1. INTRODUCTION

At the request of Homestake Mineral Development Company, we have completed a reconnaissance induced polarization and resistivity survey on a grid covering a portion of a claim group in the Hemlo area of Ontario. The area of interest is located within the Thunder Bay Mining District. The Reconnaissance Grid covers part of the Captain Consolidated-Koala Resources Claim Group.

The area is of interest because of several gold discoveries to the southeast. In the Hemlo Area, the gold is contained within disseminated sulphide mineralization. The weakly disseminated, metallic sulphide zones occur within any of several types of metamorphic rocks (schists, quartzites, volcanics, etc.). The background IP effects in the general
Hemlo Area are low in magnitude; this must be due to the low level of metallic minerals (pyrite, magnetite, etc.) in the country rocks.

The IP anomalies from the gold-bearing sulphide zones vary from low in magnitude to quite strong. The sulphide concentration within the ore zones varies considerably; however, the anomalies detected are often quite definite due to the low background. The interpretation is also often aided by the fact that the overburden is relatively thin in many areas. This means that any bedrock sources of IP effect will be "shallow" in the reconnaissance survey; i.e., they will be anomalous for the n = 1 measurement.

The IP results shown in the enclosed reprint were measured over typical gold-bearing sulphide zones in the Hemlo Area. It can be seen that the IP anomalies measured are low to moderate in magnitude. There may or may not be a region of lower apparent resistivities associated with the IP anomaly. However, there is almost certainly not enough mineralization present to cause these low resistivities; the low resistivities where they are present, are perhaps due to porosity changes in the host rocks, caused by shearing, fracturing, alteration, etc.

The IP data we have enclosed from the Hemlo Area was measured using X = 50 meters, X = 25 meters and X = 1.0 meters. With these short electrode intervals, the n = 1 measurement is anomalous; i.e. the source is shallow. However, in a reconnaissance survey the electrode interval used is sometimes greater. It must be kept firmly in mind (see Appendix to this report) that if a large electrode interval is used to detect a narrow source, the magnitude of the apparent IP anomaly will be reduced. In order to better locate, and evaluate, the source of a narrow, shallow
anomaly detailed measurements with shorter electrode intervals must be completed. (See Appendix).

2. PRESENTATION OF RESULTS

The induced polarization and resistivity results from the reconnaissance survey are shown on the following enclosed data plots. The results have been plotted using the pseudo-section format.

<table>
<thead>
<tr>
<th>Line</th>
<th>Electrode Intervals</th>
<th>Dwg.No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>7S</td>
<td>50 meters</td>
<td>IP 5387-1</td>
</tr>
<tr>
<td>12S</td>
<td>50 meters</td>
<td>IP 5387-2</td>
</tr>
<tr>
<td>15S (west portion)</td>
<td>25 meters</td>
<td>IP 5387-3a</td>
</tr>
<tr>
<td></td>
<td>(center portion) 25 meters</td>
<td>IP 5387-3b</td>
</tr>
<tr>
<td></td>
<td>(east portion) 25 meters</td>
<td>IP 5387-3c</td>
</tr>
<tr>
<td>17S</td>
<td>50 meters</td>
<td>IP 5387-4</td>
</tr>
<tr>
<td>19S</td>
<td>50 meters</td>
<td>IP 5387-5</td>
</tr>
<tr>
<td>21S</td>
<td>50 meters</td>
<td>IP 5387-6</td>
</tr>
<tr>
<td>22S</td>
<td>50 meters</td>
<td>IP 5387-7</td>
</tr>
</tbody>
</table>

Also enclosed with this report is Dwg. I.P.P.3128, a plan map of the Reconnaissance Grid at a scale of 1:5,000. 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 50 meter electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 50 meters 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 centre 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.

The topographic information shown on Dwg. I.P.P. 3128 has been taken from maps made available by the staff of Homestake Mineral Development Company.

3. DISCUSSION OF RESULTS

On all of the reconnaissance lines surveyed, there is some evidence of a conductive overburden layer, in the apparent resistivity data for part of the line. The central portion of Line 17S would be typical. On all of the lines, the apparent resistivities measured for the larger values of \((n)\) are moderately large; this indicates that the depth of detection is great enough to be influenced by the basement rocks.

Fairly definite reconnaissance IP anomalies have been detected on all of the lines surveyed. The anomalies interpreted on the data plots have been transferred to the plan map. As shown on Dwg.No. I.P.P.3128, in most cases the lines surveyed are too far apart to permit the IP anomalies to be correlated from line to line. However, at the extreme western end of the grid, some correlation is possible.
The reconnaissance anomalies detected using $X = 50$ meters are relatively indistinct. As outlined in the Appendix to this report, this would be expected for narrow, shallow sources. The anomalies detected using $X = 25$ meters on Line 15S are more definite than the corresponding anomalies detected with $X = 50$ meters on Line 17S.

The sources of some of the more definite anomalies shown on Dwg.No.I.P.P.3128, should be better located and evaluated using detailed measurements with shorter electrode intervals. These reconnaissance anomalies are fairly typical for the Hemlo Area. If the sources are not known from other investigations a drill test would be warranted.

**4. **RECOMMENDATIONS

As shown on Dwg.No. I.P.P.3128, several reconnaissance IP anomalies of interest were detected on the grid covering the Captain Consolidated-Koala Resources Claim Group. In most cases, the anomalous patterns indicate narrow, shallow sources. These sources can be better located, and more fully evaluated, by making detailed measurements using shorter electrode intervals. There is some depth to the source centered at 17+50W to 17+00W on Line 21S; this anomaly should also be detailed.

