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GEOLOGICAL REPORT ON THE MOUNT HOPE
COPPER MINE, MOUNT HOPE.

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GEOLOGICAL REPORT ON THE MOUNT HOPE COPPER MINE,
MOUNT HOPE.

INTRODUCTION.

SITUATION AND ACCESS:

Mount Hope is situated 11 miles north of Matakana on the main road which runs through to Cobar, 100 miles farther north. Matakana is 413 miles west of Sydney on the Broken Hill railway line. A light branch railway which formerly connected Matakana to Mount Hope has been dismantled in recent years. The mine property occupies portions 10, 12, and 34, Parish of Mount Hope, County of Blaxland. The village of Mount Hope, adjacent to the mine, comprises hotel, store, post office, police station, bush nursing establishment, and a few houses. The mail car meets all passenger trains, which arrive from Sydney Mondays, Wednesdays and Fridays at 11.30am., and from Broken Hill on Tuesdays, Thursdays and Saturdays at 3.30 pm.

MAPPING:

Ten days were spent in examination of the property, from July 8th to 18th. All accessible underground workings were mapped in detail on a scale of 30 feet to 1 inch and the surface in the immediate vicinity of the mine on the scale of 100 feet to 1 inch. Mr. J.W. Whiting of the New South Wales Geological Survey provided competent assistance during the surface and part of the underground mapping. Mr. W.P. Green of Zinc Corporation Limited and his assistants did everything possible to facilitate the examination of the workings. Plans which have been prepared to accompany this report comprise: Surface plan, Plate 1, plans of all levels and of intermediate stopes, Plates 2-8, east-west cross-sections through the lode at 50 feet intervals, Plates 9 to 13, a longitudinal projection of the lode showing the distribution of mineralisation, and a longitudinal section outlining the amount of stoping which has been done, Plates 14 & 15.

TOPOGRAPHY:

The surrounding country is mostly flat and fairly well timbered with "cypress pine", small eucalypts, bolah etc. West of the main road and also to the north a series of small porphyry hills and ridges rise to a height of 200 to 300 feet. Mount Solitary is a similar, but isolated, hill a few miles east of Mount Hope. The outcrop of the Mount Hope lode occupies the crest of a low ridge which is elongated in a north-south direction. The highest point on the ridge is 80 to 100 feet above the general level of the country and is 860 feet above sea level, as determined by reference to Mount Hope Trig. Station.

WATER:

Dams within 600 yards of the mine have a capacity of at least 1½ million gallons. A bore on the flat near the mine struck water at 240 feet depth, which rose to 150 feet, and is considered to be capable of delivering 8,000 gallons per day. The mine water production is given in old reports as 14,000 gallons per day. During the recent drilling campaign, after dewatering the mine, 34,000 gallons per day had to be pumped to keep the water level constant. This was increased slightly by a flow struck in the deep diamond drill hole, No. 4, from the bottom of the shaft. It is probable that if pumping were maintained long enough, the surrounding country would be drained out and the flow of water would ultimately decrease to approximately the 14,000 gallons originally reported. When pumping ceased the mine water filled up to within 50 feet of the 270' level within two weeks. In the early stages of dewatering the mine water was very corrosive but improved in quality after pumping had been in progress for some time. The Great Central

dam, 4 miles south of Mount Hope at present contains 8 to 10,000,000 gallons of water, but its total capacity is many times greater than this figure.

TIMBER:

The variety of pine locally known as cypress was used during mining operations in log form, and its durability is shown by the fact that with the exception of one short stretch on the 100' level all of the workings are in excellent condition, and this timber has been in place for at least 40 years. An abundant supply is readily available close to the mine so that provision of adequate timber for mining operations would present no difficulty.

HISTORY:

HISTORY

The Mount Hope ore body was discovered by a miner named McDowall in July, 1878. The mine was worked by the New Mount Hope Copper Mining Company from 1881 to 1902, with a break owing to low copper prices from 1885 to 1887. From 1890 onwards most of the work was done by tributers. The mine was closed from 1902-06 when it was re-opened under a new Proprietary, and operated until 1908. In 1913 Mount Hope Limited acquired the mine and between 1913 and 1918 the dumps were treated by the Pechey leaching process and a certain amount of mining and development done, particularly on the lower levels. In 1920 the shaft was deepened to 383 feet and preparations made for resuming, but no further production was achieved and the plant was finally sold up in 1929. Commencing April, 1942, Zinc Corporation Limited, acting in conjunction with the Controller of Minerals Production, dewatered the mine and put out shallow inclined drill holes eastward from the bottom of the shaft to test the sulphide zone below the 340' level. Results of the drilling will be dealt with in detail later in this report. At the time of writing pumping has ceased, the water has been allowed to fill up to its original level and preparations are being made to extract ore from the upper levels. Mining of sulphide ore above the 340' level and recovery of copper from the slag dumps by flotation will be undertaken later. Following is the production table compiled from the reports of the New South Wales Mines Department and from the records of the New Mount Hope Copper Mining Company:

PRODUCTION TABLE MOUNT HOPE COPPER MINE.

Year	Tons Smelted.	Copper Produced.	Remarks.
1881-2	3087	661	
1883	3269	706	
1884	6194	1258	
1885	4290	633	
1886-7	--	--	(Mine idle owing to low price of copper.
1888	1187	133.5	
1889	1870	260	
1890	1143	235.2	
1891	1094	208.3	
1892	1160	191.1	
1893	1049	203.2	
1894	893	135.1	
1895	858	143.5	
1896	1093	141.5	
1897	984	133.5	
1898	1012	131.6	
1899	662	103.8	
1900	1571	242.4	(Concentrating plant installed.
1901	1093	195.4	
1902	2504	47.1	Approximate.
March, 1902 to 1905.)	--	--	Mine idle.
<u>TOTAL TO 1905</u>	32769	5761.2	Average Smelting recovery 17.6% Cu.

Year	Tons Treated.	Copper Produced.	Remarks.
1906	6950	173	
1907	8500	305	
1908	8305	235	
1909	--	--	Mine idle
1913	15000(tailings) 3000(oxid. ore)	105	{ Leaching process installed.
1914	--	66	{ From leaching of tailings
1915	--	70	- do. -
1916	--	111	- do. -
1917	6550	267	
1918	8231	299	8500 tons ore raised.
1919	--	8.9	
<u>TOTAL FROM 1906 TO 1919</u>		--	1639.9
<u>TOTAL COPPER PRODUCTION</u>		-	7401 TONS.

WORKINGS.

The Mount Hope mine has been developed by four principal levels, the 100', 150', 270' and 340', according to their depth below the collar of the Main Shaft. The former 60' level is now largely absorbed in the open cut. The 100' is the most extensive level, with drives 210 feet north and 160 feet south from the main crosscut. Details of the workings are shown on the various level plans, Plates 3, 5, 7 and 8. The main shaft is vertical, or intended to be, though actually it is not quite plumb. Total depth is 383 feet, two compartments to 340' level, three compartments below. The various levels and stopes are connected by ladderways and the whole of the mine is readily accessible at all times down to permanent water level at 282 feet depth. As the water had been pumped out at the time of the examination it was possible to map all the workings in detail.

The ore has been extracted by open cut, and by cut and fill stoping with a certain amount of timbering where necessary. The open cut measures approximately 150' by 50' on the surface, and reaches a depth of 80 feet. Stopes have been opened out to the full width of the lode on the levels and the ore followed upwards. Of the whole width broken, the ore was selected in the stopes to smelting grade, so that only one ton out of every two or three broken was sent to the surface, the remainder being left as filling in the stopes. Any additional filling required was drawn from the open cut. At a later stage in the operations lower grade ore was mined and concentrated by jigs etc.

Above the 100' level stoping has erratically followed lenses of ore and many of the stopes are merely openings on the level up to 30 feet high. Between the 150' and 100' levels there is a main stope north and south of the Main Shaft, crosscut (Plate 4), and other smaller ones. From the 270' level up, ore has been extracted from one main stope to an average height of 80 feet, with some smaller stopes above in the southern half. On the 340' level, the original drive was opened out to an average of 17 to 18 feet width and stoped up to 27 feet high with a maximum width of 45 feet above the level just south of the cross-cut (see Plate 8). Two small intermediate stopes exist between the 350' stope and the 270' level. The ground stands well even in the oxidised zone and as a rule little timbering has been necessary.

GENERAL GEOLOGY.

The country rock of the Mount Hope mine varies from shales or mudstones to moderately fine-grained sandstones. In the mine they are generally fairly massive except where longitudinal shearing has developed the fissility of the shales, but in outcropping exposures

surface weathering shows up bedding and shear planes more conspicuously. The general strike is from 0° - 10° east of north, but divergences from this direction occur. The dip is consistent to the west from 75° to 90° except in the immediate neighbourhood of the ore-body on the eastern side, where steep easterly dips are common. Mr. A.C. Lloyd of the New South Wales Geological Survey (Progress Report A.R.D.M. New South Wales, 1937, Page 121) refers the Mount Hope sedimentaries to the Cobar Series of Silurian age. He describes them regionally as "slates, phyllites, cleaved and crushed calcareous sandstones and quartzites, which have been altered and intensely folded by orogenic movements towards the close of Silurian times." The most prominent geological feature at Mount Hope is a strong band of massive sandstone, up to 20 feet or more in thickness which runs along the crest of the low ridge on which the mine is situated. Other similar bands of lesser thickness and more lenticular habit parallel the main one. This principal sandstone bed south of the mine strikes 120° east but at 250' from the main shaft, at a point where its thickness locally increases to about double the normal width, it makes a definite bend to the west and for the next 300 feet strikes 12° west. North of this the strike reverts to normal and remains very constant at 6° east (see surface plan, Plate 1). Dip at the surface of this bed is 75° to 80° to the west throughout. The less competent beds parallel the main sandstone band do not observe the same definite dislocations in strike, but are adjusted to the displacement by a gradual bending and shearing of the strata.

On the flat 700 to 800 feet east of the centre of the Mount Hope ridge an elongated outcrop of quartz-felspar-porphyry is imperfectly exposed. Though largely masked by alluvium it appears to be comparatively long narrow sill conforming, in strike at least, to the sedimentary rocks. In composition it is typically of the porphyry intrusives of the district, described by Mr. Lloyd, and in the writer's report on the Great Central Mine.

ECONOMIC GEOLOGY.

