

ARIS SUMMARY SHEET

District Geologist, Nelson

Off Confidential: 91.09.27

ASSESSMENT REPORT 20554

MINING DIVISION: Fort Steele

PROPERTY: Estella

LOCATION: LAT 49 47 00 LONG 115 36 00  
UTM 11 5515262 600785  
NTS 082G13E

CAMP: 001 Purcell Belt (Sullivan)

CLAIM(S): TC 1, Stel 2-9, Lewis 4-6, Stel 20-21, Stel 31-34, Lewis 22

OPERATOR(S): Cominco

AUTHOR(S): Jackisch, I.

REPORT YEAR: 1990, 32 Pages

COMMODITIES

SEARCHED FOR: Lead, Zinc, Silver

KEYWORDS: Proterozoic, Fort Steele Formation, Aldridge Formation  
Creston Formation, Pyroclastics

WORK

DONE: Geophysical  
EMGR 25.4 km; UTEM  
Map(s) - 1; Scale(s) - 1:10 000  
MAGG 3.2 km  
Map(s) - 1; Scale(s) - 1:2500

RELATED

PORTS: 00068, 19671, 20175

COMINCO LTD.

EXPLORATION

NTS: 826/13

LOG NO: 11-30	RD.
ACTION:	
FILE NO:	

WESTERN CANADA

**GEOPHYSICAL REPORT**  
**ON A UTEM SURVEY**  
**ON THE ESTELLA PROPERTY**  
**FORT STEELE M.D., B.C.**  
**- ASSESSMENT REPORT -**

<b>SUB-RECORDER</b>	
RECEIVED	
NOV 27 1990	
M.R. #.....	\$.....
VANCOUVER, B.C.	

Latitude : 49°46'N

Longitude : 115°36'W

Work Performed by : J.J. Lajoie, I. Jackisch &  
D. Holcombe

Time Interval of Field Work : July 30 to August 10, 1990  
: September 8 to September 14, 1990

Claims Covered : TC 1  
STEL 2,3,4,5,7,9,20,21,31-34  
LEWIS 4,5,6,22

Claim Operator : COMINCO LTD.

**GEOLOGICAL BRANCH**  
**ASSESSMENT REPORT**

NOVEMBER 1990

I. JACKISCH

20,554

# A P P E N D I X   I I

## E X H I B I T   "A"

### STATEMENT OF EXPENDITURES

ESTELLA PROPERTY - July 30 to September 14, 1990

#### 1.   STAFF COSTS

a) J.J. Lajoie, geophysicist		
10.5 days @ \$480/day	5,040.00	
b) I. Jackisch, geophysicist		
7 days @ \$340/day	2,380.00	
c) D. Holcombe, geophysicist		
13 days @ \$155/day	2,015.00	
d) A.M. Robulack, assistant		
3 days @ \$103.50/day	310.50	
e) J.V. Bjelica, assistant		
10 days @ \$ 105/day	1,050.00	
f) G. Joki, helper		
10 days @ \$ 92.70/day	927.00	
g) K. Peltzer, helper		
6 days @ \$ 102/day	612.00	
h) R. Rubiano, helper		
6 days @ \$ 120/day	720.00	
i) M.J. Davies, contractor		
10.5 days @ \$ 200/day	2,100.00	\$ 15,154.50
	<u>2,100.00</u>	

#### 2.   OPERATING DAY CHARGES

Note: This charge is applied for those days on which useful field data are acquired, to cover the cost of data compilation, drafting, and report writing.

