'80 - #330 - # 8586

GEOPHYSICAL REPORT

ON THE

RIVER CLAIM [12 UNITS]

QUEEN CHARLOTTE ISLANDS, B. C.

SKEENA M.D.

Long. 132°15'W Lat. 53°30.5'N

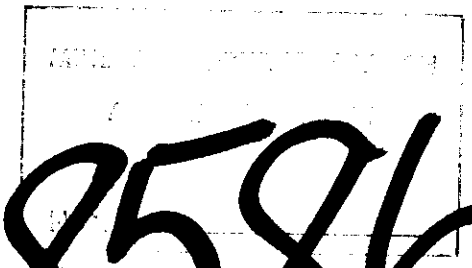
NTS 103F/8E, 8W, 9E, 9W

for

R. CALABRIGO & ASSOCIATES
Vancouver, B. C.

by

A.F. ROBERTS, P.ENG.



8586

December 10, 1980

A. F. ROBERTS, P.ENG.
CONSULTING MINING ENGINEER

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MAPS

Ref.No.

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APPENDIX

Ref.No.

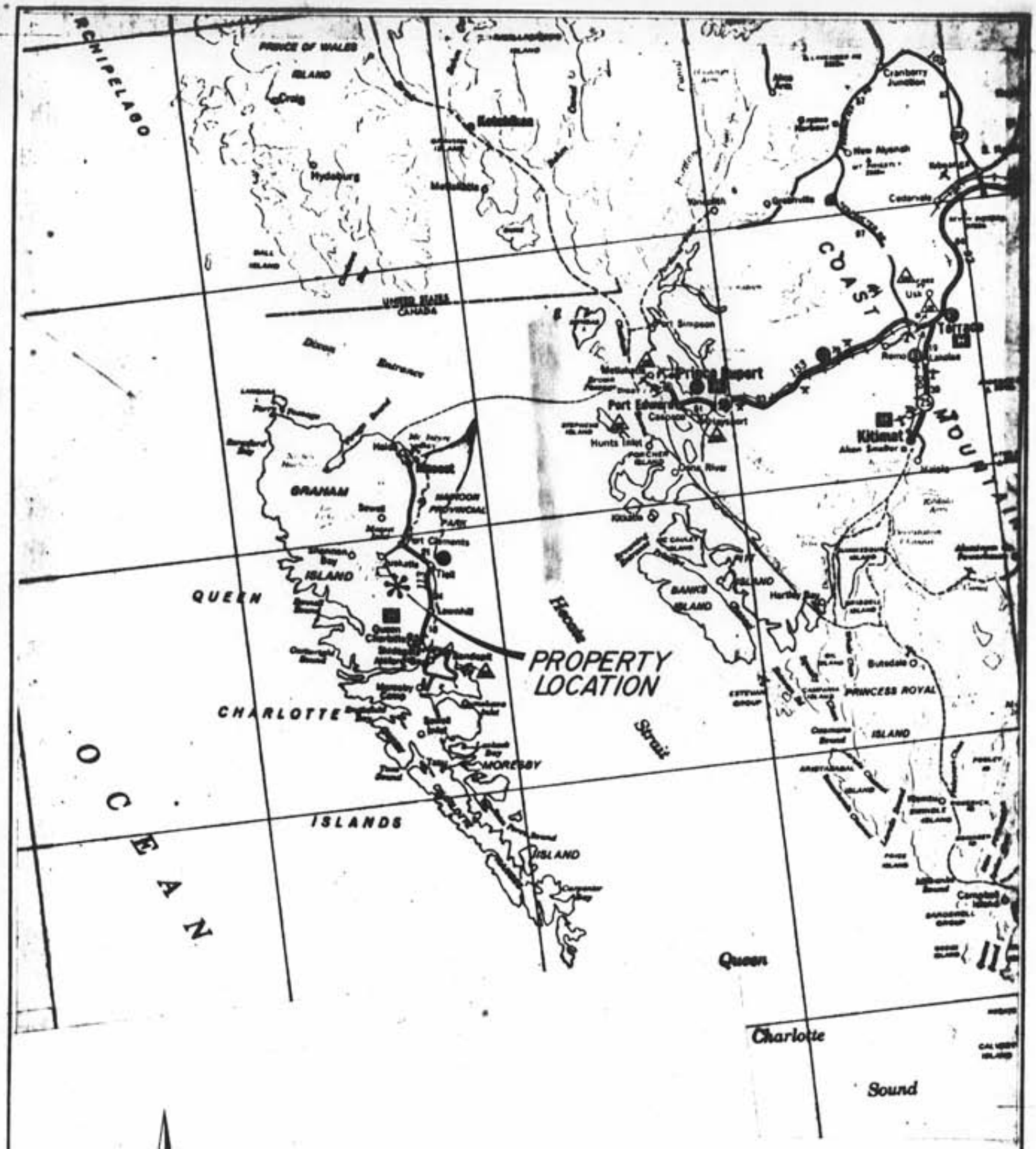
REFERENCES

6] B.C. Department of Mines & Petroleum Resources, Bulletin 54, Geology of the Queen Charlotte Islands, B.C., A. Sutherland Brown, 1968

7] B.C. Department of Mines & Petroleum Resources; Report on the Specogna Gold Prospect, Queen Charlotte Islands, B.C.; A. Sutherland Brown, T.G. Schroeter, 1975

8] Reports by A.F. Roberts, P.Eng., for Consolidated Cinola Mines, Qualifying, Geochemical, Geophysical Reports for other companies, 1977 to date.

10] Contouring VLF-EM Data; D.C. Fraser, Geophysics, Vol. 54, No. 6, 1969



RENO CALABRIGO
VANCOUVER, B.C.

RIVER CLAIM

QUEEN CHARLOTTE ISLANDS, B.C.
SKEENA M.D.
NTS 103 F / 9E, 8E

LOCATION MAP

SCALE IN KILOMETRES

0 24 48 72 96

TO ACCOMPANY REPORT BY A.F. ROBERTS, P.Eng. Dec 10, 1980

S U M M A R Y

The VLF-EM survey over the River Claim indicates a wide zone of coincident Fraser Filter and Total Field anomalies.

With the 200 metre spacing of the lines the validity of size must be accepted with caution.

A previous small geochemical survey did not reach this area, and gave only two threshold values in gold and two of mercury, coincident with the margin of two anomalies, if they are correctly spaced, on the eastern side of the current survey.

It is recommended that, a soil sampling program be carried out over the current lines, and in addition, lines run between the existing ones to make the line interval 100 metres, with a simultaneous VLF-EM and soil sampling program.

This Phase I program is estimated to cost $30,000.

A Phase II program of stripping and/or diamond drilling, following good results of Phase I, can be expected to cost $100,000.

Respectfully submitted,

A.F. Roberts, P.Eng.
December 10, 1980

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. ROBERTS

GEOPHYSICAL REPORT
ON THE
RIVER CLAIM [12 UNITS]
QUEEN CHARLOTTE ISLANDS, B.C.
SKEENA M.D.

Long. 132°15'W Lat. 53°30.5'N

NTS 103F/8E, 8W, 9E, 9W

for
R. CALABRIGO & ASSOCIATES
Vancouver, B. C.

by
A.F. ROBERTS, P.ENG.

