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Geological Report on the Chilcot Copper,
Mine, Cadia

by

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RECORD 1942/20

GEOLOGICAL REPORT ON THE CHILCOT COPPER MINE, CADIA.

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GEOLOGICAL REPORT ON THE CHILCOT

COPPER MINE, CADIA.

LOCATION ETC.

The Chilcot mine is about 15 miles from Orange by reasonably good road, in a south-south-west direction. The main shaft is 170 feet above Cadiangullong Creek on the opposite side and only $\frac{1}{2}$ mile distant from the Iron Duke iron ore deposits, which are connected to Orange by a light railway. Details of the geology and the general features of the district and of the iron ore deposits, have been presented by Dr. H. G. Haggatt in a report to the N.S.W. Mines Department. For further particulars of the Chilcot mine and equipment reference is made to Mr. H. Hawby's report to the Minerals Committee.

ORE OCCURRENCE

GENERAL FEATURES

The Chilcot ore body is a strong-brecciated lode usually 7 to 8 feet wide, striking northeast-southwest and dipping northwest at 85 degrees. The lode formation is brecciated andesite, and the country rock andesite of Silurian age. The foot-wall of the lode is a well defined fissure throughout, along which some movement has taken place, and while the hanging wall is sometimes similarly marked, it is as a rule not so distinct and can only be located in a general way by the breccia playing out and giving way to solid andesite. Faults are fairly frequent and have an important bearing upon the ore values. They are pre-ore, but subsequent to the formation by shearing stress of the brecciated lode channel. The faults displace the lode, but values on either side of the fault do not necessarily correspond. Many of the faults split into two main branches or give off smaller ones.

Ore minerals are found in the faults, which have undoubtedly acted as avenues of access for the mineralising solutions, but often are sufficiently crushed to indicate that slight post-ore movement may have taken place along the fault planes. Ore shoots are connected with the faults, but the pattern is complicated by the fact that the fissures defining the lode channel are included in this category. The ore is not entirely confined to the lode channel, as it may make out into the country on either side, or may follow the line of the displaced ore channel beyond a cross-fault into the country for a few feet on either side of the truncated lode.

The principal copper ore is chalcopyrite, generally in sub-rounded masses or lumps, up to 1 inch or so in diameter, or as smaller grains, but often as massive replacements of the brecciated andesite.

Individual fragments of the breccia up to 3 inches in diameter have been observed to be completely replaced by chalcopyrite, and mineralisation throughout is practically entirely by replacement of the susceptible andesite breccia. Bornite also is common, especially in the richer parts of the lode. Iron pyrite is distributed throughout the ore and relative increase in the proportion of pyrite may cause a lowering in copper values not readily noticeable by the untrained eye.

Hematite and magnetite are also present, especially on the upper level, and quartz and calcite are included

in the gangue. The quartz has been deposited earlier than the copper minerals. Dr. Raggatt considers that the monzonite intrusions, which outcrop within $\frac{1}{2}$ mile of the mine, are genetically responsible for the mineralisation. It is interesting also to note that the lode channel is roughly parallel to one of the regional faults in the area mapped by Dr. Raggatt.

DETAILS OF THE LODE

Workings

The lode has been developed by two levels, 160 feet in length, and at 104 and 178 feet depth respectively, with a vertical three compartment shaft 243 feet deep. Ore is being won from a stope between the Nos. 1 and 2 Levels northeast of the shaft. The levels and the stope were mapped on a scale of 1 inch to 30 feet. Geological plans accompanying this report include level and stope plans, Plate 1; a cross section through the shaft, Plate 2; and a longitudinal section, Plate 3, showing the workings and the distribution of the ore.

No. 2 Level

On No. 2 level the lode channel is well defined southwest of the shaft but contains little ore. A fault has displaced the lode right-handedly for 13-14 feet, near the end of the level. The continuation of the lode has been picked up in a cross-cut and drive, but it contains very little copper. Northeast of the shaft, ore comes in gradually along the foot-wall, and underfoot sampling returned good values. Near the northeast end the geology is obscured by timbering, but the lode is probably again displaced right-handedly by the fault system exposed in the stope overhead, and the end of the drive shows barren country with a little fissuring. A vertical winze was put down 18 feet, 30 feet northeast from the shaft. A cross-cut driven southeast through the lode from the bottom of the winze passed through 2 feet 6 inches of pyritic ore, a parcel of which, sent to Pt. Kembla returned only 2.2% copper and 47% FeO, and 6 feet of brecciated andesitic material with a few stringers of chalcopyrite. A drive 7 feet back towards the shaft from the bottom of the winze showed the values decreasing in that direction.

