During the brief time negotiations were in progress, Phelps Dodge carried out their own induced polarization survey (See Figure 6a). Although some of the results of the survey were severely affected by a water pipe in the immediate target area there does appear to be an anomaly in the 1000 foot dipole results plotted.

The presence of an I.P. anomaly in an area of favorable geology is the main reason CoCa Mines entered the picture at Jerome. Uncertainties as to the extent and exact location of the anomaly lead to the decision by CoCa Mines to carry out a detailed I.P. Survey on the property.

Throughout the interpretational exercise on the induced polarization data the theoretical results presented in Appendix 2 should be kept in mind. These results show that for a deeply buried massive sulfide body no resistivity anomaly should be expected. Thus, as is quite obvious anyway from geometrical considerations, the strong resistivity anomaly found in the survey are caused by the unconsolidated Tertiary rocks in the trough immediately east of the Verde fault.

South A & A Anomaly

A remarkably sudden change in the electrical response was found in the prime area of investigation at the southwest corner of the A & A property. This can best be seen by comparing the pseudosections of lines 42N and 38N in the vicinity of station 15W (Figures 7c and d, respectively). Although the high N=½ and N=1 readings on line 38N in this area are doubtlessly caused by sulfide rich dump rocks on the surface, this source does not appear to be responsible for the high readings obtained at depth. The dump is also the most likely source of the anomaly detected by Brant in his 1950 survey.

As mentioned before, high noise levels encountered while carrying out surveys on line 38N were thought to have been a factor in generating this anomaly. In order to test the feature's validity the entire line was repeated on ½ unit N spacings. As the pseudosection shows the results confirmed the presence of a strong chargeability anomaly, albeit still quite "noisy".

Effects due to a pair of pipelines and a powerline near the location of the So. A & A anomaly might be invoked to discount its reality. Such an explanation, however, is not considered valid inasmuch as the same pipelines and powerlines were crossed by line 42N and, in part, by line 46N with no effect such as shown by the anomaly on line 38N.

If it is accepted that the anomaly detected in line 38N is due to mineralization and is a confirmation of the anomaly detected in the Phelps Dodge survey then the size of the source can be roughly circumscribed. Such is shown on plan maps Figure 5 and Plate 4. While further refinement of the source's position must await the continuation of the detailed surveys it appears most likely to lie mostly on lands owned by Phelps Dodge.

As shown on the pseudosection for line 38N the source is interpreted to apex at a depth of about 1200 feet and to plunge either vertically or possibly southward. Examination of Figure 5 shows that, with a steep southward plunge, the source of the anomaly projects directly toward the deep North Orebody in the United Verde mine. This massive sulfide body was noted for its high zinc content relative to the remainder of the United Verde deposit.

Apart from drill hole MM-1 (See section on Figure 7d) which was drilled in 1950 to test the geophysical anomaly discovered by Brant, no exploration seems to have been done over the 3000 foot vertical block of ground above the North Orebody. Norman (1952, p.42), at the conclusion of his exploration program, pointed this area out as being the only place he felt an optimistic outlook for further work remained.

The geologic projections made into the site of the South A & A anomaly suggest that the source lies within upper sequence rocks of the Grapevine Gulch formation. The Cleopatra member quartz porphyry mass is believed to lie 1000 feet to the east. While thus not lying precisely at the projected favorable horizon this anomaly is still considered very prospective. The highly folded nature of the area makes geologic projections such as that shown here subject to great uncertainties.

There is cause to worry, however, since hole MM-1, passing over the top of the interpreted body, encountered barren sulfides in bedded sediments. Quoting Norman (1952, p.42): drill hole MM-1 ..."showed 1 to 5 percent, disseminated pyrite and locally in narrow streaks 30 percent pyrite in bedded sediments along the contact of a diorite tongue..." If widespread disseminated pyrite is present in the Upper Sequence rocks of the area the anomaly is most likely its manifestation. Short of test drilling it will be very difficult to determine the true nature of the source of the South A & A anomaly.

Hopewell Anomaly

Largely through an unplanned extension of induced polarization coverage east of the A & A leased area,a previously unknown high quality anomaly was discovered on lines 38N, 42N and 46N in the vicinity of stations 33E to 40E. (See Appendix 4 for a narrative of this discovery.) This feature is called the Hopewell anomaly.

The source of the Hopewell anomaly is interpreted to lie at a depth of approximately 1500 ft below line 38N where it is most strongly expressed. In stark contrast to the So. A & A anomaly described above, the Hopewell anomaly is detectible, progressively less strongly,on lines 42N and 46N and possibly even line 54N. While this progressive weakening northward might be interpreted as indicating a weakening in the degree of mineralization the writer prefers the interpretation that the mineralization plunges northward at approximately 45° making its depth beyond the detection limit of the I.P. survey as line 54N is approached.

Two very interesting corollaries to this interpretation are:

1) The up-plunge direction lies to the south of line 38N where perhaps the source will reach the Precambrian/Paleozoic unconformity and be enriched by ancient supergene processes.

2) The source may lie at depth within the confines of the A & A lands.

In searching for confirmation for the Hopewell anomaly one is at once struck by the fact that the area immediately north of the UVX deposit has never been suitably surveyed with I.P. While the reason is not certain the fact is that Anaconda avoided this area with their surveys in 1974, 1977 and 1979. (See Figures 6b and 6c.) Only their line 38 approached the area of the Hopewell anomaly, however without detecting it. Phelps Dodge, in their 1977 survey passed directly over the anomaly with a line on which an "A" spacing of only 500 feet was used. (See line 10N of PD survey, not presented herein.) A very weak and ambiguous anomaly was detected on the Phelps Dodge line in the vicinity of stations 35E-50E (their coordinate system) which may relate to the Hopewell anomaly. The Depth of exploration for the 500 foot "A" spacing, however, would not be expected to be great enough to detect the interpreted source of the Hopewell anomaly.

The chances that the Hopewell anomaly represents an artifact in the data due to fence lines, dumps and other such surficial influences are considered remote. The feature exists on 3 lines in a coherent set of readings involving several electrodes. Study of effects from surface structures as presented in Nelson, 1977 yields no conclusive match to the data in this case.

The anomaly signature is not perfect however. As pointed out by Charles Swift (pers. commun.), the unusually low readings plotting below the high readings in the pseudo sections (in particular on line 38N) are inconsistent with the interpretation made herein. Inasmuch as the signals from which these unexpected low readings were obtained were amongst the weakest in the survey (N=6, 7, 8) a poor but possibly correct explanation lies in the inherent unreliability of such readings.

Very little geologic information is available in the immediate area of the anomaly. Underground exploration work at an elevation of 3700 feet by the United Verde Extension Company sixty five years ago lies 2000 feet to the south of the anomaly. Precambrian rocks outcrop in the Bessie Window area 2500 feet east of the anomaly. Anaconda drilled holes AV 4, 5, 6, 26, 27 and 28, 1500 to 2000 feet away to the southeast and southwest of the anomaly. Thus it is quite likely that geologic projections made into the area of the Hopewell anomaly will be in error by a large margin.

Nevertheless, such a projection has been attempted by P. Lindberg and is presented on the sections and in plan on Plate 7. These are necessarily provisional awaiting a complete relogging of drill holes in the area. Lindberg's projections suggest that the site of the Hopewell anomaly is on or near the highly prospective Cleopatra/Grapevine gulch contact.

While the Hopewell anomaly is still very much "open" to the south its size is already quite impressive. A study of the templates in Appendix 2 suggests that the source might very well be a massive sulfide deposit of size and tenor similar to that at the United Verde mine less than 1 mile away.

This optimistic interpretation should be considered in combination with a more pessimistic one in which the source of the anomaly is a large zone of disseminated mineralization in Upper Sequence rocks. Indeed, support for the pessimistic view exists in the anomalous I.P. effects found by Anaconda 4000 to 5000 feet to the southeast in the Dundee area. (See Figure 5 in combination with 6b and 6c.) If future work results in making a connection between these high readings and the Hopewell anomaly then the pessimistic interpretation would prevail due to the sheer size of the source required to explain the anomaly.

Other Indications From I.P. Survey

A number of interesting features, other than the So. A & A and the Hopewell anomalies, are present in the I.P. results. Perhaps the most striking is in the resistivity pseudosections on lines 38N, 42N and 46N at the extreme east ends. These three lines crossed the Bessie and Valley faults far enough to detect a strong low resistivity response from the thick sedimentary Tertiary and Quaternary cover of the Verde Valley. It is clear that any extension of geophysical coverage easward will have to cope with low surficial resistivities and will require high power equipment in order to attain exploration depths such as those attained in the existing survey.

The low resistivity of the Tertiary Hicky basalt and associated sediments is amply demonstrated on each line. The Hicky formation is preserved best on the down dropped block immediately east of the Verde fault. In each line a strong resistivity low is found having a large source at the surface corresponding to the location of the Tertiary rocks. Care should be taken in attaching significance to extensions of this resistivity low to depth on the pseudosections. Such apparent extensions are present on lines 42N, 46N and 54N, in each case having plausible explanations involving surficial features rather than those at depth. For example: the large resistivity low in the N= 4, 5 and 6 separations at the west end of line 54N is probably due to the effect of the surficial Tertiary rocks in the center of the line in combination with the effect of such rocks at the extreme west end of the line. Another example is on line 42N at station 35E where a topographic effect enhances the resistivity low due to Tertiary rocks.

It is unfortunate but not unexpected to find the lack of a consistent and strong resistivity contrast between the Paleozoic and the Precambrian rocks. Such does not appear to be the case with respect to chargeability, however. In each line an increase in the background chargeability is noted with depth as the Precambrian rocks come more into play as to affecting the reading. It is this "high background" type of response that is interpreted to be the cause of the weak mid-depth anomalies encountered on lines 42N and 46N in the vicinity of the Verde fault where the Precambrian rocks are quite close to the surface. The "A&A Anomaly" noted by Anaconda in their 1974 survey is here interpreted to be due to the "high background" effect.

Small zones of mineralization are known to be present at or near the Verde fault as reported in the old A & A mine records. Thus the "high background" interpretation given above may be in error on the pessimistic side. It is clear, however, that no large body of massive sulfides is present at intermediate depths (500-1000 feet) on the A & A property near the Verde fault in the region covered by the survey.

A definitive measurement of background chargeability from the Precambrian rocks in the survey area should be attempted upon extension of the I.P. survey eastward across the Bessie Window area (coordinate 7000E). Such an extension of the traverses will be required in order to fully map the Hopewell anomaly's eastern edge.

An ambiguous feature is noted in the chargeability pseudo-section for line 38N in the vicinity of station 25E at the N=2½-3½ level. The high chargeability readings appear "real" inasmuch as the known surface disturbances cannot explain their presence. The Hopewell tunnel passes through the area at a depth of 300 feet. Although no such effect is noted associated with the tunnel on lines 54N and 46N where it lies at shallower depths, the coincidence on line 38N is cause to worry. Consistent with the optimistic interpretations made elsewhere, the source of the small anomaly is interpreted as a possible small massive sulfide body at the Precambrian-Paleozoic unconformity.

Disturbances from surficial features are readily noted on the I.P. survey results. The most serious such effect is on line 38N around station 10W. The high chargeabilities measured on the N=½ and N=1 separations are interpreted to be caused by sulfide material on the large waste dump located between stations 0E and 17E. This dump represents mostly diorite, Grapevine Gulch formation and massive pyrite stripped off of the United Verde orebody in the open pit operation between 1917 to 1940. Obviously not much corrective action can be taken in the case of these large dumps.

Next important in terms of severity of effect is the grounded wire fenceline crossed by lines 42N and 38N in the vicinity of station 30E. In both cases data is disturbed on the N=½ reading where the "inside" receiver pot was placed within 100 feet of the fence. This is the result predicted in Nelson, 1977.

Two metal pipelines were discovered crossing the traversed area in the vicinity of station 0E. One of these serves the small parcel of surface rights owned by John Birmingham on the A & A property near at 4550N, 250E. The second line is unused. Both pipelines were mapped by use of the VLF electro-magnetic instrument. The induced polarization survey layout was made so as to minimize the effect from these pipes by cen-

tering them between two current electrodes. This appears to have been a successful strategy on all lines except 38N where a disturbance, similar to the one noted for the fence-line above, was detected. Again this effect is unambiguously noted in the data.

A small powerline crosses two of the traverses at a shallow angle immediately west of the pipelines. This power serves the small house on the Birmingham land mentioned above. Only one grounding wire exists along the pipeline in the area surveyed. This ground is on the pole nearest the house. No effect in the data is noted from this powerline.

Future electrical work in the area should be preceeded by digging up the unused pipeline at the south end of the A & A property and by temporarily cutting or insulating the wire fenceline.

Magnetic and VLF Results

As noted earlier the magnetic and VLF surveys are considered of only secondary importance, having been run only to gain maximum usefulness from the carefully laid out control lines. Although there was hope that target massive sulfide bodies would be magnetic, such was not expected. According to Anderson and Creasey, 1958 (p. 132) the Haynes body is unusual in the district as being strongly magnetic. The magnetic minerals may not have been primary, rather they may be the result of contact metamorphism (Anderson and Nash, 1972, P. 855).