December 10, 1980

INTRODUCTION

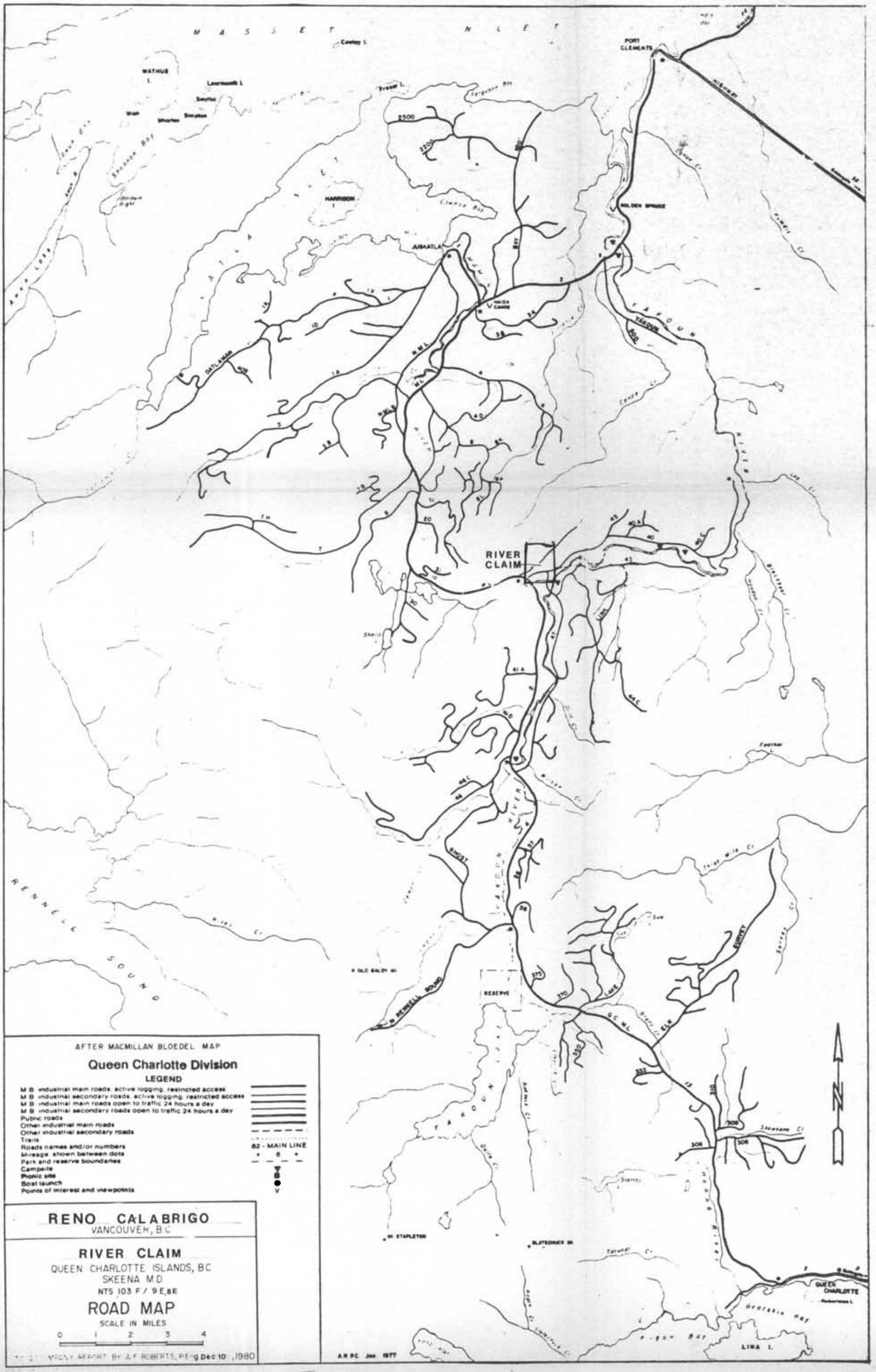
This report is authorized by Mr. R. Calabrigo, the registered owner of the claims.

Its purpose is to evaluate the results of a VLF-EM program carried out over a portion of the property in the period July 23-August 9, 1980. A minor geochemical program was carried out on a portion of the property a year ago. The results of this program will be commented on with the geophysical report.

The geochemistry was done by Team Mineral Services Inc. of Delta, B.C.

The geophysical work was carried out by Strato Geological Inc. of Vancouver, B.C.

The writer has been on this property several times in the past two years in conjunction with work on adjacent claims.



AFTER MACMILLAN BLOEDEL MAP

Queen Charlotte Division

LEGEND

- M B industrial main roads, active logging, restricted access
- M B industrial secondary roads, active logging, restricted access
- M B industrial main roads open to traffic 24 hours a day
- M B industrial secondary roads open to traffic 24 hours a day
- Public roads
- Other industrial main roads
- Other industrial secondary roads
- Trails
- Roads names and/or numbers — 82 - MAIN LINE
- Mileage shown between dots
- Park and reserve boundaries
- Campsite
- Picnic site
- Boat launch
- Points of interest and viewpoints

RENO CALABRIGO
VANCOUVER, B.C

RIVER CLAIM
QUEEN CHARLOTTE ISLANDS, B.C.
SKEENA M.D.
NTS 103 F / 9E,8E

ROAD MAP

SCALE IN MILES
0 1 2 3 4

FIELD REPORT BY A.F. ROBERTS, P.Eng. Dec 10, 1980

ARPC Jan 1977

LOCATION, ACCESS, TOPOGRAPHY [1] [2] [3]

The claim lies in central Graham Island. It is accessible from Juskatla in the north or from Queen Charlotte City in the south via MacMillan-Bloedel logging roads, a distance of about 25 miles or 45 km either way.

The southern area of the claim is cut by several logging roads and the Yakoun River. Branch Road 42 cuts through the centre portion of the claim, angling northward to the NE corner post, the L.C.P. Elevations range from 200 feet [60 m] to 1,600 feet [500 m], as the ground rises rapidly from the river to the mountain top.

The lower portions along the road are covered by slash and dense second growth timber, and are generally swampy. The mountain side is steep and covered mostly with virgin timber.

Water is plentiful near the river, and fair from several small streams on the mountain side.

1] Location Map: B.C. Road Map
1 cm = 20 km [Frontispiece]

2] Road Map: MacMillan-Bloedel
1 cm = 1.6 km [Follows page 1]

3] Topographic Map: NTS 103F/8E, 8W, 9E, 9W, 1:50,000 [Follows page 2]

RENO CALABRIGO
VANCOUVER, B.C.

TOPOGRAPHY
QUEEN CHARLOTTE ISLANDS, B.C.
SKEENA M.D.
NTS 103F/8E,8W,9E&W

RIVER CLAIM
SCALE IN KILOMETERS

1 .5 0 1 2

To Accompany Report by A. F. Roberts, P.Eng. dated December 16, 1980

CLAIM [4]

The claim is described as follows:

Name	Units	Record No.	Expiry Date
River	12	797[10]	October 16, 1980

The assessment work has been filed, therefore on acceptance the claim is in good standing until October 16, 1980.

Posts on the claim have been found to be in accordance with the Mining Act.

The exact location and the area of the claim can only be determined by a legal survey.

GEOLOGY [5] [6] [7] [8]

For this report the general geology map has been enlarged from 1:125,000 to 1:62,500, entailing some loss of detail.

This map indicates that the northern part of the claim is underlain by the Paleocene Massett formation consisting of basalt rhyolite flows brecciated and faulted.

4] Claim Map: B.C. Department of Mines & Petroleum Resources, 1:50,000 [Follows page 3]

5] General Geology: 1:62,500 from Bulletin 54 [Follows page 4]

6] B.C. Department of Mines & Petroleum Resources, Bulletin 54, Geology of the Queen Charlotte Islands, A. Sutherland Brown, 1968

7] B.C. Department of Mines & Petroleum Resources, Report on the Specogna Gold Prospect, Queen Charlotte Islands, A. Sutherland Brown, T.G. Schroeter, 1975

8] Reports by A.F. Roberts, P.Eng., for Consolidated Cinola Mines, Qualifying, Geochemical, Geophysical Reports for other companies, 1977 to date.

