86-578-15174

COMINCO LTD

EXPLORATION

WESTERN DISTRICT

NTS: 82 G/12E

UTEM ELECTROMAGNETIC SURVEY

ON THE

KOOTENAY KING CLAIMS

IN THE

FORT STEELE MINING DIVISION

- ASSESSMENT REPORT -

Latitude: 49° 52'N 43.5'

Longitude: 115° 35'W

Work Performed by: J.J. LAJOIE and S.J.VISSER

Claim Owner and Operator: COMINCO LTD

OCTOBER, 1986

JULES J. LAJOIE

TABLE OF CONTENTS

INTRODUCTION

The Kootenay King claims are located 30 km east of Kimberley, B.C. (Plate 307-86-1). The Wild Horse Creek logging road and two subsidiary mining roads provide access to the property.

The Kootenay King deposit was discovered in 1882. It was put in production in 1951 and closed in 1952 after producing 13,000 tons of 5.5%Pb, 8.7%Zn. Cominco acquired the property in 1969.

The area is underlain by rocks of the Aldridge Formation which are known to host the Sullivan Mine at Kimberley, B.C., and gabbro sills and dykes.

This report describes a Utem electromagnetic survey whose objective was to locate conductive rocks which may indicate economic mineralization.

The work was done on claims KK 1 to 4, KK 9, King 1 to 5, and Min. Lease M-52.

FIELD WORK

The work was performed from July 28 to August 14, and August 27, 1986. Nine lines were surveyed from three transmitter loops as shown in Plate 307-86-2. 22.3 km of Utem surveying were completed at a station spacing of 50 metres.

Progress was slow due to the very difficult and dangerous terrain encountered on this grid.

DESCRIPTION OF THE UTEM SYSTEM

UTEM is an acronym for "University of Toronto ElectroMagnetometer". The system was developped by Dr. Y. Lamontagne 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 1.75kW motor generator. Survey lines are generally oriented perpendicular to one side of the loop and surveying can be performed both inside and outside the loop.

The transmitter loop is energized with a precise triangular waveform at a carefully controlled frequency (30.974Hz 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 fifty years.

The receiver sensor coil measures the vertical component of the electromagnetic field and responds to its time derivative. Since the transmitter current waveform is rectangular, 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 information 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.

It was mentioned above that the UTEM receiver records data digitally on a cassette. This tape is played back into a computer at the base camp. The computer processes the data and controls the plotting on an 11" x 15" graphics plotter. Data are portrayed on Data Sections as profiles of each of the nine channels, one section for each survey line.

DATA PRESENTATION

The results of this survey are presented in one compilation map (Plate 307-86-2) and 14 Data Sections which all face North.

The maps are listed as follows:

Plate 304-86-1 (in text)	Location Map Scale 1:50,000
Plate 304-86-2 (in envelope)	Utem Grid and Compilation Map Scale 1:10,000

A legend for the compilation map and data sections is included. The data sections are arranged in order of loop number, then in order of line number, from North to South.

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 from the transmitter loop. 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 according to the following schemes:

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

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

where Ch.n is the observed amplitude of Channel n (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 to help interpretation by providing a different perspective to the data.

The above normalizing procedures result in chaining errors displayed in Channel 1 only.

INTERPRETATION

The results of the survey are compiled on Plate 307-86-2.

A contact type of response occurs in the eastern part of the survey area starting at about 7150E, indicating more conductive rocks to the east.

A crossover type of anomaly occurs near the western edge of the survey area, indicating a moderately conducting zone at that location.

A minor crossover response was obtained over the Kootenay King Mine at 7175E on line 1100N.

CONCLUSIONS

22.3 km of Utem electromagnetic surveying were completed on the Kootenay King property. Anomalies indicating more conductive rocks were located at the east and west ends of the grid.

Report by:

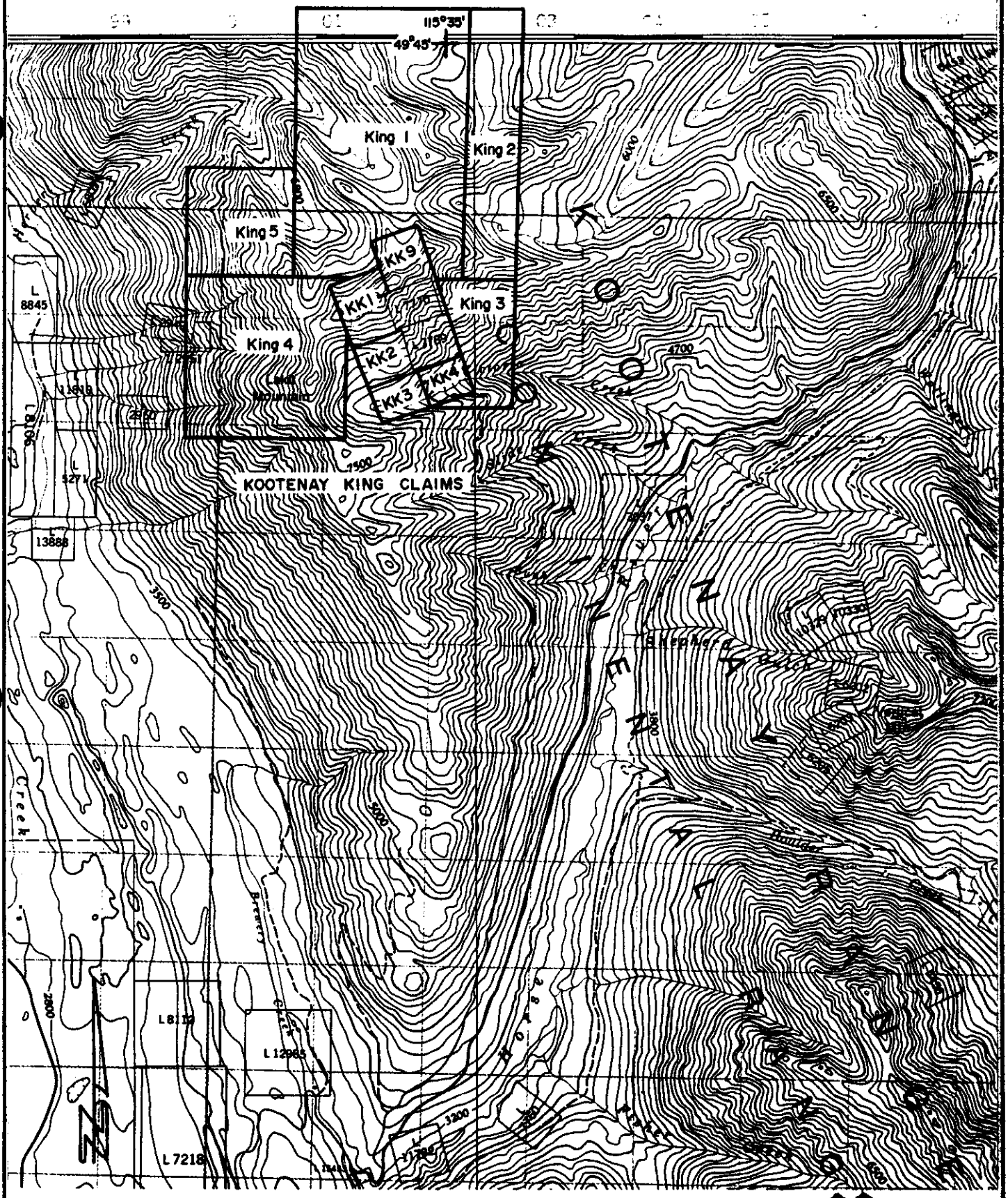
Jules J. Lajoie, Ph.D., P.Eng.
Geophysicist, Cominco Ltd.

Approved for Release by:

John M. Hamilton, P.Eng.
Manager, Western District,
Cominco Ltd.

Distribution:

Mining Recorder (2)
Kootenay Exploration
Western District
Geophysics



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

KOOTENAY KING

CLAIM LOCATION MAP

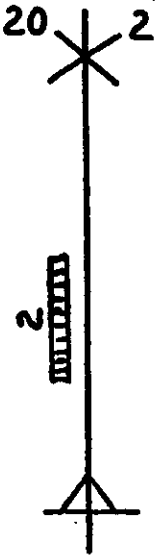
Scale: 1 : 50,000 Date: September 1986 Plate: 307-86-1

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 Channels 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, or S = shallow depth, M = moderate depth and D = deep.

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

APPENDIX I

IN THE MATTER OF THE B.C. MINERAL ACT

AND THE MATTER OF A GEOPHYSICAL PROGRAMME

CARRIED OUT ON THE KOOTENAY KING CLAIMS

LOCATED 30 KM EAST OF KIMBERLEY, B.C.

IN THE FORT STEELE MINING DIVISION OF THE

PROVINCE OF BRITISH COLUMBIA, MORE PARTICULARLY

N.T.S. 82 G/12

S T A T E M E N T

I, Jules J. Lajoie, of the City of West 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 KOOTENAY KING claims;

3. THAT the said expenditures were incurred between July 28 and August 14, and on August 27, 1986, for the purpose of mineral exploration of the above-noted claims.

Jules J. Lajoie, Ph.D., P.Eng.
Geophysicist, Cominco Ltd.

APPENDIX II

EXHIBIT 'A'

STATEMENT OF GEOPHYSICAL EXPENDITURES (1986)

KK 1-4 and 9, King 1-5, and M.L. M-52

1. SALARIES

a) J.J. Lajoie, geophysicist 17 days @ $280.00/day	$4760.00
b) S.J. Visser, geophysicist 14 days @ $240.00/day	$3360.00
c) J.Vyselaar, geophysicist 1 day @ 240.00	$240.00
d) M.J. Davies, technician 19 days @ $115.00/day	$2185.00
d) S. Kemp, assistant 19 days @ $80.00/day	$1520.00
e) G. Allen, assistant 11 days @ $70.00/day	$770.00
f) N. Murphy, assistant 13 days @ $70.00/day	$910.00
	$13745.00

2. OPERATING DAY CHARGES Note: This charge is applied for those days on which useful data are acquired, to cover the costs of data compilation, drafting, interpretation, and report.

10 days @ 250.00/day $2500.00

3. EQUIPMENT RENTAL

10 operating days @ 150.00/day $1500.00

4. EXPENSE ACCOUNTS

J.J. Lajoie	$1729.68
S.J. Visser	$827.49
J. Vyselaar	$53.00
M. Davies	$605.17
	$3215.34

5. MISCELLANEOUS

Accomodation:	
19 days @ $50.00/day	$950.00
Wire Usage Charge:	$200.00
Trucks:	
2 trucks x 19 days x $40/day	$1520.00
	$2670.00

6. LINECUTTING: (D. Calder, Cranbrook)

3 km @ $300.00/km	$900.00
rechaining: 8 km @ $75.00/km	$600.00
	$1500.00

7. ROAD WORK: (Wright Contracting, Cranbrook)

Road work: 38 hrs @ $70.00/hr	$2660.00
Supervision: 5 days @ $85.00/day	$425.00
Hauling:	$244.00
Truck: 5 days @ $40.00/day	$200.00
	$3529.00

TOTAL	$28,659.34

NOTE: Of the above total of $28,659.34, $13,759.00 was spent in the period to August 4, 1986.

I certify this to be a true statement of expenditures for the geophysical program on the Kootenay King claims in 1986.

Jules J. Lajoie, Ph.D., P.Eng.
Geophysicist, Cominco Ltd.

APPENDIX III

C E R T I F I C A T I O N

I, Jules J. Lajoie, of 5655 Keith Road, in the City of West Vancouver, in the Province of British Columbia, do hereby certify that:

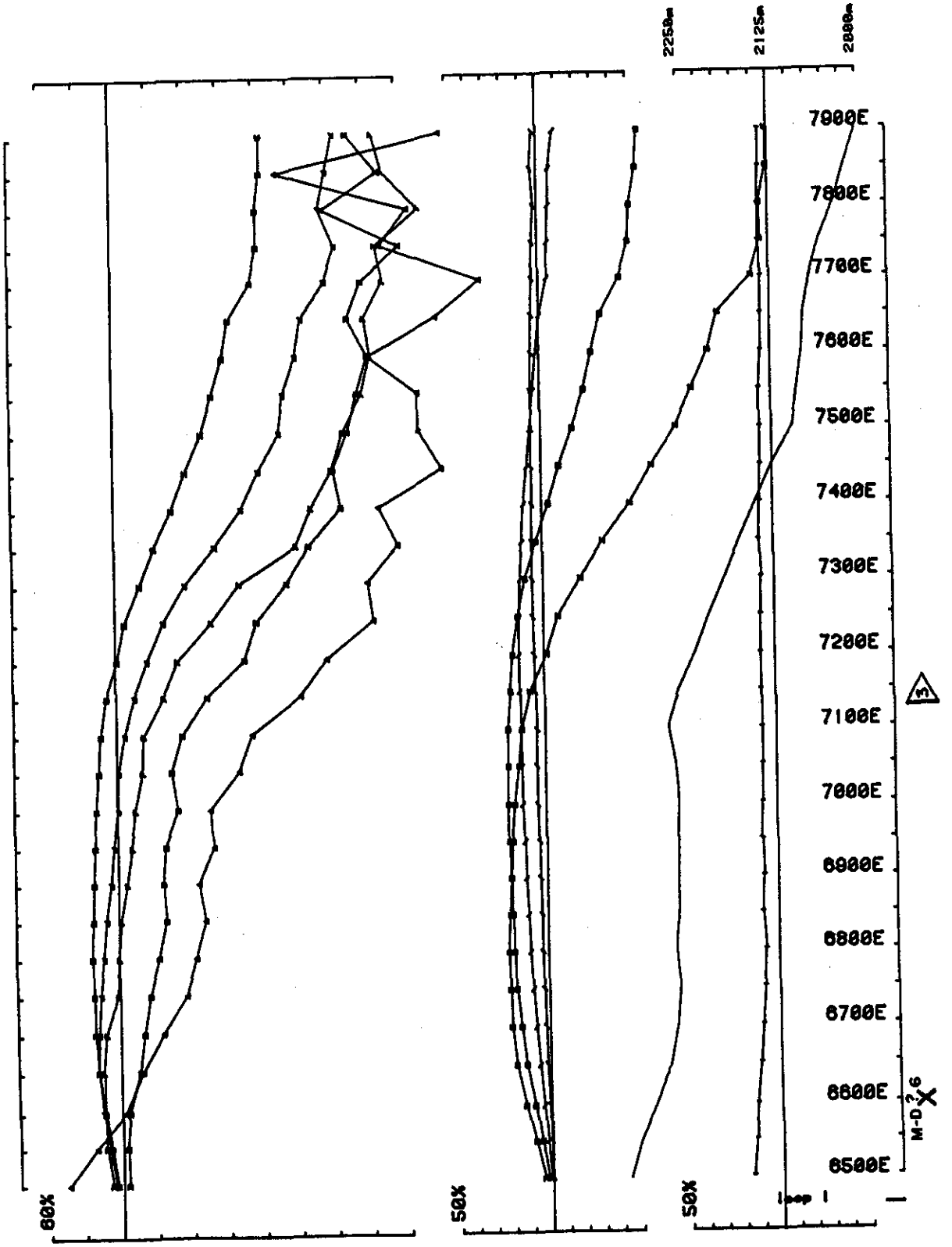
1. I graduated from the University of Ottawa in 1968 with an Honours B.Sc. in Physics, from the University of British Columbia in 1970 with an M.Sc. in Geophysics, and from the University of Toronto in 1973 with a Ph.D. in Geophysics.

