REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY OF THE FROG CLAIM GROUP, MARION COUNTY, OREGON FOR AMOCO MINERALS COMPANY

INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE FROG CLAIM GROUP MARION COUNTY, OREGON FOR AMOCO MINERALS COMPANY

---

1. INTRODUCTION

At the request of Mr. A. G. Humphrey, exploration manager for Amoco Minerals Company, Phoenix Geophysics has completed an Induced Polarization and Resistivity Survey on the Frog Claim Group, Marion County, Oregon. The survey area is situated in sections 30, 31 and 32, R5E. T.8S of Marion County.

The geology of the survey area, supplied by Amoco Minerals Company, indicates the claim block is underlain by andesite, intrusive, and silicified rock containing up to 5% pyrite with traces of chalcopyrite.

The purpose of the Induced Polarization and Resistivity survey was to locate possible concentrations of sulphide mineralization in the subsurface. Three lines were traversed using a 400 foot dipole-dipole electrode array and measurements were made at frequencies of .3 and 2.5 Hz with readings from N = 1 to N = 6.

The survey was conducted by Mr. Robert Anderson, geophysicist, under the direction of Amoco Minerals Company staff during the period of August 3 to August 20, 1976.

2. PRESENTATION OF RESULTS

The Induced Polarization and Resistivity Survey results are shown on the following data plots in the manner described in the notes accompanying this report.

Line	Electrode Intervals	Dwg. No.
1	400 foot	IP-U-5019-1
3	400 foot	IP-U-5019-2
4	400 foot	IP-U-5019-3

Also enclosed with this report is Dwg. I.P.P.-U-5019, a plan map of the Frog Claim Group property grid at a scale of 1" = 500 feet. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the Induced Polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the electrode interval length; i.e. when using 400' electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 400' apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with a corresponding increase in the uncertainties of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

Metal Factor (M.F.) anomalies and percent frequency effect (PFE) are shown on the data plots. The percent frequency effect results indicate polarizable areas without taking into account the resistivity of the areas. The metal factor is obtained by combining the percent frequency effect and the resistivity. A good conductor (low resistivity) that is strongly polarizable (high PFE) will give a well defined or "definite" metal factor anomaly. Less well-defined metal factor anomalies are designated as probable or possible.

The percent frequency effect and metal factor parameters are complimentary. The relative importance of each type of information depends upon the particular geophysical environment encountered and the type of target expected. For example, a mineralized silicified zone will give a "strong" percent frequency effect anomaly, but may not give a "definite" metal factor anomaly. Alternatively, an oxidized ore zone may only give a "weak" percent frequency effect anomaly, but will give a "definite" metal factor anomaly. Since the apparent resistivity is used in calculating the metal factor parameter, topographic effects affecting the resistivity will also affect the metal factor parameter. Thus, since hills increase the apparent resistivity they will in turn decrease the metal factor, and conversely, where valleys give rise to lower apparent resistivities the metal factor parameter will be enlarged. Judicious consideration of both the percent frequency effect and the metal factor results permits a comprehensive evaluation of the geophysical environment.

The anomalies as shown on the data plots represent the surface projection of the polarizable zones. Contacts or faults inferred from the resistivity patterns are also shown. Anomaly boundaries and fault locations should be considered accurate to the electrode interval used.

The anomalies shown on the plan map are designated apparent depths of

shallow, moderate, or deep. At larger dipole separations a greater volume of rock is averaged, in lateral extent as well as depth. Thus, the source of a deep-appearing anomaly detected along a single line may be at shallow depth to one side of the line. The data plots, therefore, cannot represent true depth. Depths can be calculated from the apparent resistivity data in the case of ideal horizontal layers, but even this calculation depends on an assumed resistivity contrast between the zone at depth and the overlying rock. Although ambiguous, the simple depth designations are useful for correlating or comparing anomalous zones obtained on adjacent survey lines. Drill hole information from one or more zones frequently permits one to make a fair depth estimate for other zones. The following depth generalizations apply to porphyry copper and contact-replacement bodies:

	Apparent Depth (dipole separations)	Drill Hole Depth (in dipole lengths)
Shallow	1 - 2	1/2 - 1
Moderate	2 - 3	1 - 1-1/2
Deep	3 - 5	1-1/2 - 2+

Thus, a shallow zone is one detected at a one-to-two dipole separations and should be tested by a drill hole from a half-to-one dipole length deep.