Brant, 1949, undertook physical property measurements on many samples in the Jerome district. He states (p. 2): "Preliminary tests...showed that little magnetic contrast existed between the porphyry, diorite and certain of the volcanics, and that sulfide samples from the south side of the Verde pit, Copper Chief and Iron King were very weak magnetically. Hence little was to be expected from the magnetic work."

Examination of the magnetic profiles on Plates 6a-d along with posted anomaly positions on the sections demonstrates that, as expected, the Tertiary basalts of the Hicky formation dominate the field. Anomalies in excess of 3000 gammas are commonly observed over exposures of these rocks. The profiles are useful in this regard since they serve to "pinpoint" the location of the edges of the Hicky basalts in areas where thin cover obscures the contact.

Attempts were made on lines 38N and 42N to discern a possible weak signal from depth so as to confirm the presence of the Hopewell and So. A & A anomalies. The means chosen to make this attempt was to replot readings at a detailed scale. Unfortunately these attempts have been frustrated by the presence of the highly magnetic Tertiary rocks in key areas near the sought after weak anomalies. Until further I.P. work tracks the anomalies into non-magnetic areas definitive confirmation of the I.P. indications with magnetics will be very difficult to obtain.

A number of unexplained features are present on the magnetic data. The most important of these appears at the east ends of each of the lines where magnetic effects of a complex nature correlate with the Bessie Window of Precambrian rocks and with the down dropped (east) blocks of the Bessie and Valley faults. It is reported that in the Texas Shaft, 4000 feet away to the south, Tertiary basalts were encountered below the Quaternary cover. It is possible that the anomalies discovered in a similar setting on our lines represent the same source. Detailed magnetic surveys in the area may resolve the issue.

A 100 gamma magnetic level change was noted on line 46N at station 41W. This correlates with the position of a small mapped fault in the Haynes graben;however, the mechanism causing the magnetic level change is not known.

The VLF electromagnetic survey was only about 70% completed. Thus the west part of line 46N, the east end of line 42N and the west end of line 38N have not been covered. A great deal of information is present on the VLF results, all of which relates to the near surface environment. Thus the Verde fault, edges of the electrically conductive Tertiary and Quaternary deposits and the positions of minor faults or lithologic changes are marked by anomalies on the VLF profiles.

As usual many more anomalies were found than can be suitably explained by known geologic features. This is particularly the case over the Tertiary Hicky formation. It is likely that many such anomalies have their explanation in the complex changes in lithology characteristic of this unit involving lava flows, clays and unconsolidated stream bed deposits.

A group of unusually good quality anomalies was detected at the extreme east end of the traverses in the Bessie fault area. It is likely that further detailed VLF work will help resolve the complex faulting situation in this important area.

The VLF method proved valuable in finding and mapping pipelines and cables which might otherwise have raised havoc with the I.P. survey. Knowing the positions of such disturbing influences the I.P. electrode positions could be optimally placed to avoid the problem as much as possible.

CONCLUSIONS &
RECOMMENDATIONS

CONCLUSIONS

Exploration in the northern part of the Verde (Jerome) district is under severe handicap due to thick cover of post mineral formations. Chiefly for this reason this highly prospective northern area has witnessed very little effective exploration work during the history of the district. This is in stark contrast to massive sulfide camps in Canada where saturation drilling is the norm.

Induced polarization surveys have proved successful in exploring the subject area for large United Verde type deposits. Two high quality (and several lesser quality) targets have resulted from the I.P. surveys run in the area by CoCa Mines, Phelps Dodge and The Anaconda Company. The two high quality targets have been named the So. A & A and the Hopewell anomalies in this study.

The South A & A anomaly possibly represents the upward continuation of the Cu-Zn North Orebody mined at a depth of 4000 feet during the last years of the United Verde mine's operation. The target is believed to lie at a depth of about 1200 feet and plunge either vertically or at a steep southward angle. It appears to lie mostly within lands owned by Phelps Dodge but may, at depths below the detection limit of our survey, extend onto lands owned by Verde Exploration,Ltd. (either or both the Haynes and the A & A lands). Geologic projections suggest that the So. A & A target lies within Upper Sequence rocks 1000 feet above (stratigraphically) the Cleopatra/Grapevine Gulch contact.

The Hopewell anomaly possibly represents a new mineral deposit similar in size and grade to the famous United Verde massive sulfide pipe. The target, not fully defined by the survey, appears to lie at a depth of approximately 1500 feet below line 38N. It is interpreted as plunging northward at a shallow angle from lands owned by Verde Exploration, Ltd., across the corridor area owned by Phelps Dodge, back into the A & A lands owned by Verde. If this interpretation is correct further I.P. surveys to the south may detect the up-plunge extent of the mineralization to the Precambrian-Paleozoic contact. Tentative long range geologic projections place the source of the Hopewell anomaly at or near the Cleopatra/Grapevine Gulch contact. This contact hosts both the United Verde and the UVX ore deposits elsewhere in the camp.

Insofar as secondary enrichment may have occurred during the 1.2 billion year period between the formation of massive sulfide deposits and the deposition of Paleozoic cover rocks, one might expect bonanza grades in the upper portions of newly discovered mineral deposits at Jerome. Of course, a necessary requisite is that such deposits must reach the Precambrian/ Paleozoic unconformity.

Both the So. A & A and the Hopewell anomalies are considered "real". That is: it is not considered probable that they represent artifacts caused by disturbing surficial or instrumental influences. On the other hand both could be the result, not of massive sulfide bodies but, of zones of disseminated and barren mineralization. This possibility is particularly applicable to the So. A & A anomaly near which such mineralization has been intersected in an exploration drill hole.

High electrical noise conditions prevail in the survey area due, most probably, to industrial activity at the Phoenix Cement plant. Future electrical exploration work must utilize high power equipment with good signal enhancement capabilities.

The results of the I.P. survey underscore the need for precise control in the geophysical traverse positions for the detailed surveys required. Dramatic changes in the results were found with only a 400 foot difference in line position.

RECOMMENDATIONS

The South A & A and the Hopewell targets warrant an agressive follow-up land acquisition and exploration program. The leasing activity recommended in Rivera, 1982a and subsequently in memos dated May 24, 1982 and June 2, 1982 is again proposed as the minimum requirement to give adequate scope to the exploration program. In addition the open lands listed in the "Land Situation" section of this report should be immediately secured by location subject only to verification by futher title search.

An $800,000 work plan and budget has been proposed as the next step in the exploration of the subject area (see Rivera, 1982b).As outlined on Table 4 this program consists of: completion of the geophysical surveys to fully define the targets found in the January-February survey, extensive geologic work and 13,500 feet of drilling. It is felt that completion of the proposed work plan will bring the Jerome project to a point of decision relative to abandonment, dilution of interest by formation of a joint venture and/or commencement of under-

TABLE 4
SUMMARY OF RECOMMENDED EXPLORATION
(See Work Plan for details)

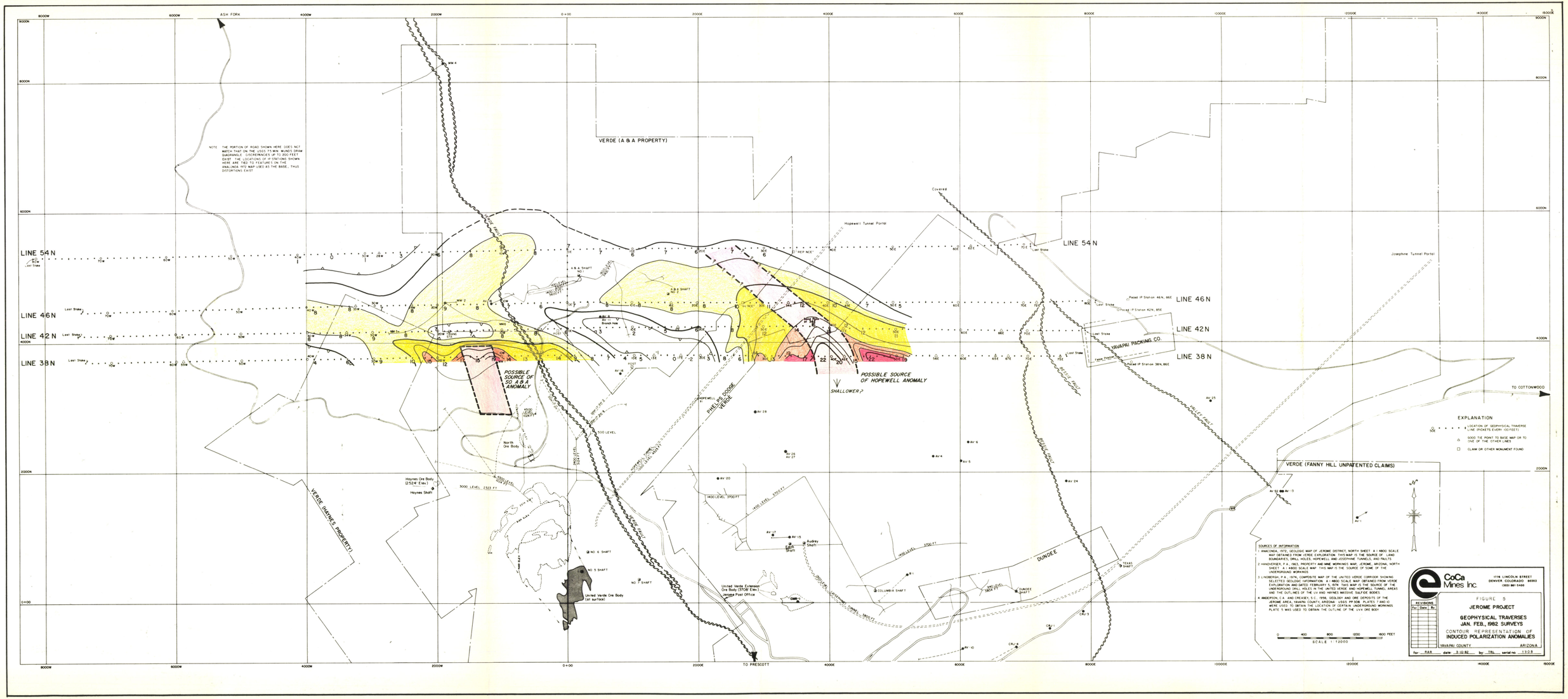
CLASS OF WORK	AMOUNT	PURPOSE
Geophysics: Line layout, induced polarization, VLF and magnetics, test CSAMT Survey	27 line mi, 6 man-mo	Refine targets
Geology: Relog core, make skeleton logs, underground mapping, compilation of records onto level plans and sections	10 man-mo	Reinterpretation and layout of framework for test drilling
Geochemistry: Sample Tapeats unit in drill cuttings and on surface	50 spls	Confirmation of targets
Drilling: Six holes, 3 on each target (So. A&A and Hopewell), downhole surveying, logging and assaying, downhole geophysical surveys	13,500 ft 12 man-mo	Test targets
Summary Report	5 man-mo	Presentation of results and recommendations
Total	33 man-mo	

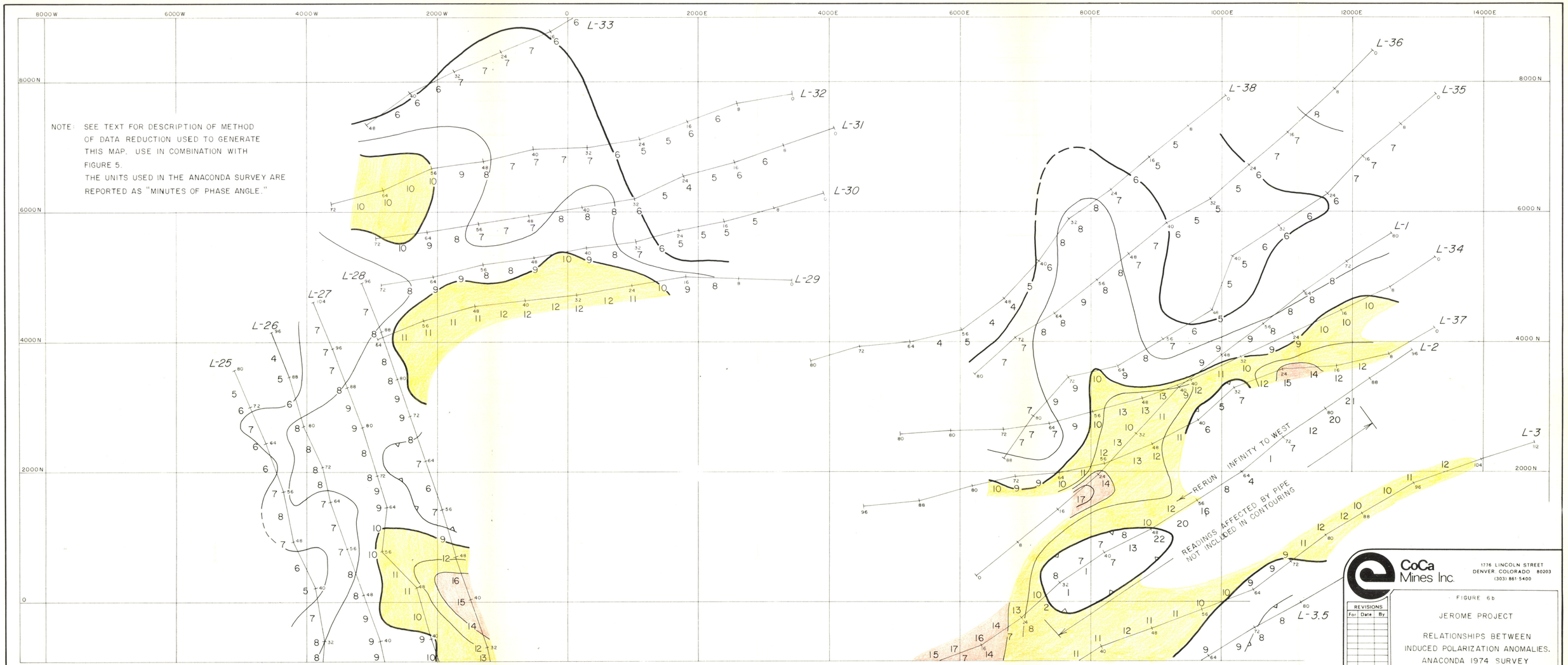
ground exploration work. Such underground work most probably would utilize access through the 1400 foot level in the UVX mine.