2. I am a registered member (#12077) of the Association of Professional Engineers of the Province of British Columbia, the Society of Exploration Geophysicists, and the British Columbia Geophysical Society.

3. I have been practicing my profession for the past thirteen years.

Jules J. Lajoie, Ph.D., P.Eng.
Geophysicist, Cominco Ltd.

DATA SECTIONS



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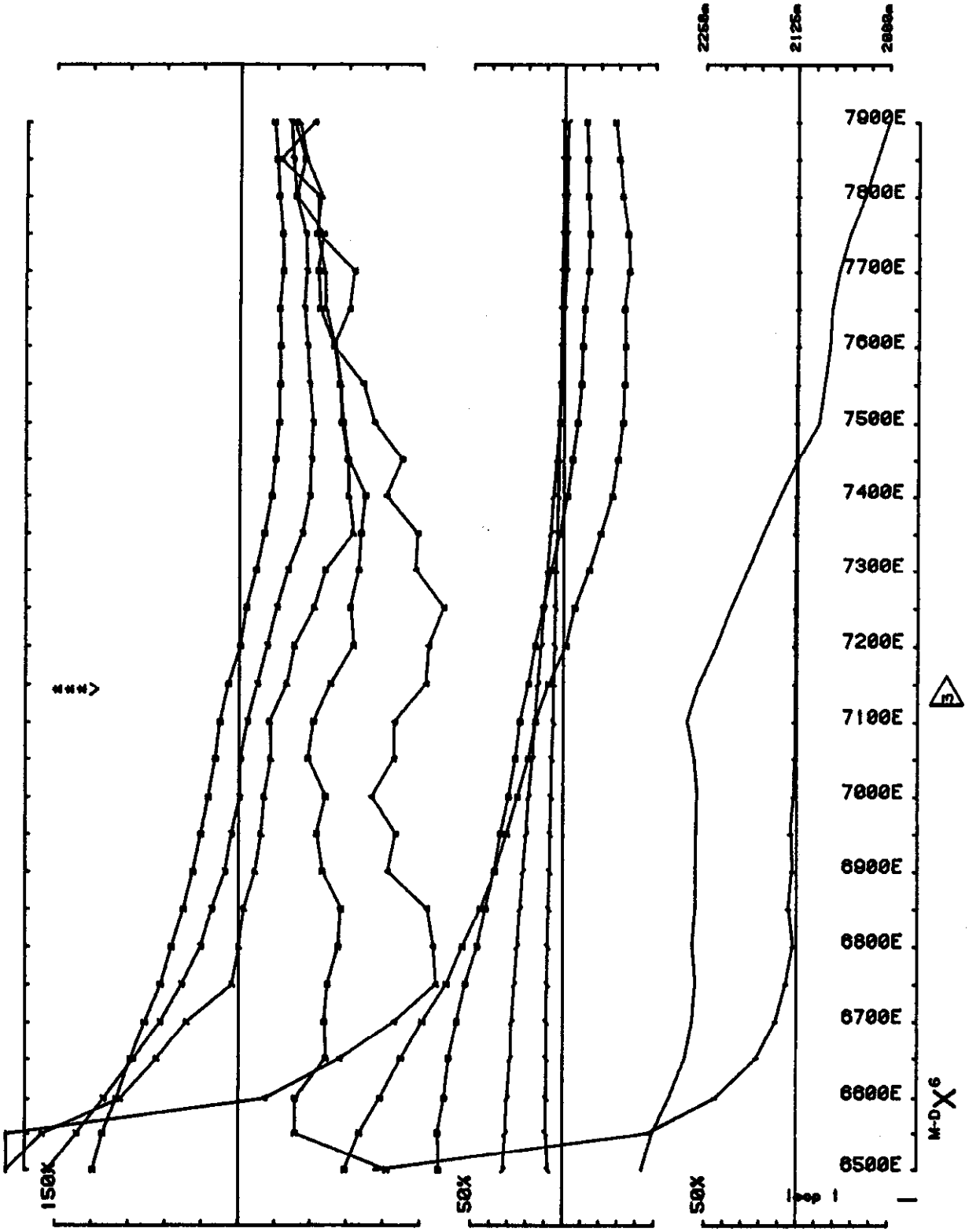

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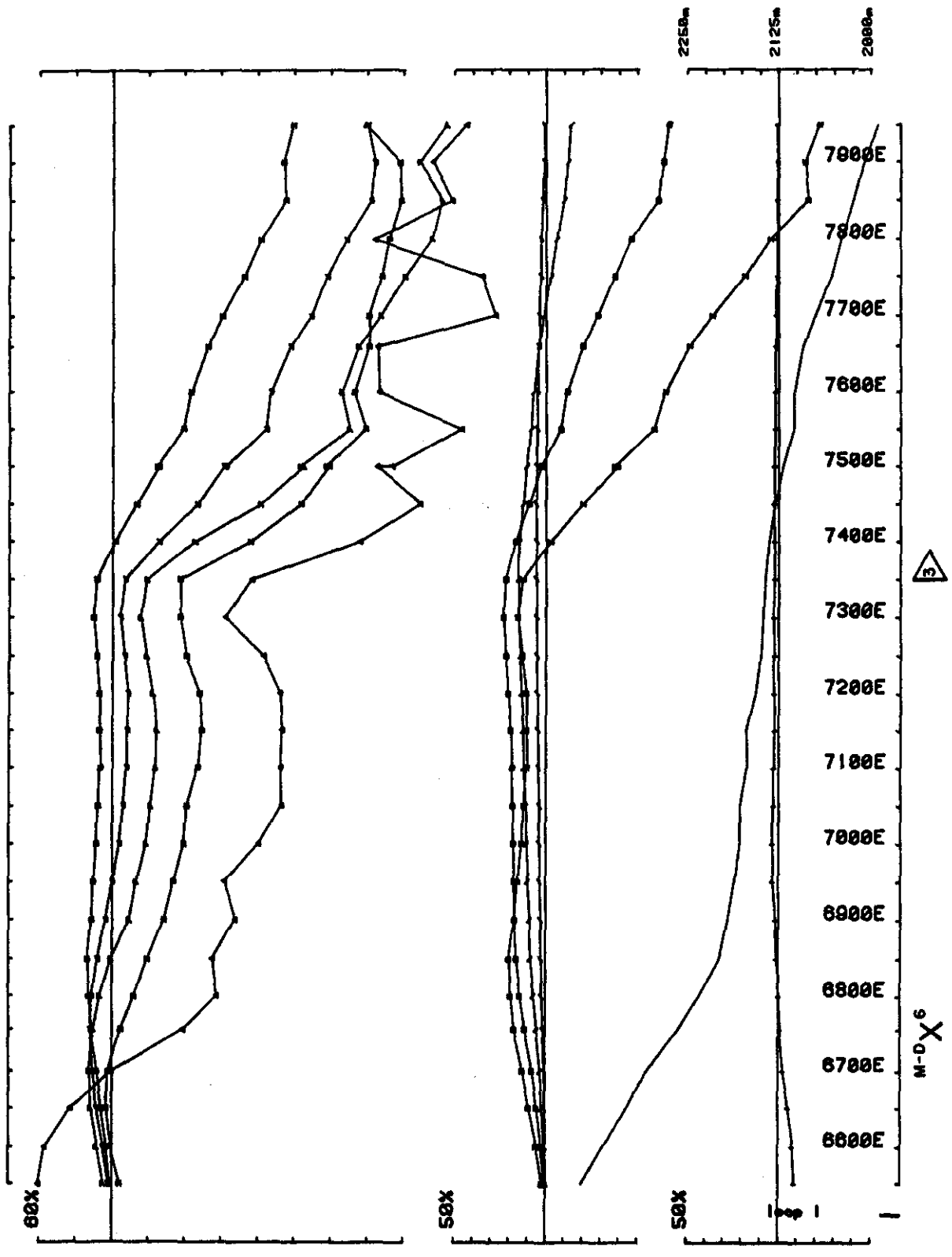

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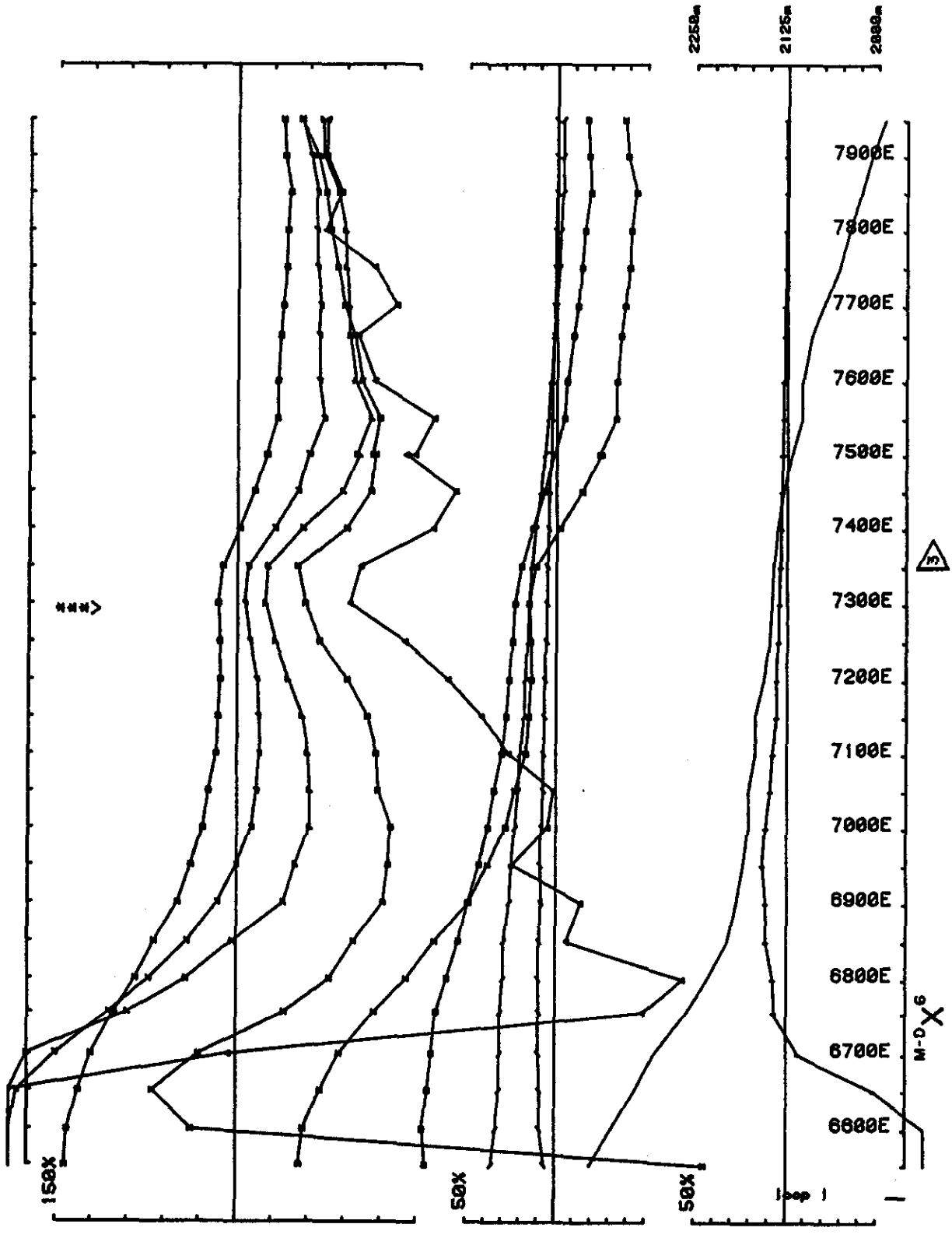

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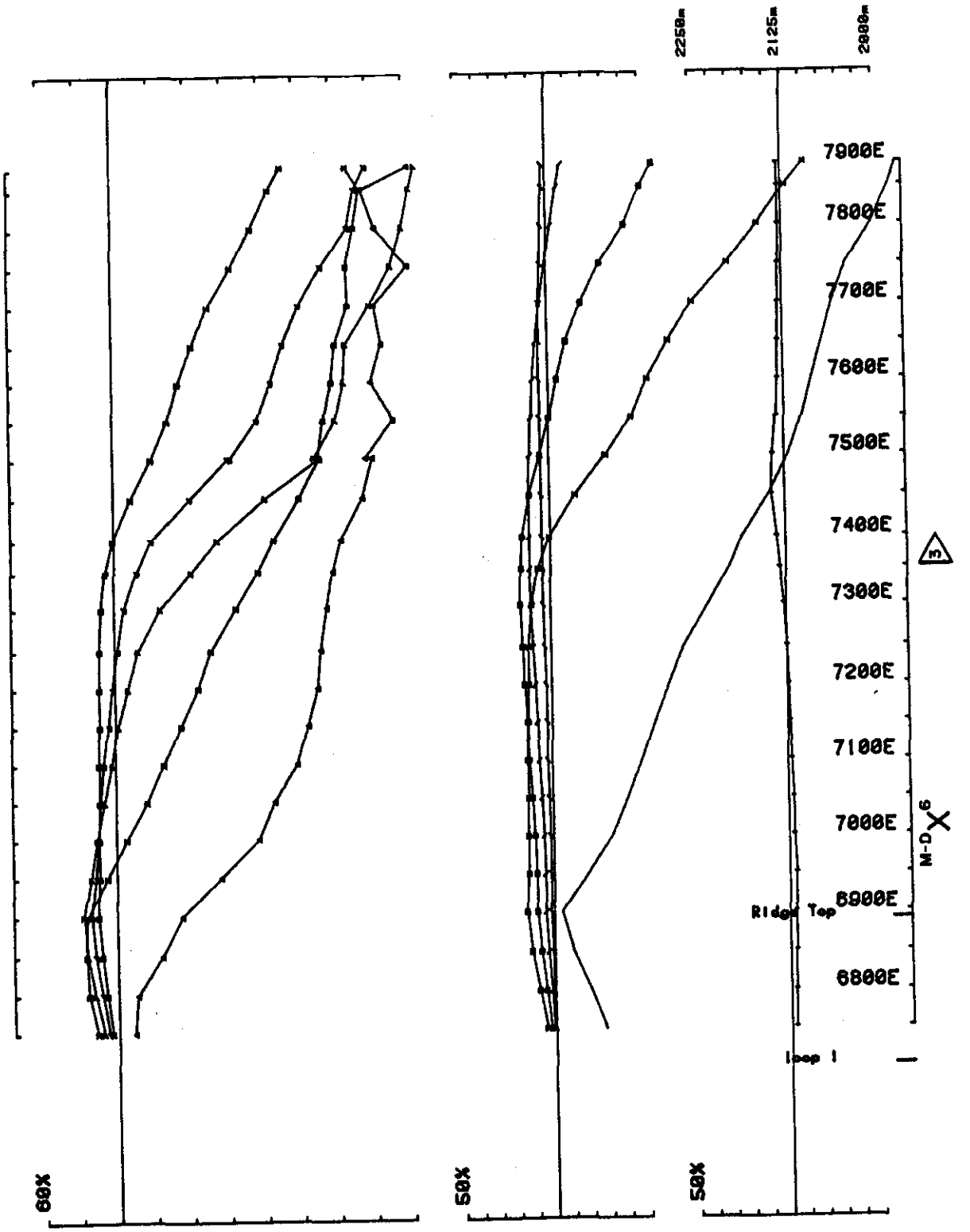

