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EXPLORATION OF THE CALICO AREA
WALKER RIVER INDIAN RESERVATION, MINERAL COUNTY, NEVADA

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ABSTRACT

The Calico area lies within the Walker Lane fault zone, six miles north of Schurz, Nevada. The mineralized area is overlain by a thick section of Tertiary tuffs and ash-flows, that have been intruded by a series of andesite plugs, dikes, and sills. The pre-Tertiary rocks outcrops only in two areas at one to two miles distance from the drilling areas. Underlying the volcanics are sediments ranging from siltstones, sandstone, calcareous shales, to carbonates of the Luning sequence. These have been intruded by one or more phaneritic intrusives ranging in composition from quartz diorite to quartz monzonite, with the development of a skarn zone on the south flank that contains extensive mineralization consisting of magnetite, pyrrhotite, pyrite, and chalcopyrite, with traces of sphalerite, galena, and molybdenite. The magnetite, pyrrhotite, and part of the pyrite appears to be contemporaneous with the skarn, while part of the chalcopyrite, galena, sphalerite, molybdenite, quartz, and calcite, occurs as minute veinlets cutting the other minerals. This later mineralization may be associated with a late stage of the same sequence, or possibly associated with another intrusive to the southwest.

Geophysical work has consisted of aerial magnetics, ground magnetics, gravity, seismic, and induced polarization surveys. Preliminary induced polarization surveys indicated anomalies at depth, both over the magnetic anomaly and to the northwest. Subsequent IP work confirmed this earlier anomaly, and drilling disclosed extensive mineralization at depths of 400 feet on the northwest end and over 1,000 feet to the southeast.

INTRODUCTION

The Calico area is located in the northern part of the Walker River Indian Reservation, which consists of some 500 square miles in west-central Nevada (Fig.1). The Walker Martel Mining Company, operating under an exclusive mineral prospecting permit, has been conducting an extensive mineral exploration program. Previous work in the Hottentot area has been described by Lawrence and Wilson (1966). Acknowledgement is given to the company for permission to publish this information.

This paper will describe only the exploration activities in the Calico area, which lies approximately six miles north of Schurz and extends from U.S. 95 eastwards for four miles, consisting of an area approximately 12 square miles in size. The topography is gentle to the west but quite rough to the east. The elevation varies from 4300 feet on the flat south of the Calico Hills to 5140 feet at the highest point. Much of the area to the west and north is covered with alluvium and sand.

GEOLOGY

The Calico Hills lies in an area of Tertiary volcanics consisting of a thick section of crystal tuffs which have been intruded by later andesite, basalt, and rhyolitic dikes and plugs (Fig.2). Basalt flows cover part of the area to the east. The basement rock is granitic, varying in composition from quartz-monzonite to diorite, which intruded Mesozoic sediments of the Luning formation (?). However there are no exposures of the earlier sediments except for a small area of calc-sillicates in Section 31. The granitic rocks are exposed only as small patches in Section 30-31, and in a small outcrop in the southeast corner of Section 4. All of these have been partially covered by lacustrine sediments of Lahontan age.

PRE-TERTIARY ROCKS

Granitic rocks outcrop principally in the extreme northwest corner of the area near U.S.95 in Section 30-31, the largest outcrop being 600 by 1,000 feet in size. Here the granitic rocks varies in composition from quartz-monzonite to quartz diorite and diorite. It is usually medium to coarse grained with 30-55% plagioclase, 2-25% orthoclase, 15-25% green hornblende, 3-5% pyroxene, 2-5% quartz, 1-3% biotite, and scattered grains of magnetite. The hornblende is commonly chloritized. Quartz veins are associated with the quartz monzonite in the northwest corner of Section 30.

The small granitic outcrop in Section 4 consists of quartz diorite with associated granite aplite and quartz veinlets carrying traces of green copper carbonates. Some limonite pseudomorphs after pyrite are present in the quartz veinlets. The rock is fine-grained, with 20-30% plagioclase showing good albite twinning, up to 55% horblende, and 5% quartz. No contacts are observable as the area is covered with sand and alluvium. Whether this is a topographic high or a fault block could not be determined.

Granitic rock, apparently quartz diorite in composition, occur in CA-1 drill hole at 1270 to 1441 feet. Coring was not started until 1330 feet, therefore the contact is not seen in the core and no evidence was available as to the nature of the upper contact of the quartz diorite. At 1330 feet the diorite is almost completely silicified, with only ghost outlines of plagioclase and wisps of chlorite replacing amphiboles making up from 2-8% of the groundmass, and with cryptocrystallined quartz up to 98%. At 1330 feet the rock is fine-grained diorite with 30-60% amphiboles. The amphiboles are usually highly chloritized. At 1441 feet the drill hole enters a skarn zone consisting of actionlite, garnet (andradite), and epidote, with varying amounts of pyrite, pyrrhotite, chalcopyrite, and magnetite (Fig. 3 & 4).

The spatial relationship of the granitic mass in CA-1 drill hole to the other outcrops are obscured by the overlying Tertiary tuffs. The difference in elevation of this mass to the granitic rocks in the other outcrops may be due to the old topography, and partly to block faulting.

The only evidence of the older Mesozoic sediments is a small sliver of calc-silicates along the quartz-diorite outcrop in Section 21, but even here the relationship is obscured. The skarn in drill hole CA-1 is due to contact metamorphism of limestone and calcareous sediments or dolomites of the Luning (?) sequence by the diorite intrusive, which was also responsible for the iron mineralization. This skarn shows relict banding from 25-85°, averaging 65°. This section of skarn is at least 1,000 feet thick.

The granitic rocks are probably Cretaceous in age, but may be of Eocene age. Further work in the area may shed light on this problem.

TERTIARY ROCKS

The granitic rocks are covered by a thick section of tuffaceous sediments consisting of crystal tuffs, coarse-grained lapilli tuffs, and glass. These are ash-flows, ash-falls, and water-lain in origin. In some sections fragments of other volcanics occur up to 6 inches across, but commonly are ½ to 2 inches wide. These rocks are white to tan in color, consisting of up to 35% crystals in a hyaloline (glassy) to aphanitic groundmass, commonly with glass shard structure. They are rhyolitic to quartz latitic in composition. There appears to be at least two large ash-flows in the area, with interfingering ash-falls and water-lain tuffs. There are glass units near the bottom of each ash-flow, occurring either as massive black glass, or as 10-50% fragments of black togray glass in tuffaceous groundmass. Crystal tuffs are present in all of the drill holes (Fig. 14, 15, 16 & 17). These tuffs are at least 1,300 feet in thickness.

The red, green, and purple coloration in the tuffs is due to alteration caused by the numerous intrusives in the area. Usually the tuff is purplish and greenish nearest the intrusive, grading into a dark to bright red color further out. Some of the whiteness appear to be due to bleaching.

TERTIARY INTRUSIVES

There are numerous intrusives varying in composition from rhyolite to andesite and basalt. Some of these appear to be controlled by the northeast faults while others appear to be controlled by the northwest structures. The acidic and intermediate intrusives are usually quite small in areal exposures while the andesite intrusives are quite large. The basalt plugs and flows are restricted to the extreme southeast end of the area, and along the northwest structure bounding the north side of the area. It also occurs along this same lineament immediately west of the highway.

Rhyolite

No detail work was done on these as they do not appear to be closely related to the problem of ore genesis and the present exploration activities. Some of these may be welded tuffs, partially altered. They are usually tan to reddish in color, glassy to aphanitic groundmass with 15-50% phenocrysts of orthoclase, plagioclase, quartz, and glass. Biotite and hornblende are common.

Intermediate Rocks

No detail work was done on these rocks but they appear to be intermediate in composition. They occur along a northeast trending structure. The tuffs around them show the typical purplish, greenish, and reddish coloration due to alteration caused by these intrusives.

Andesite

Andesite occurs as plugs, dikes, and sills. A thin section of a sample taken near the mouth of Calico Canyon revealed the groundmass to be made up of 40% plagioclase, 5% orthoclase, 2-3% quartz, 5% green hornblende, and with scattered magnetite and pyroxene making up 1%. Phenocrysts make up 35% of the section with 5% orthoclase and 30% plagioclase, both euhedral and zoned, showing Carlsbad and albite twinning. Green hornblende crystals make up 10% of the rock. It has been slightly chloritized. Magnetic susceptibility tests showed an equivalent of ½% magnetite.

The andesite varies slightly in the other intrusives. In the plug just west of the mouth of Calico canyon the rock is diabasic (?) in texture, and may represent the throat of a vent. Usually the andesite is finer-grained to glassy near the margins. They usually show cross-cutting features.

Spatially some of these plugs appear to be flows resting on the tuff but closer inspection reveals high-angle, cross-cutting features, and typically as on the west end of the andesite plug 1,200 feet northeast of CA-1 drill hole, the tuff on the contact is highly sheared at a high angle, brecciated, highly silicified, and purplish to dark red in color. Usually a few feet out the tuff is greenish in color, probably due to the formation of celadonite. Further out the tuff is bright red, and sometimes bleached to a high whiteness. The induration and silicification of the tuffs causes them to resist erosion and to stand high around the intrusive plugs giving the appearance of a flow resting on the tuff. In at least one spot one of these bodies is a sill with the top eroded off, giving the appearance of a flow. The andesite high on the hill a few hundred feet southwest of CA-1 drill hole may be partially a sill but the main body appears to be a plug.

QUATERNARY ROCKS

Basalt

The basalt in the northwest corner of the area appear to be a dike along a northwest structure, while that on the north side of the area in Section 32-33 appears as vents with high-angle, cross-cutting contacts. The basalt to the east occurs in several vents, and as flows dipping to the east. These rocks are dense, with some olivine, and are partly vesicular. These flows are up to 40 feet in thickness.

Lacustrine Deposits

Much of the area is covered by lake sediments of Lahontan age. These vary from fine sand and gravel to water-lain tuffs and clays.

Alluvium and Sand

Much of the area of interest is covered by wind-blown sand, in some area forming dunes. The alluvium and sand appear to drop off fairly rapidly along the front of the range south of Calico Hills. No estimates can be made to the north, but they are fairly shallow apparently.

STRUCTURE

There are two sets of faults in the area. The prominent northwest structure varies from N 20° W to N 40° W, and appears to be the northern extension of the Walker Lane fault zone further to the southeast, described by Locke (1940), Ferguson and Muller (1949, p.29), and Nielsen (1965). Ferguson and Muller postulated up to 4 miles of right-lateral movement along a strike-slip fault in Soda Springs Valley. Nielsen suggests a movement of 10 miles along the Soda Springs Valley fault, and a total aggregate right-lateral strike-slip displacement of 12 miles along the Walker Lane in the vicinity of Mina, which is 50 miles southeast of the Calico area.

The Calico Hills are bounded and cut by parallel faults of the Walker Lane structure, and appear to be a fault block within this major discordance (Fig. 2). Although there is some evidence for small lateral displacement, the ore deposit does not appear to have been materially affected by movement along these faults. However there may be considerable lateral displacement both north and south of the Calico Hills, with possibly up to 10 miles total aggregate lateral displacement. Further mapping should delineate this problem.