15 days @ \$390/day	5,850.00
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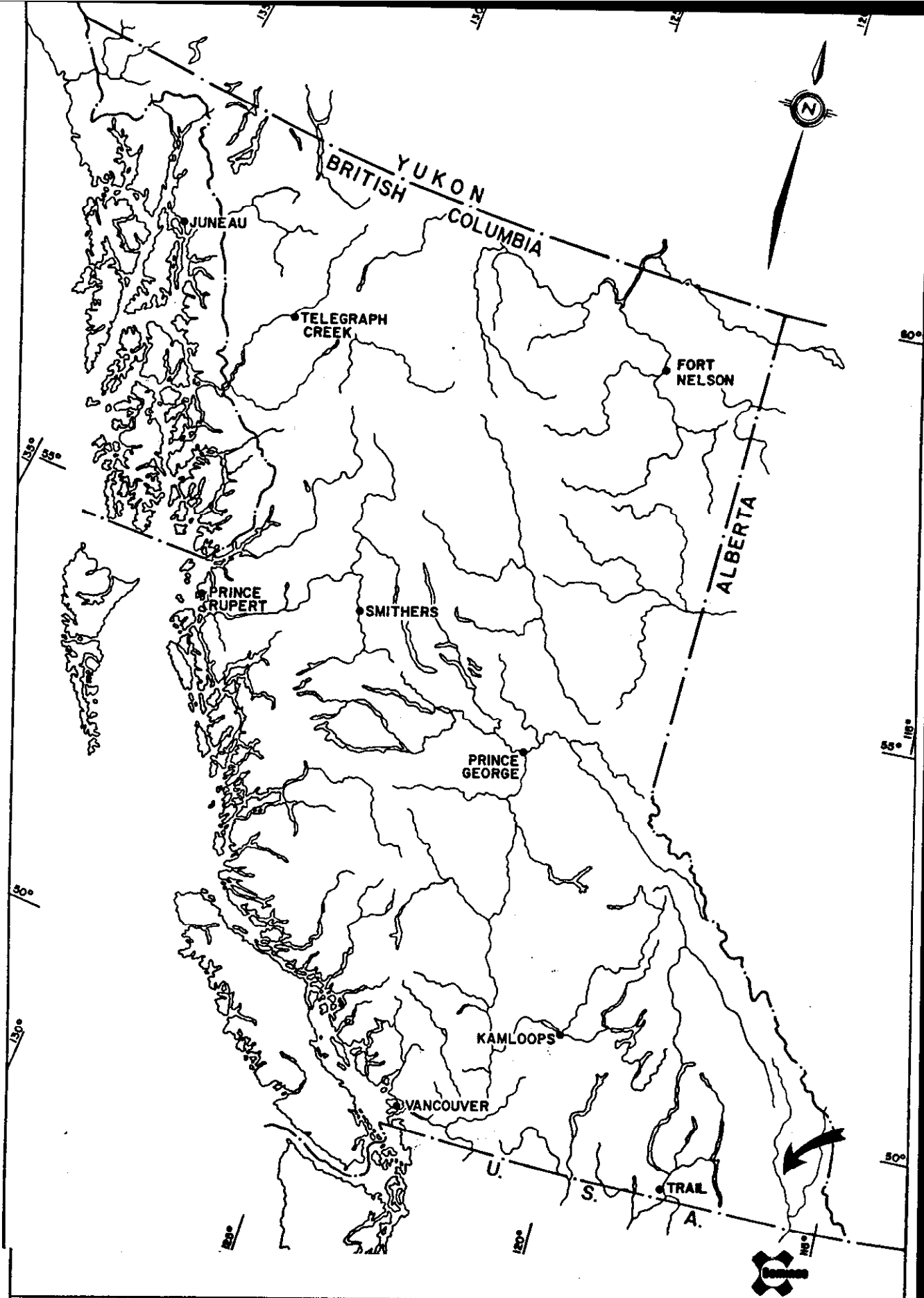
#### 3.   EQUIPMENT RENTAL

UTEM System : 17 days	2,550.00	
Two 4x4 Rental Trucks : 15 days	<u>3,165.00</u>	5,715.00

#### 4.   EXPENSE ACCOUNTS

J.J. Lajoie	679.79	
I. Jackisch	439.00	
D. Holcombe	730.99	
A.M. Robulack	230.08	
J.V. Bjelica	141.11	
G. Joki	153.16	
M.J. Davies	<u>579.96</u>	<u>2,954.09</u>

Carried Forward   \$ 29,673.59



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

ESTELLA PROPERTY  
LOCATION MAP  
FT. STEELE M.D., B.C.