- Line 15S, 15+75S detail with $X = 15$ meters
- 10+25S detail with $X = 15$ meters
- 2+50W to 2+25W detail with $X = 15$ meters
Line 17S 20+00W detail with X = 30 meters and X = 15 meters

16+00W detail with X = 30 meters and X = 15 meters

Line 19S, 17+00W detail with X = 30 meters and X = 15 meters

2+00W detail with X = 30 meters and X = 15 meters

Line 21S, 17+50W to 17+00W detail with X = 60 meters, also shift electrodes

If the anomalies listed above are confirmed by the detailed measurements, it will also be desirable, in most cases, to survey more closely spaced parallel lines. When the sources have been better located, short, angled drill holes can be planned to determine the nature of the metallic mineralization that is the source of the IP effects.

PHOENIX GEOPHYSICS LIMITED

Philip G. Hallof, Ph.D., P.Eng.
Geophysicist

Dated: May 22, 1984
ASSESSMENT DETAILS

PROPERTY: Captain Consolidated-Koala

PROVINCE: Ontario

SPONSOR: Homestake Mineral Development Co.

LOCATION: Hemlo Area

TYPE OF SURVEY: Induced Polarization and Resistivity

OPERATING MAN DAYS: 28.0 DATE STARTED: January 9, 1984

EQUIVALENT 8 HR. MAN DAYS: 42.0 DATE FINISHED: January 29, 1984

CONSULTING MAN DAYS: 3.0 NUMBER OF STATIONS: 222

DRAFTING MAN DAYS: 5.0 NUMBER OF READINGS: 2877

TOTAL MAN DAYS: 50.0 KM OF LINE SURVEYED: 8.6

CONSULTANTS:

P.G. Hallof, 3505 - 2045 Lakeshore Blvd. West. Toronto, Ontario

FIELD TECHNICIANS:

G. Mullan, P.O. Box 72, R.R.#1, Hudson, Quebec.

S. Van Der Vecht, 30 Grovetree Crescent, Rexdale, Ontario

CARTOGRAPHERS:

R.C. Norris, 2499 Linwood Street, Pickering, Ontario

M.W. Reh, 58 Crossbow Crescent, Willowdale, Ontario

PHOENIX GEOPHYSICS LIMITED

Philip G. Hallof, Ph.D. P.Eng.
Geophysicist

Dated: May 22, 1984
## STATEMENT OF COST

Homestake Mineral Development Co. - IP Survey  
Captain Consolidated-Koala

**CREW:**  
G. Mullan - S. Van Der Vecht

**PERIOD:**  
January 9 - 29, 1984

<table>
<thead>
<tr>
<th>Description</th>
<th>Days</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Operating days</td>
<td>14</td>
<td>@ $990.00/day</td>
<td>$13,860.00</td>
</tr>
<tr>
<td>1½ Travel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Organization 3½ days</td>
<td>3½</td>
<td>@ $685.00/day</td>
<td>$2,397.50</td>
</tr>
<tr>
<td>1 Bad Weather</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobilization</td>
<td></td>
<td></td>
<td>$300.00</td>
</tr>
</tbody>
</table>

**Total:** $16,557.50

---

**PHOENIX GEOPHYSICS LIMITED**  

![Signature](signature.png)  

Philip G. Hallof, Ph.D.  
Geophysicist

**Dated:** May 22, 1984
CERTIFICATE

I, Philip G. Hallof, of the City of Toronto, do hereby certify that:

1. I am a geophysicist residing at Suite 3505, 2045 Lakeshore Blvd., W. Toronto, Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.Sc. Degree (1952) in Geology and Geophysics, and a Ph.D. Degree (1957) in Geophysics.


5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the properties or securities of Homestake Mineral Development Company, or any affiliate.

6. The statements made in this report are based on a study of published geological literature and unpublished private reports.

7. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto
This 22nd day of May, 1984

Philip G. Hallof, Ph.D.
Registered Professional Engineer
Province of Ontario
APPENDIX

THE INTERPRETATION OF
INDUCED POLARIZATION ANOMALIES
FROM RELATIVELY SMALL SOURCES

The induced polarization method was originally developed to detect disseminated sulphides and has proven to be very successful in the search for "porphyry copper" deposits. In recent years we have found that the IP method can also be very useful in exploring for more concentrated deposits of limited size. This type of source gives sharp IP anomalies that are often difficult to interpret.

The anomalous patterns that develop on the contoured data plots will depend on the size, depth and position of the source and the relative size of the electrode interval. The data plots are not sections showing the electrical parameters of the ground. When the electrode interval (X) is appreciably greater than the width of the source, a large volume of unmineralized rock is averaged into each measurement. This is particularly true for the large values of the electrode separation (n).

The theoretical scale model results shown in Figure 1 and Figure 2 indicate the effect of depth. If the depth to the top of the source is small compared to the electrode interval (i.e. d X) the measurement for n = 1 will be anomalous. In Figure 1 the depth is 0.5 units (X = 1.0 units) and the n = 1 value is definitely anomalous; the pattern on the contoured data plot is typical for a relatively shallow, narrow, near-vertical tabular source. The results in Figure 2 are for the same source with the depth increased to 1.5 units. Here the n = 1 value is not anomalous; the larger values of (n) are anomalous but the magnitudes are much lower than for the source at less depth.

When the electrode interval is greater than the width of the source, it is not possible to determine its width or exact position between the electrodes. The true IP effect within the source is also indeterminate; the anomaly from a very narrow source with a very large true IP effect will be much the same as that from a zone with twice the width and \( \frac{1}{2} \) the true IP effect. The theoretical scale model data shown in Figure 3 and Figure 4 demonstrate this problem. The depth and position of the source are unchanged but the width and true IP effect are varied. The anomalous patterns and magnitudes are essentially the same, hence the data are insufficient to evaluate the source completely.