GENERAL DESCRIPTION:

The Mount Hope ore-body is contained within a mass of sheared country of generally lenticular shape, immediately to the north of the prominent flexure on the surface in the main sandstone rib. The maximum dimensions of the ore-bearing ground are 360 feet vertical, 270 feet longitudinal and 90 feet through. The vertical axis of the lens dips east at 75° - 80° and has a slight pitch south at perhaps 5° from vertical. As the different mineralised sections, which are seldom clearly defined enough to be referred to as separate lodes, occur in a more or less en echelon arrangement, successively more easterly from south to north, the horizontal axis of the whole ore body strikes somewhat more easterly than the bedding, varying from 15° to 35° east on the various levels.

Mineralisation at Mount Hope is mainly in thin veins and streaks along bedding or shear planes. They usually follow the general direction of the bedding but are often transgressive, cutting obliquely across, and sometimes forming an intricate network of tiny veinlets which lie generally parallel to the strike of the beds. Veins in bedding planes between massive beds are common, or the veins may follow the bedding for some distance, then break across along fracture or shear planes to another bed. Areas of higher grade mineralisation are due to more intense shearing of the beds prompting freer access of mineralising solutions, while the nature of the beds may also have had some effect, thinner beds being more susceptible to shearing and partial replacement than the massive ones. In general, replacement processes have played a very minor part in the formation of the ore bodies, which may be described as aggregations of small veins occupying fracture, shear and bedding planes.

RELATION OF ORE DEPOSITION TO STRUCTURE: At some time subsequent to the general orogeny which was responsible for the closely folded structure of the Cobar Series, forces operating in a N.N.E.-S.S.W.

direction affected the Mount Hope Mine area, resulting in a relative displacement to the west of the northern section by about 100 feet. The exact nature of this displacement is clearly shown by the main sandstone bed at the surface (Platel) which has been sufficiently competent to resist fracturing and to move as a whole. The more friable parallel beds of shale and mudstone to the east have been extensively sheared by this movement and instead of moving bodily to conform with the sandstone, they have adjusted themselves to the new structure by shattering and shearing, though without conspicuous faulting, and their strike as far as it can be followed through reflects more gently the definite displacements of the sandstone rib. The local thickening of the sandstone south of the open cut appears to have acted as a buttress against which the shearing forces operated in pivotal fashion. On the surface, running north-northeast from the open cut for nearly 400 feet, a conspicuous zone of shearing is developed, characterised by fracturing parallel to the strike and parallel to the axis of the shear zone, with numerous tiny quartz veins filling the fractures, and by a certain amount of iron staining and silicification. Sandstone beds, coarser grained than the adjacent mudstone, but not so prominent as the main sandstone bed, occur in line with the eastern edge of the open cut, and it is possible that they cut off further mineralisation towards the north-north-east, confining it to the inner portion of the shear zone back so far as the principal sandstone bar.

Shearing is fairly well developed throughout the mine and it is often difficult to distinguish from bedding, especially as the angle between bedding and shear planes is acute. In places shearing definitely predominates over bedding. Faulting is not common in the mine and the few faults observed appear to have small displacement. Flat fractures are plentiful throughout the workings, usually more or less at right angles to the dip of the beds.

The direction of bedding underground shows local slight variations, with an average of 15° east through the mineralised section on the upper levels, decreasing to 6° east on the bottom level. Dips vary from the normal steep westerly dip to steeply east. The easterly dip is especially noticeable along the eastern side of the ore body, but becomes steeper going down (refer to cross sections, Plates 9 to 13) and in depth - 340' level and below - reverts to the normal westerly direction. Striations, on slickensided surfaces, especially prominent along the walls of the 150' level south stope, pitch at steep to moderate angles to the north. The whole structure is best explained by the application of shearing stress from the north-northeast resulting in a slight overturning of the strata in the upper levels with a general adjustment by shearing to the main movement as revealed by the sandstone.

Formation of individual ore lenses within the mineralised area is irregular. Defined walls seldom exist, bands of good ore following the bedding may be separated by lower grade ore, or barren rock, and mineralisation may make from one band to another or follow local zones of shearing slightly transverse to the bedding. Shoots often lens out both horizontally and vertically, or the grade may gradually decrease across the whole width, or drop very sharply. Shearing has localised the ore zone as a whole, but apart from its differential effect, from one section to another, factors governing the size and extent of individual shoots are probably bound up with variations in the original texture of the rocks both along the strike and between different beds, thinner beds being more susceptible to shearing and subsequent mineralisation than massive ones. Detailed microscopic examination of the country rock from the various parts of the mine might reveal these differences but no economic purpose would now be served by such investigation.

By plotting the axial line of the mineralised area on the plan of the various levels an interesting measure of the relation of shearing to mineralisation is obtained. On the 150' and 270' levels where the lode obtains its maximum development, the axis

of mineralisation makes an appreciable angle, up to nearly 300, with the general strike of the beds while on the 60' and the 340' level, respectively above and below the principal mineralised area, the two almost coincide. The cross sections indicate that the mineralisation dies out, presumably because the shearing does likewise, when the beds revert approximately to their standard steep westerly dip.

ORE DISTRIBUTION:

Surface and 60' Level - The lode on the surface is said to have been up to 24 feet in width over a length of 120 feet. This is now represented by the open cut. In the open cut and on the 60' level (Plate 2) some streaks and lenses of ore remain but much of the mineralised section on the 60' level has been leached of its copper content, leaving friable limonitic material behind. Leaching is most conspicuous in the bedded and shattered ore bands, but has also taken place in the thin seams of ore lying between massive shale beds.

A prospecting shaft put down 250 feet north-northeast of the main shaft in the centre of the shear zone, is said to have passed through "kaolonised lode material". The south prospecting shaft 800 feet south of the Main Shaft is reported to have passed through a flat make of ore at 116 feet.

100' Level - The 100' level represents a horizontal section through the ore body at a point just above the most heavily mineralised portion, and the mineralisation is beginning to weaken perceptibly upwards. Narrow shoots and streaks are in evidence but as a rule are not persistent. Good values are exposed in the stope just under the main crosscut. Ore on this level is associated with noticeably thinner beds, often playing out where the shales become massive, evidence of local shear zones. Fractures are abundant and dip west at a low angle. At the south end in particular mineralisation plays out suddenly leaving only a little ironstaining and irregular silicification.

150' Level - The values on the 150' level and in the stopes above it show a marked increase in regularity. As much of the level is timbered, values have to be interpolated from the exposed sections and from reports by John Munday and others, made when the level was being opened. Dips on this level are 80-90° to the east and fractures flat to the west.

270' Level - The stopes below the 150' level demonstrate clearly the change from completely oxidised to sulphide ore. The upper sub-level stope, 23 feet to 30 feet below the level, is still in oxidised ore; the next sub-level, 48 feet below the level, shows the chalcopryite in the transition stage to copper oxide; while in the main stope just below, the ore is almost entirely chalcopryite with a little black oxide of copper showing on exposed faces and a considerable development of post-mine copper sulphate crystals. The force of crystallisation of these secondary minerals from solution has been great enough here and elsewhere in the mine to open up the cracks along which they have percolated and caused slabbing off of sections of the walls and back of the workings.

The 270' level was driven at a horizon just below the main mineralisation, more or less corresponding to the 100' level above it, for below the level the values retreat rapidly. Mapping on the level is limited by timbering, and ore distribution has been reconstructed on the plan (Plate 7) from present exposures and from reports and plans by Munday, Audley Smith and others. A little minor faulting was observed and fractures are mainly flat or dipping slightly to the east. A cross-cut 65 feet west from the shaft passed through barren steeply dipping shales with conspicuous fracturing and shear zones in places, and a little copper staining. Small quartz veins are plentiful in a long south-east cross-cut outside the limits of the mineralised area.

Four winzes have been put down from this level, two in the main cross-cut, one to the north, one to the south. In the first

winze in the cross-cut medium grade ore passes out in the east wall at 15 feet depth and the remainder is in barren rock. The winze at the end of the cross-cut cuts irregular streaks of ore, decreasing generally downwards to the 340' level, to which it is connected. The north winze for 14 feet depth contains excellent sulphide ore, which plays out suddenly on a flat floor dipping into the east wall (see section B-B', Plate 10). The south winze (not mapped in detail) was sunk on a streak of 6% Cu. ore, which according to John Munday, passed out on the north side of the winze at 40 feet depth (Section D-D', Plate 12).

340' Level - The 340' level consists of a cross-cut 150 feet long with a stope drive on the lode for a total length of 150 feet. Ore plays out completely at both ends. Just above the level south of the cross-cut the stope has been opened out on both sides without revealing anything but narrow streaks of ore. Mineralisation consists of seams of sulphides running along roughly parallel to the bedding, but sometimes cutting across, and separated by varying thicknesses of barren rock, with occasional specks and veinlets.

Average of 188 feet of sampling on this level, which includes 70.5' by W.P. Green averaging 4.1% Cu. and 117.5' by J. Audley Smith averaging 3.6% Cu. is 3.8% Cu., and this may be taken as a representative value for the level although it includes two samples by J. Audley Smith assaying less than .5% Cu.

Diamond Drilling - Four inclined diamond drill holes were put out eastward from the 340 level plat. Their position is shown in plan on Plate 8. Details of the holes are summarised as follows:

No. of Hole.	Co-ordinates of collar referred to datum point.	Bearing.	Inclination.	Depth.
No. 1	3'S., 36.5'E.	96°E.	-20°	207'
No. 2	6'S., 31'E.	133°E.	-21°	187'
No. 3	4.5'N., 31'E.	62°	-21°	204'
No. 4	2.5'N., 31.5'E.	96°E.	-43.5°	247.5'

From 100-116'6", only 40 feet below the 340' level (Plate 11) No. 1 hole passed through low grade sulphide mineralisation averaging 1.7% Cu. A few other splashes of chalcopryite were observed in the core, and a little silicification, brecciation and quartz veining from 81 to 87 feet. Nos. 2, 3 and 4 holes contained no copper values. In No. 2 occasional quartz veinlets were noticed from 71 to 163 feet, in No. 3 from 76' to 166', and in No. 4 from 76' to 126', with fairly pure quartz from 180' to 186'. It is worth recording that a considerable flow of water was met within No. 4 hole, which was drilled later than No. 1, and after this the water was found to be drained out of the south winze from the 270' level.

