ARIS SUMMARY SHEET

District Geologist, Nelson Off Confidential: 89.10.13

ASSESSMENT REPORT 18102 MINING DIVISION: Fort Steele

PROPERTY: Sullivan
LOCATION: LAT 49 41 00 LONG 115 59 30
UTM 11 5503692 572739
NTS 082G12W
CLAIM(S): Kitty,Sheba,Weeks,Trent,Fillin,Hillside,Dephole,Canada,Clark Stewart,Foam,Thompson,Rodder,Lone Fr.,Spring
OPERATOR(S): Cominco
AUTHOR(S): Jackisch, I.
REPORT YEAR: 1988, 30 Pages
COMMODITIES SEARCHED FOR: Lead,Zinc,Silver
GEOLOGICAL SUMMARY: The UTEM survey was conducted over Aldridge Formation strata of siliclastic and argillaceous rocks believed to have been deposited in an intracratonic basin. These rocks host the stratiform Sullivan silver-lead-zinc orebody to the west.
WORK DONE: Geophysical
EMGR 6.8 km; UT
Map(s) - 1; Scale(s) - 1:5000
LINE 17.6 km
Map(s) - 1; Scale(s) - 1:25 000

COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

NTS: 82F/9
82G/12

KIMBERLEY WEST 1988

UTEM SURVEY

FORT STEELE M.D., B.C.

- ASSESSMENT REPORT -

Latitude : 49°40'N

Longitude : 116°00'W

Work Performed by : J.J. Lajoie & M. Price
during period July 2 to 5, 1988

Claim Owner and Operator : COMINCO LTD.

Claims : KITTY 88-1 Group

18,102

NOVEMBER 1988

Ingo Jackisch

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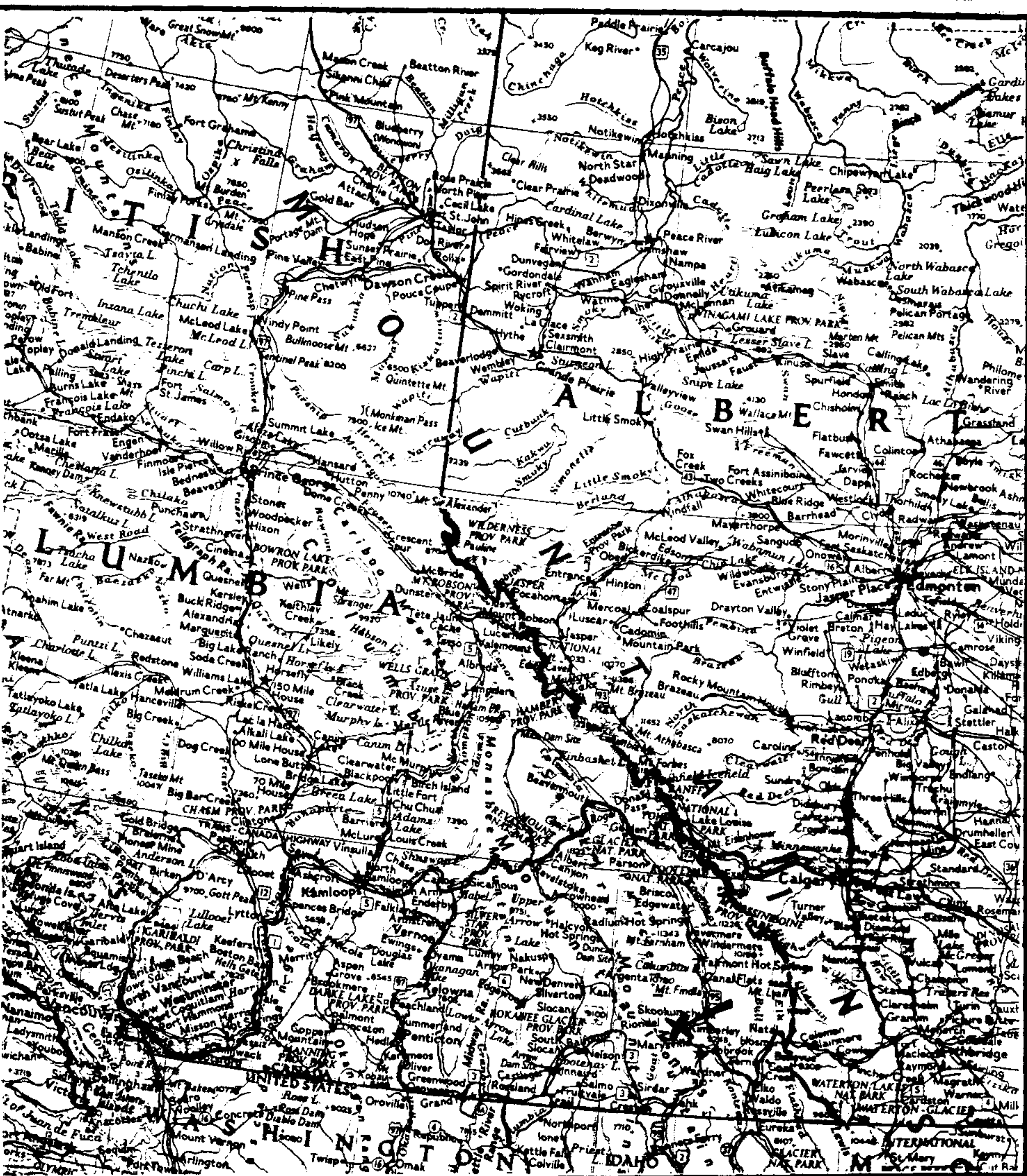


KIMBERLEY WEST

N.T.S. 82F/9
82G/12

Drawn by:		Traced by:	
Revised by	Date	Revised by	Date

Kitty 88-1 Claim Group
LOCATION MAP
Ft. Steele M.D., B.C.

Scale: | Date: NOV 1988 | Plate: 347-88-1

210-0620

COMINCO LTD.

EXPLORATION WESTERN DISTRICT

NTS: 82F/9
82G/12

KIMBERLEY WEST 1988
UTEM SURVEY

- ASSESSMENT REPORT -

INTRODUCTION

During the period of July 2 to 5, 1988, 6.8 km of UTEM surveying was completed on the Kimberley West grid.

This survey was an extension of and has the same grid coordinates as a 1985 UTEM program. Also, it is directly east of an area covered by horizontal EM. The eastern part of the present survey extends up to the edge of the town of Kimberley.

The objective of the survey was to determine the mineral potential of an area adjacent to the Kimberley townsite.

This report presents the data and interprets the results.

LOCATION AND ACCESS

There are numerous roads to the west of the town of Kimberley, B.C., so access is excellent to all parts of the loop and survey lines. The back of Loop 20 was placed along a conveniently located road.

DESCRIPTION OF UTEM SYSTEM

UTEM is an acronym for "University of Toronto ElectroMagnetometer". The system was developed by Dr. Y. Lamontagne (1975) while he was a graduate student of that University.

The field procedure consists of first laying out a large loop of single strand insulated wire and energizing it with current from a transmitter which is powered by a 1.7 kW motor generator. The loop is generally

square shaped, wherever possible, with sides between 500 metres and 1,500 metres long. In this survey, the loop dimension was 1,500 m x 1,000 m. Survey lines are generally oriented perpendicular to one side of the loop and surveying can be performed both inside and outside the loop. The field procedure is similar to Turam, a better known electromagnetic surveying method.

The transmitter loop is energized with a precise triangular current waveform at a carefully controlled frequency (30.9 Hz for this survey). The receiver system includes a sensor coil and backpack portable receiver module which has a digital recording facility on cassette magnetic tape. The time synchronization between transmitter and receiver is achieved through quartz crystal clocks in both units which must be accurate to about one second in 50 years.

The receiver sensor coil measures the vertical magnetic component of the electromagnetic field and responds to its time derivative. Since the transmitter current waveform is triangular, the receiver coil will sense a perfect square wave in the absence of geologic conductors. Deviations from a perfect square wave are caused by electrical conductors which may be geologic or cultural in origin. The receiver stacks any pre-set number of cycles in order to increase the signal to noise ratio.

The UTEM receiver gathers and records 9 channels of data at each station. The higher number channels (7-8-9) correspond to short time or high frequency while the lower number channels (1-2-3) correspond to long time or low frequency. Therefore, poor or weak conductors will respond on channels 9, 8, 7 and 6. Progressively better conductors will give responses on progressively lower number channels as well. For example, massive, highly conducting sulphides or graphite will produce a response on all nine channels.

The UTEM receiver records data digitally on a cassette. This tape is played back into a computer at the base camp. The mini computer processes the data and controls the plotting on a small (11" x 15") graphics plotter. Data are portrayed as profiles of each of the nine channels, shown for each survey line of each transmitter loop. These profiles and an interpretive plan are appended to this report.

The magnetic field amplitudes from both the transmitter loop (primary field) and from the electric currents induced in the ground (secondary field) vary considerably from the beginning of a line (near the transmitter loop) to the end of the survey line (far away from the transmitter loop). In order to present such data, a normalizing scheme must be used. In this survey, the primary field from the loop is used for normalizing and presenting the data in two ways.

1. Continuously normalized plots.

This is the standard normalization scheme.

a) For Channel 1:

$$\% \text{ Ch.1 anomaly} = \frac{\text{Ch.1} - P}{P} \times 100$$

where P is the primary field from the loop at the station and Ch.1 is the observed amplitude for Channel 1.

b) For the remaining channels (n=2 to 9)

$$\% \text{ Ch.n anomaly} = \frac{\text{Ch.n} - \text{Ch.1}}{\text{Ch.1}} \times 100$$

where Ch.n is the observed amplitude of Channel n (2 to 9).

2. Point normalized plots.

These plots display an arrow at the top of the section indicating the station to which all data on the line are normalized. The purpose of point normalized plots is to display only the relative amplitude variation of the secondary field along the line, that is, only that magnetic field from the currents induced in the ground.

a) For Channel 1:

$$\% \text{ Ch.1 anomaly} = \frac{\text{Ch.1} - \text{Ppn}}{\text{Ppn}} \times 100$$

where Ppn is the primary field from the loop at the point norm station and Ch.1 is the observed amplitude for Channel 1.

b) The remaining channels (n=2 to 9) are Channel 1 reduced and Channel 1 normalized:

$$\% \text{ Ch.n anomaly} = \frac{\text{Ch.n} - \text{Ch.1pn}}{\text{Ch.1pn}} \times 100$$

where Ch.n is the observed amplitude of Channel n and Ch.1pn is the observed Channel 1 amplitude at the point norm station

Point normalized plots are usually produced on data sections containing anomalies in order to help interpretation by providing a different perspective to the data. In this survey, all the Data Section numbers containing a "p" are point normalized plots.

The above normalizing procedures result in chaining errors displayed in Channel 1 only, since all other channels are normalized to Channel 1.

