85-968-14118

GEOPHYSICAL REPORT

ON THE

FIRESTEEL CLAIM

TOODOGGONE RIVER AREA

OMINECA MINING DIVISION

94E/2W

($57^{\circ}04'$ N. Latitude, $126^{\circ}45'$ W. Longitude)

FOR

SEREM INC.

21st FLOOR - 1055 W. GEORGIA ST.

VANCOUVER, B.C.

(OWNER AND OPERATOR)

BY

MOHAN VULIMIRI, B.Sc., M.Sc.

AND

GRANT CROOKER, B.Sc., F.G.A.C.

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ILLUSTRATIONS

INTRODUCTION

General

Field work was carried out on the property by Grant Crooker and Sheila Keilbach, geologists, from August 10th through August 12th, 1985.

A VLF-EM survey was carried out over the northern section of the claims.

Location and Access

The Firesteel claim is located between 57°03' and 57°05' north latitude and 126°44' and 126°46' west longitude in the Firesteel River - Thutade Lake area, Toodoggone River Map Sheet, 94E-2W, Omineca Mining Division, B.C. (Figures 1 and 2).

Access to the property is by fixed wing aircraft from Smithers to Sturdee Airstrip, a distance of 280 kilometers, and from Sturdee Airstrip to the property by helicopter, a distance of 15 kilometers.

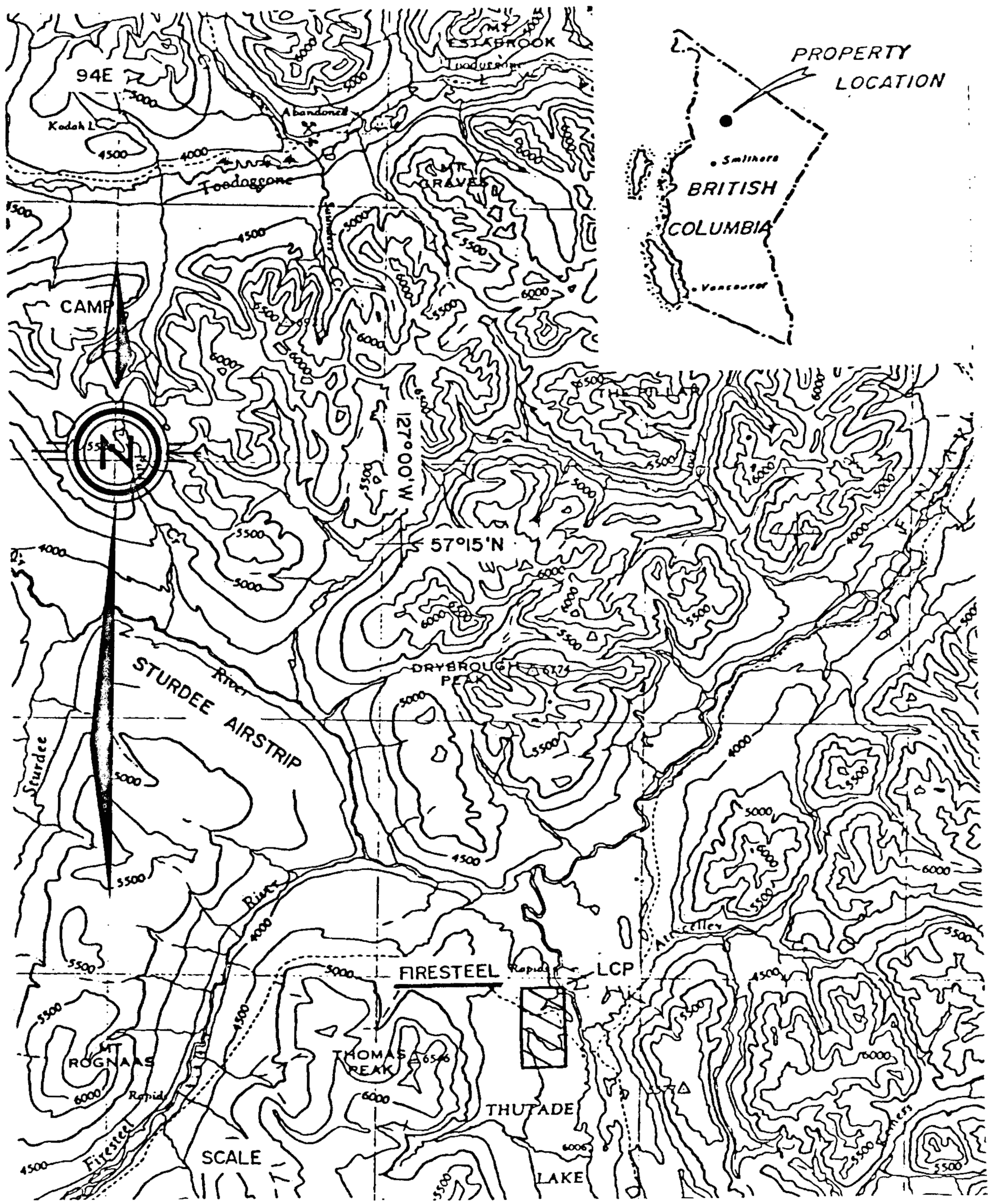
Physiography

Topography is gentle, with several small hills, elevation is approximately 2200 meters above sea level. Outcrop varies from 0% to 40%, and much of the property is covered by glacial till.