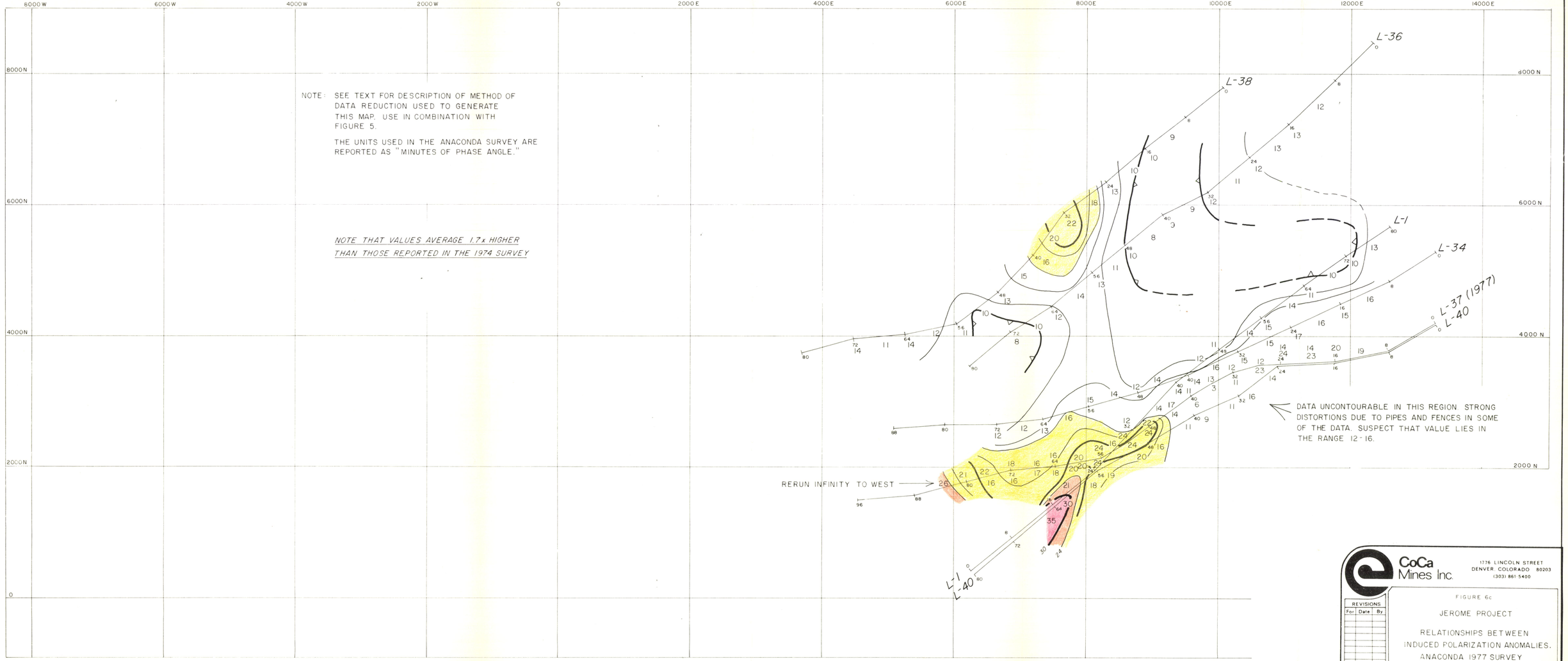
R. A. Rivera

RAR:njb

FIGURES 5 to 8


ASH FORK
VERDE (A & A PROPERTY)
NOTE: THE PORTION OF ROAD SHOWN HERE DOES NOT MATCH THAT ON THE USGS 7.5 MIN. MUNDS DRAW QUADRANGLE. DISCREPANCIES UP TO 200 FEET EXIST. THE LOCATIONS OF IP STATIONS SHOWN HERE ARE TIED TO FEATURES ON THE ANACONDA 1972 MAP USED AS THE BASE, THUS DISTORTIONS EXIST.
LINE 54 N
LINE 46 N
LINE 42 N
LINE 38 N
Hopewell Tunnel Portal
Covered
Josephine Tunnel Portal
Paced IP Station 46N, 86E
Paced IP Station 42N, 85E
Paced IP Station 38N, 86E
YAVAPAI PACKING CO.
POSSIBLE SOURCE OF SO 4 & A ANOMALY
POSSIBLE SOURCE OF HOPEWELL ANOMALY
SHALLOWER?
PHELPS DODGE VERDE
North Ore Body
Haynes Ore Body (2524' Elev.)
Haynes Shaft
VERDE (HAYNES PROPERTY)
3000 LEVEL 2523 FT
1400 LEVEL 3700 FT
United Verde Ore Body (at surface)
United Verde Extension Ore Body (3708' Elev.) Verde Post Office
Audrey Shaft
Edith Shaft
COLUMBIA SHAFT
DUNDEE
DUNDEE SHAFT
TEXAS SHAFT
VERDE (FANNY HILL UNPATENTED CLAIMS)
TO PRESCOTT
TO COTTONWOOD
EXPLANATION
LOCATION OF GEOPHYSICAL TRAVERSE LINE (POCKETS EVERY 100 FEET)
5000 TIE POINT TO BASE MAP OR TO ONE OF THE OTHER LINES
CLAIM OR OTHER MONUMENT FOUND
SOURCES OF INFORMATION
1 ANACONDA, 1972, GEOLOGIC MAP OF JEROME DISTRICT, NORTH SHEET: A 1:4800 SCALE MAP OBTAINED FROM VERDE EXPLORATION. THIS MAP IS THE SOURCE OF LAND BOUNDARIES, DRILL HOLES, HOPEWELL AND JOSEPHINE TUNNELS, AND FAULTS
2 HANDVERGER, P. A., 1963, PROPERTY AND MINE WORKINGS MAP, JEROME, ARIZONA, NORTH SHEET: A 1:4800 SCALE MAP. THIS MAP IS THE SOURCE OF SOME OF THE UNDERGROUND WORKINGS
3 LINDBERGH, P. A., 1974, COMPOSITE MAP OF THE UNITED VERDE CORRIDOR SHOWING SELECTED GEOLOGIC INFORMATION: A 1:4800 SCALE MAP OBTAINED FROM VERDE EXPLORATION. THIS MAP IS THE SOURCE OF THE LOCATIONS OF SOME OF THE UNDERGROUND DRILL HOLES IN THE UNITED VERDE AND HOPEWELL TUNNEL AREAS AND THE OUTLINES OF THE UV AND HAYNES MASSIVE SULFIDE BODIES
4 ANDERSON, C. A. AND CREASEY, S. C., 1958, GEOLOGY AND ORE DEPOSITS OF THE JEROME AREA, YAVAPAI COUNTY, ARIZONA: USGS PP 308, PLATES 7 AND 10 WERE USED TO OBTAIN THE LOCATION OF CERTAIN UNDERGROUND WORKINGS. PLATE 5 WAS USED TO OBTAIN THE OUTLINE OF THE UVX ORE BODY
0 400 800 1200 1600 FEET
SCALE 1:12000
CoCa Mines Inc.
1776 LINCOLN STREET
DENVER, COLORADO 80203
(303) 861-5480
REVISIONS
FIGURE 3
JEROME PROJECT
GEOPHYSICAL TRAVERSES
JAN. FEB., 1982 SURVEYS
CONTOUR REPRESENTATION OF
INDUCED POLARIZATION ANOMALIES
YAVAPAI COUNTY
ARIZONA
for HAR date 3-10-82 by TRL serial no. 1303


8000W
6000W
4000W
2000W
0
2000E
4000E
6000E
8000E
10000E
12000E
14000E
6000N
4000N
2000N
0
8000N
6000 N
4000 N
2000N
NOTE: SEE TEXT FOR DESCRIPTION OF METHOD OF DATA REDUCTION USED TO GENERATE THIS MAP. USE IN COMBINATION WITH FIGURE 5.
THE UNITS USED IN THE ANACONDA SURVEY ARE REPORTED AS "MINUTES OF PHASE ANGLE."
L-33
L-32
L-31
L-30
L-29
L-28
L-27
L-26
L-25
L-36
L-38
L-35
L-1
L-34
L-37
L-2
L-3
L-3.5
INFINITY TO WEST
RERUN
READINGS AFFECTED BY PIPE NOT INCLUDED IN CONTOURING
CoCa Mines Inc.
1776 LINCOLN STREET
DENVER, COLORADO 80203
(303) 861-5400
FIGURE 6b
JEROME PROJECT
RELATIONSHIPS BETWEEN INDUCED POLARIZATION ANOMALIES. ANACONDA 1974 SURVEY
YAVAPAI COUNTY
ARIZONA
REVISIONS
For
Date
By
for: RAR
date: 3-26-82
by: TRL
serial no. 1290



NOTE: SEE TEXT FOR DESCRIPTION OF METHOD OF DATA REDUCTION USED TO GENERATE THIS MAP. USE IN COMBINATION WITH FIGURE 5.

THE UNITS USED IN THE ANACONDA SURVEY ARE REPORTED AS "MINUTES OF PHASE ANGLE."

NOTE THAT VALUES AVERAGE 1.7x HIGHER THAN THOSE REPORTED IN THE 1974 SURVEY

CoCa Mines Inc.

1776 LINCOLN STREET
DENVER, COLORADO 80203
(303) 861-5400

REVISIONS		
For	Date	By

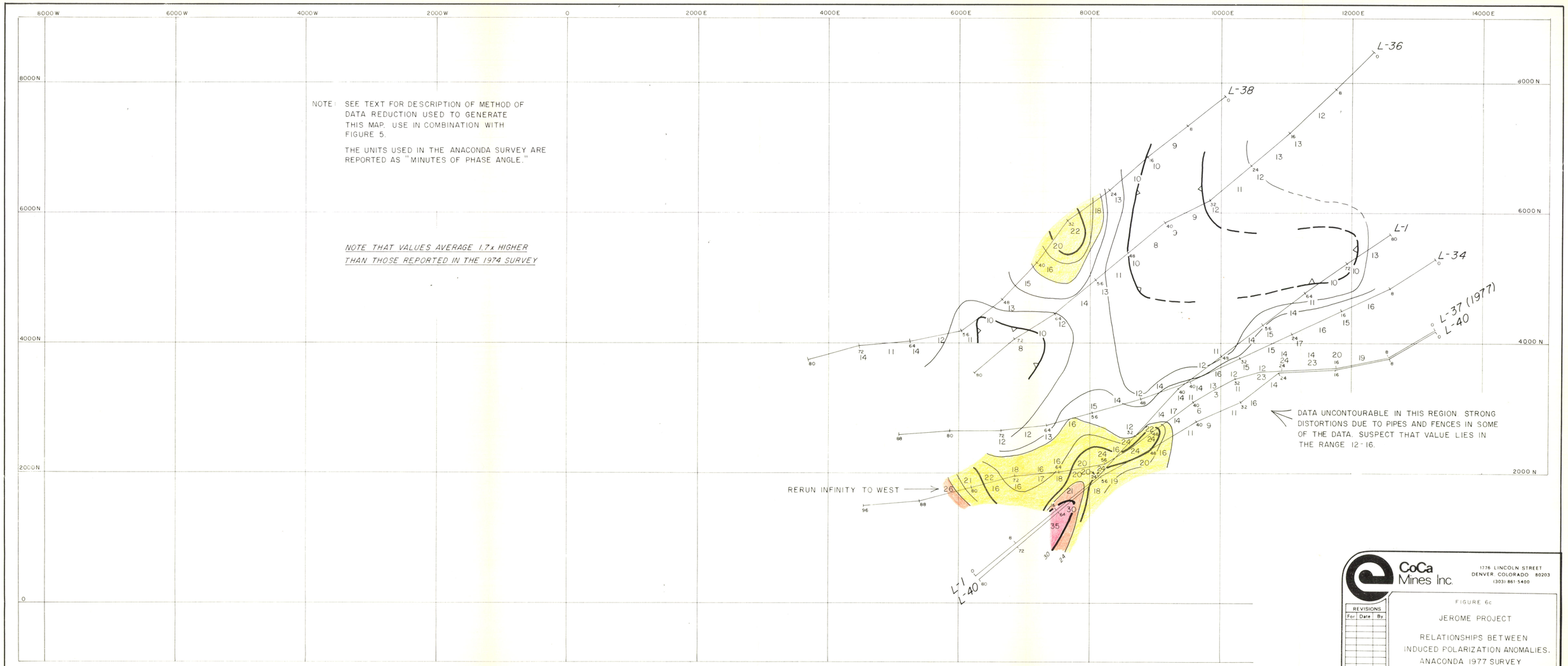
FIGURE 6c

JEROME PROJECT

RELATIONSHIPS BETWEEN INDUCED POLARIZATION ANOMALIES. ANACONDA 1977 SURVEY

YAVAPAI COUNTY ARIZONA

for: CFB date: 3-26-82 by: TRL serial no. 1291



CoCa Mines Inc.