INTERPRETATION

Plate 347-88-2 shows the UTEM compilation map for this survey. The most significant feature detected on the grid is a N-S striking, slightly more more conductive unit than the surrounding rocks, centered at about 4000E from Lines 2000S to 250S. It has a surface width of 200 metres and is open to the north and south. This feature responds on all channels down to Channel 4 on Line 2000S, and to Channels 4, 5 or 6 on Lines 1500S to 250S.

A second UTEM response is noted directly under or just inside the loop front on Line 1750S (and possibly Line 1500S). It is directly in front of the loop on Line 2000S (-3675E) and is a shallow, weak, steeply dipping conductor, possibly a minor fault zone or a weakly conductive formation.

A positive shift in some of the channels at the eastern end of the survey lines is caused by cultural noise from the town of Kimberley (water pipes, power lines, etc.). Lines 500S (D.S. 2) and 1250S (D.S. 5) are examples of this.

CONCLUSIONS

A 6.8 km UTEM survey was completed at a location directly west of the town of Kimberley and to the east (and joining with) a previous UTEM survey performed in 1985.

A N-S striking zone of slightly lower resistivity than the surrounding rocks is the most dominant feature.

A second conductor gives a crossover response near the loop front on Line 1750S.

Report by: Ingo Jackisch

Ingo Jackisch, B.Sc.
Geophysicist
Cominco Ltd.

Approved for Release: John Hamilton

J. M. Hamilton, P.Eng.
Manager, Exploration
Western Canada
Cominco Ltd.

Distribution:

Mining Recorder	(2)
Kootenay Expl. Office	(1)
Western District Files	(1)
Geophysics File	(1)

A P P E N D I X I

IN THE MATTER OF THE B.C. MINERAL ACT

AMD THE MATTER OF A GEOPHYSICAL PROGRAMME

CARRIED OUT ON THE KITTY 88-1 GROUP

LOCATED DIRECTLY WEST OF KIMBERLEY, B.C.

IN THE FT. STEELE MINING DIVISION OF THE

PROVINCE OF BRITISH COLUMBIA,

MORE PARTICULARLY

N.T.S. 82F/9

S T A T E M E N T

I, Ingo Jackisch, of 424 Somerset Street, in the City of North Vancouver, in the Province of British Columbia, make oath and say:

1. THAT I am employed as a geophysicist by Cominco Ltd. and, as such have a personal knowledge of the facts to which I hereinafter depose;

2. THAT annexed hereto and marked as "Exhibit A" to this statement is a true copy of expenditures incurred on a geophysical survey on the KITTY 88-1 Group;

3. THAT the said expenditures were incurred between July 2nd and July 5th, 1988 for the purpose of mineral exploration on the above-noted claim group.

Ingo Jackisch

Ingo Jackisch, B.Sc.
Geophysicist, Cominco Ltd.

Dated this 28 day of November, 1988
at Vancouver, B.C.

APPENDIX II

EXHIBIT "A"

STATEMENT OF EXPENDITURES (1988)

KITTY 88-1 GROUP

1.	STAFF COSTS			
	a) P.W. Ransom, supervision 1 day @ $265/day		265.00	
	b) J.J. Lajoie, geophysicist 1 day @ $375/day		375.00	
	c) M.A. Price, geophysicist 4 days @ $275/day		1,100.00	
	d) S. Kemp, assistant 2 days @ $125/day		250.00	
	e) N. Murphy, assistant 4.5 days @ $100/day		450.00	
	f) P. Muir, assistant 3 days @ $100/day		300.00	2,740.00
2.	OPERATING DAY CHARGES Note: This charge is applied for those day on which useful data are acquired, to cover the cost of data compilation, drafting, interpretation and report.			
	2 days @ $350/day			700.00
3.	EQUIPMENT RENTAL			
	Travel & Standby	2 days @ $ 75/day	150.00	
	Operating Days	2 days @ $150/day	300.00	450.00
4.	EXPENSE ACCOUNTS			
	J.J. Lajoie	210.00		
	M.A. Price	56.00		
	S. Kemp	50.00		
	N. Murphy	112.50		
	P. Muir	75.00		503.50
		Carried Forward		$ 4,393.50

Carried Forward		$ 4,393.50

5. MISCELLANEOUS

Use of Radio	50.00	
Rental of Pickup Truck, 4 days @ $40/day	160.00	210.00
T O T A L		$ 4,603.50

I certify this to be a true Statement of Expenditures for the geophysical program on the KITTY 88-1 Group in 1988.

Ingo Jackisch

I. Jackisch
Geophysicist, Cominco Ltd.

Line 17.6 km 5165.52

A P P E N D I X III

CERTIFICATE OF QUALIFICATIONS

I, INGO JACKISCH, of 424 Somerset Street, in the City of North Vancouver, Province of British Columbia, do hereby certify:

1. THAT I graduated with a B.Sc. in Geophysics from the University of British Columbia in 1975.

2. THAT I am a member of the British Columbia Geophysical Society.

3. THAT I have been practising my profession for the past fourteen years.

4. THAT I have been employed by Cominco Ltd. since 1980.

Ingo Jackisch

Ingo Jackisch
Geophysicist, Cominco Ltd.

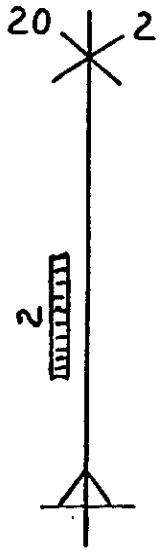
NOVEMBER 1988

LEGEND

UTEM COMPILATION MAP AND DATA SECTIONS

SYMBOL	CHANNEL	MEAN DELAY TIME
		30 Hz
	1	12.8 ms
	2	6.4
	3	3.2
	4	1.6
	5	0.8
	6	0.4
	7	0.2
	8	0.1
	9	0.05
	10	0.025

In the data sections, the upper graph contains Channesl 9 to 5, the centre graph contains Channels 5 to 2, and the lower graph contains Channel 1. Station numbers are indicated along the abscissa. Elevations along the survey line are shown by the solid profile in the lower graph, the scale for which is the ordinate on the right hand side of the graph.



Axis of a crossover anomaly. The right superscript indicates the latest anomalous channel. The left superscript indicates depth to current axis in metres.

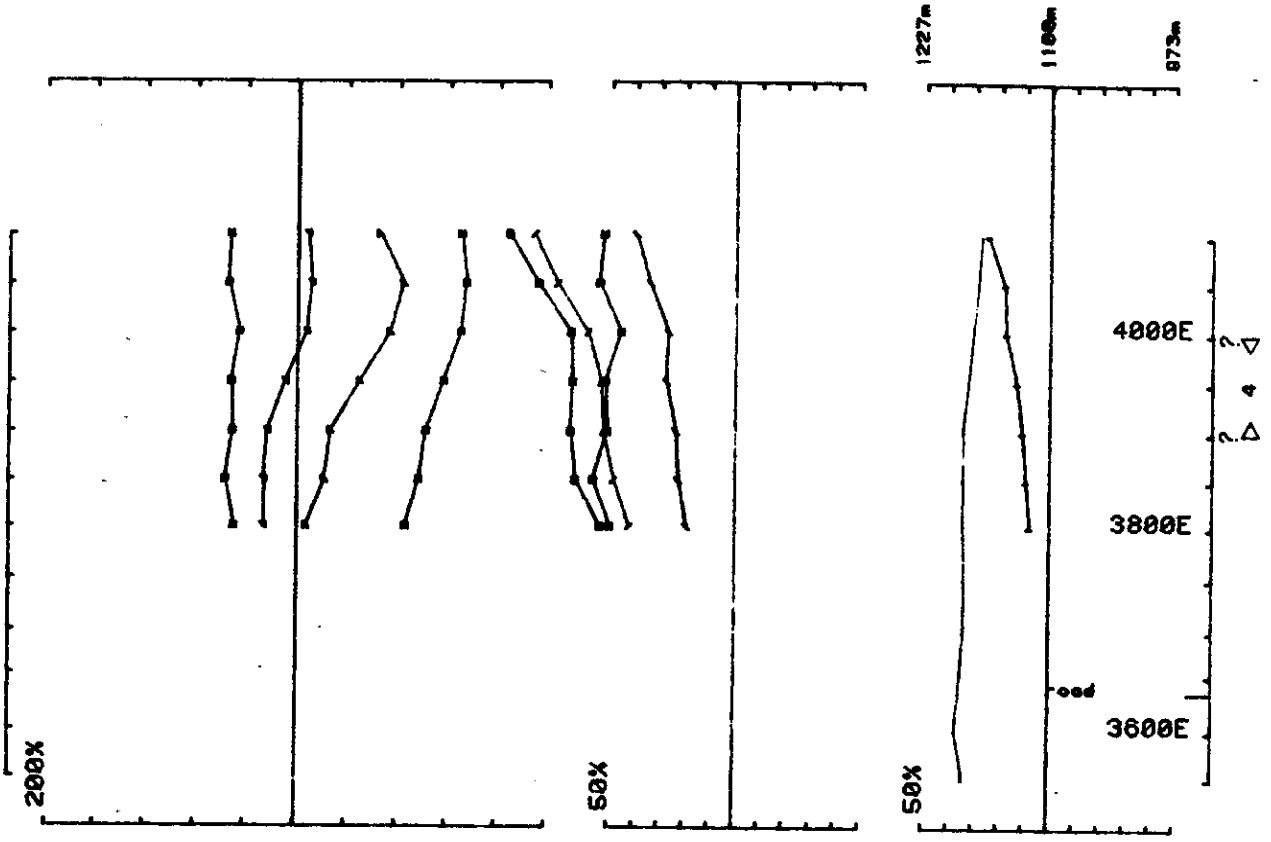
Indicates a negative anomaly of width shown by the dash. The latest anomalous channel is shown. Can sometimes be confused with the negative part of a crossover anomaly.

Indicates contact between two regions of differing resistivity. Arrow points to low resistivity zone.