Fir and spruce cover most of the property, and deadfall is plentiful.

Property and Claim Status

The claim (Figure 2) is owned and operated by Serem Inc., Box 11175, Royal Centre, 1055 West Georgia St., Vancouver, B.C.



0 5 10 15 KMS.
scale

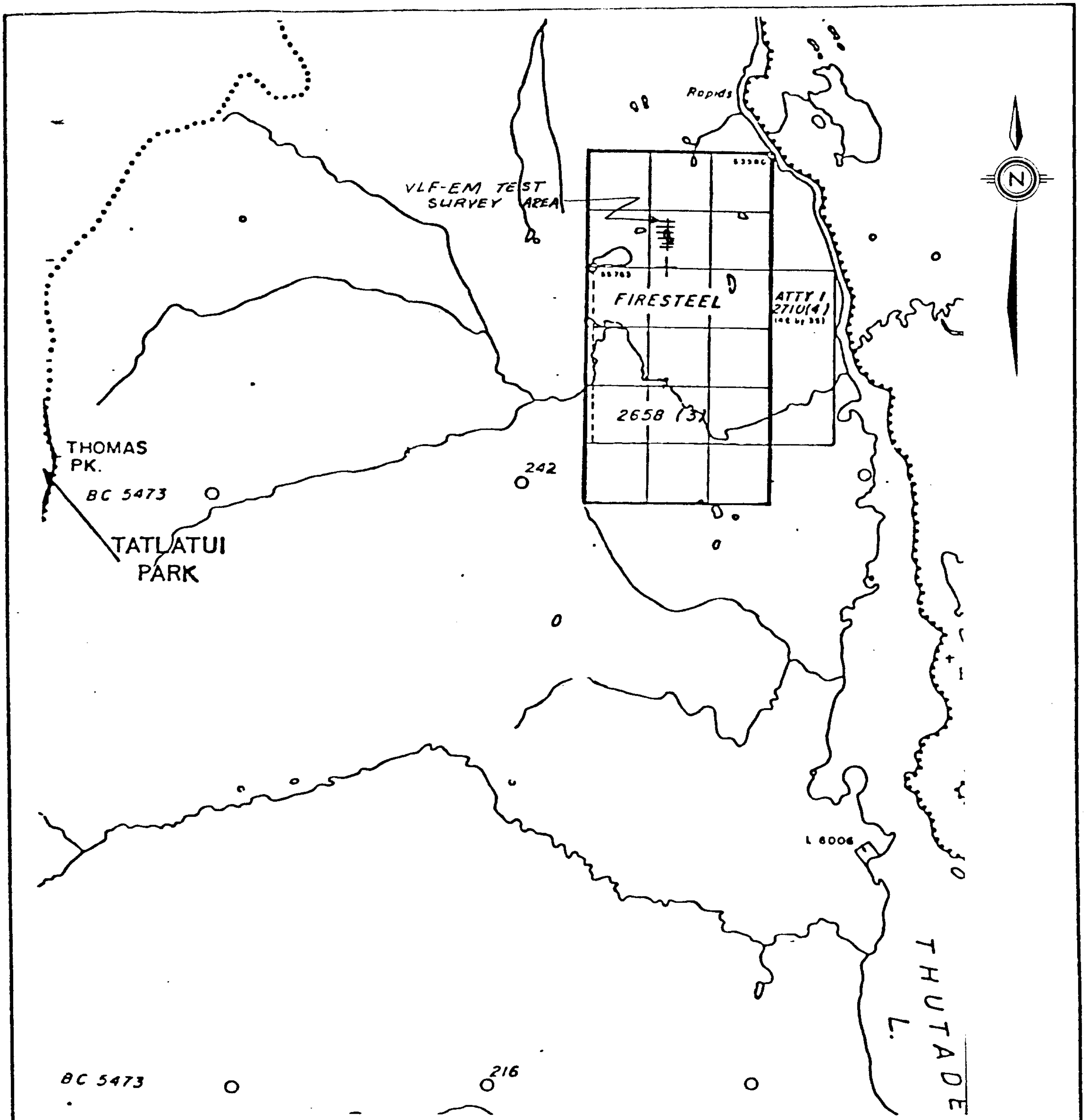
VANCOUVER, B.C.

SEREM INC.

FIRESTEEL CLAIM

LOCATION MAP

DRAWN BY : G. CROOKER	N.T.S. : 94E/2W
DATE : Nov. 1985	FIGURE Nº. 1



0 1 2 3 KMS.

scale

VANCOUVER, B.C.

SEREM INC.

FIRESTEEL CLAIM

CLAIM MAP

DRAWN BY : G. CROOKER	N.T.S. : 94E/ 2W
DATE : NOV. 1985	FIGURE Nº. 2

Claim	Unit	Record No.	Record Date
Firesteel	18	2658	March, 1980

Property History

Previous work on the claims goes back to 1931, when Cominco staked the ground. Trenching, prospecting, and geological mapping were carried by Cominco in 1931-1933 and 1944-1946 to try and locate the source of lead-zinc float at the north end of the Firesteel claim (Calcine Showing). Silver bearing quartz veins were also found at the south end of the Firesteel claim.

