82-#841

PHOENIX GEOPHYSICS LIMITED

REPORT ON THE

INDUCED POLARIZATION AND RESISTIVITY SURVEY

ON THE

TA HOOLA PROJECT
KAMLOOPS MINING DIVISION
BRITISH COLUMBIA

FOR

SMD MINING COMPANY LIMITED

Latitude:	51°35'N Longitude: 120°26'W
N.T.S.:	92P/9,10
CLAIMS:	Ta Hoola 1-12
OWNER:	SMD MINING CO. LTD.
OPERATOR:	SMD MINING CO. LTD.

BY

Paul A.Cartwright, B.Sc.
Geophysicist

Dated

December 2, 1982

TABLE OF CONTENTS

1. INTRODUCTION

Induced Polarization and Resistivity Surveys have been completed on two separate grids on the Ta Hoola Project, Kamloops Mining Division, British Columbia, on behalf of SMD Mining Company Ltd., property operator and owner.

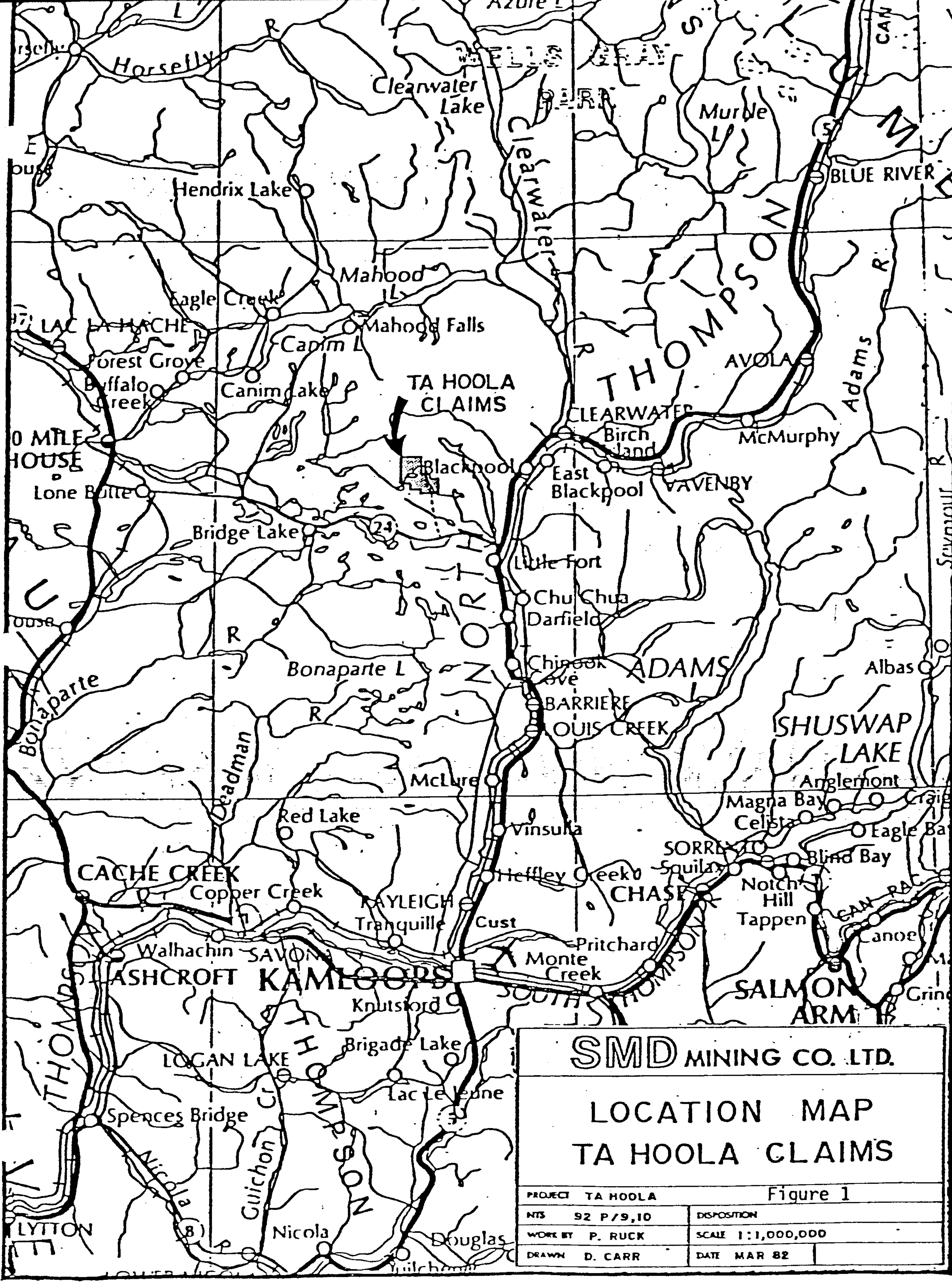
The property is located approximately 100 kilometers due north of the City of Kamloops, B.C. Access is via the Yellowhead Highway to the hamlet of Little Fort, B.C., and then west on Highway 24 for approximately 12 kilometers before turning northward on logging roads which traverse the property.

The following geological description of the project area has been provided by the staff of SMD Mining Co. Ltd.

"Geological mapping on the property has outlined the Upper Triassic (Nicola Group), and Lower to Middle Jurassic volcanic and sedimentary stratigraphy. The interbedded volcanic flows, pyroclastic and epiclastic rocks have been intruded by several Upper Triassic diorite plugs, and a younger microgranite porphyry. The volcanic rocks adjacent to the microgranite porphyry have been altered to a biotite hornfels.

The rocks around the microgranite porphyry stock have undergone varying degrees of alteration and pyritization accompanied by disseminated and fracture filling chalcopyrite, galena, molybdenite and pyrrhotite.

The rocks on the Ta Hoola 1-6 claims have been



SMD MINING CO. LTD.

LOCATION MAP
TA HOOLA CLAIMS

PROJECT	TA HOOLA	Figure 1	
NTS	92 P/9,10	DISPOSITION	
WORK BY	P. RUCK	SCALE	1:1,000,000
DRAWN	D. CARR	DATE	MAR 82

folded and block-faulted. Tight, isoclinal folding with minor inclined folds is inferred from the sedimentary rocks in the northeastern part of the claims. The fold axes trend 120^{o} to 140^{o}, parallel to the strike of the beds, but their plunge is not know. A large fault zone trending 130^{o} to 140^{o} roughly parallels the contact between the predominantly volcanic and volcanic-epiclastic facies".

"To the south and east of the microgranite porphyry stocks, lead-silver-copper mineralization is associated with an areally extensive zone of brecciation and alteration. These lead-silver and copper anomalies are peripheral to a central molybdenum core suggesting that they are associated with a calc-alkaline system".