Outline of a transmitter loop

DATA SECTIONS

(D.S. 1 - 8p)



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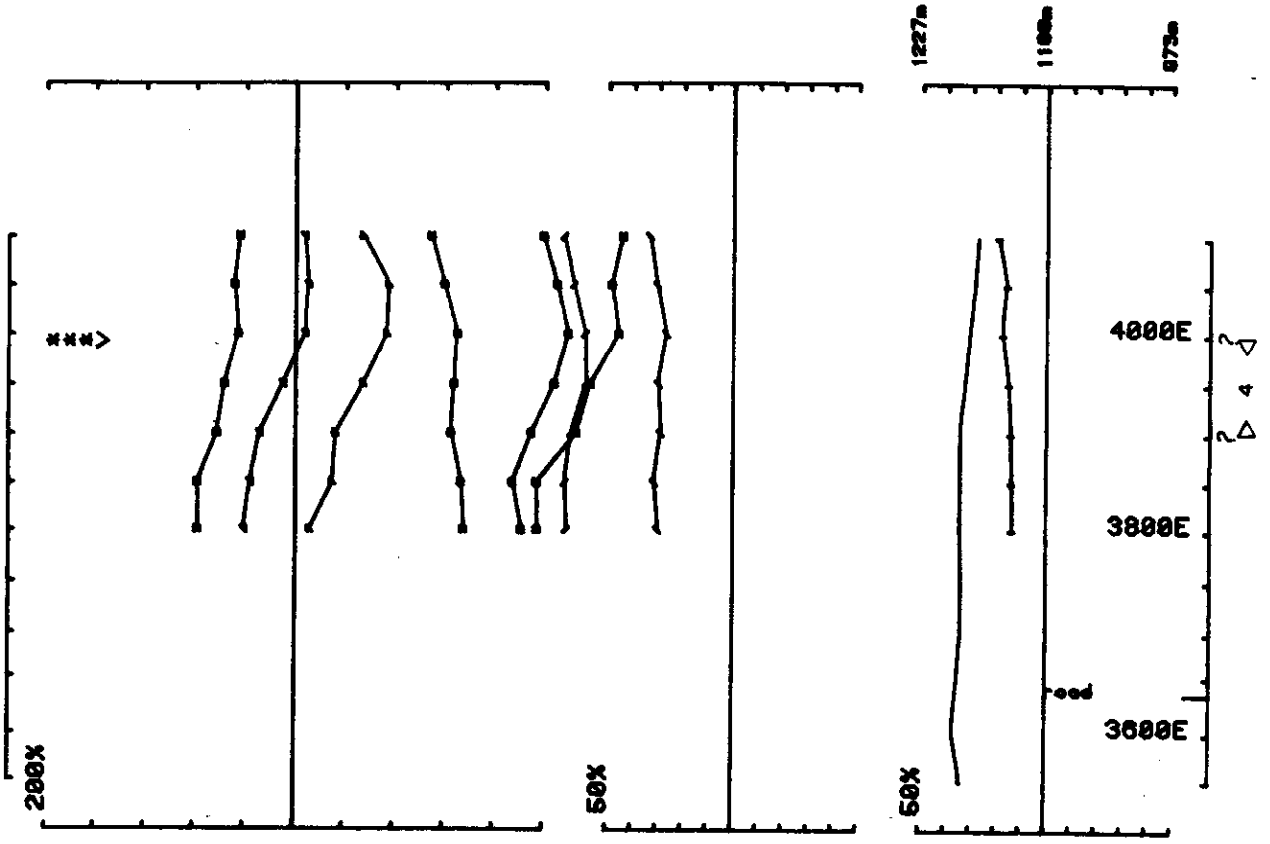
Loopno 20 Line 250S component Hz secondary Ch 1 normalized Ch 1 reduced



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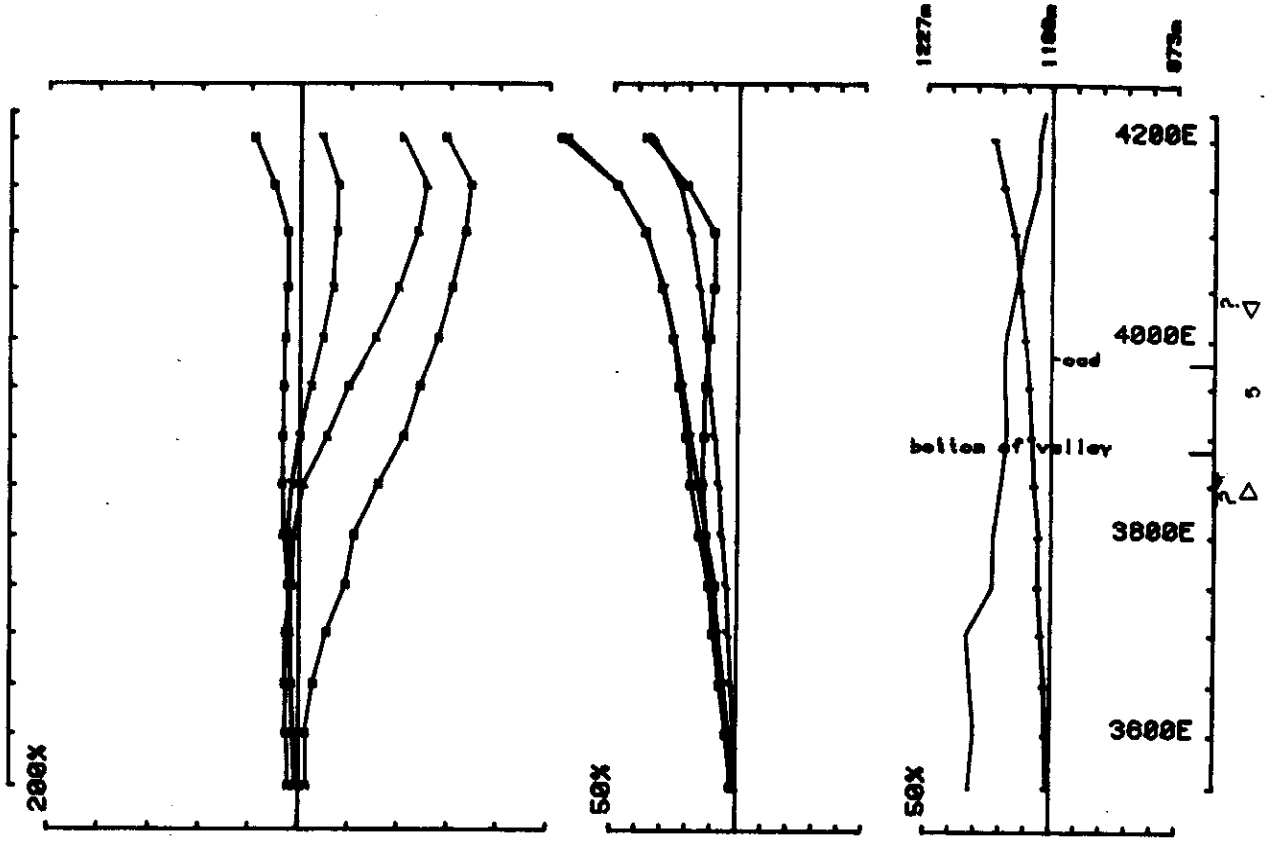
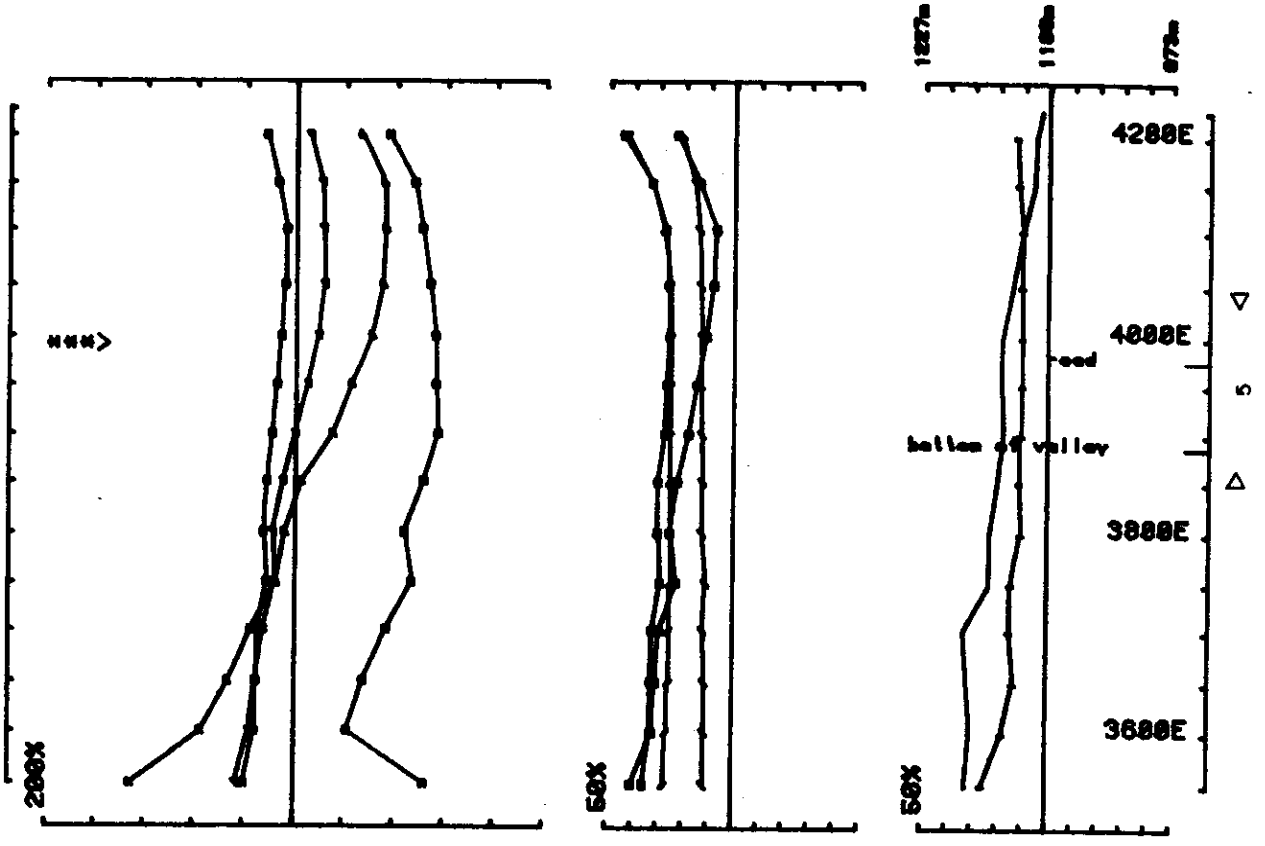
Loopne 20 Line 250S component Hz secondary Ch I normalized ; Ch I reduced

D. S. Ip



Area KIMBERLY WEST 88 Cominco operator JJL&MP freq(hz) 30.974
Loopno 20 Line 500S component Hz secondary Ch I normalized Ch I reduced

