1868

REPORT ON INDUCED POLARIZATION SURVEY ON SOME JOB AND EDEN CLAIMS IN THE HIGHLAND VALLEY AREA BRITISH COLUMBIA ON BEHALF OF VANANDA EXPLORATIONS LIMITED

NO DEPOSIT
TWO LOCATIONS
CENTERED ON
50° 28½' 92I/7W
120° 53.6'
and
50° 30.7' 92I/10W
120° 54.6'

by

Jon G. Baird, B.Sc., P.Eng.

January 15, 1969

CLAIMS:

Name	Record Number
JOB 1 to 15	45921 to 45935
JOB 16 and 17	47702 and 47703
EDEN 9 and 10	45889, 45890
CL 64	46820

LOCATION:
Highland Valley area
about 30 miles southeast of Ashcroft, B.C.
Kamloops Mining Division
120° 50° ~~NW~~ SW

DATES:
November 28 to December 13, 1968

TABLE OF CONTENTS

	Page No.
SUMMARY	
INTRODUCTION	1
GEOLOGY	2
DISCUSSION OF RESULTS	3
CONCLUSIONS & RECOMMENDATIONS	5

PLATES:

(in text)

Plate 1 - Property Location Map 1" = 4 miles

(in envelope)

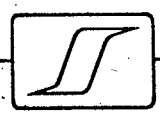
Plate 2 - Reconnaissance Induced Polarization Survey
JOB Claims - 1" = 400'

Plate 3 - Detail Induced Polarization Survey
EDEN Claims - 1" = 200'

SUMMARY

A reconnaissance induced polarization survey on the JOB claims has revealed no significant abnormal responses. We may conclude that there is little possibility that a large tonnage, low grade deposit of sulphide mineralization of economic significance may lie within about 300' of the ground surface in the area covered by this survey.

Detailed surveying on the EDEN claim group over two selected anomalous areas located by an earlier induced polarization survey has again revealed above-normal chargeability responses. These observations could be caused by concentrations of 1% to 2% by volume of metallically conducting material in the subsurface. To date, two drill holes, one in the area of each anomaly, have failed to reveal any explanation for the anomalous geophysical results. Trenching and two new drill holes totalling 800' are herein recommended to further test the anomalous areas. If the drill results are favourable, further induced polarization surveying would be warranted.



REPORT ON INDUCED POLARIZATION SURVEY ON SOME JOB AND EDEN CLAIMS IN THE HIGHLAND VALLEY AREA BRITISH COLUMBIA ON BEHALF OF VANANDA EXPLORATIONS LIMITED

INTRODUCTION

During the period November 28 to December 13, 1968 a geophysical field party under the direction of Mr. Tony Guernier executed induced polarization surveys on some JOB and EDEN claims in the Highland Valley area, British Columbia on behalf of Vananda Explorations Limited.

The property lies about 30 miles southeast of Ashcroft, B.C. and is reached by truck using an unimproved road northwards from the Highland Valley Road. The location of the claim group is shown on Plate 1 on a scale of 1" = 4 miles. Glacial drift covers most of the surface of the property and topographic relief is moderate. The elevation of the survey area is about one mile above sea level. The claims covered, in whole or part, by this survey are listed on the title page of this report and are shown on Plate 2 on a scale of 1" = 400'. These claims are held jointly by New Indian Mines Limited and Vananda Explorations Limited.

Seigel Mk VI time-domain (pulse-type) induced polarization equipment has been employed on this property. The transmitting unit had a rating of 2.5 kw and equal on and off times of 2.0 seconds. The receiving unit was a remote, ground-pulse type triggered by the rising and falling primary voltages set up in the ground by the transmitter. The integration of the transient polarization voltages takes place for 0.65 seconds after a 0.45 second delay time following the termination

of the current-on pulse.

The purpose of an induced polarization survey is to map the subsurface distribution of metallically conducting mineralization beneath the grids covered. In the present area such mineralization could include bornite, chalcopyrite, molybdenite, pyrite and other metallic sulphide minerals. As well, many other minerals such as sericite, magnetite and graphite can give responses not always distinguishable from sulphide mineralization.

The accompanying copy of H.O. Seigel's paper entitled "Three Recent Irish Discovery Case Histories Using Pulse Type Induced Polarization" gives a description of the phenomena involved in this type of survey, the equipment employed, the field procedures and the nature of the results obtained over various base metal ore bodies.

For the reconnaissance survey grid lines were cut oriented north-south at 600' intervals. The three electrode array, with electrode spacings of 400' and station intervals of 200', was employed.

In the area of a previous induced polarization survey on the EDEN claims, parts of profiles H and H+1.5 were selected for detailed surveying. These profiles were covered using the three electrode array and electrode spacings of 50', 100', 200' and 400'.

GEOLOGY

A description of the geology of the area including and surrounding the present claims is found in G.S.C. Memoir 249 "Geology and Mineral Deposits of Nicola Map Area, British Columbia" by W. E. Cockfield, 1961. In addition, K. Northcote has mapped the geology of the Guichon Creek Batholith and his maps on the scale of 1" = 1 mile have been made available to the writer. Northcote shows the Guichon

Creek Batholith as a series of differentiated granitic and granodioritic rocks and the present property is shown as being underlain by one such phase called the Witches Brook Phase. The Highland Valley area, centred on the Guichon Creek Batholith, is well known for the occurrence of disseminated copper deposits. The target of the present surveys was one of these low grade, large tonnage deposits, the upper surface of which would occur within 300' of the ground surface.

DISCUSSION OF RESULTS

JOB Claims

Plate 2, on the scale of 1" = 400', shows the results of the geophysical survey on the JOB claims in profile form. Two parameters are plotted, chargeability (the induced polarization characteristic of the rock) and resistivity. The vertical scales for these profiles are 1" = 10.0 milliseconds for chargeability and 1" = 1000 ohm-metres for resistivity.

The chargeability profiles indicate that the observed chargeability values average about 2.5 milliseconds and are everywhere less than 5.5 milliseconds. This is well within the non-metallic chargeability range for the intrusive rocks believed to underlie the survey area. With this background a uniform distribution of 1% by volume of metallically conducting mineralization in the subsurface would be expected to add approximately 6.0 milliseconds to the background level. Chargeabilities in excess of 6.0 milliseconds would be considered worthy of further investigation since deposits of very low concentrations of copper and molybdenum of sufficient dimensions may have economic significance. Experience has shown, however, that most deposits of the Highland Valley type contain sufficient sulphide mineralization to give chargeability

responses in the order of 15.0 milliseconds.

The apparent resistivity values are quite uniform over most of the property and lie in the 100 to 500 ohm-metre range. One area of apparent resistivities ranging from 1000 to 3000 ohm-metres is observed on three profiles in the northwest corner of the survey area. This change in apparent resistivity may indicate a change in the character of the bedrock or of the overburden type or depth.

EDEN Claims

Plate 3, on the scale of 1" = 200', shows the results of detailed traverses on L H and L H + 1.5 in profile form. The profile scales are 1" = 10.0 milliseconds for chargeability and 1" = 1000 ohm-metres for resistivity. The locations of previously drilled diamond drill holes No. 3 and No. 5 are shown with a vertical scale of 1" = 200'.

The highest chargeability response on L H + 1.5 was 11.0 milliseconds at station 5 + 50 S for the 100' spacings although all electrode spacings show responses in excess of 6.0 milliseconds. The amplitude of these responses would be explained by a subsurface concentration of 1% by volume of metallically conducting material. The peak responses to the wider electrode spacings occur to the north of those for the narrower electrode spacings indicating that the distribution of metallically conducting material may have a northerly dip of about 45°. The depth to the upper surface of the causative material may be 25' or less between stations 5 S and 7 S. Interpretation of the present results reveals that drill hole No. 5 should have intersected the upper portion of the body; however, no metallic mineralization of note has been observed in the core for this hole which was drilled to a depth of 199'. There is just a possibility, suggested by the 50' spacing profile, that a small window in the high chargeability material exists in this vicinity.