There is a prominent set of faults varying from N 10° E to N 35° E. These appear to cut the northwest structures, but in a few places have been cut by the northwest faults. These faults are probably a result of movement along the northwest faults. The northeast faults appear to be down-faulting to the southeast, and may account for some of the difference in elevation between the granitic outcrops to the northwest and the quartz diorite in CA-1 drill hole. Other minor faults do not appear to show much displacement.

structure Section

GEOPHYSICAL SURVEYS

Extensive geophysical surveys were made over the Walker River Indian Reservation, including induced polarization, aerial magnetic, ground magnetic, afmag, gravity, refraction and reflection seismic, and down-the-hole induced polarization. Most of the work has been concentrated in smaller areas of economic interest, one of which, the Hottentot area, was described by Lawrence and Wilson (1966). The seismic work was done to determine the feasibility of applying seismic methods to mining exploration in the Calico Hills. The seismic data indicated that further studies of this nature should be made.

MAGNETIC SURVEYS

An aerial magnetic survey, flown at 500 feet above terrain, on one third mile line spacing, was made over the Walker River Indian Reservation in 1963. Several interesting magnetic features were indicated by this survey among which was the magnetic high referred to as the "Calico". This particular anomaly is by far the largest in areal extent of any found in the general area. Figure 5 illustrates the simplified aerial magnetics and location of the Calico.

Ground Magnetic Survey

A ground magnetic survey was made using a Jalander, vertical magnetometer with a sensitivity of 10 gammas per scale division. Lines were oriented northeast-southwest, perpendicular to the strike of the anomaly, on line spacing of 100 feet to 750 feet. Station reading on each line were spaced from 25 feet to 200 feet dependent upon the character of the line encountered. Figure 7 is the plan map of the ground magnetics with the six core drill holes plotted which were used to test the anomaly. Figure 8 is the magnetic profile along strike with three cross lines at drill hole intersects. Upon completion of the ground survey several interpretations were made from the magnetic data. In general, the inflection points of the profiles indicates that the top of the source to be between 1400 and 1600 feet deep. The asymmetric nature of the curves suggests that the body dips to the northeast. Suggested size was 4000 in length by 1000 or more in width. Further work in surface geologic mapping found that some of the volcanics exhibit remnant magnetism which probably exerted a modifying influence on the magnetic profiles. The volcanic magnetism caused a spreading of the curves which in turn caused difficulty in interpretating the size of the magnetic body. However the magnetic volcanics could not in themselves explain the overall anomaly.

Upon completion of the ground magnetic survey a test drill site was selected, and CA-1 was drilled to a depth of 3600 feet. The pre-Tertiary-volcanic contact was cut at 1308 feet. From this depth to the bottom, a highly mineralized magnetic section was cut, comprised of magnetite, pyrrhotite, pyrite and chalcopyrite. Five additional drill tests were made which indicate that the mineralized body has the probable following dimensions: In excess of 5600 feet of strike length, approximately 600 feet in width and more than 2000 feet in vertical extent (Figs. 14, 15, 16 & 17).

INDUCED POLARIZATION SURVEYS

Induced polarization surveys were made in the Calico, Afterthought, Hottentot, and Bounder areas to detect the presence of metallic mineralization (Fig.1). Only the Calico will be discussed in this paper. Line "O" was surveyed along the axis of the magnetic anomaly, which strikes northwest-southeast, and to the northwest along the flanks of the magnetic anomaly (Fig.6). It was run on 1,000 foot spreads with frequencies of 0.1 - 1.0 cps (Fig.11). McPhar reported anomalous IP effects at depth along this line. They reported "apparent resistivities are somewhat low, and because of the large electrotrode intervals used, some frequency effects would be expected from induction coupling. However for resistivities in the range 7.5 to 10.0 the frequency effects due to coupling for n-3 would be 3.5 to 4.5 per cent. The frequency effects measured are at least twice this magnitude". They stated in a report dated August 13, 1964, that this survey indicated an "extremely broad IP anomaly that extends well beyond the location of the magnetic high. The source of the IP effects is at considerable depth; since the source is so wide spread and does not correlate with the magnetic anomaly, it may be of little geologic interest. It can best be evaluated by surveying parallel lines 1,000 feet to each side".

Subsequent to this IP survey, a drill hole, CA-1, was drilled at 500 NE on Line 4500 NW. This hole encountered quartz diorite and skarn at 1308 feet, and went through 2,325 feet of highly mineralized skarn and quartz diorite (Fig.14), consisting of magnetite, pyrrhotite, and pyrite, with minor amounts of chalcopyrite.

The earlier IP data was re-evaluated in light of the new data from this drill hole, and in the summer of 1966 an IP survey was conducted with traverses perpendicular to the original zero line at 2,000 foot intervals (Fig.10), starting at 7250 NW, which is in the vicinity of CA-4 drill hole. These were run at electrode spreads of 1,000 feet. Resistivities were low to the northeast and southwest indicating alluvium areas. McPhar reported a "definite IP anomaly present on Line 13250NW (Fig.12), just at, and northeast of, the baseline. A similar anomaly is located on most of the other lines surveyed" (Fig.13). They also stated that "there is some depth indicated by the 1,000 foot spread measurements, but the source appears to be getting shallower to the northwest", which correlated with the known geology. Line 13250NW was checked by re-surveying using 500 foot electrotrode spreads.

The original hypothesis and conclusions drawn from the IP surveys by McPhar were supported by later data from WC-1 and CA-4 drill holes (Fig.16 & 17). WC-1 was drilled at 730NE on Line 13250NW, and CA-4 was drilled at 109 NE on Line 7118 NW. Both holes encountered considerable sulfide mineralization, with WC-1 passing into the mineralized zone at 385 feet, and CA-4 at 1010 feet.

DRILLING PROGRAM

Subsequent to the aerial and ground magnetic surveys, and the original IP work along Line "O", a drilling program was initiated in November, 1965, which consisted of seven holes for a total footage of 19,887 feet. The usual practice was to drill a 5-1/8 inch rotary hole through the overlying volcanic rocks, and then core drill using NX wireline until required to reduce to BX wireline.

Below is a summary of the drill logs. Detailed description of the mineralogy is given under mineralization.

Hole No.	Total Depth	Depth to Bottom of Volcanics	Thickness of Mineralized Zone	Thickness of Quartz - Diorite	Thickness of Skarn and Hornfels
CA-1	3633'	1308'	2325'	199'	2126'
CA-2	2306'	1393'	?	126'	787'
CA-3	3422'	2048'	1374'	661'	713'
CA-4	3325'	1100'*	1440'**	297'**	1143'**
CA-5	3370'	1317'	2053'	68'	1985'
CA-6	2560'	1350'	1210'	522'	688'
WC-1	1271'	385'	886'	830'	56'

* Andesite breccia cuts contact in drill hole. The bottom is somewhere between 1010 and 1160'.

** Using 1885' as top of mineralized zone, although probably higher. Andesite breccia cuts out the contact.

Although only one sliver of calc-silicates can be seen on the surface in outcrop in Section 31, a large section of skarn and hornfels were cut in all of the Calico drill holes. CA-2 cut 787 feet of siltstone, sandstone, calcareous shales, and carbonates of the Luning sequence, (Silberling, 1962, p. 28), that have been metamorphosed to hornfels and skarn. The other Calico holes cut from 688 to 2126 feet of skarn and hornfelsic skarn. The skarn consisted of andradite, grossularite, actinolite, epidote, hornblende, diopside, augite, zoisite, calcite, plagioclase, and wollastonite, with magnetite, pyrrhotite, pyrite and chalcopyrite.

Metallization was intense in the skarn zone. Assays from CA-1 drill hole showed a continuous section of 2,259 feet from 1374 to 3633 feet averaging 36.8 per cent iron and 0.093 per cent copper. One section of 147 feet at 2775 to 2922 feet in CA-3 drill hole averaged 0.720 copper.

MINERALIZATION

The principal mineralization has been in the skarn zone, where magnetite has formed contemporaneously with garnet, epidote, actinolite, calcite, and other metamorphic minerals. Pyrrhotite, pyrite, and chalcopyrite are usually associated with the magnetite in varying amounts. In places this same suite of minerals occurs in hornfels, granulite, and calc-silicates. The iron mineralization appears to occur in replacement bodies that are probably controlled partially by favorable beds in the earlier sediments and partially by structure. Veins and pods of magnetite and pyrrhotite usually are roughly parallel to the relict bedding, but in places cut across it. The shape of the ore body is unknown due to scarcity of drill holes.

Magnetite is usually the earliest ore mineral, followed by pyrrhotite, pyrite, and chalcopyrite. In some places magnetite occurs as later veinlets or pod-like masses filling open spaces in the skarn, and in such cases is usually euhedral. Likewise pyrrhotite and pyrite often occur as veinlets cutting the earlier minerals, but appearing to be merely later in the same sequence of deposition. Chalcopyrite occurs in pods, disseminated grains, and veinlets, usually closely associated with pyrrhotite and pyrite, but usually later in the sequence.

In several places in CA-1 and CA-5, and especially strong in CA-4, there are numerous low angle (10-25°) veinlets of calcite, quartz, pyrite, and/or chalcopyrite. There are also similar veinlets in CA-4 below 2400 that dip at 65-86°. These veinlets cut the earlier skarn mineralization, and may be late-phase mineralization of the same sequence or possibly a second period of mineralization connected with another intrusive on the south flank of the main intrusive, or possibly a satellitic stock off of the main intrusive. There is some evidence in WC-1 of a second intrusive, however the differences in the intrusive may be due to assimilation of the country rock.

The principal iron mineralization appears to be the result of a temperature front moving outwards from the main intrusive, metamorphosing the carbonates and calcareous sediments of the Luning sequence, with the addition of some elements such as Fe, S, and SiO_2. The granitic rocks are usually enriched with calcium and silica near the contacts, causing the formation of hybrid rocks that are difficult to identify, but are to be expected in such areas.

Copper mineralization has been strongest in CA-3 and CA-4, but also present in CA-1, CA-5, CA-6 and WC-1. Molybdenite, galena, and sphalerite occur with chalcopyrite in CA-4 associated with quartz veins. Chalcopyrite and traces of molybdenite are found in WC-1, associated with quartz veinlets, pyrite, and pyrrhotite. Copper mineralization occur in the granitic rocks as well as the skarn, granulite, and hornfels.

The presence of the veinlets in CA-4 and the mineralization in CA-4 and WC-1 described above may indicate the possibility of a copper deposit along the southern flank of the intrusive. The area between CA-4 and WC-1 appears to have the strongest possibilities for such a deposit.

The volcanic rocks are all later than the mineralization. The intrusive, metamorphics, and tuffs have all been cut by later plugs and dikes of andesite. In CA-4 the andesite cuts the quartz diorite, hornfels, skarn, and tuffs, and contains fragments of all these rocks. Some of the granitic and metamorphic fragments are mineralized, and usually the magnetite has been reduced to hematite by baking, and the pyrite and pyrrhotite show some oxidation. Both CA-4 and CA-2 tend to confirm earlier conclusions that the andesitic plugs probably came up along narrow dikes at depth, and broke out into larger bodies along less-competent tuffaceous beds near the surface.

ECONOMICS

Two mining consultants were retained independently to examine the core from the Calico project to determine the feasibility of block caving. Both reported that the deposit should cave easily, and without any major problems.

