104-J-8

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GEOPHYSICAL REPORT

on the

Induced Polarization Survey of the

Hu No. 1 to 40 and 43 to 52 (inclusive) Mineral Claims

known as the

TANZILLA PROPERTY

Centered 9 air miles southwest of the

Settlement of Dease Lake

Northern British Columbia

Liard Mining Division

Latitude 58°20'N; Longitude 130°10'W

N.T.S. 104 J/8

and owned by TOURNIGAN MINING EXPLORATIONS LTD.

of Vancouver, B.C.

Report by:

A. Scott, B.Sc.

D. R. Cochrane, P.Eng.,
July 20, 1972,
Delta, B.C.

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* Figures 2 and 3 also contain a claims location map and frequency histogram

A-1 INTRODUCTION:

Between June 9 and June 25, 1972, a field crew employed by Cochrane Consultants Ltd. completed some 16.6 line miles of a reconnaissance induced polarization survey on the Hu mineral claims (known as the Tanzilla Property) situated near Dease Lake, B.C. The work was done on behalf of Tournigan Mining Explorations Ltd.

A time domain induced polarization unit was used in a Wenner Field Array and with an "a" spacing of 500 feet. Maps showing the location of the survey lines and the results obtained accompany this report.

This report discusses the procedures followed and the results obtained.

A-2 CONCLUSIONS:

1. Two apparent resistivity "families" were detected on the Tanzilla survey. They are thought to be response from two electrically distinct rock types.

2. Several zones of "moderately to strongly anomalous" chargeability were outlined.

3. These anomalous chargeability zones generally lie within or on the flanks of high apparent resistivity response.

4. Extension of the grid to close off the anomalous chargeability zones and the detailing and further investigation of these and any other anomalies detected is recommended.

Respectfully submitted,

A. Scott, B.Sc.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. R. COCHRANE

D. R. Cochrane, P.Eng.,
July 20, 1972,
Delta, B.C.

PART B:

B-1 LOCATION AND ACCESS:

Tournigan's Tanzilla property is located 9 air miles southwest of the Settlement of Dease Lake in Northern B.C. and 135 air miles south of Watson Lake, (the local servicing center). Dease Lake may be reached by road via the Cassiar-Dease Lake-Telegraph Creek gravel road which proceeds south and west from the Alaska Highway just west of the town of Watson Lake in the Yukon Territories. Nine miles of a 4 x 4 access road was constructed to the Hu claims in 1969 by Silver Standard Mines and joins the Dease Lake road just west of the settlement of Dease Lake. A helicopter pad has been constructed on the east side of the property at the head of Stain Creek and helicopter service is available during the summer months at a Dease Lake base. Float equipped fixed wing service and year-round helicopter service is available in Watson Lake, (in 1971) and an air strip near the D.O.T. weather station at the south end of Dease Lake accommodates small aircraft. The latitude and longitude of the claims area is 58°20'N and 130°10'W respectively. (see Figure 1)

B-2 CLAIMS AND OWNERSHIP:

The Hu full sized located mineral claims form a contiguous block as shown in Figure 2. They are located in the

Liard Mining Division and are shown on B.C. Department of Mines Mineral Claims Map No. 73M. Hu No. 1 to 62 inclusive are owned outright by Tournigan Mining Explorations Ltd., office at 704 - 535 Thurlow Street, Vancouver, B.C.

The following table lists pertinent claims data:

Claim Name(s)	Record Number(s)	Anniversary Date
Hu No. 1 to 32 incl.	38127 - 38158 incl.	June
Hu No. 33 to 62 incl.	39336 - 39365 incl.	August

The author inspected claim posts on the east property half and claims appear to be staked in accordance with the regulations set out in the Mineral Act of the Province of British Columbia.

B-3 HISTORY:

To the author's knowledge no claims or exploration work was ever conducted on the property prior to 1969. In June 1969, Hu No. 1 to 32 were staked on behalf of Tournigan Mining Explorations Ltd. after the investigation of a gossan zone at the head of Stain Creek. Later in the summer of 1969, the first 32 Hu claims were optioned to Standard Silver Mines Ltd., and an additional 30 claims were added to the group. During that field season, Silver Standard built nine miles of road to the property and excavated 22 trenches totalling 7,970 feet in length. (Reference, Geology, Exploration and Mining in British

Columbia, 1969, page 44).