The anomaly on L H exhibits a peak response of 18.0 milliseconds for the 100' spacing. A quantitative interpretation of these results reveals that the metallically conducting mineralization may be as much as 2% by volume and have a northerly dip. The body comes to within 25' of the surface between 14 N and 17 N. Drill hole No. 3 appears to have been well positioned and should have intersected the metallic mineralization causing the anomalous chargeability responses although it may be just off the north contact of the near surface portion of the high chargeability source.

CONCLUSIONS AND RECOMMENDATIONS

Since there are no significant abnormal chargeability responses for the area surveyed on the JOB claims, we may conclude that there is little possibility that a large tonnage, low grade deposit of sulphide mineralization of economic significance may lie within 300' of the ground surface in the area covered by this survey.

The detailed surveying on the EDEN claims reveal that a distinct body containing metallically conducting mineralization occurs in the area of each of the two profiles surveyed. Study of the core of two diamond drill holes has not revealed sufficient quantities of metallically conducting mineralization to explain the anomalous induced polarization responses, although the holes appear to have been directed to intersect some of the causative material. Since concentrations of 1% to 2% by volume of metallically conducting material containing bornite, chalcopyrite and/or molybdenite may be of great economic significance in the present geological environment, further investigation of the present anomalies appears warranted.

Trenching in the above mentioned areas where the anomalous material approaches the surface may be useful. Further diamond drilling should be directed as follows:

Hole	Collar	Inclination	Bearing	Length
DH #10	L H, 18+60N	45°	South	400'
DH #11	L H+1.5, 3+40S	45°	South	400'

If further exploration reveals sulphide mineralization of economic interest, then additional induced polarization surveying would be warranted prior to additional drilling. Such a programme would determine the areal extent of the mineralization so that a complete drilling programme may be proposed.

Respectfully submitted,

SEIGEL ASSOCIATES LIMITED

Jon G. Baird, B.Sc., P.Eng.
Geophysicist

Vancouver, B.C.
January 15, 1969

Richard O. Crosby, P.Eng.

DOMINION OF CANADA:

PROVINCE OF BRITISH COLUMBIA. } In the Matter of a geophysical survey on behalf of Vananda Explorations Limited

TO WIT:

I, E.M. Flett for Seigel Associates Limited

of 750 - 890 West Pender Street, Vancouver

in the Province of British Columbia, do solemnly declare that an induced polarization survey has been executed on some JOB and EDEN claims in the Highland Valley area, British Columbia between November 28 to December 13, 1968. The following expenses were incurred:

JOB Claims - 9.73 line miles of survey @ $450.00 per line mile	$4,379.15
EDEN Claims- 5.65 line miles of survey @ $450.00 per line mile	2,543.10
	$6,922.25

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City of Vancouver, in the Province of British Columbia, this 11th day of February, 1969, A.D.

E M Flett

Jill Turner

A Commissioner for taking Affidavits for British Columbia or *A Notary Public in and for the Province of British Columbia.*

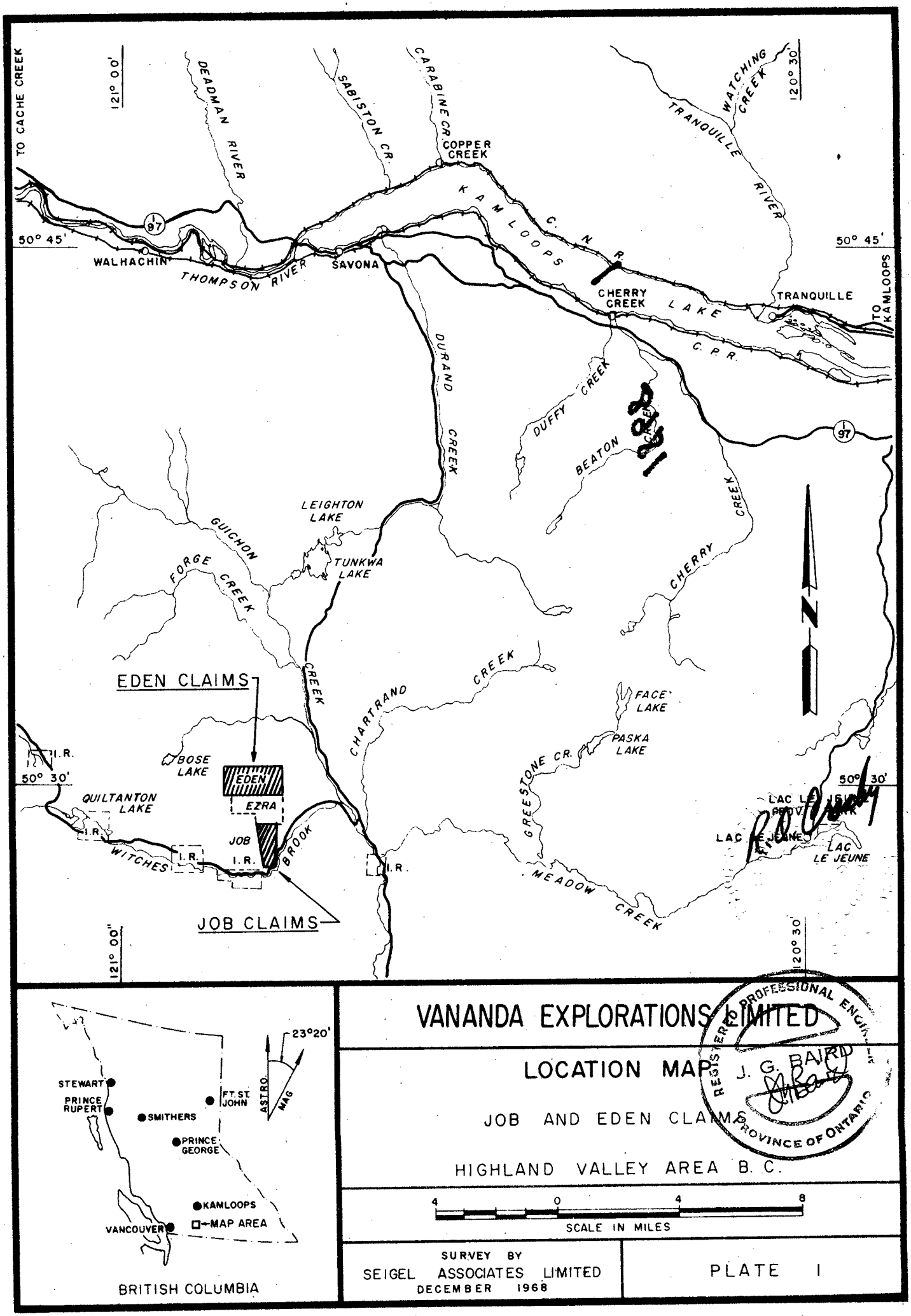
Sub-mining Recorder

★o

In the Matter of

Statutory Declaration

(CANADA EVIDENCE ACT)



VANANDA EXPLORATIONS LIMITED

LOCATION MAP

JOB AND EDEN CLAIMS

HIGHLAND VALLEY AREA B. C.

4 0 4 8

SCALE IN MILES

SURVEY BY
SEIGEL ASSOCIATES LIMITED
DECEMBER 1968

PLATE I

REGISTERED PROFESSIONAL ENGINEER
J. G. BAIRD
PROVINCE OF ONTARIO

Harold O. Seigel

President,
Harold O. Seigel & Assoc., Ltd.,
Downsview, Ontario

Annual General Meeting,
Toronto, March, 1965

Three Recent Irish Discovery Case Histories Using Pulse-Type Induced Polarization

Transactions, Volume LXVIII, 1965, pp. 343-348

ABSTRACT

In the intensive Irish exploration program which has followed the discovery of the Tynagh deposit (Northgate Exploration, Ltd.) in 1962, three base metal discoveries have been made to date. These include the lead-zinc-silver deposits at Silvermines (Consolidated Mogul Mines, Ltd.), which are now being readied for production, the copper-silver deposit at Gortdrum (Gortdrum Mines, Ltd.) and the lead-zinc deposits near Keel (Rio Tinto-Zinc Ltd.). Each of these discoveries is the result of a combined geological-geochemical-geophysical exploration sequence in which pulse-type induced polarization surveys defined the precise location and lateral extent of the near-surface metallic sulphide mineralization and guided the initial drilling program. Whereas the Silvermines mineralization is, in part, composed of massive sulphides, the other two deposits are characterized by generally less than 5 per cent conducting sulphides and constitute an excellent demonstration of the unique merits of the pulse-type induced polarization system.