From 1957 through 1972, a number of companies (Granby, Newconex, and El Paso Mining and Milling) carried out x-ray diamond drilling (approximately 15 holes, 676 meters) trenching, soil sampling, electro-magnetic surveying, geological mapping, etc. No economic mineralization was encountered.

In 1980 Serem staked the ground, established a grid, and carried out soil sampling and preliminary geological mapping and prospecting. A number of samples returned anomalous silver, gold, lead and zinc values.

In March 1985 a reconnaissance electro-magnetic survey was carried out over the Calcine Showing. Several electro-magnetic conductors were indicated. This survey is a continuation of the earlier program. For detailed results the earlier assessment reports can be referred to.

EXPLORATION PROCEDURE

Work in 1985 consisted of a VLF electro-magnetic survey on the Firesteel claim. The purpose of the survey was to delineate and structural features associated with the silver-lead-zinc mineralization at the Calcine Showing.

The old grid established in 1980 was re-established as closely as possible to the original. The baseline was ran at 160°-340° for 350 meters, and crosslines were ran at 50 meter intervals. A total of 6.64 kilometers of crosslines were established.

Approximately 6.6 kilometers of VLF-EM surveying were carried out, with readings taken every 20 meters along the lines. A Geonics EM-16 was used as a receiver, with NLK, Seattle, Washington, at 24.8 KHz the transmitter. This transmitter was used due to its good signal strength and orientation to the geological structures.

The EM-16 measures In-phase and Quadrature components of vertical magnetic field as percentage of horizontal primary field. (That is tangent of the tiltangle and ellipticity). Both values are given in percentages. Field procedure requires to always face the same direction when taking readings. When approaching a conductor the readings will be positive, and when leaving a conductor the readings will be negative. The EM-16 is rotated in the vertical plane until a minimum signal is obtained. This reading is the "In-phase" and gives the tiltangle in degrees and the tangent of the tiltangle expressed as percent. Once this minimum signal is obtained, the "Quadrature" knob is rotated until the signal minimum is obtained. This reading is approximately the ratio of the quadrature component of the vertical secondary field to the horizontal primary field.

The VLF-EM can pick up conductors caused by electrolyte-filled fault or shear zones and porus horizons, graphite, carbonaceous sediments, lithological boundaries as well as sulphide bodies.

The In-phase and Quadrature data were plotted as percentages on Figure 3 at a scale of 1:1250. The Fraser filter method was then applied to the In-phase data, and the results plotted at a scale of 1:1250 on Figure 4.

A compilation map (Figure $) at a scale of 1:5000 was prepared to show the conductors in relation to the geology.

GEOLOGY

The claims are underlain by limestone and mafic volcanics (Figure 5). The Geological Survey of Canada has assigned the limestone to the Permian Asitka Group and the volcanics to the Upper Triassic Takla Group (Gabrielse etal, 1975). However, geological mapping by Seren indicates some of the volcanic rocks are contemporaneous with the limestone, and thus the ages should be re-determined.

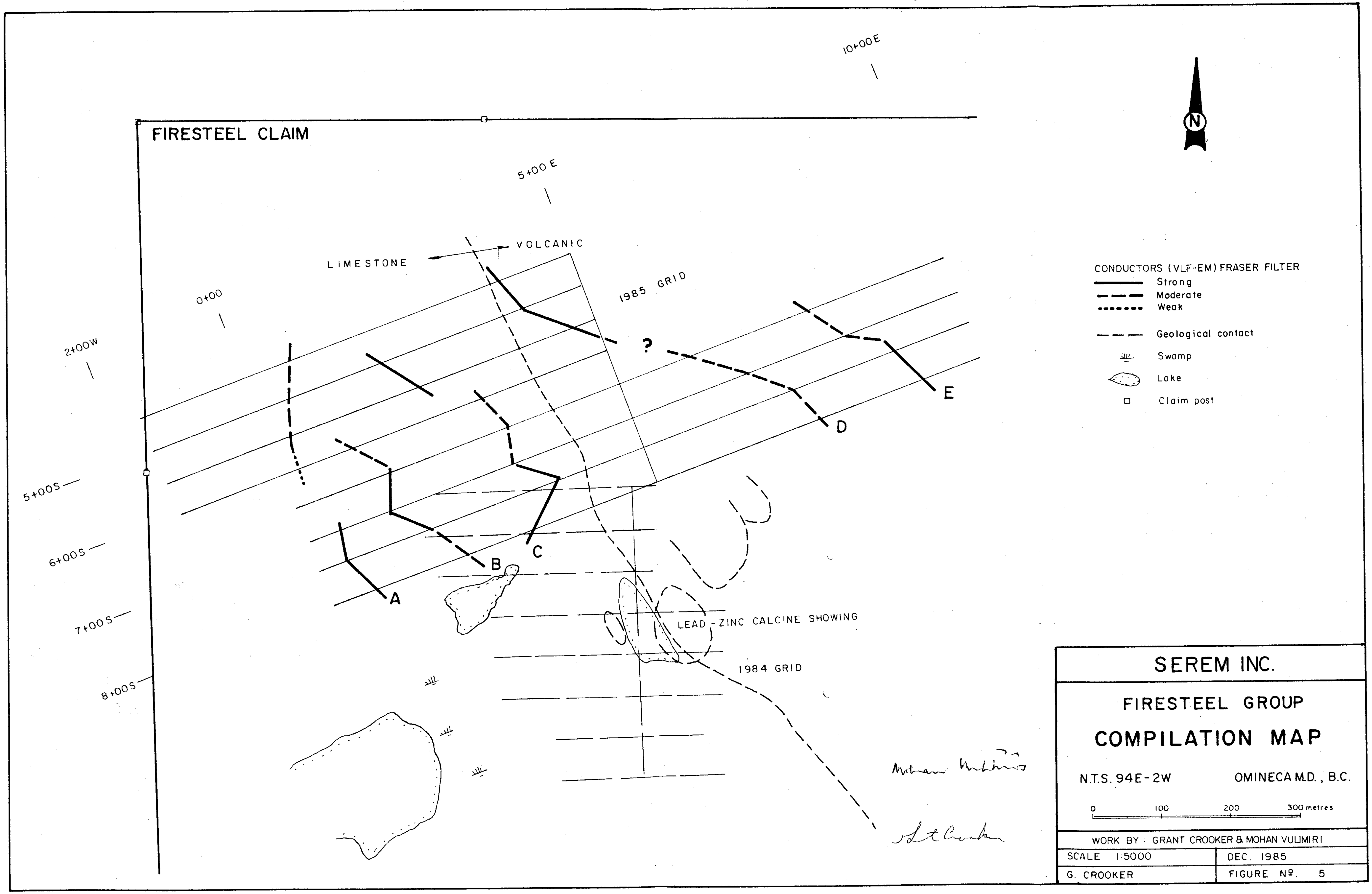
The limestone is generally pale grey, massive and recrystalized. Narrow bioclastic horizons contain well preserved crinoids and branching corals. Minor pyrite is also present in places. Solution breccia, consisting of angualr limestone fragments chaotically dispersed in a calcite matrix occurs discontinuously along a zone parallel to the limestone-volcanic contact.