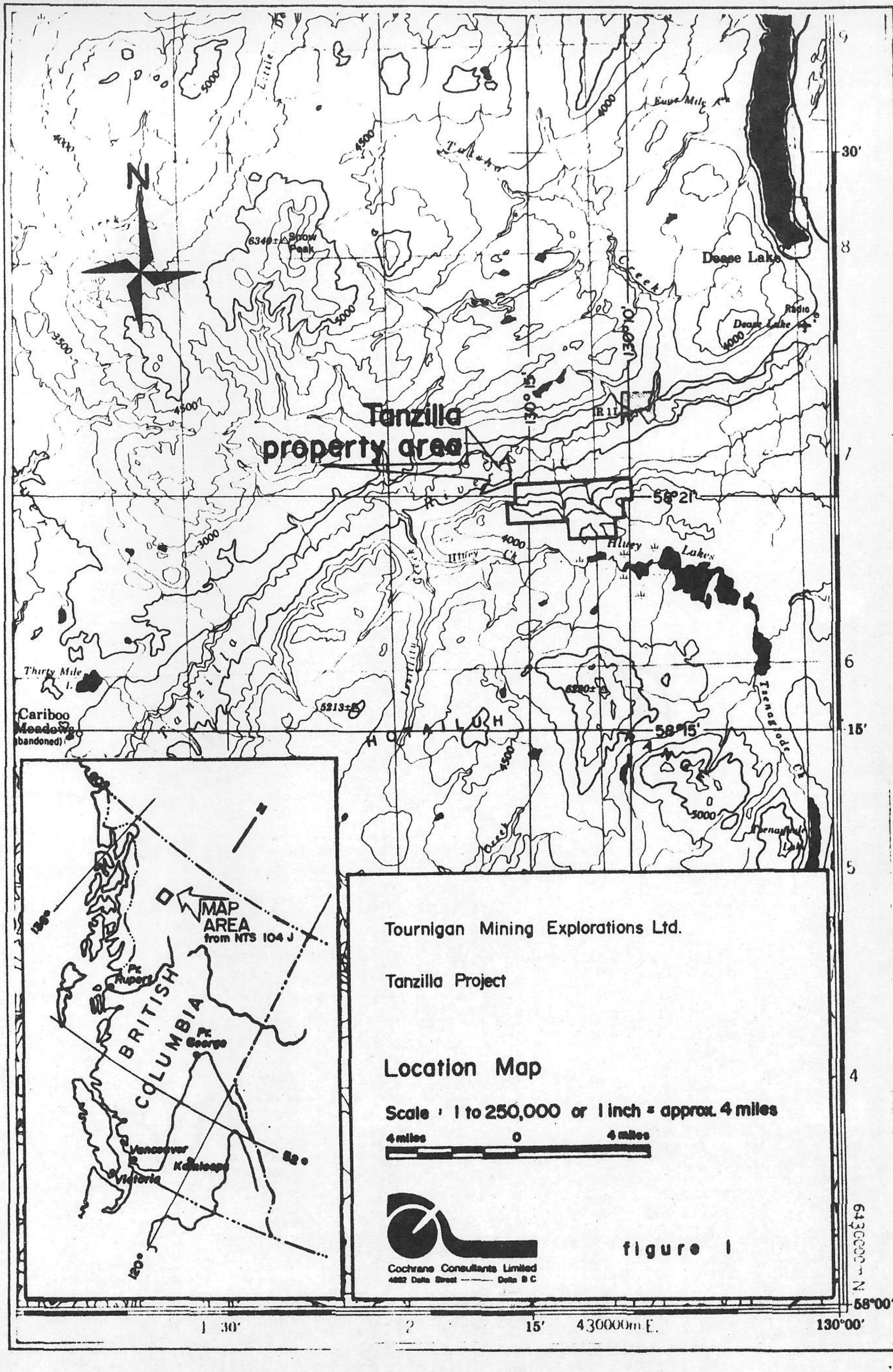
In August and September, geologic mapping was completed by W. Dunn of Silver Standard and R. H. Seraphim of Seraphim Engineering Limited.

In the summer of 1970, Silver Standard Mines cut, flagged and chained nearly 20 line miles of ground control grid, and completed a geochemical soil sampling survey on the grid area.