The normal practise is to indicate the IP anomalies by solid, broken, or dashed bars, depending upon their degree of distinctiveness. 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. As illustrated in Figure 1, Figure 2 Figure 3 and Figure 4, no anomaly can be located with more accuracy than the spread length. While the centre of the solid bar indicating the anomaly corresponds fairly well with the source, the length of the bar should not be taken to represent the exact edges of the anomalous material.
If the source is shallow, the anomaly can be better evaluated using a shorter electrode interval. When the electrode interval used approaches the width of the source, the apparent effects measured will be nearly equal to the true effects within the source. When there is some depth to the top of the source, it is not possible to use electrode intervals that are much less than the depth to the source. In this situation, one must realize that a definite ambiguity exists regarding the width of the source and the IP effect within the source.

Our experience has confirmed the desirability of doing detail. When a reconnaissance IP survey using a relatively large electrode interval indicates the presence of a narrow, shallow source, detail with shorter electrode intervals is necessary in order to better locate, and evaluate, the source. The data of most usefulness is obtained when the maximum apparent IP effect is measured for \( n = 2 \) or \( n = 3 \). For instance, an anomaly originally located using \( X = 300' \) may be checked with \( X = 200' \) and then \( X = 100' \). The data with \( X = 100' \) will be quite different from the original reconnaissance results with \( X = 300' \).

The data shown in Figure 5 and Figure 6 are field results from a greenstone area in Quebec. The expected sources were narrow (less than 30' in width) zones of massive, high-grade, zinc-silver ore. An electrode interval of 200' was used for the reconnaissance survey in order to keep the rate of progress at an acceptable level. The anomalies located were low in magnitude.

The very weak, shallow anomaly shown in Figure 5 is typical of those located by the \( X = 200' \) reconnaissance survey. Several anomalies of this type were detailed using shorter electrode intervals. In most cases the detail measurements suggested broad zones of very weak mineralization. However, in the case of the source at 20N to 22N, the measurements with shorter electrode intervals confirmed the presence of a strong, narrow source. The \( X = 50' \) results are shown in Figure 6. Subsequent drilling has shown the source to be 12.5' of massive sulphide mineralization containing significant zinc and silver values.

The change in the anomaly that results when the electrode interval is reduced is not unusual. The \( X = 50' \) data more accurately locates the narrow source, and permits the geophysicist to make a better evaluation of its importance. The completion of this type of detail is very important, in order to get the maximum usefulness from a reconnaissance IP survey.
Theoretical Induced Polarization and Resistivity Studies
Scale Model Cases

\[ \frac{P}{2\pi} = 10 \]
\[ (Mf) = 0 \]
\[ (fe) = 25\% \]

CASE II-03-BU-10-q

\[ \frac{P}{2\pi} = 2.51 \]
\[ (Mf) = 10000 \]
\[ (fe) = 25\% \]

CASE II-03-BU-10-q

\[ \frac{P}{2\pi} = 26 \]
\[ (Mf) = 9250 \]
\[ (fe) = 24\% \]

CASE II-15-BU-10-q
THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE

PLAN VIEW

X EQUALS 1 UNIT

THEORETICAL
INDUCED POLARIZATION
AND
RESISTIVITY STUDIES
SCALE MODEL CASE

PLAN VIEW

X EQUALS 1 UNIT
INDUCED POLARIZATION AND RESISTIVITY RESULTS
BATCHelor LAKE AREA, QUEBEC.

FIG. 5

FIG. 6

GLACIAL OVERBURDEN
GREENSTONE

MASSIVE SULPHIDE
ZONE

FIG. 5

FIG. 6

MASSIVE SULPHIDE
ZONE

FIG. 5

FIG. 6

MASSIVE SULPHIDE
ZONE

FIG. 5

FIG. 6

MASSIVE SULPHIDE
ZONE

FIG. 5

FIG. 6

MASSIVE SULPHIDE
ZONE
Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present
in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d.c. current is allowed to flow through the rock; i.e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d.c. voltage used to create this d.c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.
The values of the per cent frequency effect or F.E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M.F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F.E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method cannot be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM
anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i.e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of apparent resistivity, apparent per cent frequency effect, and the apparent metal factor
measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A). The resistivity values are plotted at the top of the data profile, above the percent frequency effect. On a third line, below the percent frequency effect, are plotted the values of the metal factor values. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and the theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made.
One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance \( X \) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for \( X \). In each case, the decision as to the distance \( X \) and the values of \( n \) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent percent frequency effect, and apparent metal factor effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of \( n \) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of \( n \); i.e. the depth of the measurement is increased.