Mineralisation Intensity Diagram - To illustrate the shape, extent and intensity of mineralisation, a longitudinal projection of the lode (Plate 14) has been prepared, on which thickness contours have been drawn. In plotting these contours, in order to gain a truer picture of the actual quantity of copper at any section through the ore-body, ore better than 6% Cu. has been allotted double the value of ore 3 to 6% Cu. i.e. 1' of 3 to 6% Cu. is adopted as the unit of mineralisation, while 1' of over 6% Cu. is evaluated at two units. This longitudinal section shows clearly the dimensions of the ore body, playing out altogether below the 340' level, and with its maximum development between the 100' and 270' levels. The values shown in the upper part of the section, together with the small size of the former surface outcrop, plainly indicate that the original top of the lode was not far above the present surface, so that the shape of the whole ore body was that of a roughly oval lens with its long axis almost vertical and its horizontal axis just below the 150' level.

The embayment from the north of lesser mineralisation between the 270' and 150' levels about the centre of the picture, may be partly due to the fact that the country west of the 270' stope

has not been explored and may contain bands of ore which would to some extent eliminate this apparent anomaly.

A statement which frequently appears in reports on the Mine, particularly by interested parties, that "the limits of the ore body longitudinally, transversely and vertically have not been determined, is, of course, substantially incorrect, as it is obvious from the plans that the exploration carried out has been quite adequate to satisfactorily determine the full extent of the ore, and the diamond drilling has disposed of the possibility of the lode continuing below the 340' level.

ORE MINERALS:

The primary mineral is almost exclusively chalcopyrite. Practically no pyrite or other metallic sulphide was seen. The principal minerals in the oxidised zone are malachite, particularly in the upper levels, with azurite, chalcantite etc., and cuprite. The Mines Department records that thick arborescent masses of native copper were frequently found in the upper levels and also small quantities of cerussite. (Small particles of native copper were also found in some of the drill holes below the 340' level).

In the transition zone from 180' to 270' depth, all stages in the oxidation of chalcopyrite to cuprite can be observed, but chalcopyrite is still the dominant mineral up to near the top of this zone. Both in and above the transition area black oxide of copper, melaconite, is common on exposed faces of chalcopyrite and cuprite. Chalcocite has been identified from this zone. Very little gold is present; a concentrate obtained during flotation tests and assaying 28% Cu., contained only .2 dwts. Au. per ton.

Quartz occurs fairly commonly throughout the mine, but is not usually associated with the ore. Its most typical mode of occurrence is as a vein filling in flat fractures. Some of these veins may be more than 1 foot thick, but are usually less, and they are seldom more than a few feet in horizontal extent. They may contain a proportion of ore minerals, which are later than the quartz. The quartz veins are shattered parallel to the direction of shearing and appear to have been emplaced before the main copper mineralisation. They are nearly always found along the margins of the lodes, seldom within the mineralised area. Occasional quartz veins conforming roughly to the strike and dip of the beds contain a higher proportion of copper and seem to be more closely associated with the mineralisation. Another type of quartz is a very thin but persistent veining noticed in the surface shear zone and in several cross-cuts in the mine outside the ore area. Irregular silification of the shales is not uncommon particularly at the ends of the ore body. In general the presence of silica in any form does not seem to be a favourable sign for ore.

SECONDARY ENRICHMENT:

Although chalcocite has been recognised from the transition zone it is not plentiful, and the part played by supergene sulphide enrichment is comparatively small. In the lower part of the oxidised zone it is probable that the values have been enhanced by secondary processes. From the 60' level to the surface extensive leaching of copper from the lode is evident, so it is reasonable to assume that it has been added to the ore lower down. The mineralisation intensity diagram, Plate 14, suggests a close correspondence between ore values and the lower limit of partial oxidation, but this is largely coincidental, though secondary processes may have lifted the grade the necessary 1 or 2 per cent to register on the diagram. In general the outline of the ore shown on the various plans corresponds closely to the outline of the ore shoots as originally deposited.

The principal factor limiting the amount of secondary enrichment which has taken place is the probable small amount of copper available for redistribution. It has been pointed out in discussing the longitudinal projection of the lode, that the ore

body begins to decline above the 100' level, the surface outcrop was small, and the original ore probably did not persist much above the present surface.

The relation of the sulphide zone to the permanent water level is unexpected. Water stands in the mine at a depth of 282 feet, 12 feet below the 270' level, yet for 80 feet above this level the ore is dominantly sulphide, and throughout this section most of the signs of oxidation are sulphates of post-mine origin. The main change over from chalcopyrite to oxide takes place just above the 270' main stope at about 200' from the surface, and is well exemplified in the first sub-level stope above the main stope (Plate 16). The obvious inference is that there has been a recent lowering of the water table by about 80', but it is equally obvious that such a change was not achieved by an equivalent lowering of the surface, as the topography has evidently been stable for a sufficiently long period to lead one to expect complete oxidation down very close to water level.

ORE RESERVES:

It is apparent from Plate 14, even without the negative results of the diamond drills, that the ore body naturally bottoms not far below the 340' level and that no possibility exists of extracting ore below that horizon. Production from the mine therefore must depend on ore that can be mined above the bottom level -- in other words, Mount Hope becomes a salvage proposition only. Owing to the method in which mining was originally carried out -- largely by tributaries gouging out rich patches -- it is virtually impossible to make any accurate estimate of ore reserves, a difficulty which is further increased by the erratic nature of the ore lenses and the lack of continuity from one level to another. Mining will be largely a matter of following the patches of ore which remain, and extreme caution will have to be exercised coming up under sections previously stoped.

Between the 270 and 340' levels the ore zone pitches south, and though not continuous (refer to 270' level plan, Plate 17, and Sections B-B', C-C', and D-D', Plates 10, 11, and 12) it can probably be mined as one series of operations. The best ore showing between the levels is in the north winze and as the ore pitches south this winze should be connected for mining purposes by an inclined rise from the north end of the 340' stope. The south winze could also probably be utilized. A revised estimate of the tonnage available between the two levels gives a maximum of 10-11,000 tons. Average value on the lower level is 3.8% Cu., in the intermediate stopes (limited area; W.P. Green's sampling) 6.3% Cu. and on the 270' level (J. Audley Smith) 5.45% Cu. so that 4.5% Cu. seems a safe average grade to assume for this ore.

Above the 270' stope the ground at the north end is unbroken up to the 150' level. The extreme north ore shoot was tested by diamond drill from the 150' level and found to be lensing out, 6.5% averaging only 4.3% Cu., in two high grade streaks, (Section A-A', Plate 9). Probable ore here amounts to 900 tons at 8.5% Cu. Above the north half of the main stope 2500 tons may be expected, which from sampling in the stope averages only 4.4% Cu. However by selective mining this grade could probably be increased above 5% Cu. In the southern portion of the stope a large area of good sulphide ore is exposed in the back, but stoping operations here will be limited by the smaller stopes above, which are partly filled with mullock and timber. It is considered that perhaps 2,000 tons of ore going 6% or better are obtainable here, mostly sulphide, while around the central portion of the main stope and from the sub-level stopes it may be possible to gouge out a few hundred tons of similar grade. Reference to Sections C-C' and D-D', Plates 11 and 12 show that ore is exposed on both 150' and 270' levels west of the area covered by the 270' stope, and as previously mentioned in reference to Plate 14 it is possible that a band of ore occurs here. Short horizontal drill holes west from the 270' stope at 20' north and 20' south should be sufficient to test this area.

Ore between the 150' and 100' levels is practically confined to the north stope, where the ore-bearing section has at least 20 feet backs and contains 2,000 tons, average grade 6.4% Cu. on stope sampling, omitting two samples in practically barren rock. Tonnage may be increased here by extending the stope both north and south. Small quantities of payable ore may also be obtained from the sub-level stope off this main stope and from the north end of the south stopes just below the 100' level. Similar gouging operations may win small quantities on and above the 100 feet level up to the 60' level.

The following tabulation shows the ore reserves in the various sections very approximately. The difficulties in the way of any exact estimation have already been pointed out but the figures presented will be useful as a working guide:

<u>Section of Mine.</u>	<u>Tonnage.</u>	<u>Grade.</u>	<u>Remarks.</u>
Between 340 and 270' levels.	10500	4.5	Sulphide ore
Above 270' stope extreme North.	900	8.5	Almost completely oxidised
Between 270' Main Stope North and 150' level.	2500	4.4+	Mostly oxidised
Above 270' Main stope south.	2000	6.0+	Mostly sulphides
270' sub-level stopes. say	500	6.0+	Transition ore
150' stope North up to 100' level.	2000	6.4	Oxidised ore
Other stopes in this level say	300	6.0+	- do. -
Above 100' level say	200	6.0+	- do. -
<u>Total</u>	<u>18900</u>	<u>5.25%</u>	

Copper content 987 tons, recoverable say 90% - 888 tons.

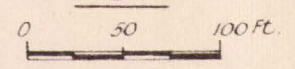
SUMMARY:

The Mount Hope Mine, which has produced 7400 tons of copper, is developed down to 340 feet from the surface by four main levels. The ore-body is generally lenticular in shape, and mineralisation is localised by N.N.E. shearing in steeply dipping Silurian shales and mudstones adjacent to a resistant sandstone bed. The ore is in shoots and poorly defined mineralised areas, with the copper minerals mainly in veins and seams running roughly north-south, more or less parallel to the strike of the country rock. Primary minerals is chalcopyrite, main oxidised ore cuprite and malachite. Secondary enrichment is unimportant. Shearing and mineralisation both decline below the 270' level and drill holes failed to find values 40 feet below the 340' level. Production from the mine depends upon extracting marginal grade ore left in the stopes and an approximate estimate indicates 10 - 11,000 tons sulphide, 3,400 tons oxidised and 5,000 tons mixed ore, with a total recoverable copper content of 888 tons.

N.H. Fisher
(N.H. FISHER)
CHIEF GEOLOGIST.