D.S. 2



Area KIMBERLY WEST 88 Cominco operator JJL&MP freq(hz) 30.974
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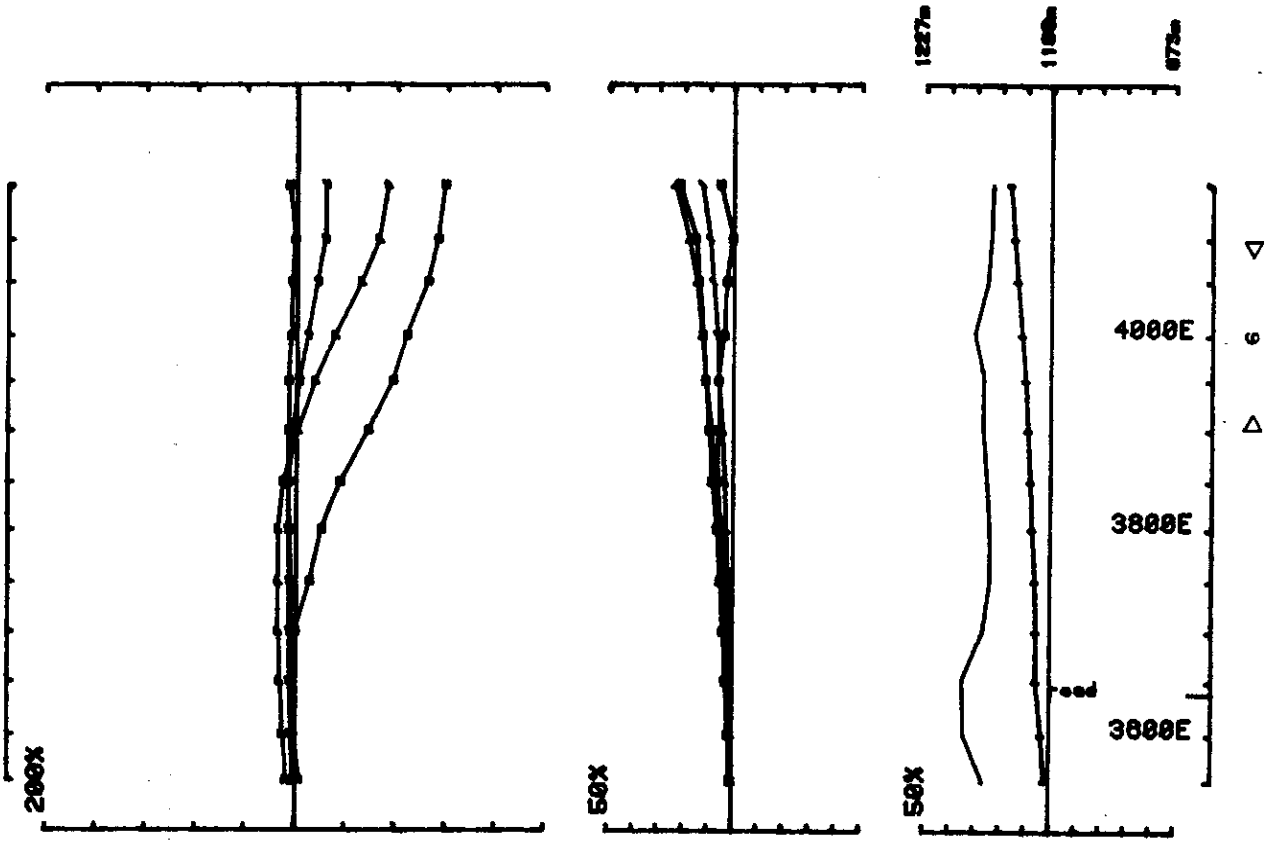

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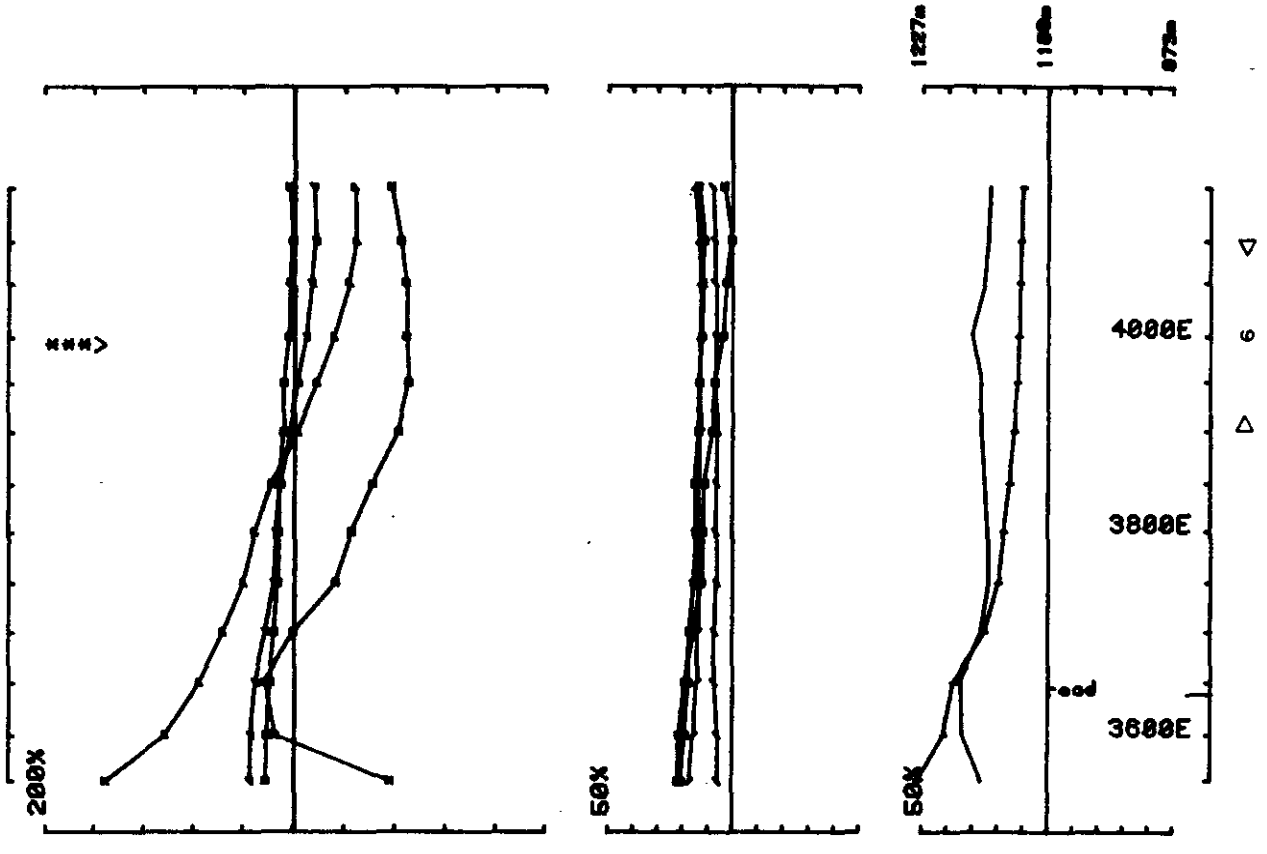
Loopno 20 Line 750S component Hz secondary Ch 1 normalized Ch 1 reduced



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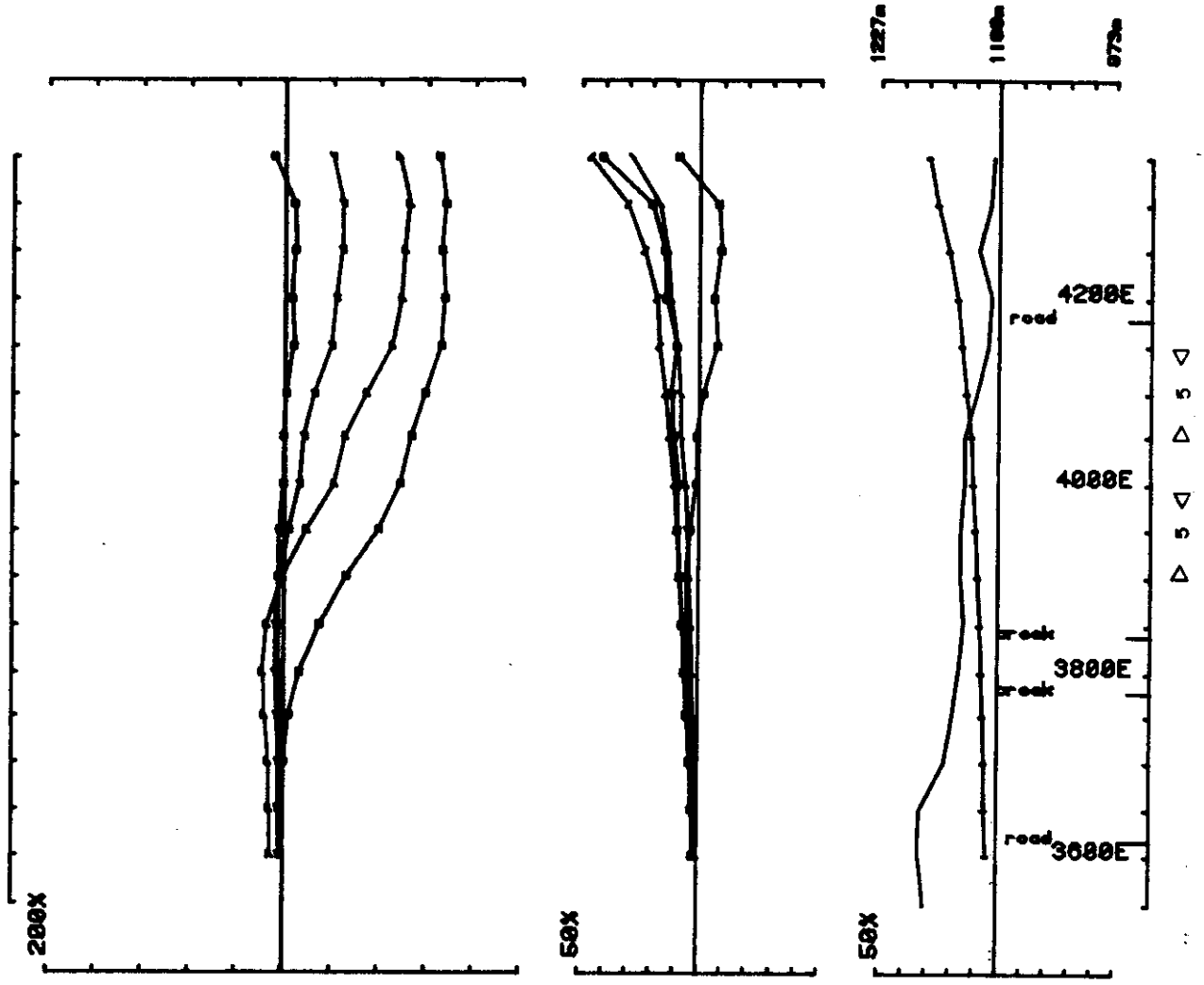