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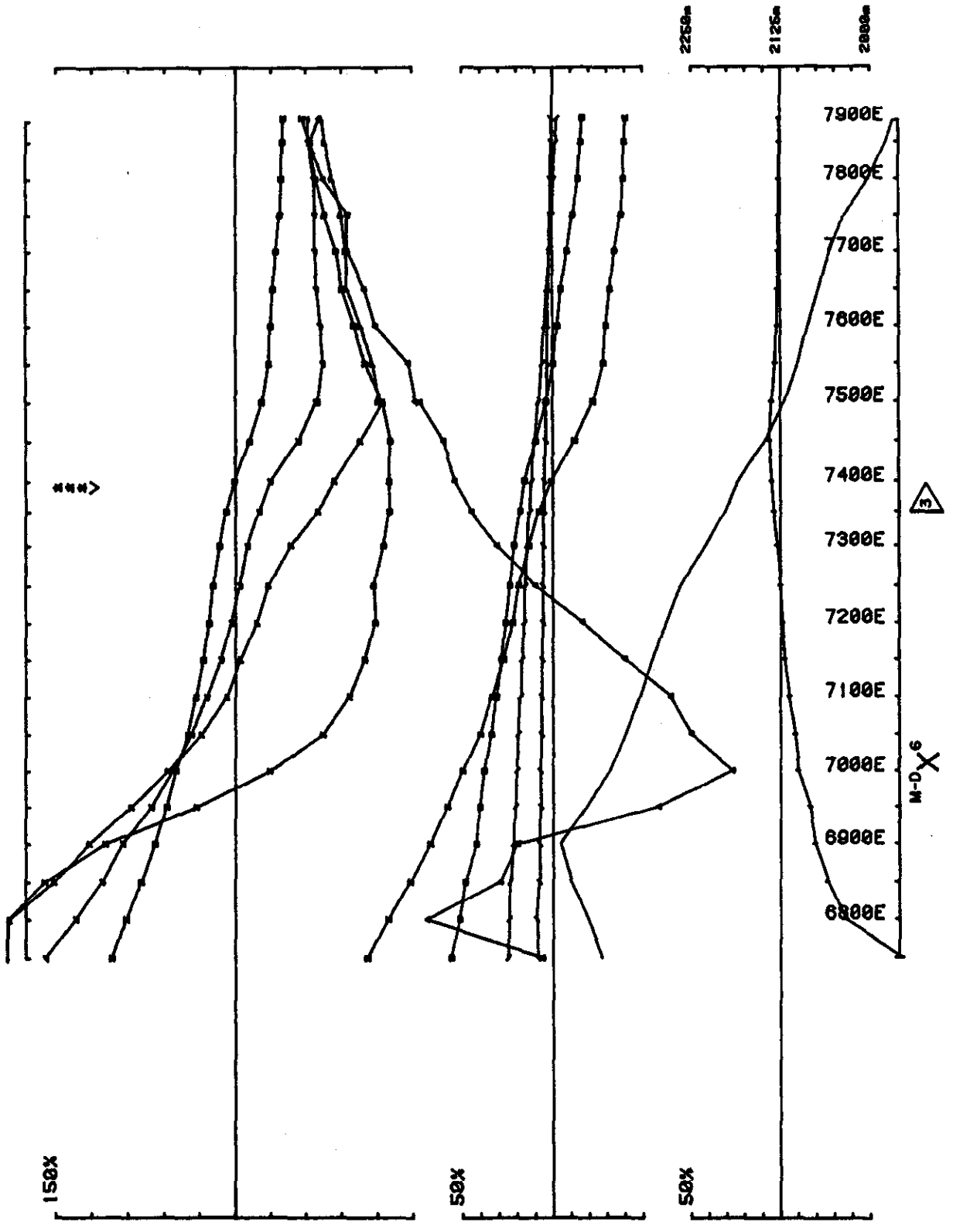

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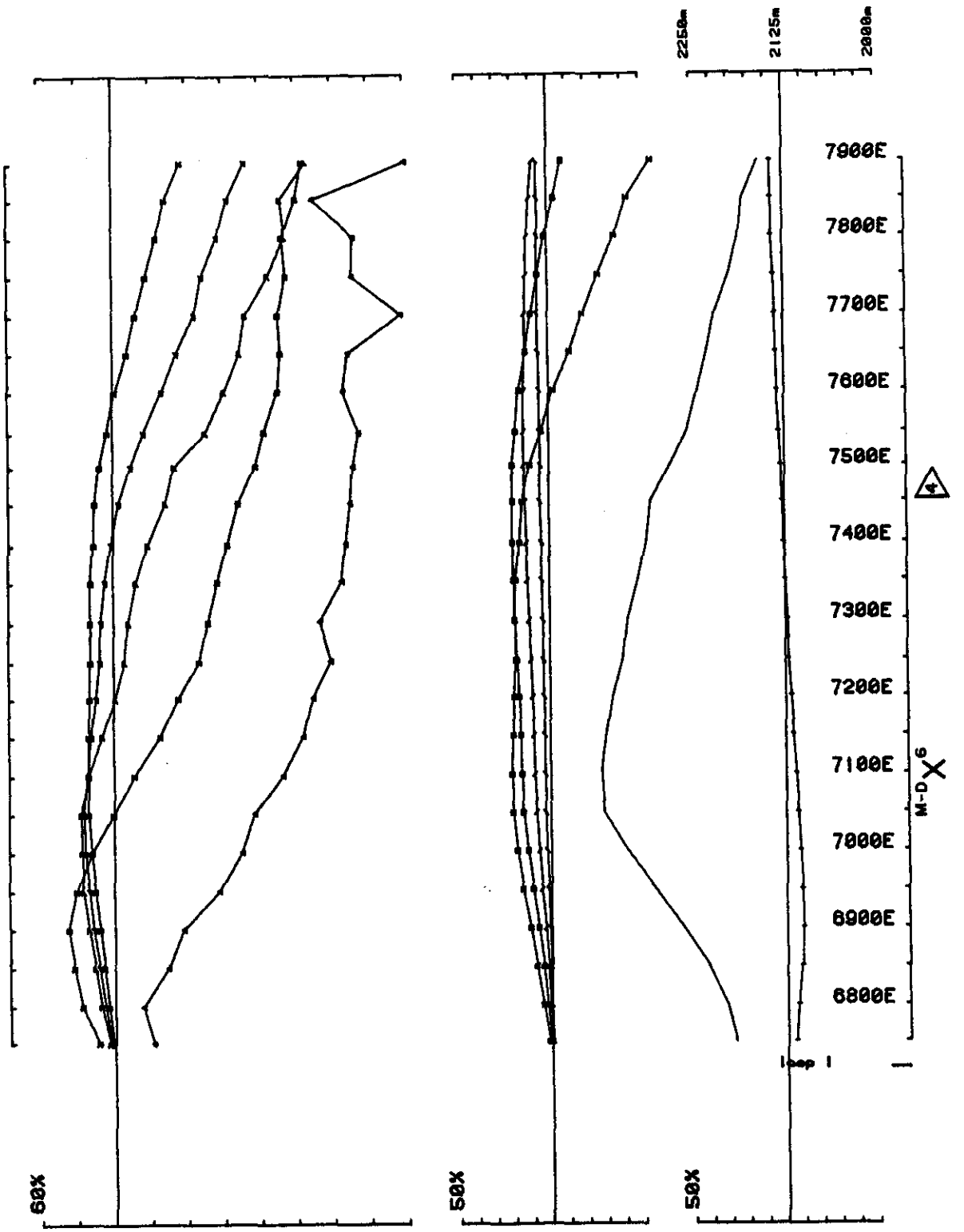
DS 3a



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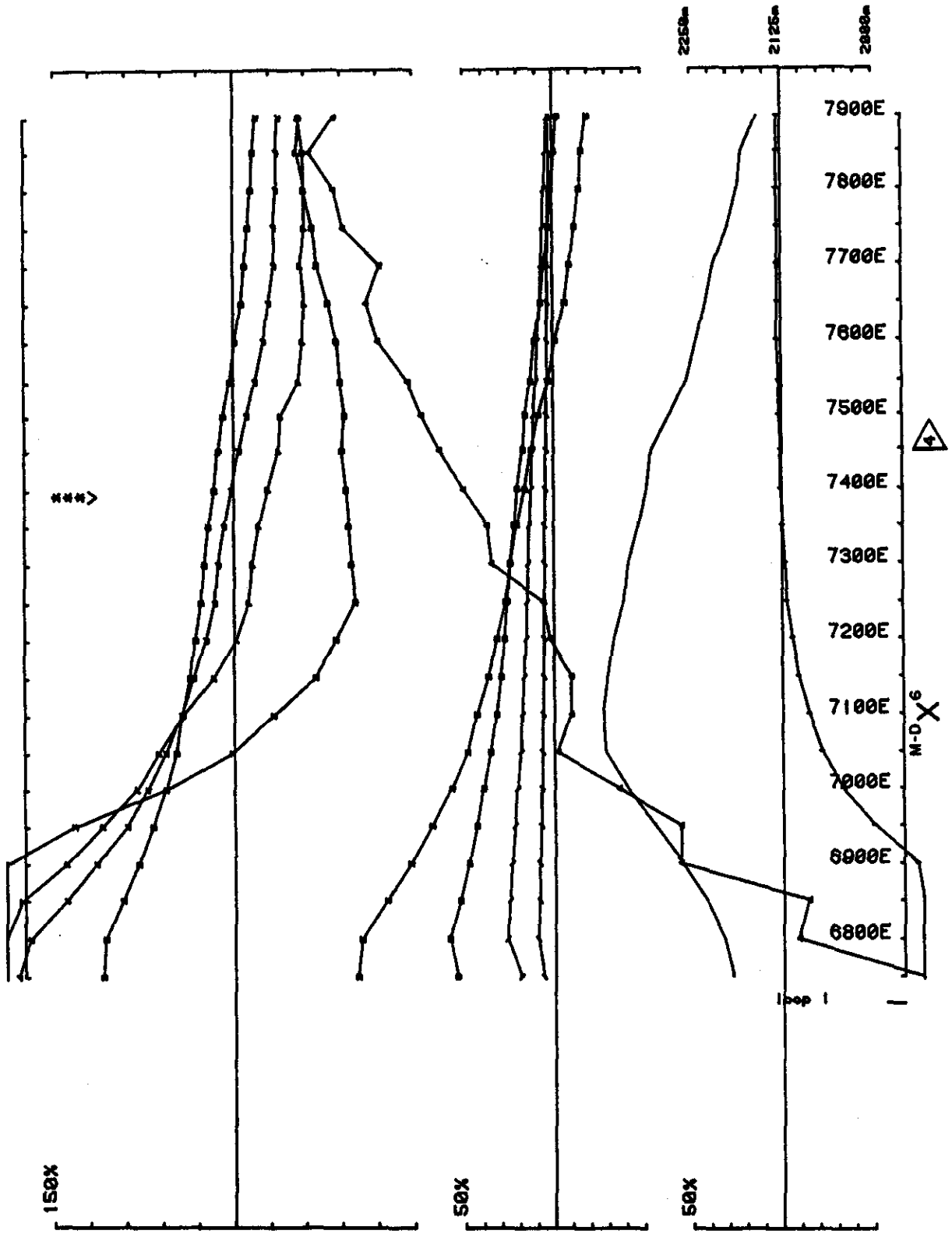

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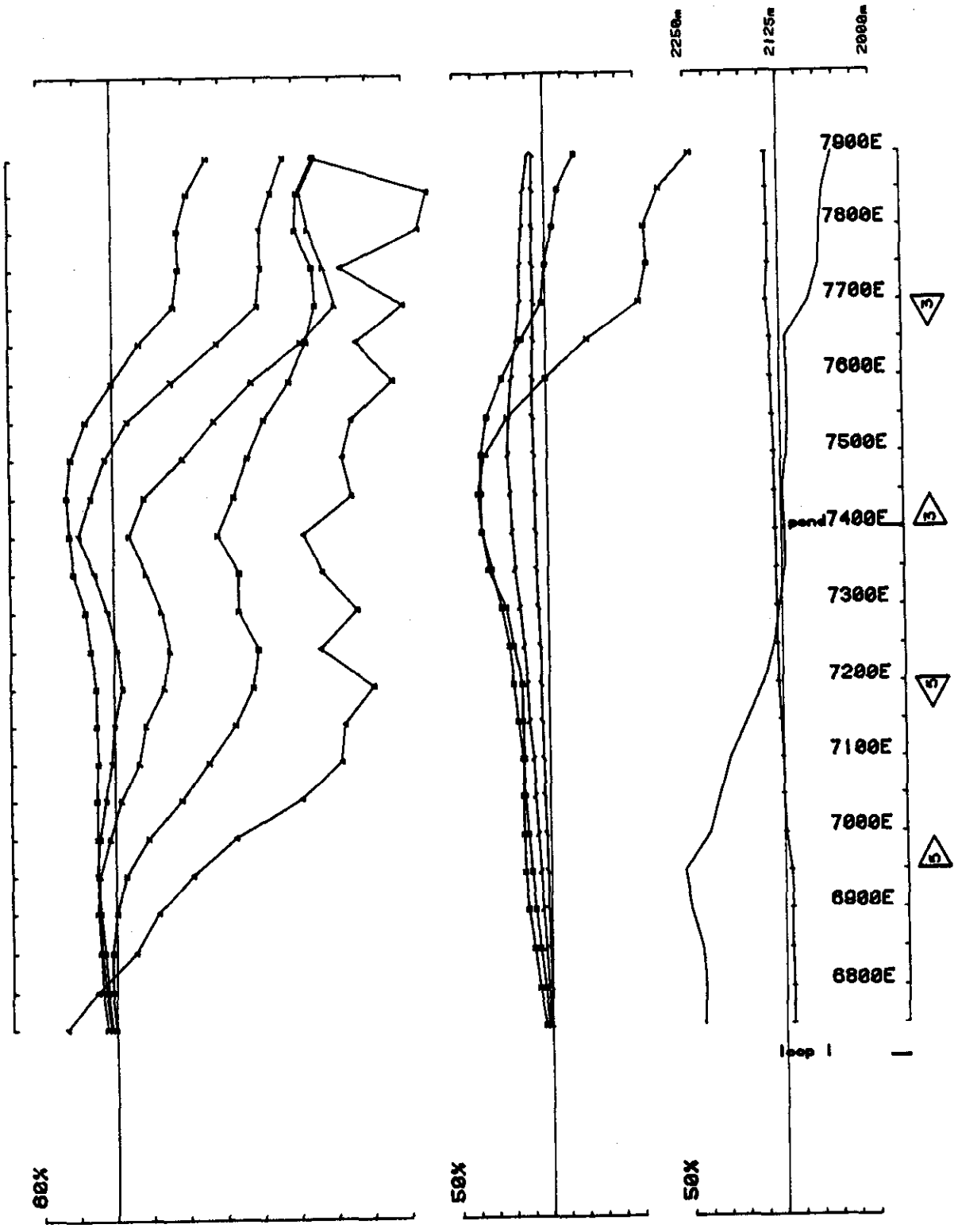