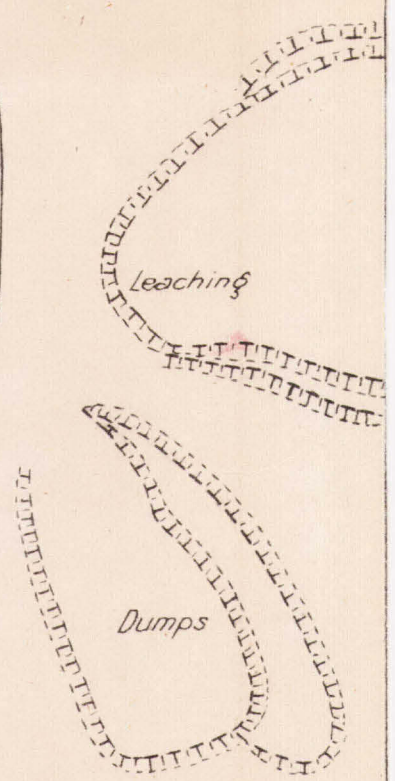
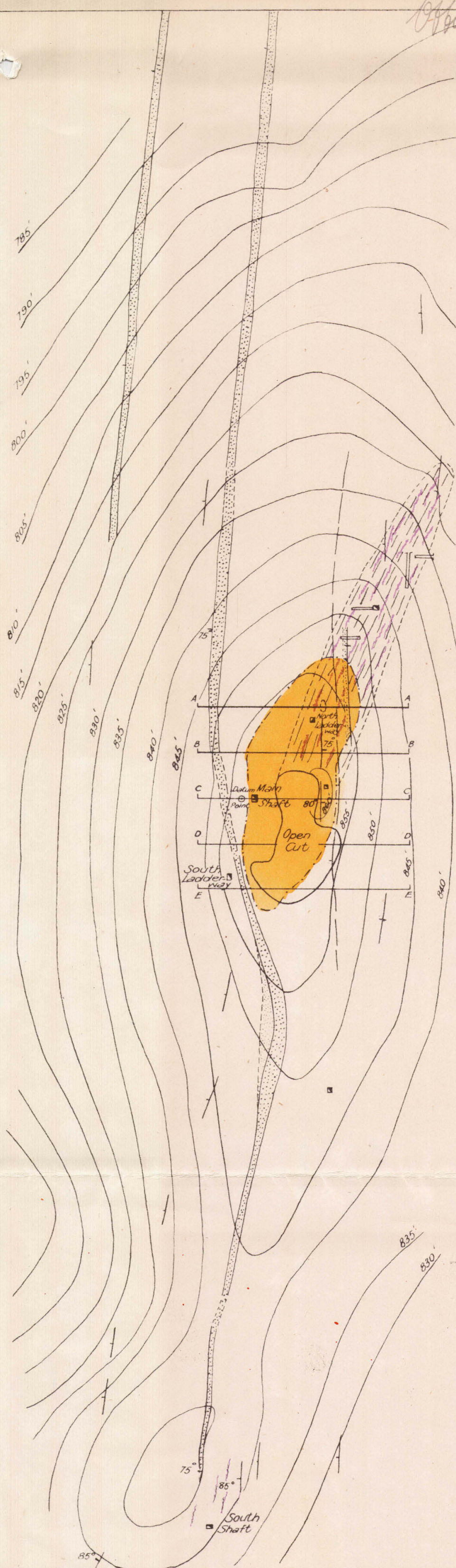
14th September, 1942.

**SURFACE
GEOLOGICAL PLAN
MT. HOPE MINE
PARISH MT. HOPE
COUNTY BLAXLAND
N.S.W.**



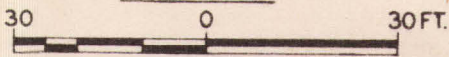
Contour heights above sea level referred to Mt Hope Trig. Station.

- Shales, phyllites
- Massive sandstone
- Shear Zone
- Quartz veinlets
- Strike & dip
- Section Line
- Ore-bearing area down to 150' level projected to surface.



— GEOLOGICAL PLAN —
60' LEVEL (R.L. 796') ✓

— MT. HOPE —



100' E

Section A-A'

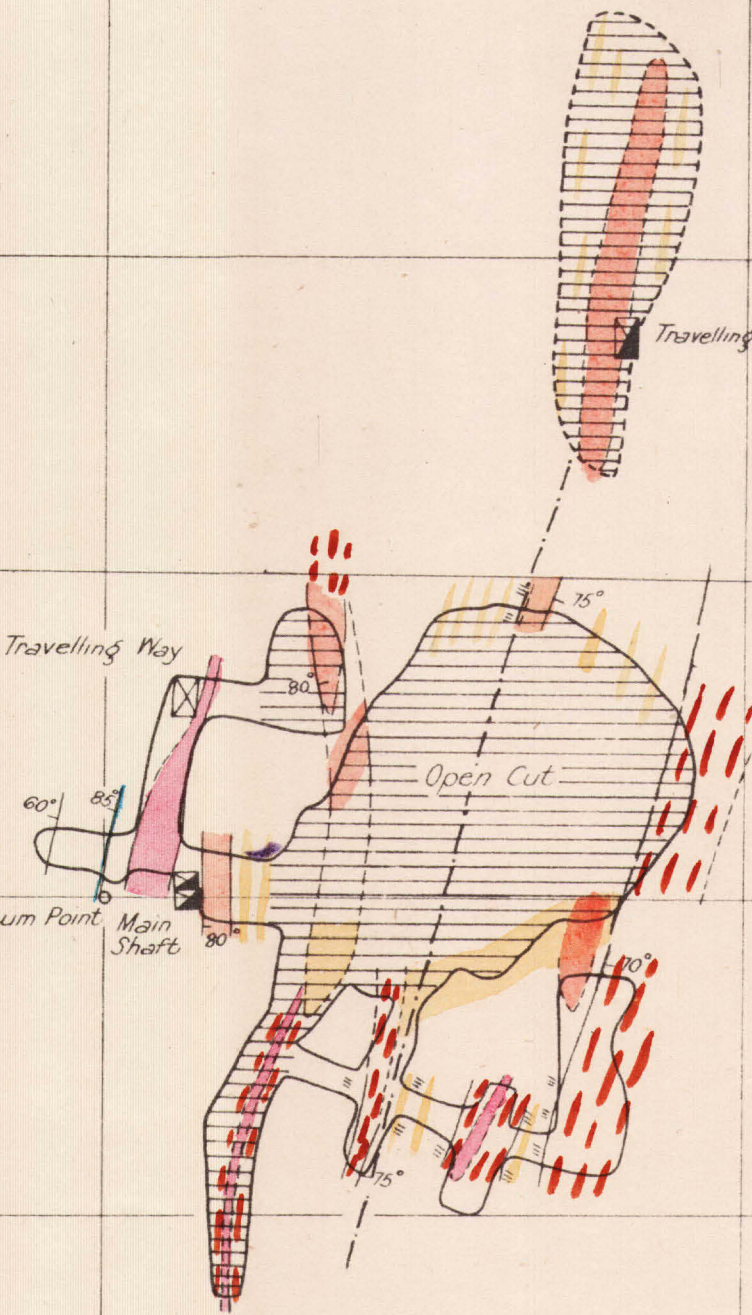
100' N

Section B-B'

Section C-C'

Section D-D'

Section E-E'



— LEGEND —

- > 6% Cu
- 3-6% Cu
- < 3% Cu
- Secondary Copper Staining
- Quartz veins, usually flat.
- Leached Sections
- Silicification
- Approximate slope outline on and just above levels

- Rise
- Winge
- Chute
- 70° Strike and dip of bedding
- 10° Direction & dip of fracturing
- Fault
- Section Line
- Axis of Mineralisation



— GEOLOGICAL PLAN —
100' LEVEL (R.L. 755')
— MT. HOPE —
FOR LEGEND SEE PLATE 2.

30 0 30 FT.

Section A-A'

100' N

Section B-B'

Section C-C'

Datum Point

Main Shaft

Section D-D'

Section E-E'

South Travelling Way

Sheared

Rise to Surface

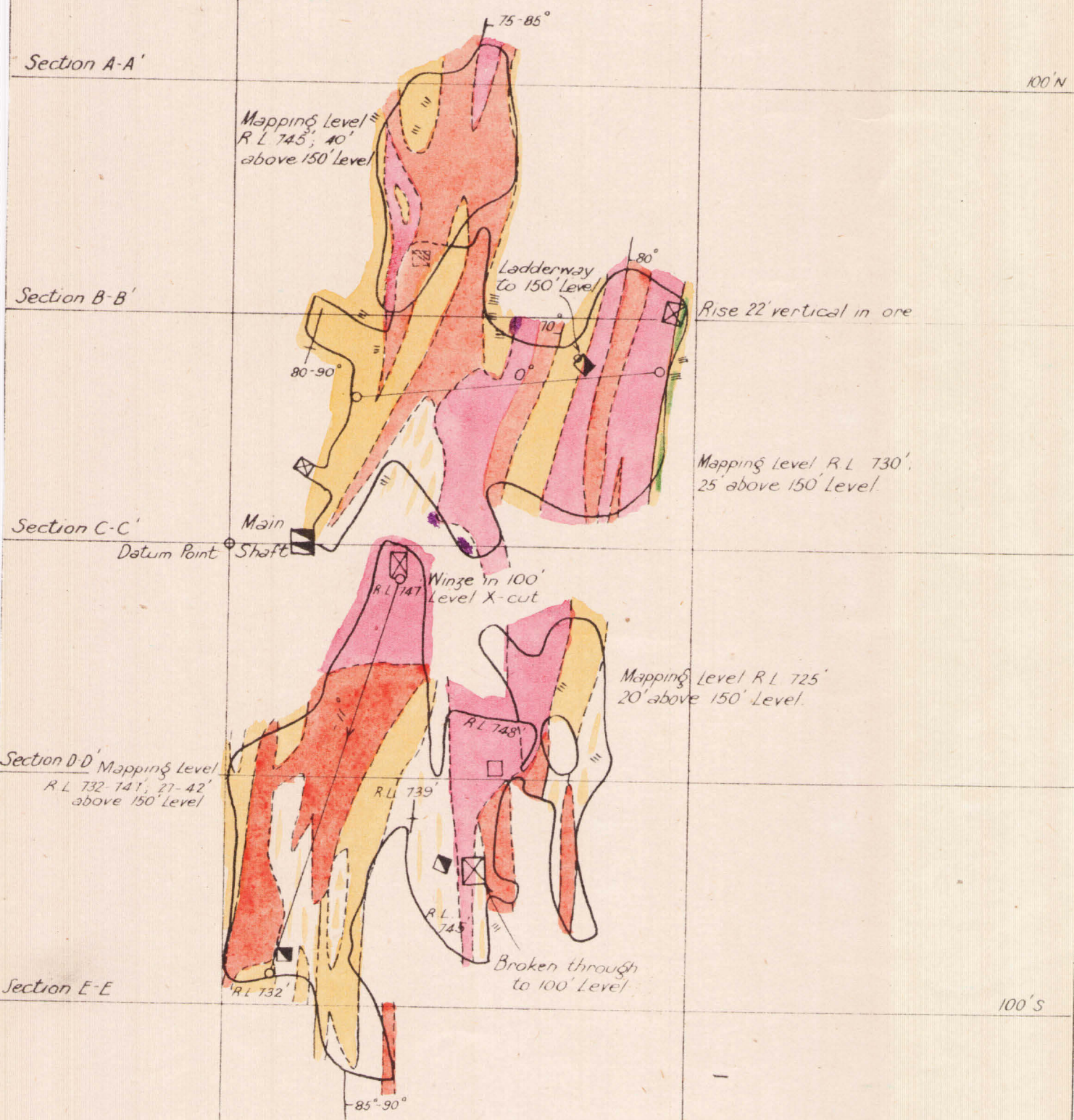
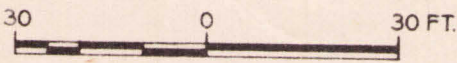
not known

Exact slope outline

Inaccessible

100' S

— GEOLOGICAL PLAN —
150' LEVEL STOPES (R.L. 725-748)
MT. HOPE
FOR LEGEND SEE PLATE 2.