1776 LINCOLN STREET
DENVER, COLORADO 80203
(303) 861-5400

REVISIONS		
For	Date	By

FIGURE 6c

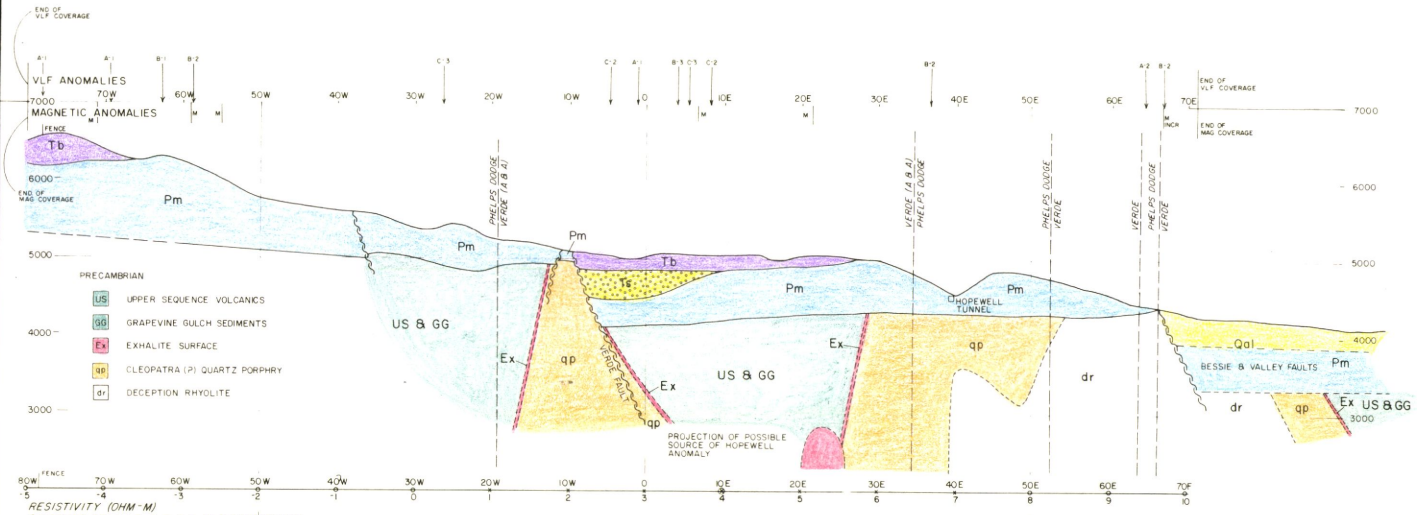
JEROME PROJECT

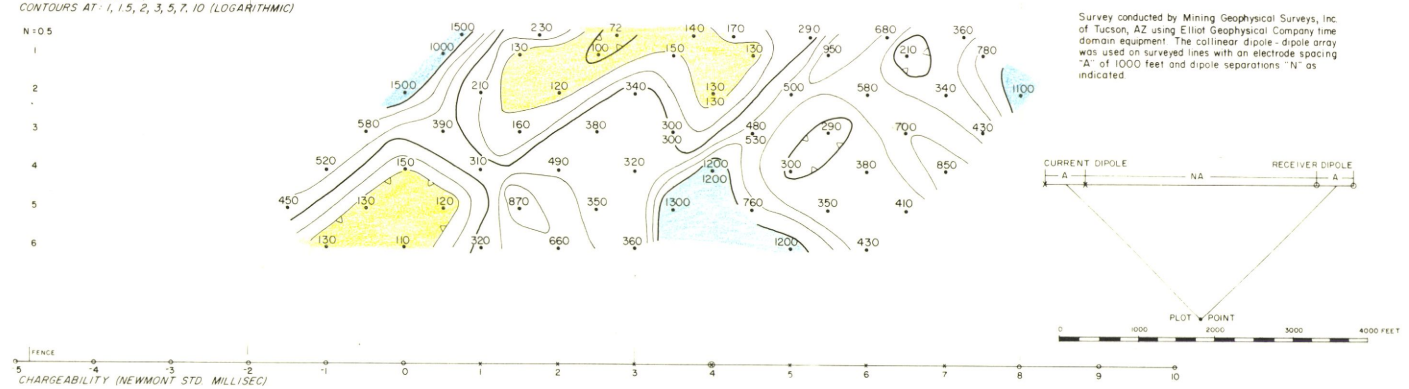
RELATIONSHIPS BETWEEN INDUCED POLARIZATION ANOMALIES. ANACONDA 1977 SURVEY

YAVAPAI COUNTY ARIZONA

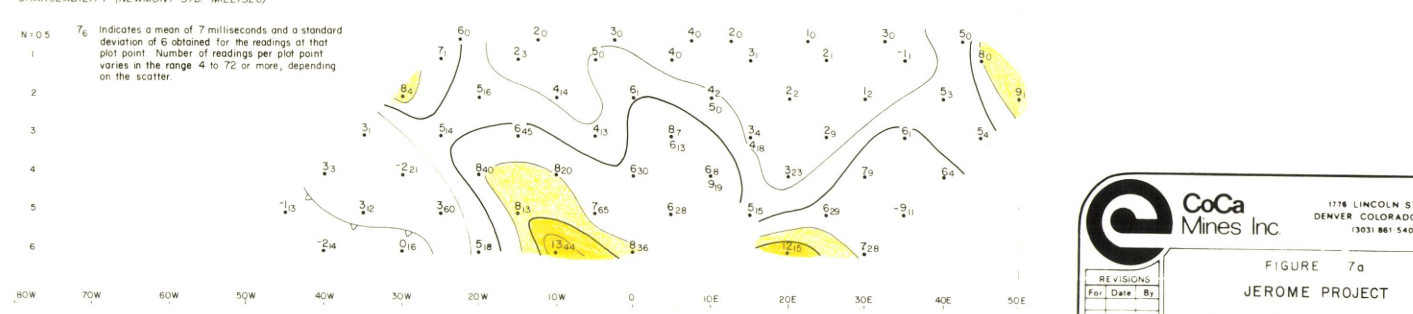
for: CFB date: 3-26-82 by: TRL serial no. 1291

LINE 54N





Survey conducted by Mining Geophysical Surveys, Inc. of Tucson, AZ using Elliot Geophysical Company time domain equipment. The collinear dipole - dipole array was used on surveyed lines with an electrode spacing "A" of 1000 feet and dipole separations "N" as indicated.



7_6 Indicates a mean of 7 milliseconds and a standard deviation of 6 obtained for the readings at that plot point. Number of readings per plot point varies in the range 4 to 72 or more, depending on the scatter.

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For	Date	By

FIGURE 7a

JEROME PROJECT

INDUCED POLARIZATION SURVEY

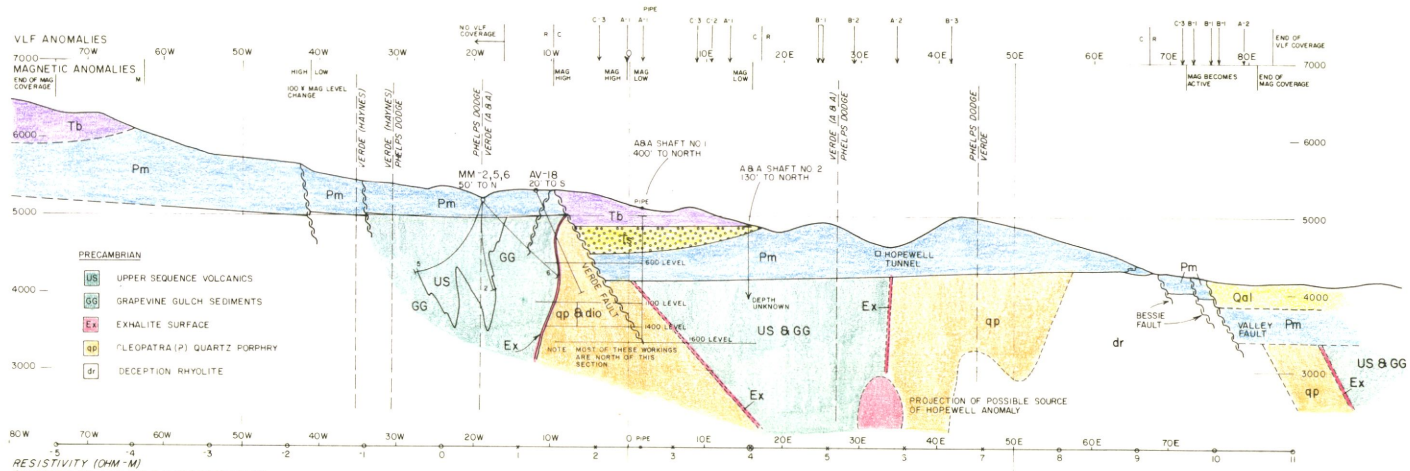
OF JAN.-FEB., 1982

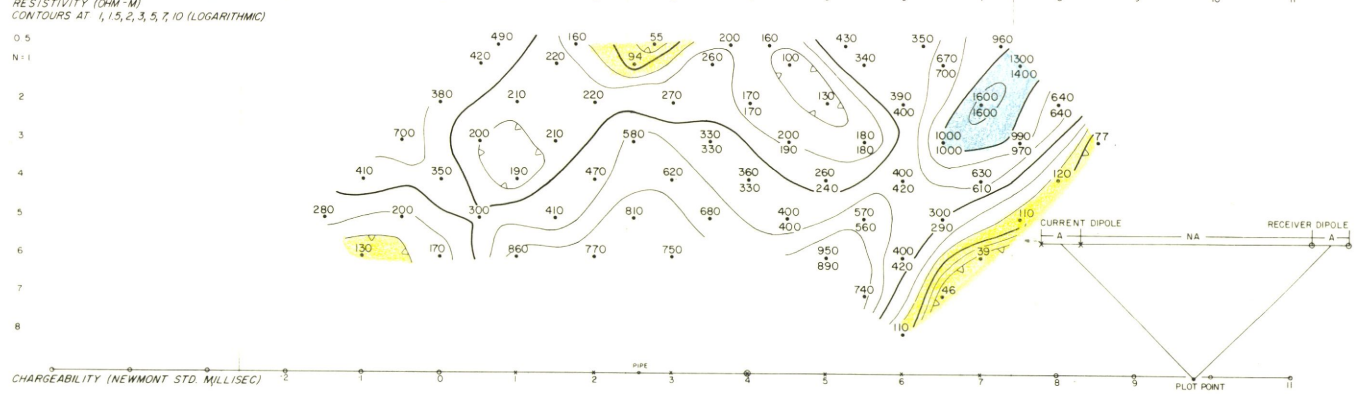
PSEUDO-SECTION OF LINE 54N

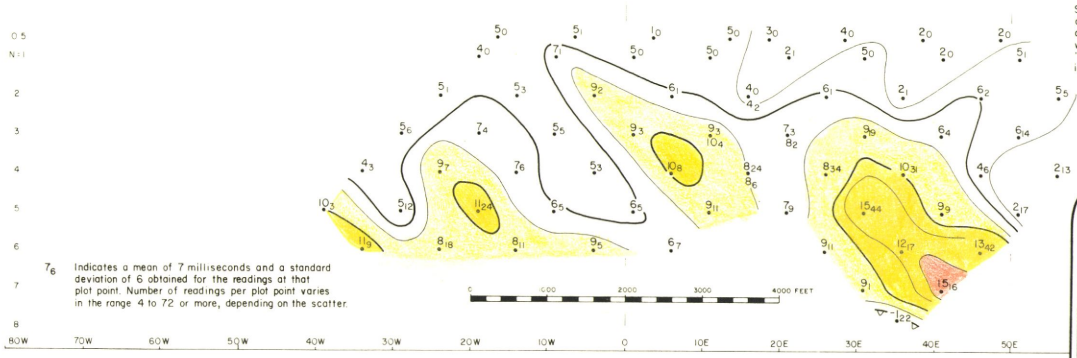
YAVAPAI COUNTY ARIZONA

for RAR date 4-5-82 by TRL serial no. 1329

LINE 46N







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7_6 Indicates a mean of 7 milliseconds and a standard deviation of 6 obtained for the readings at that plot point. Number of readings per plot point varies in the range 4 to 72 or more, depending on the scatter.