Scale:

Date: Nov 1990

Plate: 381-90-1

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(in envelope)

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(in envelope)

COMINCO LTD.

EXPLORATION

WESTERN CANADA

NTS: 82G/13

GEOPHYSICAL REPORT  
ON AN UTEM SURVEY  
ON THE ESTELLA PROPERTY  
FORT STEELE M.D., B.C.

- ASSESSMENT REPORT -

INTRODUCTION

Grid and reconnaissance UTEM surveying was performed over the Estella Mine and in the immediate area during the 1989 field program. Results directly over and adjacent to the Mine did not show any significant responses, but conductors on several selected reconnaissance lines were of interest and required re-surveying on a proper grid.

During July 30 to Aug. 10, 1990, two small grids totalling 25.4 kms were surveyed to better define these conductors. From Sept. 8 to 14, 1990, the northern half of the South Grid was re-surveyed (7.4 kms) from the opposite direction to confirm the presence of a conductor on this grid. The work was carried out by Cominco Ltd. personnel under the direction of geophysicists, J.J. Lajoie, I. Jackisch, and D. Holcombe.

3.2 kms of magnetic data was collected on the North Grid in August 1990, to test for a coincident magnetic response over the UTEM conductor on this grid.

This report discusses the operation of the UTEM system, plotting format, and presents the results.

LIST OF CLAIMS SURVEYED

The following is a list of claims on which geophysical data were collected in the 1990 field season:

TC 1

STEL 2,3,4,5,7,9,20,21,31,32,33, and 34

LEWIS 4,5,6, and 22

### LOCATION AND ACCESS

The Estella Property is located 28 km east-northeast of Kimberley, B.C. and 17 km north of Ft. Steele, B.C. It is in the front range of the Rocky Mtns., 2 km north of Mt. Bill Nye (elev. 2,429 m).

The North and South Grids can be reached by dirt road from Wasa, B.C., which is on the Kootenay River, 17 kms north-northeast of Ft. Steele, B.C. The dirt access road roughly follows Lewis Creek up into the mountains.

### DESCRIPTION OF UTEM SYSTEM AND FIELD PROCEDURE

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 dimensions were 1,800 m x 1,300 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 in solid state memory. The memory is dumped on to a field computer at the base camp. The mini computer processes the data and controls the plotting on a graphics plotter. Data are portrayed as profiles of each of the nine channels, shown for each survey line of each transmitter loop. These profiles 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.

#### 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).

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

#### SURVEY GRID

The survey grid lines were cleared by chain saw and pickets were stapled with metal tag labels to preserve the grid for future years. Station interval is 50 m (slope corrected). The line interval is 250 m (North Grid) and 300 m (South Grid), which is adequate in exploring for massive sulphide deposits of the Sullivan type.

Actual picket slope distances were measured using a nylon chain, not topofil. These distances plus changes in elevation between pickets (using an inclinometer) and line direction were recorded during line preparation. These measurements are used for the UTEM survey in calculating the loop and survey station coordinates, from which a primary EM field is calculated.



The grid location is quite confidently known because of good control with the numerous roads present.

### INTERPRETATION

The UTEM profiles are presented on Data Sections 1 to 19.

The data from Loop 1 shows a good Channel 1 conductor, approximately 600 metres from the loop front. The shallowest depth to the top of this conductor occurs on Lines 1500N, 1750N, and 2000N. The 150-300 gamma magnetics response (Plate 381-90-3) is 50 m to the west of this conductor on Lines 1500N and 1750N, and 300 m to the west on Line 2000N.

Surveying from Loop 2 detected a conductor approximately 900 metres from the loop front. The crossover response is broad which indicates a deep source.

The Loop 3 data re-surveys the four northern lines of Loop 2 from the opposite direction and confirms the presence of the deep conductor.

### CONCLUSIONS

32.8 kms of UTEM surveying and 3.2 kms of magnetics surveying were completed on the Estella Property in the time periods, July 30 to Aug. 10 and Sept. 8 to 14, 1990.

A shallow to moderately deep crossover response on Loop 1, and a deep crossover response on Loops 2 and 3 need to be followed up by geological work.