MB8
MB4
MB2
MB7
MB1
MB16
MB3
MB12
MB11
MB15
MB13
MB
14
N
MAMIN BAY
JUSKAT
PORT CLEMENT
BRIDGE
MAMIN RIVER
FLORENCE CREEK
YAKOUN RIVER
VENTORA
RESOURCES
RESOURCES
NORTH FLORENCE
CANOE CREEK
SOUTH
FLORENCE
KENNY
MUTUAL
RESOURCES
KNOBBY
LAKE
HOOK
CONSOLIDATED
CINOLA
STAKED
HILL
GRAHAM
ISLAND
YAKOUN RIVER
MUTUAL
IBEX
RIVER
ASHCROFT
KENNEDY
RESOURCES
MARIE
LAKE
GOLD CREEK
BURLINGTON
BRIDGE
STAKED
UN.
GUNN
CHEVRON
UN.
GUNN
GIGI
OIL
&
GAS
UNITED
GUNN
CANYON CREEK
SHELL
UNION MINIERE
DRILL CREEK
ZEP ENERGY
STAKED
PRYME
ENERGY
KING CREEK
WILSON CREEK
GHOST
CREEK

LEGEND
Main Road:
Secondary Road:
Subject Claim:

RENO CALABRIGO
VANCOUVER, B.C.

RIVER CLAIM
QUEEN CHARLOTTE ISLANDS, B.C.
SKEENA M.D.
NTS 103 F/8E,8W,9E,9W.

CLAIM MAP
SCALE IN KILOMETERS

1 5 0 1 2

To Accompany Report by A. F. Roberts, P. Eng., dated December 10, 1980.

It is known that there are basaltic rocks on the northwestern section, and rhyolite breccia lower down.

The map indicates that the southern part of the claim is underlain by the Cretaceous Haida formation of sandstones, shale and calcareous siltstones.

The writer has seen some sandstone, some dacite, and rhyolite in this area, and possibly some ash flow, the rocks being highly oxidized, and identification only tentative.

Minor pyrite was seen in several locations in southern areas striking slightly west of north.

The map indicates one strong fault near the east boundary.

GEOCHEMISTRY

The geochemistry sampling was done on a reconnaissance basis to cover assessment work in 1979.

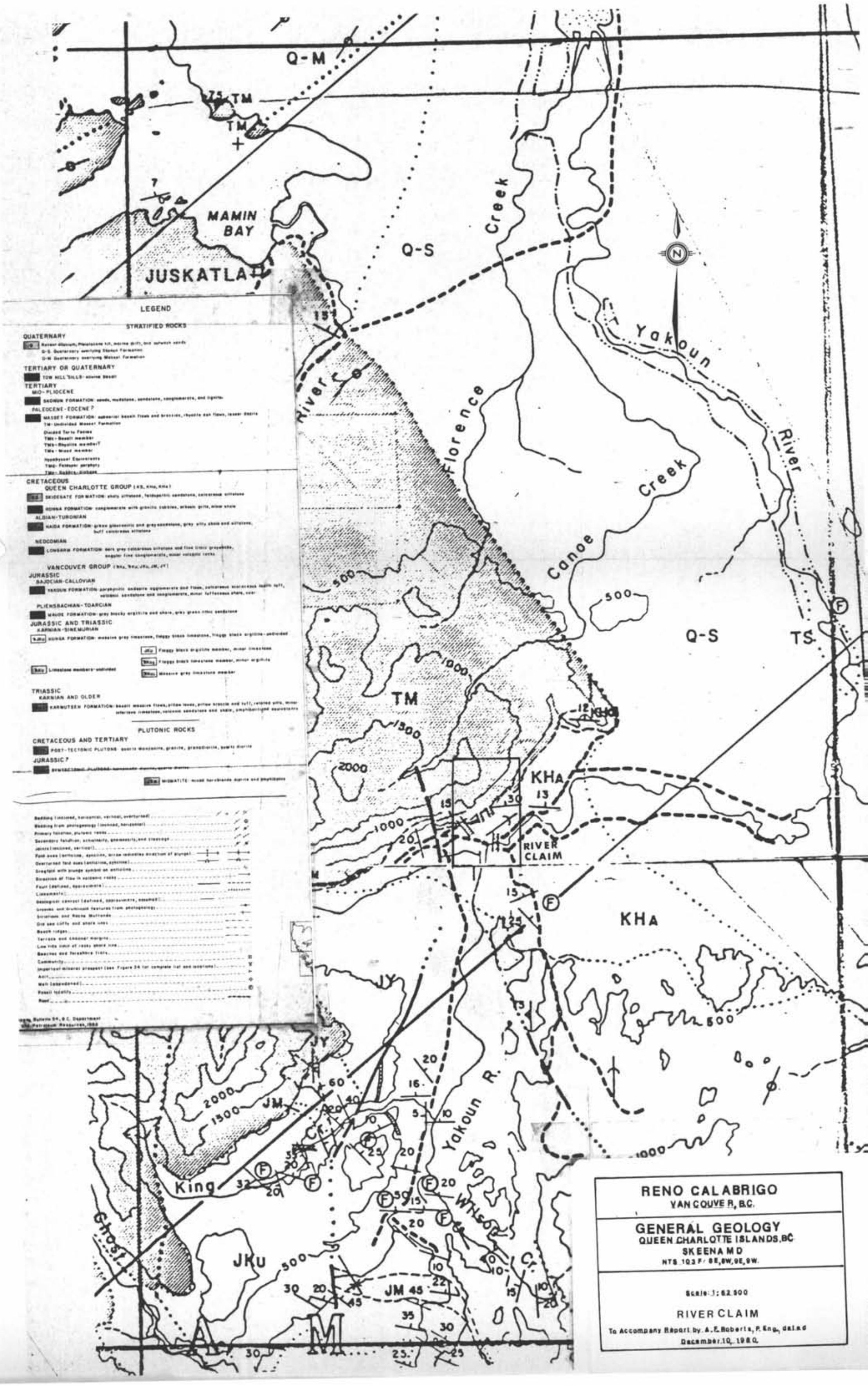
Only four lines, and 42 samples were taken.

Spacing was on a 250 metre by 100 metre grid. This is too far apart to give a good analysis of the ground.

Two values for gold at threshold value of 10 ppb, and two for mercury above the threshold value of 300 ppb.

These were the only two metals assayed for.

The gold values suggest a northeast trend.