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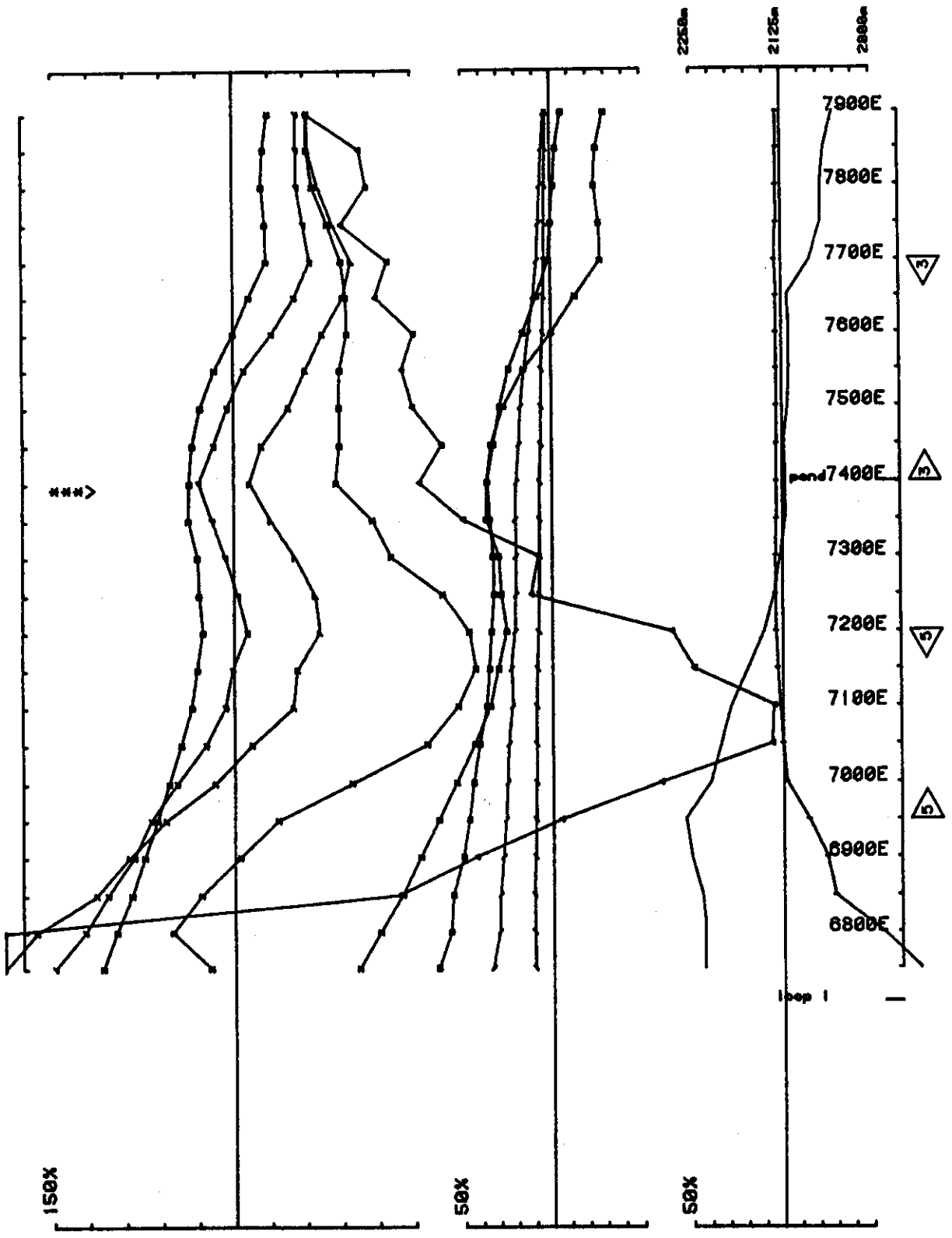

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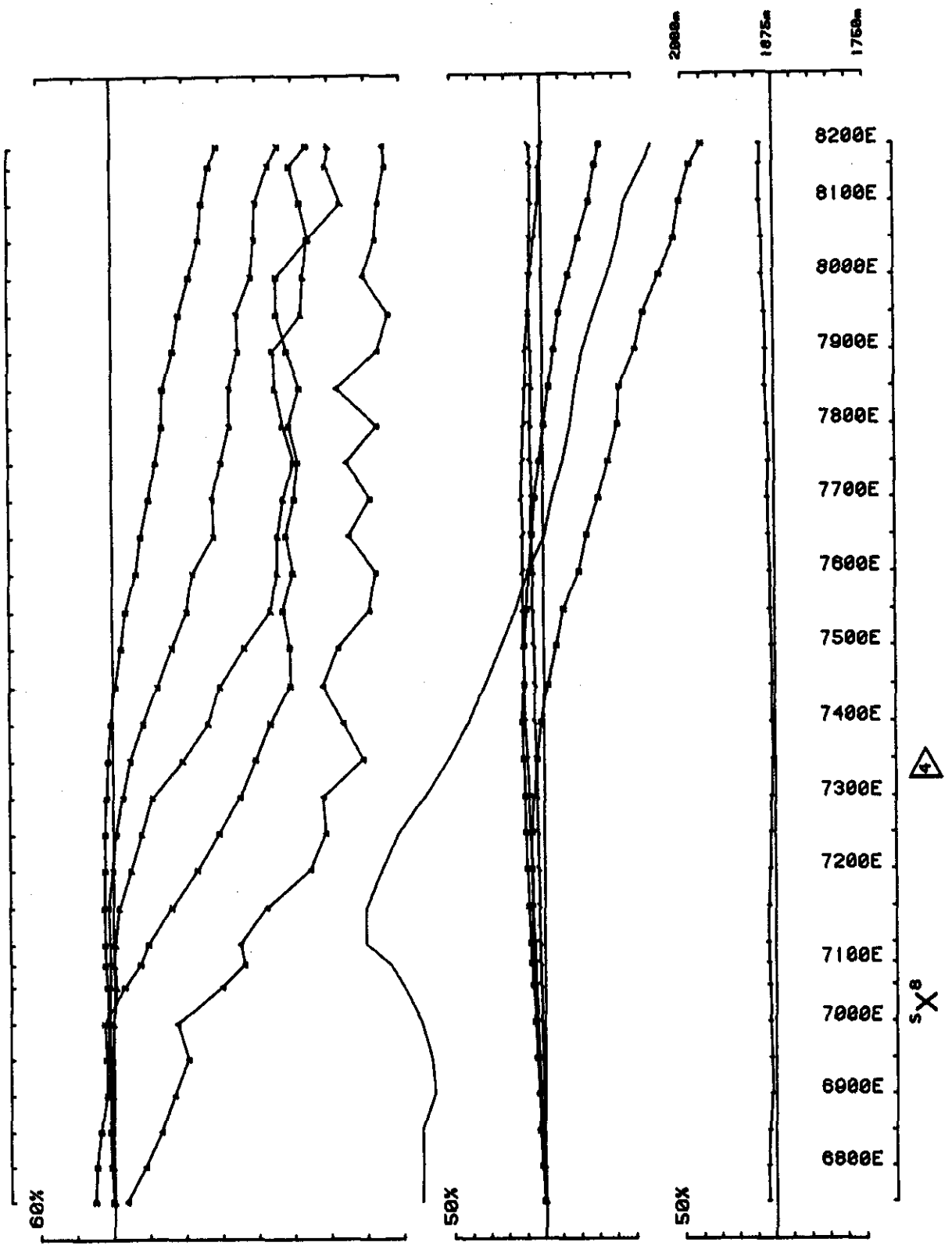

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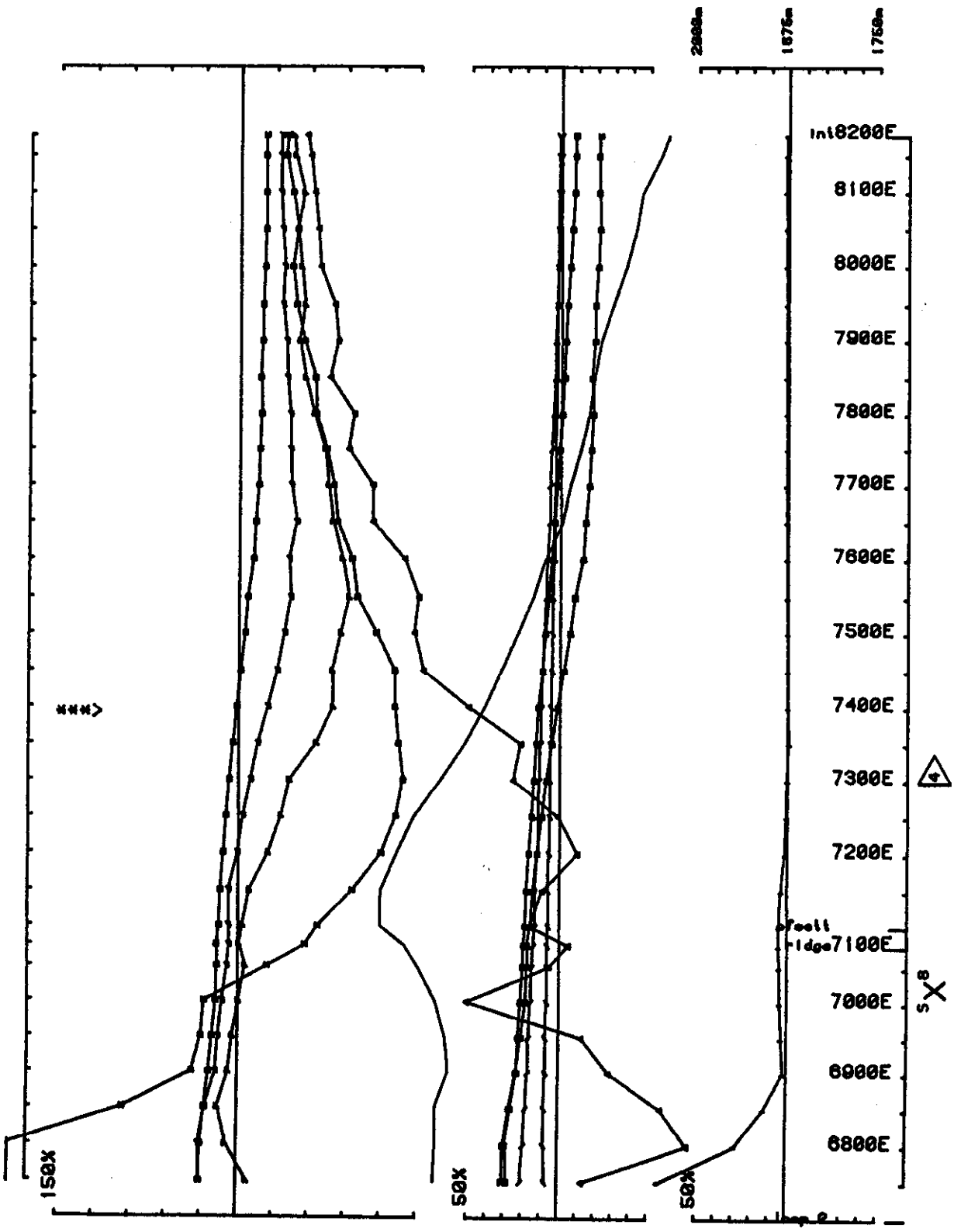

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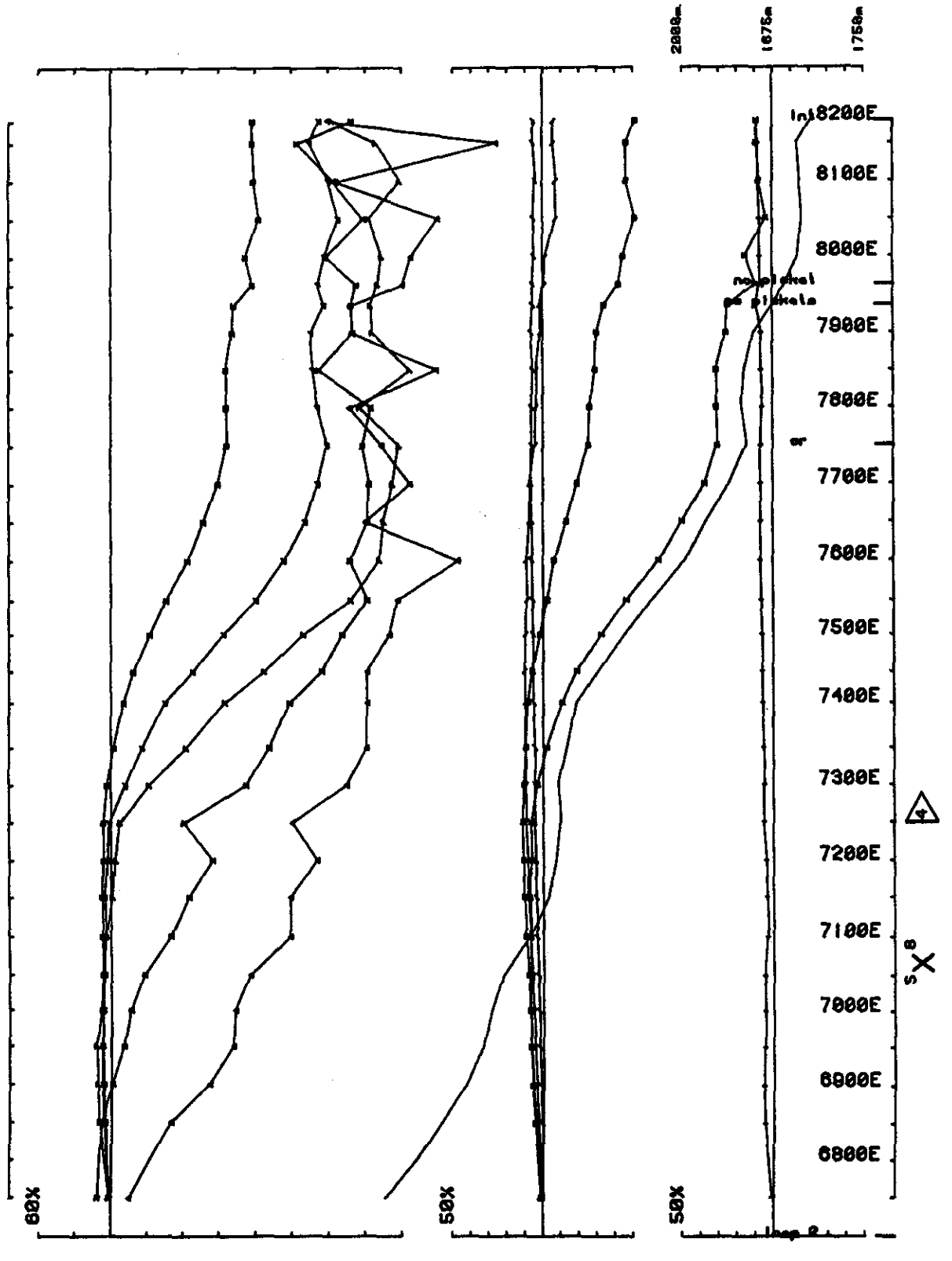
DS 6a