Metallurgical tests were made by the Colorado School of Mines Research Foundation on a sample consisting of the rejects from the NX core split used for assay, representing 520 feet from 1766 to 2286 feet in CA-1 drill hole. The sample assayed 46.8% iron, 3.08% sulfur, 0.059% copper, and 0.03% phosphorus. Magnetic concentrations gave a produce containing 62-69% iron, less than 0.02% copper, and 1.9 to 2.5% sulfur. Roasting of the palletized magnetic concentrate reduced the sulfur content to 0.01%. Flotation tests gave a product containing 65.3% iron and 0.20% sulfur, with a recovery of 78.9%. In addition, a 12.6% copper concentrate was made. Their report stated that "the ore represented by this NX core sample had satisfactory beneficiation characteristics using techniques currently practiced in the iron industry."

CONCLUSIONS

The Calico area is underlain by a large granitic mass, which is exposed in only a few small outcrops. The intrusive varies from quartz monzonite to quartz diorite in composition. Quartz veins and granite aplite crops out in some areas, with copper sulfides and pyrite occurring in some of the veins. These granitic rocks intruded Mesozoic sediments of the Luning sequence, consisting of siltstone, sandstone, calcareous shales, and carbonates.

At the contact of the granitic and sedimentary rocks a skarn zone was formed containing a large magnetite-pyrrhotite deposit, with minor amounts of pyrite and chalcopyrite. Based on geophysical and drill hole data, this deposit appears to be in excess of one mile long, over 2,000 feet in thickness, and 600 feet wide.

The estimates of the size of the ore body vary according to the interpretation of the shape of the andesite intrusives in the anomalous areas. These intrusives appear to have come up along narrow dike-like vents, and spread laterally along incompetent bedding in the tuffs, especially as the lava neared the surface at the time of intrusion. Drill hole data supports this hypothesis.

Evidently the topography was considerable at the time of the deposition of the tuffs. In places they exceed 1,300 feet in thickness.

Although the Calico area lies in the center of the Walker Lane fault zone, the mineral deposit itself does not show much displacement.

Exploration of the area has been difficult because of the great thickness of the overlying tuffs. First interest in the area was aroused by the aerial magnetic data. Geologic examination had indicated the presence of a subtle alteration pattern. Preliminary drilling combined with all other data indicate that the induced polarization anomalies are probably significant, and only future drilling will determine the economic value of these anomalies.

At the present time it appears that there is good geologic and geophysical evidence that metallization extends out away from the magnetic closures. The amount of copper found in drilling the magnetic anomaly suggests that it is worthwhile to continue with exploration in the anticipation of finding a copper deposit flanking the magnetic body.

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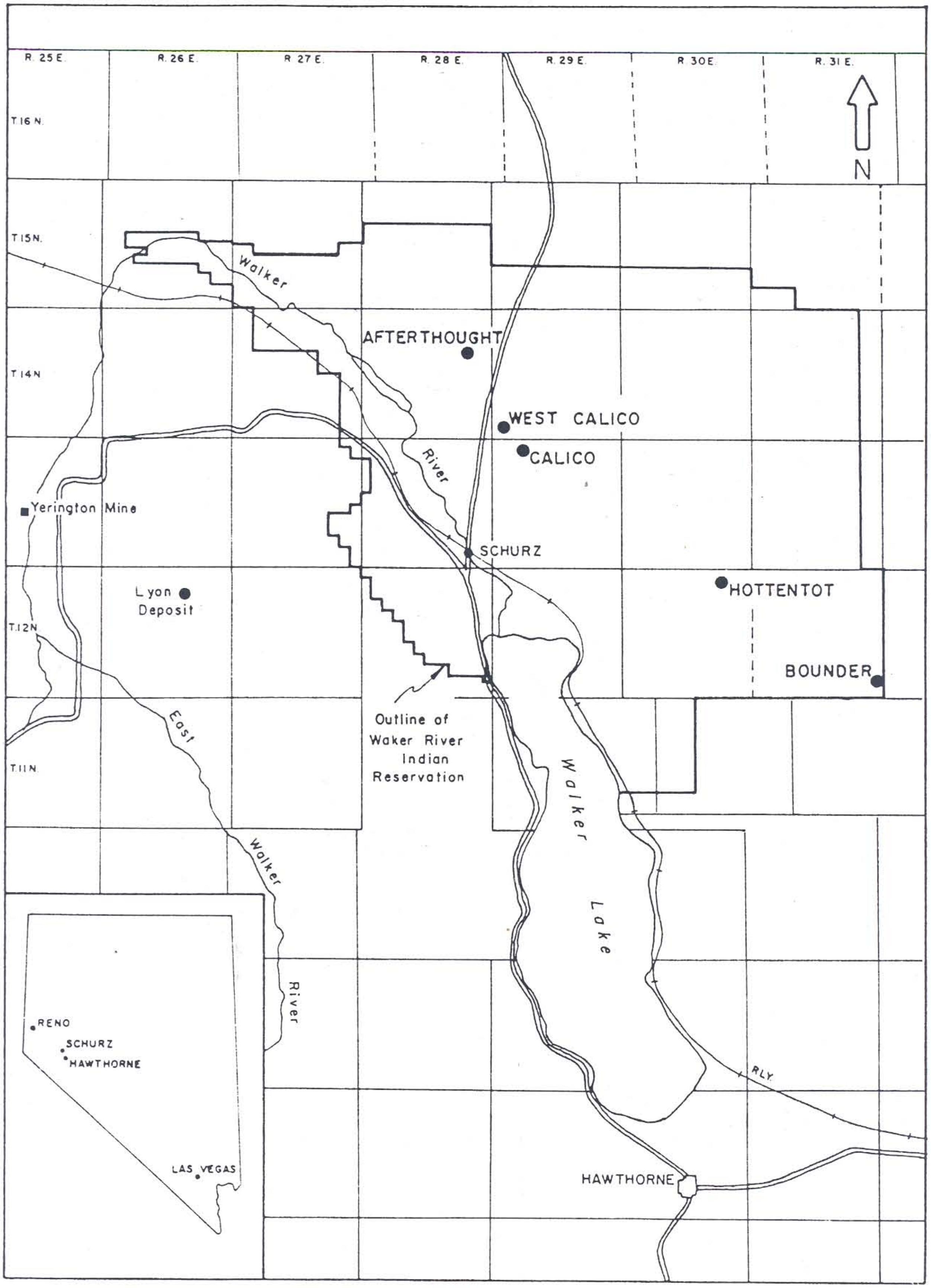