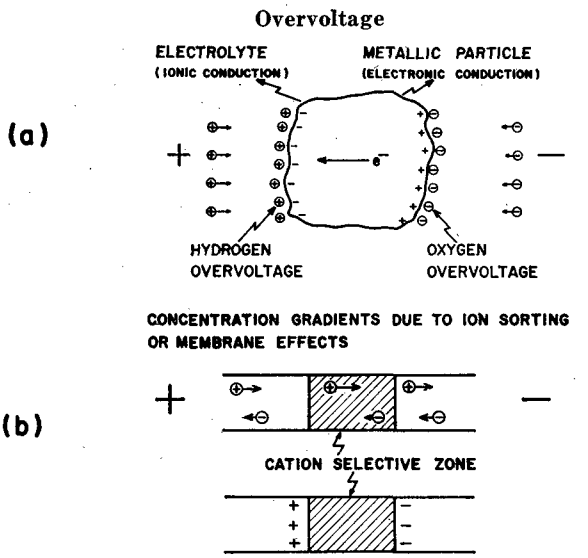


Figure 1.—Induced Polarization Agents.

Introduction

FOR the benefit of those who are unfamiliar with the induced polarization method in general or with the pulse-type method in particular, a few introductory remarks will be directed on the system employed in the present case histories. Those who wish a fuller treatment of the subject are directed to Seigel (1962),* which paper also includes an extensive list of references.

Induced polarization, in its broadest sense, means a separation of charge to form an effective dipolar (polarized) distribution of electrical charges throughout a medium under the action of an applied electric field. When current is caused to pass across the interface between an electrolyte and a metallic conducting body (Figure 1a) double layers of charge are built up at the interface, in the phenomenon known to the electrochemists as "overvoltage." This is the phenomenon which can be utilized for the detection of the metallic conducting rock-forming minerals such as most sulphides, arsenides, a few oxides and, unfortunately, graphite. In addition, effective dipolar charge distributions occur to some extent in all rocks, due to ion-sorting or membrane effects in the fine capillaries in which the current is passing (Figure 1b). Induced polarization responses may therefore arise from metallic or non-metallic agencies. Fortunately, the latter generally fall within fairly low and narrow limits for almost all rock types, although there is still no reliable general criterion for differentiating overvoltage responses from graphite and metallic sulphides, or for distinguishing between the responses of one type of sulphide and another. Despite these limitations, the induced polarization method has amply demonstrated its value in mineral exploration since its initial development as a useful exploration tool in 1948. (Wait *et al.*, 1953).**

*Seigel, H. O., "Induced Polarization and its Role in Mineral Exploration," C.I.M. *Bulletin*, Vol. 55, No. 600, pp. 242-249; *Transactions*, Vol. LXV, pp. 151-158; 1962.

**"Overvoltage Research and Geophysical Applications," *Pergamon Press*, 1959, edited by J. R. Wait.

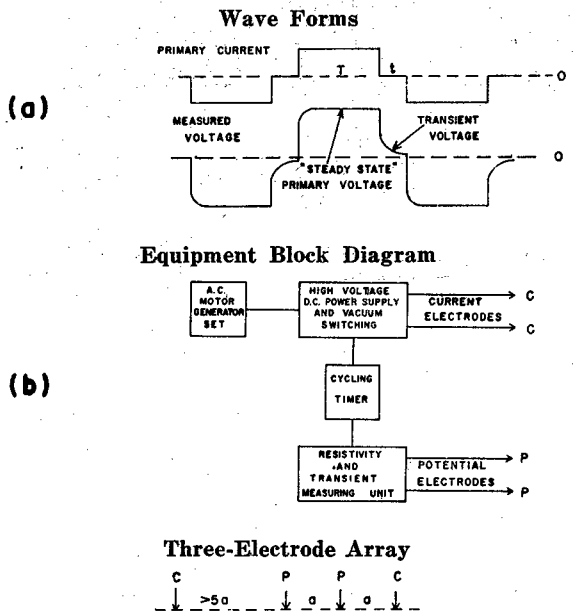


Figure 2.—The Pulse System.

Description of Method

For the present program, the pulse or time-domain system was employed. As shown on Figure 2a, the primary current wave form consists of square wave pulses of 1.5 seconds duration, separated by a 0.5-second gap and alternately reversed in direction. The polarization voltages established during the current-on time decay slowly during the current-off time. They are amplified, integrated over the current-off time and divided by the amplitude of the steady-state voltage measured during the current-on time. In this way, we determine the "chargeability;" i.e., the induced polarization property of the region under investigation. The units of chargeability are milliseconds. Normal (non-metallic) background chargeabilities in most rocks range from 1 millisecond to 5 milliseconds. A distribution of 1 per cent, by volume, of metallic conducting material of an average range of particle size may be expected to increase the response level by about 3 milliseconds, which is readily visible.

The pulse system provides an absolute measurement of induced polarization; i.e., the significant measurement is made in the absence of the primary field. As such, it is inherently more sensitive than the frequency variation system, wherein two measurements are compared, both of which are made in the presence of the primary field. This is a critical consideration when mineralized bodies of low sulphide content, small size or great depth are being sought.

Figure 2b shows a block diagram of the apparatus employed and the electrode array used. The spacing "a" of the three-electrode array determines the effective depth of penetration of the survey and is selected to give adequate penetration to the depth desired. By varying the electrode spacing over an anomalous area and comparing the responses on the various spacings, one may obtain an estimate of the depth of burial of the source and its dip, etc.

A photograph of the type of apparatus employed on these surveys is shown in Figure 3. This is known as Seigel Mk V equipment and consists of the following major components: (a) a 1,200-watt A.C. motor-generator set, (b) a power control unit capable of supplying up to 1000 volts and 2 amperes D.C. output current and (c) a measuring unit. All of these items are packboard-mounted for maximum portability.

Figure 4 shows a typical instrumental set-up in Ireland. In the normal operating procedure, the electronic chassis are set up in a tent and cables are fed out to the line being surveyed. As the line crew is prepared, both mentally and by apparel, to work under all types of weather conditions, the survey is not stopped by rain, etc. This is important in Ireland, where, traditionally, there are no more than 60 rain-free days a year.

For the primary survey coverage on most properties, an electrode spacing of 200 to 300 ft. was generally employed, with a station interval of 200 ft. and a line separation of 300 to 500 ft. On anomalous areas located by the primary coverage, more closely spaced stations and lines are employed, as well as additional spacings to supply the detail necessary for subsequent drilling, etc.

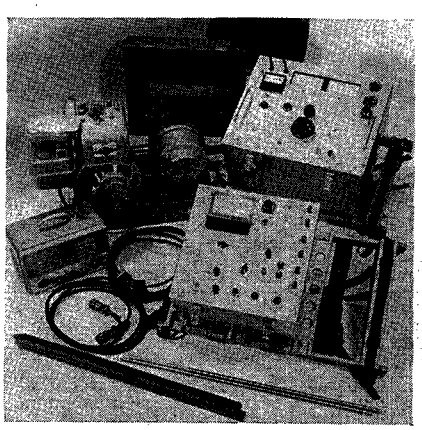


Figure 3.—(above)—The Seigel Mk V Induced Polarization Unit.

Figure 4.—(right)—Typical Field Operational Base in Ireland.

Case Histories

In presenting the three case histories that follow, it must be made perfectly clear at the outset that these mineral discoveries are the product of teamwork, involving geological, geochemical and geophysical phases. It is on the basis of the first two phases that the areas for geophysical investigation have been selected. As the writer and his organization have been concerned only with the geophysical phase, this paper will, naturally, appear to emphasize it. The contribution of others to the broader exploration program must not be minimized, however.