The volcanics consist of darkgreen mafic tuff, lapilli tuff and plagioclase-porphyry lava. Greywacke, chert and volcaniclatic conglomerate with rare limestone clasts are associated with the volcanics.

In general, beds dip moderately to the west. Major faults trend 140° to 170° azmuth, with a second set trending at 060°.

Lowgrade skarn is developed at the volcanic limestone contact.

Mineralization at the Calcine Showing consists of sphalerite-chalcopyrite-galena clasts in a zinc rich carbonate matrix. The conglomerate fills a circuliar depression in realatively barren limestone. Average grade is approximately 1.0 oz/ton silver, 0.3 % copper and 10% zinc. Limestone in the area contains minor amounts of galena, sphalerite, chalcopyrite and pyrite, but no source has been found for the high grade material.


FIRESTEEL CLAIM
10+00E
5+00E
0+00
2+00W
5+00S
6+00S
7+00S
8+00S
LIMESTONE
VOLCANIC
1985 GRID
?
A
B
C
D
E
LEAD-ZINC CALCINE SHOWING
1984 GRID
N
CONDUCTORS (VLF-EM) FRASER FILTER
Strong
Moderate
Weak
Geological contact
Swamp
Lake
Claim post
SEREM INC.
FIRESTEEL GROUP
COMPILATION MAP
N.T.S. 94E-2W
OMINECA M.D., B.C.
0 100 200 300 metres
WORK BY: GRANT CROOKER & MOHAN VULIMIRI
SCALE 1:5000
DEC. 1985
G. CROOKER
FIGURE Nº. 5
CHONG

Freibergite-bearing quartz veins occur to the south of the grid, but mineralization was considered too erratic to be economic.

GEOPHYSICIS

The Fraser Filter method was applied to all In-phase readings to allow contouring of the data. The results were contoured at 10 percent intervals.

Five moderate to strong conductors (Figures 4 and 5) were delineated. These conductors generally strike 300^{o} to 340^{o} which is the same general direction as major faulting indicated by previous geological mapping.

Conductors D and E are moderate to strong conductors within the volcanics and are probably due to faults or low grade skarns.

Conductors A, B, and C are moderate to strong conductors occurring within the limestone. These conductors are probably due to faults or sulphide bodies. As no source has been found for the sulphide rubble at the Calcine Showing, the 3 conductors warrant detailed investigation. Conductor C may be related to the Calcine Showing.

CONCLUSIONS AND RECOMMENDATIONS

The August 1985 VLF electro-magnetic survey delineated 5 conductors. Conductors C and D are located within the volcanics and are probably related to faults. They are not considered significant.

Conductors A, B, and C are located within the limestone and may be significant. They may be related to faults or sulphide bodies. Conductor C may be related to sulphide mineralization at the Caline Showing.

Recommendations are to continue the VLF electromagnetic survey to the southern part of the claim. Detailed prospecting and geological mapping should be carried out along the conductors.

As outcrop exposure is generally poor over the area of limestone, any conductors found to be associated with sulphide mineralization should be trenched with back-hoe and diamond drilled.

Respectfully submitted,

Mohan Vulimiri

Mohan Vulimiri, B.Sc.,(Hons), M.Sc.

Grant Crooker

Grant Crooker, B. Sc., F.G.A.C.

REFERENCES

ASSESSMENT REPORT 4200; - British Columbia Ministry of Energy, Mines and Petroleum Resources.

CRAWFORD, S.A. and VULIMIRI, M.R., (1980) - Geochemical and Geological Report on the Firesteel Claim.