Report by :

Ingo Jackisch  
Ingo Jackisch  
Geophysicist  
Cominco Ltd.

### Distribution:

Mining Recorder (2)  
Kootenay Expl. Office (1)  
Bakra Resources (1)  
Bethlehem Resources (1)  
Western Dist. Files (1)  
Geophysics Files (1)

Approved

for Release :

W. J. Wolfe  
W. J. Wolfe  
Manager, Exploration  
Western Canada  
Cominco Ltd.

REFERENCE

Lamontagne, Y., 1975

Applications of Wideband, Time Domain EM  
Measurements in Mineral Exploration: Doctoral  
Thesis, University of TorontoSUMMARY GEOLOGY (lithology, age, structure, alteration, mineralization, size, and attitude):

The claims are underlain by north striking Proterozoic clastic rocks belonging to the Purcell Supergroup. The oldest unit, the Fort Steele Fm., lies at the west end of the claim block. It is overlain by the Aldridge Fm. which is in turn overlain by the Creston Fm. to the east. The rocks are in the east limb of a major anticlinal fold which plunges to the NNW. Parasitic, recumbent, open folds are common as are steeply dipping, NW oriented faults. Purcell intrusives, feldspar porphyry plugs, sills & dikes are also present. Pb, Zn mineralization occurs in quartz veins and in vein fissures.

(over)

A P P E N D I X I

IN THE MATTER OF THE B.C. MINERAL ACT  
AND THE MATTER OF A GEOPHYSICAL PROGRAMME  
CARRIED OUT ON THE ESTELLA PROPERTY  
LOCATED 28 KMS EAST-NORTHEAST OF KIMBERLEY, B.C.  
IN THE FORT STEELE MINING DIVISION OF THE  
PROVINCE OF BRITISH COLUMBIA,  
MORE PARTICULARLY  
N.T.S. 82G/13

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 ESTELLA Property;
3. THAT the said expenditures were incurred from July 30 to Aug. 10, 1990 and from Sept. 8 to 14, 1990, for the purpose of mineral exploration on the above-noted property.

Ingo Jackisch  
Ingo Jackisch  
Geophysicist, Cominco Ltd.

Dated this 15 day of November, 1990  
at Vancouver, B.C.

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Carried Forward   \$ 29,673.59

STATEMENT OF EXPENDITURES      cont'd

ESTELLA PROPERTY - July 30 to September 14, 1990

Carried Forward      \$ 29,673.59

5.      MISCELLANEOUS

Linecutting and Supervision	\$ 19,517.49	
Accommodation - Geophysical Crew	650.00	
UTEM Wire Charge	240.00	
Drafting and Printing	114.49	
Geophysical Freight Charges	<u>487.86</u>	21,009.84
(Mob/Demob)		

TOTAL	<u>\$ 50,683.43</u>
-------	---------------------

A P P E N D I X   I I I

CERTIFICATE OF QUALIFICATIONS

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

- i.    THAT I graduated with a B.Sc. in Geophysics from the University of British Columbia in 1975,
- ii.   THAT I have been practising Geophysics from 1975 to 1990, and have been an employee of Cominco Ltd. from 1980 to 1990.