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FIGURE 7b

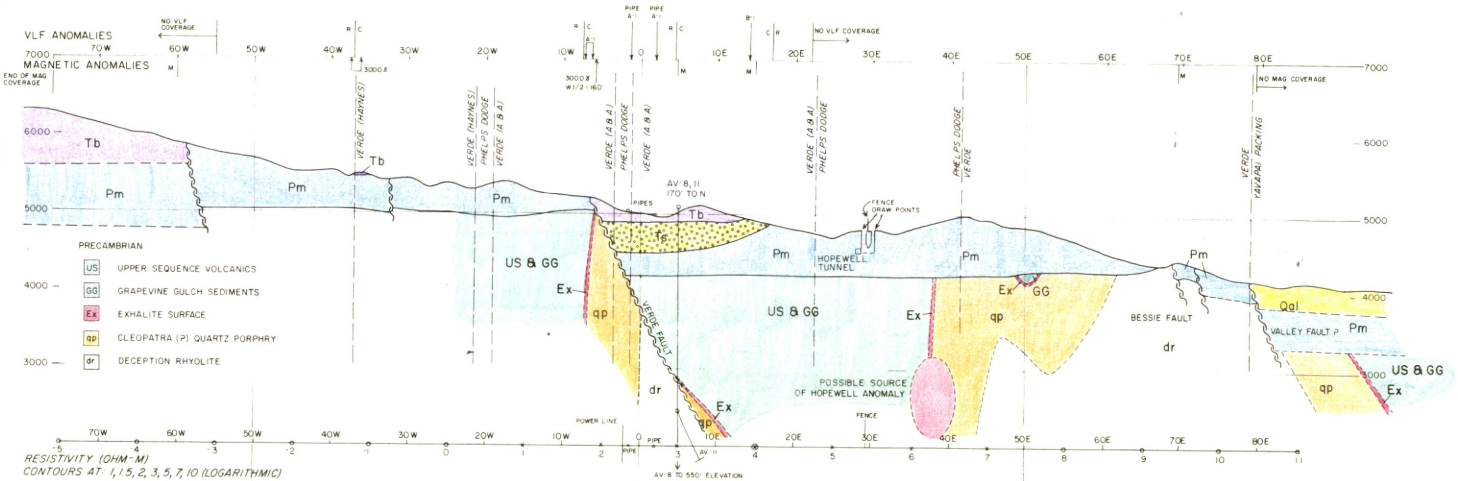
JEROME PROJECT

INDUCED POLARIZATION SURVEY
OF JAN.-FEB., 1982
PSEUDO-SECTION OF LINE 46N

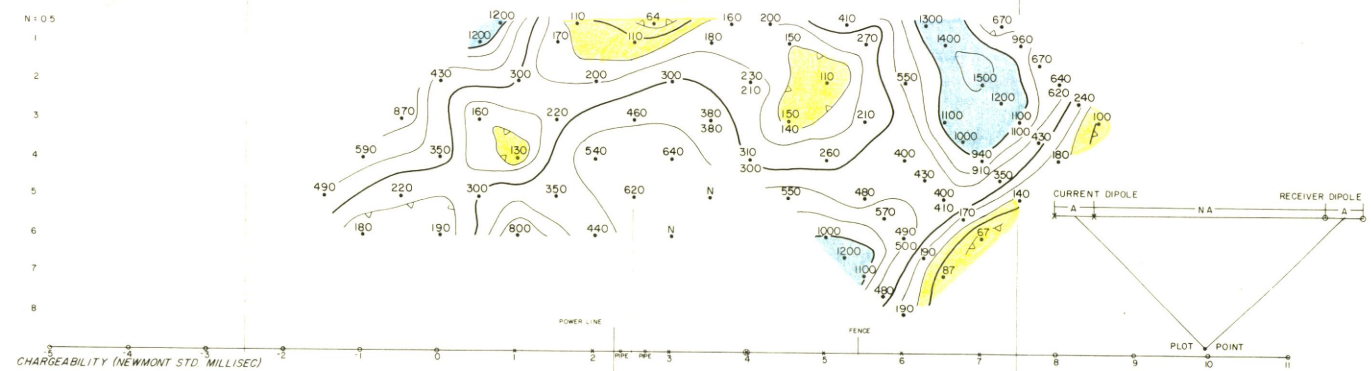
YAVAPAI COUNTY ARIZONA

for RAR date 4-5-82 by TRL serial no 1330

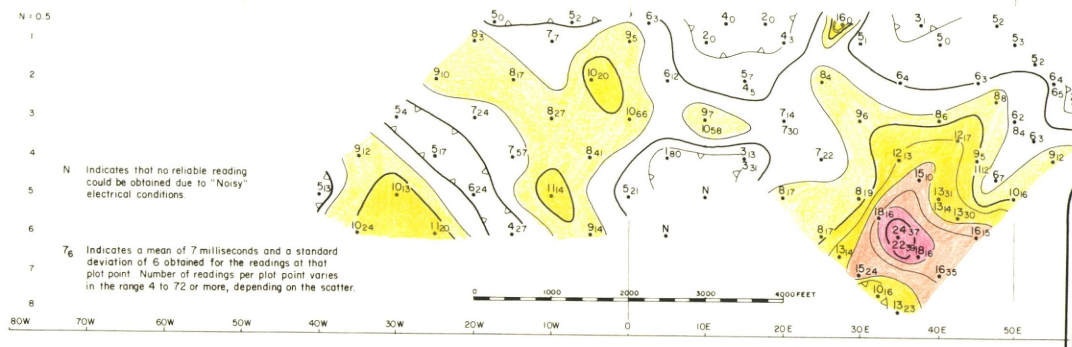
LINE 42N



RESISTIVITY (OHM-M)
CONTOURS AT: 1, 1.5, 2, 3, 5, 7, 10 (LOGARITHMIC)



CHARGEABILITY (NEWMONT STD. MILLISEC)



Survey conducted by Mining Geophysical Surveys, Inc. of Tucson, AZ using Elliot Geophysical Company time domain equipment. The collinear dipole-dipole array was used on surveyed lines with an electrode spacing "A" of 1000 feet and dipole separations "N" as indicated.

N Indicates that no reliable reading could be obtained due to "Noisy" electrical conditions.

7_6 Indicates a mean of 7 milliseconds and a standard deviation of 6 obtained for the readings at that plot point. Number of readings per plot point varies in the range 4 to 72 or more, depending on the scatter.

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FIGURE 7c

JEROME PROJECT

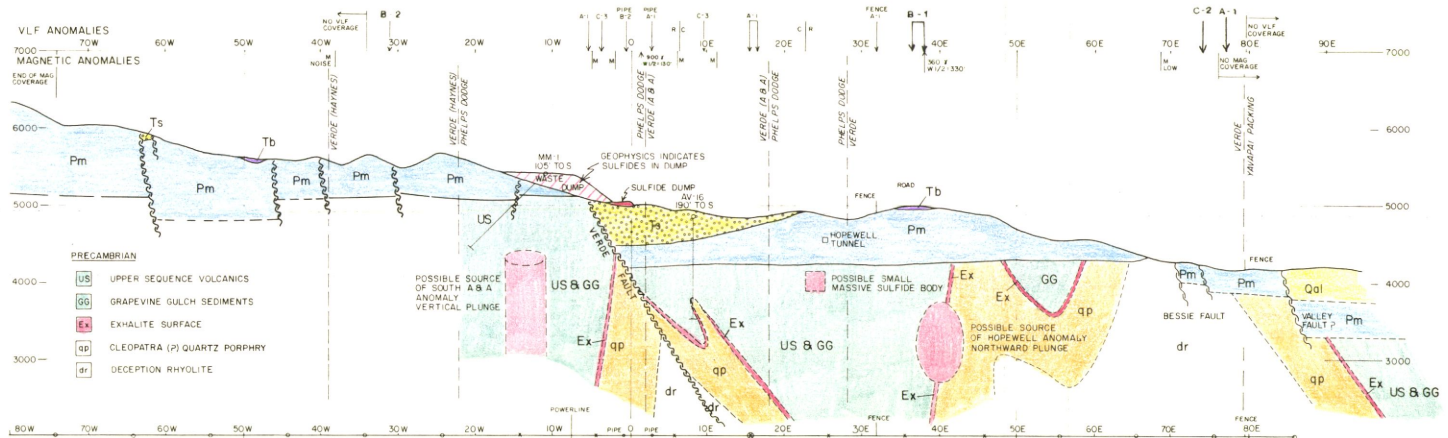
INDUCED POLARIZATION SURVEY OF JAN.-FEB., 1982

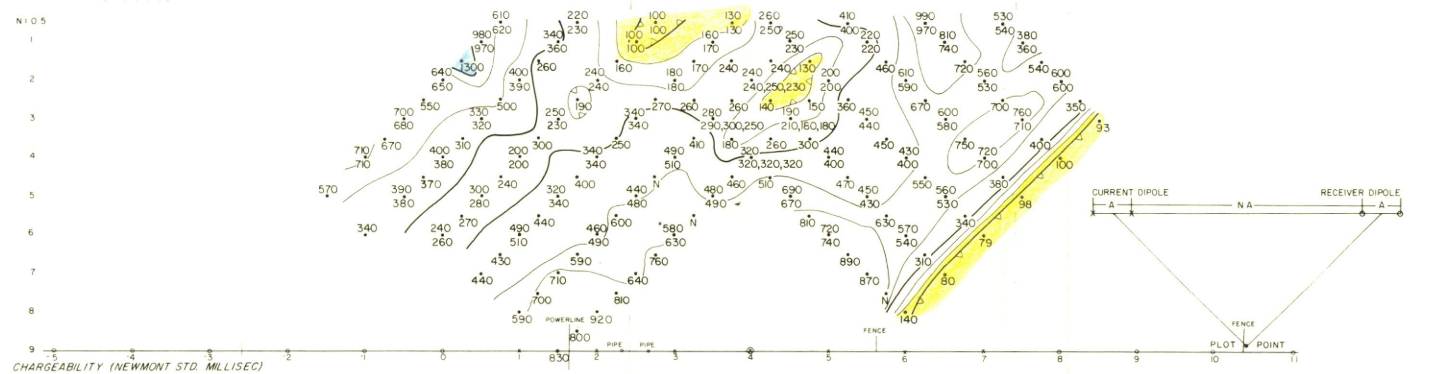
PSEUDO-SECTION OF LINE 42N

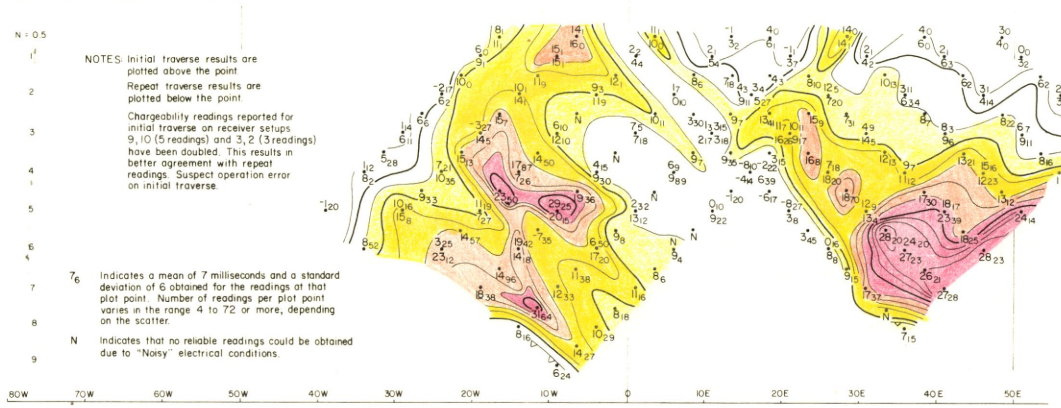
YAVAPAI COUNTY ARIZONA

for: RAR date 4-5-82 by: TRL serial no 1331

LINE 38N







NOTES: Initial traverse results are plotted above the point.

Repeat traverse results are plotted below the point.

Chargeability readings reported for initial traverse on receiver setups 9, 10 (5 readings) and 3, 2 (3 readings) have been doubled. This results in better agreement with repeat readings. Suspect operation error on initial traverse.

7_6 Indicates a mean of 7 milliseconds and a standard deviation of 6 obtained for the readings at that plot point. Number of readings per plot point varies in the range 4 to 72 or more, depending on the scatter.

N Indicates that no reliable readings could be obtained due to "Noisy" electrical conditions.

Survey conducted by Mining Geophysical Surveys, Inc. of Tucson, AZ using Elliot Geophysical Company time domain equipment. The collinear dipole-dipole array was used on surveyed lines with an electrode spacing "A" of 1000 feet and dipole separations "N" as indicated.