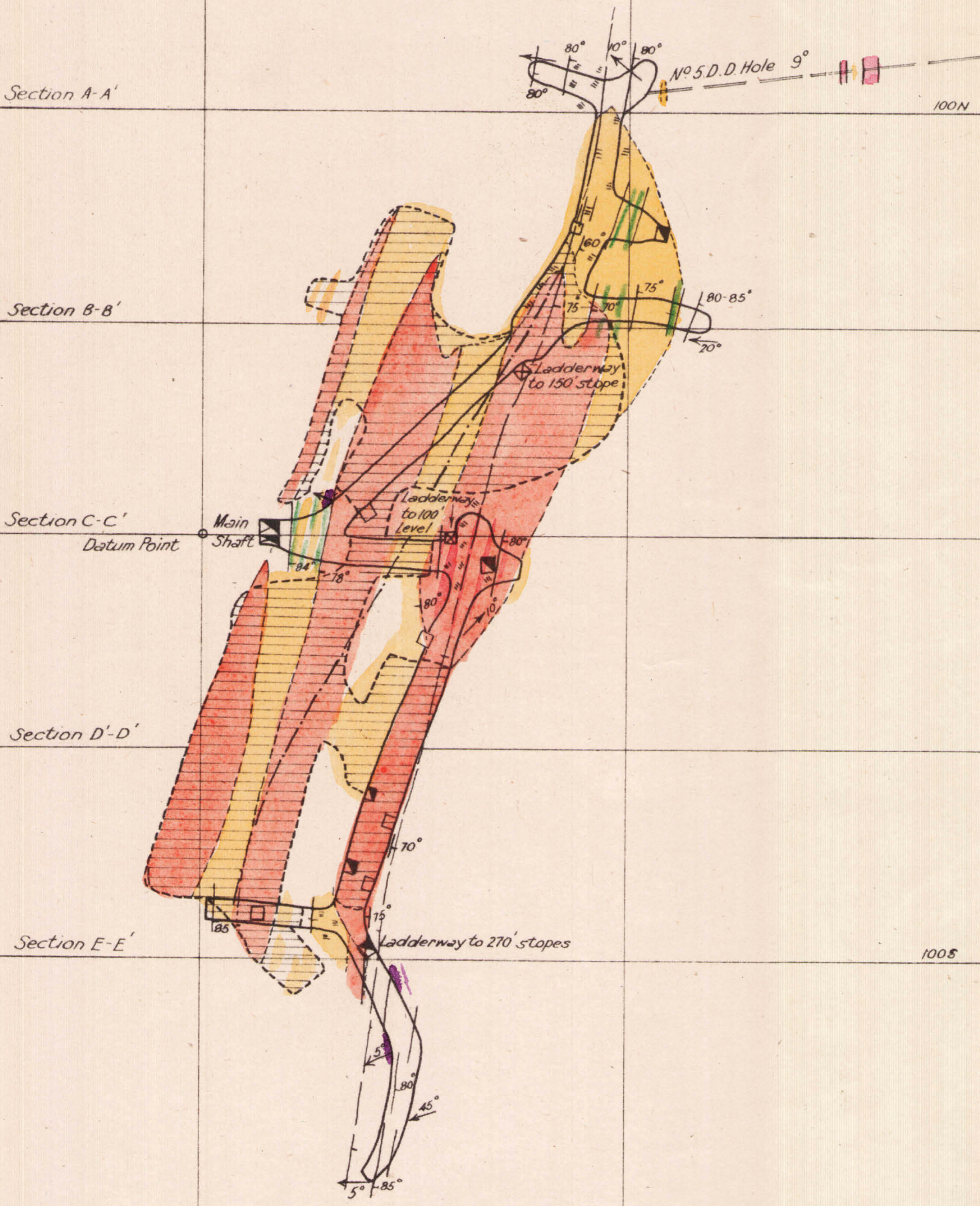


— GEOLOGICAL PLAN —
150' LEVEL (R.L. 705')

MT. HOPE
FOR LEGEND SEE PLATE 2.

30 0 30 FT.

Values Generalised from available information



— GEOLOGICAL PLAN —
270' LEVEL STOPE (R.L. 614 - 682')

MT. HOPE



FOR LEGEND SEE PLATE 2.

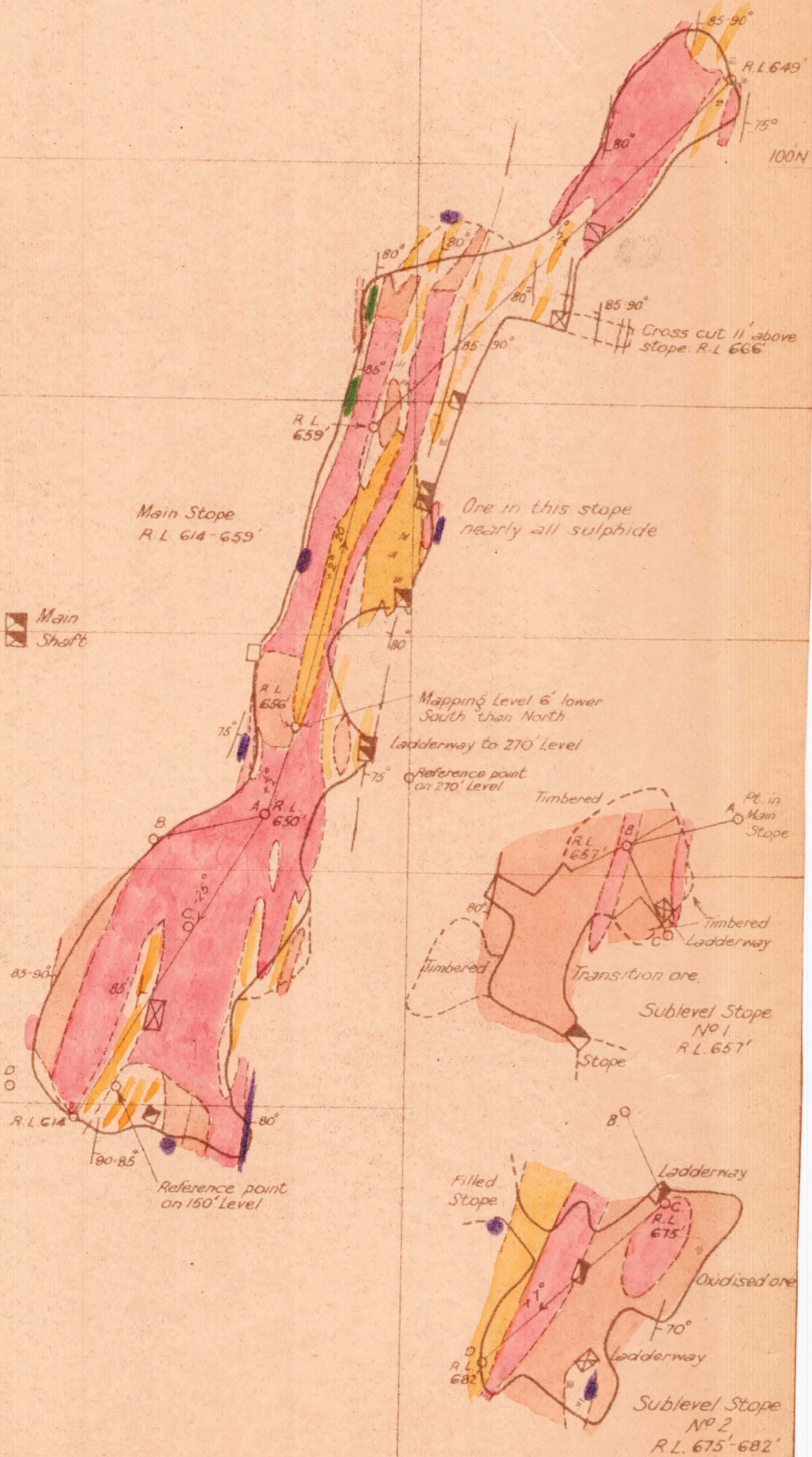
Section A-A

Section B-B'

Section C-C'

Section D-D'

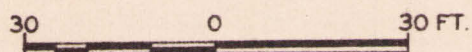
Section E-E'