FAHRNI, K.C., (1958) - Reprot on the Firesteel Claims submitted to Granby Consolidated Mining, Smelting and Power Co. Ltd.

JOHNSON, A.E., (1962) - Norpex, Ltd. Report on the Calcine Showing, Firesteel Group, Thutade Lake, Cassiar District, B.C.

LEMMON, T.C., (1972) - Report on the 1972 Fieldwork on Firesteel Porperty, Thutade Lake, Omineca Mining Division, B.C. (Noranda Mines Ltd.)

PENTLAND, A.G., (1947) - The Consolidated Mining and Smelting Company of Canada Ltd. Engineering Report No. 2, Calcine.

TEGART, P.C., (1985) - Geophysical Report on the Firesteel Claim.

CERTIFICATE OF QUALIFICATIONS

I, Grant F. Crooker, of Upper Bench Road, Keremeos, in the Province of British Columbia, hereby certify as follows:

1) That I graduated from the University of British Columbia in 1972 with a Bachelor of Science Degree in Geology.

2) That I have prospected and actively pursued geology prior to my graduation and have practised my profession since 1972.

3) That I am a member of the Canadian Institute of Mining and Metallurgy.

4) That I am a Fellow of the Geological Association of Canada.

5) That I have no direct or indirect interest in the property.

Dated this 28 day of Nov. , 1985, at Vancouver, in the Province of British Columbia.

Grant F. Crooker, B.Sc., F.G.A.C.
Geologist

CERTIFICATE OF QUALIFICATIONS

I, Mohan R. Vulimiri, of 1120 Heywood Street, North Vancouver, in the Province of British Columbia, hereby certify as follows:

1) I am a graduate with a B.Sc. (Hons) degree from the Indian Institute of Technology, Kharagpur.

2) I am a graduate with a M.Sc. (Economic Geology) degree from the University of Washington.

3) I am involved in mineral exploration in British Columbia, and have been since 1970, and I have acted in responsible positions since 1974.

4) I have no direct or indirect interest in the property.

Dated this 28 day of Nov. , 1985, at Vancouver, in the Province of British Columbia.

Mohan Vulimiri

Mohan R. Vulimiri, B.Sc., M.Sc.
Geologist

DETAILED COST STATEMENT

WAGES

1 Geologist, G. Crooker 6 days @ $300.00 per day Aug. 10-12, Ñov. 14-16, 1985	$1,800.00
1 Geologist,M Vulimiri. 1 days @ $300.00 per day Ñov. 14, 1985	300.00
1 Geologist, S. Keilbach 3 days @ $200.00 per day Aug, 10-12, 1985	600.00

CAMP COSTS (includes groceries, camp supplies, camp equipment, radio, expediting etc.)

G. Crooker, 3 days @ $50.00 per day Aug. 10-12, 1985	150.00
S. Keilbach, 3 days @ $50.00 per day Aug. 10-12, 1985.	150.00

TRANSPORTATION

Helicopter (Hughes 500D) 2.1 hours charter @ $450.00 per hour	945.00
2.1 hours fuel @ $115.00 per hour	241.50
Fixed Wing *(Smithers to Sturdee Strip) 3 days @ $72.50 per day Aug. 10-12, 1985	217.50
Mob. and Demob.* 3 days @ $78.25 Aug. 10-12, 1985	234.75

SUPPLIES (flagging, topofil thread, etc.) 25.00

INSTRUMENT RENTAL

Geonics EM-16R 3 days @ $25.00 per day	75.00

PREPARATION OF REPORT (secretarial, draughting, reproduction, etc.)	500.00
TOTAL	$5,238.75

* Mobilization and demobilization costs and Fixed Wing costs are pro-rated over 7 projects in the Toodoggone covering 44 days.

GEONICS LIMITED
1745 Meyerside Drive, Unit 8, Mississauga, Ontario, Canada L5T 1C5 Tel. (416) 676-9580 Cables: Geonics