In January, 1962, a large lead-zinc-silver deposit of a very unusual type was discovered near Tynagh, Co. Galway, in the Republic of Ireland. This deposit includes both a supergene enriched, partly oxidized upper zone and a sulphide primary zone and lies in dolomitic reef limestones of Carboniferous age near a fault contact with Devonian sandstones. Similar rock types and contacts occur in many parts of Ireland, so that an extensive program of exploration was initiated by a number of mining companies, starting in the summer of 1962. Although the pace has slowed up somewhat from the hectic days of 1962 and early 1963, this exploration program continues to the present time.

The usual exploration sequence, although not followed in detail by all companies, is as follows:

1 . . . . . .

A selection of areas is made, based on the good government geological maps available. As nearly as possible, rock types and structures similar to those of the Tynagh deposit are sought. Those areas with known mineral showings are given high priority, of course.

2 . . . . . .

The stream sediments in the drainage pattern are sampled and analyzed for significant amounts of copper, lead and zinc. Soil samples may also be taken, often on a regular grid basis, and analyzed. In this fashion, areas of abnormal metal content may be broadly defined. In detail, such geochemical sampling has often been hampered by man-made contamination and confused by soil transport by glacial, fluvial or human agencies.

3 . . . . . .

Geophysical surveys, primarily the induced polarization type, are then conducted to map the subsurface distribution of sulphide mineralization and to provide guidance for a drilling program thereon.

This exploration program has already been remarkably successful, resulting, to date, in a new lead-zinc-silver mine-to-be at Silvermines, Co. Tipperary, for Consolidated Mogul Mines, Ltd., the probable copper-silver mine-to-be at Gortdrum, Cos. Tipperary and Limerick, for Gortdrum Mines, Ltd., and the interesting lead-zinc prospect at Keel, Co. Longford, for the Rio Tinto-Zinc group (Riofinex Ltd.). Figure 5 shows the location of the various recent mineral discoveries in Ireland. Despite a remarkable similarity in geological setting, the deposits are widely separated geographically, over a length of 80 miles, and no two are located on what can be called the same structure. This bodes well for the possibility of further discoveries being made in Ireland.

Each of the three case histories will be discussed below.

Silvermines Deposit

As the very name of the area implies, the Silvermines region had been known, for many centuries, as a locality mineralized with lead, zinc and silver. Metal production had taken place at several periods in the past, although at the time of the present investigations the mines were dormant. The very prominent Silvermines fault, striking about N 70°E, was known to be the significant control in the region, with the old mines and prospect pits scattered along its length over a distance of about 2 miles. Due to the past mining activity and transport by both drainage and man, a very extensive area gave rise to extremely high geochemical indications in lead and zinc. The induced polarization survey executed in late 1962 and early 1963 covered much of the concession area on 800-ft. sections and the geologically interesting portion thereof on 400-ft. sections. The three-electrode array, with 200-ft. electrode spacing, was employed on all lines, and spacings of 100 ft. and 400 ft. were also employed on the 400-ft. detail lines. In all, approximately 5 miles of the strike length of the Silvermines fault were covered by the present survey, 2½ miles in detail. At least ten distinct zones of abnormally high polarization were indicated, of which about half lay in the Silvermines mineralized belt and its extensions to the west and east.

One of these zones, designated the Garryard, has responded favourably to the subsequent drilling, resulting in the discovery of a mineable orebody.

To date, the announced proven tonnage figures include 12 million tons averaging approximately 8 per cent zinc, 3 per cent lead and 1 ounce of silver in the Garryard zone. This zone lies to the west of the zone from which the previous production had taken place.

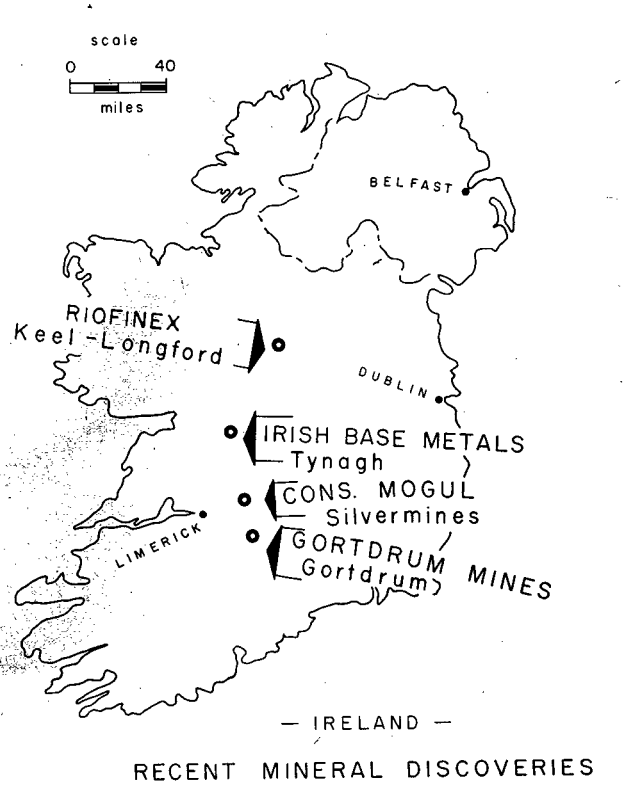


Figure 5.—Location Plan of Recent Mineral Discoveries in Ireland.

Figure 6 shows a typical discovery profile across the main ore zone, on the section 38,400E. The 200-ft. electrode spacing results, both chargeability and resistivity, are shown in profile form. The geologic section, as deduced from nine drill holes, is shown below the geophysical profiles. In a fashion almost identical to that of the Tynagh deposit, the Silvermines orebody is located in gently north-dipping dolomitic limestones adjacent to a fault contact with the Devonian "Old Red" sandstone. The mineralization here is composed of both massive and disseminated sulphides, with the former composed of a high percentage of pyrite. The mineralization is essentially conformable, in two distinct horizons, and is therefore flatly dipping except in the vicinity of the fault, where the dips are much steeper, perhaps due to "drag folding" on the fault.

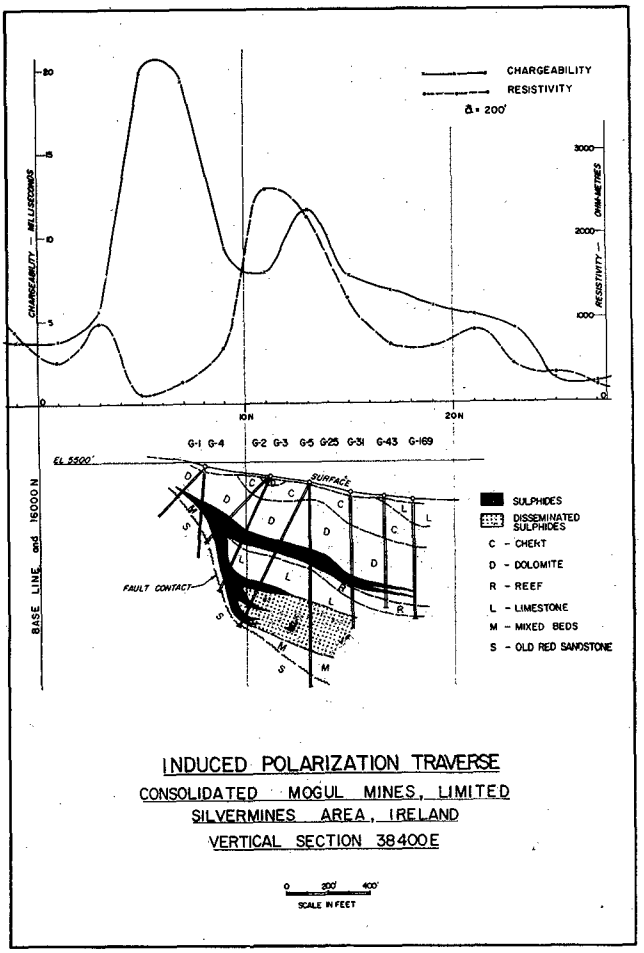


Figure 6.—Typical Discovery Traverse, Silvermines Deposit.