The IP measurement is basically obtained by measuring the difference in potential or voltage \( \Delta V \) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of \( \Delta V \) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.
In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisy to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however, the symbol "NEG" is indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

PHOENIX GEOPHYSICS LIMITED.
METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS

Stations on line

\( x = \) Electrode spread length
\( n = \) Electrode separation

\[
\begin{align*}
n - 1 & \quad 1.2-3.4, 2.3-4.5, 3.4-5.6, 4.5-6.7, 5.6-7.8, 6.7-8.9 \\
n - 2 & \quad 1.2-4.5, 2.3-5.6, 3.4-6.7, 4.5-7.8, 5.6-8.9 \\
n - 3 & \quad 1.2-5.6, 2.3-6.7, 3.4-7.8, 4.5-8.9 & \text{Apparent Resistivity} \\
n - 4 & \quad 1.2-6.7, 2.3-7.8, 3.4-8.9 \\
\end{align*}
\]

\[
\begin{align*}
n - 1 & \quad \text{F.E. F.E. F.E. F.E. F.E. F.E.} \\
n - 2 & \quad 1.2-4.5, 2.3-5.6, 3.4-6.7, 4.5-7.8, 5.6-8.9 \\
n - 3 & \quad 1.2-5.6, 2.3-6.7, 3.4-7.8, 4.5-8.9 & \text{Apparent Percent} \\
n - 4 & \quad \text{F.E. F.E. F.E. F.E.} \\
\end{align*}
\]

\[
\begin{align*}
n - 1 & \quad \text{M.F. M.F. M.F. M.F. M.F. M.F.} \\
n - 2 & \quad 1.2-4.5, 2.3-5.6, 3.4-6.7, 4.5-7.8, 5.6-8.9 \\
n - 3 & \quad 1.2-5.6, 2.3-6.7, 3.4-7.8, 4.5-8.9 & \text{Apparent Metal Factor} \\
n - 4 & \quad \text{M.F. M.F. M.F. M.F. M.F.} \\
\end{align*}
\]

Fig. A
THE USE OF THE INDUCED POLARIZATION METHOD
IN THE HEMLO AREA

BY

Philip G. Hallof, Ph.D. P.Eng.,
Phoenix Geophysics Limited

INTRODUCTION

The recent surge of exploration in the Hemlo Area of central Ontario is less than thirty-six months old. Many thousands of mineral claims have been staked and recent announcements have raised the total tonnage of gold ore outlined to over fifty million tons. During this period, Phoenix Geophysics Limited has completed more than one thousand line kilometers of reconnaissance induced polarization and resistivity surveys in the area.

SOURCE OF INDUCED POLARIZATION ANOMALIES

The gold-bearing rocks at Hemlo are within the upper members of the Goliath Formation. Gold occurs as finely disseminated native gold in pyritiferous schists. The mineralized zones may range from three to forty meters in thickness. The pyrite content of the ore horizon may vary from very sparse to as high as twenty percent; the average is perhaps eight per cent. However, the gold grade of the ore horizon is apparently not dependent upon the concentration of pyrite present.

Induced polarization anomalies can be expected from this type of source. However, as we shall see, the IP anomaly from a three meter band containing two percent pyrite is much different from that due to a forty meter band containing as much as twenty percent pyrite.

ANOMALY OVER CORONA ZONE

In our work at Hemlo, we have used the phase IP measurement technique almost exclusively. This is done by measuring the phase shift between the applied current and the measured voltage. This measurement
is about one order of magnitude more sensitive than older, variable frequency or time-domain IP measurements. This is useful, since some of the anomalies detected are very low in magnitude.

The Corona deposit is quite shallow, and a test survey was completed using a one meter dipole-dipole electrode configuration (Figure 1a). Due to the broad, shallow character of the source, the effects measured should be equal to the true IP effects within the source.

The resistivity results show extremely variable values. These indicated changes in porosity must be due to silicification, alteration, fracturing, etc. The pyrite content is not sufficient to significantly change the resistivity value.

The IP results show a definite anomaly, with the measured phase-shifts as large as eighty milliradians. Although it cannot be seen in the limited data shown on the pseudo-section, the background IP effects are quite low.

**OBVIOUS RECONNAISSANCE ANOMALIES**

Many of the claim groups in the Hemlo Area are quite large. Therefore, in order to keep the cost of a reconnaissance survey to a reasonable amount, it is necessary to use an electrode interval greater than twenty-five meters. Our usual reconnaissance electrode interval is in the range from fifty to seventy-five meters.

The results in Figure II are from a reconnaissance test survey over the up-dip edge of the rock unit that contains the Golden Sceptre ore zone, at depth. The zone is relatively narrow and weakly mineralized. The reconnaissance anomaly detected using $X = 50$ meters, is low in magnitude. However, the anomalous pattern on the pseudo-section is quite distinct. This reconnaissance anomaly would be chosen for detailed measurements using shorter electrode intervals.
INDEFINITE RECONNAISSANCE ANOMALIES

Most of the reconnaissance IP anomalies located by our work in the Hemlo Area are not as definite as that shown in Figure II. The results shown in Figure IIIa, were also measured using $X = 50$ meters. The anomaly at approximately 5000E occurred in a region of favourable rock types; despite the indefinite pattern, it was chosen for detail. The measurements using $X = 25$ meters (Figure IIIb) confirm a definite, narrow, shallow source. Measurements using $X = 15$ meters could be used to better locate, and further evaluate the source.

This anomaly is very similar to the anomalies from the gold-bearing pyrite ore zones in the Hemlo Area. A hole drilled to test this zone, intersected disseminated pyrite in a tuffaceous schist band; the source of the IP anomaly was similar in lithology and amount of sulfides present to the ore zones located previously.

CONCLUSIONS

The gold ore zones in the Hemlo Area of Ontario are found within schist bands that usually contain enough pyrite to be detected by careful induced polarization measurements. Narrow zones containing low concentrations of pyrite are, of course, the most difficult to detect during a reconnaissance survey using large electrode intervals. In most locations in the Hemlo Area, the glacial overburden is relatively thin (zero to thirty meters). In this situation, detailed IP measurements, using shorter electrode intervals, are necessary to better locate and fully evaluate the source.

The IP anomalies in the Hemlo Area are due to pyrite in several rock types. The gold cannot be detected directly, but careful IP surveying (particularly employing phase IP measurements) can be used to locate, and outline, mineralized zones that have the same characteristics as the ore zones.