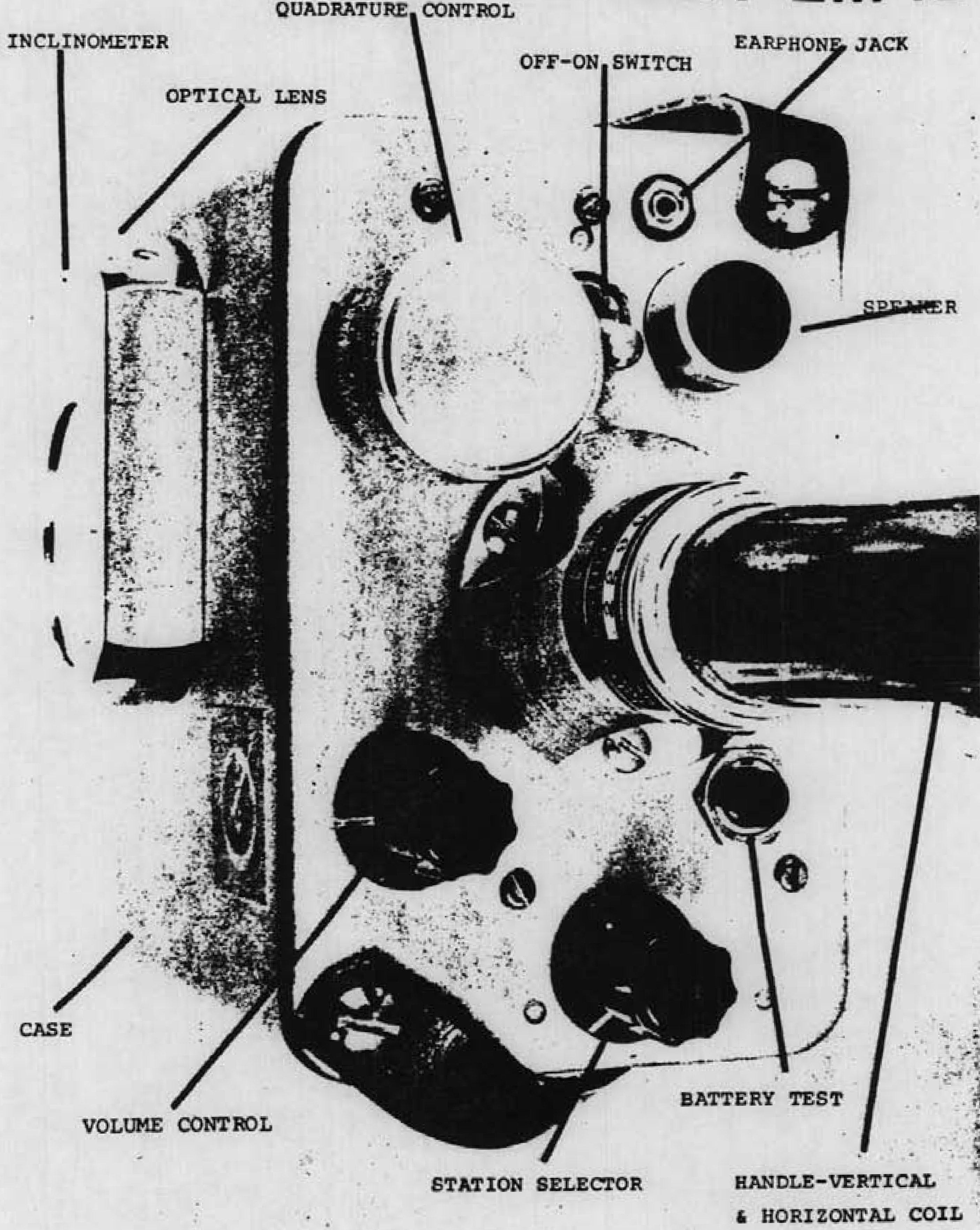
OPERATING MANUAL
for
EM16 VLF-EM

Revised Jan.1979

EM16 SPECIFICATIONS

MEASURED QUANTITY	In-phase and quad-phase components of vertical magnetic field as a percentage of horizontal primary field. (i.e. tangent of the tilt angle and ellipticity).
SENSITIVITY	In-phase :±150% Quad-phase :± 40%
RESOLUTION	±1%
OUTPUT	Nulling by audio tone. In-phase indication from mechanical inclinometer and quad-phase from a graduated dial.
OPERATING FREQUENCY	15-25 kHz VLF Radio Band. Station selection done by means of plug-in units.
OPERATOR CONTROLS	On/Off switch, battery test push button, station selector switch, audio volume control, quadrature dial, inclinometer.
POWER SUPPLY	6 disposable 'AA' cells.
DIMENSIONS	42 x 14 x 9cm
WEIGHT	Instrument: 1.6 kg Shipping : 4.5 kg

FIG. 1 EM 16


QUADRATURE CONTROL
INCLINOMETER
OFF-ON SWITCH
EARPHONE JACK
OPTICAL LENS
SPEAKER
CASE
VOLUME CONTROL
BATTERY TEST
STATION SELECTOR
HANDLE-VERTICAL
& HORIZONTAL COIL

PRINCIPLES OF OPERATION

The VLF-transmitting stations operating for communications with submarines have a vertical antenna. The Antenna current is thus vertical, creating a concentric horizontal magnetic field around them. When these magnetic fields meet conductive bodies in the ground, there will be secondary fields radiating from these bodies. (See Figures 3 & 4). This equipment measures the vertical components of these secondary fields.

The EM16 is simply a sensitive receiver covering the frequency band of the VLF-transmitting stations with means of measuring the vertical field components.

The receiver has two inputs, with two receiving coils built into the instrument. One coil has normally vertical axis and the other is horizontal.

The signal from one of the coils (vertical axis) is first minimized by tilting the instrument. The tilt-angle is calibrated in percentage. The remaining signal in this coil is finally balanced out by a measured percentage of a signal from the other coil, after being shifted by 90°. This coil is normally parallel to the primary field,(See instrument Block Diagram - Figure 2).

Thus, if the secondary signals are small compared to the primary horizontal field, the mechanical tilt-angle is an accurate measure of the vertical real-component, and the compensation $\pi/2$-signal from the horizontal coil is a measure of the quadrature vertical signal.

Some of the properties of the VLF radio wave in the ground are outlined by Figures 4 thru 9.

ACCOMPANYING NOTES FOR FIGURES 2 - 9

FIGURE 2 is the block diagram of the EM16. The diagram is self-explanatory. Both the coils (reference and signal coil) are housed in the lower part of the handle. The directions of the axis of the coils are as follows: The reference coil axis is basically horizontal and is kept more or less parallel to the primary field during measurement. The signal coil is at right angles to the reference coil and its axis is, of course, vertical.