No. 1 Level

No. 1 level exposes 100 feet or so of reasonable ore, which has been partly stoped out above. The lode on this level is almost completely oxidised, except in the more massive portions, and water level is about this horizon. The ore previously stoped above No. 1 level may have been enriched oxidised ore. No sign of sulphide enrichment was noticed. Copper values near the surface appear to be low.

The drive is close timbered at the southwest end, but as the face is in barren solid andesite, it is assumed that the lode channel has been displaced to the northwest by faulting as on the No. 2 level. At the northeast end of the drive and in the cross-cut off it, a complex system of faulting has been responsible for irregular low grade mineralisation of lode and country over a considerable area, but the apparent net result is another displacement of the lode to the southeast, with the ore improving to the northeast, past the fault.

The back of the mill stope at the time of mapping was from 13-45 feet below the No.1 level. Except for a few narrow streaks, mineralization is poor at the end nearest the shaft, but comes in strongly in the lower portion of the stope, especially in the vicinity of a fault which displaces the northeast end of the lode to the right. Good copper values were exposed on both sides of the fault and out into the foot-wall country beyond the normal lode channel for some distance each way from the fault. The hanging wall of the stope followed a fissure along but values were poor for the first 4 feet in from the wall for the whole length.

PROSPECTS & RECOMMENDATIONS

Plotting the values known on the levels and in the stope on a longitudinal section (Plate 3) reveals a definite strong pitch to the northeast, at an average angle of perhaps 45 degrees. It cannot at present be definitely stated whether this is one continuous shoot or two separate shoots. In any case it seems that there should be a triangle of ore underneath the No.1 level southwest of the shaft. Ore above the stope appears to be limited by the low grade area northeast of the shaft on the No.1 level, but if the present bunch of good ore should persist up along the fault, several hundred tons will be available and new possibilities will be opened up in the unproved ground northeast of the fault on No.1 level.

The existence of such a strong lode channel, with a matrix so favorable to ore, in a proven copper-bearing area, simply demands further exploration for extensions of the known ore, or for new shoots. The continuation of the present shoot northeast down the pitch calls first for attention, as well as the practically untried ground northeast of the fault. With regard to possible extension of the ore beyond the present northeast limit of No.1 level, it would be preferable to let present stoping operations prove this section, if the ore in the stope should persist up to this horizon. If not, a drive northeast would be advisable on the No.1 level itself, as recommended by Mr. Hawby.

A cross-cut southeast at the extreme northeast end of the No.2 level is recommended to test for ore on that side of the drive and to examine the exact position created by the faulting in that area. Exploration below the No.2 level should take into consideration three factors:-

1. The northeast pitch of the ore shoot.
2. Association of ore with the steep cross-fault.
3. Extraction of the ore when proved.

A winze on the ore 70 feet northeast of the shaft would probably best meet these requirements.