Because of the high pyritic content of the mineralization near the fault, along which it comes closest to the ground surface, we see both a marked increase in chargeability and a sharp decrease in resistivity in that vicinity. From a normal background of 2-4 milliseconds, the chargeability curve rises to a peak response of 20 milliseconds over the sub-outcrop of the body on this section. The subsidiary peak of about 12 milliseconds near 11N is believed to be due to disseminated pyrite in the chert horizon.

Figure 7 shows the multiple spacing chargeability results on the same section, using electrode spacings of 100, 200 and 400 ft. and the three-electrode array. On comparing the results with the various spacings, two items of interest may be noted; firstly, the progressive increase in peak amplitude with spacing, testifying to the increase of mineralization with depth, even down to a depth of 300 ft., and, secondly, the presence of buried material of high polarization at depth beneath section 10N to 18N on this line. The latter is undoubtedly due to the down-dip extension of the upper mineralized horizon, which is present at depths of 300 to 400 ft. over this region.

The induced polarization results on the Silvermines deposit were quite definitive and have provided good guidance for the exploratory drilling. It is true, however, that the massive sulphide portions of this deposit would be amenable to detection by the more conventional electrical methods, such as electromagnetic induction or resistivity. As such, it is not as good a test of the capabilities of the induced polarization method as are the two case histories which follow.

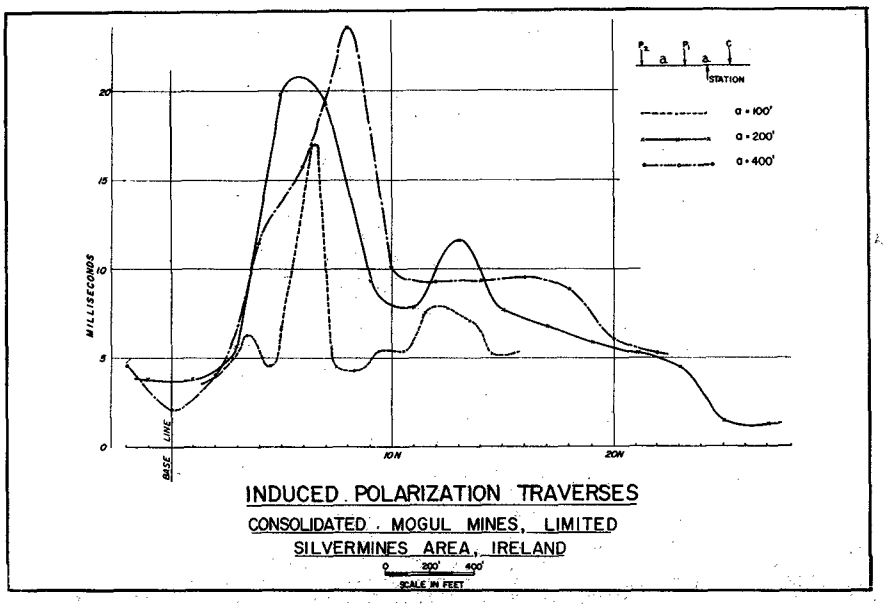


Figure 7.—Multiple Spacing Results, Silvermines Deposit.

Gortdrum Deposit

The Gortdrum area, near the mutual border of Cos. Limerick and Tipperary, was originally selected to cover the eastern extension of the former Oola Mines lead-zinc deposit, some 3 miles to the west. Regional geochemical sampling of the stream sediments in this area, followed by soil traverses, indicated a moderately strong copper soil anomaly. Induced polarization surveys were carried out in May, 1963, and January, 1964, leading to the localization of the sulphide mineralization associated with the geochemical anomaly. As there was a 300-ft. lateral displacement between the centers of the geophysical and geochemical indications and the surface topography is very gentle, it was initially queried as to whether the two indications

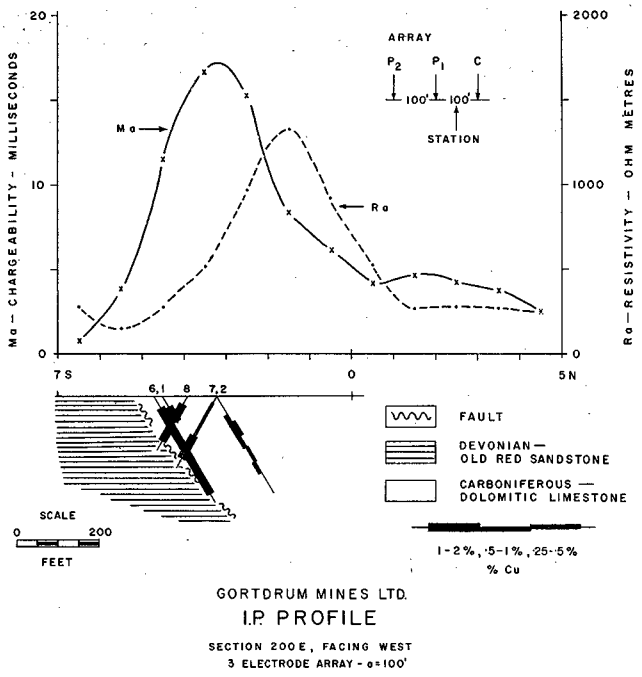


Figure 8.—Typical Discovery Traverse, Gortdrum Deposit.

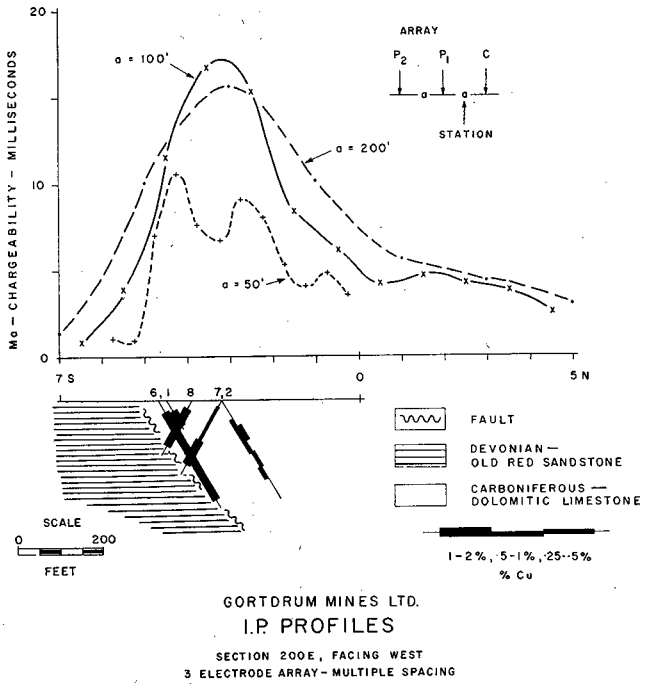


Figure 9.—Multiple Spacing Results, Gortdrum Deposit.

were related. The subsequent drilling has fully confirmed the geophysical predictions.

On the initial two geophysical programs, the three-electrode array with 100-ft. spacing was employed, as a relatively shallow source of the geochemical anomaly was expected. The survey lines were at 200-ft. intervals. Figure 8 presents a typical discovery traverse, showing both the chargeability and resistivity profiles as well as the corresponding geologic section. A peak chargeability of about 17 milliseconds is observed, rising from the normal background of 2-4 milliseconds. There is no resistivity expression of the mineralized zone, lying as it does on the flank of a high-resistivity area.

Figure 9 shows the chargeability profiles for electrode spacings of 50, 100 and 200 ft. Points of special interest deduced from these profiles include the following:

1.—The extremely sharp cut-off of the high chargeability levels on the south side of the area and the gradual drop-off in level on the north side. This was inconsistent with the thought of a bedded-type deposit conformable with the limestones, which are known to dip flatly to the south. A fault or other contact was postulated, dipping steeply, probably to the north. The initial drill holes on the section (Nos. 1, 2 and 6) were drilled to the north on the original geologic-dip premise, but the later holes (e.g., Nos. 7 and 8) have all been drilled to the south.

2.—The high-polarization material does not quite outcrop, but still comes within about 25 ft. of the ground surface across a width of about 200 ft., including two or more lenses. This material extends to at least 200 ft. in depth.