B-4 GENERAL SETTING:

Tournigan's Tanzilla property is situated in the Hotailuh Range of the Tanzilla Plateau, a physiographic subdivision of northern British Columbia. It is a relatively gentle upland surface, ranging from just below 2,500 feet above sea level, in the broad "U" shaped Tanzilla River valley, to just over 6,000 feet in the Hotailuh Range. The Hu claims lie on the north flank of the range between Hluey Lakes (elev. approximately 4,500 feet) and the Tanzilla River. Gabrielse, Souther and Roots show the Hu claims group as lying entirely within an Upper Triassic sequence, composed chiefly of volcanics, with numerous incalated sedimentary members. This sequence is characterized by the presence of many small stocks, sills and dikes of porphyritic andesite. Small intrusive Triassic (and later) syenitic stocks are shown on Map 21-1962 several miles south of the claims, and intrude the volcanic sedimentary sequence. The syenite and monzonite intrusives of the area are particularly geologically interesting, since, especially near the contacts with Triassic volcanics, they are the host rocks in many of the major copper occurrences now being developed in the district. These include the occurrences at Gnat Lakes, Shaft Creek and Galore Creek.

Pleistocene and recent glacial till, alpine moraines, and glacial outwash cover much of the bedrock. The claims area is quite well forested with spruce and pine, and in more open places there is a thick undergrowth of buck brush.



N
Snow Peak
6340±
Dease Lake
Radio
Tanzilla property area
58°21'
58°15'
Thirty Mile L.
Cariboo Meadows (abandoned)
Tanzilla
Lakes
Tsenaglode Ck
30'
15'
58°00'
130°00'
430000m E.
6430000 N
130°15'
130°0'
MAP AREA from NTS 104 J
BRITISH COLUMBIA
Pr. Rupert
Pr. George
Vancouver
Victoria
Kamloops
Tournigan Mining Explorations Ltd.
Tanzilla Project
Location Map
Scale : 1 to 250,000 or 1 inch = approx. 4 miles
4 miles
0
4 miles
Cochrane Consultants Limited
4882 Delta Street —— Delta B C
figure 1

PART C:

C-1 FIELD PROCEDURE:

A standard Wenner Array with an "a" spacing of 500 feet was used for the I.P. survey of the Tanzilla Property. For this array, the distance between the electrodes is equal, as illustrated below:

E_1 --- a --- P_1 --- a --- P_2 --- a --- E_2

"E" positions are current electrodes and "P" positions receiving electrodes.

transit direction →

The front positions are electrically positive and the rear positions negative.

The actual "in field procedure" was as follows:

A suitable station was chosen for the instrument to set up on, and the crew men moved to the appropriate positions on the line. A small hole was dug beneath the humus and cleared of rocks for the receiving pots (P) and the stakemen cleared a small strip of ground (roughly one square foot) of grass, leaves and rocks, spread aluminum foil over the cleared area and buried the foil (positions "E"). Salt water was poured over the foil to assure good ground contact.

Communication with the instrument operator was facilitated by portable transceivers and when all positions were reported "ready" the instrument operator commenced measurement. Firstly, the self potential of the ground between the two receiving pots was balanced and this value was recorded (in millivolts) on standard pre-printed note forms. A 4 cycle 2 second current on period sequence was then initiated during which the transmitter current (I) and the impressed EMF (V_p) between receiving pots was noted. On cessation of the current pulse the receiver automatically integrates the residual decay voltage (V_s). This value was recorded along with notes on the position of the instrument, terrain, road locations, etc.

The I.P. was normalized and the procedure repeated for a minimum of three successive pulses.

The order was then given to move on 500 feet to the next station.

C-2 DATA PROCESSING:

The I.P. data was normalized and the apparent resistivities were calculated by slide rule in the field and were spot checked in the office with an electronic calculator.

The chargeability is defined by dividing the residual decay voltage (V_s) by the impressed EMF (V_p).

The apparent resistivity is calculated from the formula:

$$\text{apparent resistivity (ohm-feet)} = \frac{2\pi a \times V_p}{I}$$

The chargeabilities and apparent resistivities were plotted and contoured and accompany this report.

The grouping of the data and calculation of the arithmetic mean, standard deviation and coefficient of correlation was done with the aid of an electronic calculator. A representative sample of 79 values was used for statistical purposes (i.e. every second data point).

PART D: DISCUSSION OF RESULTS

D-1 APPARENT RESISTIVITY RESULTS:

Apparent resistivity values vary from a high of 3800 ohm feet at station 22.5 S, line 22E to a low of 430 ohm feet on the base line near line 9E. The frequency distribution histogram (Figure 2) is bimodal, suggesting that two electrically distinct rock types underlie the survey area.