Q-M
TM
TM
MAMIN BAY
JUSKATLA
Q-S
Creek
Yakoun
River
Florence
Canoe Creek
500
1000
1300
2000
TM
KHA
RIVER CLAIM
Q-S
TS
KHA
JY
JM
JKU
King
Ghost
Yakoun R.
WILSON
Cr.
LEGEND
STRATIFIED ROCKS
QUATERNARY
TERTIARY OR QUATERNARY
TOW HILL BASALT- alkaline basalt
TERTIARY
MIO-PLIOCENE
SKONUN FORMATION: sands, mudstone, sandstone, conglomerate, and lignite
PALEOCENE-EOCENE?
MASSET FORMATION: subaerial basalt flows and breccias, rhyolite ash flows, lesser basalt
TM- Undivided Masset Formation
Diabase Dyke Facies
TMb- Basalt member
TMr- Rhyolite member?
TMa- Mixed member
Hypabyssal Equivalents
Tmp- Feldspar porphyry
Tmg- Gabbro, diorite
CRETACEOUS
QUEEN CHARLOTTE GROUP (KS, Kha, Khs)
SKIDEGATE FORMATION: shaly siltstone, feldspathic sandstone, calcareous siltstone
HONNA FORMATION: conglomerate with granitic cobbles, arkosic grits, minor shale
ALBIAN-TURONIAN
HAIDA FORMATION: green glauconitic and grey sandstone, grey silty shale and siltstone, buff calcareous siltstone
NEOCOMIAN
LONGARM FORMATION: dark grey calcareous siltstone and fine clastic greywacke, angular fine conglomerate, minor volcanic rocks
VANCOUVER GROUP (JKu, JKv, JKs, JM, JY)
JURASSIC
BAJOCIAN-CALLOVIAN
YAKOUN FORMATION: porphyritic andesite agglomerate and flows, calcareous siltstone, tuffaceous sandstone and conglomerate, minor tuffaceous shale, coal
PLIENSBACHIAN-TOARCIAN
MAUDE FORMATION: grey blocky argillite and shale, grey green lithic sandstone
JURASSIC AND TRIASSIC
KARNIAN-SINEMURIAN
IOUNA FORMATION: massive grey limestone, thinly bedded limestone, thinly bedded argillite-undivided
Thinly bedded argillite member, minor limestone
Thinly bedded limestone member, minor argillite
Massive grey limestone member
Limestone members-undivided
TRIASSIC
KARNIAN AND OLDER
KARMUTSEN FORMATION: basalt massive flows, pillow lavas, pillow breccia and tuff, related sills, minor interbed limestone, volcanic sandstone and shale, amphibolitized equivalents
PLUTONIC ROCKS
CRETACEOUS AND TERTIARY
POST-TECTONIC PLUTONS: quartz monzonite, granite, granodiorite, quartz diorite
JURASSIC?
MIGMATITE: mixed hornblende diorite and amphibolite
Bedding (inclined, horizontal, vertical, overturned)
Bedding from photogeology (inclined, horizontal)
Primary foliation, plutonic rocks
Secondary foliation, schistosity, gneissosity, and cleavage
Joints (inclined, vertical)
Fold axes (anticline, syncline, arrow indicates direction of plunge)
Overturned fold axes (anticline, syncline)
Drag fold with plunge symbol on anticline
Direction of flow in volcanic rocks
Fault (defined, approximate)
Lineaments
Geological contact (defined, approximate, assumed)
Grooves and striations from photogeology
Striations and Roche Moutonée
Dip sea cliffs and shore lines
Beach ridges
Terrace and channel margins
Low tide limit of rocky shore line
Beaches and foreshore flats
Landslide
Important mineral prospect (see Figure 24 for complete list and locations)
Adit
Well (abandoned)
Fossil locality
Road
RENO CALABRIGO
VANCOUVER, B.C.
GENERAL GEOLOGY
QUEEN CHARLOTTE ISLANDS, BC
SKEENA M.D.
NTS 103 F/ 8E, 8W, 9E, 9W.
Scale: 1: 62,500
RIVER CLAIM
To Accompany Report by A. E. Roberts, P. Eng., dated December 10, 1980.

GEOPHYSICS [8] [9] [10] [11] [12] [13] [14]

This program, also done to cover assessment work, was done over a 200 metre by 25 metre grid on east-west lines.

A VLF-EM instrument, Sabre Model 27, Serial No. 103, made by Sabre Electronics Ltd. of Burnaby, B.C., was used, with Seattle, as the frequency supplying station, at 18.6 KHz.

A cross section of each line was plotted showing Dip Angle, Total Field, and Fraser Filter values.

A plan was plotted for each of Dip, Total Field, and Fraser Filter, then contoured.

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[8] Reports by A.F. Roberts, P.Eng., for Consolidated Cinola Mines; Qualifying, Geochemical, Geophysical Reports for other companies, 1977 to date.

[9] Appendix A - Operating Instructions, Sabre Model 27, VLF-EM receiver. Fraser Filter Calculations

[10] Contouring VLF-EM Data, D.C. Fraser; Geophysics Vol.34, No. 6, 1969

[11] Plate A - Plan, Dip Angle [Back Pocket]

[12] Plate B - Plan, Fraser Filter [Back Pocket]

[13] Plate C - Plan, Total Field [Back Pocket]

[14] Plate D - Cross Sections, Dip Angle, Fraser Filter, Total Field [Back Pocket]

The plans indicate, as contoured, an east-west trend for the conductors, with a slight bias to the north-east.

There are several zones of higher Field Strength, from 10% to 20% above the background of 50%.

These zones coincide with stronger zones of conductivity as shown by the Fraser Filter. Caution should be exercised in accepting these zones in crossing 200 metre spacing. That is enough to lose a mine in.

The two gold values, if the geochemistry locations are accepted, coincide with the edges of Fraser Filter conductors as do the mercury values.

The strongest coincidental zone is in the north-west section of the area surveyed and encompasses an area 14+50 to 19+00N, [450 metres], and from 7+00 West to 12+00 West [500 metres], approximately. On Line 10+00 West this same zone comes as far south as 10+00 North. This zone is open to the west.

Several smaller zones lie to the east at about the same levels. Detail surveying may show that they are closely related.

CONCLUSIONS

This reconnaissance survey has indicated an anomalous zone of approximate dimensions, 400 metres by 500 metres, with an east-west trend.

This is indicated by coincidence between Fraser Filter values, and Total Field values.

There is no geochemistry to back it up. It is possible that this could be a pyritic zone carrying gold values.

RECOMMENDATIONS

[1] In between the lines of this survey report the VLF-EM survey to give better detail. At the same time take soil samples at all stations.

[2] Take soil samples at all the stations of the previous VLF-EM survey.

ESTIMATED COSTS

Phase I

A contractor has given an estimate of $702.00/km for a VLF-EM and soil sampling surveys. This includes all costs, with a crew of three men and a cut base line.

Assaying is extra, as is the cost of employing an engineer.

Soil sampling alone, using an auger as required, is estimated at $500.00/km.

a] 12 km at $702.00	$ 8,424.00
b] 12 km at $500.00	6,000.00
Assaying - 960 samples @ $8.75 for gold, silver, arsenic, mercury	8,400.00
Engineering, supervision, reports, maps	3,000.00
	$25,824.00
15% contingencies	3,873.60
Total	$29,697.60

Say $30,000.00

Phase II

A follow-up program of trenching and/or diamond drilling will cost a minimum of $75,000.00.

Respectfully submitted,

A.F. Roberts, P. Eng.
December 10, 1980

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. ROBERTS

C E R T I F I C A T E

I, A.F. Roberts, of 812 Fairbrook Crescent, Richmond, British Columbia, do hereby certify that:

1] I am a graduate of the University of British Columbia, B.Ap.Sc., in Mining Engineering, 1951.

2] I am a Registered Professional Engineer of the Province of British Columbia; and am a Member of the Canadian Institute of Mining and Metallurgy.

3] I have practiced my profession since 1951, with Quatsino Copper-Gold Mines Ltd., Giant Mascot Mines Ltd., Cochenour-Willans Gold Mines Ltd., Mogul Mines Ltd., Kerr-Addison Gold Mines Ltd., Atlantic Coast Copper Corporation Ltd., Wasamac Mines Ltd., Brenda Mines Ltd., and T.C. Explorations Ltd.

Since January 1970, I have been an independent Consulting Engineer.

Previous to, and during University, I worked underground as a miner, and on several exploration-development projects.

4] The accompanying report is based entirely on my personal examination of the property and on material referred to in the text.

5] I have no interest, direct or indirect, in the River Claim, nor have I any interest, direct or indirect, in any companies with whom Mr. Reno Calabrigo may be associated. I have not, nor do I expect to receive any interest in the shares of any company, in its securities, or any company with which it may become associated.

6] I consent to the use of this report in, or in conjunction with, a prospectus, or a statement of material facts, relating to the raising of funds for this project.

DATED at Vancouver, British Columbia this tenth day of December, 1980.

A.F. Roberts, P.Eng.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. ROBERTS

STATEMENT OF COSTS

RIVER CLAIM [12 UNITS]

RECORD NO. 797

Direct Costs

Labour	$1,375.00	
E.M. Rental	50.00	
Transportation	125.00	$1,550.00

Personnel [July 27-August 9, 1980]

G. Smith
J. Higginson
B. Parker
W. Davidson
K. Alliksaar

The above data supplied by Strato Geological of Vancouver, B.C., the contractor.

Engineer's Report		736.42
	TOTAL	$2,286.42

The above is a true statement of the costs of this project.