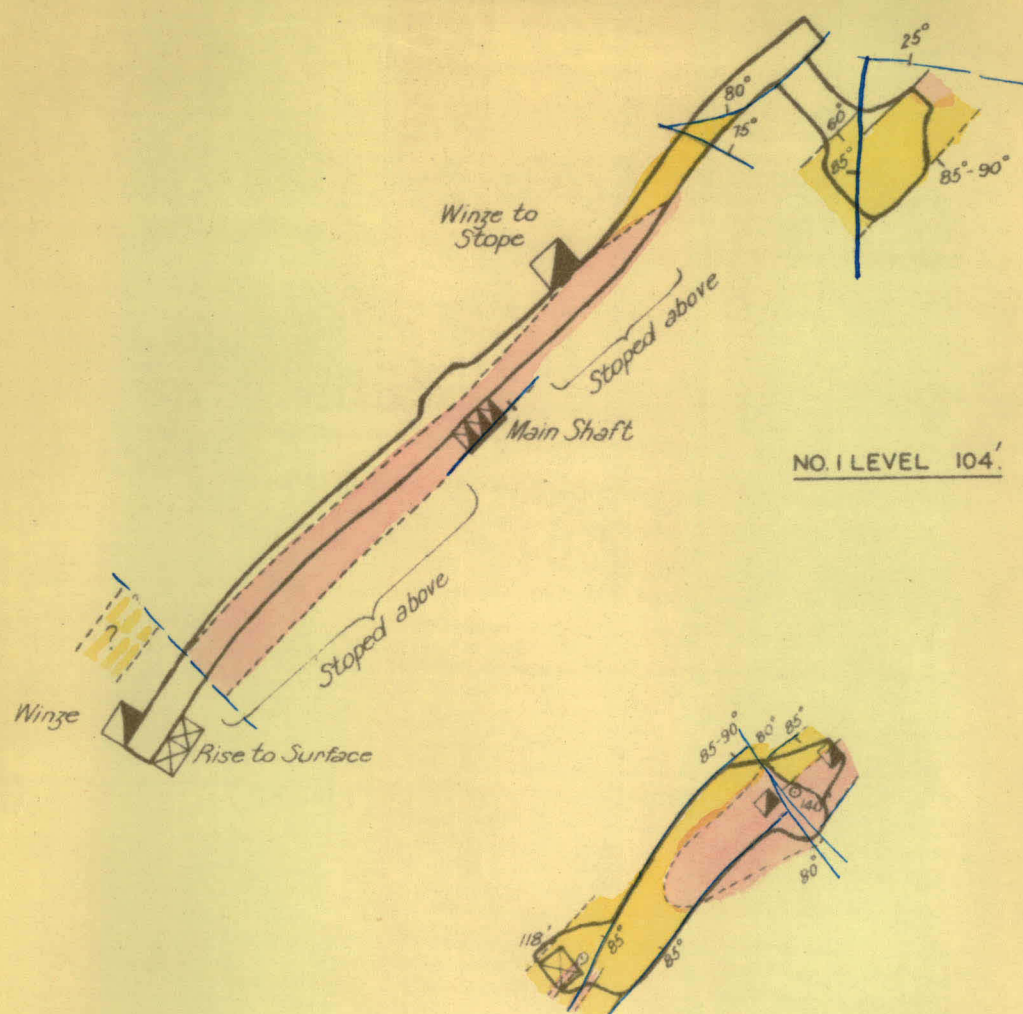
Exploration for further shoots along the lode channel is difficult to specify at this stage, in view of the possible association of shoots of ore with either cross-faults or fissures along the lodes, or other features not exposed, and it would be easy for a drive on any level to miss such a shoot. It is therefore recommended that geophysical methods be applied to the location of further ore areas, and the laying out of an exploration programme beyond that recommended above should be deferred until the results of their investigations are known.

SUMMARY

The Chilcot ore body is a steeply dipping, well defined fissure zone of brecciated andesite, with chalcoppyrite in shoots, averaging about 8 per cent copper. Other minerals are bornite, pyrite, hematite, magnetite, quartz and calcite. Pre-ore faults displace the lode channel and are associated with the mineralisation. The ore body is developed by two levels 160 feet in length at 104 and 178 feet depth, and ore is being extracted from a stope between the two levels northeast of the shaft. Water level is a little over 100 feet from the surface. The general pitch of the ore body is about 45 degrees to the northeast. Exploration is recommended of the probable northeast extension of the lode down the pitch, and geophysical investigation to attempt to locate further possible shoots of ore.