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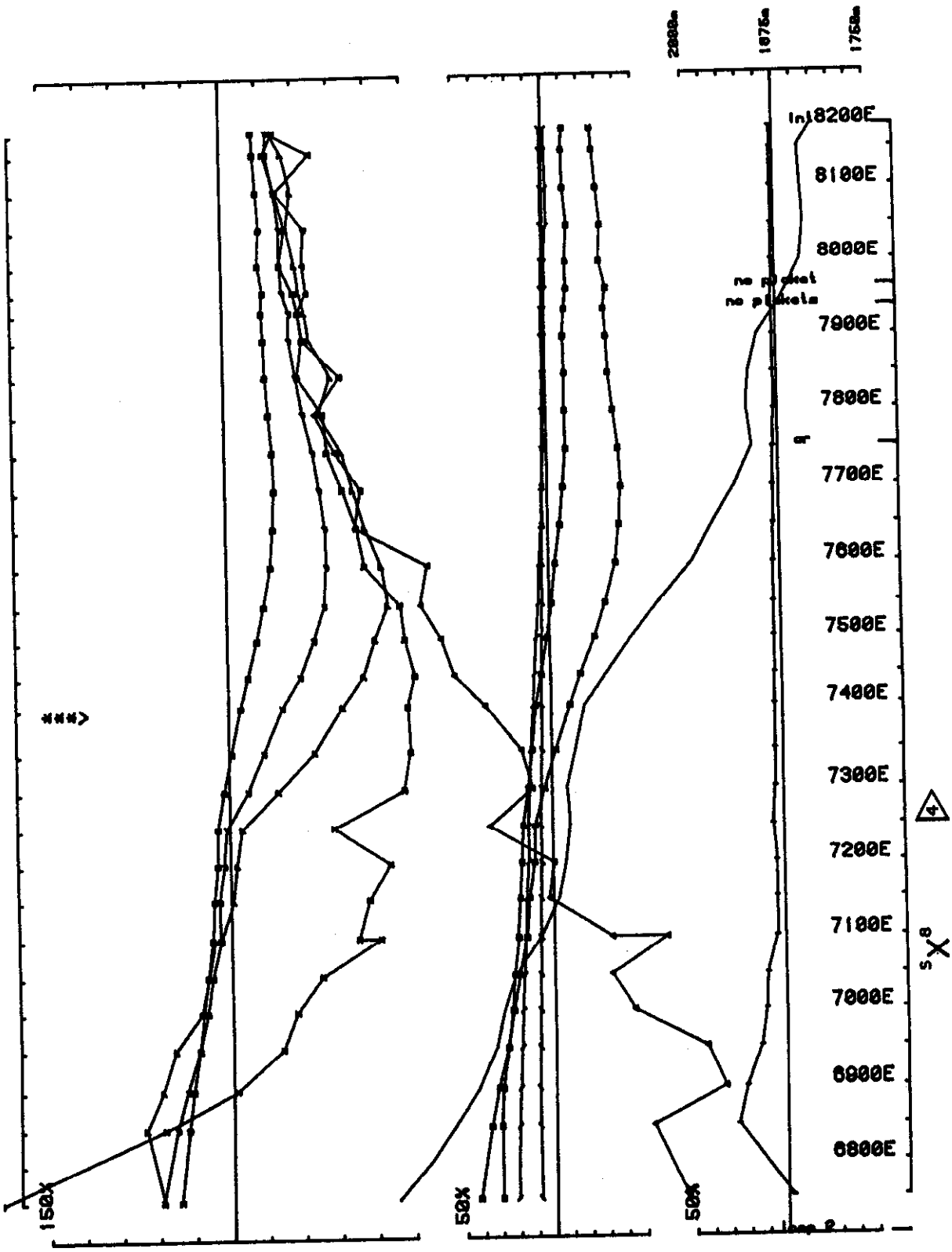

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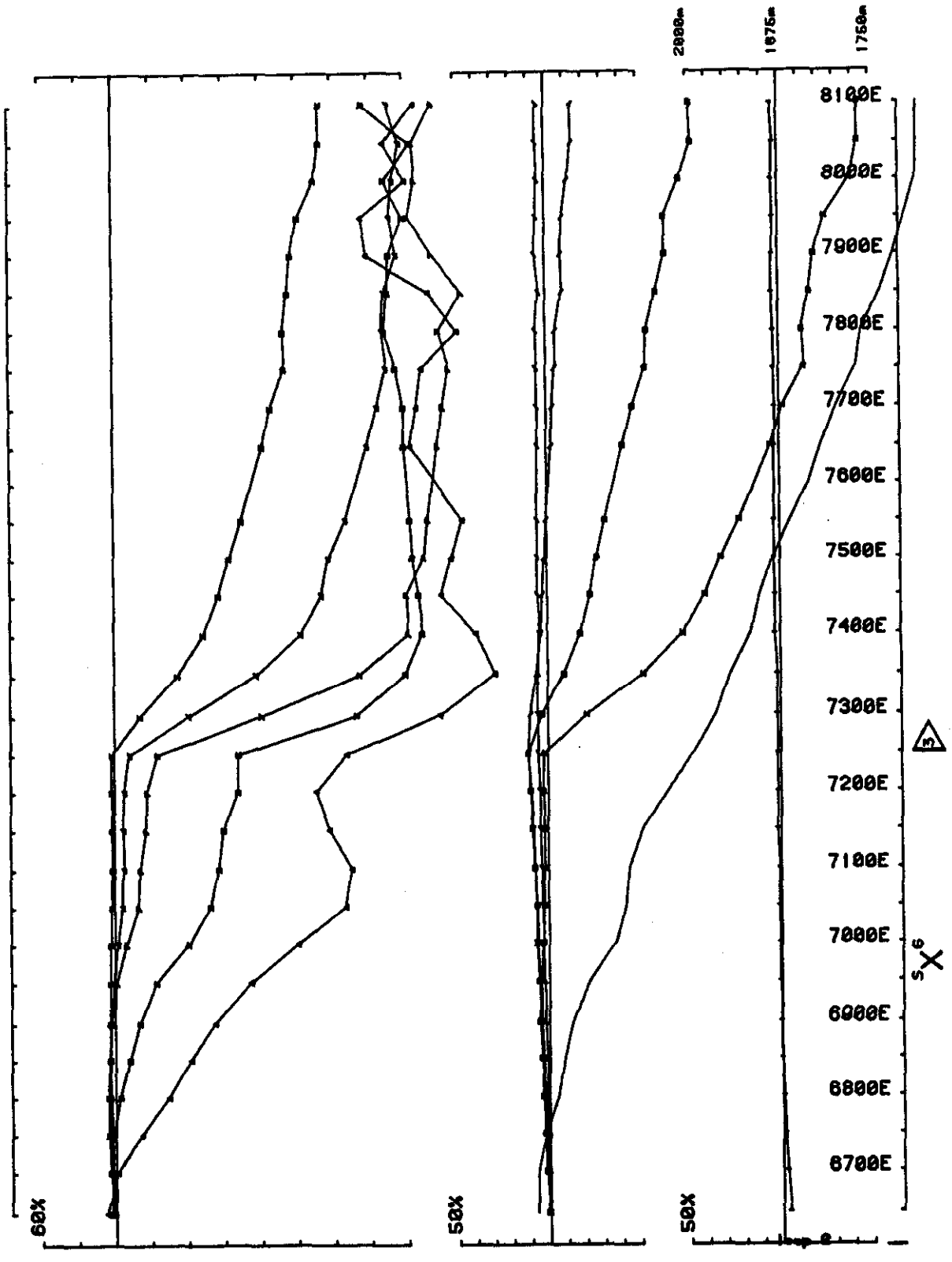

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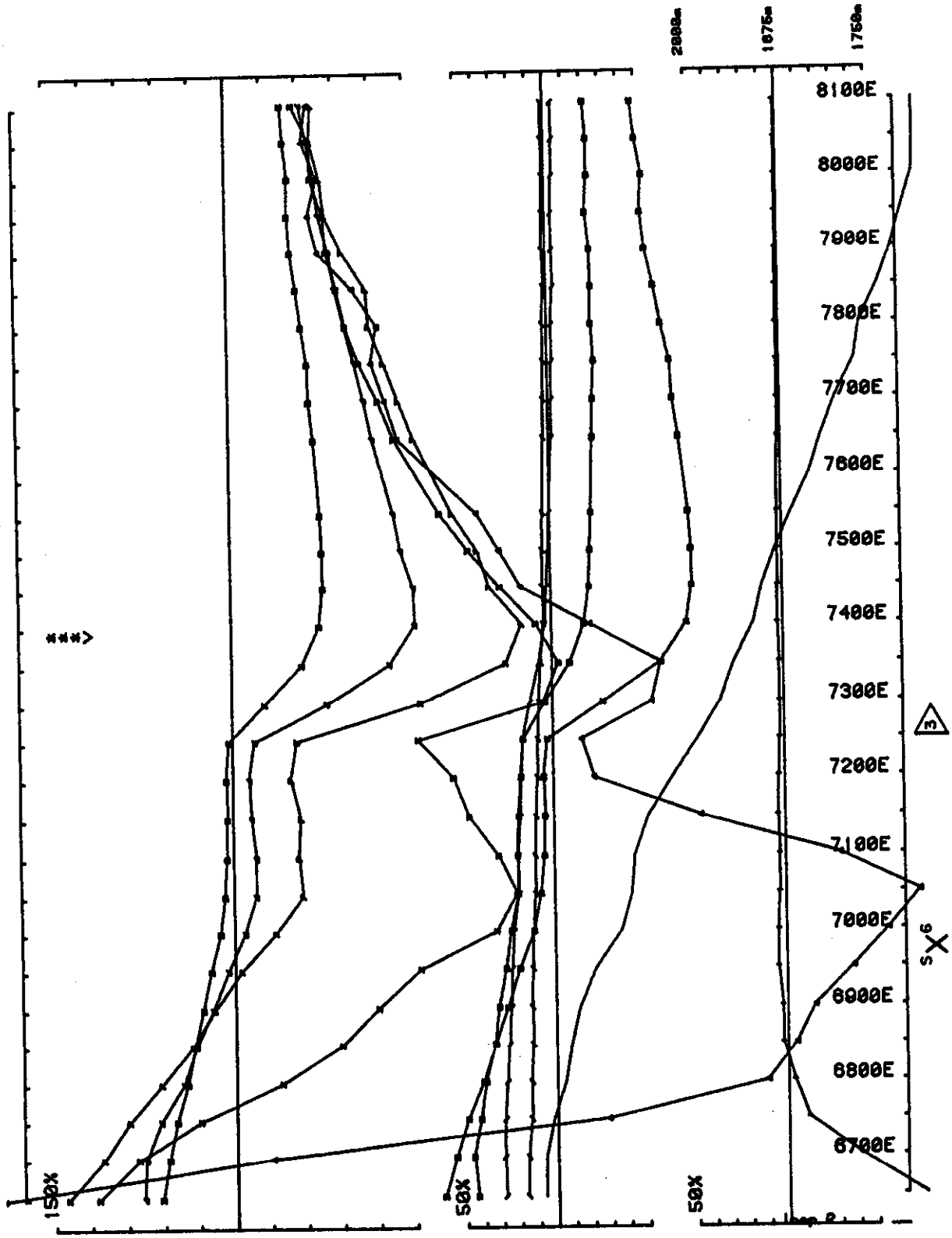

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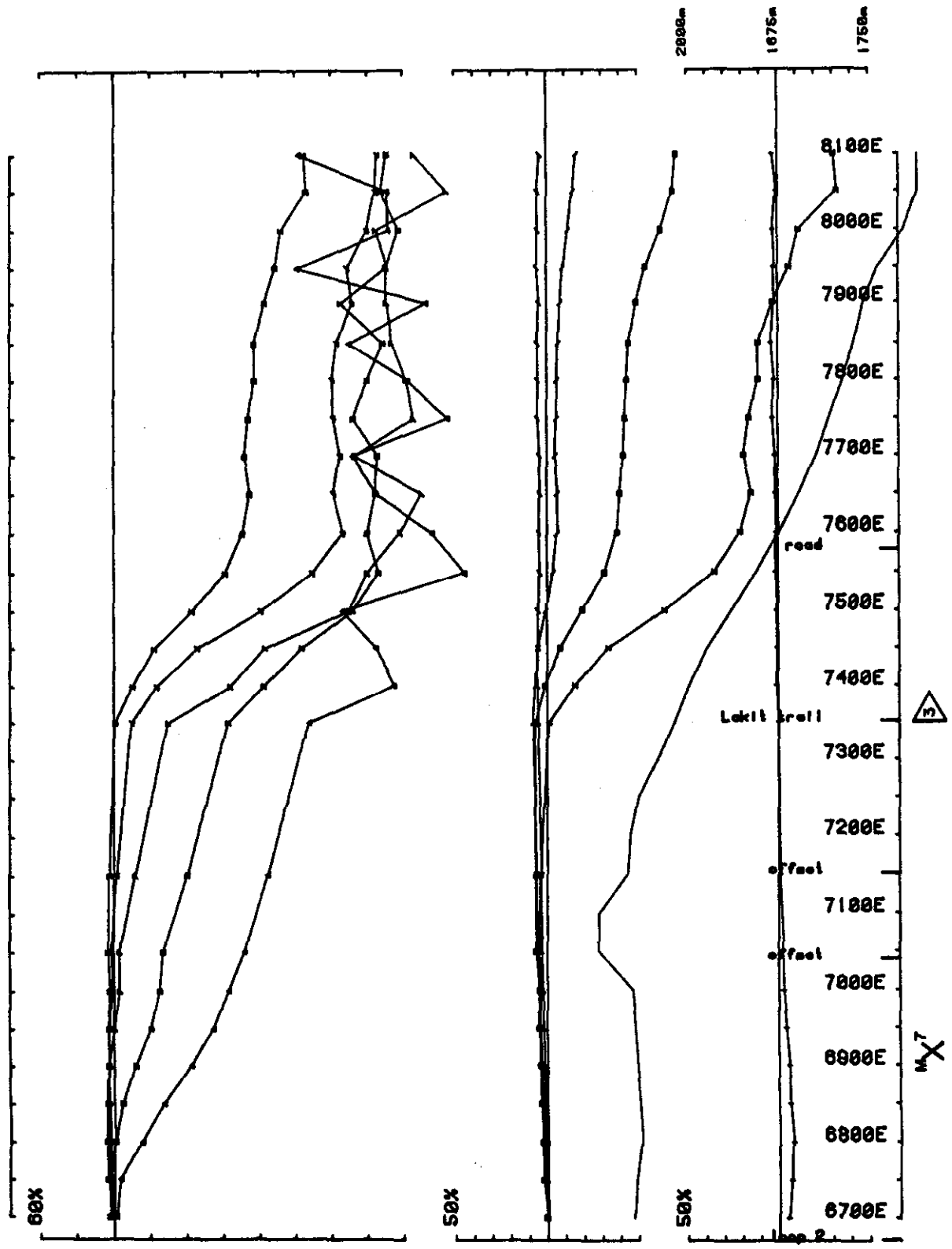