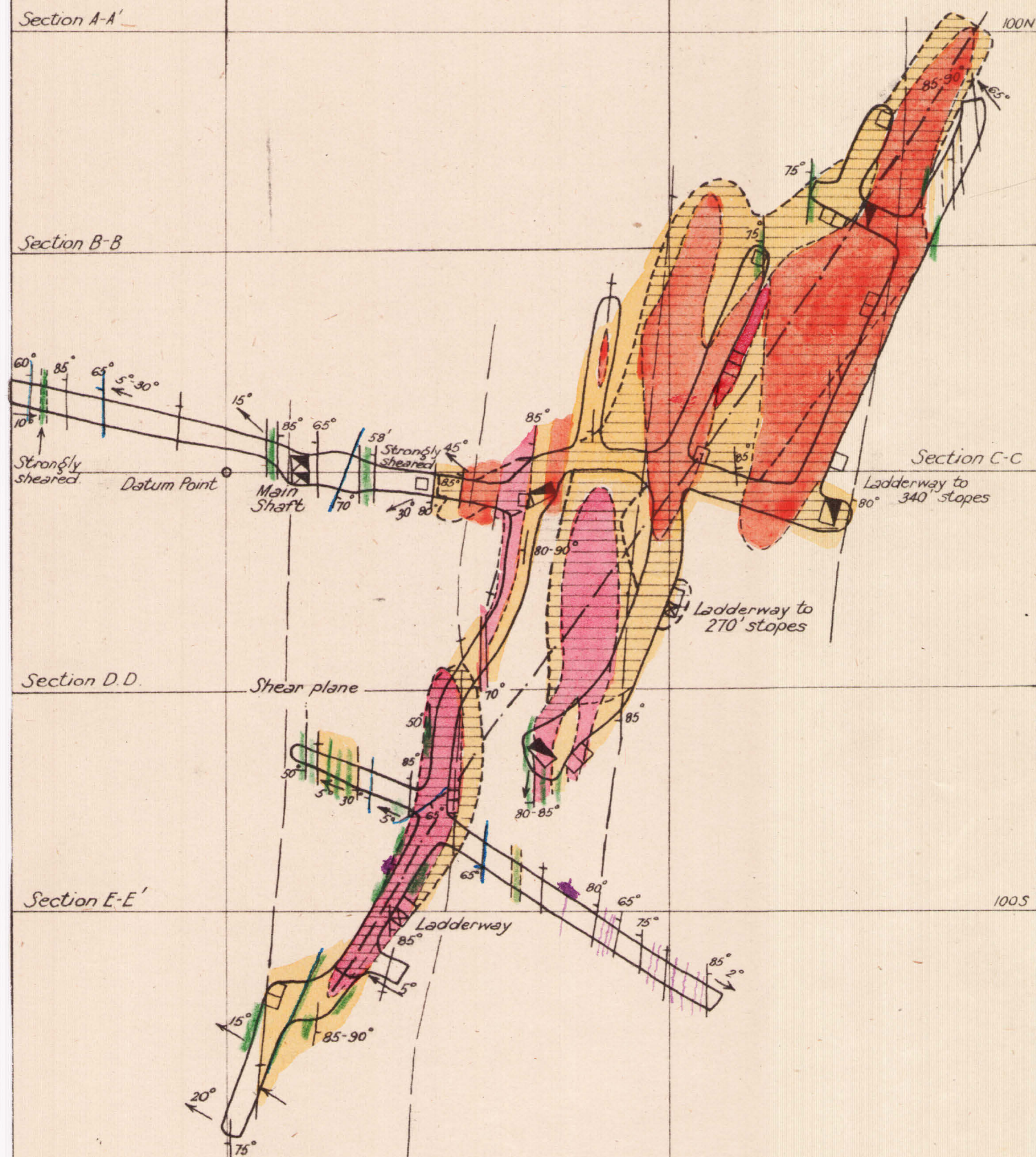
GEOLOGICAL PLAN
270' LEVEL (R.L. 585')

— MT. HOPE—

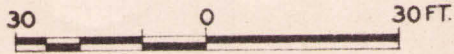
FOR LEGEND SEE PLATE 2



Values generalised from available information



— GEOLOGICAL PLAN —
340' LEVEL (R. L. 515')
MT. HOPE
FOR LEGEND SEE PLATE 2.



Note:- 16'-6" from 100' to 116'-6"
in D.D. Hole N°1 averaged 1.7% Cu.
See Section C-C'

Section A-A'

100'E

Section B-B'

Section C-C'

Datum Point

Section D-D'

Section E-E'

Ladderway

Sublevel Slope N°2
R.L. 566'

Ladderway

Sublevel Slope N°1
R.L. 551'

Slope outline 20-25'
above Level floor

Ladderway

(Barren)

N°1 D.D. Hole -21° 207'
(Barren)

N°3 D.D. Hole -21° 204'

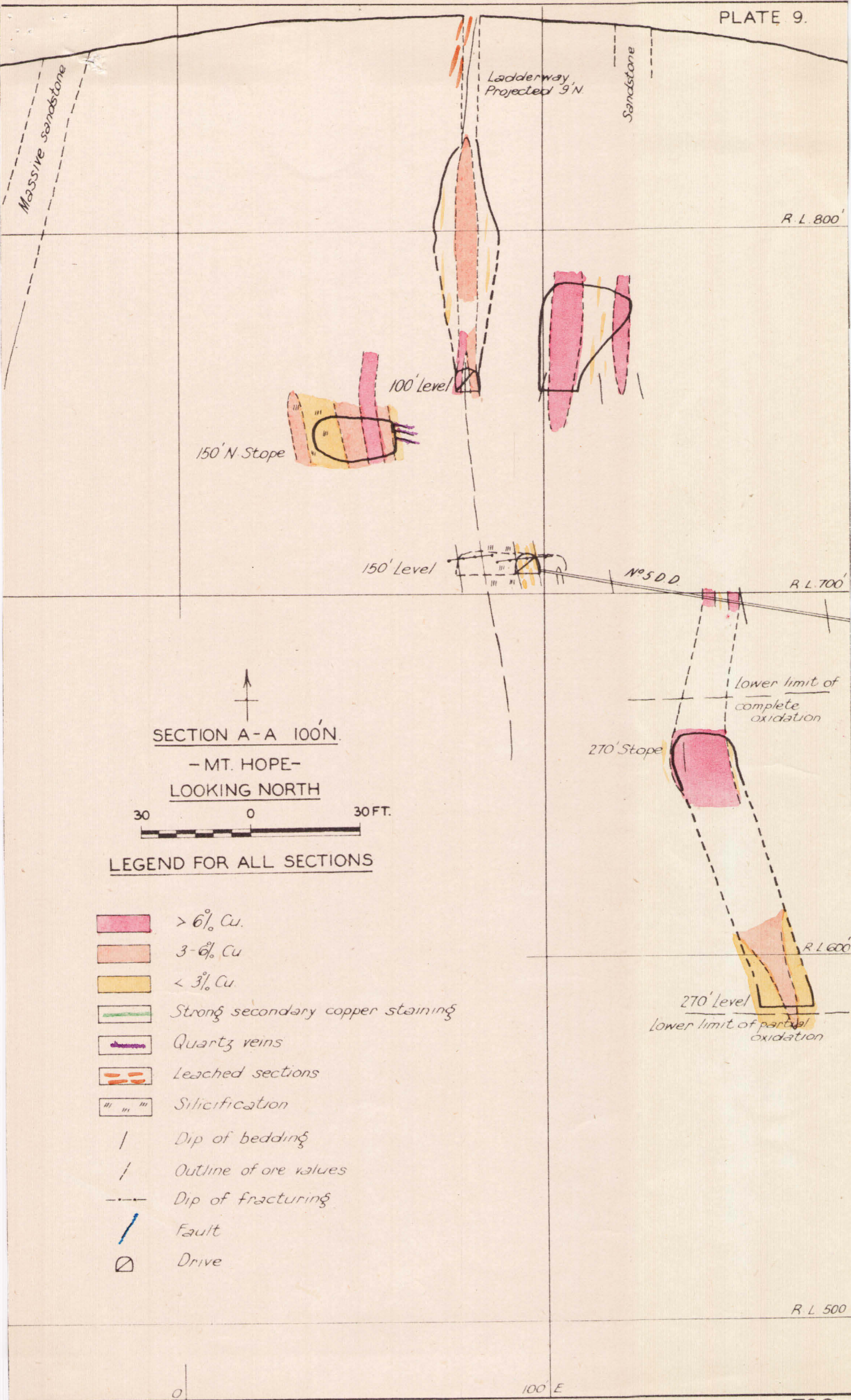
N°4 D.D. Hole -43½° 247½'

N°2 D.D. Hole

R.L. 515'

21° 187' (Barren)