Figure I Index Map Showing Drilling Areas

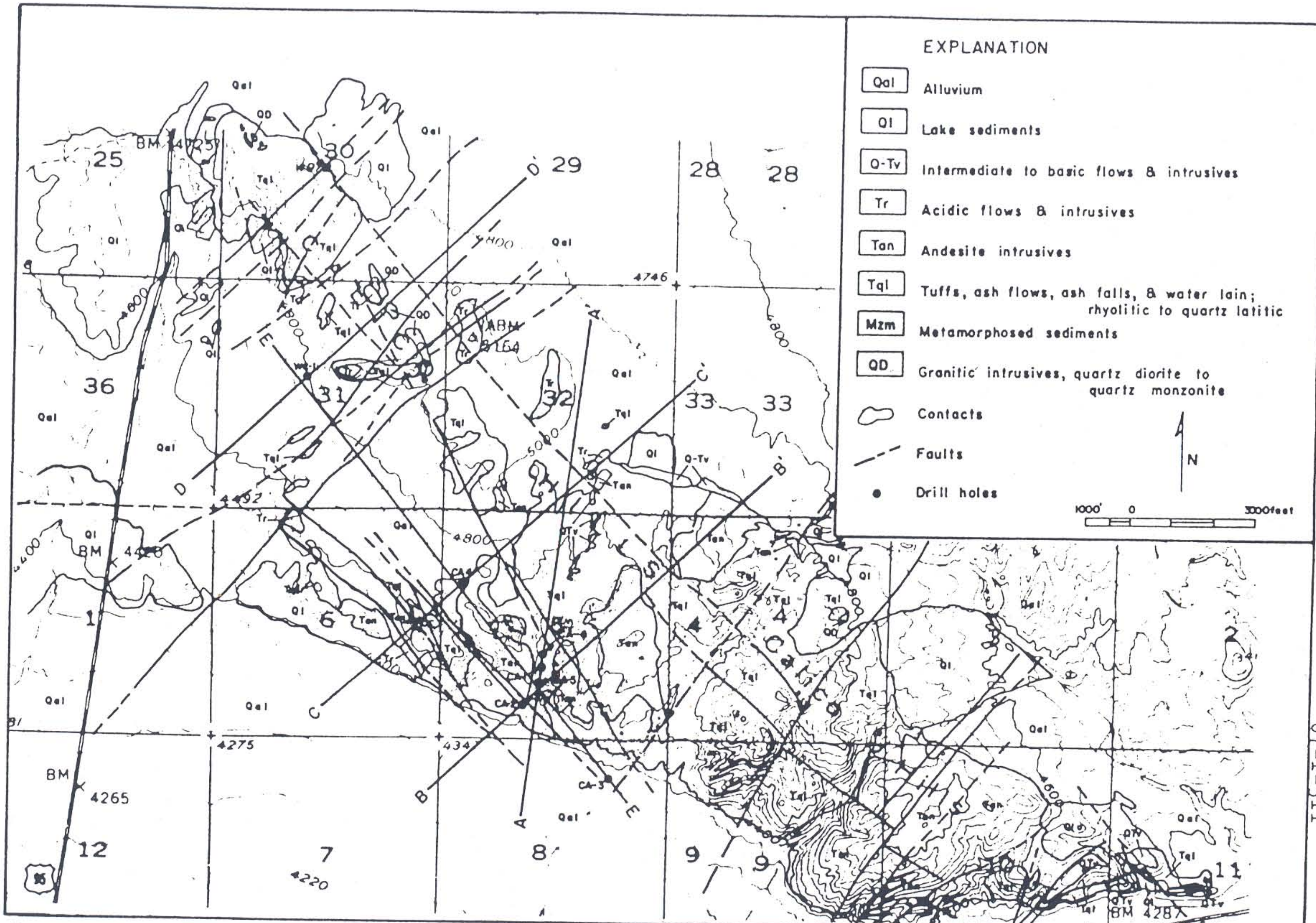

Figure 2 Geologic Map – Calico Area – Walker River Paiute Reservation, Nevada

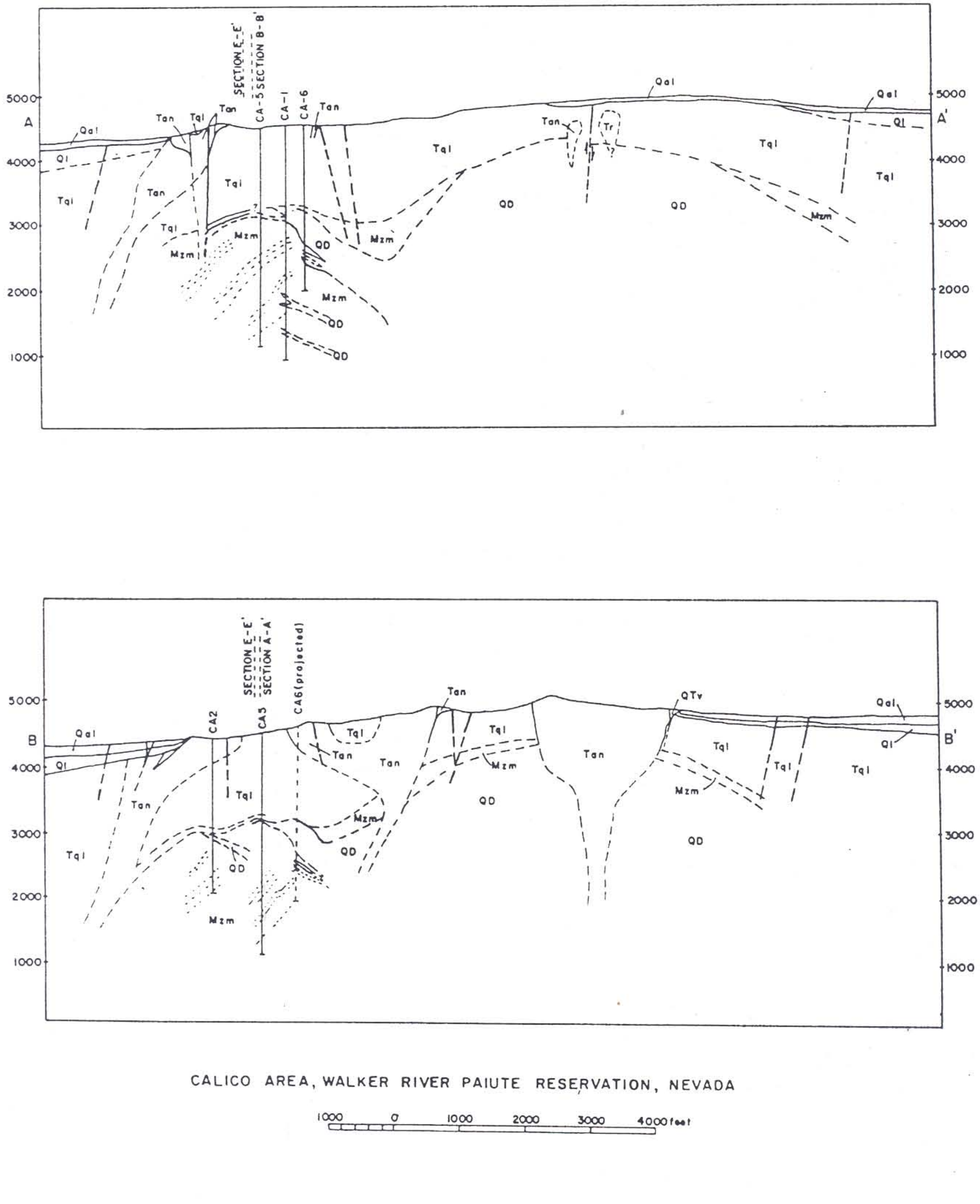

Figure 3 Geologic Cross Section A-A', B-B'

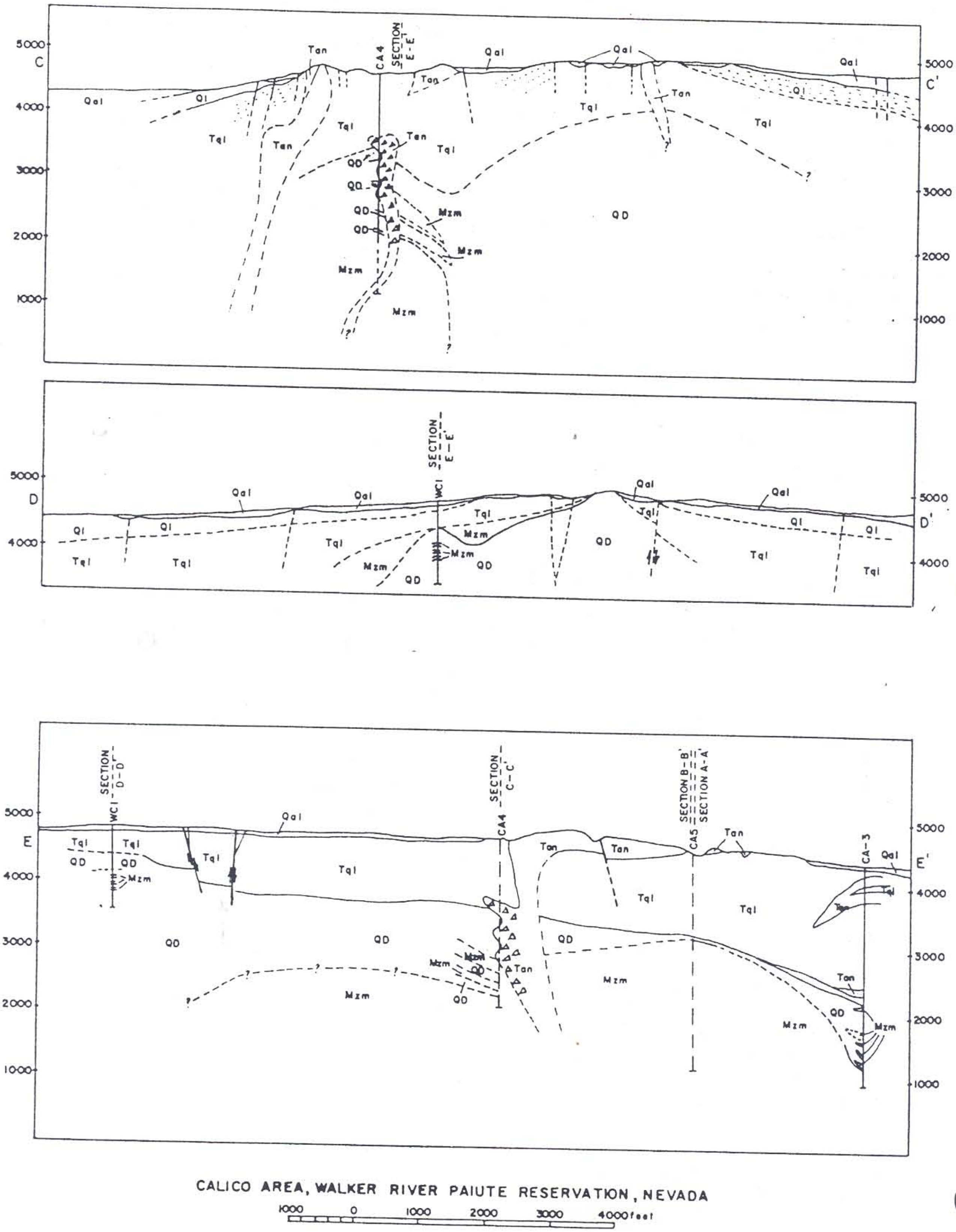

Figure 4 Geologic Cross Sections C–C', D–D', E–E'

