
Dec 1943
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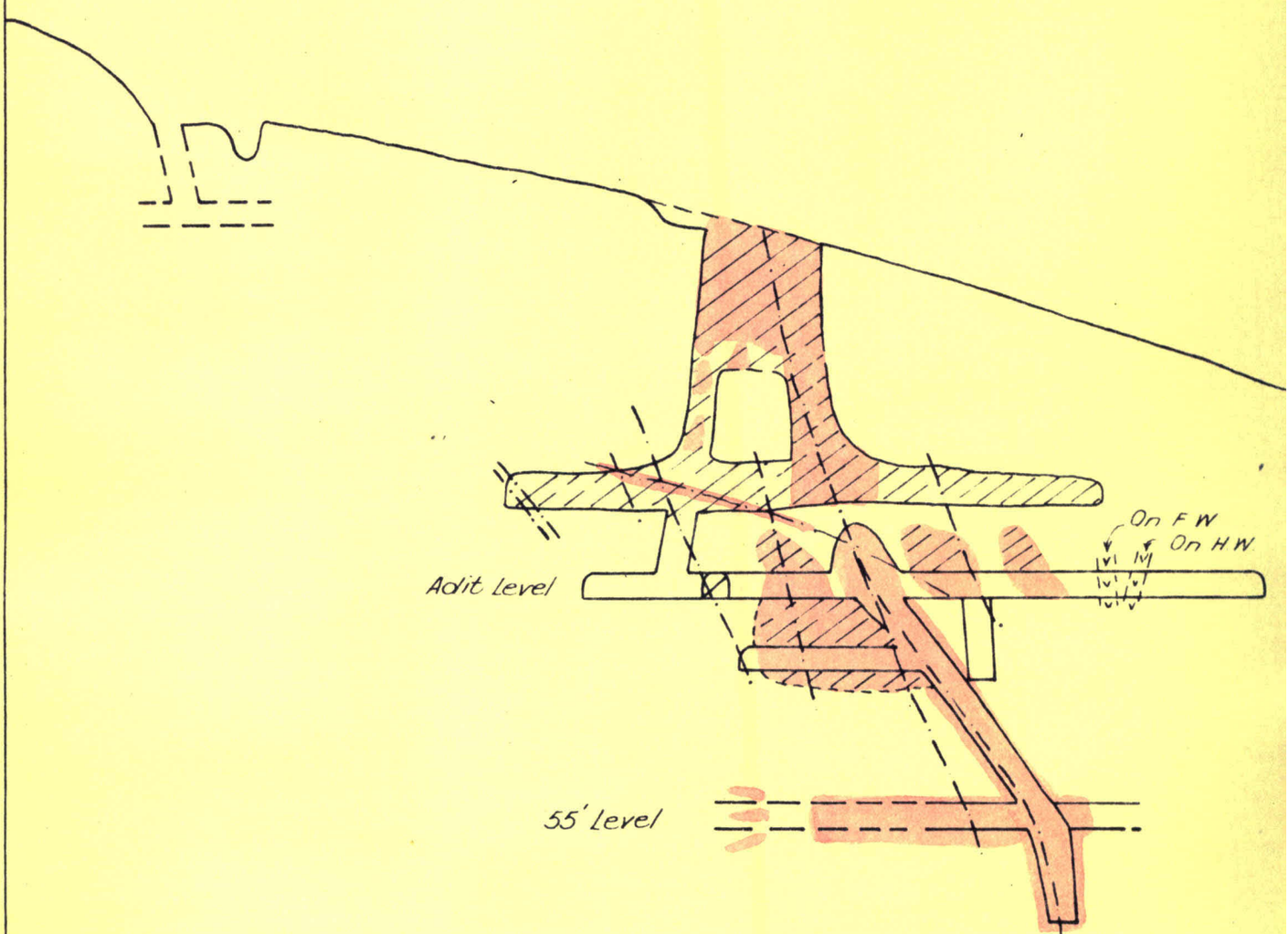
LONGITUDINAL PROJECTION
NO. 1 (DRAPER'S) SECTION.
COIMADAI ANTIMONY MINE
VICTORIA
LOOKING W.N.W.