Objective of the present IP and Resistivity surveys was to outline any metallic sulphide mineralization present on the two grid areas in question.

Phoenix Model IPV-1 IP and Resistivity receiver units were used in conjunction with Phoenix Model IPT-1 IP and Resistivity transmitters powered by 1.0 kw motor-generators. IP effect is recorded directly as Percent Frequency Effect (P.F.E.) at operating frequencies of 4.0 Hz and 0.25 Hz. Apparent resistivity values are normalized in units of ohm-meters, while metal factor values are calculated according to the formula: M.F. =(P.F.E. x 1000) ÷ Apparent Resistivity.

Dipole-dipole array was utilized to make all of the measurements, with a basic interelectrode distance of 50 meters.

Four dipole separations were recorded in every case. Number of line kilometers surveyed during the present survey was 85.35 line kilometers.

Field work was carried out during June, July and August 1982, under the supervision of Messrs.Stephen Henshall, Maurice Parent, John Marsh and Glen Mullan, geophysical crew leaders. Their certificates of qualification are included with this report. The author spent three days on the site during the course of two visits to the area.

2. DESCRIPTION OF CLAIMS

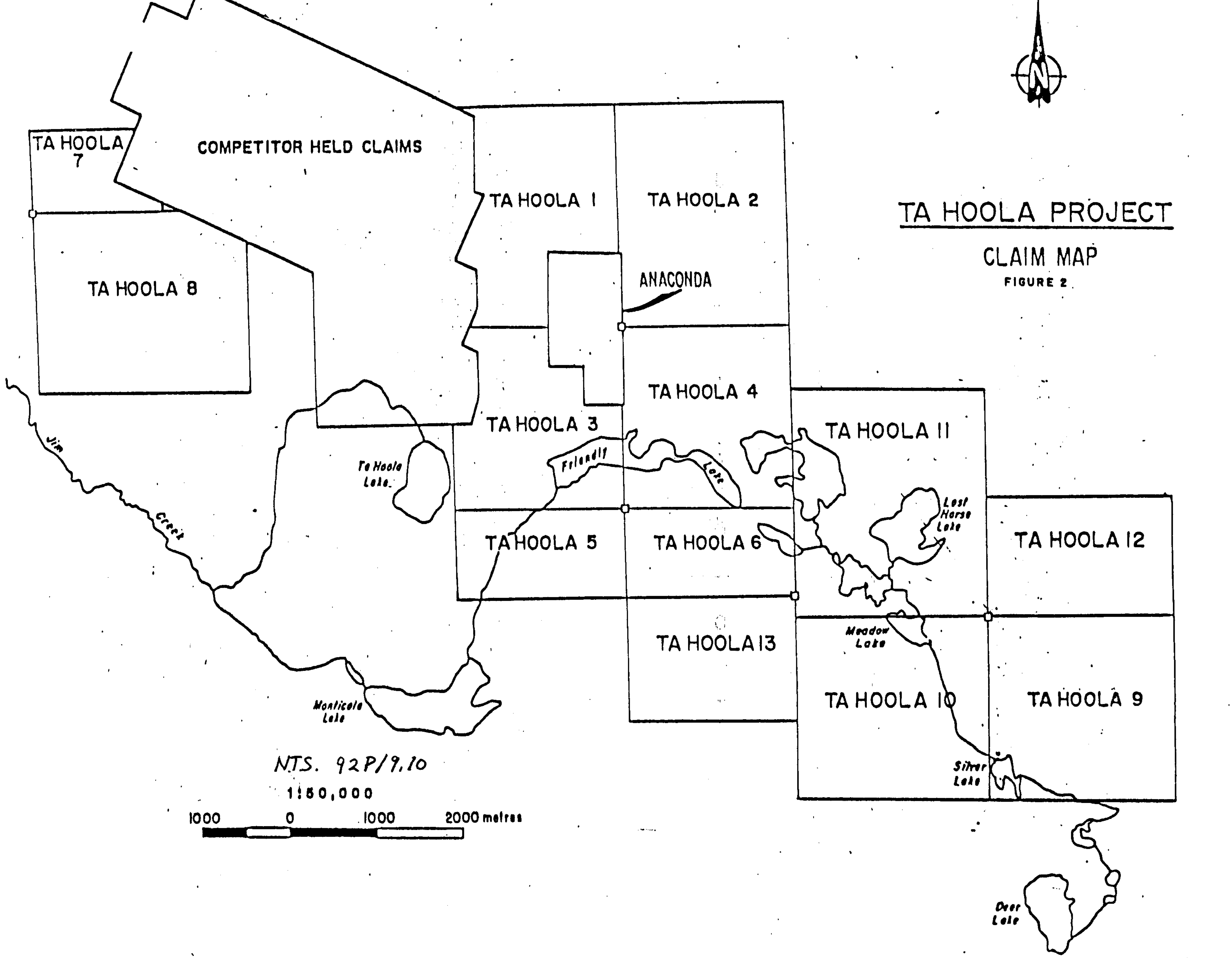
The Ta Hoola Property consists of 13 claims comprising 190 units, and was staked in 1981.

Owner of the claims is SMD Mining Co. Ltd.

Operator is SMD Mining Co. Ltd.

3. PRESENTATION OF DATA

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



TA HOOLA PROJECT
CLAIM MAP
FIGURE 2
COMPETITOR HELD CLAIMS
TA HOOLA 7
TA HOOLA 8
TA HOOLA 1
TA HOOLA 2
ANACONDA
TA HOOLA 3
TA HOOLA 4
TA HOOLA 5
TA HOOLA 6
TA HOOLA 11
TA HOOLA 12
TA HOOLA 13
TA HOOLA 10
TA HOOLA 9
Jim Creek
Ta Hoola Lake
Friendly Lake
Lost Horse Lake
Meadow Lake
Monticola Lake
Silver Lake
Deer Lake
N
NTS. 92P/9,10
1:50,000
1000 0 1000 2000 metres