The signal amplifier has the two inputs, one connected to the signal coil and one to the reference channel. By tilting the coils, the operator minimizes the signal from the signal (vertical axis) coil. Any remaining signal is reduced to zero by the quadrature control in the reference channel. The signal amplifier has zero output

SELECTION OF THE STATION

The magnetic field lines from the station are at right angles to the direction of the station. Always select a station which gives the field approximately at right angles to the main strike of the ore bodies or geological structure of the area you are presently working on. In other words, the strike of geology should point to the transmitter. (See Figure 3). Of course, $\pm 45^{\circ}$ variations are tolerable in practice.

Tuning of the EM16 to the proper transmitting station is done by means of plug-in units inside the receiver. The instrument takes two selector-units simultaneously. A switch is provided for quick switching between these two stations.

To change a plug-in unit, open the cover on top of the instrument, and insert the proper plug. (Figure 10) Close the cover and set the selector switch to the desired plug-in.

On the following pages is a variety of information on the most commonly used (i.e. reliable) VLF Transmitters including transmission frequency, geographical location and their scheduled maintenance periods.

Fig.10

Fig.11

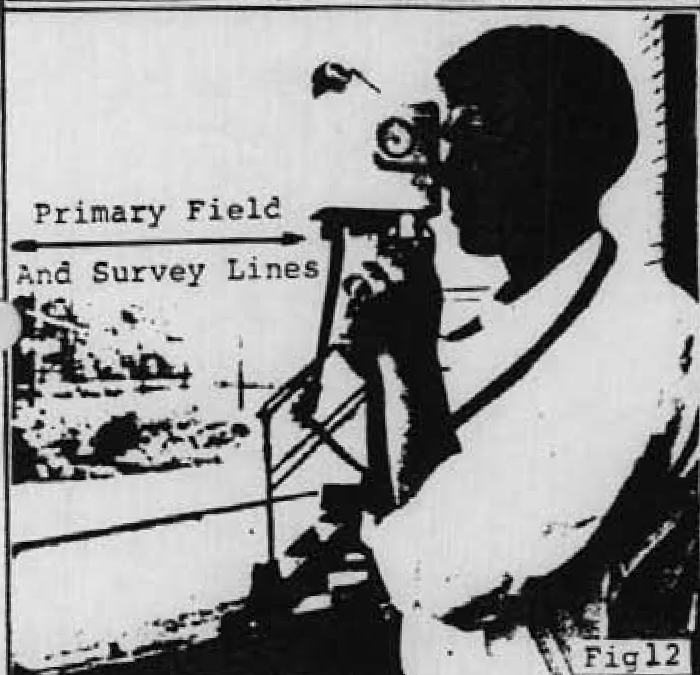
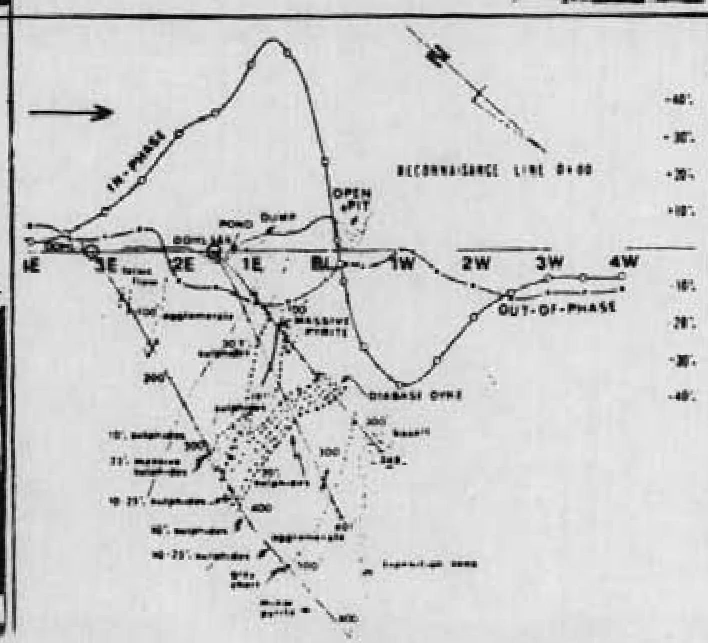


Fig.12

Fig.13



FIELD PROCEDURE

Orientation & Taking a Reading

The direction of the survey lines should be selected approximately along the lines of the primary magnetic field, at right angles to the direction to the station being used. Before starting the survey, the instrument can be used to orient oneself in that respect. By turning the instrument sideways, the signal is minimum when the instrument is pointing towards the station, thus indicating that the magnetic field is at right angles to the receiving coil inside the handle.(Fig.11).

To take a reading, first orient the reference coil (in the lower end of the handle) along the magnetic lines.(Fig.12) Swing the instrument back and forth for minimum sound intensity in the speaker. Use the volume control to set the sound level for comfortable listening. Then use your left hand to adjust the quadrature component dial on the front left corner of the instrument to further minimize the sound. After finding the minimum signal strength on both adjustments, read the inclinometer by looking into the small lens. Also, mark down the quadrature reading.

While travelling to the next location you can, if you wish, keep the instrument in operating position. If fast changes in the readings occur, you might take extra stations to pinpoint accurately the details of anomaly.