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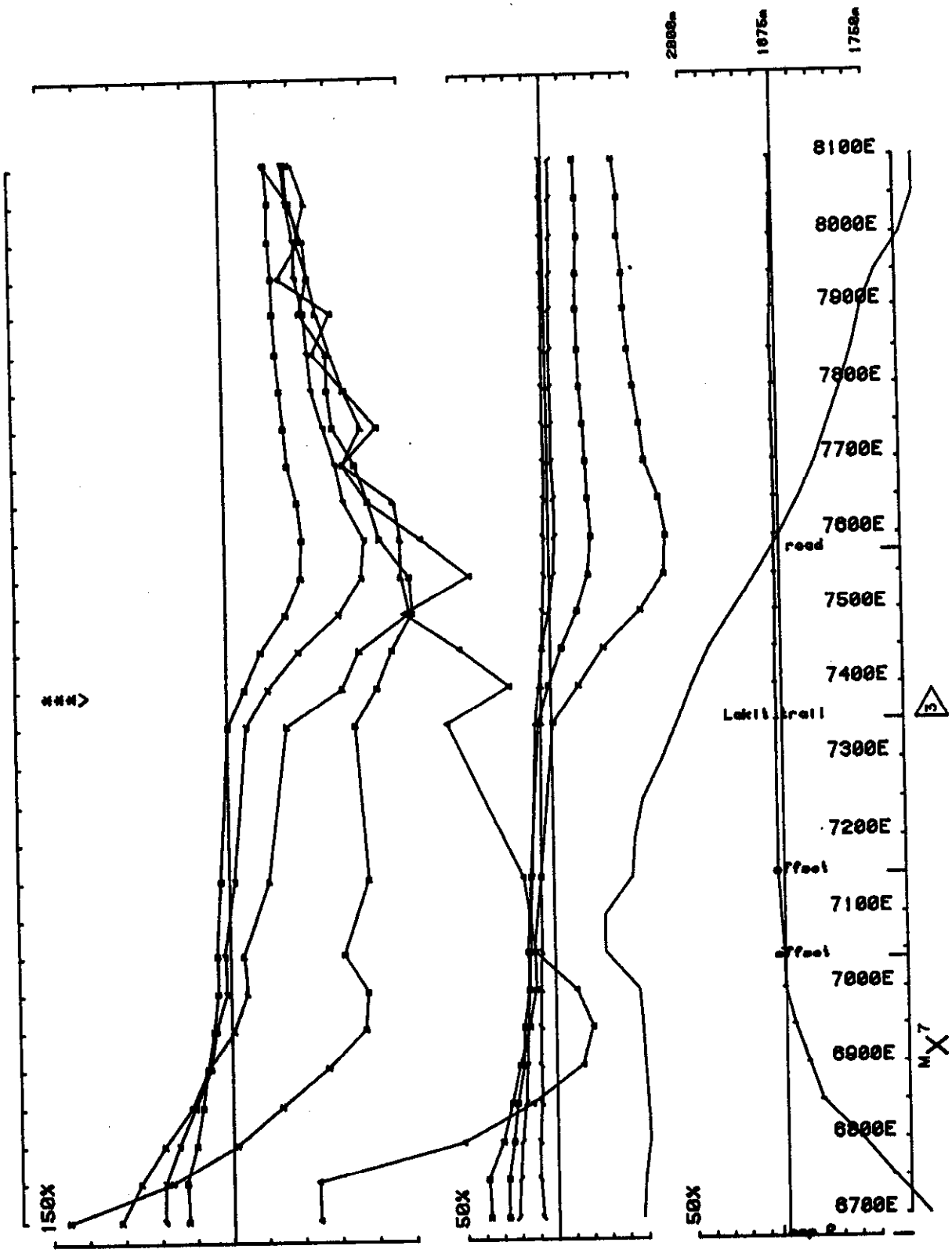

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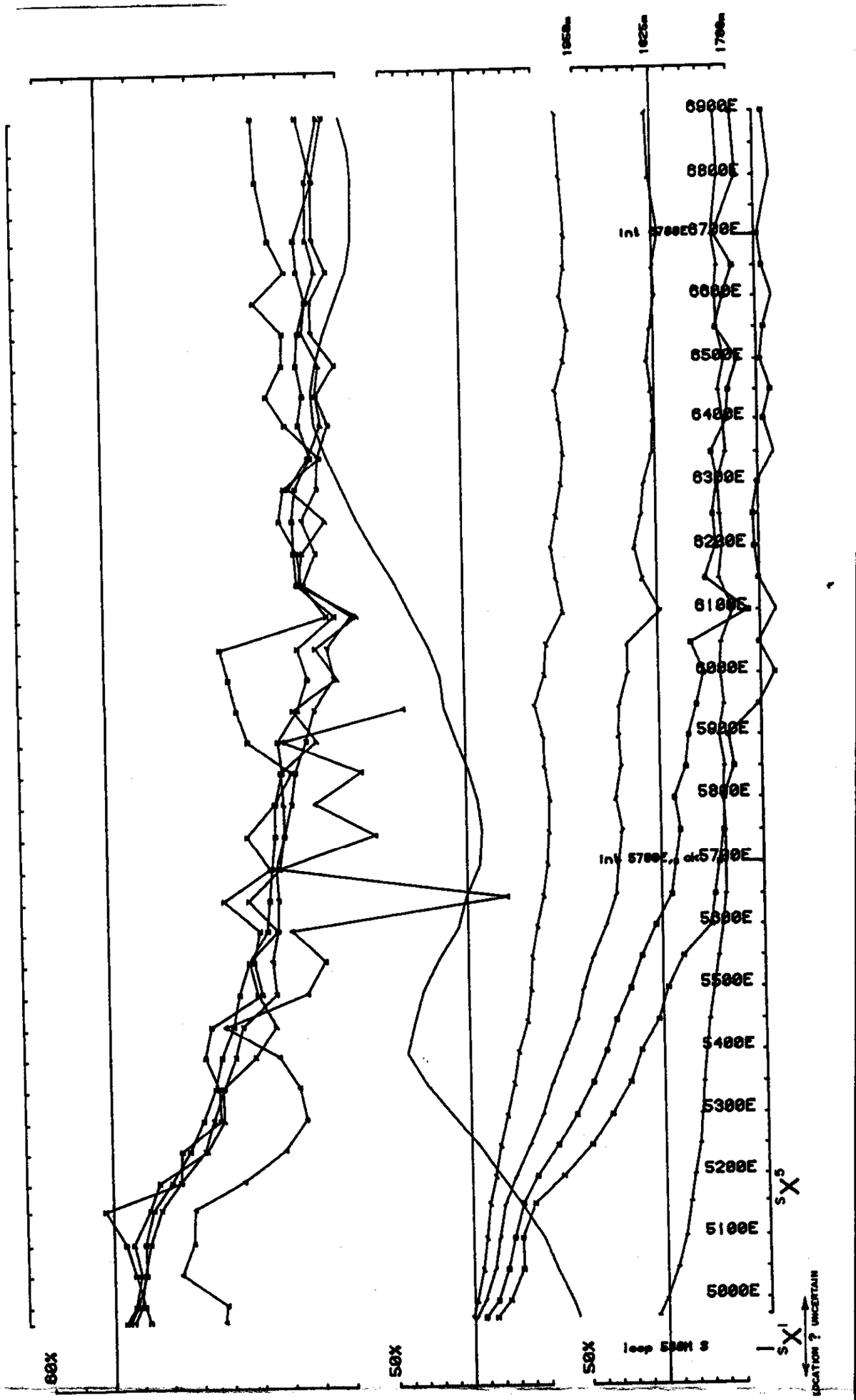
DS 9a



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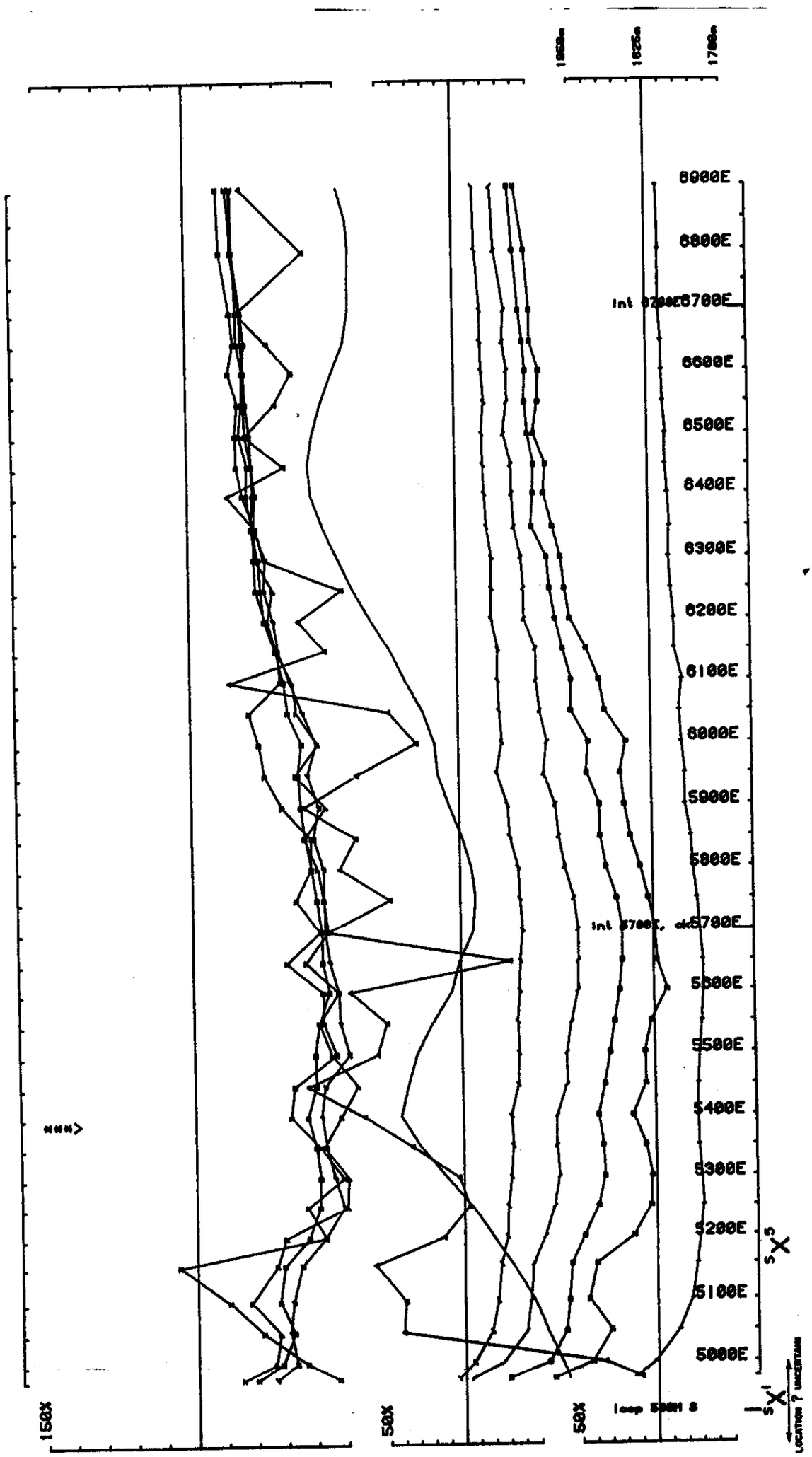

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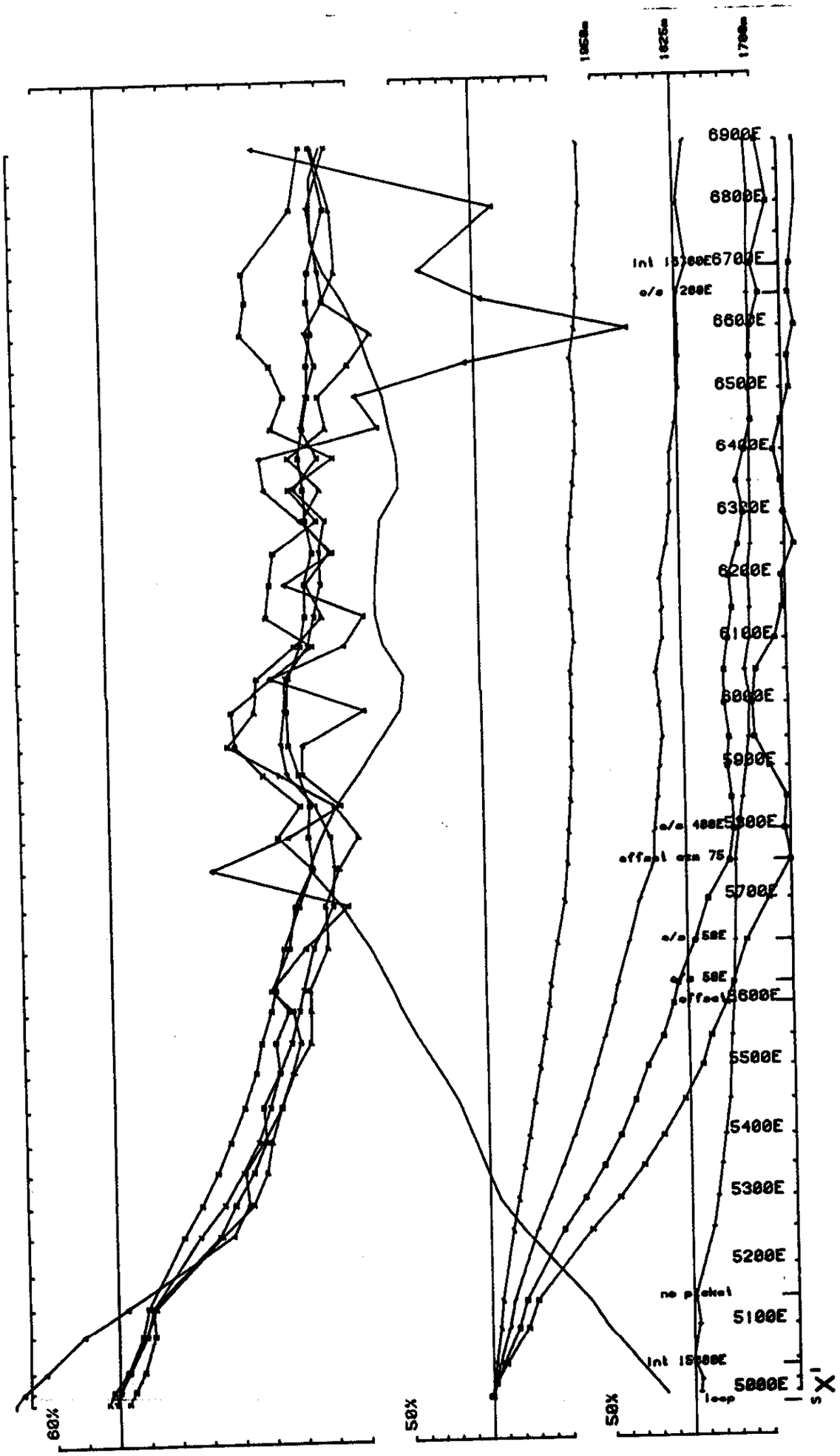