a) Ta Hoola 1-6 Grid

LINE	ELECTRODE INTERVAL	DWG. NO.
119+52N	50 meters	I.P.-5826-1
118+23N	50 meters	I.P.-5826-2
117+08N	50 meters	I.P.-5826-3
114+64N	50 meters	I.P.-5826-4
113+42N	50 meters	I.P.-5826-5
112+20N	50 meters	I.P.-5826-6
111+00N	50 meters	I.P.-5826-7
109+76N	50 meters	I.P.-5826-8
108+54N	50 meters	I.P.-5826-9
107+32N	50 meters	I.P.-5826-10
106+10N	50 meters	I.P.-5826-11
104+88N	50 meters	I.P.-5826-12
104+88N	50 meters	I.P.-5826-13
103+00N	50 meters	I.P.-5826-14
103+00N	50 meters	I.P.-5826-15
102+44N	50 meters	I.P.-5826-16
102+44N	50 meters	I.P.-5826-17
101+22N	50 meters	I.P.-5826-18
101+22N	50 meters	I.P.-5826-19
100+00N	50 meters	I.P.-5826-20
100+00N	50 meters	I.P.-5826-21
99+00N	50 meters	I.P.-5826-22
99+00N	50 meters	I.P.-5826-23
97+56N	50 meters	I.P.-5826-24
97+56N	50 meters	I.P.-5826-25
96+00N	50 meters	I.P.-5826-26
95+12N	50 meters	I.P.-5826-27
93+90N	50 meters	I.P.-5826-28
92+68N	50 meters	I.P.-5826-29
91+46N	50 meters	I.P.-5826-30
90+24N	50 meters	I.P.-5826-31

LINE	ELECTRODE INTERVAL	DWG. NO.
89+02N	50 meters	I.P.-5826-32
87+80N	50 meters	I.P.-5826-33
86+58N	50 meters	I.P.-5826-34
85+36N	50 meters	I.P.-5826-35
83+50N	50 meters	I.P.-5826-36
82+86N	50 meters	I.P.-5826-37
81+56N	50 meters	I.P.-5826-38
80+06N	50 meters	I.P.-5826-39
1+00E	50 meters	I.P.-5826-40
2+00E	50 meters	I.P.-5826-41
3+00E	50 meters	I.P.-5826-42

b) Ta Hoola 9-12 Grid

8+00S	50 meters	I.P.-5825-1
9+00S	50 meters	I.P.-5825-2
10+00S	50 meters	I.P.-5825-3
11+00S	50 meters	I.P.-5825-4
12+00S	50 meters	I.P.-5825-5
13+00S	50 meters	I.P.-5825-6
14+00S	50 meters	I.P.-5825-7
15+00S	50 meters	I.P.-5825-8
16+00S	50 meters	I.P.-5825-9
17+00S	50 meters	I.P.-5825-10
18+00S	50 meters	I.P.-5825-11
19+00S	50 meters	I.P.-5825-12

Also enclosed with this report are Dwgs. I.P.P. 4023a, 4023b, 4022a, and 4022b, plan maps of Ta Hoola 1-6 Grid, and the Ta Hoola 9-12 Grid at a scale of 1:5000. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on these plan maps 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.

The contoured Fraser filtered P.F.E. and apparent resistivity data are also shown on the above plan maps.

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 oder to definitely locate, and fully evaluate, a narrow, shallow source it is ncessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals must be used, with corresponding increase in the uncertainties of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

The topographic, claim and grid information shown on Dwgs. I.P.P. 4023a, 4023b, 4022a, and 4022b, have been taken from maps made available by the staff of SMD Mining Company Ltd.

4. DISCUSSION OF RESULTS

4a. Ta Hoola 1-6 Grid

The background level of Induced Polarization values recorded on the Ta Hoola 1-6 grid area is of moderately high intensity, as are the majority of the apparent resistivity readings. This suggests that the entire region is underlain by rock types which all host at least some concentration of disseminated metallic sulphides.

Twelve zones of increased metal sulphide content are interpreted to be present within this mineralized terrane. Each of these anomalous IP zones is discussed separately below, and is illustrated on Plan Map Dwg. I.P.P.-B-4023 a.

IP Zone 1

This feature is only seen on the westernmost ends of the two most southerly grid lines. The response outlined on Line 80+06N is of moderate magnitude, with the depth to the top of the source being considerably less than 50 meters. Additional survey coverage would be required to fully define the northern, western and southern extent of the trend.

IP Zones 2a, 2b, 2c

The same discontinuous mineralized band, tightly folded along a roughly northwest-southeast axis, is interpreted to be the source of all three of the above IP zones. Considerable variation in the magnitude of the IP effects within each zone is evident. Data from Zone 2a shows the most anomalous results on Line 97 + 56N, between Station 98 + 50E and Station 99 + 00E. Here, the source is relatively conductive, which, together with the high magnitude IP effects, points to the presence of substantial amounts of sulphides.

Somewhat lesser concentrations of sulphides would appear to be the cause of the most anomalous response outlined within zone 2b, on Line 96 + 00N, between Station 108 + 00E and Station 109 + 00E.

Results from Zone 2c are the least anomalous of the three zones, with the highest concentrations of sulphides being detected in the vicinity of Line 100 + 00 N, between Station 101 + 50 E and Stateion 103 + 00 E.

The source of zones 2a, 2b and 2c is buried at a relatively shallow depth, in relation to the dipole length used, i.e., it is certainly less than 50 meters sub-surface.

IP Zone 3

Data from only two lines, Line 102 + 44N and Line 101 + 22N, outline this weakly anomalous feature, which is interpreted to strike parallel to IP zone 2c. A marginal increase in sulphide concentration above background could account for these responses.

IP Zone 4a, 4b

Although Zone 4a and Zone 4b appear to form one single zone, the characteristics of each are quite different. IP Zone 4a apparently outlines a zone of mineralization yielding high gold values, which is considerably more conductive than the source of IP Zone 4b.

The two most interesting anomalies recorded over IP Zone 4a are noted on Line 102 + 44N and Line 101 + 22N. Both lines cross the source at a very shallow angle, which probably accounts for the distinct "pant leg" anomaly patterns recorded. The true width could be much less than 50 meters. Depth to the top is probably much less than 50 meters as well.

IP Zone 5

Marginally anomalous IP effects mark IP Zone 5. However, most of the individual anomaly signatures are quite similar to those seen in IP Zone 4a where a narrow, near surface, source is apparently being traversed at a shallow angle. The amount of polarizable material contained in the source of IP Zone 5 is probably much less than is contained in the source of IP Zone 4a.

Data from Line 97 + 56N outlines the most distinctive response, in the area between Station 110 + 50E and Station 111 + 50E.

IP ZONE 6

This anomalous IP trend is interpreted to strike roughly south-eastward from the vicinity of the western end of Line 107 + 32 N, to the region of Line 99 + 00 N., Station 118 + 00E. It may, in fact, continue further eastward in the form of IP Zone 8, although this is somewhat unclean.

The source of the zone appears to be most concentrated in the vicinity of Line 101 + 22N and Line 100 + 00N, where moderate magnitude frequency effects are recorded, set within a rather uniform region of moderately low apparent resistivity values.