A.F. Roberts, P.Eng.
December 10, 1980

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. ROBERTS

APPENDIX A

OPERATING INSTRUCTIONS

for

SABRE MODEL 27, VLF-EM

FRASER FILTER CALCULATIONS

A. F. ROBERTS, P.ENG.
CONSULTING MINING ENGINEER

SABRE ELECTRONIC
INSTRUMENTS LTD.

4245 EAST HASTINGS STREET • BURNABY, B.C. V5C 2J5 • TELEPHONE: 291-1617

SABRE MODEL 27 VLF-EM RECEIVER

The model 27 EM unit was designed originally for a large Canadian mining company to overcome the deficiencies inherent in existing units.

The instrument is so stable and selective that completely reliable measurements can be made on distant stations without interference from nearby powerful transmitters. Stability and selectivity are especially important when making field-strength measurements, which are now being emphasized as a means of locating conductors.

This EM receiver is very compact, requires no earphones or loudspeakers and is housed in a heavy scotch saddle leather case. All of these features add up to make an ideal one-man EM unit of unexcelled electrical performance and mechanical ruggedness.

SPECIFICATIONS

Source of Primary Field - VLF radio stations (12 to 24 KHz.)

Number of Stations - 4, selected by switch; Cutler, Main on 17.8 KHz. and Seattle, Washington on 18.6 KBz. are standard, leaving 2 other stations that can be selected by the user.

Types of Measurement

1. Dip angle in degrees, read on a meter-type inclinometer with a range of $\pm$ 60° and an accuracy of $\pm$ ½°.
2. Field strength, read on a meter and a precision digital dial with an accuracy exceeding 1%.
3. Out of phase component, read on the field strength meter as a residual reading when measuring the dip angle.

SABRE MODEL 27 VLF-EM RECEIVER - (Continued)

Dimensions and Weight

Approx. 9½" x 2½" x 8½"; Weighs 5 lbs.

Batteries

8 alkaline penlite cells. The instrument will run continuously on 1 set of batteries for over 200 hours; So that in normal on-off use, the batteries will last all season. The battery condition under load is shown by pushing a button and reading voltage on the field strength meter.

SELECTION OF STATIONS:

The stations are selected by the switch on the control panel, with the following abbreviations being used;

C = Cutler, Maine.	Frequency =	17.8 Khz.
S = Seattle, Wash.	Frequency =	18.6 Khz.
A = Annapolis, Md.	Frequency =	21.4 Khz.
H = Hawaii.	Frequency =	23.4 Khz.

The two most useful stations are Cutler and Seattle and these will be used almost exclusively. Note that Seattle is off the air for several hours on Thursdays for maintenance (between 10 A.M. and 2 P.M. usually). Cutler is off the air for the same length of time every Friday.

If Equipment fails to operate:

(a) Check that station is transmitting (see above). If one station appears to be dead, check another one to see if it is operating normally.

(b) Check batteries. If they read low or the reading begins to drop after the test button is held down for a few seconds, replace them. Note also that there are 8 batteries in the instrument and they cannot be individually checked by the test button. If the batteries have been in the unit for a long time it is possible that one is dead or very weak but that the total voltage indicated by the test button is near normal. It is cheap insurance to instal new batteries before starting a big survey.

(c) If unit still fails to operate check that battery connectors are tight, then check wiring of battery connectors for breaks or damage.

VLF-EM OPERATING INSTRUCTIONS

The equipment is operated in the usual way as follows:

1. With the instrument held horizontal in front of you, turn around until a null appears on the field strength meter. You should now be facing the station.

2. With the receiver still facing the station, lift it to the vertical position and rotate it slightly in the vertical plane to your right or left until the best null appears on the field strength meter. Record the angle on the inclinometer at which the null appears. This is the DIP ANGLE (Positive or negative).

3. Return the instrument to the horizontal plane and turn around until the field strength meter is at its maximum reading. Set this maximum reading at 100 on the meter and record the reading on the gain control dial. This is the Field Strength Reading.

4. Repeat steps 1, 2 and 3 at each station.

5. To test the batteries turn the power switch on and push the test button. The field strength meter should read above the red mark. Battery life is approximately 200 hours and if the instrument is turned off between readings, the batteries should last for an entire season.

NOTE: An alternative way of measuring field strength is as follows:

PREFERRED METHOD >

Proceed as in step 3, setting the meter to 100. Now push the field strength button (marked FS) and the meter will read 50. (If it doesn't, adjust the gain control slightly). Leave the Gain Control setting where it is and take comparative Field Strength readings at each station by pressing the Field Strength button and recording the meter reading, which will vary from its Base Station Reading as you pass over conductive zones.

DETAILED

OPERATING INSTRUCTIONS
SABRE VLF-EM RECEIVER

INTRODUCTION:

The VLF-EM method utilizes electromagnet field transmitted from radio stations in the 15-25 K Hz range. The signals are propagated with the magnetic component of the field being horizontal in undisturbed areas.

Conductivity contrasts in the earth create secondary fields, producing a vertical component and changes in the field strength or amplitude. These conductive areas may be located, and to a degree, evaluated by measuring the various parameters of this electromagnetic field.

The Sabre VLF-EM receiver is tuned to receive any 4 transmitter stations: usually C-Cutler Maine, S-Seattle, H-Hawaii and P-Panama.

The station used in the survey should be selected so that the direction of the signal is roughly perpendicular to the direction of the grid lines which, in turn, should be laid out perpendicular to the regional strike.

MEASUREMENTS:

The Sabre VLF-EM receiver can be used to measure the following characteristics of the VLF field.

(a) Tilt angle of resultant field;

(b) Field strength of (a) horizontal component of field
(b) vertical component of field

Field Procedure

The following procedure should be followed to measure the dip angle of null and the field strength of the horizontal component of the VLF field.

Initial Field Strength Adjustment

Adjust the gain control to provide a suitable relative field strength measurement, as follows:-

(a) hold receiver in horizontal position (meter faces horizontal) and rotate in a horizontal plane until a null is indicated on the F.S. meter; rotate 90° in this horizontal plane (F.S. meter reads maximum)

(b) adjust fain control so that the F.S. meter reads 100

(c) record gain control setting (000 to 999). Close guard over gain control and do not readjust unless a major field strength occurs.

The above procedure should be carried out at the beginning of each day's survey and checked during the day.

Dip Angle Measurement Procedure

1. Hold receiver in horizontal position and rotate in the horizontal plane until a null is observed. This aligns receiver in the field and the operator should be facing southerly or easterly depending on transmitter location.

2. Bring receiver up to the vertical position (meter faces vertical) and rotate the receiver in the vertical plane perpendicular to the transmitter direction until a null or minimum reading is observed on the field strength meter.

3. Hold the receiver in this field strength null position and read the inclinometer in degrees. Record this dip angle of null along with sign (+ or -).

Horizontal Field Strength Measurement Procedure

1. Return receiver to the horizontal position.
2. Reestablish null bearing in horizontal plane.
3. Rotate receiver 90° in the horizontal plane.
4. Depress damp push button switch and observe field strength meter reading for sufficient time to obtain an average F.S. meter reading. (depressed damp switch slows needle action and reduces meter reading by half. The reading will normally range around 50).
5. Record F.S. reading.

Filtering Techneque For VLF-EM Dip Angle Data

The standard profile method of presenting dip angle data may be difficult to interpret. A filtering technique, described by D.C. Fraser 1969 (Geophysics, V.34 No. 6,P. 958-967) enables the data to be presented on a plan map with conductive areas defined by contours.