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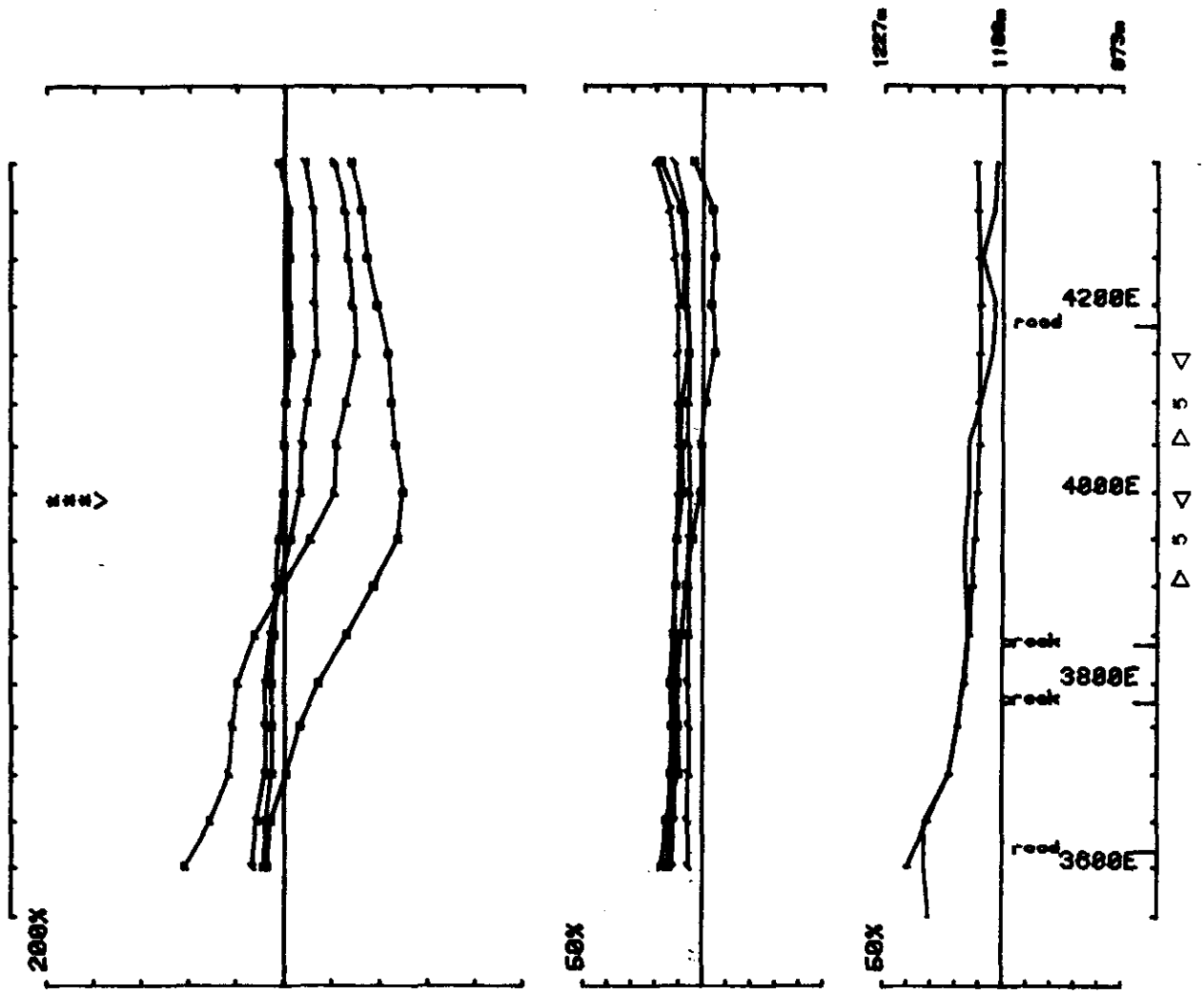

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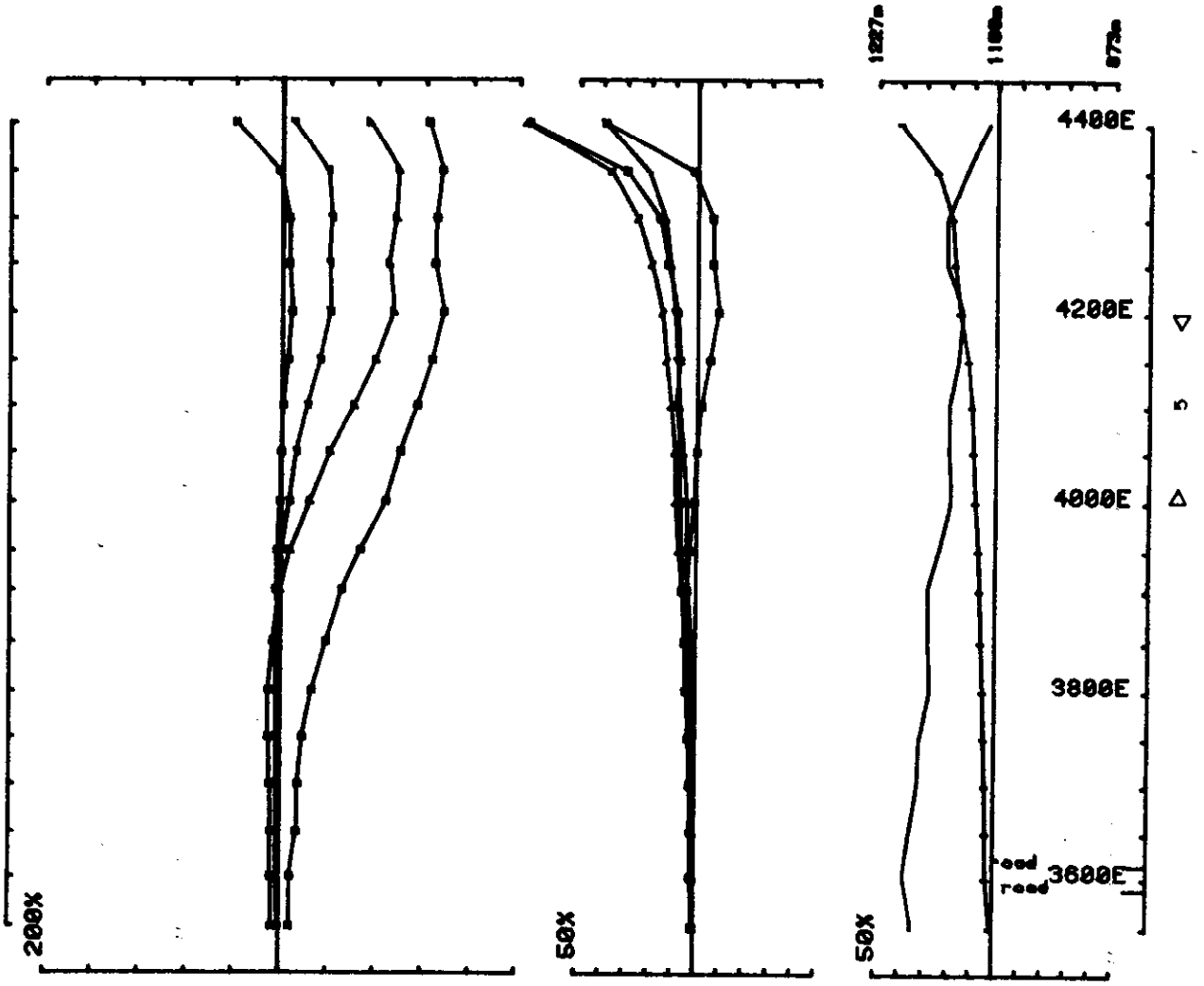

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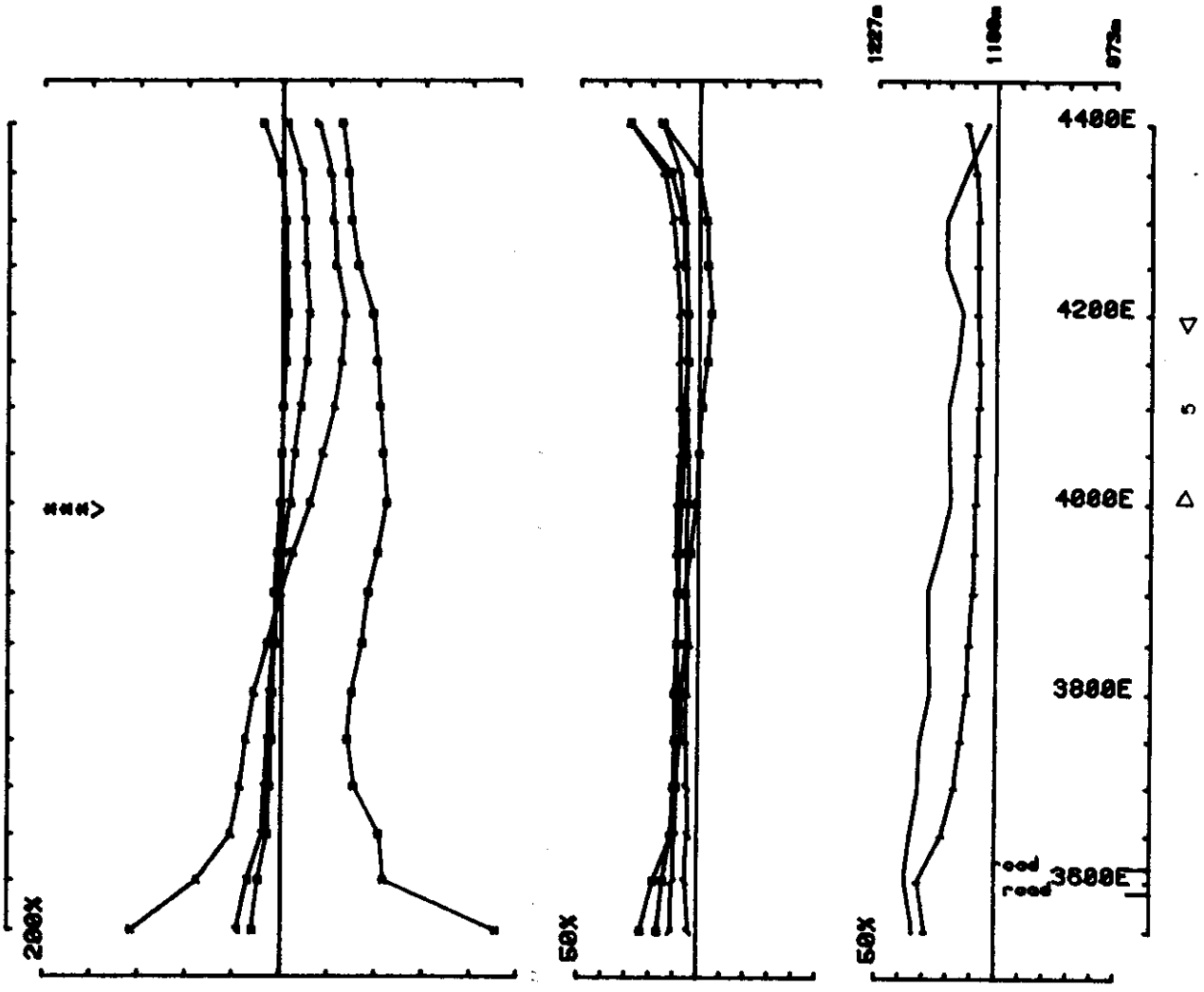