0 1000 2000 3000 4000 FEET

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FIGURE 7d

JEROME PROJECT

INDUCED POLARIZATION SURVEY OF JAN.-FEB., 1982

PSEUDO-SECTION OF LINE 38 N

YAVAPAI COUNTY ARIZONA

for: RAR date: 4-5-82 by: TRL serial no. 1332

NOTE: THE PORTION OF ROAD SHOWN HERE DOES NOT MATCH THAT ON THE USGS 7.5 MIN. MUNDS DRAW QUADRANGLE. DISCREPANCIES UP TO 800 FEET EXIST. THE LOCATIONS OF IP STATIONS SHOWN HERE ARE TIED TO FEATURES ON THE ANACONDA 1972 MAP USED AS THE BASE, THUS DISTORTIONS EXIST.

VERDE (A & A PROPERTY)

VERDE (HAYNES PROPERTY)

VERDE (FANNY HILL UNPATENTED CLAIMS)

YAVAPAI PACKING CO.

LINE 54 N

LINE 46 N

LINE 42 N

LINE 38 N

ASH FORK

TO PRESCOTT

TO COTTONWOOD

DUNDEE

PHELPS DODGE VERDE

EXPLANATION

- LOCATION OF GEOPHYSICAL TRAVERSE LINE (PICKETS EVERY 100 FEET)
- GOOD TIE POINT TO BASE MAP OR TO ONE OF THE OTHER LINES
- CLAW OR OTHER MONUMENT FOUND
- VLF ANOMALY
- MAGNETIC ANOMALY
- END OF COVERAGE

SOURCES OF INFORMATION

1. ANACONDA, 1972, GEOLOGIC MAP OF JEROME DISTRICT, NORTH SHEET- A 1:4800 SCALE MAP OBTAINED FROM VERDE EXPLORATION. THIS MAP IS THE SOURCE OF LAND BOUNDARIES, DRILL HOLES, HOPEWELL AND JOSEPHINE TUNNELS, AND FAULTS
2. HANDVERGER, P.A., 1963, PROPERTY AND MINE WORKINGS MAP, JEROME, ARIZONA, NORTH SHEET- A 1:4800 SCALE MAP. THIS MAP IS THE SOURCE OF SOME OF THE UNDERGROUND WORKINGS
3. LINDBERGH, P.A., 1974, COMPOSITE MAP OF THE UNITED VERDE CORRIDOR SHOWING SELECTED GEOLOGIC INFORMATION- A 1:4800 SCALE MAP OBTAINED FROM VERDE EXPLORATION AND DATED FEBRUARY 5, 1974. THIS MAP IS THE SOURCE OF THE UNDERGROUND DRILL HOLES IN THE UNITED VERDE AND HOPEWELL TUNNEL AREAS AND THE OUTLINES OF THE UV AND HAYNES MASSIVE SULFIDE BODIES
4. ANDERSON, C.A. AND CREASEY, S.C., 1958, GEOLOGY AND ORE DEPOSITS OF THE JEROME AREA, YAVAPAI COUNTY, ARIZONA: USGS PP 308. PLATES 7 AND 10 WERE USED TO OBTAIN THE LOCATION OF CERTAIN UNDERGROUND WORKINGS. PLATE 9 WAS USED TO OBTAIN THE OUTLINE OF THE UVX ORE BODY.

0 400 800 1200 1600 FEET

SCALE 1:12,000

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REVISIONS		
No.	Date	By

FIGURE 8

JEROME PROJECT

GEOPHYSICAL TRAVERSES

JAN. FEB., 1982 SURVEYS

LOCATION OF MAGNETIC AND VLF AROMALIES

YAVAPAI COUNTY ARIZONA

for RAR date 3.22.82 by TBL serial no. 1347

APPENDIX

APPENDIX

1. References (4 pages)

2. Templates of Induced Polarization Response from Idealized Massive Sulfide bodies (10 pages)

3. Report Prepared by Mining Geophysical Surveys, Inc. Regarding the I.P. Survey (Wieduwilt, 1982) (14 pages)

4. An Account of the Discovery of the Hopewell I.P. Anomaly (2 pages)

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APPENDIX 2

TEMPLATES OF INDUCED POLARIZATION RESPONSE FROM IDEALIZED MASSIVE SULFIDE BODIES

R. A. Rivera February 1982

Introduction

As a preliminary exercise, published information has been used to derive theoretical induced polarization responses to be expected from the United Verde type massive sulfide target at Jerome.

Unfortunately the model most ideally suited to the Jerome case (a steeply plunging, 800 ft diameter cylinder) could not be found in the published literature. Computer modelling methods will be used to generate theoretical responses for the United Verde case in the future, given that additional work is undertaken on the project.

The approximations used in the preliminary study involve the following model massive sulfide bodies:

1. Horizontal prism with infinite strike length and 330 x 330 ft. cross sectional area. This model was analyzed at a depth of 330, 1000 and 2000 feet (reference - Geoscience, 1965).

2. Horizontal prism with infinite strike length and 330 x 1000 foot (vertical) cross sectional area. This model was analyzed at depths of 1000 and 2000 feet (Reference - Geoscience, 1965).

3. Finite prisms of approximately 75 million ton size. This model was analyzed at a depth of 1000 feet in two different orientations. (Source Hallof, 1968)

Computational Procedure

Dimensions of the models were scaled up linearly to match the 1 dipole length = 1000 ft. scale size used in the January-February, 1982 survey at Jerome. Thus, model dimensions are expressed in feet herein rather than in units of dipole length as given in the references.

Treatment of the electrical parameters given in the references is as follows:

For the Geoscience, 1965 computer model studies the resistivity background is given as 100 units and the target resistivity is given as 10 units. Both are multiplied x 6.0 to give the 600 ±200 ohm-m background value observed in the Jerome area. This operation results in a 60 ohm-m target resistivity which is undoubtedly too high for a massive sulfide deposit. All resistivity values given in the numerical model results were multiplied x 6.0 for presentation herein.

The chargeability background given in the Geoscience reference is 1 unit with the target value given as 25 units. Both were multiplied x 6.7 to approximate the 4-8 millisecond background observed at Jerome. This results in a 168 millisecond value for the target which is at the low range of values to be expected in massive sulfide bodies. All chargeability values given in the numerical model results were multiplied x 6.7 for presentation herein.

For one of the McPhar physical model target studies (Hallof, 1968, case V-1.0-CW-300-a) resistivity background is given as 300 units and target resistivity is given as 3 units. Both are multiplied x 2.0 to give the 600 ohm-m figure required at Jerome. This results in a 6 ohm-m target resistivity which is a realistic value for a fractured massive sulfide deposit. All resistivity values given in the reference psuedosection were multiplied x 2.0 for presentation herein.

The chargeability background given in the McPhar (Hallof, 1968) reference for this case is zero with the target value given as 30 units. In order to approximate the Jerome situation, the chargeability of the target was multiplied x 6.7 to give a value of 201 milliseconds. This is a reasonable value for a massive sulfide deposit. All chargeability values given in the reference psuedosection were multiplied x 6.7 and then increased by 6.7 to yield the background values observed. In other words:

Value given herein = (1.0 + value in reference) x 6.7

The second McPhar model study used (case IVa-1.0-125-a) was treated in a manner similar to that described above. Differing model resistivity and chargeabilities result is slightly different scaled-up values and ratios of values.

Discussion

Three compensating factors operate in the Geoscience-based cases which tend to make the predicted anomalies credible. Thus while the infinite strike length will serve to overestimate the strength of the response, the high target resistivity and low target chargeability should serve to underestimate the response. A judgment as to whether these factors are properly balanced must await future modelling work of 3-dimensional targets.

The response predicted from the first McPhar model (case V-1.0-CW-300-a) is surprisingly strong for a target buried at a depth of 1000 feet. Inasmuch as the model is not an unrealistic approximation of the United Verde Deposit, this result is quite encouraging. Comparison of this case with Geoscience case FB-20 (depth=2,000 feet) together with the actual data from lines 46N, 42N and 38N suggests that the survey may have detected such a deposit at depths in the order of 1500 feet or greater!

Both references truncate their observations as "N' values smaller than those used in the Jerome survey. This results in giving the impression, in the deeply buried target cases, that little or no anomalous response can be expected. This is probably an incorrect impression.

CoCa Mines Inc.

THEORETICAL RESPONSE — INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2-24-82 BY: TRL NO. 1265

SURFACE

C_0 = 6.7 milliseconds

ρ_0 = 600 Ohm-m

t = 330 FT

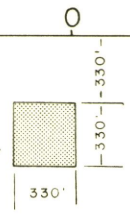
w = 330 FT

l = Infinity

d = 330 FT

C_1 = 168 milliseconds

ρ_1 = 60 Ohm-m

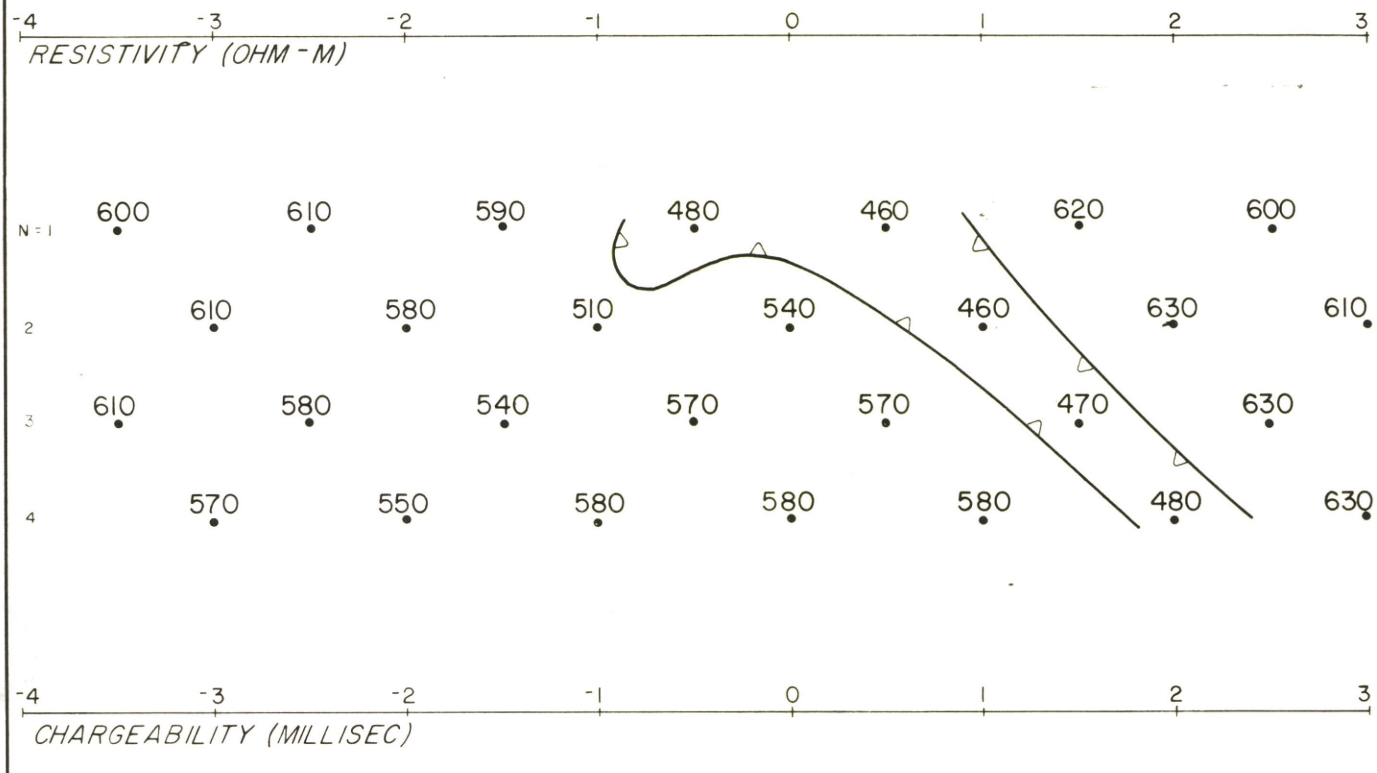


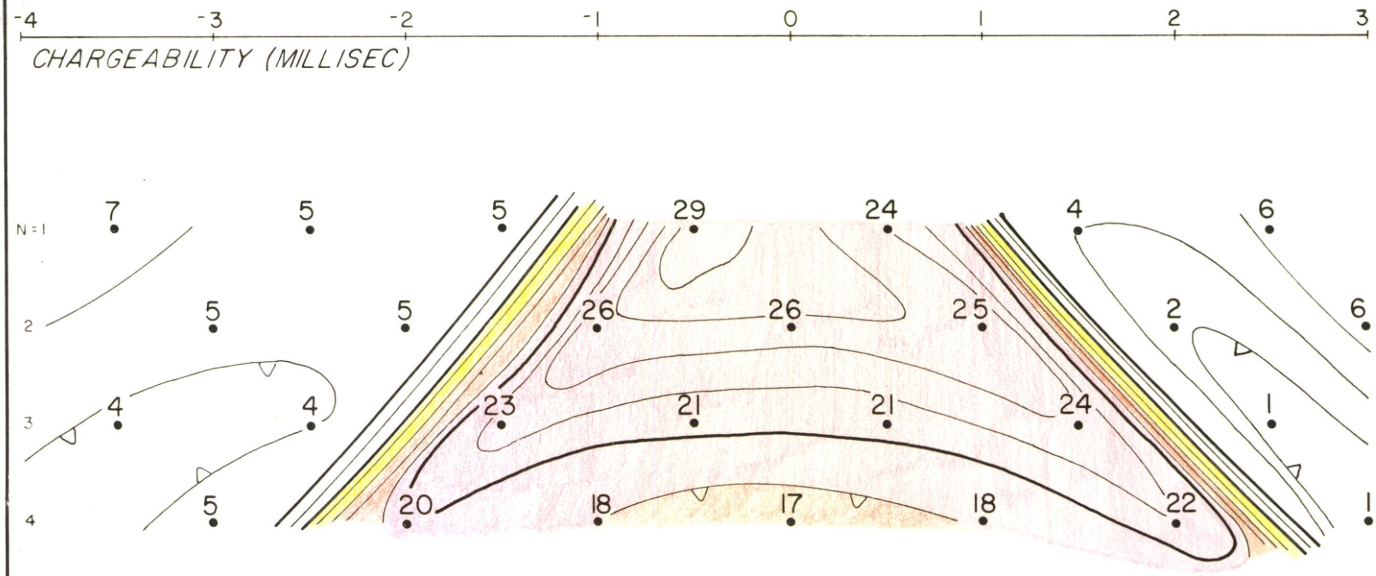
INFINITE STRIKE LENGTH

Source: Geoscience (1965)

Case FB-1

Dipole - Dipole Array





CoCa Mines Inc.