The following explains the calculation:-

Line	Station	Null			Filter
8N	0 E	+ 3	+3+4=	+7	
	1 E	+ 4	+4+4=	+8	+7-(+10)= -3
	2 E	+ 4	+4+6=	+10	+8-(+13)= -5
	3 E	+ 6		+13	+10-(+16)= -6
	4 E	+ 7		+16	-8
	5 E	+ 9		+21	-12
	6 E	+ 12		+28	+3
	7 E	+ 16		+18	+30
	8 E	+ 2		-2	+32
	9 E	- 4		-14	+14
	11 E	- 6	-6-1=	-16	-14-(-7)= -7
	12 E	- 1		-7	

Fig. 1 is an example of a field sheet showing null angle reading, filtered reading and relative field strength. Fig. 2 shows the field sheet with filter card overlaid. The small window in the side of the card shows the four readings used to calculate the filtered reading, and an arrow showing that the filter reading fs to be plotted between station 8E and 9E as indicated in fig. 1. The card is moved down the field sheet, one reading at a time as a guide while carrying out the filtering procedure. Throughout the survey care must be taken to ensure that the filtered data has the correct sign. The positive values only are plotted and contoured while for negative values, only the negative sign is plotted.

Crone suggests in instructions for the Radem VLF-EM, the use of N-S or E-W notation instead of (+ or -) signs, however for filtering a sign must be substituted.

The following convention may be used to ensure the correct sign of filtered data and provide a consistent crossover pattern when studying the profiled null angle data.

1. When taking a reading, always face southerly, on east-west lines, and always face easterly on north-south lines.

2. Record data on field sheets (top to bottom) as follows: on N-S lines record from south to north
: on E-W lines record from west to east

3. Plot and profile dip angle data on plan maps facing map north or map west.

The above convention will provide correct data regardless of the property location relative to the transmitter being used.

J.T. WALKER

MAY 17, 1974

VLF-EM SURVEY

Grid — 0 2+

PROPERTY Gross TRANS Seattle PAGE 1
OPERATOR _____ INSTR. Sapre DATE Nov 4/74

Line	Sta.	Null	Filter	F. S.	
8N	0E	+3		50	
	1E	+4	-3	50	
	2E	+4	-5	52	
	3E	+6	-6	52	
	4E	+7	-8	52	
	5E	+9	-12	52	
	6E	+12	+3	52	
	7E	+16	+30	60	
	8E	+2	+32	65	X over
	9E	-4	+11	62	
	10E	-10	-7	50	
	11E	-6	-10	48	
	12E	-1	+14	48	
	13E	+2	-6	50	
	14E	+4	-1	52	
	15E	+4	+6	50	
	16E	+4	+13	55	X over
	17E	-2	+1	55	
	18E	0	-2	50	
	19E	+1			
	20E	-1			