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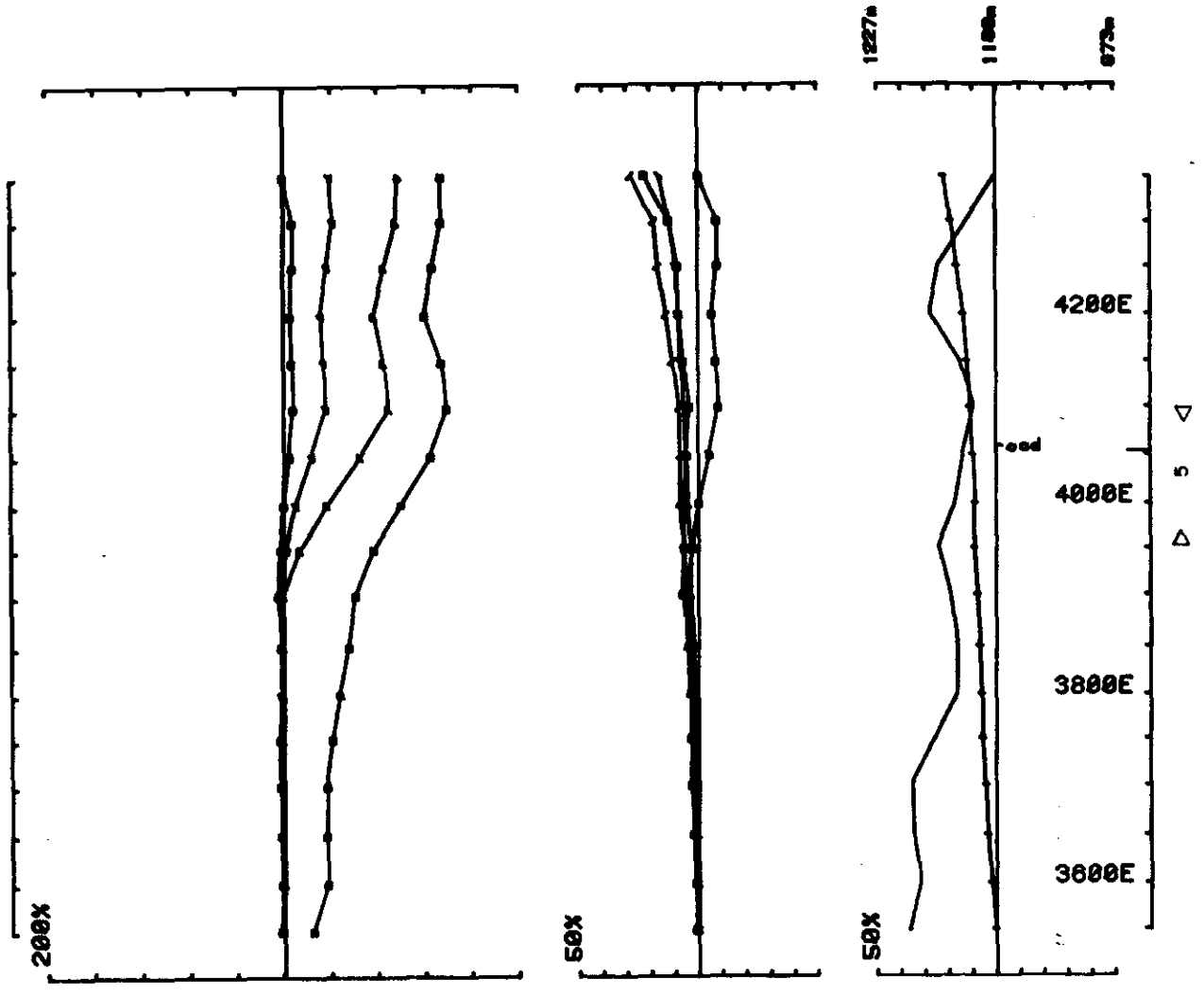
Loop# 20 Line 1250S component Hz secondary Ch I normalized Ch I reduced

D. S. 5p



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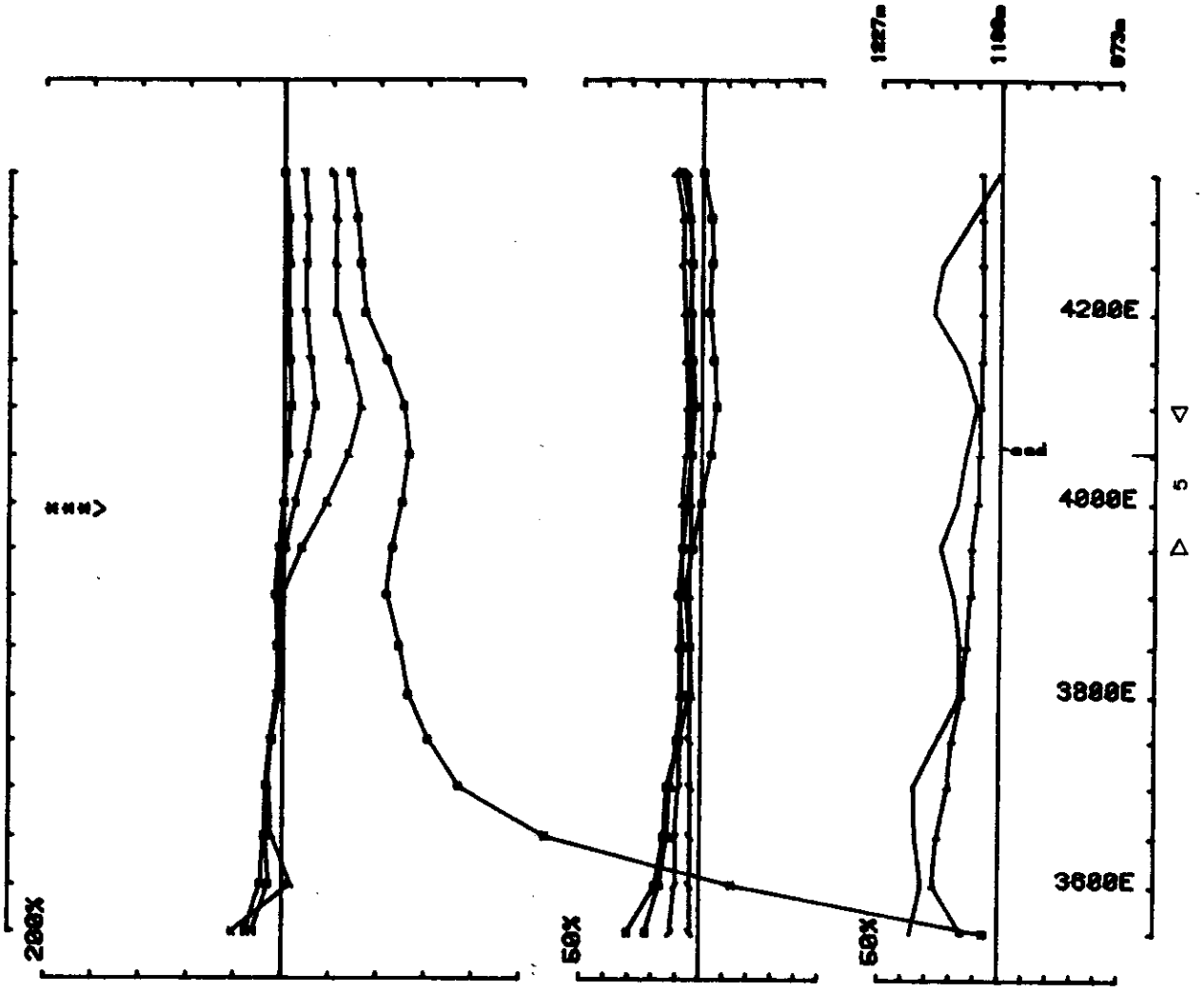
Loopno 20 Line 1500S component Hz secondary Ch I normalized Ch I reduced



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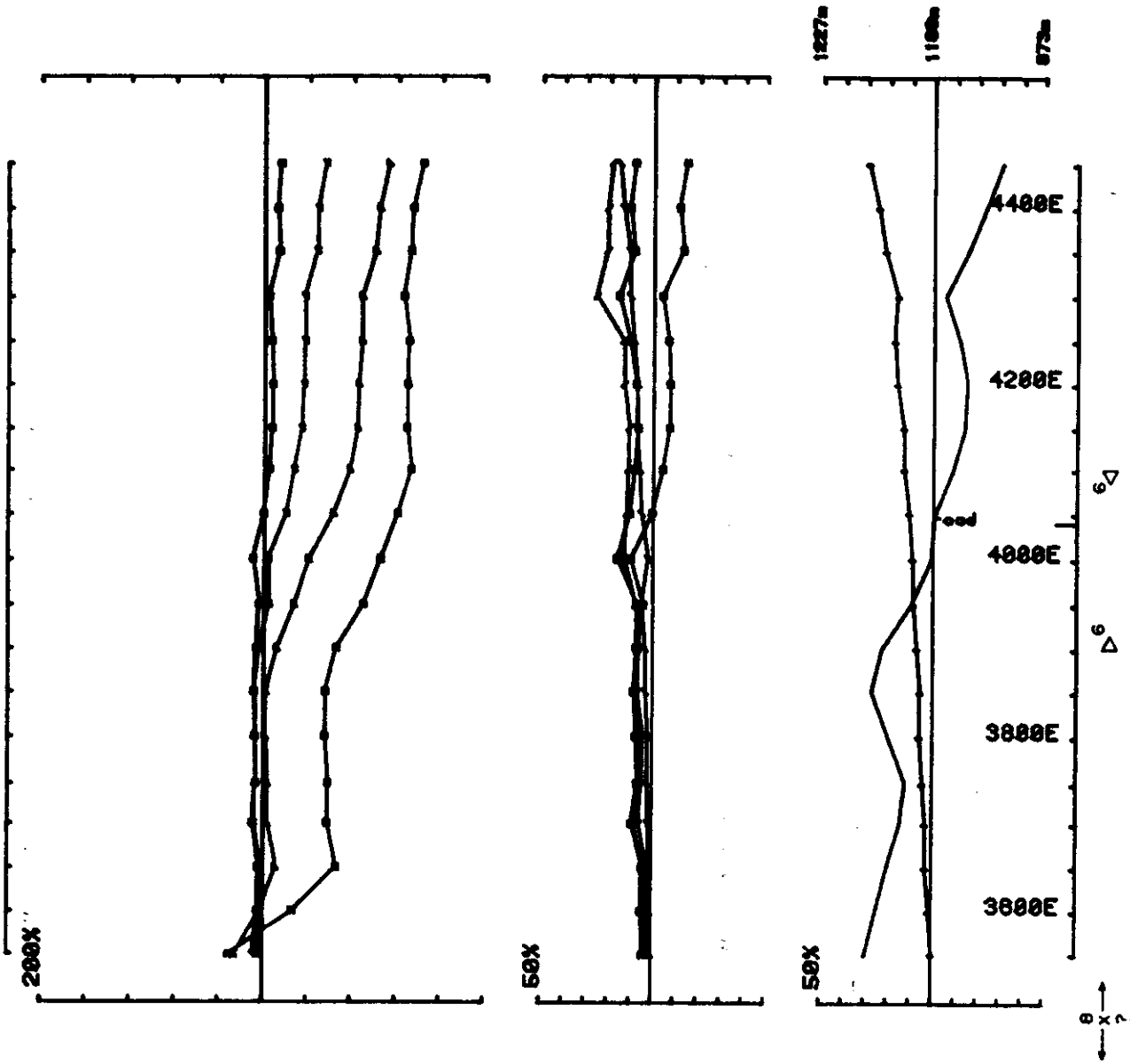