The following statistical information was obtained:

primary mode	1000 to 1500 ohm-foot classes	32% of values
secondary mode	2000 to 2250 ohm-foot class	11% of values
arithmetic mean	1660 ohm feet	
standard deviation	700 ohm feet	

and the following resistivity categories have been defined:

less than 1750 ohm feet	Family "A"
1750 to 2000 ohm feet	transitional
greater than 2000 ohm feet	Family "B"

The family "B" resistivities are indicated by the stipled areas on the accompanying apparent resistivity plan (Figure 2). Family "B" resistivities were encountered on the north part of lines 13, 15, and 17; over a width of some 2000 feet trending east-west across lines 11 to 25 to the south of the base line; along recon line 17W; and at lines 3 and 6 west on the baseline.

The high chargeability zones generally lie within, or on the flanks of, the family "B" resistivity zones.

D-2 CHARGEABILITY RESULTS:

An iso-chargeability plan accompanies this report as Figure 3. The values vary from a high of 28.6 milliseconds (m.s.) to a low of 2.2 m.s. at 22.5S, line 21E and at 42.5 S, line 21E respectively.

Figure 3 shows the frequency distribution of the chargeability values and the following statistical information was obtained:

primary mode	14 to 16 m.s. class	20% of values
secondary mode	8 to 10 m.s. class	14% of values
tertiary mode	24 to 26 m.s. class	5% of values
arithmetic mean	14 m.s.	
standard deviation	5.4 m.s.	

Based on the above the following categories of chargeability have been defined:

less than 14 m.s.	"background"
14 to 20 m.s.	"weakly anomalous"
20 to 25 m.s.	"moderately anomalous"
greater than 25 m.s.	"strongly anomalous"

Areas of greater than 20 m.s. chargeability are indicated on the plan by stipling. These zones are located at:

(a) On lines 13E, 15E, 17E and between stations 22N and 4N. The chargeability peaks at 26.0 at 8N,line 13E and is open to the west and to the northeast.

(b) On line 21E, stations 24S and 32S, and line 23E, station 12S. The chargeability peaks are all above 20 m.s. and lie on the flank of a high resistivity zone. As previously mentioned the change in resistivity values is believed to be due to a change in rock types.

(c) On line 11E at the south end of the line a single value of 25.0 m.s. was obtained.

Chargeability peaks in excess of 20 m.s. were obtained on the base line and on line 17W. Since these lines were single reconnaissance lines the size or shape of the anomalies is not known at this time. The anomalous point on the base line at about 8E, possibly connects with the largest anomaly discussed in (a) above.

D-3 DISCUSSION:

The reconnaissance induced polarization survey on the Tanzilla Property is part of a program recommended by the author in a report dated July 15, 1971. The recent I.P. work follows a trenching-soil sampling program conducted by Silver Standard Mines in 1969 and 1970. Soil samples were collected 1000 feet north and 1000 feet south of the base line on all the cross lines, and analyzed for copper, and occasional samples of Mo and Ag.

There is good coincidence of high geochemical copper areas with high chargeability as, for example on line 23E at 10S where a 112 p.p.m. Cu coincides with a peak chargeability response of 21.6 m.s. The large chargeability anomaly at the head of Stain Creek is coincident with scattered high copper results of up to 242 p.p.m. Two geochemical samples at 10N and 8N on line 19E contained 24 and 17 p.p.m. Mo respectively. This geochemical high lies on the east "nose" of the large chargeability anomaly close to a 20 m.s. response zone.

Because of extensive overburden and spotty permafrost areas, the geochemical data is somewhat questionable, however it is of value in "priority rating" the chargeability anomalies, and additional soil sampling is recommended.

Respectfully submitted,

A. Scott, B.Sc.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. R. COCHRANE

D. R. Cochrane, P.Eng.,
Delta, B.C.,
July 20, 1972.

APPENDIX I

Certificate

NAME: COCHRANE, DONALD Robert
Education: B.A. Sc. - U. of T.
M. Sc. (Eng.) - Queens University

Professional Associations: Professional Engineer of B.C., Ontario, and Saskatchewan. Member of C.I.M.M., G.A.C., M.A.C., Geological Engineer
Experience: Engaged in the profession since 1962 while employed with Noranda Exploration Co. Ltd., Quebec Cartier Mines Ltd., and Meridian Exploration Syndicate.