Fig. 1 Example of Field Sheet

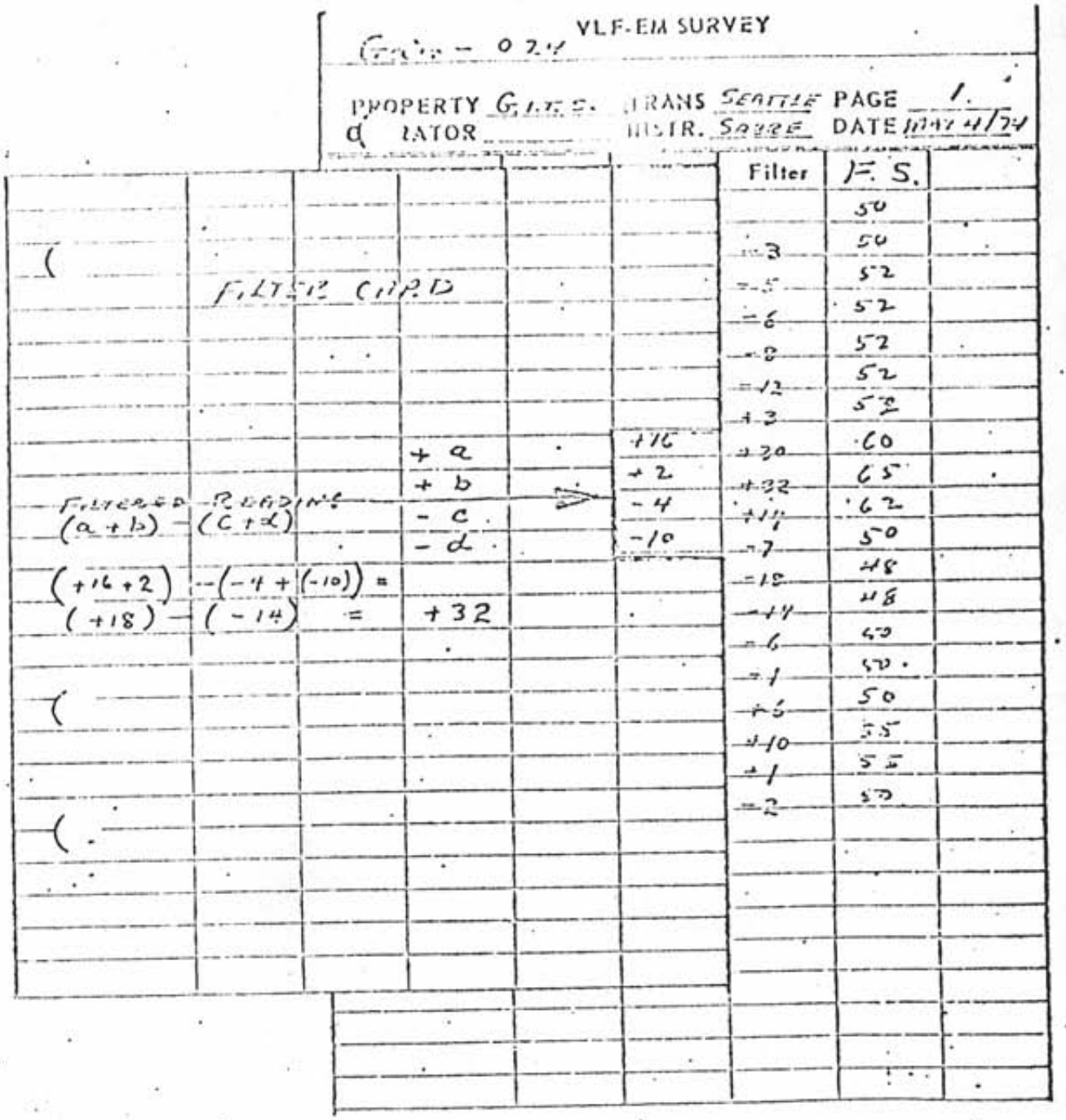

Fig. 2 Field Sheet with Filter Card Overlayed

Dip Angle

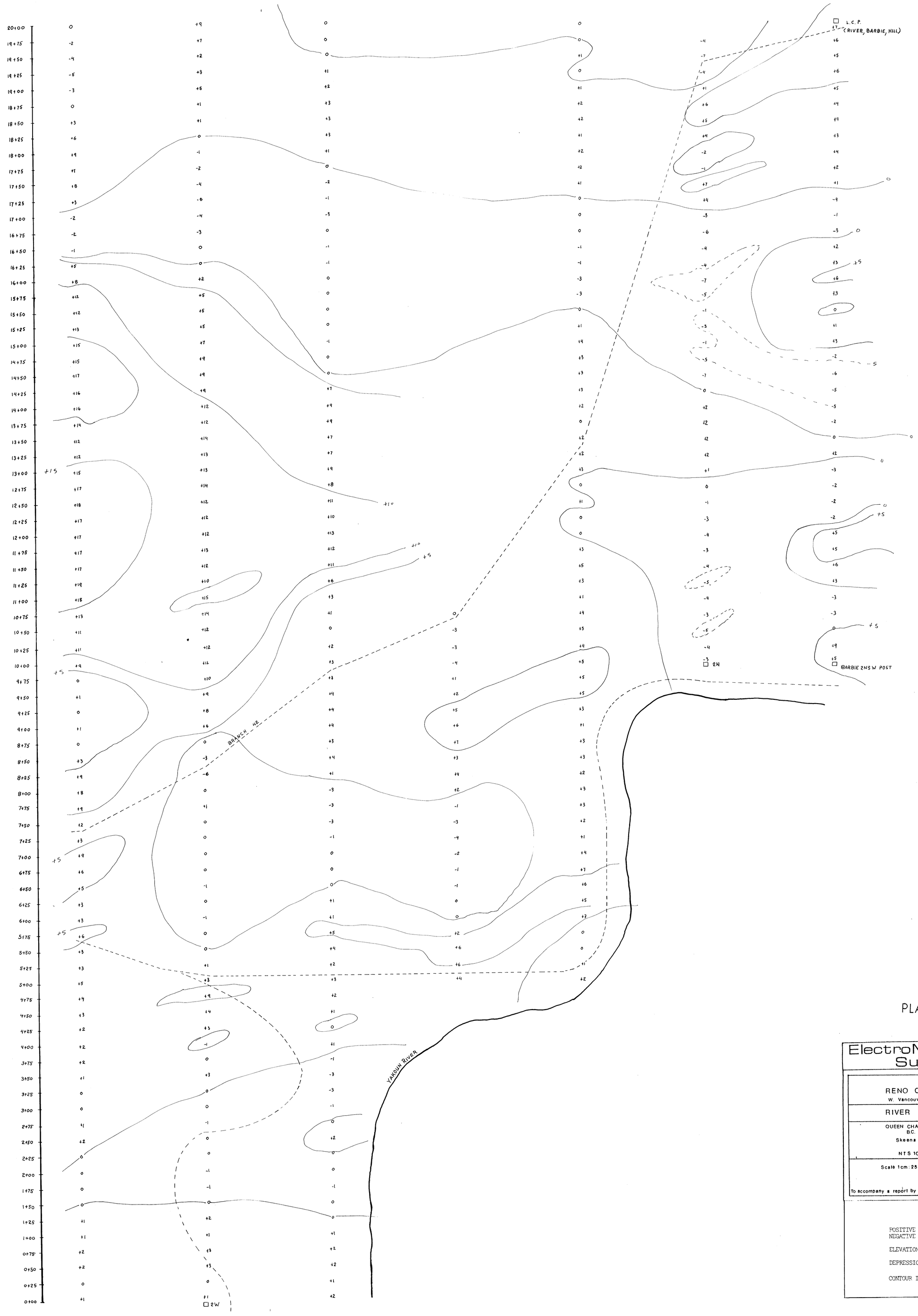

PLATE A

ElectroMagnetic Survey

RENO CALABRIGO
W. Vancouver, B.C.

RIVER CLAIM

QUEEN CHARLOTTE ISLANDS
B.C.
Skeena M.D.

NTS 103F/8E,9F

Scale 1cm:25m

To accompany a report by A.F. Roberts P. Eng Dec 10, 1980

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. F. ROBERTS

LEGEND

POSITIVE AREAS
NEGATIVE AREAS
ELEVATION
DEPRESSION

CONTOUR INTERVAL 5

FILTER

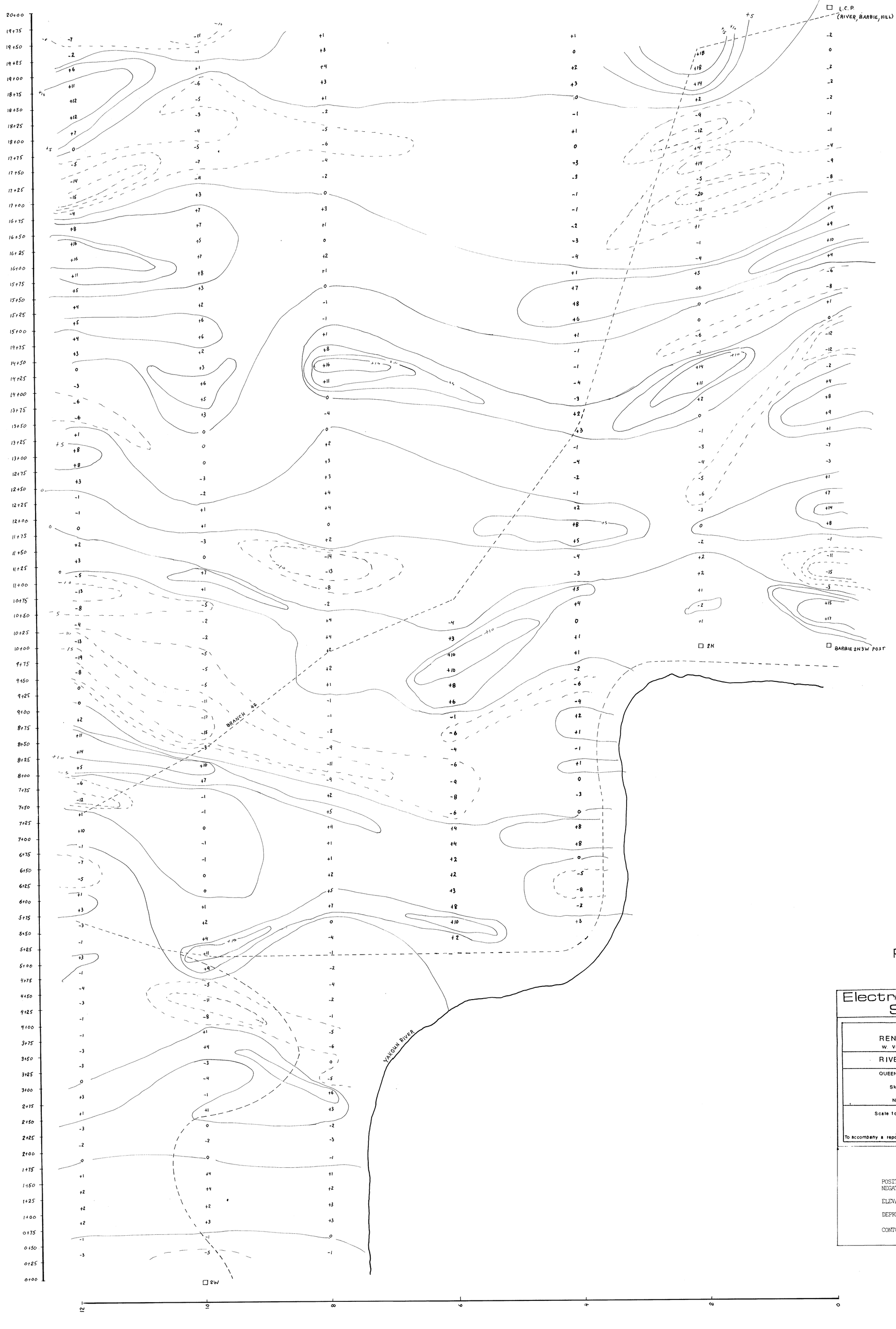

PLATE B

ElectroMagnetic Survey

RENO CALABRIGO
W. Vancouver, B.C.

RIVER CLAIM

QUEEN CHARLOTTE ISLANDS
B.C.
Skeena M.D.