The dials inside the inclinometer are calibrated in positive and negative percentages. If the instrument is facing 180° from the original direction of travel, the polarities of the readings will be reversed. Therefore, in the same area take the readings always facing in the same direction even when travelling in opposite way along the lines.

The lower end of the handle, will as a rule, point towards the conductor. (Figs.13 & 14) The instrument is so calibrated that when approaching the conductor, the angles are positive in the in-phase component. Turn always in the same direction for readings and mark all this on your notes, maps, etc.

THE INCLINOMETER DIALS

The right-hand scale is the in-phase percentage(ie.Hs/Hp as a percentage). This percentage is in fact the tangent of the dip angle. To compute the dip angle simply take the arc-tangent of the percentage reading divided by 100. See the conversion graph on the following page.

The left-hand scale is the secant of the slope of the ground surface. You can use it to "calculate" your distance to the next station along the slope of the terrain.

(1) Open both eyes.

(2) Aim the hairline along the slope to the next station to about your eye level height above ground.

(3) Read on the left scale directly the distance necessary to measure along the slope to advance 100 (ft) horizontally.

We feel that this will make your reconnaissance work easier. The outside scale on the inclinometer is calibrated in degrees just in case you have use for it.

PLOTTING THE RESULTS

For easy interpretation of the results, it is good practice to plot the actual curves directly on the survey line map using suitable scales for the percentage readings. (Fig.15) The horizontal scale should be the same as your other maps on the area for convenience.

A more convenient form of this data is easily achieved by transforming the zero-crossings into peaks by means of a simple numerical filtering technique. This technique is described by D.C. Fraser in his paper "Contouring of VLF-EM Data", Geophysics, Vol. 34, No. 6. (December 1969)pp958-967. A reprint of this paper is included in this manual for the convenience of the user.

This simple data manipulation procedure which can be implemented in the field produces VLF-EM data which can be contoured and as such provides a significant advantage in the evaluation of this data.

REVISED
April 2, 1982

VLF Transmitter Information

NAVY STATIONS OFF-AIR TIMES:

NAA	Schedule off 1300 to 2300 UT daily 15 Nov. through Nov. 17
NDT	Scheduled off twenty-four hours each day 28 Oct. and 29 Oct. (Local); ten hours each day Mon. through Sat. (Local) Beginning 14 Jan. 1979 at 2300 UT and ending 6 Feb. at 0900 UT; Twenty-four hours each day Mon. 0900 UT; Ten hours each day Mon. through Sat. (Local) Beginning 7 Mar. at 2300 UT and ending 13 Apr. at 0900 UT.
NPM	19 Oct. 1800 to 2158 UT Scheduled off 1800 to 0200 UT Mon. through Fri. (Local) 15 Jan. 1979 to 17 Mar.
NSS	Scheduled off 15 Oct. to 10 Nov. and 1200 to 2400 UT daily 21 Nov. through 24 Nov.
NWC	May be off intermittently untill 24 Nov.

NORMAL MAINTENANCE PERIODS:

Cutler NAA	Every Mon. 1200 to 2000 UT. If Holiday falls on Mon., maintenance will be preformed on preceding Fri.
NDT	First Thur./Fri. of month 2300 to 0900 UT, other Thur./Fri. 2300 to 0700 UT
Seattle NLK	Every Thur. 1600 to 2400 UT. During daylight saving time every Thur. 1500 to 2300 UT.
NPM	Every Wed./Thur. 1700 to 0500 UT.
NSS	Every Tues. 1200 to 2000 UT.
NWC	Every Wed. 0000 to 0800 UT.

For further information the U.S. Naval Observatory, Time Service Division, Washington D.C. may be contacted at (202) 254-4548.

REVISED
Sept. 22, 1982

The frequency of NLK is now 24.8 kHz.

GEOLOGICAL BRANCH
ASSESSMENT REPORT

14,118

SEREM INC.

FIRESTEEL CLAIM

VLF - EM SURVEY

IN-PHASE & QUADRATURE DATA

N.T.S. 94E-2W OMINECA M.D., B.C.

0 20 40 80 METRES

WORK BY : GRANT CROOKER & MOHAN VULIMIRI

SCALE 1:1250	DEC. 1985
G. CROOKER	FIGURE No. 3

CORNER POST 3 W
FIRESTEEL CLAIM
I.D. POST 2 W
I.D. POST 1 W
I.D. POST 3 W, 1 S
B.L. Az. 340°
5+00 E
0+00 E
2+00 E
8+00 E
10+00 E
L 5+00 S
L 6+00 S
L 7+00 S
L 8+00 S
CONDUCTOR A
CONDUCTOR B
CONDUCTOR C
CONDUCTOR D
CONDUCTOR E
N
FRASER FILTER VALUE (%)
CONTOUR INTERVALS 10, 20, 30, 40, 50 (%)
INSTRUCTION : GEONICS EM-16
TRANSMITTER : NLK - 24.8 KHz, SEATTLE, WASHINGTON
GEOLOGICAL BRANCH ASSESSMENT REPORT
14,118
SEREM INC.
FIRESTEEL CLAIM
VLF - EM SURVEY
FRASER FILTER DATA
N.T.S. 94E-2W OMINECA M.D., B.C.
0 20 40 80 METRES
WORK BY : GRANT CROOKER & MOHAN VULIMIRI
SCALE 1:1250
DEC. 1985
G. CROOKER
FIGURE Nº. 4