ACKNOWLEDGEMENTS

It is obvious that this paper could not have been prepared for presentation without the help and permission of

Homestake Mineral Development Company
Noranda Exploration Ltd.
Teck Corporation.

We owe them our thanks.
DETAILED IP RESULTS OVER TYPICAL HEMLO ORE ZONE AT ZERO DEPTH VISIBLE SULPHIDE MINERALIZATION
LINE - 16 W  \( X = 50 \text{ m.} \)

![Figure II]

RESISTIVITY (OHM-M)

ZONE II

METAL FACTOR

WITH LARGER INTERVALS SOME SOURCES GIVE NO RESISTIVITY LOW AND WEAK IP EFFECTS
LINE - 175  X = 50 m.  FIGURE IIIa

RESISTIVITY (OHM-M)

PHASE (10 Hz.)

ZONE III METAL FACTOR

DETAIL TO FOLLOW RECCE IS CRITICAL
LINE - 175  X = 25 m.  FIGURE III b

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RESISTIVITY (OHM-M)

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PHASE (1-0 HZ.)

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ZONE III

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METAL FACTOR
### Homestake: C.C.K. Prop. Line-7S

**X=50m Metal Factor**

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**X=50m Phase (1.0Hz)**

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**X=50m Rho (Ohm-M)**

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## Homestake - C.C.K. Prop Line-12S

### Physical - C

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| 1 | 5551 | -722 | -202 | -242 | 1732 | 214 | 195 | 164 | 236 | 242 | 302 | 224 | 177 | 181 | 180 | 169 | 266 | 246 |
| 2 | 9214 | 7279 | 7365 | 1556 | 1401 | 896 | 257 | 300 | 383 | 300 | 371 | 359 | 298 | 228 | 228 | 488 | 349 | 197 |
| 3 | 1560 | 2274 | 1212 | 1221 | 1783 | 2683 | 468 | 451 | 492 | 314 | 492 | 352 | 257 | 692 | 554 | 304 | 9 |
| 4 | 4560 | 4672 | 839 | 1244 | 1915 | 1042 | 671 | 426 | 381 | 387 | 614 | 561 | 368 | 813 | 694 | 454 | 366 |
| 5 | 1302 | 531 | 887 | 1396 | 3399 | 1412 | 621 | 392 | 440 | 436 | 635 | 510 | 1140 | 748 | 536 | 504 | 8 |
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### Phase (1.0Hz)

### Metal Factor

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| 2 | -.02 | .2 | .1 | .4 | -.3 | -.4 | .2 | .5 | -.1 | .3 | .3 | .5 | .7 | .4 | .4 | .4 | .4 | .3 |
| 3 | .06 | -.05 | -.4 | .2 | .03 | -.1 | -.3 | .1 | .3 | -.5 | .2 | .04 | .3 | .3 | .3 | .3 | .3 | .2 |
| 4 | -.1 | -.6 | -.1 | .2 | .2 | -.3 | -.3 | -.05 | .2 | -.4 | .08 | .2 | .2 | .2 | .2 | .2 | .2 | .2 |
| 5 | -.01 | -.7 | -.6 | -.2 | .1 | -.3 | -.4 | .05 | -.05 | -.6 | .05 | .1 | .2 | .2 | .2 | .2 | .2 | .2 |
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HOMESTAKE MINERAL DEVELOP. CO
C.C.K. PROPERTY
HEMLO AREA / ONTARIO

LINE NO. - 12S

PLOTTING POINT

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

FREQUENCY (HERTZ)
1.0 HZ.

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1.0, 1.5
-2, -3, -5, -7.5, -10

PHOENIX GEOPHYSICS LTD.
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
### Homestake C.C.K. Prop. Line-155 Y=25m Pho (Ohm-M)

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### Homestake C.C.K. Prop. Line-155 Y=25m Phase (1 Hz)

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### Homestake C.C.K. Prop. Line-155 Y=25m Metal Factor

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### PROP LINE-15S X=25M PHO (OHH-M)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

### PROP LINE-15S X=25M PHASE (100Hz)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

### PROP LINE-15S X=25M METAL FACTOR

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

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HOMESTAKE MINERAL DEVELOP. CO
C.C.K. PROPERTY
HEMLO AREA / ONTARIO
LINE NO.-158

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

POSSIBLE

FREQUENCY (HERTZ)
1.0 HZ

NOTE- CONTOURS
AT LOGARITHMIC
INTERVALS 1-.1 .5
-2-.3-.5-.7 .9-.10

INDUCED POLARIZATION
AND RESISTIVITY SURVEY

PHOENIX GEOPHYSICS LTD.
### Homestake C.C.K. Prop. - Line 15S

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#### Interpretation

1.5 - 1.3

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### Homestake C.C.K. Prop. - Line 15S

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#### Interpretation

1.5 - 1.3

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### Homestake C.C.K. Prop. - Line 15S

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#### Interpretation

1.5 - 1.3

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**Interpretation**

- **Homestake C.C.K. Prop: Line-178**

**Phase (1.0Hz)**

- **Homestake C.C.K. Prop: Line-178**

**Metal Factor**

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**Interpretation**

- **Homestake C.C.K. Prop: Line-178**

**Metal Factor**
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### LINE-175 X=50M METAL FACTOR

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**Note:** The table and diagram represent data related to electrical parameters, such as power levels and phase, metal factor, and other technical specifications. The data is presented in a tabular format and includes various values for different points or conditions.
HOMESTAKE MINERAL DEVELOP. CO
C.C.K. PROPERTY
HEMLO AREA / ONTARIO
LINE NO. -178

PLOTTING
POINT

SURFACE PROJECTION OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE

FREQUENCY (HERTZ) 1.0 HZ.
NOTE- CONTOURS AT LOGARITHMIC INTERVALS 1.0, 1.5
-2, -3, -5, -7.5, -10

PHOENIX GEOPHYSICS LTD.
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
HOMESTAKE MINERAL DEVELOP. CO
C.C.K. PROPERTY
HEMLO AREA / ONTARIO

LINE NO - 198

PLOTTING POINT --- X --- X --- X --- X

SURFACE PROJECTION OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE

FREQUENCY (HERTZ)
1.0 HZ.