100'S

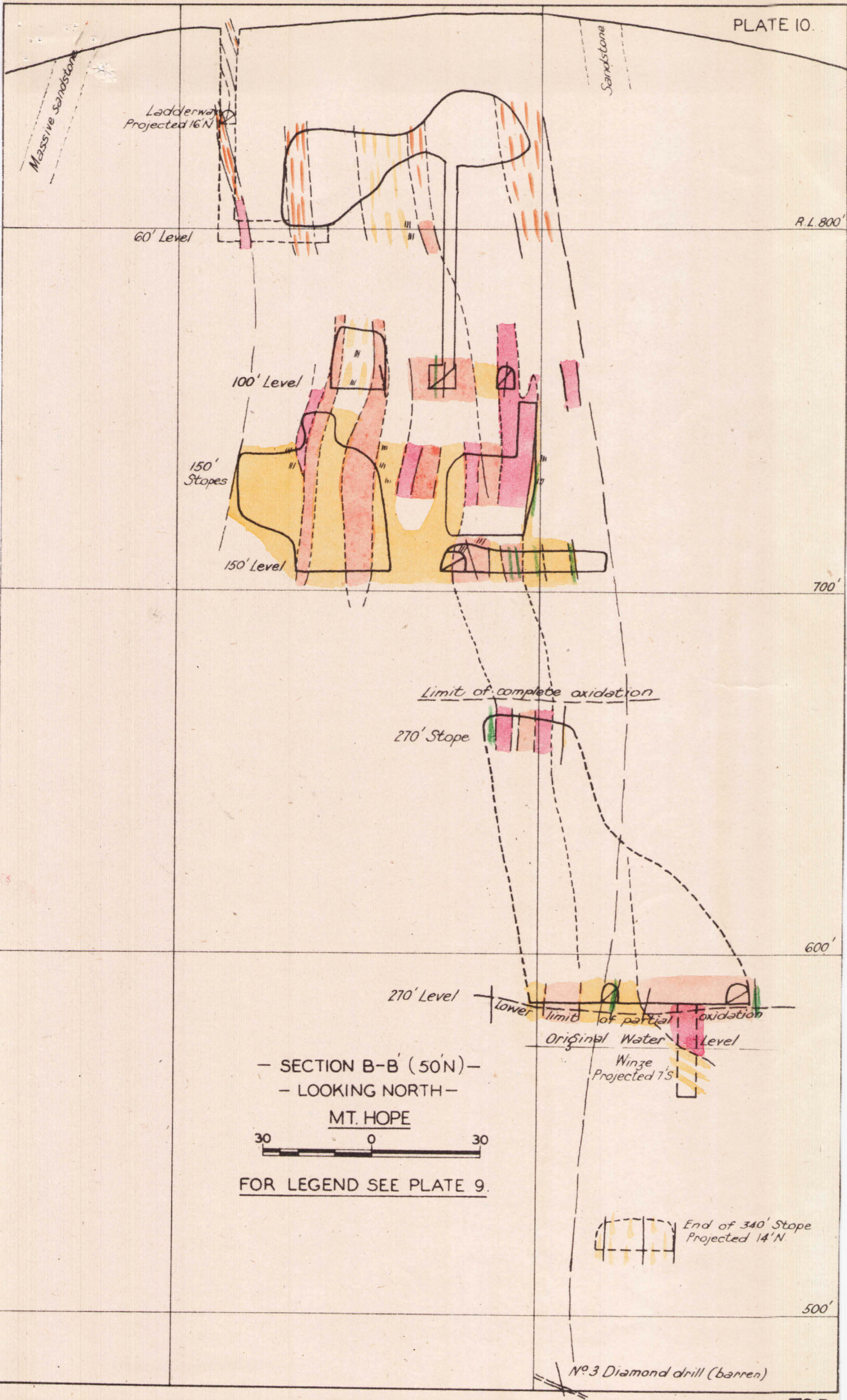


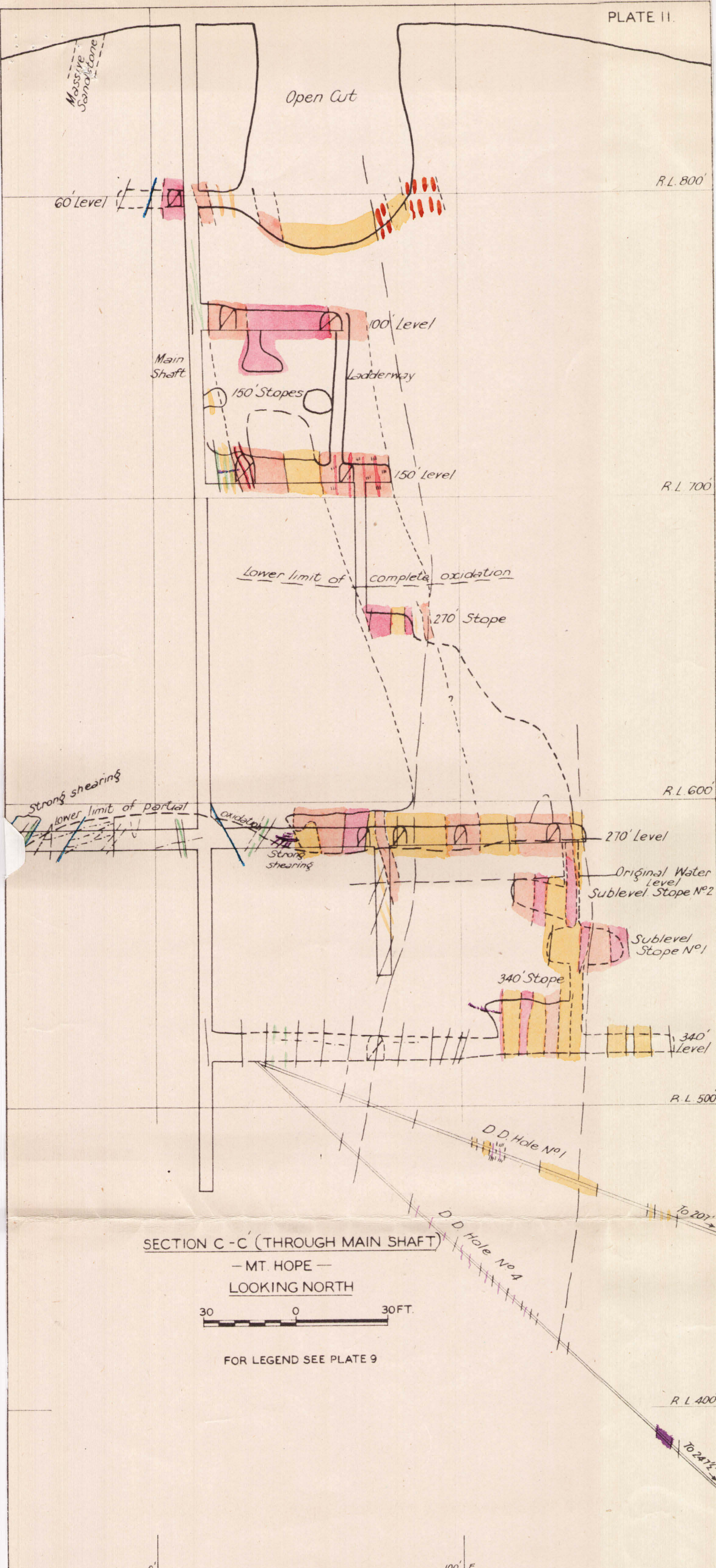
SECTION A-A 100'N.
- MT. HOPE -
LOOKING NORTH

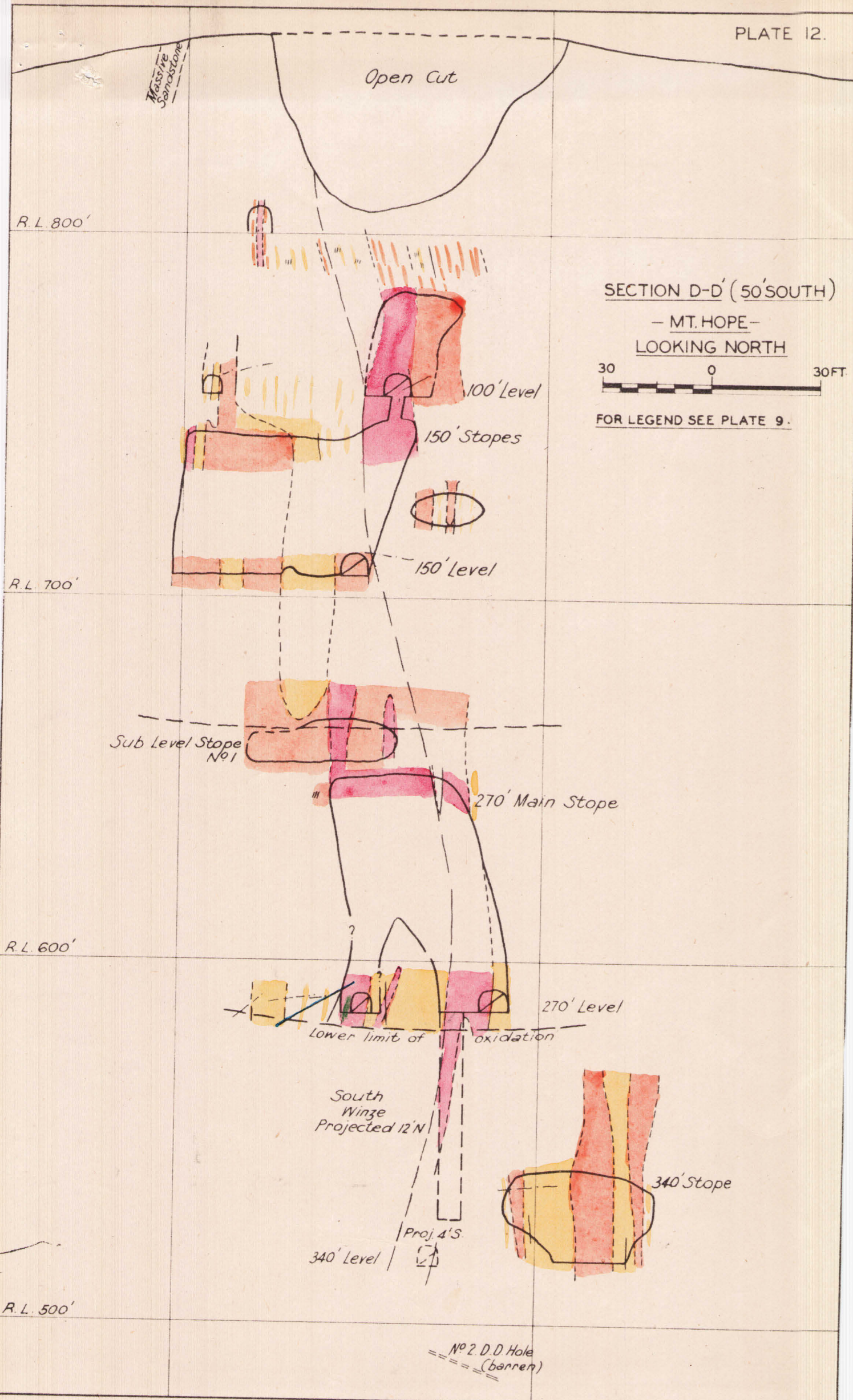
30 0 30 FT.