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

NOVEMBER 1990

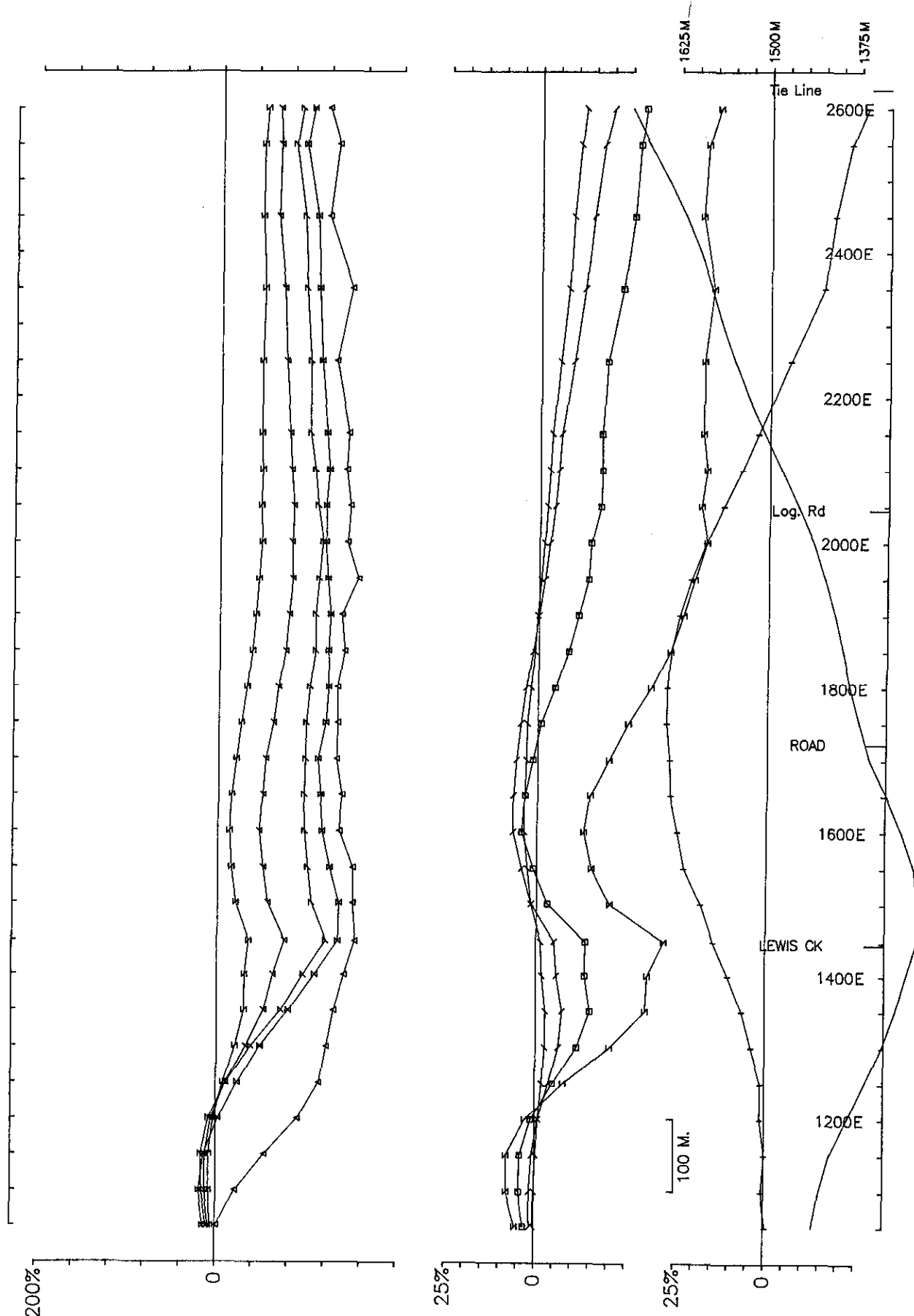
# LEGEND

## UTEM DATA SECTIONS

ORDINATE: Amplitude scale is given in %

ABSCISSA: Station or Picket Numbers in Hundreds of Meters

SYMBOL	CHANNEL	MEAN DELAY TIME	
		15 Hz	30 Hz
	1	25.6 ms	12.8 ms
/	2	12.8	6.4
\	3	6.4	3.2
□	4	3.2	1.6
Σ	5	1.6	0.8
Δ	6	0.8	0.4
7	7	0.4	0.2
X	8	0.2	0.1
△	9	0.1	0.05
◇	10	0.05	0.025