NOTE - CONTOURS AT LOGARITHMIC INTERVALS 1. - 1.5
- 2. - 3. - 5. - 7. - 5. - 10

DATE SURVEY COMPLETED 1984
APPROVED

PHOENIX GEOPHYSICS LTD.
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
### Home State C.C.K. Prop Line-21S

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#### Phase (1.0 Hz)

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#### Topography

**Lake**

### Home State C.C.K. Prop Line-21S

#### Metal Factor

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**Note:** The tables and diagrams represent data and interpretations related to the Home State C.C.K. Prop Line-21S, including dipole numbers, coordinates, and metal factors, with phases and topography indications.
### Phase (100Hz)

|          | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 |
|----------|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |

### Metal Factor

|          | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 58 |
|----------|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|          | 1 | 2 | 3 | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
HOMESTAKE MINERAL DEVELOP. CO.
C.C.K. PROPERTY
HEMLO AREA / ONTARIO

LINE NO. -21S

PLOTTING POINT

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE
PROBABLE
POSSIBLE

FREQUENCY (HERTZ)
1.0 Hz

NOTE - CONTOURS AT LOGARITHMIC
INTERVALS 1.0 - 1.5
-2, -3, -5, -7, 9, 10

DATE SURVEY COMPLETED: 1984
APPROVED: [Signature]

PHOENIX GEOPHYSICS LTD.
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
### Homestake C.C.K. Prof. Line-228

#### Dipole Number

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<th>1250W</th>
<th>1750W</th>
<th>1650W</th>
<th>1550W</th>
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<td>1250W</td>
<td>1250W</td>
<td>1750W</td>
<td>1650W</td>
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#### Interpretation

- **N=1**: 107, 920, 686, 700, 226, 1637, 2103, 16, 14, 14, 60s, 19, 1100 N=1
- **N=2**: 155, 1450, 7023, 8227, 16, 485, 6011, 17, 5, 1105 N=2
- **N=3**: 1779, 2209, 4024, 36, 1511, 2024, 1995, 8487, 4149, 5441 N=3
- **N=4**: 274, 544, 4501, 191, 7397, 390, 679, 7727, 4111 N=4
- **N=5**: 5712, 601, 20, 41, 1371, 1285, 570, 5106 N=5
- **N=6**: 11100 N=6

#### Topography

- **Lake**

#### Homestake C.C.K. Prof. Line-228

#### Interpretation

- **N=1**: 2.9, 0.3, 1.2, 0.3, 0.8, 0.5, 0.9, 0.5, 0.8, 0.7, 0.6, 0.7 N=1
- **N=2**: 0.2, 0.4, 0.5, 0.1, 0.03, 0.05, 0.1, 0.7, 0.6, 0.7 N=2
- **N=3**: 0.6, 0.2, 0.2, 0.9, 0.1, 0.3, 0.2, 0.1, 0.2, 0.1, 0.3 N=3
- **N=4**: 0.4, 0.1, 0.2, 0.9, 0.1, 0.7, 0.6, 0.7, 0.1, 0.1 N=4
- **N=5**: 0.2, 0.2, 0.9, 0.3, 0.3, 0.5, 0.7, 0.1, 0.1 N=5
- **N=6**: 0.2, 0.2, 0.9, 0.3, 0.3, 0.5, 0.7, 0.1, 0.1 N=6

#### Homestake C.C.K. Prof. Line-228

#### Interpretation

- **N=1**: 107, 920, 686, 700, 226, 1637, 2103, 16, 14, 14, 60s, 19, 1100 N=1
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- **Lake**

#### Homestake C.C.K. Prof. Line-228

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- **N=4**: 0.4, 0.1, 0.2, 0.9, 0.1, 0.7, 0.6, 0.7, 0.1, 0.1 N=4
- **N=5**: 0.2, 0.2, 0.9, 0.3, 0.3, 0.5, 0.7, 0.1, 0.1 N=5
- **N=6**: 0.2, 0.2, 0.9, 0.3, 0.3, 0.5, 0.7, 0.1, 0.1 N=6

#### Homestake C.C.K. Prof. Line-228

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- **N=6**: 11100 N=6

#### Topography

- **Lake**
HOMESTAKE MINERAL DEVELOP. CO.

C. C. K. PROPERTY

HEMLO AREA / ONTARIO

LINE NO. -228

SURFACE PROJECTION OF ANOMALOUS ZONE

DEFINITE

PROBABLE

POSSIBLE

PHOENIX GEOPHYSICS LTD.