IP ZONE 7

Definitely anomalous IP results detect the source in the area of Line 102 + 44N, between Station 115 + 00E and Station 116 + 00 E. A near-surface, moderately conductive target is indicated,lying immediately alongside IP Zone 6. Again, the relationship between IP Zone 7 and IP Zone 8 is uncertain, with the latter quite possibly being an extension of the former.

IP Zone 8

As mentioned previously, this zone may represent the same source, or sources outlined by Zone 6 and/or Zone 7. The situation is further complicated in that the source of IP Zone 10 also may intersect the polarizable material giving rise to Zone 8.

Very anomalous IP effects can be seen in the data from Line 101 + 22N in the interval between Station 121 + 00 E and Station 122 + 50E. Target depth is less than 50 meters sub-surface, and may be more conductive east of Station 122 + 00 E.

IP ZONE 9

This trend joins IP Zone 10 near the southern ends of both zones; however, the polarizable source of the former feature is generally indicated to be less concentrated, and narrower than the latter.

The northern end of IP Zone 9 displays the highest magnitude anomalies, with the results from Line 112 + 20 N, between Station 115 + 00E and Station 115 + 50E showing the most potential.

IP ZONE 10

The present interpretation sees IP Zone 10 extending from the vicinity of Line 117 + 08N, Station 118 + 00E to the vicinity of the northern edge of IP Zone 8. IP Zone 11 is thought to form the northeastern boundary of this wide, and weakly to moderately anomalous trend. Areas marked as probable anomalies may outline locally more intense mineralization set within the overall mineralized mass. One such area would be on Line 107 + 32N, between Station 121 + 50E and Station 122 + 00E, while another would be located under Line 113 + 42N between Station 120 + 50E and Station 121 + 50E.

IP ZONE 11, IP Zone 12

These two zones dominate the IP and Resistivity results obtained on the extreme northeastern corner of the Ta Hoola 1-6 grid.

It is understood that sediments underlie the area covered by the two IP zones, with the western boundary of IP Zone 11 being formed by a large fault structure separating the sediments from the volcanics to the west. This fault is clearly visible as a resistivity low.

The boundary between Zone 11 and Zone 12 is established on the basis of relative magnitude, with IP results from the latter zone being more anomalous than the former, as are the apparent resistivities values.

Depths to the top of the causative sources of all the individual responses are interpreted to be considerably less than 50 meters.

Line 1 + 00E, Line 2 + 00E, Line 3 + 00E

These lines, located just off the southeast corner of the main Ta Hoola 1-6 grid, were also surveyed.

Although a number of very weak anomalies can be seen in the data, it is difficult to form these separate responses into zones, due to the limited data available, and the low magnitude of the individual anomalies.

4b. Ta Hoola 9-12 Grid

Results of the IP and Resistivity survey on the Ta Hoola 9-12 grid confirm that disseminated sulphides probably underlie the whole grid area, as was the case on the Ta Hoola 1-6 grid area. Set within this mineralized background is a large area of quite anomalous IP effects generally associated with lower than normal apparent resistivity values. This anomalous region is thought to be composed of a number of separate zones of mineralization as illustrated on Plan Map Dwg. No. I.P.P.-B-4022a.

It appears that four major zones are detected, with several features of shorter strike length also being indicated by the present interpretation, which is hampered by the fact that most of the zones are undefined in two or more directions. The source material in all cases is less than 50 meters sub-surface.

One trend is marked as striking roughly east-west across the northern end of the survey grid, such that it intersects the other three major anomalous zones, which extend roughly north-northwest across all of the grid lines.

High concentrations of metallic sulphides are almost certainly present within the area centered around the intersection of the east-west striking IP zone and the central north-northwest striking trend. The region in question has dimensions greater than 500 meters by 500 meters. Two other shorter zones of enhanced sulphide content can be seen lying within the confines of this block. Both are interpreted to strike in a north-northeast direction.

One zone detected by the present survey is completely defined, and can therefore be evaluated with some certainty. The center of the trend can be seen extending roughly along the 10 + 00E baseline between Line 13 + 00S and Line 16 + 00S. In every case, a relatively narrow, near-surface core displaying highly anomalous IP effects and lower apparent resistivity values is evident. The interval between Station 9 + 50E and Station 10 + 00E on Line 14 + 00S, or the region between Station 10 + 50E and Station 11 + 00E on Line 15 + 00S appear to be the most anomalous.

5. CONCLUSIONS AND RECOMMENDATIONS

Induced Polarization and Resistivity surveys have been completed on two grids on the Ta Hoola Project area.

Results suggest that both grid areas are underlain by widespread disseminated metallic sulphides with various zones of greater mineral concentrations set within the mineralized area.

Conclusions and recommendations for the Ta Hoola 1-6 grid and the Ta Hoola 9-12 grid are given separately below.

5a. Ta Hoola 1-6 Grid

Twelve potentially significant zones of anomalous IP effect are outlined by the results from this grid area. Priorities for carrying out additional work recommended below should be decided after considering all other information.

IP Zone 1

Additional IP surveying is required to more fully define the northern, western, and southern limits of the zone.

IP Zone 2a

A drill hole spotted so as to pass approximately 35 meters beneath Station 98 + 75E on Line 97 + 56N is recommended.

IP Zone 2b

A drill hole located so as to pass through a point approximately 35 meters below Line 96 + 00N, Station 108 + 50E is recommended.

IP Zone 2c

Drilling is recommended to test the source of this zone. A hole drilled towards the northeast at 45^{o} from the vertical is suggested. The hole should pass roughly 60 meters beneath Station 102 + 25E, on Line 100 + 00N.

IP Zone 3

Fill-in lines should be surveyed using the IP and Resistivity method before drilling is considered to test the source of the IP zone.

IP Zone 4a, IP Zone 4b

It is understood that the sources of both of the above zones have already been evaluated by drilling.

IP Zone 5

A drill hole spotted to pass approximately 25 meters beneath Station 111 + 00E on Line 97 + 56N is recommended as this zone could represent an extension of Zone 4a, which yields anomalous silver values.

IP Zone 6

Drilling is recommended to test the source of this zone, with a drill hole located so as to pass approximately 35 meters beneath Line 100 + 00N, Station 118 + 25E.

IP Zone 7

It appears that the source of this IP response has been drilled previously.

IP Zone 8

A drill hole located to traverse the area roughly 50 meters below Line 101 + 22N, Station 121 + 75E is suggested. An alternative would be to carry out additional IP and Resistivity surveying on north-south lines before locating a drill hole.

IP Zone 9

Drilling is recommended to better evaluate the source of IP Zone 9. A hole spotted to pass approximately 35 meters beneath Line 112 + 20N, Station 115 + 35E is suggested.