The actual drilling results confirm the presence of a zone of finely disseminated chalcocite and bornite, with very minor chalcopyrite, in dolomitic limestones. The mineralization is somewhat erratically distributed but, in general, increases as one approaches a north-dipping fault, which brings the limestones into contact with the Devonian Old Red sandstones. This fault has been found to strike about N 70°E. Geologically, therefore, this environment is almost identical to that of the Tynagh and Silvermines deposits. The mineralization in the Gortdrum area is quite different, however, both in type and amount. The average grade of the deposit is less than 2 per cent copper, with about 0.65 ounce of silver for each 1 per cent copper (although considerable potential open-pit tonnage may exist), so that the average sulphide content, by volume, is 3 per cent or less. The high chargeability responses observed over this deposit are a remarkable tribute to the sensitivity of the pulse-type induced polarization method, particularly when dealing with truly disseminated-type sulphide mineralization with a small average particle size.

As development drilling is still in progress on this deposit, no over-all grade or tonnage figures have as yet been released.

Keel Deposit

The deposits near Keel and Longford, Co. Longford, occur on a known limestone-sandstone contact, which is, no doubt, one of the reasons why exploration interest was attracted thereto. Soil sampling traverses by Riofinex Ltd., an exploration subsidiary of Rio Tinto-Zinc Corporation, Ltd., established the presence of anomalous lead and zinc concentrations. A horizontal-loop electromagnetic survey was initially executed in another attempt to determine the source of the geochemical indications, but with negative results. This was followed by induced polarization surveys in November and December, 1962. The three-electrode array, with an electrode spacing of 200 ft., was employed on the reconnaissance survey. Anomalous chargeability zones were indicated and exploratory drilling commenced shortly thereafter. Although no publication of results has been made, they are of some potential interest, as drilling has continued, at intervals, to the present time.

Figure 10 shows a typical section across the prospect, presenting the geophysical and geochemical results in profile form, as well as the geological section interpreted from three holes. The relationship between the mineralized horizon, the geophysical peak and the geochemical peaks is a matter of considerable interest. The sub-outcrop of the mineralized horizon and the geophysical peak are in good agreement (see also Figure 11). The lead peak is displaced about 400 - 500 ft. down slope to the south. The zinc peak is displaced still another 300 ft. to the south. The actual topographic slope is only 1-2 degrees to the south, so that this displacement is difficult to account for on the basis of soil creep. There is only a minor resistivity depression associated with the mineralization, indicating why the electromagnetic survey failed to give any positive response to it.

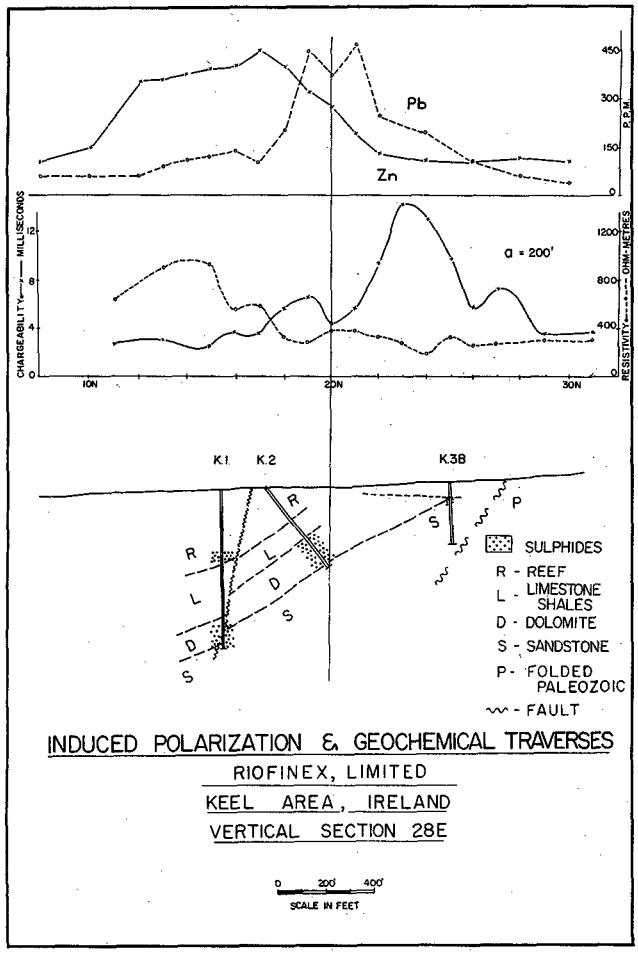


Figure 10.—Typical Discovery Traverse, Keel Deposit.

The mineralization itself is primarily sphalerite, with some galena and, on the average, less than 5 per cent pyrite. It is found to lie primarily in a dolomite horizon adjacent to a contact with sandstone. In this case, the contact may be largely a depositional one and not due to a fault. Mineralization occurs to a minor extent in the sandstone as well.

Figure 11 shows the chargeability results of the multiple spacing profiles on this section. Spacings of 50, 100 and 200 ft. were used. The progressive step-out of the peak values to the south with the increase in electrode spacing indicates the effect of the relatively flat dip to the south of the mineralization. The sub-outcrop of the mineralization is near station 26N, at a depth of less than 25 ft. As hole K3B, only 100 ft. away, intersected almost 60 ft. of overburden one must conclude that the bedrock surface is rather irregular in this area. The peak chargeability of 24 milliseconds would suggest a metallic conductor content of the order of 6 to 12 per cent, by volume, in this area.

It is the writer's hope that he has not given the impression that every induced polarization anomaly in Ireland inevitably defines an orebody, or that every exploration venture there is crowned with success. Aside from effects due to the many man-made conductors, such as grounded power lines, rabbit fences and buried pipe lines, there are certain carbonaceous sediments, in particular the Calp limestone, which overlies the ore-bearing dolomitic limestone in some places, which yield high polarization responses. Fortunately, the areal distribution of the latter is usually broad enough to suggest a formational origin. Also, fortunately, the Calp is, stratigraphically, sufficiently well separated from the ore-bearing limestones so that the effect from these two horizons may be resolved. With the geological and geochemical information available, one can usually determine whether a particular induced polarization indication warrants investigation by drilling. Despite its limitations, the pulse-type induced polarization method has well demonstrated its application to a broad range of base metal exploration problems in Ireland.

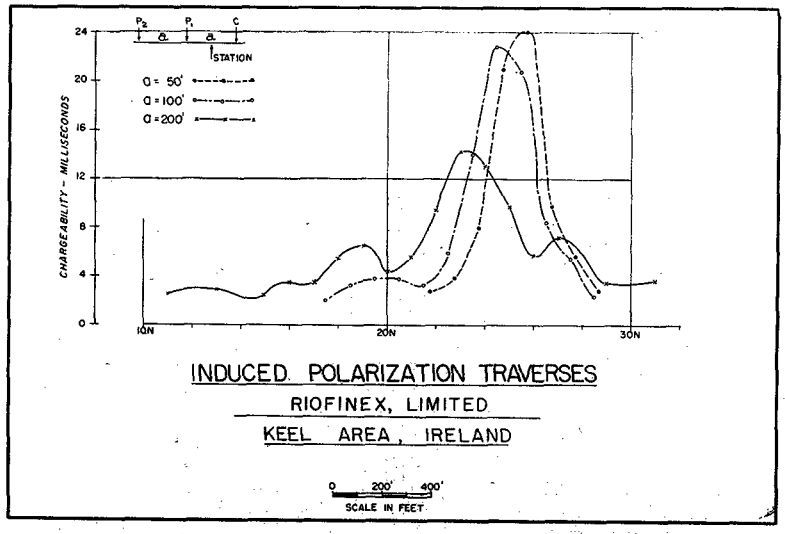


Figure 11.—Multiple Spacing Results, Keel Deposit.