INDUCED POLARIZATION

AND RESISTIVITY SURVEY
# TABLE OF CONTENTS

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<th>8 pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part B: Report</td>
<td>9 pages</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>Page 1</td>
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<td>2. Presentation of Results</td>
<td>Page 3</td>
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<tr>
<td>3. Discussion of Results</td>
<td>Page 4</td>
</tr>
<tr>
<td>4. Recommendations</td>
<td>Page 5</td>
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<tr>
<td>5. Assessment Details</td>
<td>Page 7</td>
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<tr>
<td>6. Statement of Cost</td>
<td>Page 8</td>
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<tr>
<td>8. Appendix - Small Sources</td>
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<tr>
<td>Part C: Illustrations</td>
<td>8 pieces</td>
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<tr>
<td>Plan Map (in pocket)</td>
<td>Dwg.I.P.P. 3128</td>
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<tr>
<td>IP Data Plots</td>
<td>Dwg.IP 5387-1 to -7</td>
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</table>
Mining Lands Section

Control Sheet

TYPE OF SURVEY

- [ ] GEOPHYSICAL
- [ ] GEOLOGICAL
- [ ] GEOCHEMICAL
- [ ] EXPENDITURE

MINING LANDS COMMENTS:

Claim unrecorded - awaiting section map:

L.D.

Signature of Assessor: [Signature]

Date: [ ]
Dear Madam:

Geophysical (Induced Polarization) Survey on
Mining Claims TB 723674 et al in the Areas
of Holson, Rous, Lorna and Wabikoba Lakes.

The assessment work credits, as listed with the
above-mentioned Notice of Intent, have been approved
as of the above date.

Please inform the recorded holder of these mining
claims and so indicate on your records.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch
Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone:(416)965-6918

D. Isherwood:

c: Homestake Mineral Development Co
P.O. Box 757
Marathon, Ontario
POT 2E0

c: Homestake Mineral Development Co
660 California Street
San Francisco, California
U.S.A. 94108

c: Mr. G.H. Ferguson
Mining & Lands Commissioner
Toronto, Ontario

cc: C.F. Staargaard
Suite 201
856 Homer Street
Vancouver, B.C.
V6B 2W5

Resident Geologist
Thunder Bay, Ontario
### Recorded Holder

HOMESTAKE MINERAL DEVELOPMENT COMPANY

### Township or Area

LORNA LAKE, ROUS LAKE, WABIKOBA LAKE AREA

### Type of survey and number of Assessment days credit per claim

<table>
<thead>
<tr>
<th>Type of survey and number of Assessment days credit per claim</th>
<th>Mining Claims Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geophysical</td>
<td>TB 723674 to 676 inclusive</td>
</tr>
<tr>
<td>Electromagnetic</td>
<td>723679</td>
</tr>
<tr>
<td>Magnetometer</td>
<td>723699-700</td>
</tr>
<tr>
<td>Radiometric</td>
<td>726101 to 103 inclusive</td>
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<tr>
<td>Induced polarization</td>
<td>726244</td>
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<tr>
<td>Other</td>
<td>726246-247</td>
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<tr>
<td>Section 77(19) See “Mining Claims Assessed” column</td>
<td>726275 to 278 inclusive</td>
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<tr>
<td>Geophysical</td>
<td>726283 to 286 inclusive</td>
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<tr>
<td>Geological</td>
<td></td>
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<tr>
<td>Geochemical</td>
<td></td>
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</table>

#### Special credits under section 77(16) for the following mining claims

No credits have been allowed for the following mining claims

- TB 726104 to 106 inclusive
- 726245

The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical — 60; Geological — 40; Geochemical — 40; Section 77(19) — 60.
1984 11 13

Ministry of Natural Resources
P.O. Box 5000
Thunder Bay, Ontario
P7C 5G6

Dear Madam:

Enclosed are two copies of a Notice of Intent with statements listing a reduced rate of assessment work credits to be allowed for a technical survey. Please forward one copy to the recorded holder of the claims and retain the other. In approximately fifteen days from the above date, a final letter of approval of these credits will be sent to you. On receipt of the approval letter, you may then change the work entries on the claim record sheets.

For further information, if required, please contact Mr. R.J. Pichette at 416/965-4888.

Yours sincerely,

S.E. Yundt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3

D. Isherwood:mc

Encls.

cc: Homestake Mineral Development Company
P.O. Box 757
Marathon, Ontario
POT 2E0

cc: Mr. G.H. Ferguson
Mining & Lands Commissioner
Toronto, Ontario

cc: Homestake Mineral Development Company
650 California Street
San Francisco, California
U.S.A. 94108

cc: C.F. Staargaard
Suite 201
856 Homer Street
Vancouver, B.C.
V6B 2W5
An examination of your survey report indicates that the requirements of The Ontario Mining Act have not been fully met to warrant maximum assessment work credits. This notice is merely a warning that you will not be allowed the number of assessment work days credits that you expected and also that in approximately 15 days from the above date, the mining recorder will be authorized to change the entries on his record sheets to agree with the enclosed statement. Please note that until such time as the recorder actually changes the entry on the record sheet, the status of the claim remains unchanged.

If you are of the opinion that these changes by the mining recorder will jeopardize your claims, you may during the next fifteen days apply to the Mining and Lands Commissioner for an extension of time. Abstracts should be sent with your application.

If the reduced rate of credits does not jeopardize the status of the claims then you need not seek relief from the Mining and Lands Commissioner and this Notice of Intent may be disregarded.

If your survey was submitted and assessed under the “Special Provision-Performance and Coverage” method and you are of the opinion that a re-appraisal under the “Man-days” method would result in the approval of a greater number of days credit per claim, you may, within the said fifteen day period, submit assessment work breakdowns listing the employees names, addresses and the dates and hours they worked. The new work breakdowns should be submitted direct to the Land Management Branch, Toronto. The report will be re-assessed and a new statement of credits based on actual days worked will be issued.
**LAND MANAGEMENT**

# 463

**The Mining Act**

Ministry of Natural Resources

Report of Work

(Geophysical, Geological, Geochemical and Expenditures)

---

**Notes:**
- Please type or print.
- If number of mining claims traversed exceeds space on this form, attach a list.
- Only days credits calculated in the "Expenditures" section may be entered in the "Expend. Days Cr." columns.
- Do not use shaded areas below.