NTS 103 F/8E,9F

Scale 1cm : 25m

To accompany a report by A.F. Roberts P. Eng Dec 10, 1980

LEGEND

POSITIVE AREAS
NEGATIVE AREAS
ELEVATION
DEPRESSION

CONTOUR INTERVAL 5

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8586

8586

FIELD STRENGTH

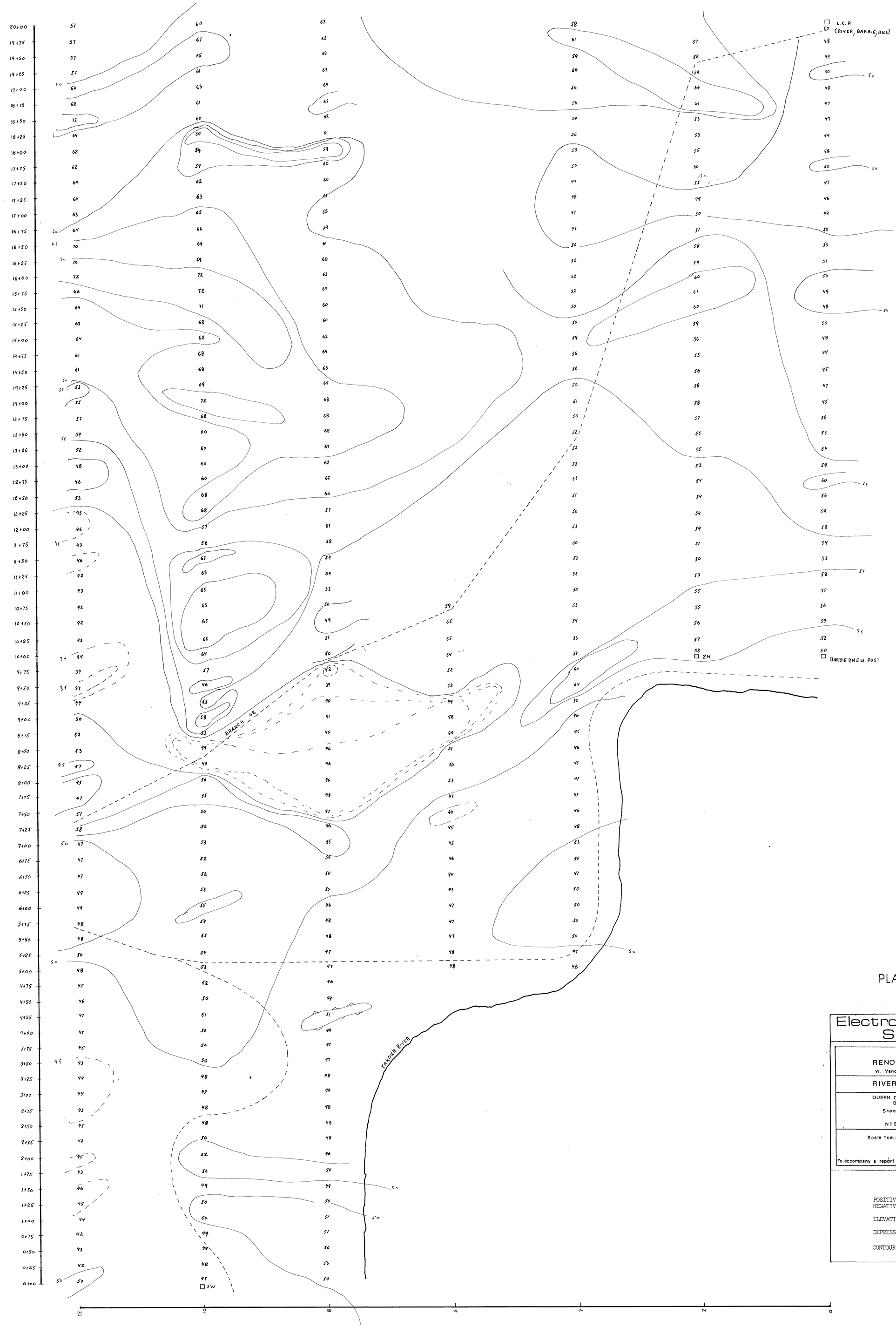

PLATE C

ElectroMagnetic Survey

RENO CALABRIGO
W. Vancouver, B.C.

RIVER CLAIM

QUEEN CHARLOTTE ISLANDS
B.C.
Skeena M.D.

NTS 103 F/8E,9F

Scale 1cm: 25m

To accompany a report by A.F. Roberts P. Eng. Dec 10, 1980

LEGEND

POSITIVE AREAS
NEGATIVE AREAS
ELEVATION
DEPRESSION

CONTOUR INTERVAL 5

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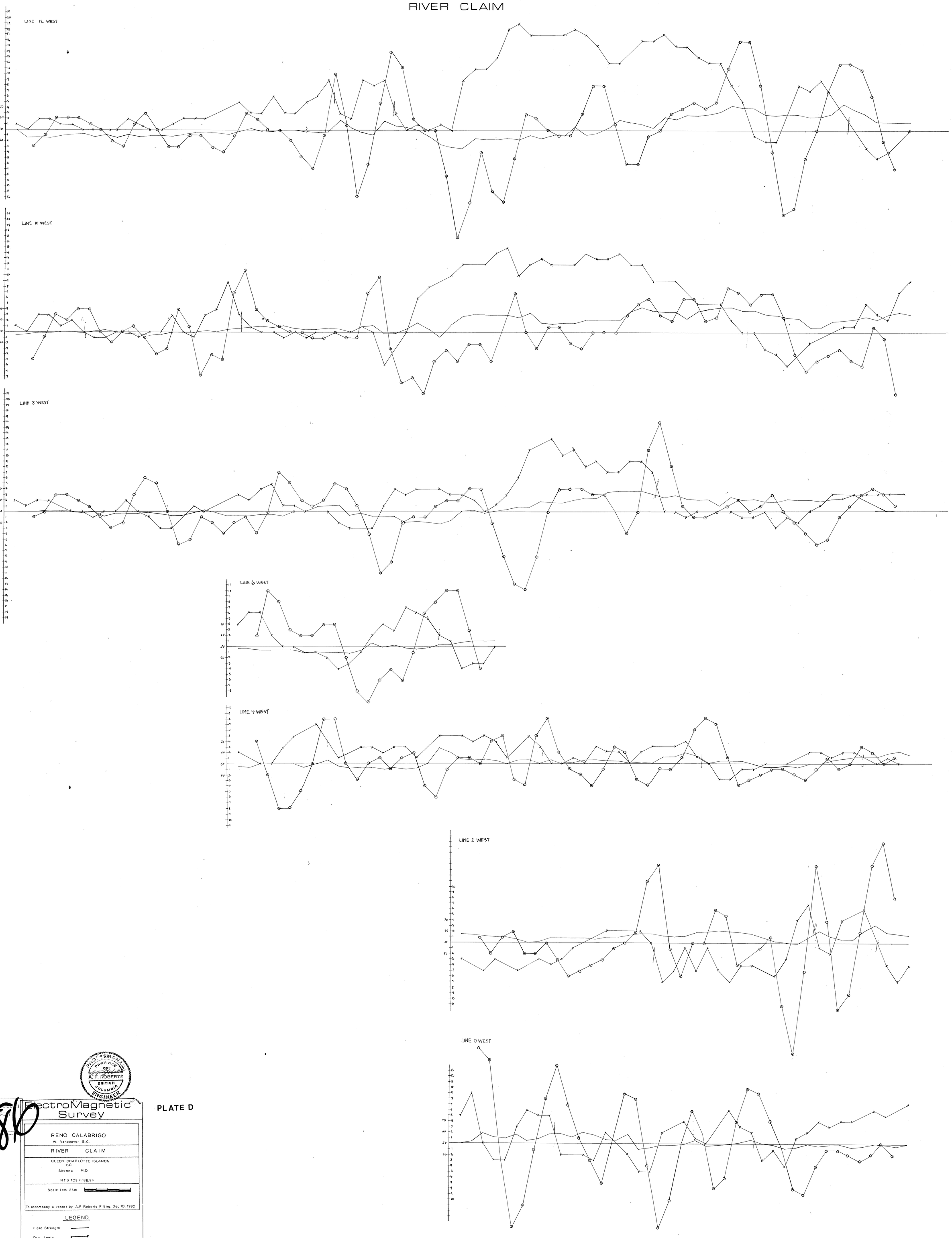
RIVER CLAIM



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MINERAL RESOURCES BRANCH
Assessment Report

8580

ElectroMagnetic Survey

RENO CALABRIGO
W. Vancouver, B.C.

RIVER CLAIM

QUEEN CHARLOTTE ISLANDS
B.C.
Skeena M.D.

N.T.S. 103 F/8E,9F

Scale 1cm 25m

To accompany a report by A.F. Roberts P.Eng. Dec 10, 1980

LEGEND

Field Strength

Dip Angle

Filter

PLATE D