The Induced Polarization method is a geophysical tool used to determine the electrical properties of the earth. The final evaluation of the Induced Polarization anomalies should also be based on available geologic evidence and concepts.

3. DISCUSSION OF RESULTS

The Induced Polarization and Resistivity survey of the Frog Claim Group has located very definite anomalous responses along each survey line which probably represent concentrations of sulphide mineralization. Several of these definite anomalies are coincident with the geologic contact between the intrusive and andesite as mapped by Amoco Minerals Company staff and

this occurance makes these anomalies more important.

The measured apparent resistivities along the three survey lines suggests that the underlying geology is comparatively simple. Generally, the percent frequency effect response, which is a measure of polarizability, has a background response of approximately 3 across most of the property and decreases near the claim boundaries. The interpreted anomalies have a PFE response greater than 5 and average approximately 8.

A discussion of the survey results along each line follows:

Line 1

The anomalous responses located on this line are as follows:

- a deep, definite anomaly between 10N to 14N extending as a probable anomaly for 200 feet on each end.
- a shallow probable anomaly between 24N and 28N.
- a possible shallow anomaly between 32N and 40N.

The definite anomaly appears to be within a uniform rock type that extends from approximately 4N to 44N. The anomalous source is more conductive than the sounding rock and the corresponding increase in PFE indicates the source is also more polarizable. This anomaly definitely warrants drilling.

The other two less definite anomalies occur at shallow depth. Each is the result of increased PFE and probably warrant additional attention but not first priority. Surface examination in these areas may determine the anomalous source.

The PFE response along this line is generally higher than the suggested background response. Possibly the line has not been conducted far enough to obtain the background responses observed on the next two lines, and also, a higher content of disseminated sulphides may occur along this line.

Line 3

This line is parallel to Line 1 but 3200 feet to the east. Thus, extrapolation between this line and the previous line may be presumptious.

Two definite anomalies have been located at moderate to deep depth between 8N to 16N and 24N to 28N. These anomalies are quite definitely separate sources within a comparatively uniform rock type. There is very little change in the apparent resistivity but the PFE response increases 1.5 to 2.5 times background to produce these anomalies.

Both these anomalies are coincident with the geologic contact between the intrusive and andesite as interpreted by Amoco geologists.

Line 4

The apparent resistivity along this line is not as uniform as the previous lines. This may be, in part, due to topography which does have effects on resistivity measurements. The resistivity low associated with the definite anomaly between 8N to 14N may be caused by the valley but the definite anomaly does have an increased PFE similar in magnitude to the definite anomalies on the previous lines.

The other shallow definite anomaly located on this line between 30N to 36N occurs adjacent to an interpreted resistivity contact and is the result of an increased PFE response.

Both these definite anomalies are also coincident with the mapped geologic contact.

4. RECOMMENDATIONS AND CONCLUSIONS

The Induced Polarization and Resistivity Survey of the Frog Claim group has located several definite anomalies that appear to occur in a similar, uniform rock type and are the result of areas of increased polarizability that may represent concentrations of sulphide mineralization. Due to the wide separation of the survey lines, it is difficult to correlate

these anomalies into zones. Additional parallel survey lines should be conducted across this claim group to permit a correlation of data.

Since outcrops of bedrock are not abundant in this area, it may be more practical for Amoco Minerals Company to test drill the definite anomalies prior to any additional geophysics. Drilling could be conducted on any of the definite anomalies and planned to intersect the center of each anomaly at a depth relating to the top of the source as described in the preceeding section on presentation of results.

If the drill results provide some encouragement regarding the potential of the Frog Claim group, a review of all geological, geochemical and geophysical data would be essential.

PHOENIX GEOPHYSICS INC.