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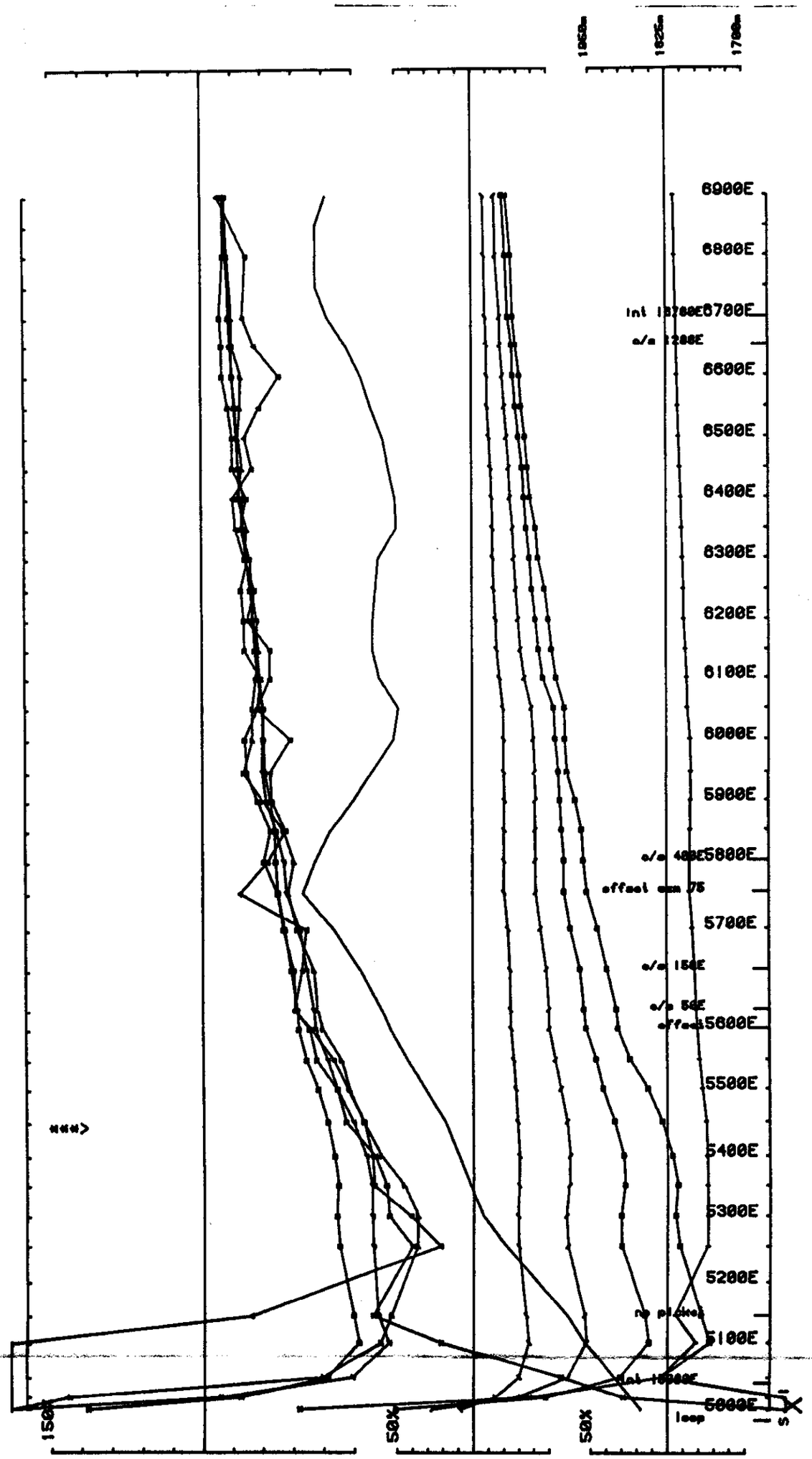

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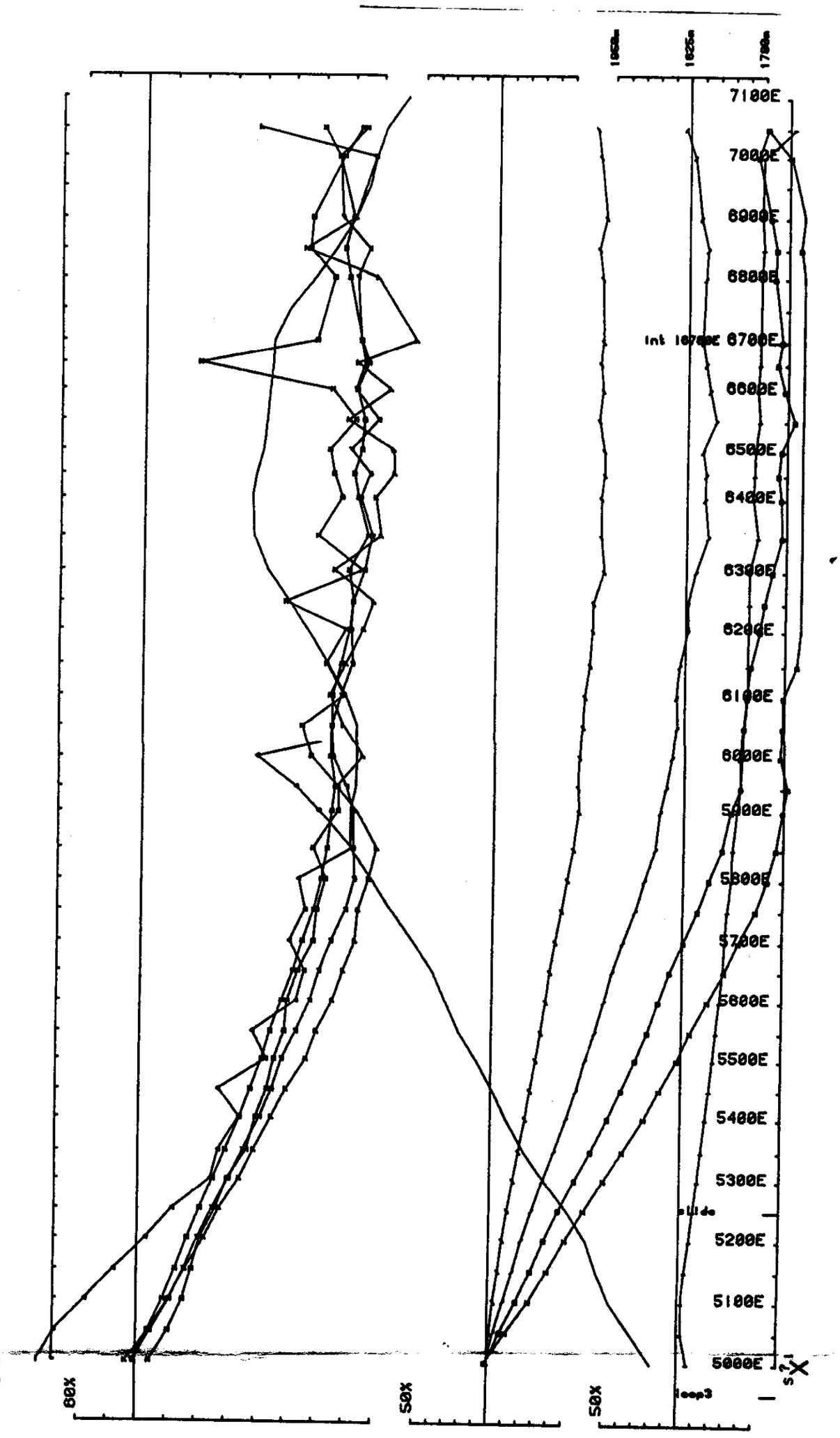

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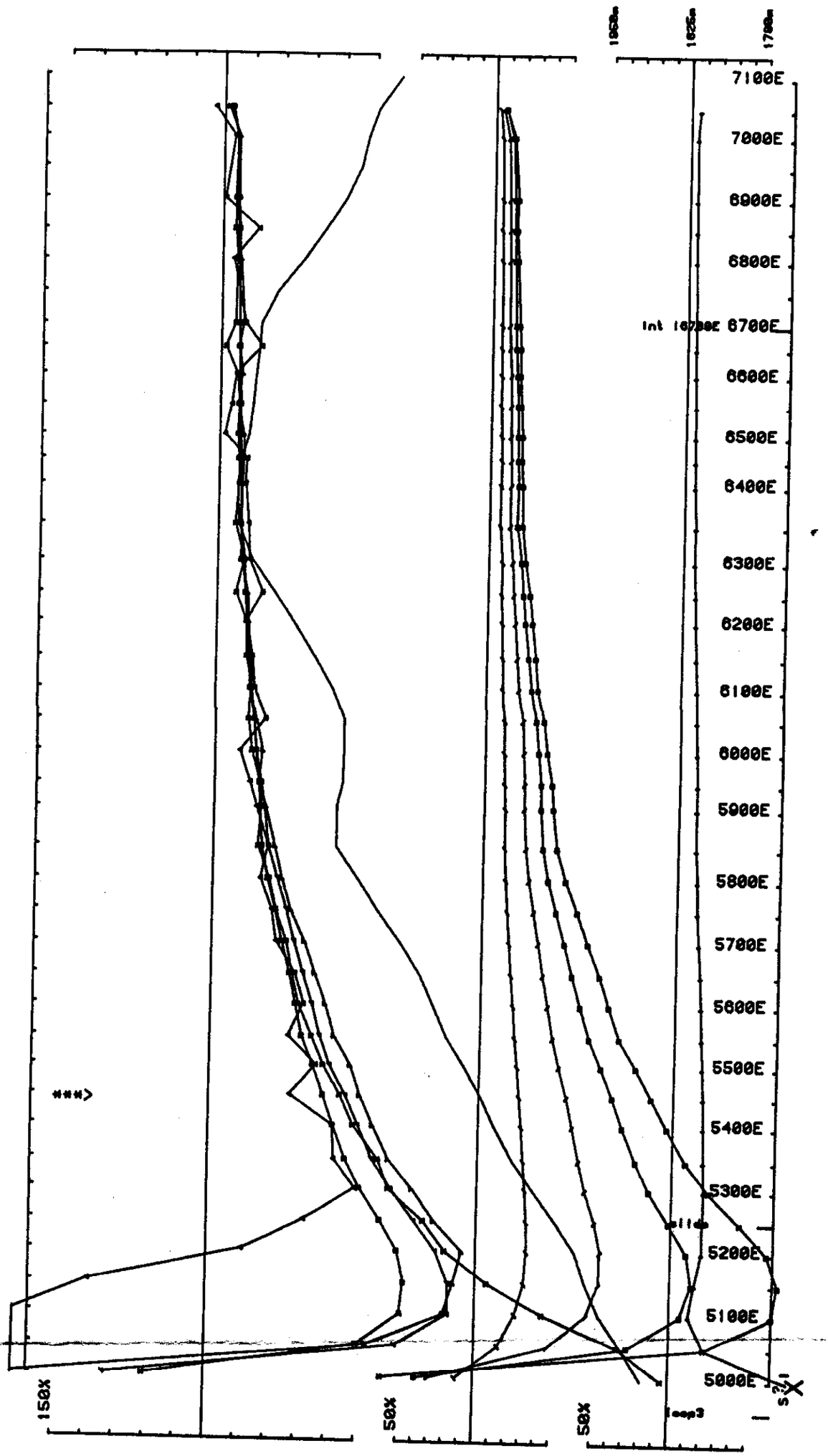