Area KIMBERLY WEST 88 Cominco operator JJL&MP freq(hz) 30.974
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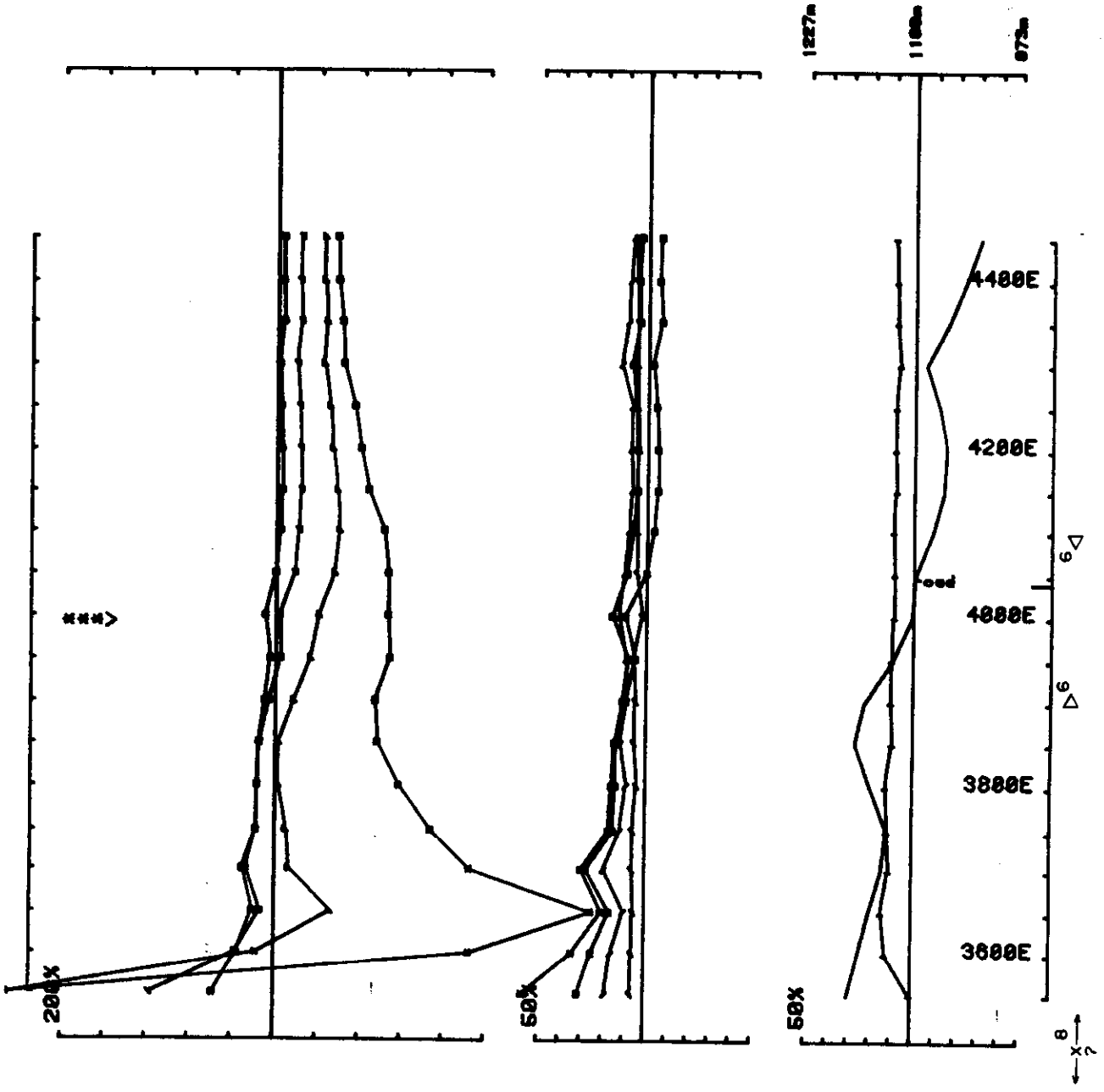

Area KIMBERLY WEST 88 Cominco operator JJL&MP freq(hz) 30.974
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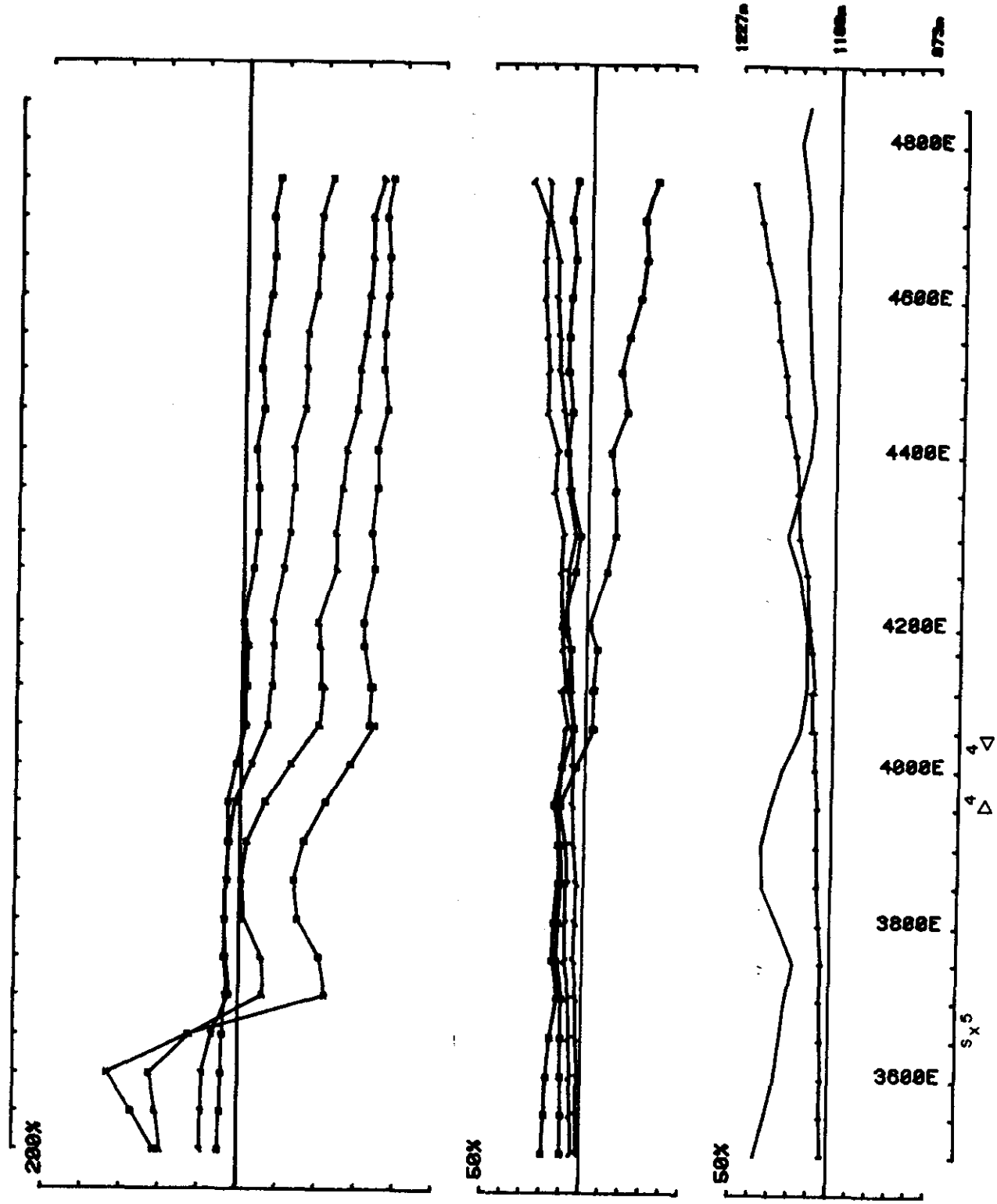
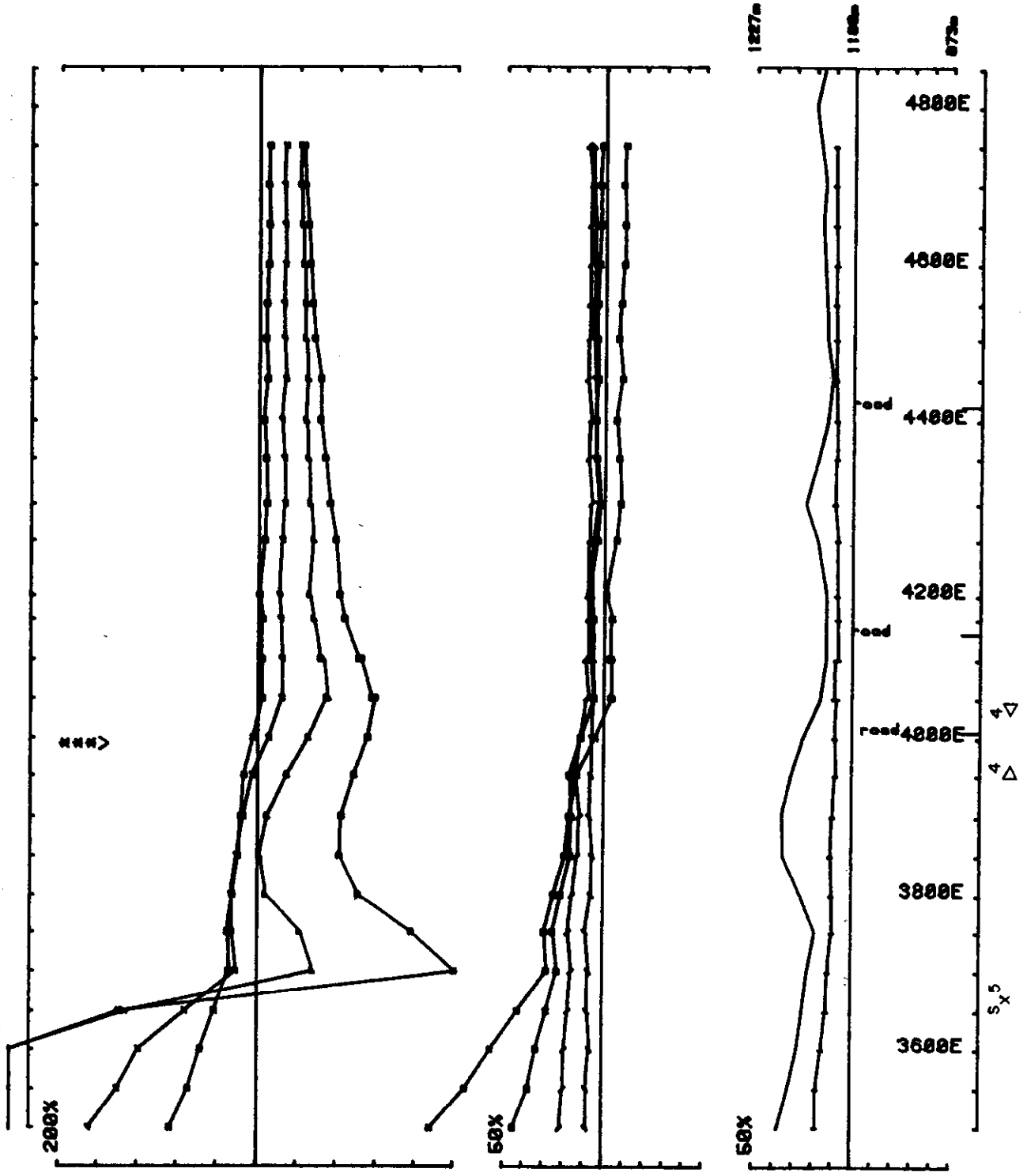