IP Zone 10

Two drill holes are recommended to test two of the more anomalous parts of this IP zone. One hole should be located to pass roughly 35 meters beneath Station 121 + 00E, on Line 113 + 42N, while the other should pass 25 meters below Line 107 + 32N, Station 121 + 75E.

IP Zone 11, IP Zone 12

Sediments are understood to be the cause of these anomalous IP zones. No further work is recommended at this time.

5b. Ta Hoola 9-12

A large sulphide system may be partially outlined by the IP and Resistivity results from the Ta Hoola 9-12 grid.

Considerable additional IP surveying is required to more fully evaluate the mineral distribution in this area. At present, anomalous zones are open in all four directions.

One zone, however, has been fully outlined by the present data. This trend could be drill-tested in either of the following manners: a drill hole located on Line 14 + 00S and passing approximately 35 meters beneath Station 9 + 75 E, or a drill hole spotted so as to pass approximately 35 meters beneath Line 15 + 00S, Station 10 + 75E.

PHOENIX GEOPHYSICS LIMITED

Paul A. Cartwright

Paul A. Cartwright, B.Sc.,
Geophysicist.

Dated: 2 December 1982

ASSESSMENT DETAILS

PROPERTY:	Ta Hoola	MINING DIVISION:	Kamloops
SPONSOR:	SMD Mining Co. Ltd.	PROVINCE:	British Columbia
LOCATION:	100 km north of Kamloops, B.C.		
TYPE OF SURVEY:	Induced Polarization and Resistivity		
OPERATING MAN DAYS:	186.75	DATE STARTED:	17 June 1982
EQUIVALENT 8 Hr. Man Days:	280.2	DATE FINISHED:	12 August 1982
CONSULTING MAN DAYS:	20	NUMBER OF STATIONS:	1707
DRAFTING MAN DAYS:	28	NUMBER OF READINGS:	11734
TOTAL MAN DAYS:	328.2	KILOMETERS OF LINE SURVEYED:	85.35

CONSULTANTS:

Paul A. Cartwright, 4238 W. 11th Avenue, Vancouver, B.C.

FIELD TECHNICIANS:

S. Henshall, 9 Roscoe Avenue, Trenton, Ontario.
J. Marsh, 200 Yorkland Blvd., Willowdale, Ontario.
G. Mullan, RR #2, Hudson, Quebec.
M. Parent, 222 St. John Street, St. Leonard, New Brunswick.
K. Corman, 10891 Bromley Place, Richmond, B.C.
M. Dugas, General Delivery, St. Leonard, New Brunswick.
G. Montpetit, 200 Yorkland Blvd., Willowdale, Ontario.
I. Parfitt, 3092 West 38th Avenue, Vancouver, B.C.
G. Richardson, 4161 Crown Crescent, Vancouver, B.C.

DRAUGHTSMEN:

R. Walaluk, 7886 Vivian Drive, Vancouver, B.C.
G. Richardson, 4161 Crown Crescent, Vancouver, B.C.

PHOENIX GEOPHYSICS LIMITED

Paul A. Cartwright

Paul A. Cartwright, B.Sc.,
Geophysicist.

DATED: 2 December 1982

STATEMENT OF COST

SMD MINING CO. LTD.
IP AND RESISTIVITY SURVEY - Ta Hoola Property, B.C.

PERIOD: June 17, 1982 to June 24, 1982.
CREW: S. Henshall, M. Parent, G. Mullan, M. Dugas, G. Montpetit, G. Richardson

PERIOD: June 25, 1982 to July 27, 1982
CREW: S. Henshall, G. Montpetit, G. Richardson

PERIOD: July 28, 1982
CREW: S. Henshall, G. Montpetit, G. Richardson, K. Corman

PERIOD: July 29, 1982 to July 31, 1982
CREW: S. Henshall, G. Montpetit, G. Richardson, G. Mullan, K. Corman, I. Parfitt

PERIOD: August 1, 1982
CREW: G. Mullan, G. Montpetit, G. Richardson, K. Corman, I. Parfitt

PERIOD: August 2, 1982 to August 10, 1982
CREW: G. Mullan, J. Marsh, G. Montpetit, G. Richardson, K.Corman, I. Parfitt

PERIOD: August 11, 1982 to August 12, 1982
CREW: J. Marsh, G. Montpetit, G. Richardson

DATA ACQUISITION	
85.35 line kilometers @ $ 490.00	$ 41,821.50
REPORT PREPARATION	
85.35 line kilometers @ $75.00	6,401.25
MOBILIZATION & DEMOBILIZATION	1,770.00
	$ 49,992.75

PHOENIX GEOPHYSICS LIMITED

Paul A. Cartwright

Paul A. Cartwright, B.Sc.
Geophysicist.

DATED: 2 December 1982

CERTIFICATE

I, Paul A. Cartwright, of the City of Vancouver, Province of British Columbia, do hereby certify that:

1. I am a geophysicist residing at 4238 W. 11th Avenue, Vancouver, B.C.

2. I am a graduate of the University of British Columbia, B.C., with a B.Sc. Degree.

3. I am a member of the Society of Exploration Geophysicists, and the European Association of Exploration Geophysicists.

4. I have been practising my profession for 12 years.

5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of SMD Mining Company Ltd. 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 Vancouver, B.C. this 2nd day of December 1982.

Paul A. Cartwright

Paul A. Cartwright, B.Sc.

CERTIFICATE

I, Stephen Henshall of Trenton, Ontario,

DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at 9 Roscoe Street, Trenton, Ontario.

2. I am a graduate of Haileybury School of Mines, Haileybury, Ontario.

3. I have been employed as a geophysical crew leader by Phoenix Geophysics Limited, 200 Yorkland Blvd., Willowdale, Ontario for a period of 3 years.

DATED AT VANCOUVER, B.C. this 2nd day of December 1982.

Stephen Henshall.

CERTIFICATE

I, Maurice Parent, of St. Leonard, New Brunswick,

DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at St. Leonard, New Brunswick.
2. I am a graduate of Radio College of Canada, Toronto, Ontario (Electrical Engineering).
3. I have been employed as a geophysical crew leader by Phoenix Geophysics Limited, 200 Yorkland Blvd., Willowdale, Ontario for a period of 4 years.

DATED AT VANCOUVER, B.C. this 2nd day of December 1982.

Maurice Parent

CERTIFICATE

I, John Marsh , of the Municipality of North York, Ontario, DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at 200 Yorkland Blvd., Willowdale, Ontario.

2. I am a graduate of the City of Norwich Technical College, U.K., ordinary National Certificate (Electrical Engineering).