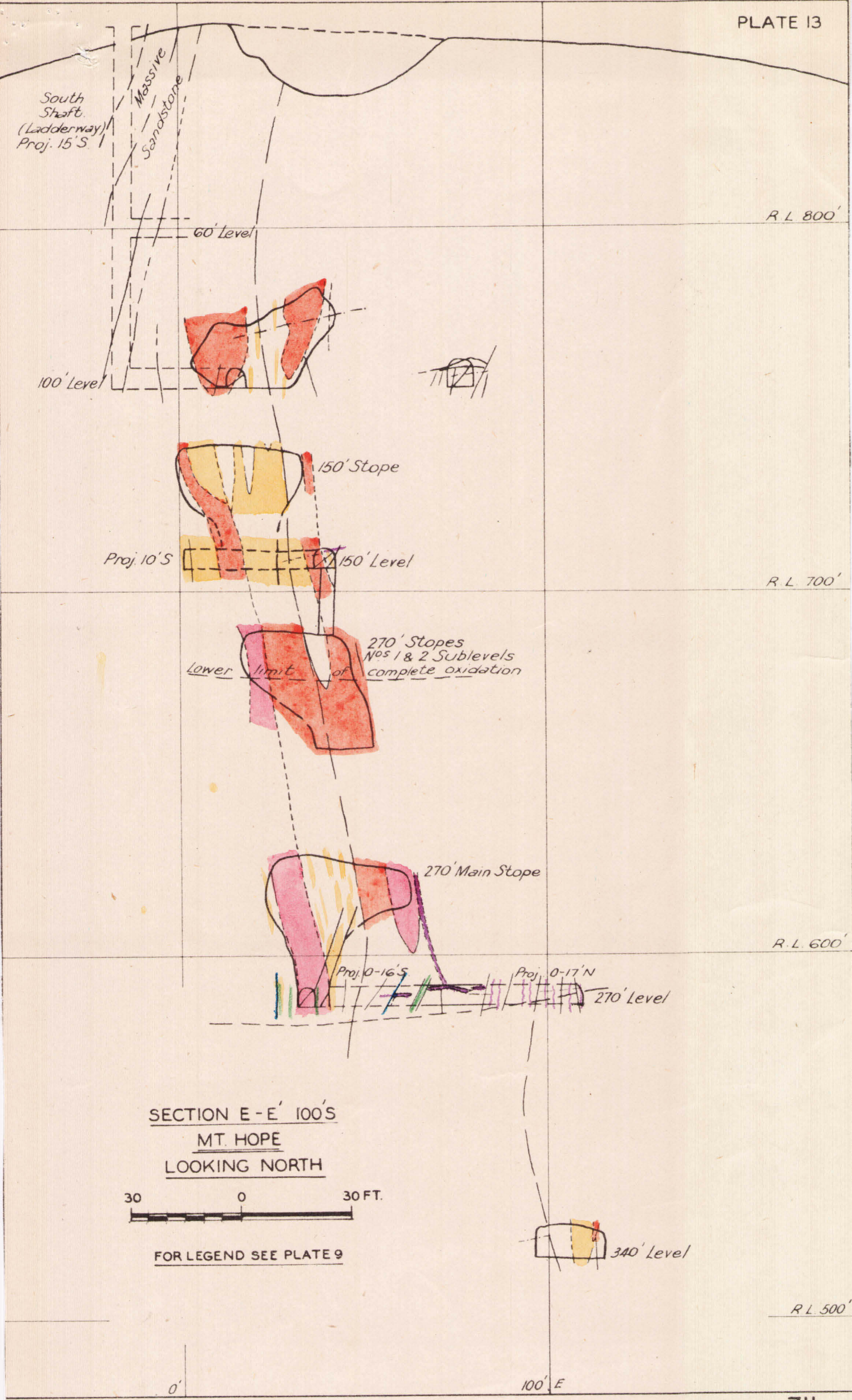
LEGEND FOR ALL SECTIONS

- > 6% Cu.
- 3-6% Cu
- < 3% Cu.
- Strong secondary copper staining
- Quartz veins
- Leached sections
- Silicification
- Dip of bedding
- Outline of ore values
- Dip of fracturing
- Fault
- Drive

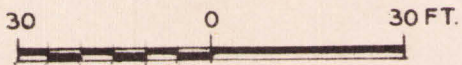




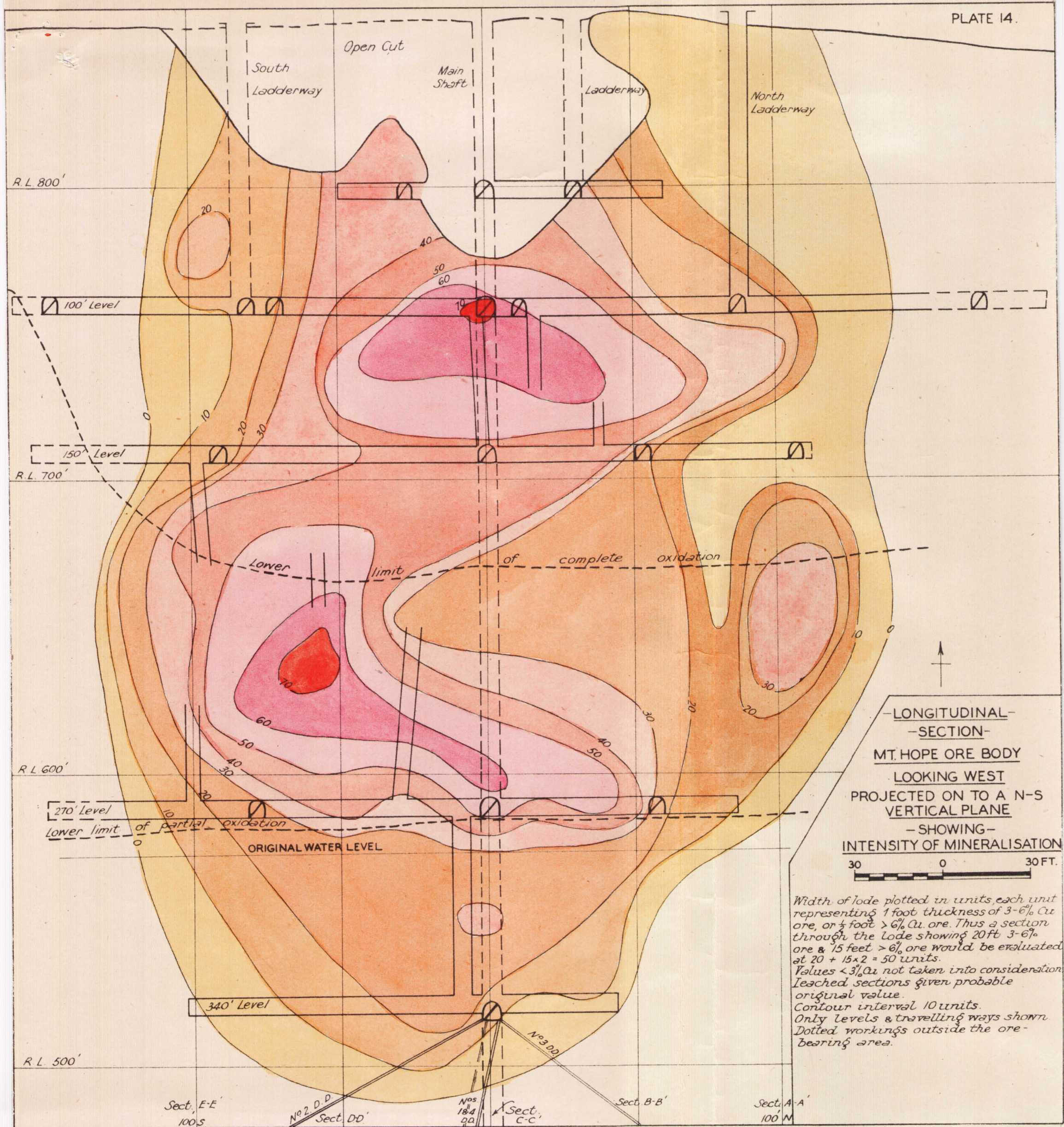


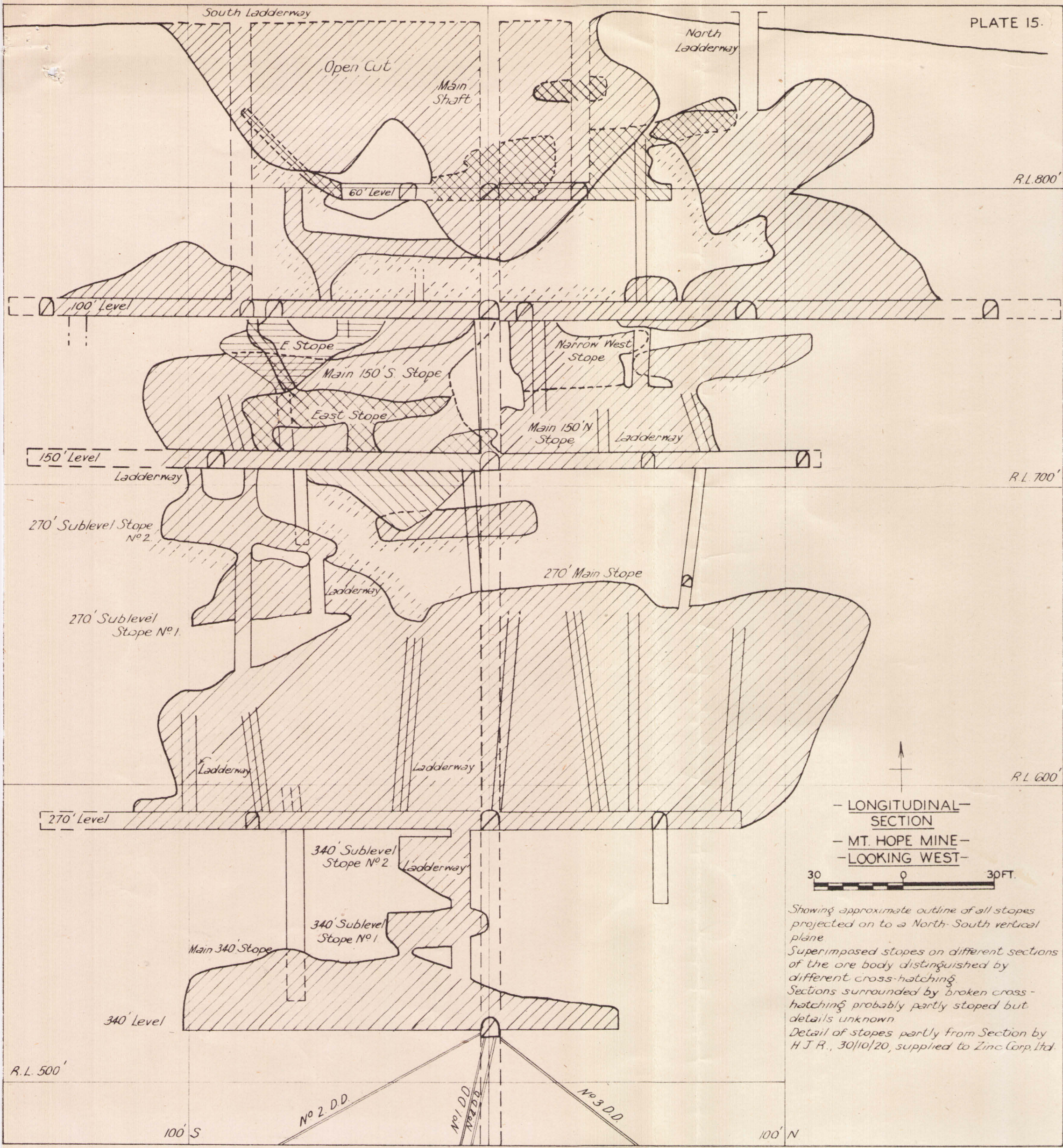


SECTION E-E' 100'S
MT. HOPE
LOOKING NORTH



FOR LEGEND SEE PLATE 9





- LONGITUDINAL-
SECTION
- MT. HOPE MINE -
- LOOKING WEST -

30 0 30 FT.

Showing approximate outline of all stopes projected on to a North-South vertical plane.
Superimposed stopes on different sections of the ore body distinguished by different cross-hatching.
Sections surrounded by broken cross-hatching probably partly stoped but details unknown.
Detail of stopes partly from Section by H J R., 30/10/20, supplied to Zinc Corp. Ltd.