NAME: SCOTT, ALAN R.
Education: B.Sc. - Geophysics, U.B.C.
Experience: Two summers - crew member and operator with Geo-X Surveys Ltd. Employed with D. R. Cochrane since 1970.
Professional Associations: Member of S.E.G.

NAME: GRIFFITH, David

Education: B.A. (English), Queen's, 1970
Experience: 2 Field Seasons, Cochrane Consultants - Chief Operator

NAME: COCHRANE, Bruce
Age: 25
Experience: 2 Field Seasons - Geo-X Surveys
1 Field Season - Cochrane Consultants
Education: Ontario College of Art Certificate

NAME: PARADIS, Robert
Age: 24
Experience: Seigel Associates Ltd.
Presently employed with Cochrane Consultants Ltd.

NAME: RAINCOCK, Larry
Age: 25
Experience: Presently employed with Cochrane Consultants Ltd.

NAME: ROSSIER, Jean-Claude
Age: 27
Education: Secondary and Vocational School - Architectural Drafting Courses
Experience: Since 1965 - General Drafting Experience
Geophysical Drafting, Seigel Associates - 1969 - 1972

APPENDIX II

Survey Details

PROPERTY: Tanzilla MINING DIVISION: Liard

SPONSOR: Tournigan Mining Explorations Ltd.

LOCATION: 9 air miles southwest of the settlement of Dease Lake, B.C.

LATITUDE: 58°20'N LONGITUDE: 130°10'W N.T.S.: 104 J/8

SURVEY: Induced Polarization (time domain)

SURVEY MAN DAYS: 16 x 4 = 64 (June 9 to 25)

STANDBY-MOBILIZATION MAN DAYS: 3 x 4 = 12 (June 6 to 9)

DATA PROCESSING & REPORT PREPARATION MAN DAYS: 5

DRAFTING MAN DAYS: 5

NO. ALONG LINE READINGS: 158 at an "a" spacing of 500 feet

LINE MILES: 16.6

DATA PROCESSING AND REPORT PREPARATION:

A. Scott, B.Sc., Geophysics
D. R. Cochrane, M.Sc., P.Eng., U.of T., Queens

FIELD CREW:

D. Griffith
B. Cochrane
B. Paradis
L. Raincock

DRAFTING:

J. C. Rossier

COCHRANE CONSULTANTS LTD.

D. R. Cochrane, President

APPENDIX III

Instrument Specifications for HEW-200
Pulse Type (Time Domain) Induced Polarization Unit

Receiver-Transmitter Package:
15" x 13" x 10"   Weight: 38 lbs.

Transmitter Power Supply:
30 volt rechargeable battery 5-RF 680 Central Lab.
Primary Power Supply: 1 #420 ER dry cell timer battery

Receiver:
Common mode rejection 100DB (DC-60 Hz)
Input impedence 1×10^{6} ohms
Operation temperature: -20° C + 75° C
Sealed galvanometer type meters for very humid or wet climates
Polarity automatically read on meter dial
Three input combinations
Sealed switches and panel for wet climate (dessicant incl.)

Transmitter:
24 - 30 volt DC-DC transistorized converter
Power output 500 watts maximum
Timer two second or four second pulse intervals
Automatic reverse current cycling
Operating temperature: -20°C to $+75^{\circ}$ C
Sealed switches and panel for wet climates (dessicant incl.)
Sealed meter for very humid or wet climates

TIME CONSTANTS:
The following table lists current on times, and corresponding delay and integration times

Current On (seconds)	Delay Time (seconds)	Integration Time (seconds)
2.0	0.4	1.2
2.5	0.5	1.5
3.0	0.6	1.8
3.5	0.7	2.1
4.0	0.8	2.4
4.5	0.9	2.7
5.0	1.0	3.0
5.5	1.1	3.3
6.0	1.2	3.6

Manufactured by:
Hewitt Enterprises and Terra Physics
12215 South, 900 East
DRAPER, Utah

APPENDIX IV

Cost Breakdown

By contract between Cochrane Consultants Ltd. and

Tournigan Mining Explorations Ltd. dated June,1972:

16.6 line miles of an induced polarization survey on the Hu claims Tanzilla Plateau Liard M.D.

@ $494 per line mile

Total .... $ 8,200.40

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. R. COCHRANE

D. R. Cochrane, P.Eng.,
President,
Cochrane Consultants Ltd.