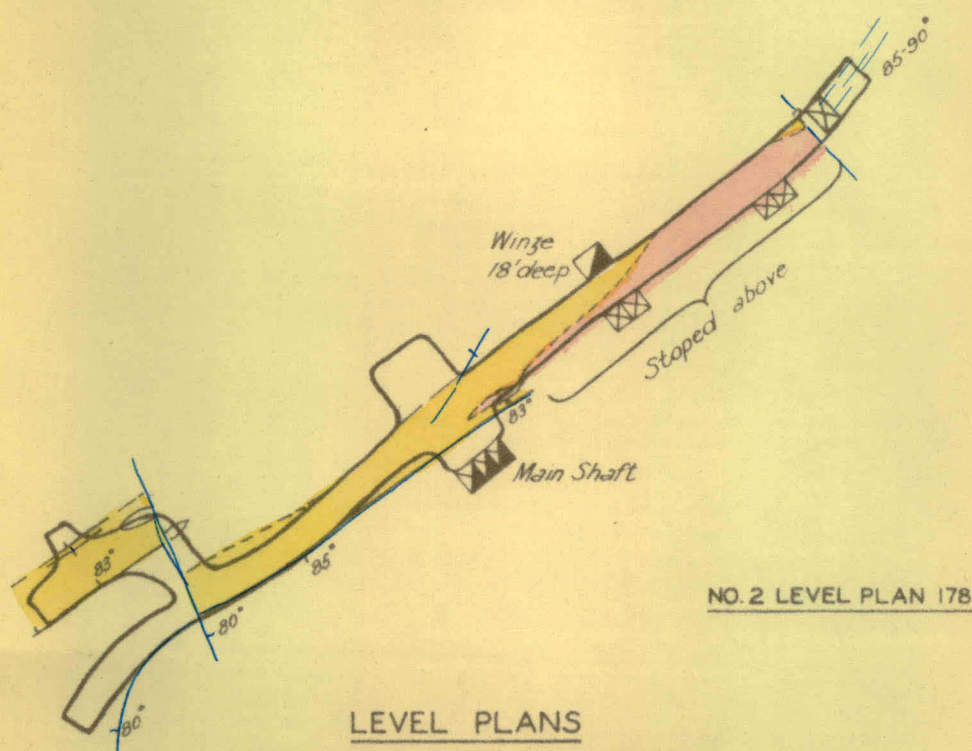
H. R. Fisher
H. R. Fisher

Chief Geologist.



STOPE PLAN 118-145' LEVEL

Main Shaft

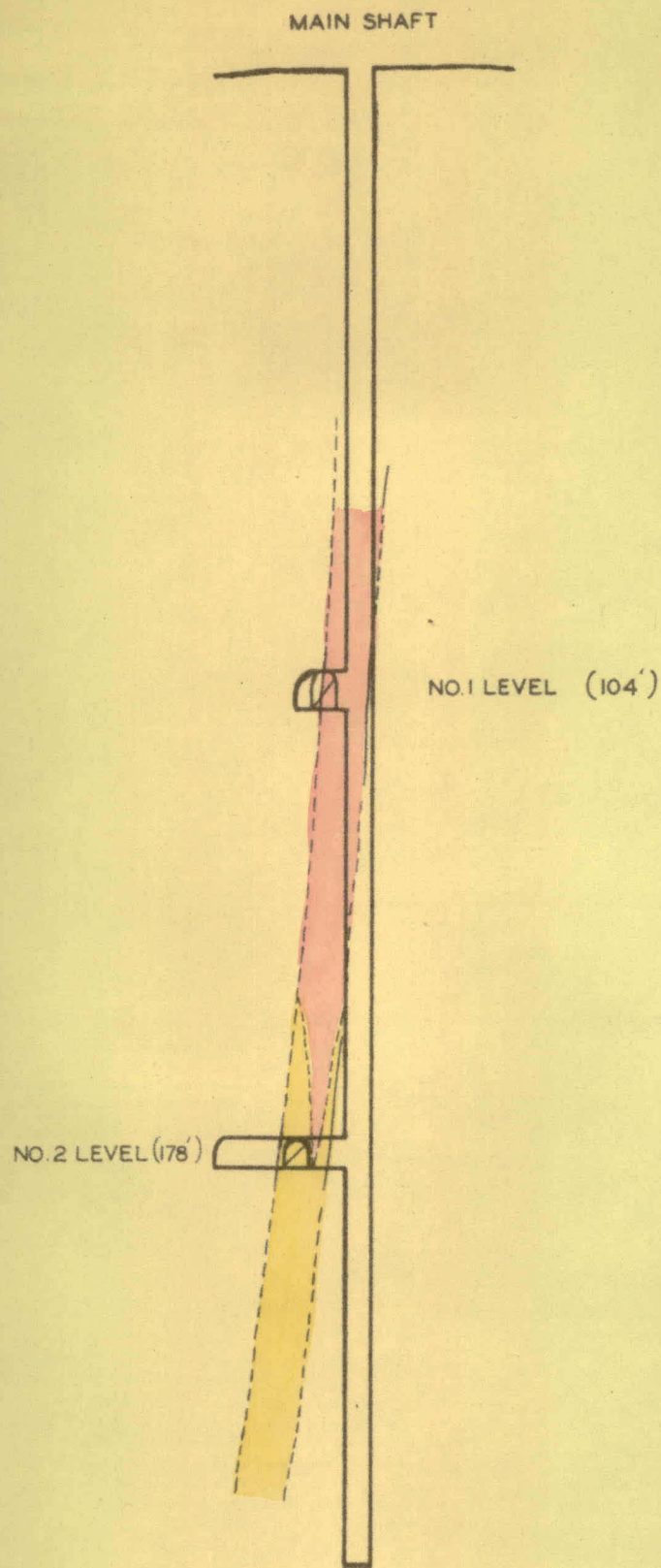


LEVEL PLANS CHILCOT MINE, CADIA.