Bruce S. Bell
Geologist

Dated: August 24, 1976

: 22117

REEL 55 PAGE 1051

ASSESSMENT DETAILS

PROPERTY: Frog Claim Group

SPONSOR: Amoco Minerals Company

LOCATION: Marion County, Oregon

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS: 43 1/2

CONSULTING MAN DAYS: 2

DRAFTING MAN DAYS: 1

TOTAL MAN DAYS: 46 1/2

DATE STARTED: August 3, 1976

DATE FINISHED: August 20, 1976

NUMBER OF STATIONS: 64

NUMBER OF READINGS: 530

MILES OF LINE SURVEYED: 4.85

CONSULTANTS:

Bruce S. Bell, 1330 W. San Lucas, Tucson, Arizona 85704

FIELD TECHNICIANS:

Robert G. Anderson, 3003 N. Alvernon, Apt.-206, Tucson, Arizona 85712
Kevin J. Blanshan, 8900 E. Tano Place, Tucson, Arizona 85715
Larry Singleton, 1802 Missoula Ave., Missoula, Montana 59801

DRAFTSMEN:

Janey S. Ross, 8060 E. Broadway, Apt. E-203, Tucson, Arizona 85710

PHOENIX GEOPHYSICS INC.

Bruce S. Bell, M.Sc.
Vice President

1975

ARIZONA

Dated: August 24, 1976

21823

REEL 55 PAGE 477

STATEMENT OF ANNUAL LABOR FOR THE YEAR
ENDING AUGUST 31, 1976

Useful work and improvements in the amount of more than $6,800.00 were done and made during the period from August 3, 1976 to August 20, 1976 by Phoenix Geophysics Inc., 818 West Miracle Mile, Tucson, Arizona 85705, at the request of AMOCO Minerals Company, whose address is 333 West Hampden, Englewood, Colorado 80110 for all of the lode mining claims listed in attached "Exhibit A", located in the Santiam mining district, Marion County, Oregon.

A total of 68 contiguous mining claims are included in this statement. Work and improvements required more than 58 man-days of labor, consisting of Induced Polarization geophysical surveys, as described in the attached "Report on the Induced Polarization and Resistivity Survey of the Frog Claim Group, Marion County, Oregon for Amoco Minerals Company".

I, A. G. Humphrey, residing at Englewood, Colorado state that the above is a true statement of fact as to the work done and the improvements made on the above named mining claims; and of the cost and value of the said work and improvements; and that such cost and value are equal in total amount to not less than $100.00 for each mining claim or fraction thereof, or not less than $100.00 for each 20 acres of each precious metal placer mining claim or fraction thereof on Federal land, named above; and that the actual amount paid for said work and improvements was more than $11,100.00.

A. G. Humphrey

Sworn and subscribed to before me
this 25th day of August, 1976

M. Carol Parker
Notary Public in and for the State
of Colorado; My Commission expires April 24, 1978

amoco Minerals Co
333 West Hampden
Englewood, Colo. 80110

EXHIBIT "A"

Name of Claims	Location	Notice of Location Filed for Record		
		Date	Book	Page
Frog 1 (Amended) through Frog 10A (Amended)	9/15/75	10/20/75	27	1352 through 1373
Frog 11 & 12	8/10/75	10/20/75	24	1251 through 1254
Frog 13 through Frog 20	8/5/75	10/20/75	24	1255 through 1270
Frog 21 through Frog 28	8/8/75	10/20/75	24	1271 through 1286
Frog 29 & 30	8/9/75	10/20/75	24	1287 through 1290
Frog 43 through Frog 46	8/4/75	9/10/75	24	1291 through 1298
Frog 47 through Frog 52	8/2/75	9/10/75	24	1299 through 1310
Frog 53 through Frog 61	8/1/75	9/10/75	24	1311 through 1328
Frog 62 (Amended)	9/15/75	10/20/75	27	1374 - 1375
Frog 63 & 64	8/1/75	9/10/75	24	1331 through 1334
Frog 66 through Frog 69	8/18/75	9/10/75	24	1335 through 1342
Frog 70 through Frog 72	8/19/75	9/10/75	24	1343 through 1348
Frog 73	8/19/75	9/10/75	24	1363 - 1364
Frog 74	8/22/75	9/10/75	24	1361 - 1362
Frog 75	8/22/75	9/10/75	24	1359 - 1360
Frog 76	8/22/75	9/10/75	24	1357 - 1358
Frog 77	8/22/75	9/10/75	24	1355 - 1356
Frog 78	8/22/75	9/10/75	24	1353 - 1354
Frog 79	8/22/75	9/10/75	24	1351 - 1352
Frog 80	8/22/75	9/10/75	24	1349 - 1350