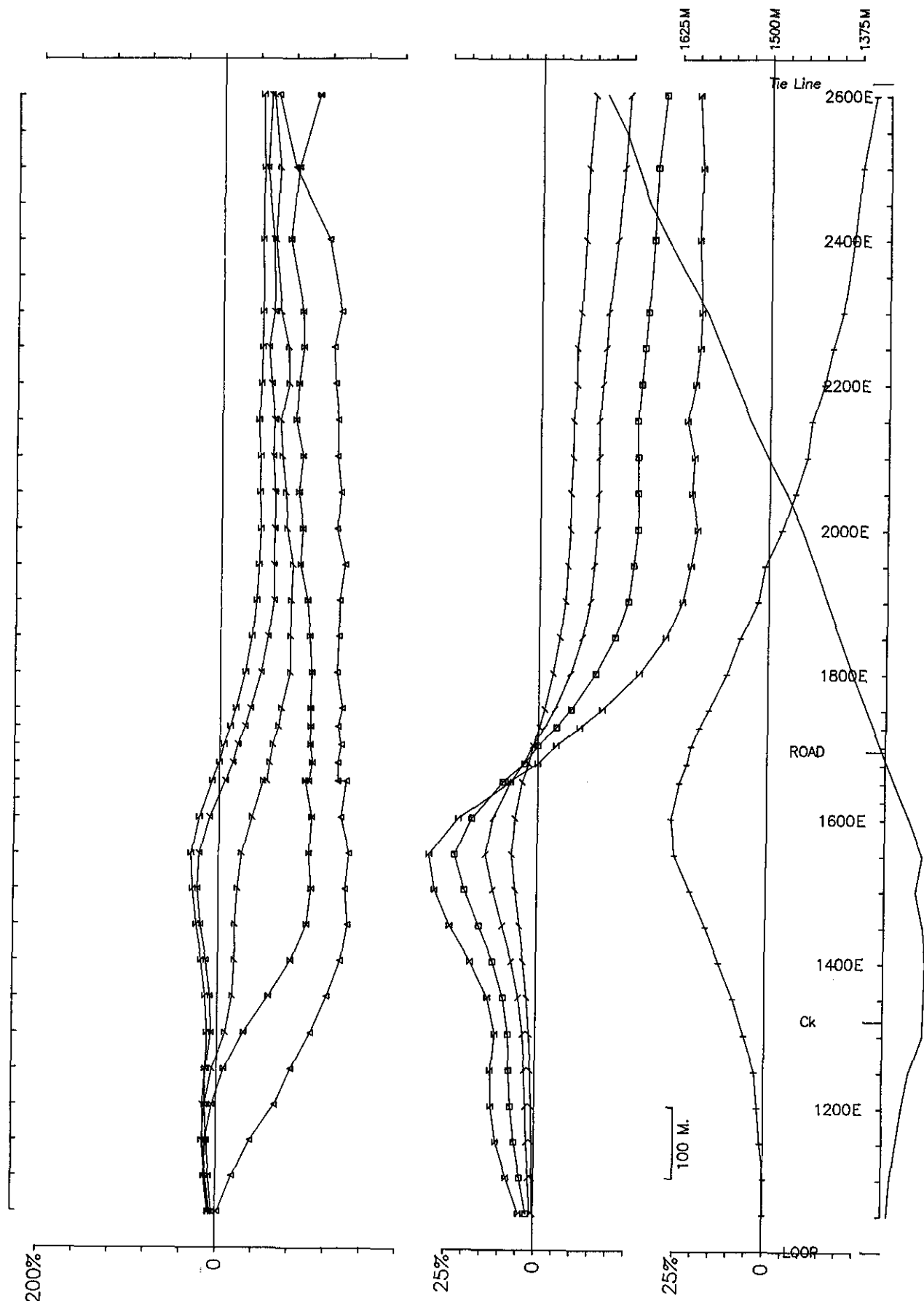


ESTELLA COMINCO  
 Op: JYL,DH,MD Freq(Hz): 30.974  
 Ch1 reduced. Ch1 normalized. Totals:P- 1549M./L- 1549M. Line Azim.: 90 . Rx Label: 10