3. I have worked with McPhar Geophysics Company from 1968 to 1975 as a geophysical crew leader.

4. I am presently employed as a geophysical crew leader by Phoenix Geophysics Ltd. of 214 - 744 W. Hastings Street, Vancouver, B.C.

DATED AT VANCOUVER, B.C. this 2nd day of December 1982.

John Marsh

CERTIFICATE

I, Glenn Mullan, of the Village of Hudson, Province of Quebec, DO HEREBY CERTIFY THAT:

1. I am a geophysical crew leader residing at RR #1, Hudson, Quebec.

2. I am presently employed as a geophysical crew leader by Phoenix Geophysics Ltd. of 200 Yorkland Blvd., Willowdale, Ontario.

3. I have been practising my vocation for about four years.

DATED AT VANCOUVER, B.C. this 2nd day of December 1982.

Glenn Mullan.

PART B

PHOENIX GEOPHYSICS LIMITED

NOTES ON THE THEORY, METHOD OF FIELD OPERATION

AND PRESENTATION OF DATA

FOR THE INDUCED POLARIZATION METHOD

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. can be useful values 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 metal factor values. On a third line, below the metal factor values, are plotted the values of the percent frequency effect. 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 metal factor, and apparent per cent frequency 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 (Δ 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 (Δ V) the change is 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.

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METHOD USED IN PLOTTING DIPOLE-DIPOLE
INDUCED POLARIZATION AND RESISTIVITY RESULTS