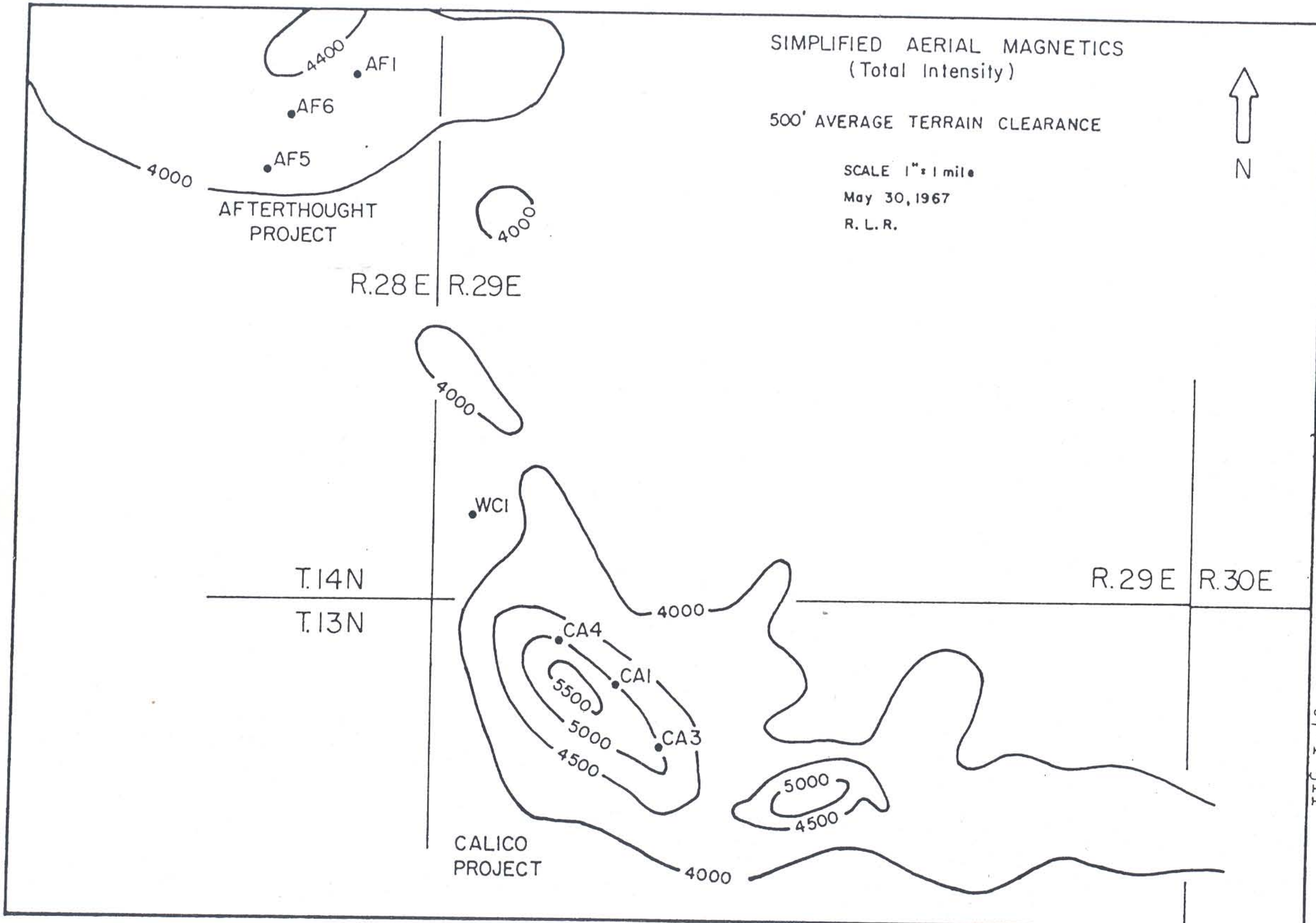

Figure 5 Simplified Aerial Magnetic Map

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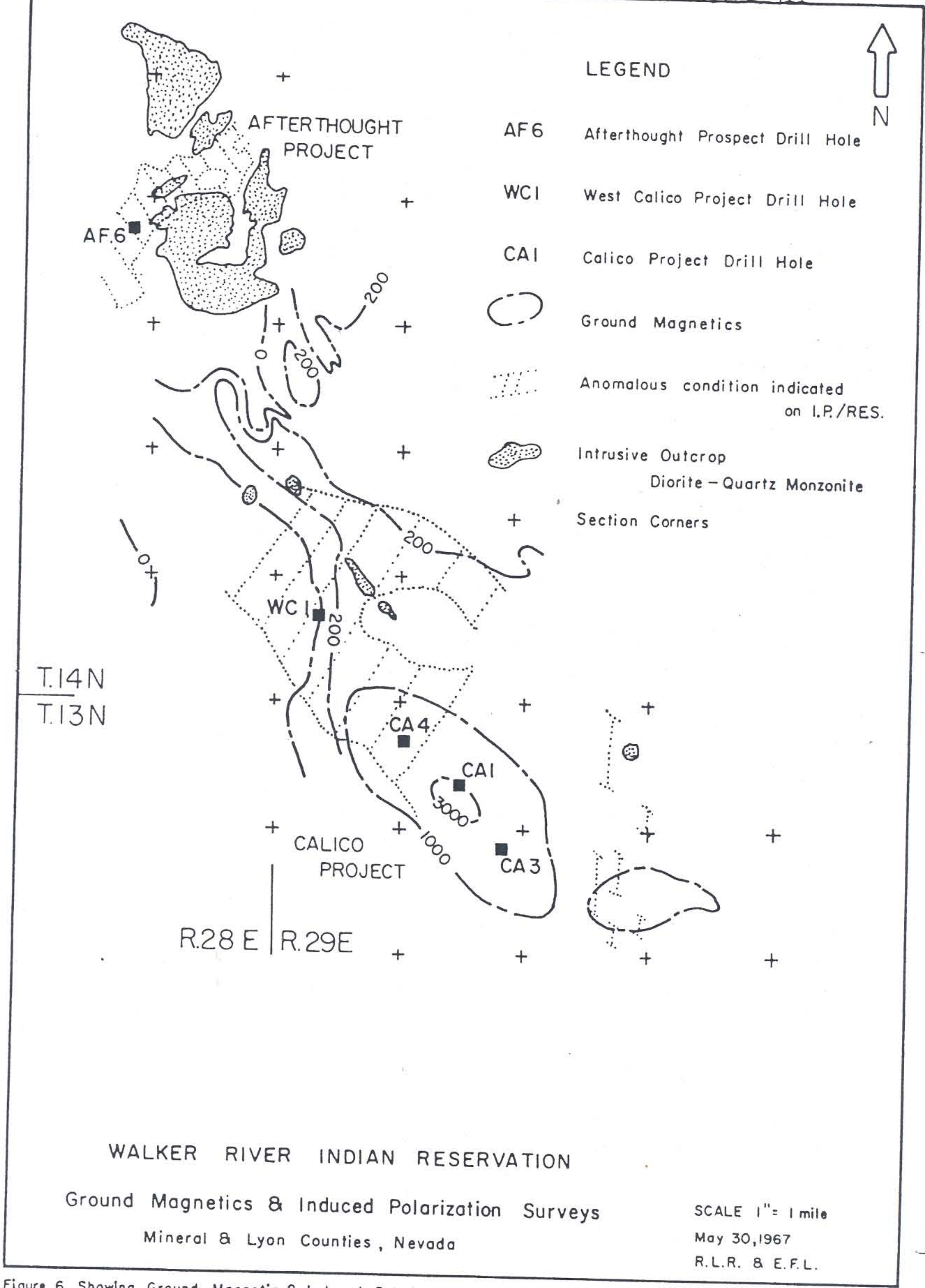

Figure 6 Showing Ground Magnetic & Induced Polarization Surveys with Intrusive Outcrops

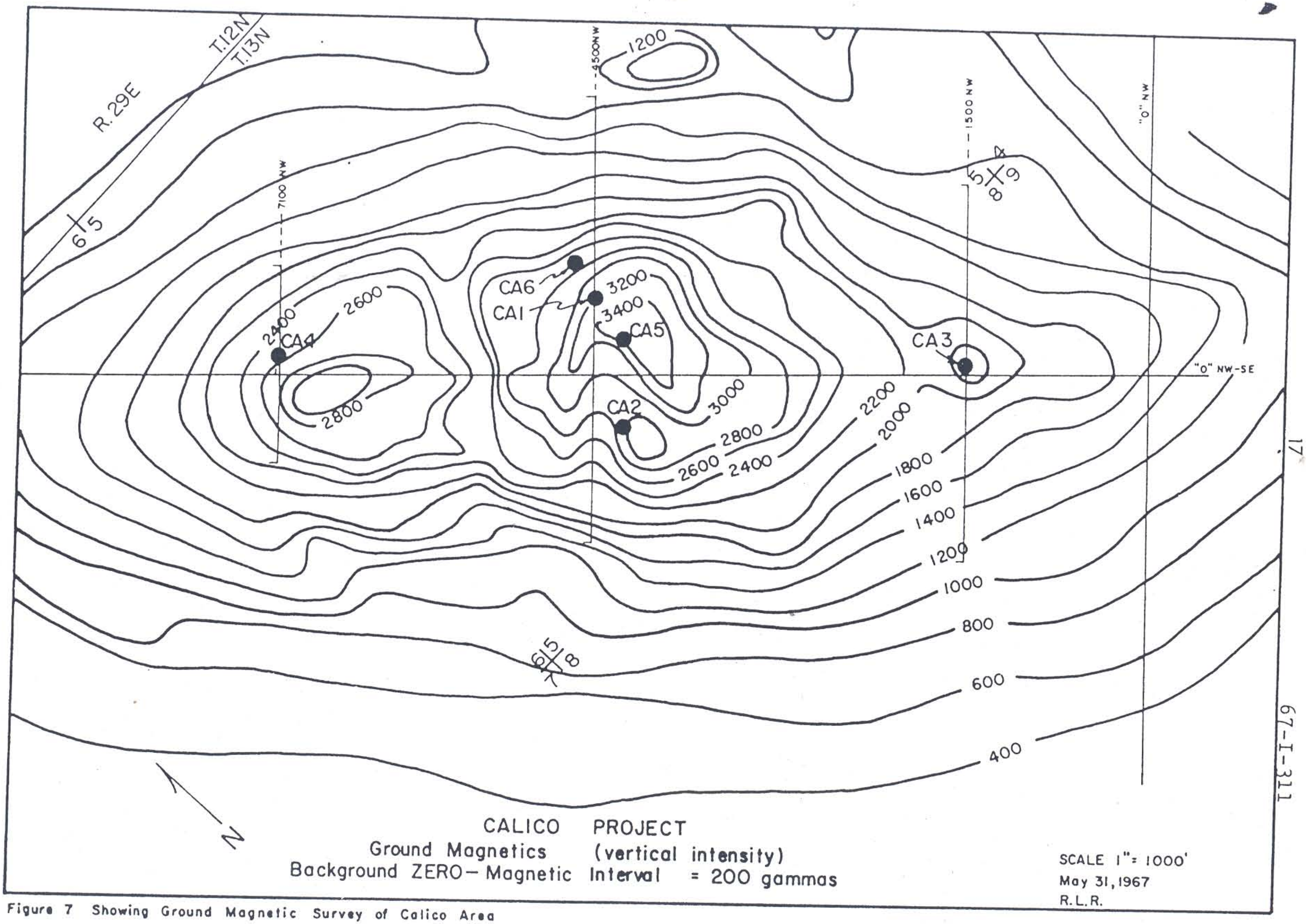

Figure 7 Showing Ground Magnetic Survey of Calico Area

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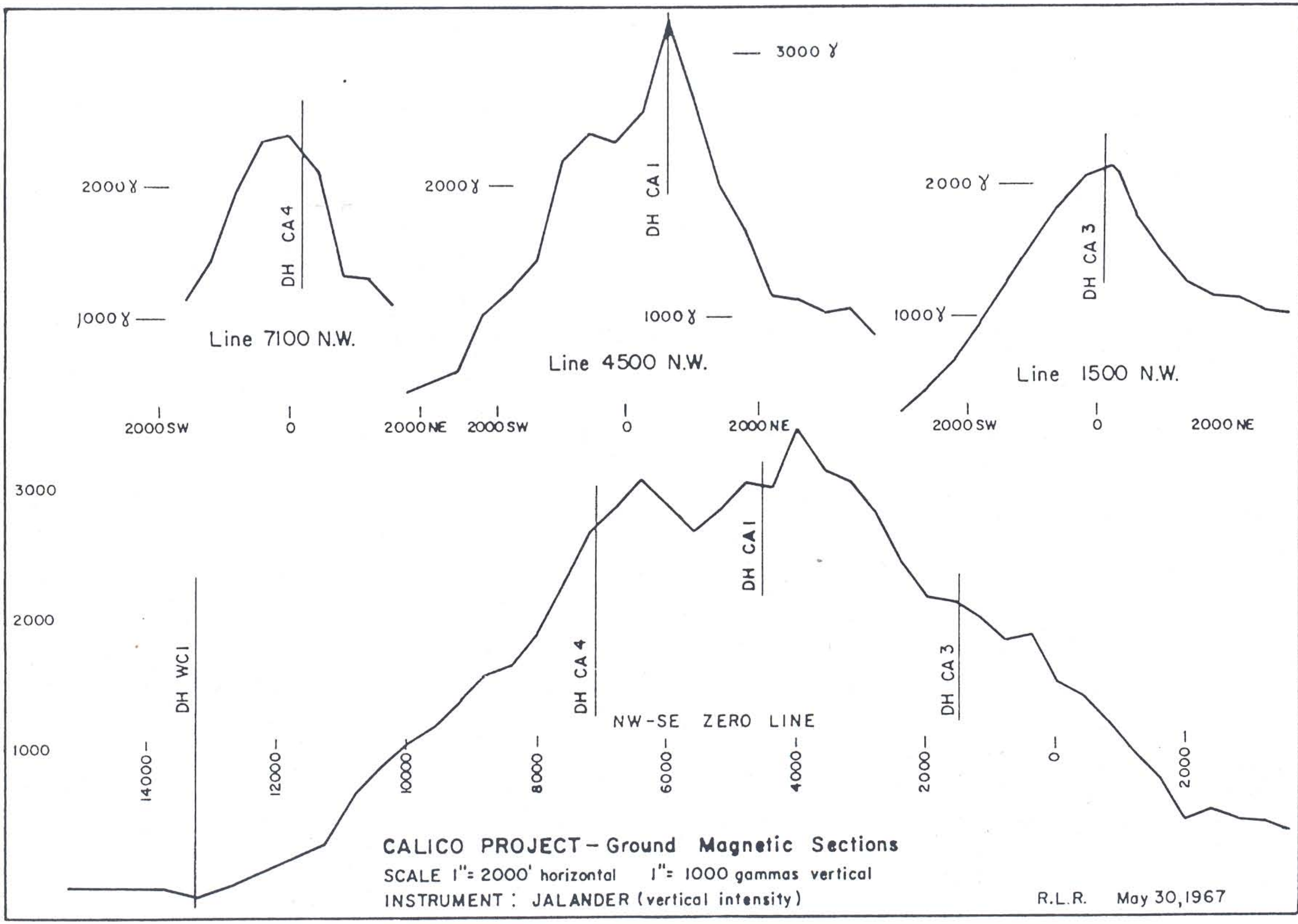