**Claim Holder(s):**
Homestake Mineral Development Company

**Address:**
650- California St., San Francisco, CA, USA, 94109

**Survey Company:**
Phoenix Geophysics Ltd

**Name and Address of Author (of Geotechnical report):**
P.G. Hall, 3505-2045 Indiana Blvd. W., Toronto, Ontario

---

**CREDITS REQUESTED PER EACH CLAIM IN COLUMNS AT RIGHT**

**Type of Survey:**
Geophysical (P + Resistivity)

**Claim Holder(s):**
Homestake Mineral Development Company

**Address:**
650- California St., San Francisco, CA, USA, 94109

**Survey Company:**
Phoenix Geophysics Ltd

**Date of Survey (from & to):**
9/1/84 - 9/24/84

**Number of mining claims traversed: Total Miles of line cut:**

<table>
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<th>Prefix</th>
<th>Number</th>
<th>Days per Claim</th>
<th>Expended Days Cr.</th>
<th>Expended Days Cr.</th>
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<td>VG 723 674</td>
<td></td>
<td></td>
<td>15</td>
<td>675</td>
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<tr>
<td>VG 726 284</td>
<td></td>
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<td>20</td>
<td>474</td>
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**Geophysical:**
- Electromagnetic
- Magnetometer
- Radiometric
- Other

**Geological:**
- Geophysical
- Geochemical

**Type of Work Performed:**
- Geophysical

**Expenditures (excluding power stripping):**

<table>
<thead>
<tr>
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<th>Days per Claim</th>
<th>Expended Days Cr.</th>
<th>Total number of mining claims covered by this report of work: 24</th>
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</thead>
<tbody>
<tr>
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<td>15</td>
<td>675</td>
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<tr>
<td>VG 726 284</td>
<td>20</td>
<td>474</td>
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</tr>
</tbody>
</table>

---

**Signature of Person Certifying:**
C. F. Stegmann, H. M. D.

**Date Certified:**
9/11/84

**For Office Use Only:**

Certification Verifying Report of Work

I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the work or witnessed same during and/or after its completion and the annexed report is true.

---

**Date:**
9/11/84

**Recorded:**
C. F. Stegmann, H. M. D.

**Titled:**
2011-856 Howo St, Vancouver, B.C.

**Certified by:**
C. F. Stegmann
October 16, 1984

Homestake Mineral Development Co
P.O. Box 757
Marathon, Ontario
POT 2EO

Dear Sirs:

RE: Geophysical (Induced Polarization) Survey
submitted on Mining Claims TB 723674 et al in the Areas of Molson, Rous, Lorna and Wabikoba Lakes

We have received reports and maps on September 28, 1984
for the above-mentioned survey.

Returned herein is the plan (in duplicate). Please plot
all claim lines and claim numbers on the plans and return
them to this office quoting file 2.7236.

For further information, please contact Doug Isherwood
at (416)965-4888.

Yours sincerely,

S.E. Youdôt
Director
Land Management Branch

Whitney Block, Room 6643
Queen's Park
Toronto, Ontario
M7A 1W3
Phone: (416)965-4888

D. Isherwood:mc

cc: Mining Recorder
Thunder Bay, Ontario

cc: C.F. Staargaard
Suite 201
886 Homer Street
Vancouver, B.C.
V6B 2W5

Encl.
**Type of Survey(s):** Geophysical

**Township or Area:** Mobil, Rees, Lake Michikan Lake areas

**Claim Holder(s):** Captera Corporated Resources

**Survey Company:** P.G. Helvey

**Author of Report:** P.G. Helvey

**Address of Author:** 7505 Westlake Blvd W Toronto

**Covering Dates of Survey:** June 9, 1984 to May 22, 1984

**Total Miles of Line Cut:** 96

**SPECIAL PROVISIONS CREDITS REQUESTED**

<table>
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<td>Other</td>
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<tr>
<td>Geological</td>
<td>20</td>
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<tr>
<td>Geochemical</td>
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**AIRBORNE CREDITS** (Special provision credits do not apply to airborne surveys)

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<th>Radiometric</th>
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<tbody>
<tr>
<td>35 days</td>
<td>35 days</td>
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**DATE:** Sept 25, 1984  **SIGNATURE:** [Signature]

**Res. Geol.** Qualifications: 63.1408

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</table>

**TOTAL CLAIMS:** 18
**GEOPHYSICAL TECHNICAL DATA**

**GROUP: SURVEYS** – If more than one survey, specify data for each type of survey

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<th>Number of Readings</th>
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<td>Profile scale</td>
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<td>Contour interval</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**MAGNETIC**

Instrument

Accuracy – Scale constant

Diurnal correction method

Base Station check-in interval (hours)

Base Station location and value

Instrument

Coil configuration

Coil separation

Accuracy

Method:  
- Fixed transmitter
- Shoot back
- In line
- Parallel line

Frequency  
(specify V.L.F. station)

Parameters measured

Instrument

Scale constant

Corrections made

Base station value and location

Elevation accuracy

Instrument  
*Phoenix*

Method  
- Time Domain
- Phase
- Frequency Domain

Parameters –  
- On time
- Frequency 1 Hz
- Off time
- Delay time
- Integration time

Power  
2000 watts

Electrode array  
Dipole - Dipole

Electrode spacing  
50 m

Type of electrode  
Transmitter - Steel stake  
Receiver - Porous Pots