Acknowledgments

The writer wishes to express his thanks to Consolidated Mogul Mines, Ltd., and Dr. W. W. Weber, to Gortdrum Mines, Ltd. and Dr. D. R. Derry, and to Rio Tinto-Zinc Corp. Ltd. and Mr. Jocelyn Pereira, for their kind permission to present the geophysical and other details relating to their respective mineral discoveries. In addition, the writer wishes to acknowledge the able assistance of the staff of Canadian Aero Mineral Surveys, Ltd., with which our company, Harold O. Seigel & Associates Ltd., has acted on a co-operative basis in Ireland.

(*Reprinted from The Canadian Mining and Metallurgical Bulletin, November*, 1965)
Printed in Canada

SEIGEL ASSOCIATES LIMITED
GEOPHYSICAL CONSULTANTS & CONTRACTORS
A DIVISION OF SCINTREX LIMITED

May 27th 1969

Mr. F. J. Hemsworth
616-850 West Hastings Street
Vancouver 1, B.C.

Dear Fred:

Re: Geophysical Report On Job & Eden Claim Groups

I am enclosing herewith the two copies of my report which I now believe are suitable for filing with the mining recorder. I have amended Plate 3 to show a location map on a scale of 1" = 400' which reveals the locations of the line surveyed with respect to the Eden and CL Claims.

The discrepancy between the actual profile lengths of 11,200' and the affadavit which claims 5.65 miles of survey lies in the definition of what constitutes a line mile. For reconnaissance purposes we define one line mile as 26 readings spaced 200' apart. When the readings lie closer together than 200', we still define one line mile to consist of 26 readings. Since Plate 3 contains 147 combined induced polarization-resistivity observations, we therefore have billed for 5.65 line miles.

The enclosed report copies have been signed by R. O. Crosby, who is a professional engineer, registered in British Columbia.

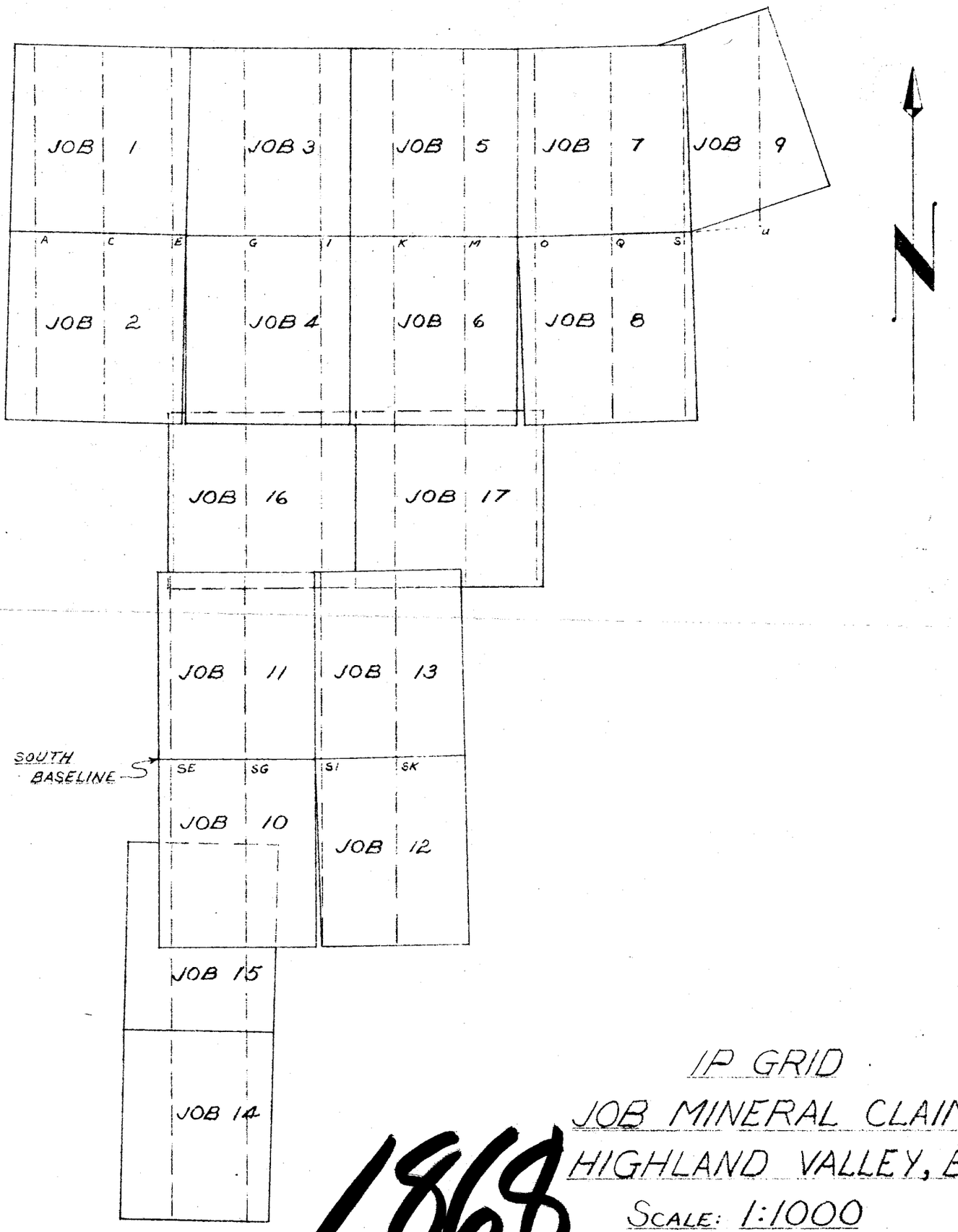
I regret the inconvenience that this has caused you.

Yours very truly,

SEIGEL ASSOCIATES LIMITED

Jon G. Baird, B.Sc., P.Eng.
Operations Manager

JGB:JT
Encl.



IP GRID

JOB MINERAL CLAIMS

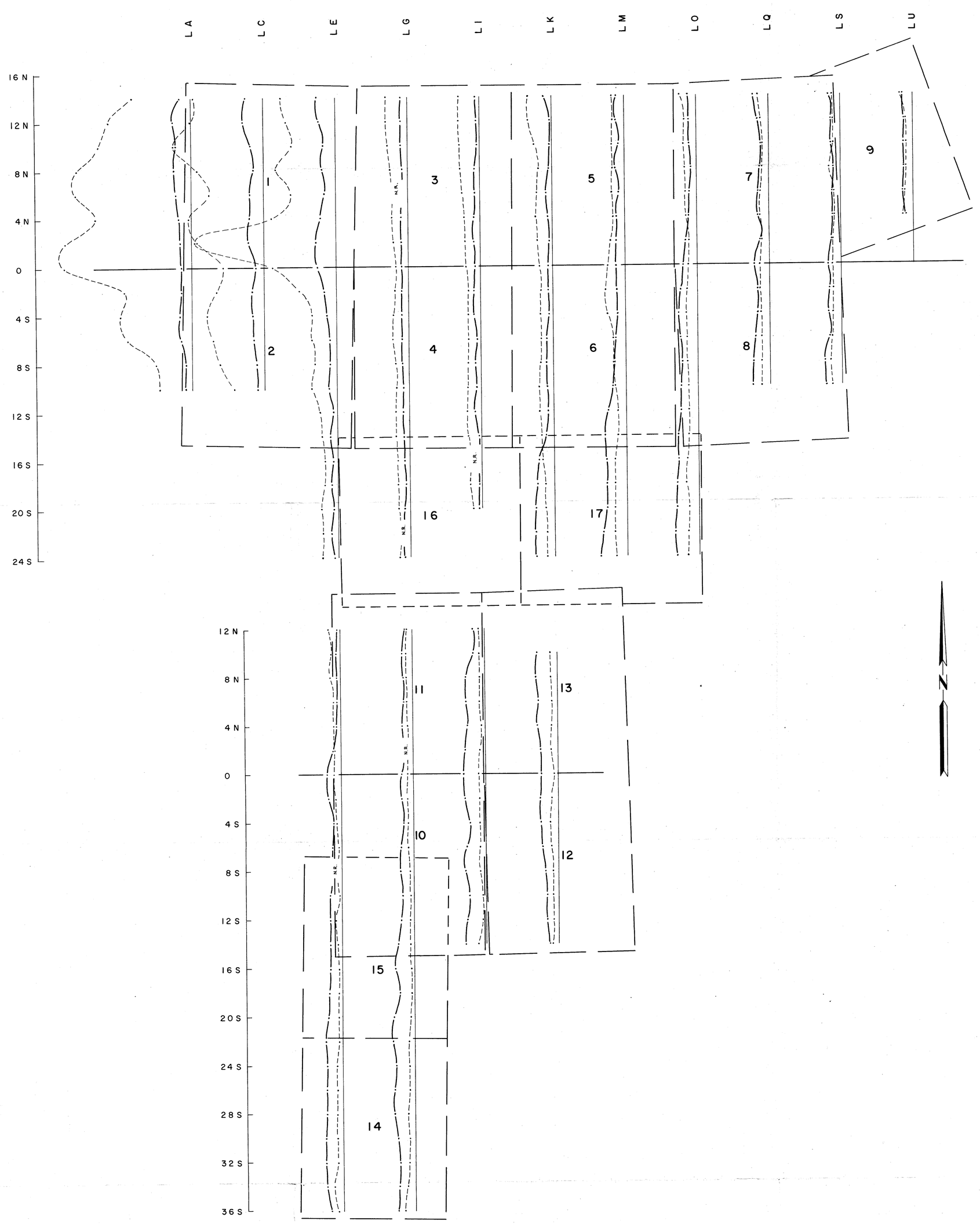
HIGHLAND VALLEY, B.C.