Figure 8 Ground magnetic profiles – Calico project

67-I-311

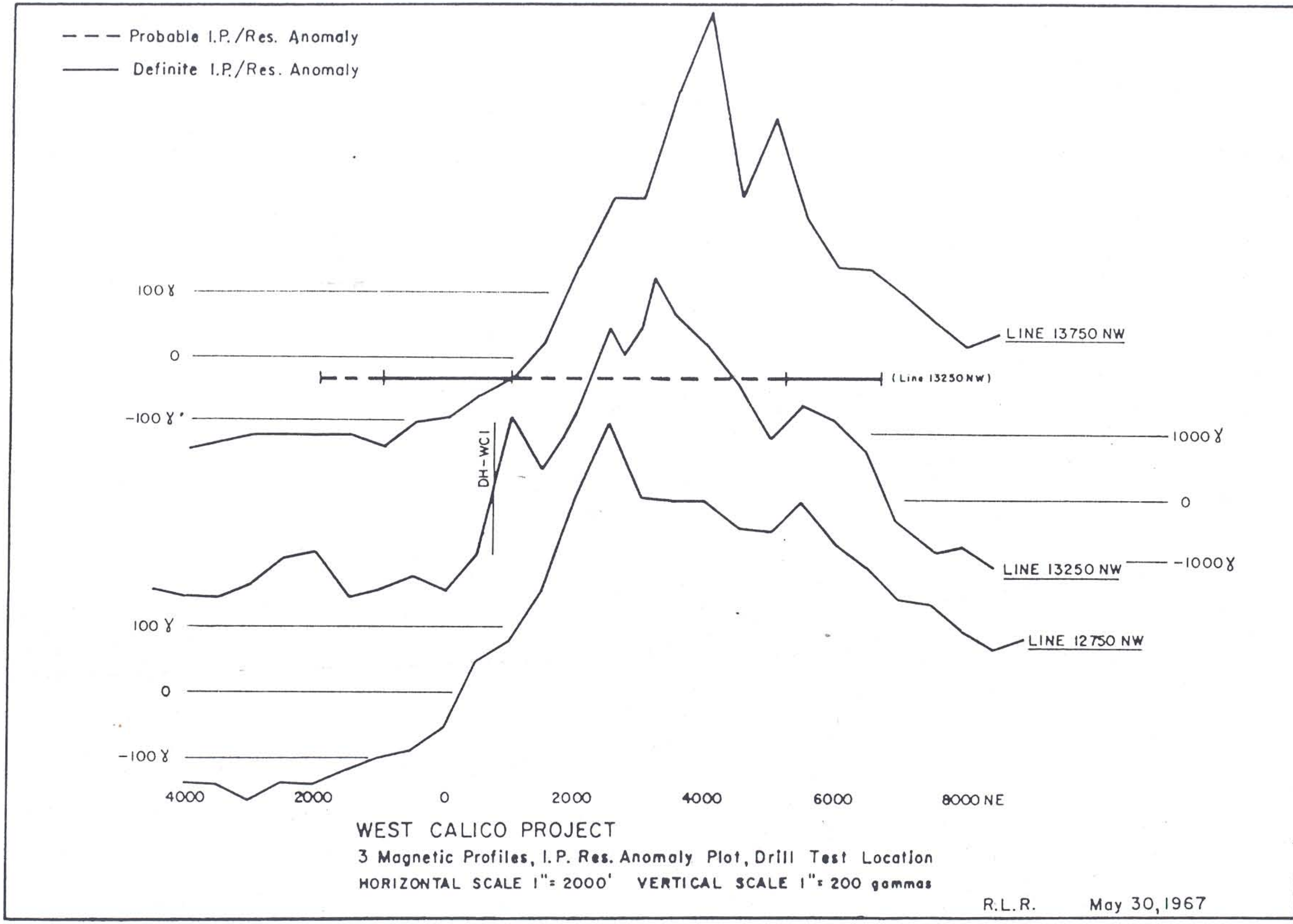


Figure 9 Ground magnetic profiles—West Calico project

67-I-311

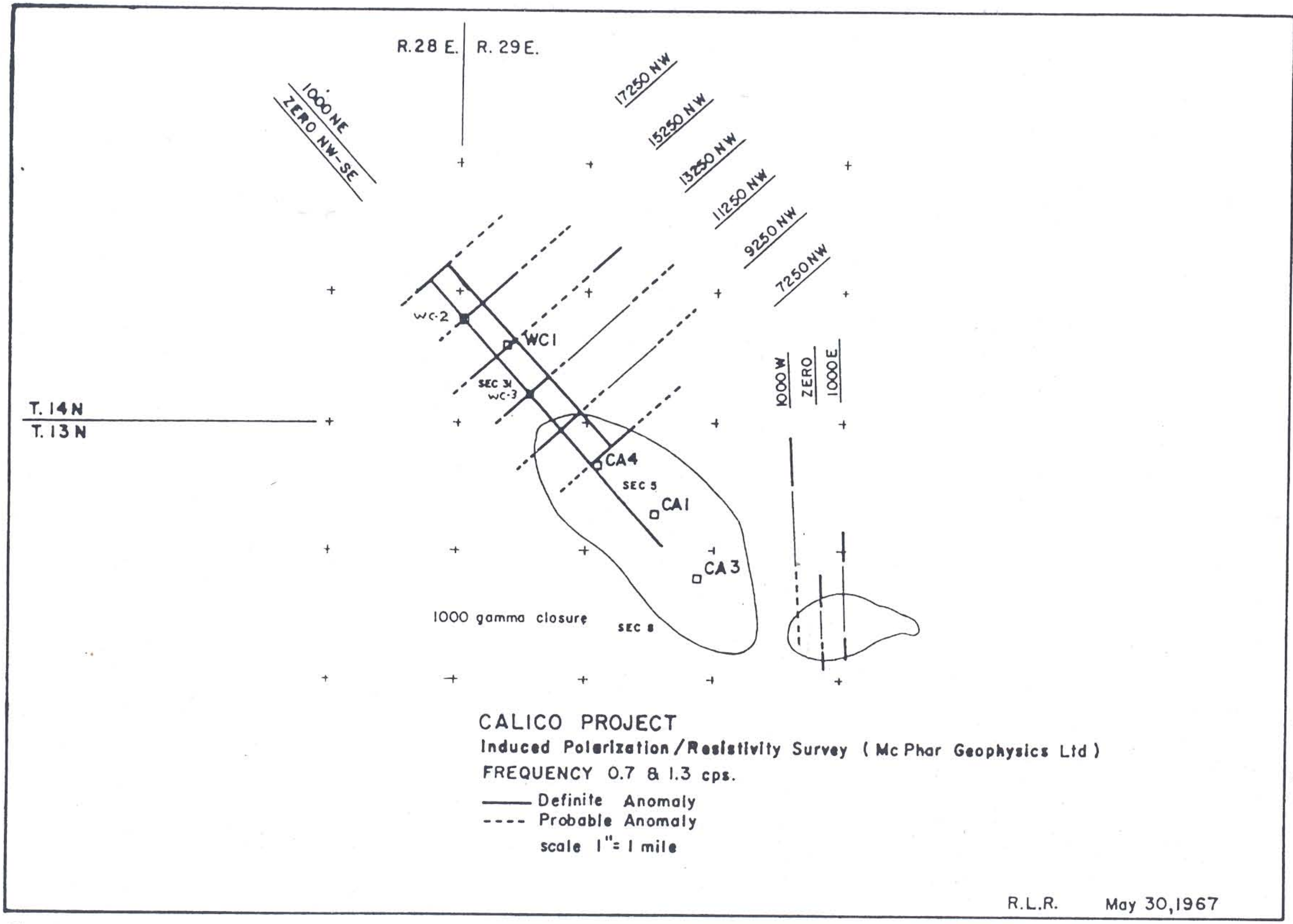


Figure 10 Induced Polarization / Resistivity Survey, Calico project

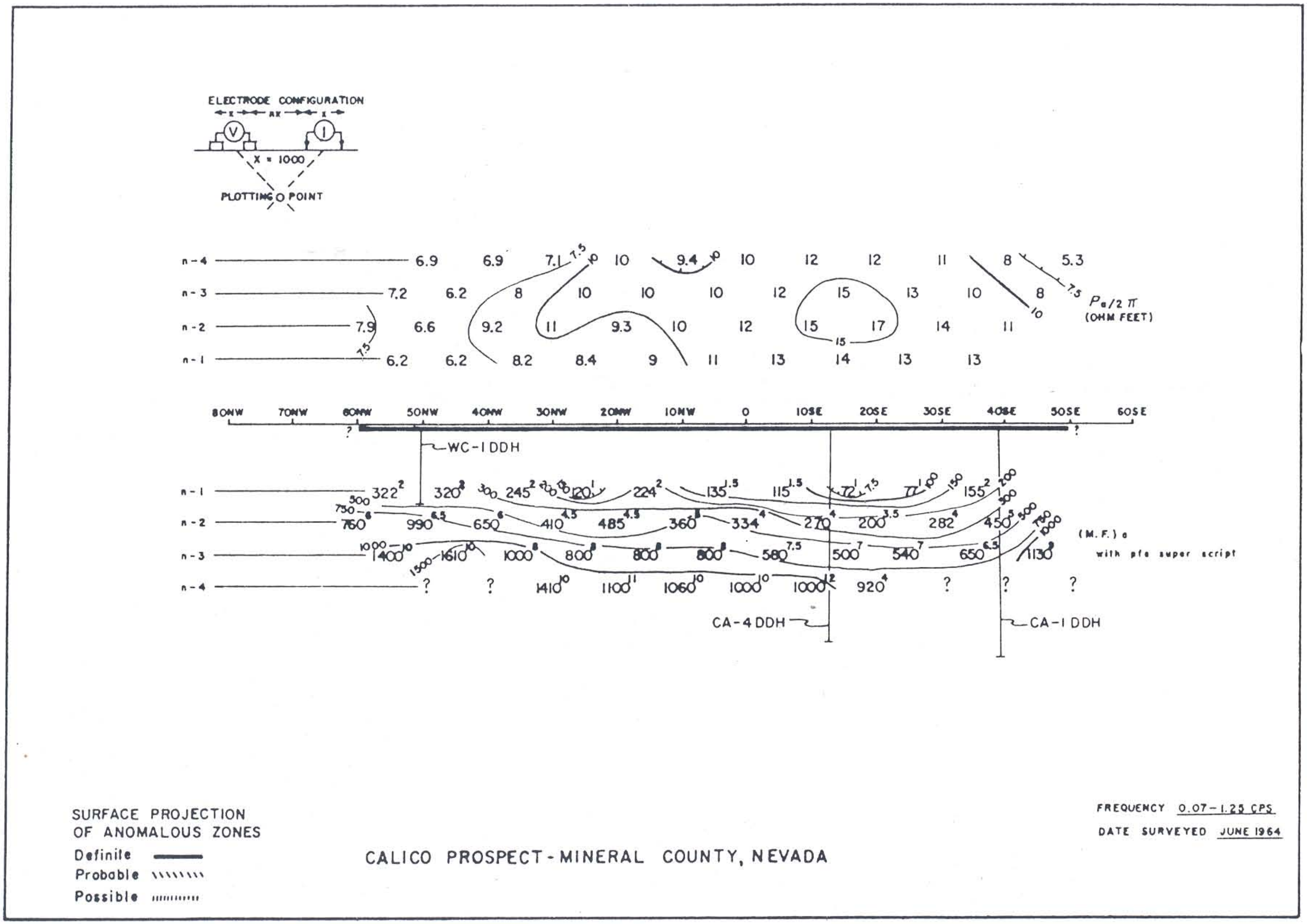
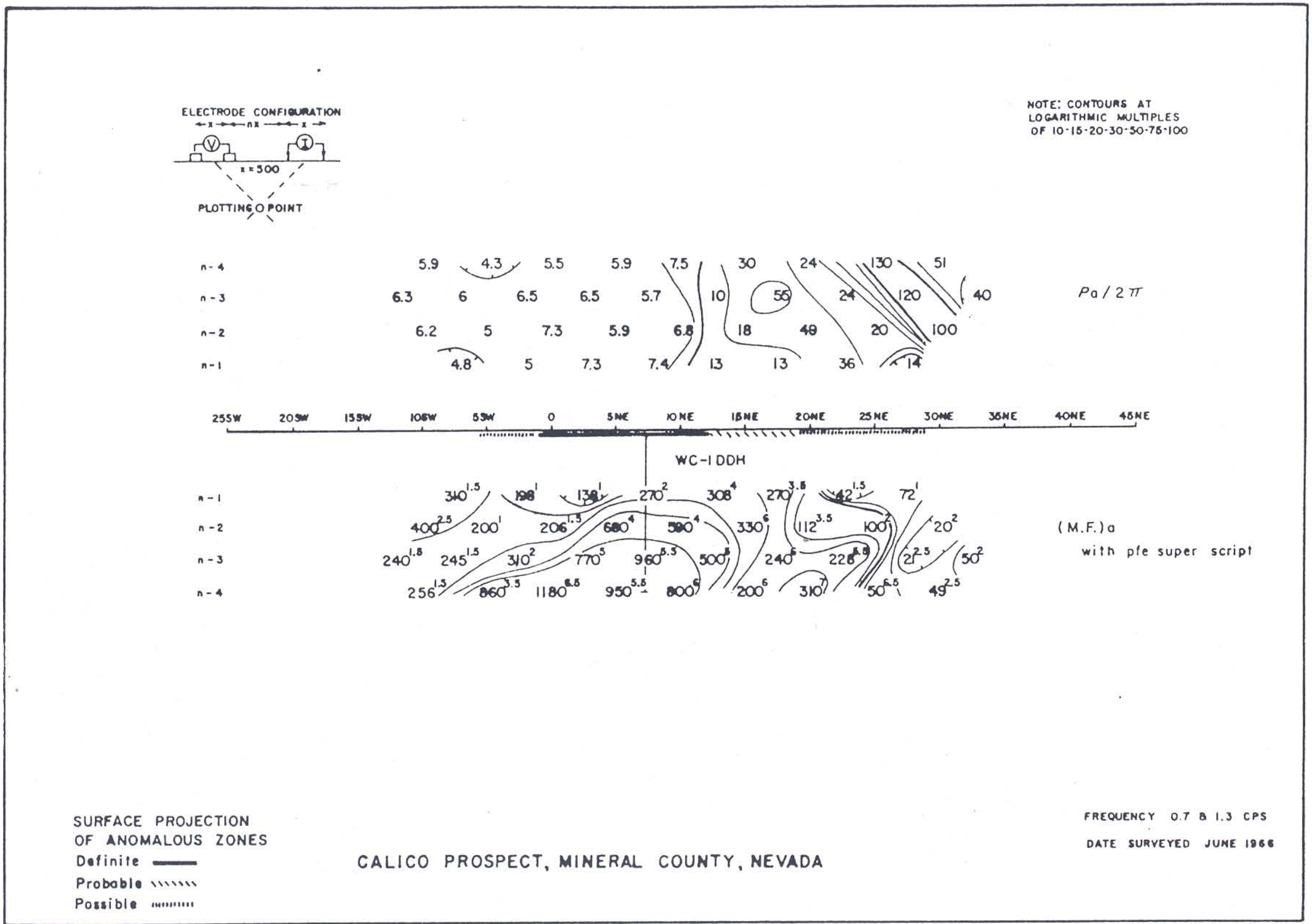