Scale 1" = 40'

LEGEND

- Ore shoot
- Porphyry
- Stope
- Principal fault & shear intersections



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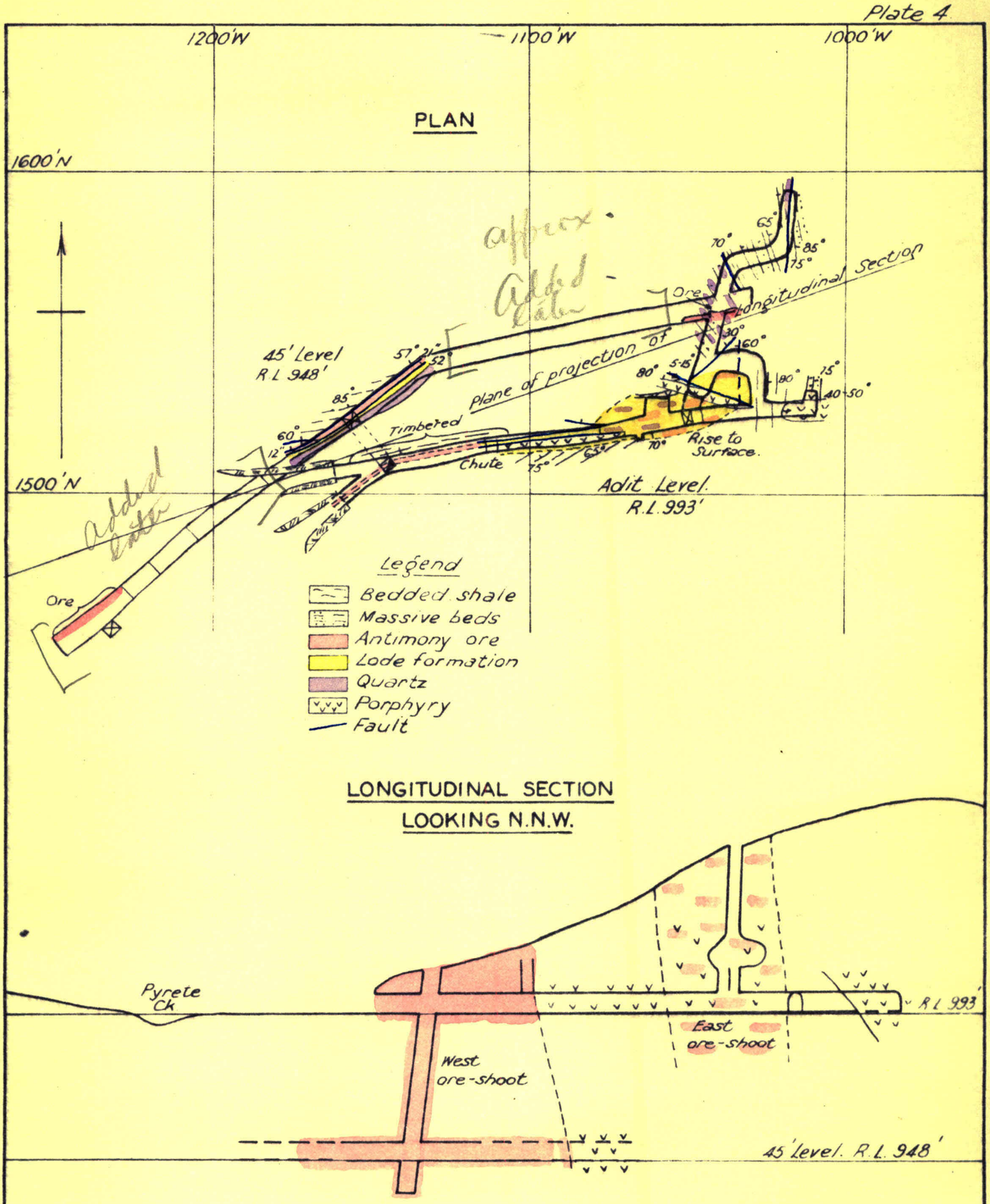
Dec. 1943



LONGITUDINAL SECTION
LOOKING N.N.W.

PLAN AND LONGITUDINAL SECTION
NO. 2 (BONDISON'S) SECTION
COIMADAI ANTIMONY MINE, VICTORIA
Scale 1" = 40 ft

H H Fraser
Chief Geologist
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Dec. 1943

V4a-1