Area KIMBERLY WEST 88 Cominco operator JUL&MP freq(hz) 30.974
Loopno 20 Line 2000S component Hz secondary Ch 1 normalized Ch 1 reduced

D.S. 8



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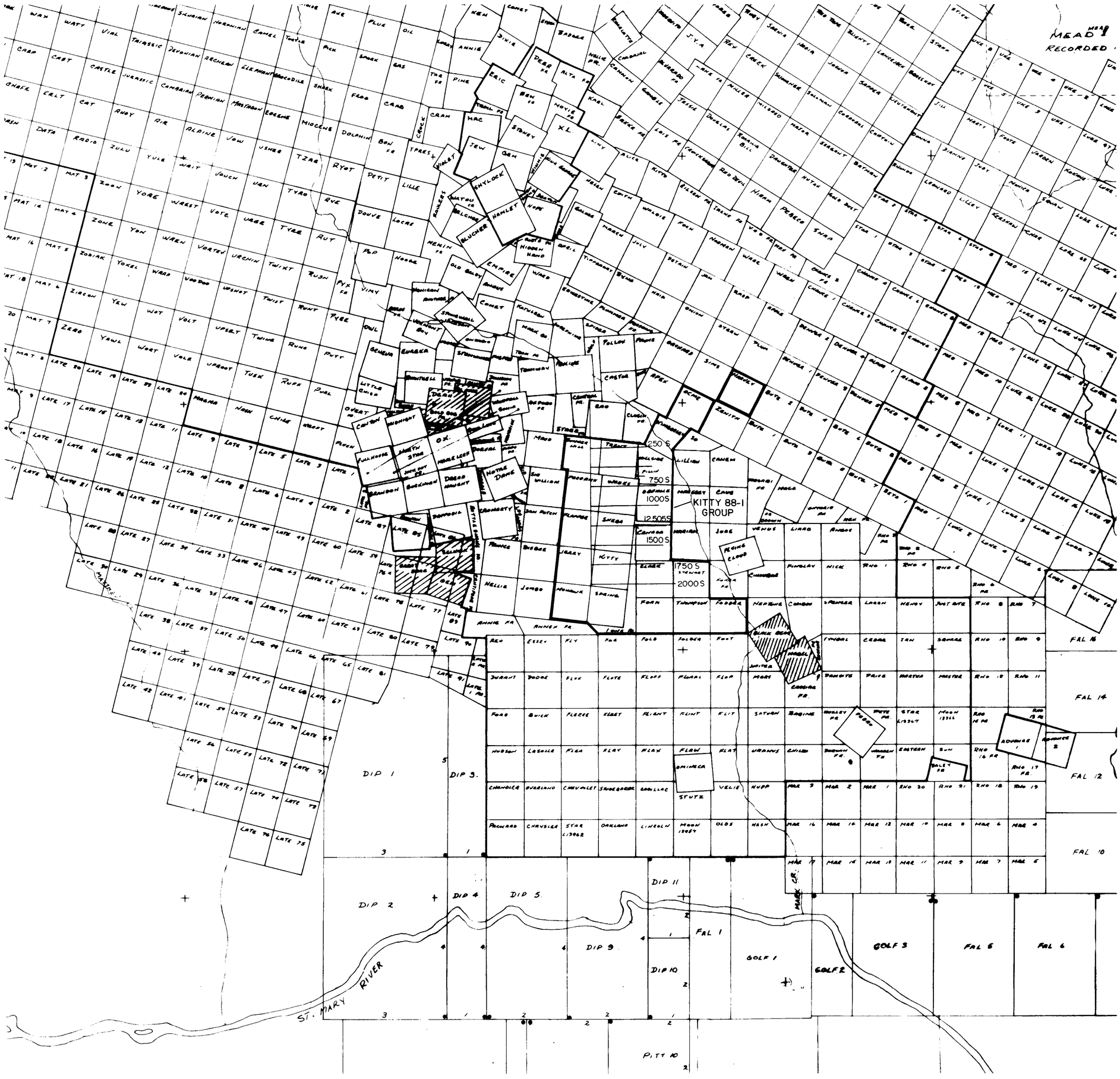
D.S. 8p



GSC OPEN FILE BRANCH
ASSESSMENT REPORT

18,102

KIMBERLEY WEST

NTS 82F/9 82G/12

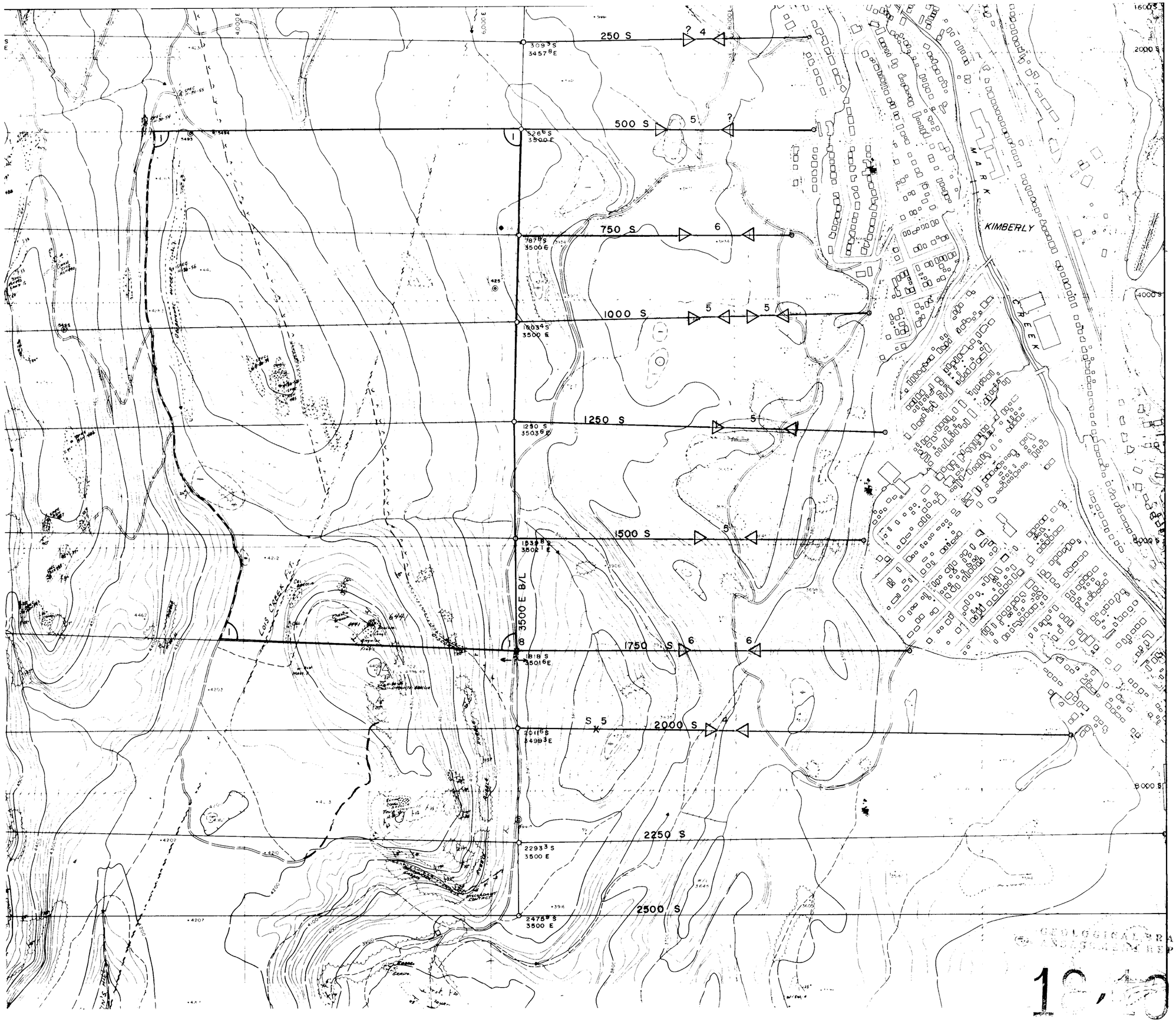
Drawn By | Digitized By

Kitty 88-1 Claim Group
CLAIM AND GRID MAP
Ft. Steele M.D., B. C.

Scale 1"= 2000 | Date NOV 1988 | Plate 347-88-3

NO. 117-CL

FORM 210 0663



GEOLOGICAL BRANCH
ASSESSMENT REPORT

18,102

SULLIVAN MINE

Kitty 88-1 Group
UTEM COMPILATION MAP
Ft. Steele M.D., B.C.

1" = 400'
±121.92 m

NOV 1988

347-88-2