Figure 11 Line "O" Induced Polarization / Resistivity Survey

67-I-311



re 12 Line 13250, Induced Polarization / Resistivity Survey

22

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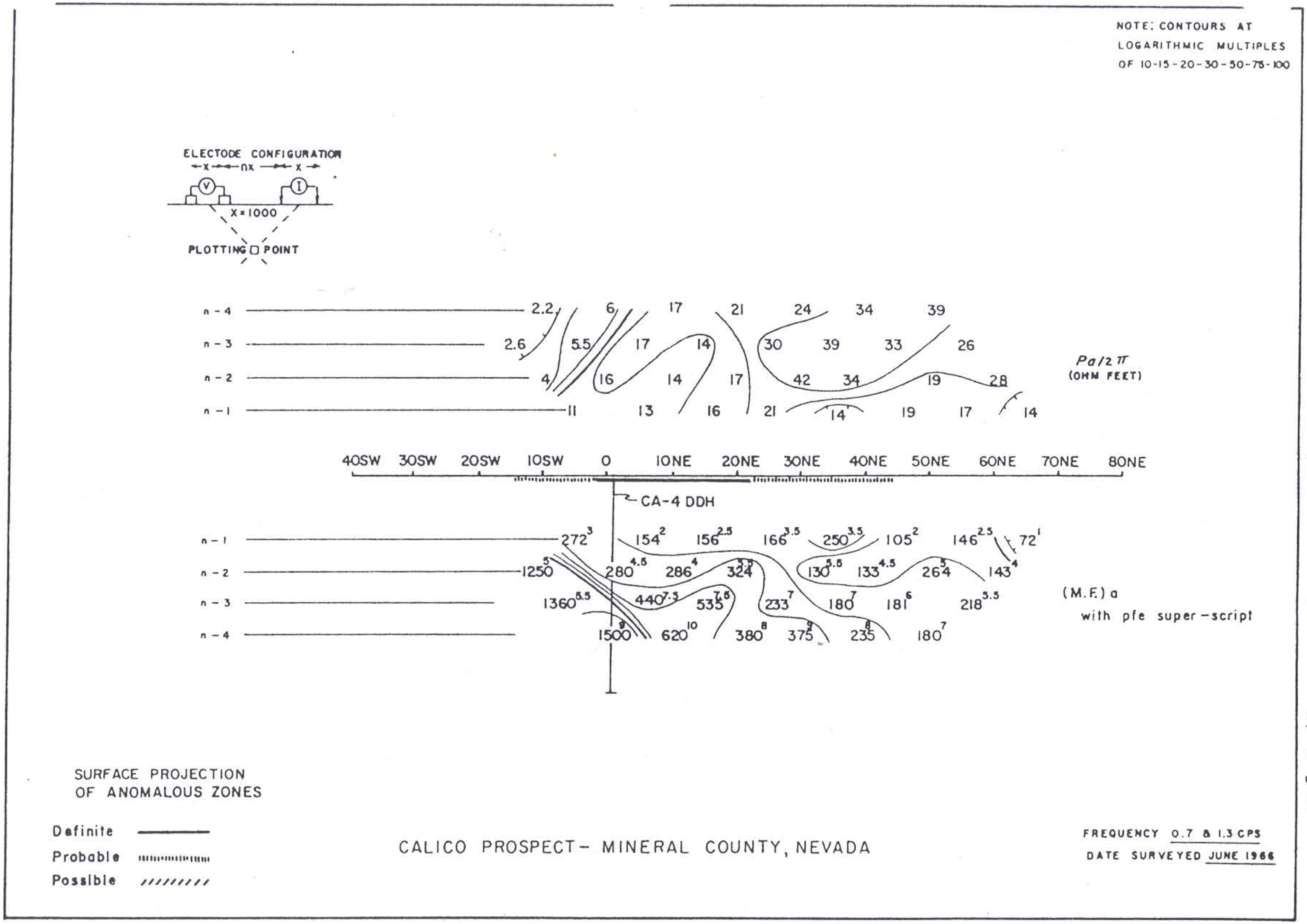