SCALE 30'=1 INCH

Legend for all Plans & Sections

- > 5% Cu
- < 5% Cu
- Fault
- Lode channel brecciated andesite
- Country rock andesite

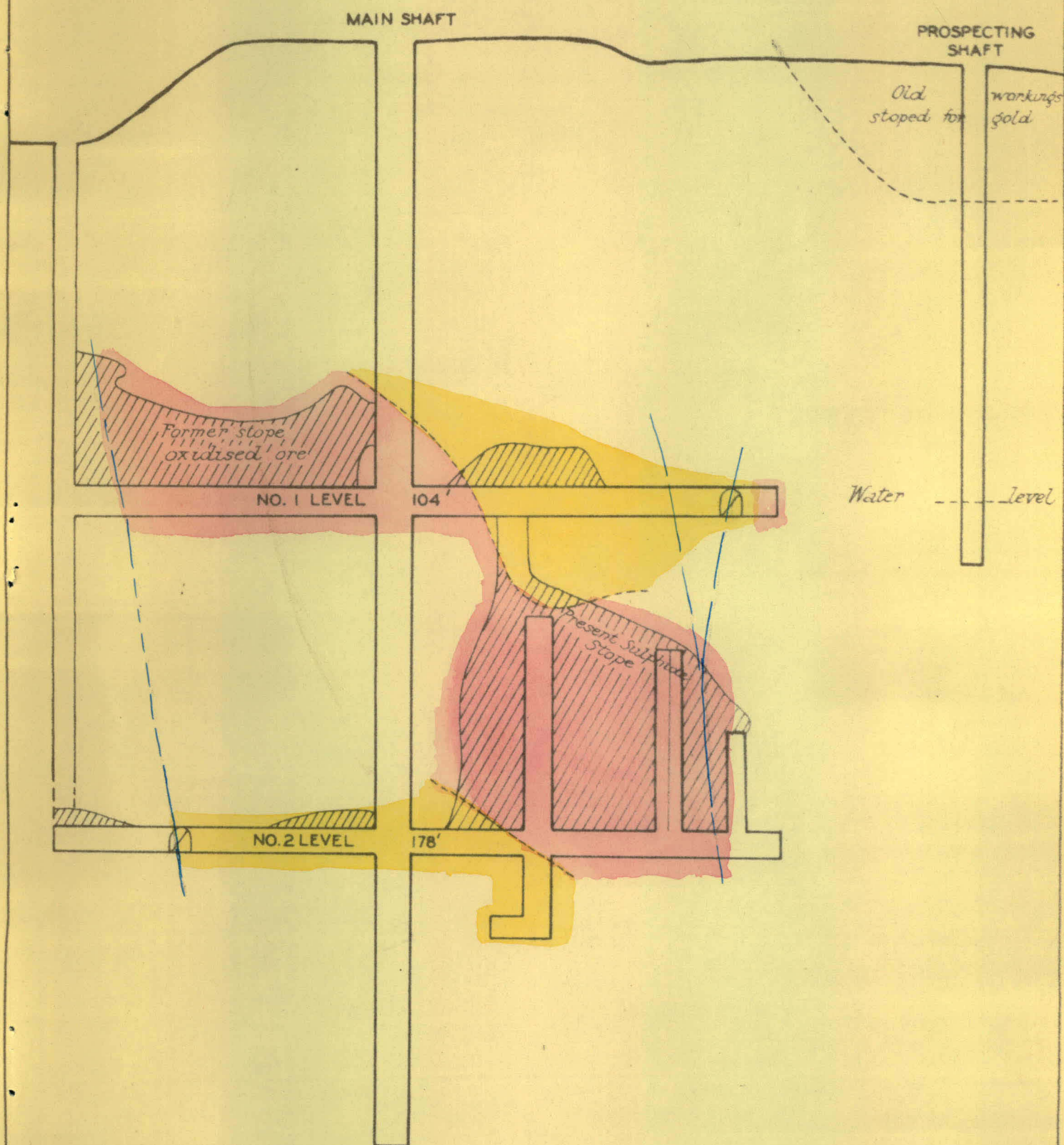


CROSS SECTION THROUGH MAIN SHAFT

CHILCOT MINE, CADIA.

LOOKING NORTHEAST

SCALE 30' = 1 INCH



LONGITUDINAL SECTION
CHILCOT MINE - CADIA
LOOKING NORTHWEST

SCALE 30'=1 INCH