THEORETICAL RESPONSE - INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2-22-82 BY: TRL NO. 1260

SURFACE

C_0 = 6.7 milliseconds

ρ_0 = 600 Ohm-m

t = 330 FT

w = 330 FT

l = Infinity

d = 1000 FT

C_1 = 168 milliseconds

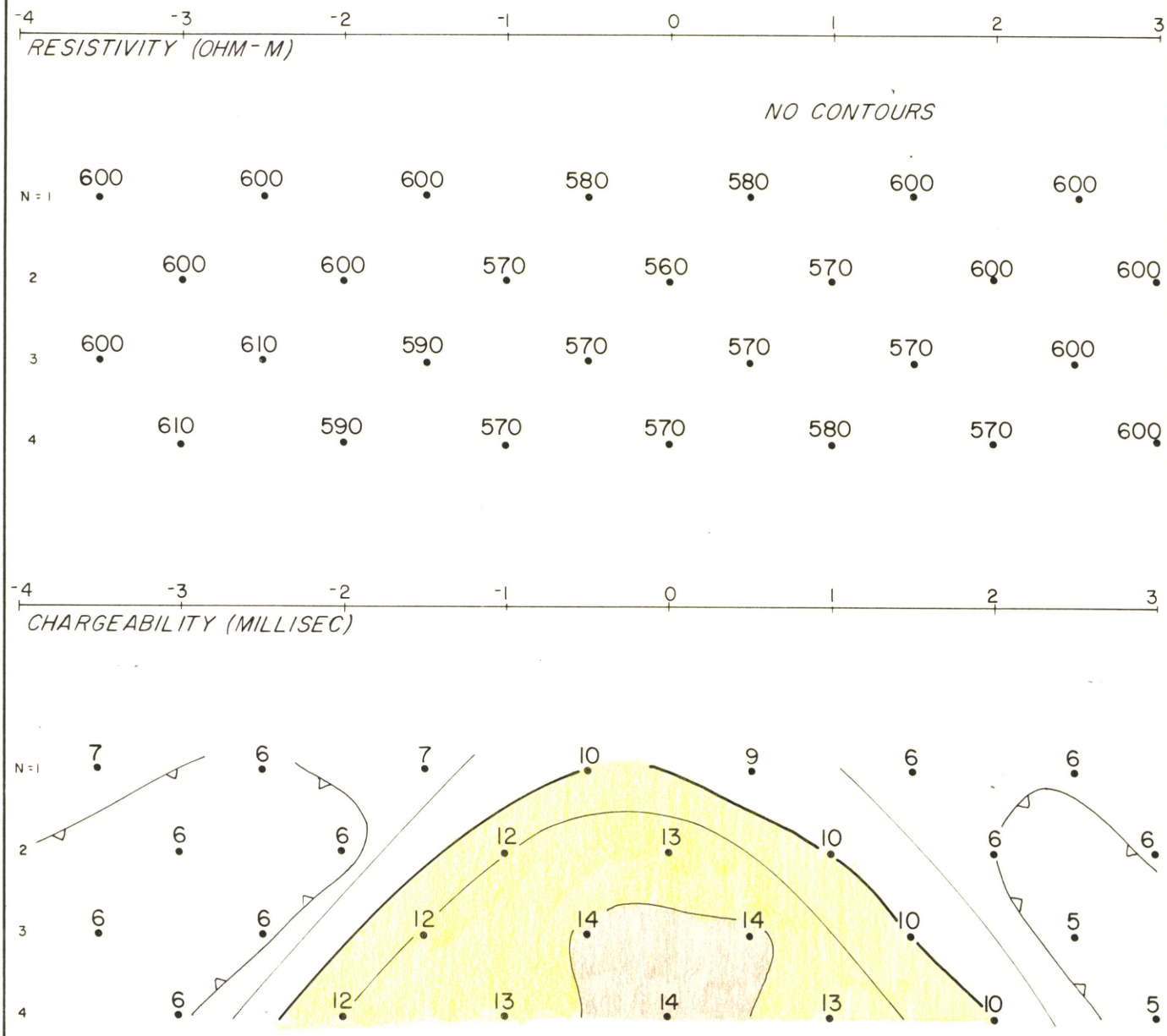
ρ_1 = 60 Ohm-m

Source: Geoscience (1965)

Case FB-10

Dipole - Dipole Array

INFINITE STRIKE LENGTH



CoCa Mines Inc.

THEORETICAL RESPONSE - INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2-24-82 BY: TRL NO. 1264

SURFACE

C_0 = 6.7 milliseconds

ρ_0 = 600 Ohm-m

t = 1000 FT

w = 330 FT

l = Infinity

d = 1000 FT

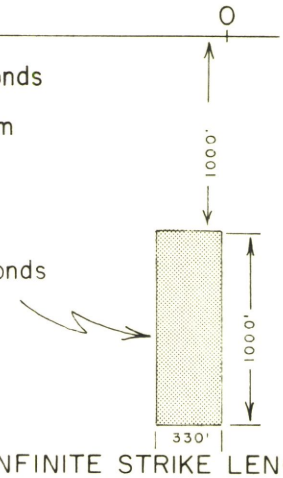
C_1 = 168 milliseconds

ρ_1 = 60 Ohm-m

Source: Geoscience (1965)

Case FB-11

Dipole - Dipole Array



INFINITE STRIKE LENGTH

RESISTIVITY (OHM-M)

NO CONTOURS

	-4	-3	-2	-1	0	1	2	3
N = 1	600	600	600	580	580	600	600	
2		600	600	570	560	570	600	600
3	610	590	570	570	570	570	600	
4		590	570	570	580	570	570	600

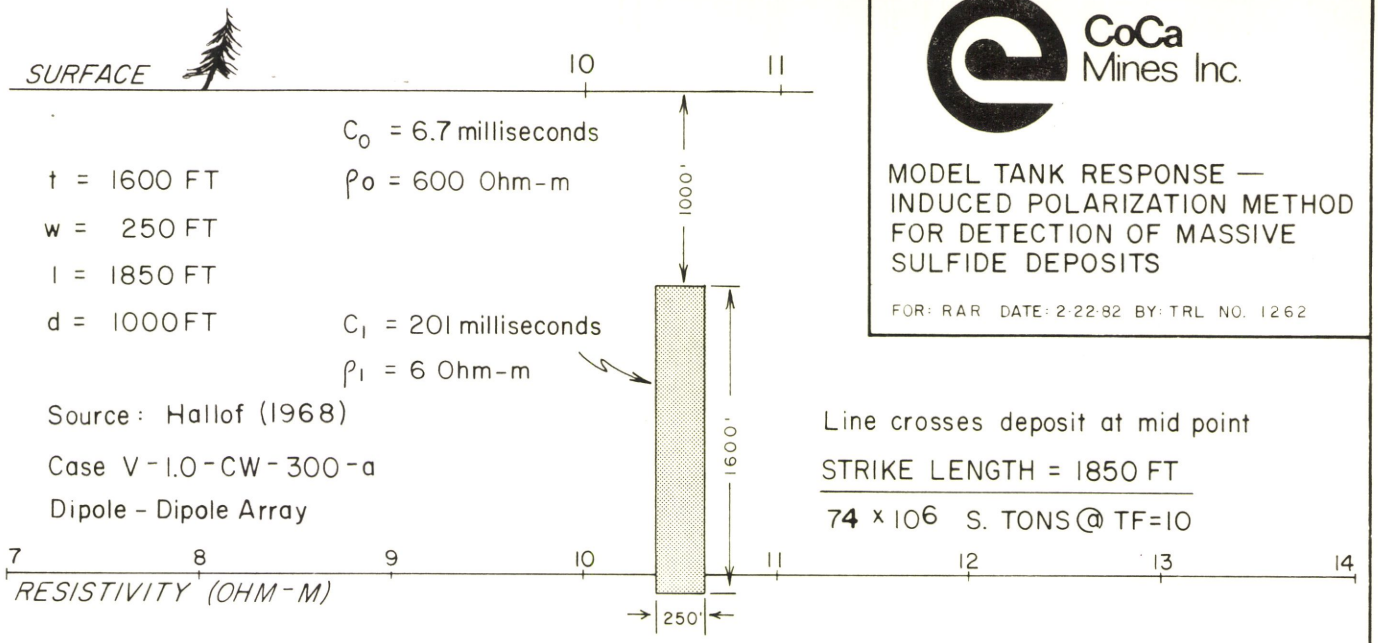
CHARGEABILITY (MILLISEC)

	-4	-3	-2	-1	0	1	2	3
N = 1	6	6	6	12	10	6	6	
2		5	6	15	19	12	5	6
3	5	5	16	22	21	12	4	
4		5	16	22	23	21	12	4

CoCa Mines Inc.

MODEL TANK RESPONSE — INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

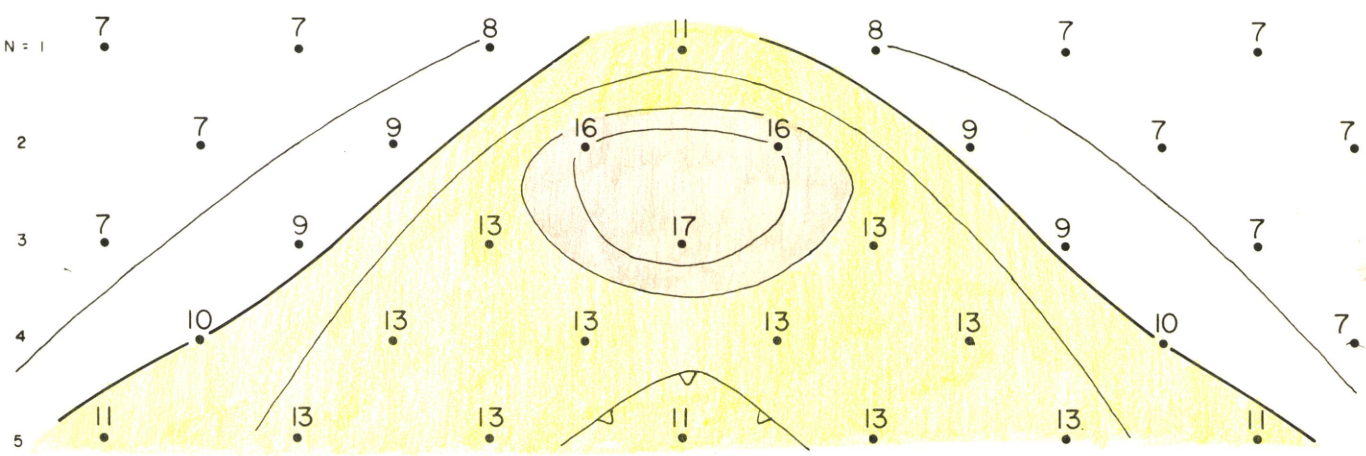
FOR: RAR DATE: 2-22-82 BY: TRL NO. 1262



NO CONTOURS

	7	8	9	10	11	12	13	14
N=1	600	600	600	590	600	600	600	
2	610	600	570	570	600	610	600	
3	610	600	570	560	570	600	610	
4	600	570	560	560	570	600	610	
5	600	580	570	580	570	580	600	

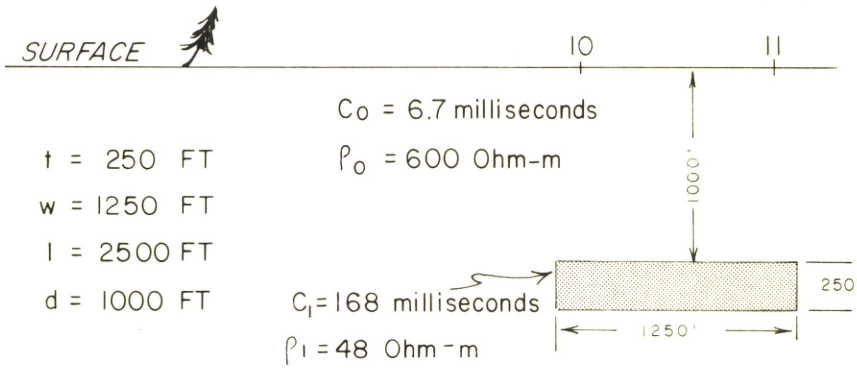
CHARGEABILITY (MILLISEC)



CoCa Mines Inc.