Figure 13, Line 72.5 NW, Induced Polarization / Resistivity Survey

67-I-311

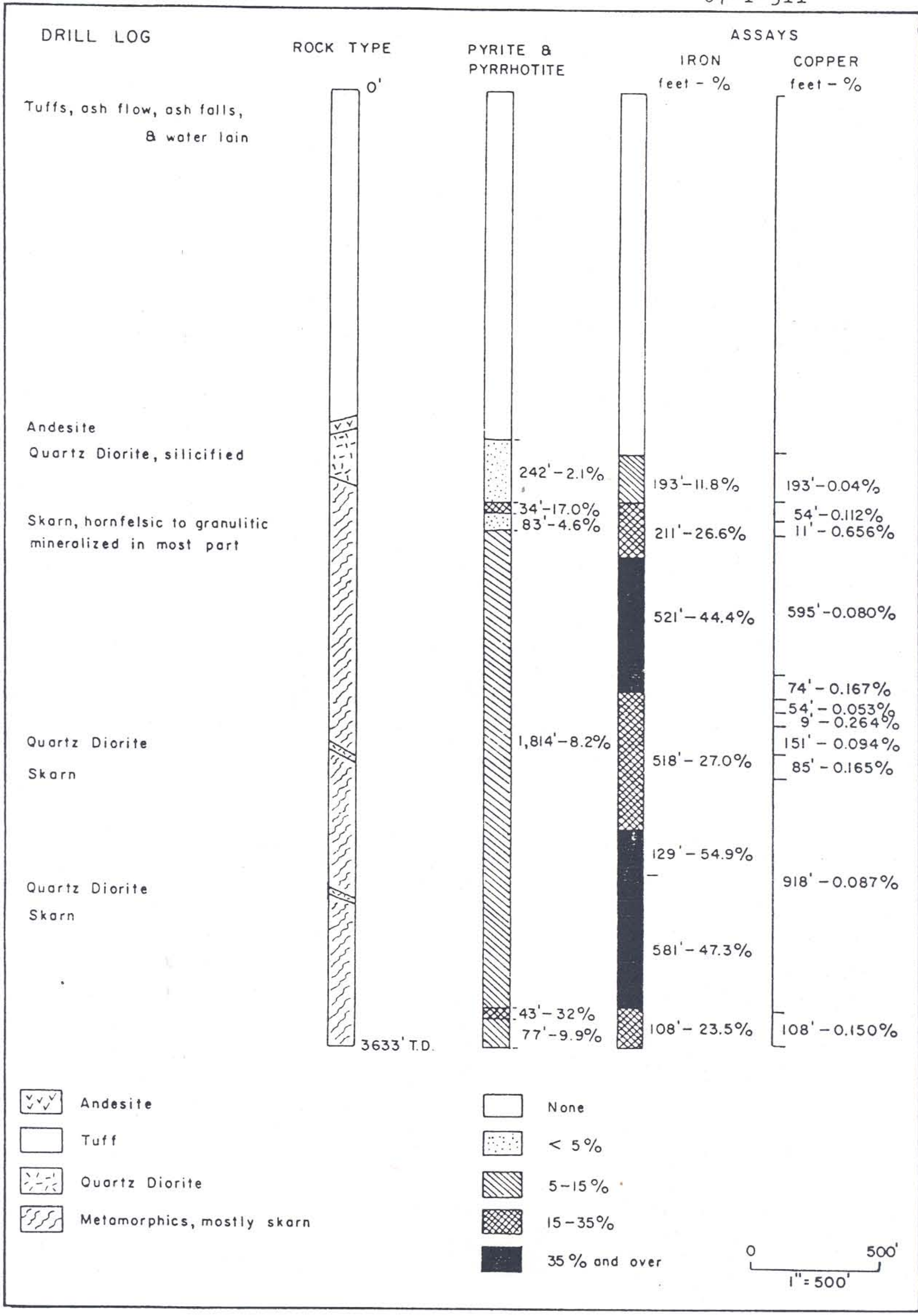

Figure 14, Drill Hole CA-1, showing assays & estimated sulfides

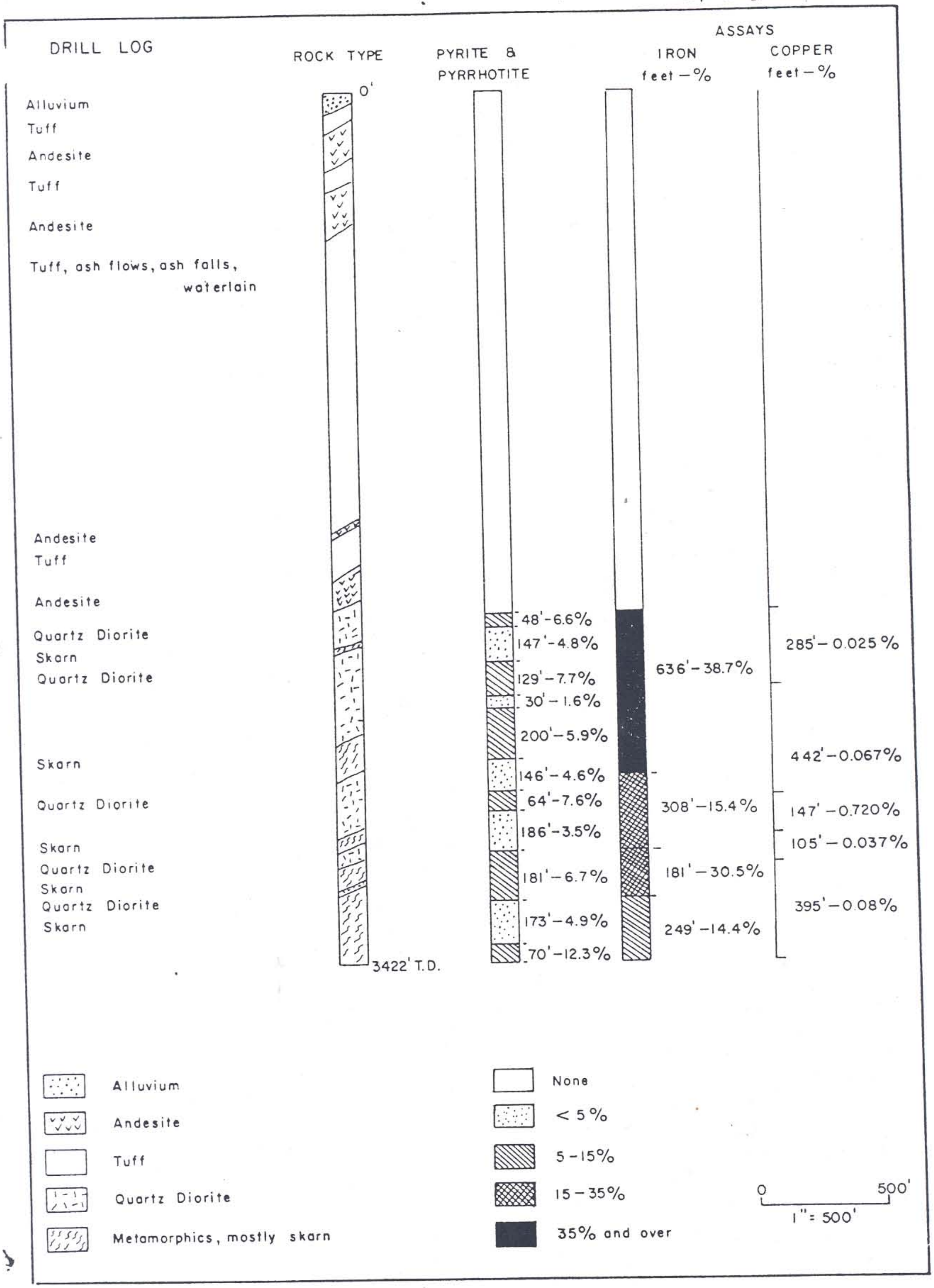

Figure 15, Drill Log, CA-3 showing assays & estimated sulfides

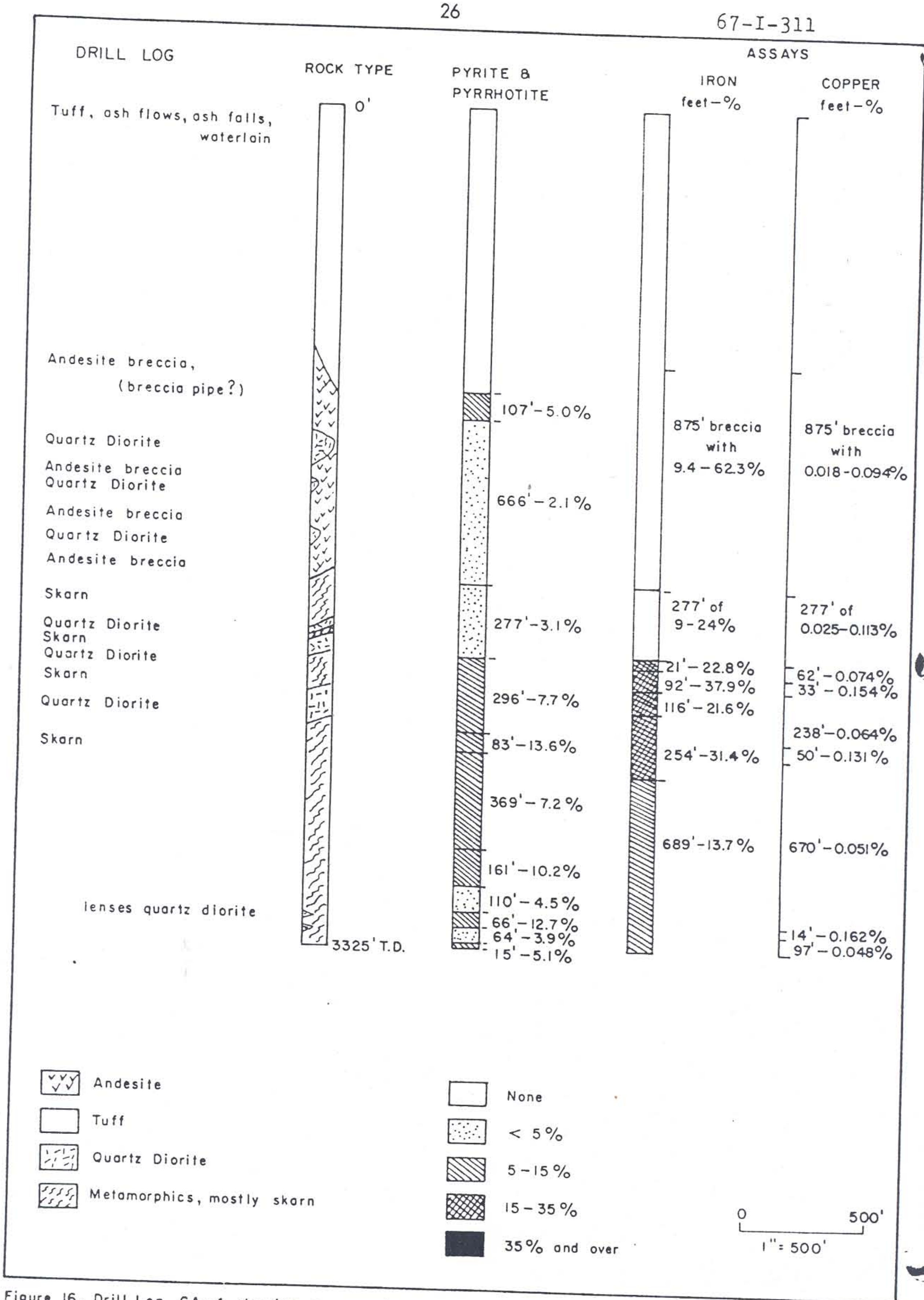

Figure 16, Drill Log, CA-4 showing assays & estimated sulfides

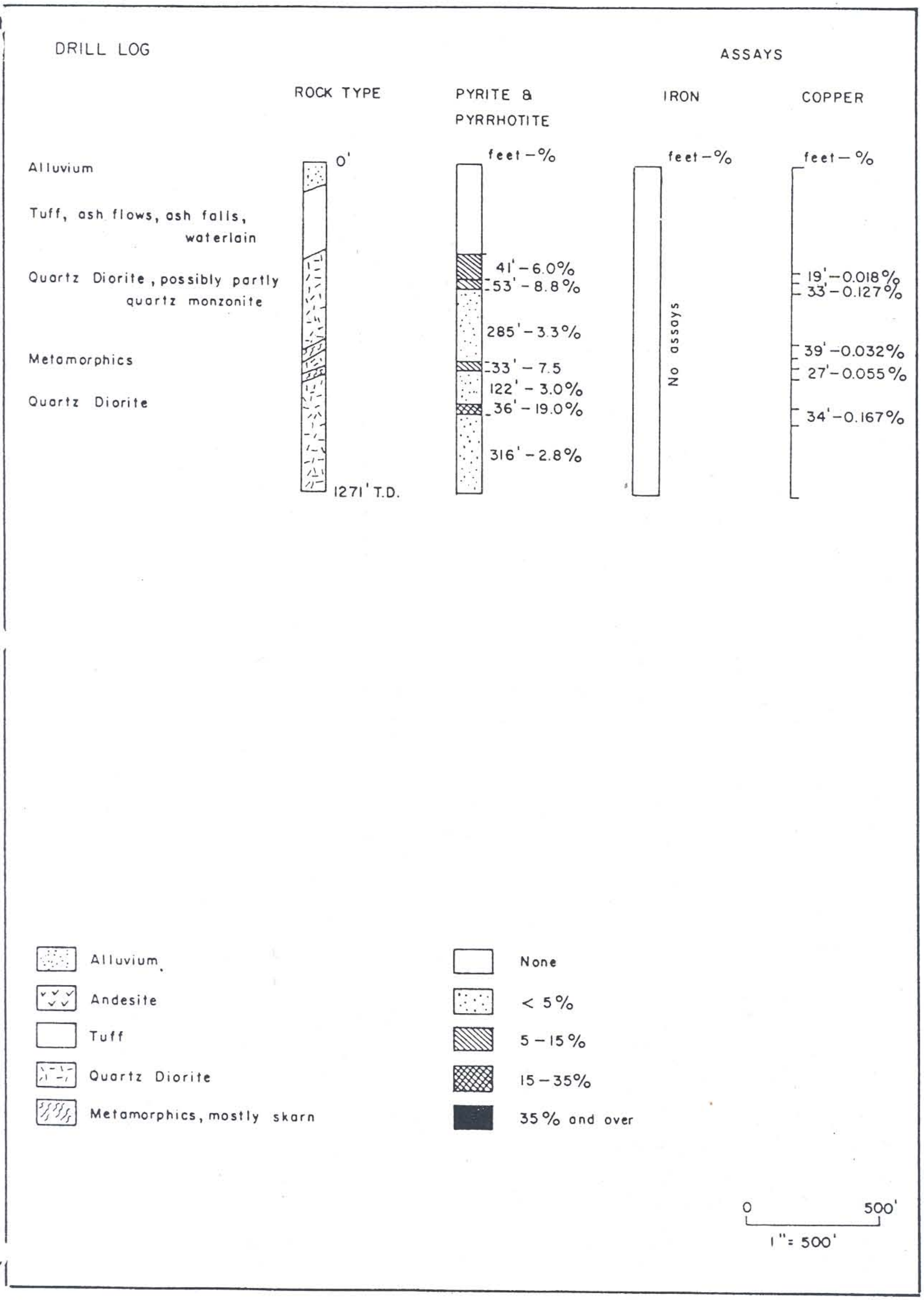

Figure 17, Drill Log, WC-1, showing assays & estimated sulfides