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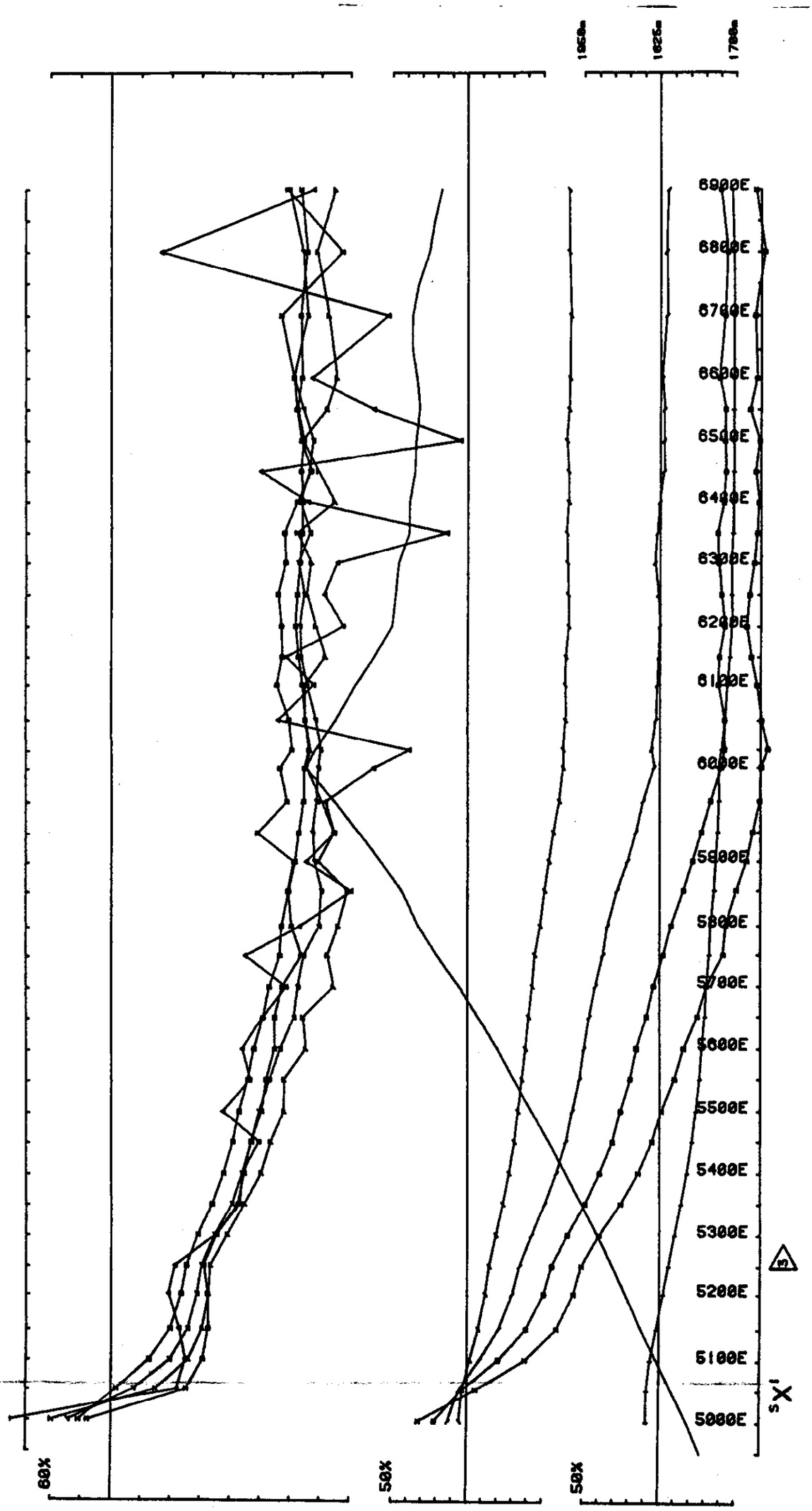
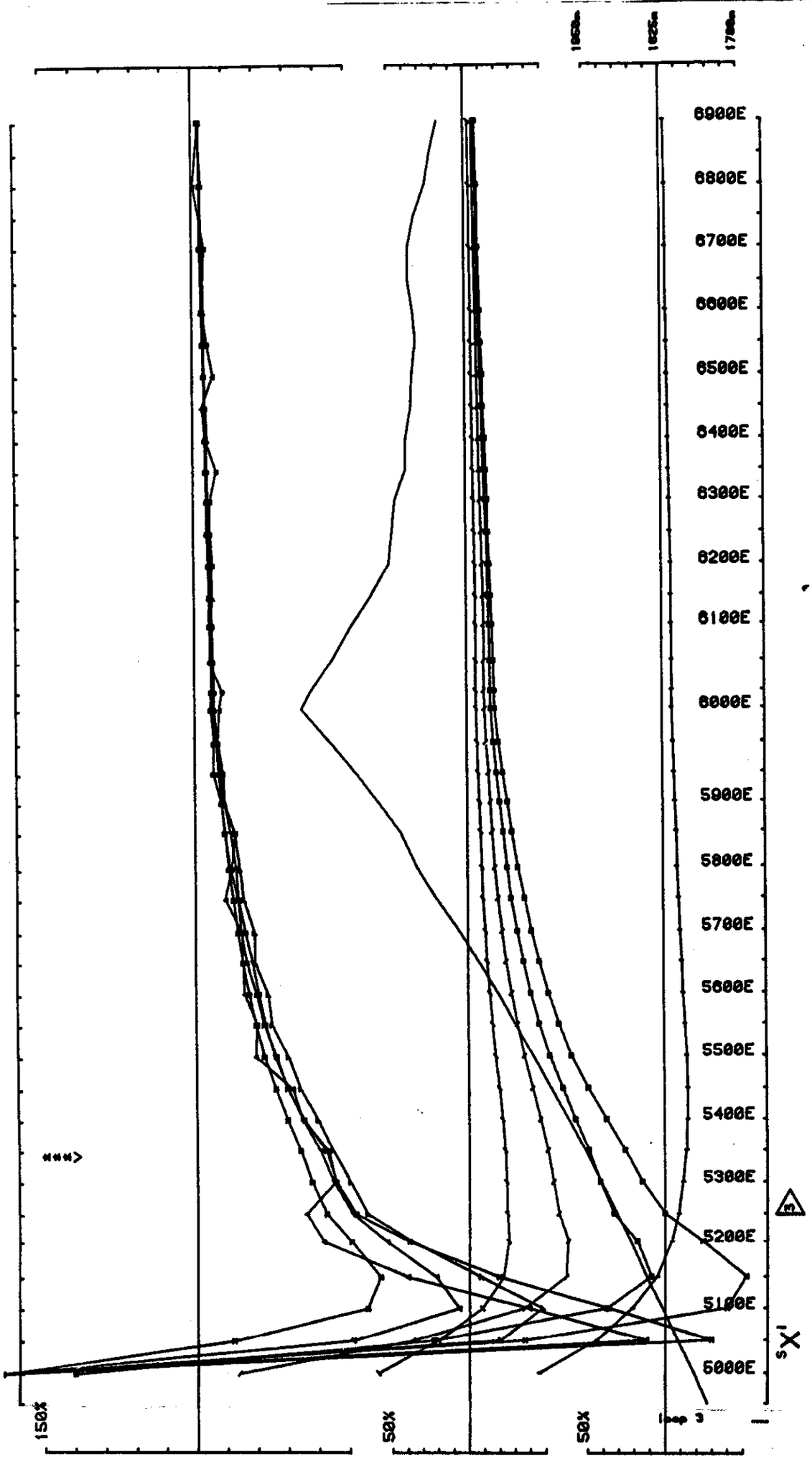
DS 12a



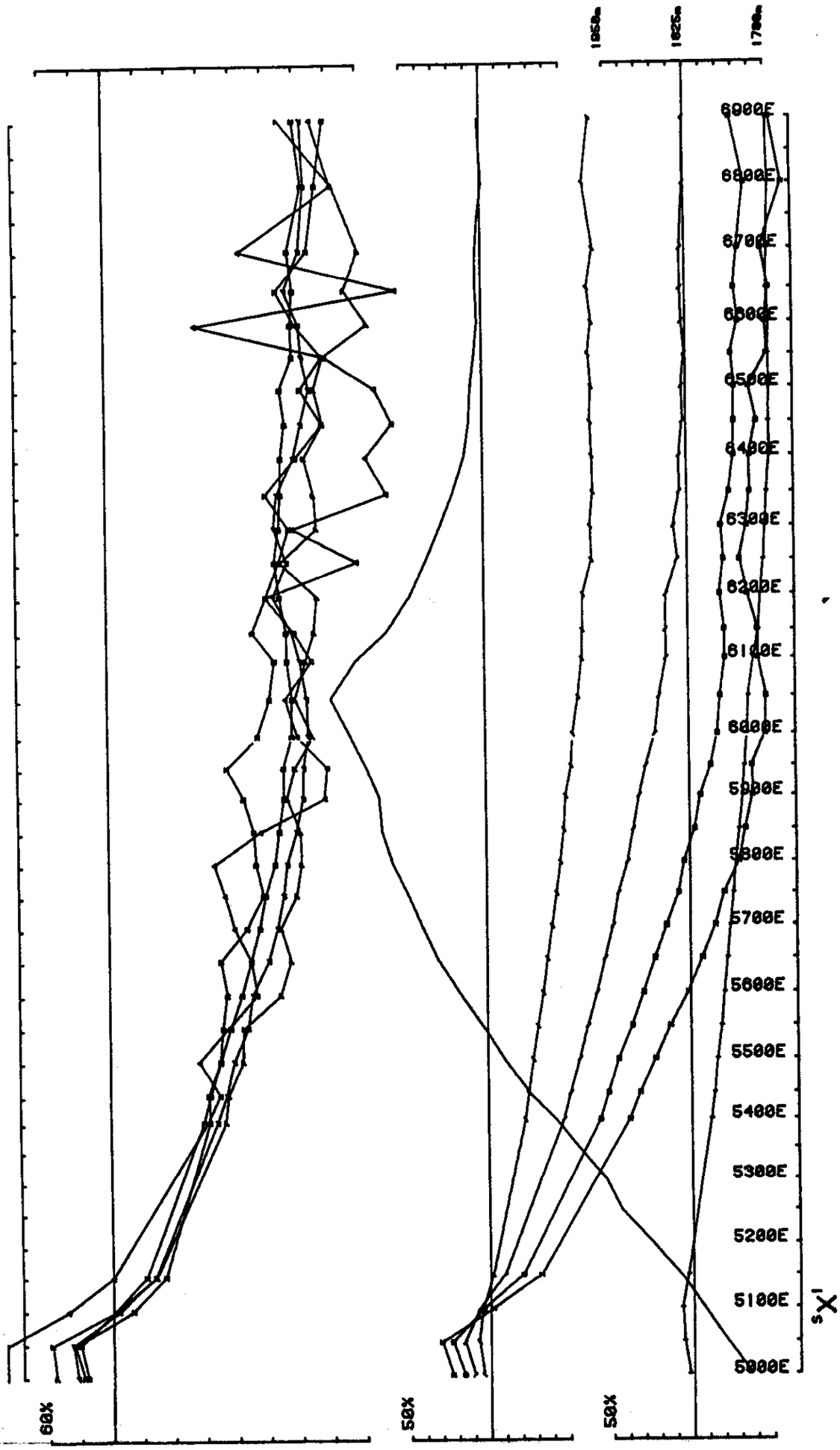
Area Kootenay king Cominco operator JJL & SJV freq(hz) 38.974
Loopno 3 Line 10500N component Hz secondary Ch I normalized Ch I reduced

DS 13



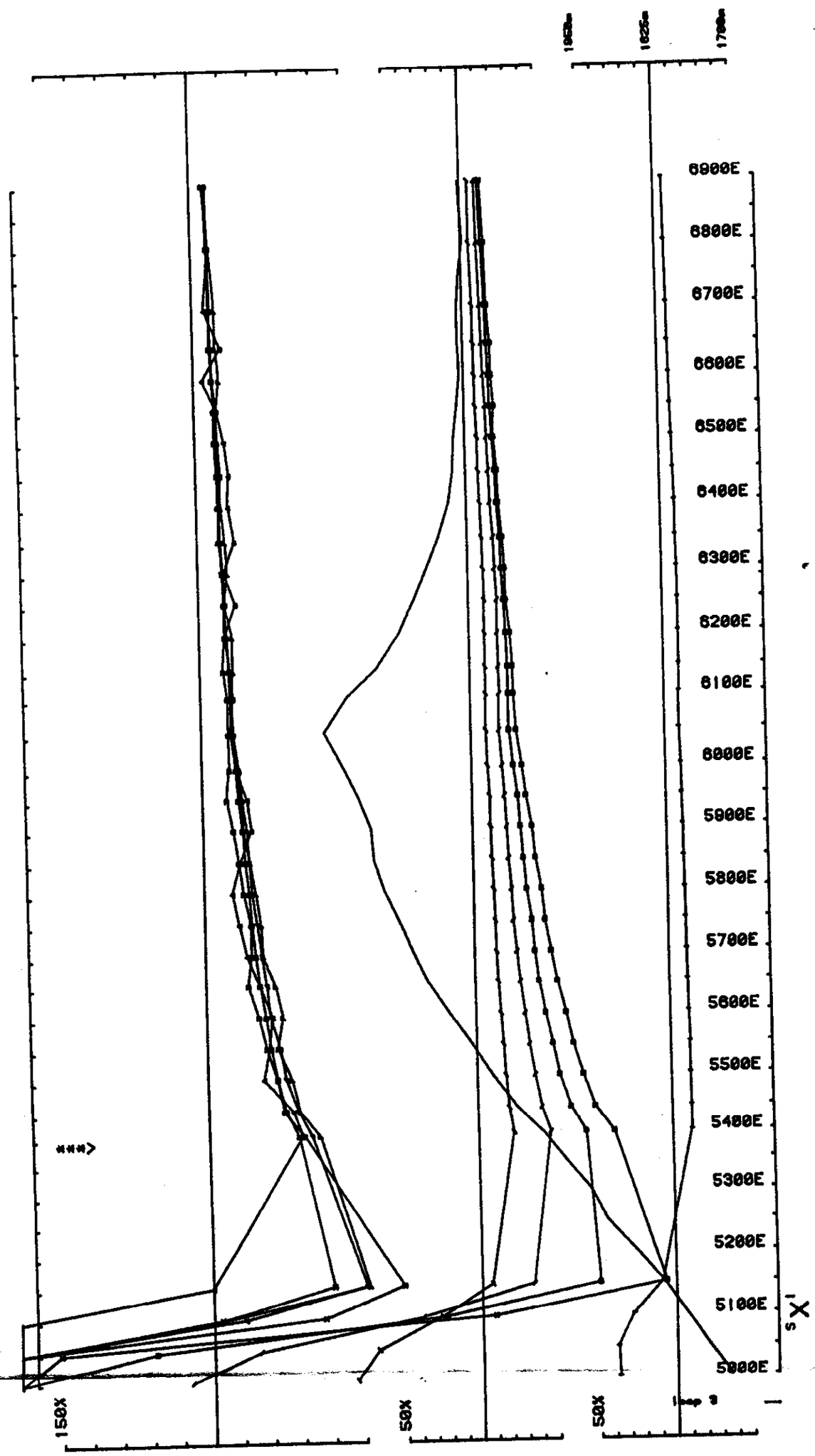
Area Kootenay king Cominco operator JJL & SJV freq(hz) 30.974
Loopno 3 Line 10500N component Hz secondary Ch 1 normalized Ch 1 reduced

DS 13a



Area Kootenay king Cominco operator JJL & SJV freq(hz) 38.974
Loopno 3 Line 10000N component Hz secondary Ch I normalized Ch I reduced

DS 14



Area Kootenay King Cominco operator JJL & SJV freq(hz) 38.074
Loopno 3 Line 10000N component Hz secondary Ch 1 normalized Ch 1 reduced

DS 14a

597 000 E | 598 000 E | 599 000 E | 600 000 E | 601 000 E | 602 000 E | 603 000 E | 604 000 E

5 512 000 N | 5 511 000 N | 5 510 000 N | 5 509 000 N | 5 508 000 N | 5 507 000 N

13,600 N | 13,200 N | 12,800 N | 12,400 N | 12,000 N | 11,500 N | 11,000 N | 10,500 N | 10,000 N

4950 E | 6700 E | 8200E

ACCESS ROAD EXTENDED IN 1986

LOCATION UNCERTAIN

ACCESS ROAD

KING·1 | KING·2 | KING·3 | KING·4 | KING·5

KK·1 | KK·2 | KK·3 | KK·4 | KK·9

Lease M·52

M-D 6 | M-D 6 | M-D 6 | M-D 6 | M 7

CLAIM OUTLINE

OUTLINE OF UTEM LOOP AND LOOP NUMBER.

AXIS OF CROSSOVER ANOMALY. RIGHT SUBSCRIPT INDICATES LATEST ANOMALOUS CHANNEL. LEFT SUBSCRIPT INDICATES APPROXIMATE DEPTH TO TOP. (S=shallow, 0-25 M.; M-moderate, 26-200 M.; D=deep, 200+ M.)

LOCATION OF A CONTACT INDICATING LATEST ANOMALOUS CHANNEL AND DIRECTION TO MOST CONDUCTIVE ROCKS.

0 100 200 300 500 750 1000
METRES

Scale and elevation datum based on limited ground control resulting in good relative, but uncertain absolute map accuracy.

Compiled from aerial photography at an approximate scale of 1:40 000 flown in 1977

McElhanney Surveying & Engineering Ltd.
1166 Alberni Street, Vancouver B.C., Canada

Scale - 1 10 000
Contour Interval - 20 Metres
Date - September 1986
Job No. - 06715-1
Sheet No. - 307-86-2

COMINCO LTD.
KOOTENAY KING
UTEM GRID AND COMPILATION MAP
PRELIMINARY RECONNAISSANCE TYPE MAPPING