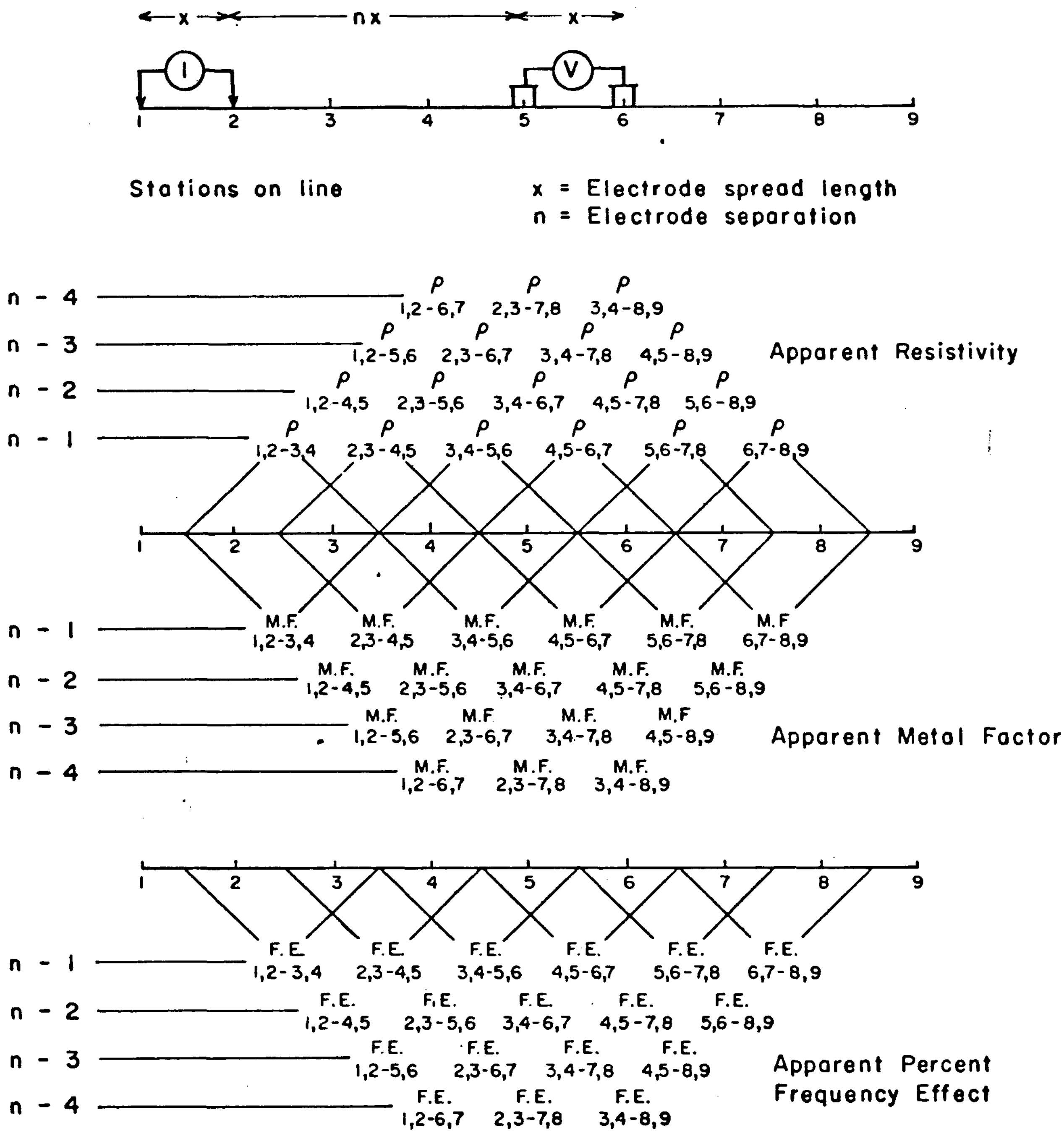
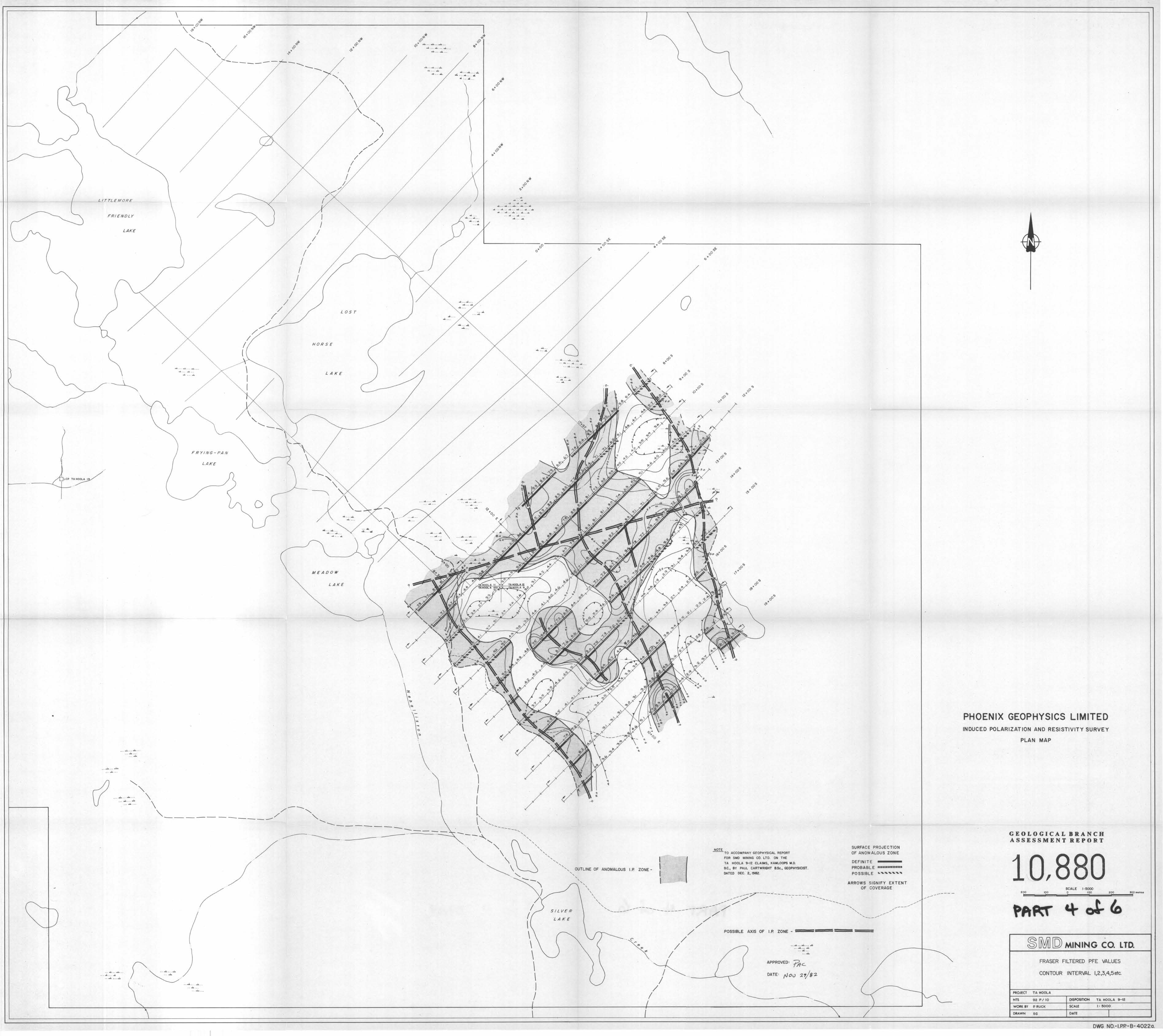
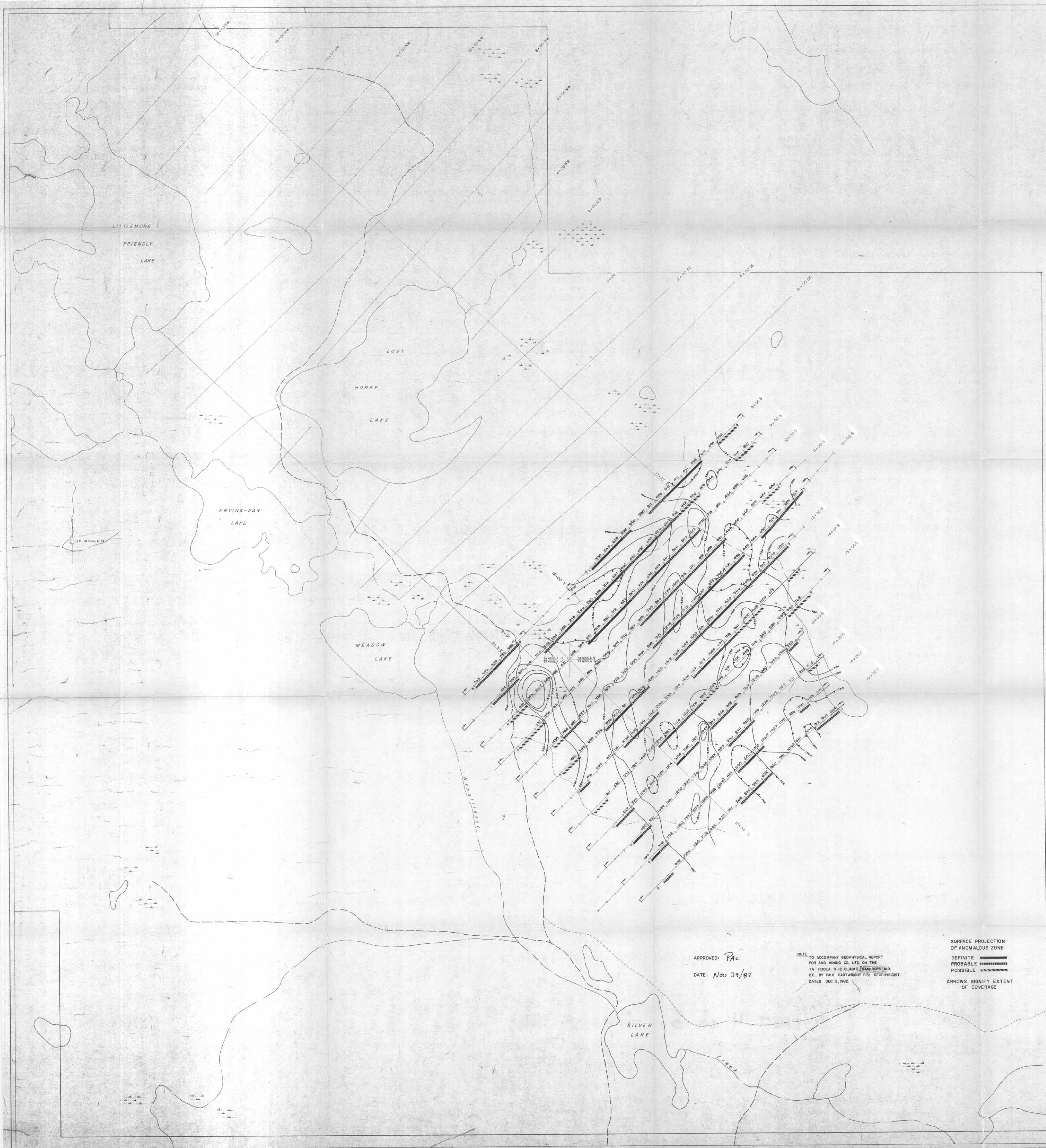