MODEL TANK RESPONSE— INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2-22-82 BY: TRL NO. 1259



C_0 = 6.7 milliseconds

ρ_0 = 600 Ohm-m

t = 250 FT

w = 1250 FT

l = 2500 FT

d = 1000 FT

C_1 = 168 milliseconds

ρ_1 = 48 Ohm-m

Source: Hallof (1968)

Case IVa-1.0-EV-125-a

Dipole - Dipole Array

Line crosses deposit at mid point

STRIKE LENGTH = 2500 FT

78×10^6 S. TONS @ TF=10

RESISTIVITY (OHM-M)

NO CONTOURS

	7	8	9	10	11	12	13	14
N=1	600	600	580	580	580	600	600	
2		600	550	550	550	550	600	600
3	600	540	560	600	560	540	600	
4		530	570	640	640	570	530	600
5	520	570	630	640	630	570	520	

CHARGEABILITY (MILLISEC)

	7	8	9	10	11	12	13	14
N=1	7	7	9	9	9	7	7	
2		7	11	9	9	11	7	7
3	7	11	9	5	9	11	7	
4		13	8	5	5	8	13	
5	13	7	3	3	3	7	13	

CoCa Mines Inc.

THEORETICAL RESPONSE - INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2.22.82 BY: TRL NO. 1257

SURFACE

C_0 = 6.7 milliseconds

ρ_0 = 600 Ohm-m

t = 330 FT

w = 330 FT

l = Infinity

d = 2000 FT

C_1 = 168 milliseconds

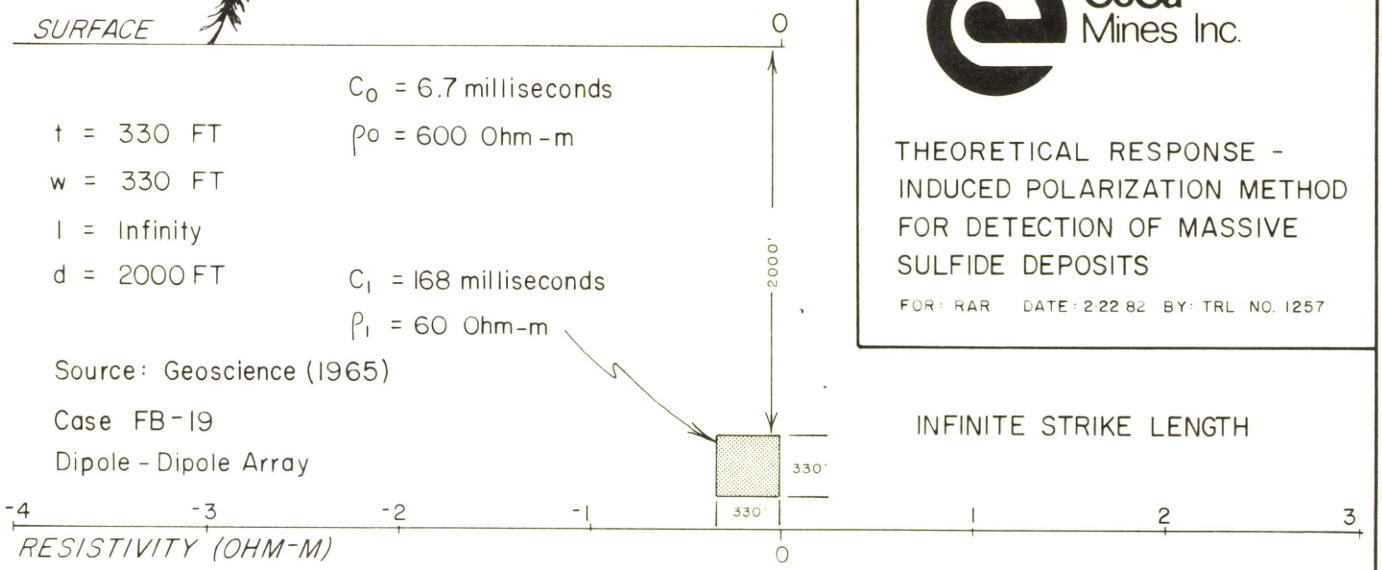
ρ_1 = 60 Ohm-m

Source: Geoscience (1965)

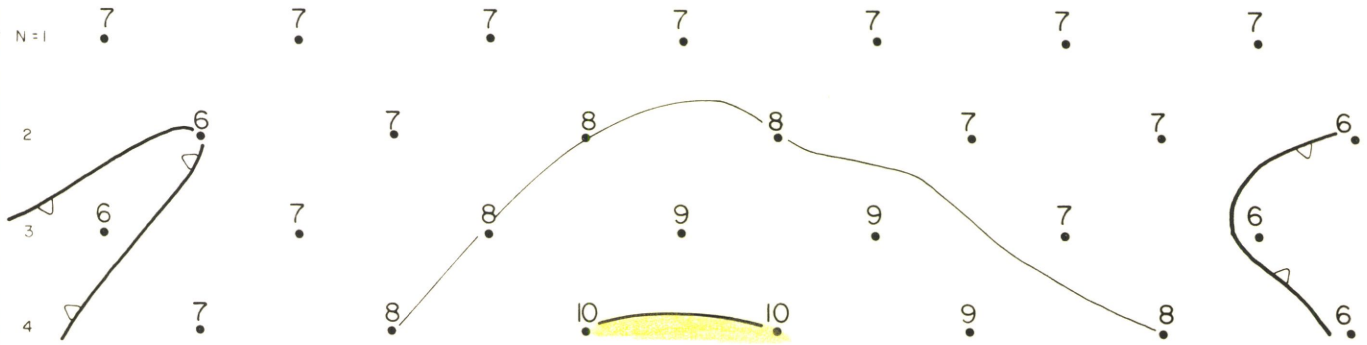
Case FB-19

Dipole - Dipole Array

INFINITE STRIKE LENGTH



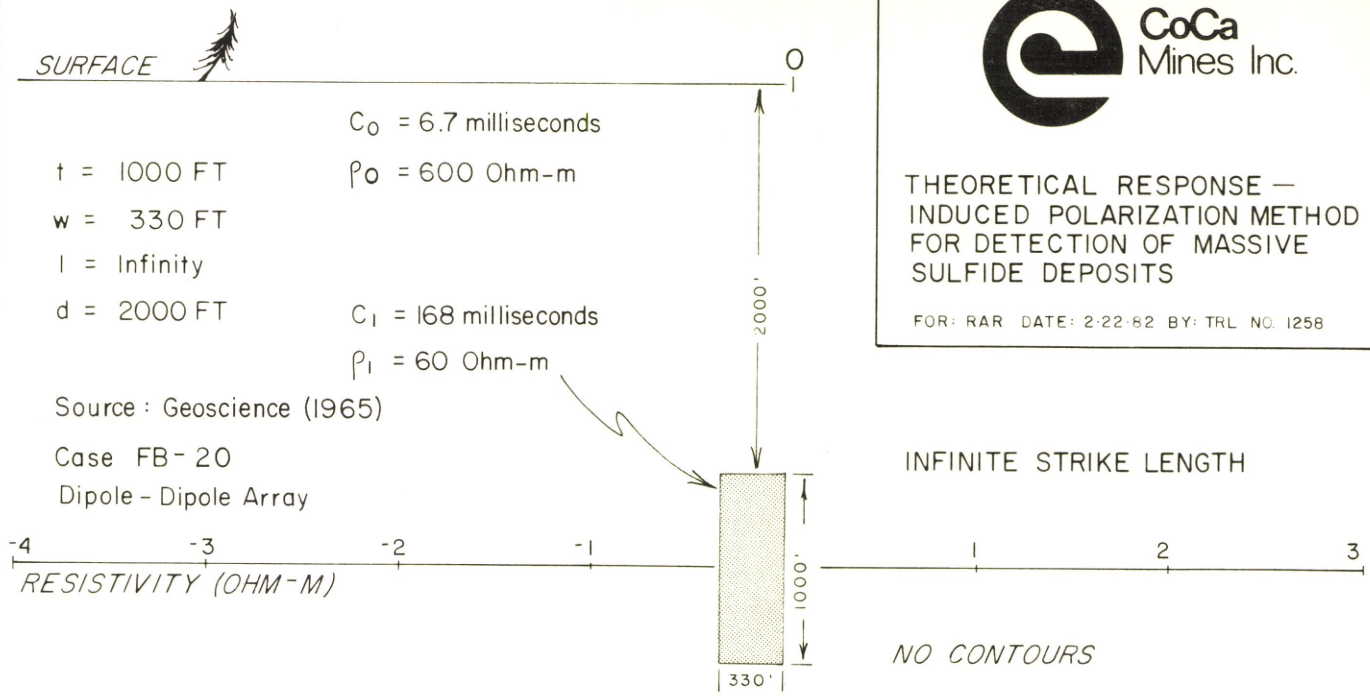
NO CONTOURS



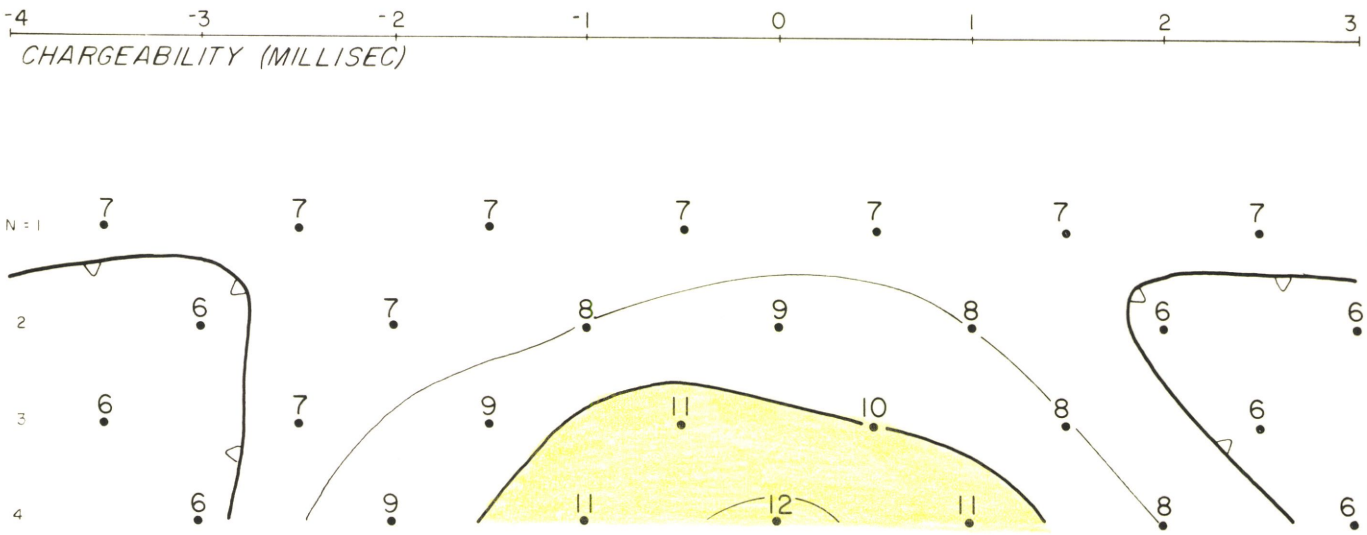
CoCa Mines Inc.

THEORETICAL RESPONSE — INDUCED POLARIZATION METHOD FOR DETECTION OF MASSIVE SULFIDE DEPOSITS

FOR: RAR DATE: 2-22-82 BY: TRL NO. 1258



N = 1	600	600	600	600	600	600	600
2	600	600	590	590	590	600	600
3	600	600	580	570	580	590	600
4	600	580	570	570	570	580	600



APPENDIX 3

Report Prepared By
Mining Geophysical Surveys Inc.
Regarding the I.P. Survey

(Wieduwilt, 1982)

INDUCED POLARIZATION AND

RESISTIVITY SURVEY

JEROME PROJECT

YAVAPAI COUNTY, ARIZONA

FOR

COCA MINES, INC.

MGS 1201

mining
geophysical surveys inc