SCALE: 1:1000

1868

D.R.F.

- Map 4



LEGEND:

CHARGEABILITY, SCALE: 1" = 10 MILLISECONDS
ELECTRODE SPACING a = 400'

RESISTIVITY; SCALE : 1" = 1000 OHM - METRES
ELECTRODE SPACING a = 400'

NOTES:
THREE ELECTRODE ARRAY
ELECTRODE SPACING AS INDICATED

TO ACCOMPANY A GEOPHYSICAL REPORT
BY J.G. BAIRD DATED JANUARY 15, 1969

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 1868 MAP 2

PLATE 2

VANANDA EXPLORATIONS LIMITED

HIGHLAND VALLEY AREA, BRITISH COLUMBIA

JOB CLAIMS

INDUCED POLARIZATION SURVEY

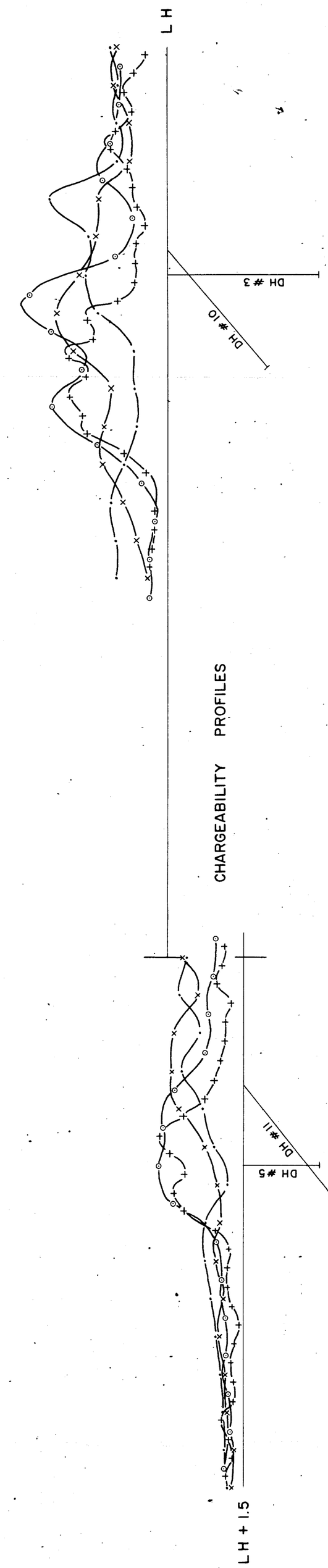
SCALE : 1" = 400'

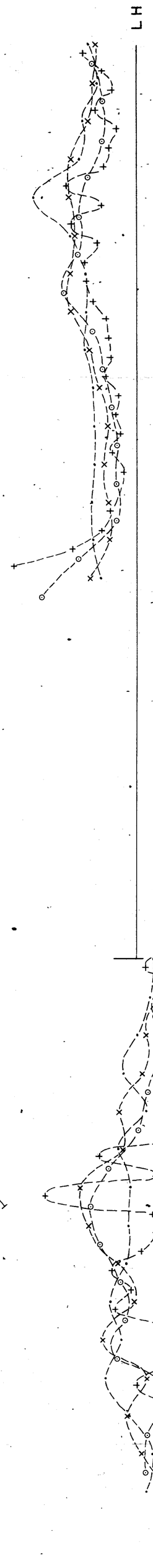
SURVEY BY SEIGEL ASSOCIATES LIMITED
DECEMBER, 1968

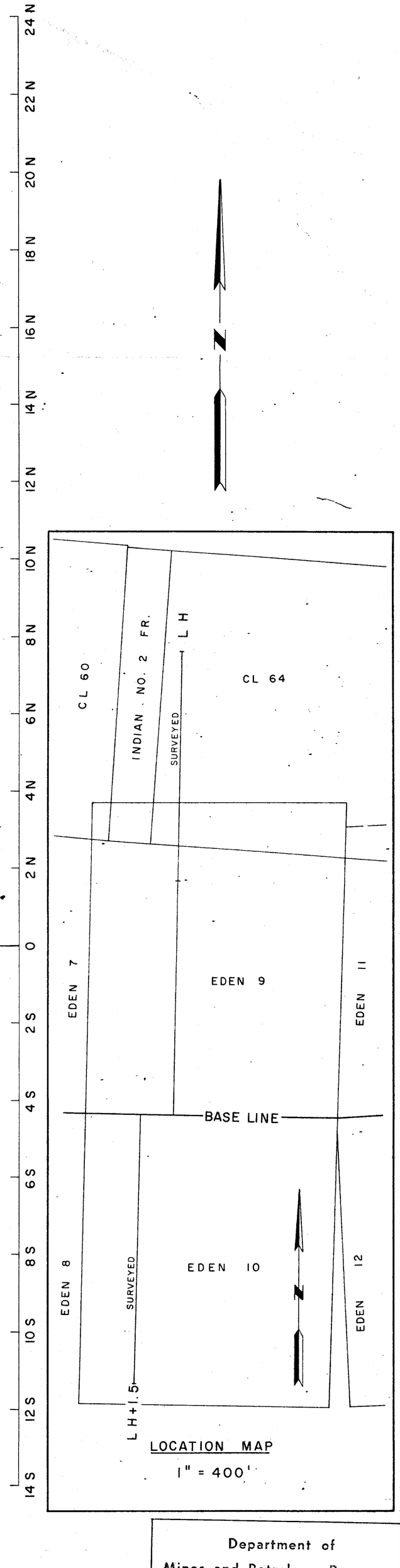
REGISTERED PROFESSIONAL ENGINEER
J. G. BAIRD
PROVINCE OF ONTARIO

R.A. Crosby

1868







LEGEND:

CHARGEABILITY; SCALE: 1" = 10 MILLISECONDS

ELECTRODE SPACING: a = 400' a = 200' a = 100' a = 50'

RESISTIVITY; SCALE: 1" = 1000 OHM - METRES

ELECTRODE SPACING: a = 400' a = 200' a = 100' a = 50'

NOTES:
- THREE ELECTRODE ARRAY
- ELECTRODE SPACING AS INDICATED

TO ACCOMPANY A GEOPHYSICAL REPORT
BY J.G. BAIRD DATED JANUARY 15, 1969

PLATE 3

VANANDA EXPLORATIONS LIMITED

HIGHLAND VALLEY AREA, BRITISH COLUMBIA

EDEN CLAIMS

DETAIL INDUCED POLARIZATION SURVEY

SCALE: 1" = 200'

SURVEY BY SEIGEL ASSOCIATES LIMITED
DECEMBER, 1968

R. A. Crosby

1868