Fig. A


LITTLEMORE
FRIENDLY
LAKE
LOST
HORSE
LAKE
FRYING-PAN
LAKE
MEADOW
LAKE
SILVER
LAKE
Creek
PHOENIX GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
PLAN MAP
GEOLOGICAL BRANCH
ASSESSMENT REPORT
10,880
SCALE 1:5000
200 100 0 100 200 300 metres
PART 4 of 6
OUTLINE OF ANOMALOUS I.P. ZONE -
NOTE
TO ACCOMPANY GEOPHYSICAL REPORT
FOR SMD MINING CO. LTD. ON THE
TA HOOLA 9-12 CLAIMS, KAMLOOPS M.D.
B.C., BY PAUL CARTWRIGHT B.Sc., GEOPHYSICIST.
DATED DEC. 2, 1982.
SURFACE PROJECTION
OF ANOMALOUS ZONE
DEFINITE
PROBABLE
POSSIBLE
ARROWS SIGNIFY EXTENT
OF COVERAGE
POSSIBLE AXIS OF I.P. ZONE -
APPROVED: PAC
DATE: NOV 29/82
SMD MINING CO. LTD.
FRASER FILTERED PFE VALUES
CONTOUR INTERVAL 1,2,3,4,5 etc.
PROJECT TA HOOLA
NTS 92 P/10
DISPOSITION TA HOOLA 9-12
WORK BY P. RUCK
SCALE 1:5000
DRAWN SG
DATE
DWG NO.-I.P.P.-B-4022a.



PHOENIX GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP

GEOLOGICAL BRANCH
ASSESSMENT REPORT

10,880

SCALE 1:5000

200 100 0 100 200 300 metres

PART 4 of 6

SMD MINING CO. LTD.

FRASER FILTERED APPARENT RESISTIVITY
(OHM-METERS)

CONTOUR INTERVAL - 1,1.5,2,3,5,7.5,10,15 etc.

PROJECT	TA HOOLA		
NTS	92 P/10	DISPOSITION	TA HOOLA 9-12
WORK BY	P. RUCK	SCALE	1:5000
DRAWN	SG	DATE	

DWG. NO.-I.P.P.-B-4022b.

FOUR POUND LAKE
LITTLE MORE FRIENDLY LAKE
FRIENDLY LAKE
TA HOOLA LAKE
CREEK
LCP TA HOOLA
TA HOOLA 5 TA HOOLA 6
SCALE
100 50 0 100 200 300 400 METRES
PHOENIX GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
PLAN MAP
GEOLOGICAL BRANCH ASSESSMENT REPORT
10,880
PART 4 of 6
OUTLINE OF THE ANOMALOUS I.P. ZONES:
APPROVED: PAC
DATE: Dec 02/82
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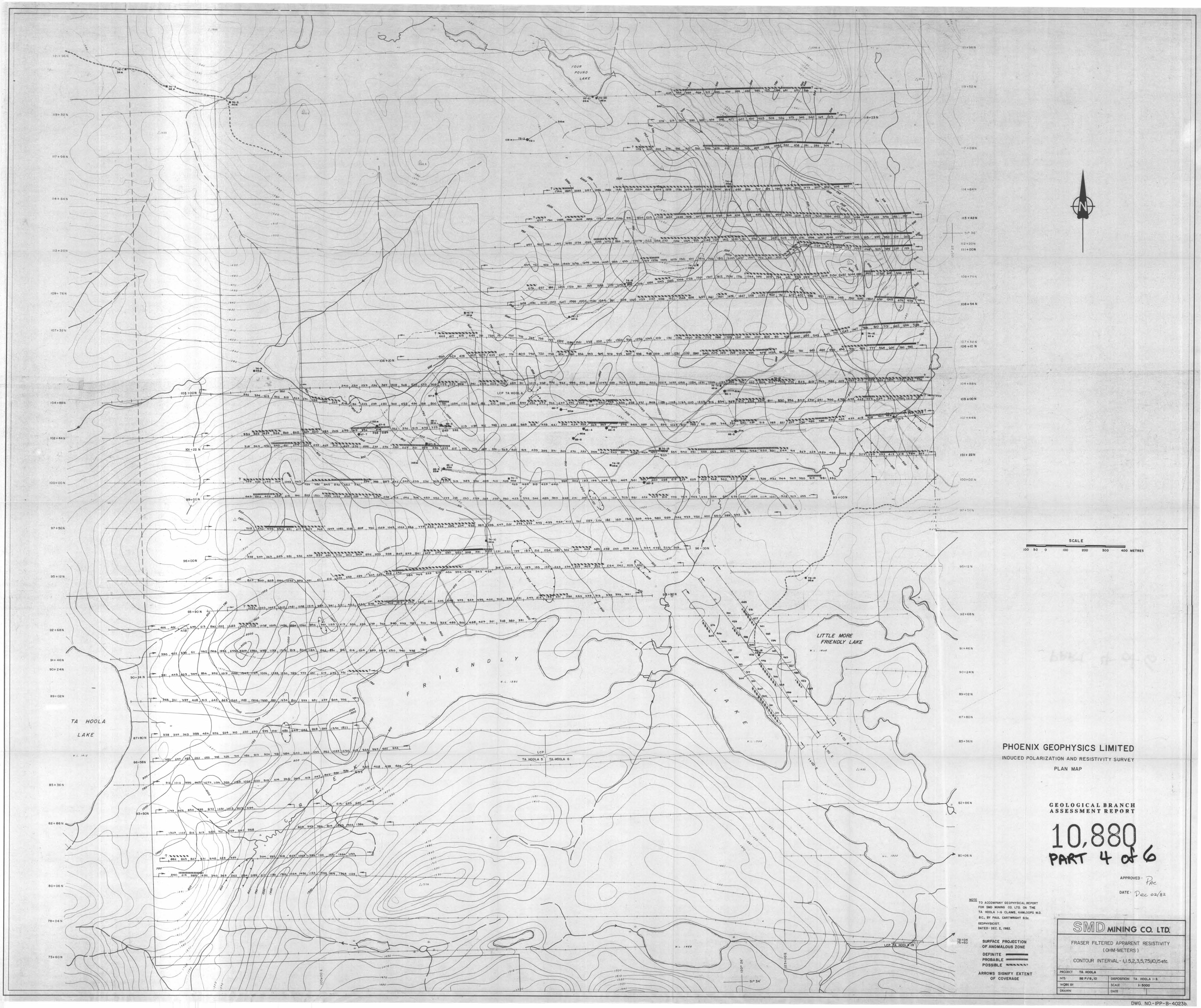
DATE
DWG NO.-IPP-B-4023a.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TA HOOLA LAKE
CREEK
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TA HOOLA 5
TA HOOLA 6
LCP TA HOOLA 6
SCALE
100 50 0 100 200 300 400 METRES
PHOENIX GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
PLAN MAP
GEOLOGICAL BRANCH
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PART 4 of 6
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