Hz

Loop: 1 Line: 1000N



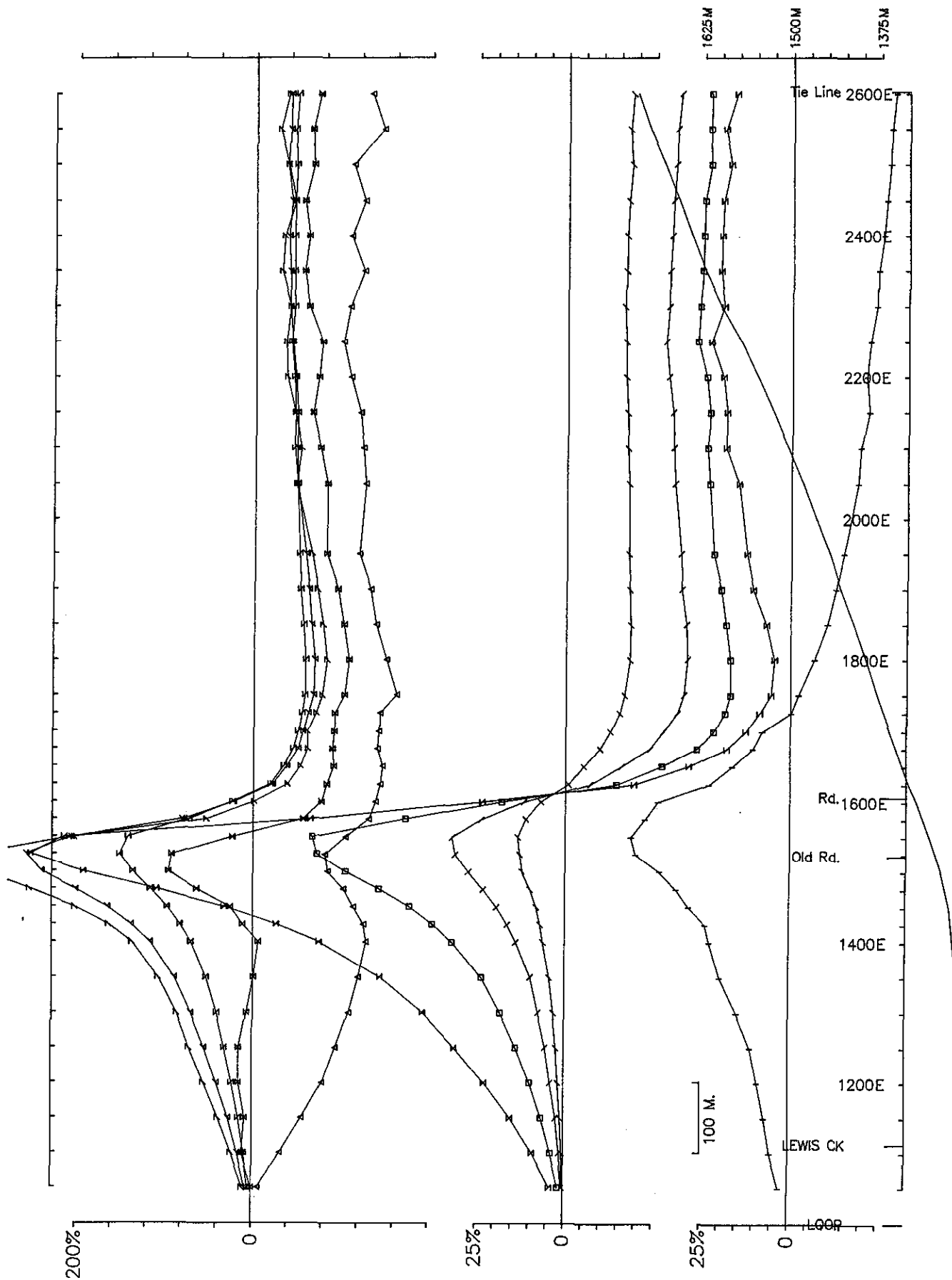


ESTELLA COMINCO

Op: JUL,DH,MD Freq(Hz): 30.974

Ch1 reduced. Ch1 normalized. Totals:P- 1552M./L- 1552M. Line Azim.: 90 . Rx Label: 13 . Base Shift: -3.8 %

Loop: 1 Line: 1250N



ESTELLA

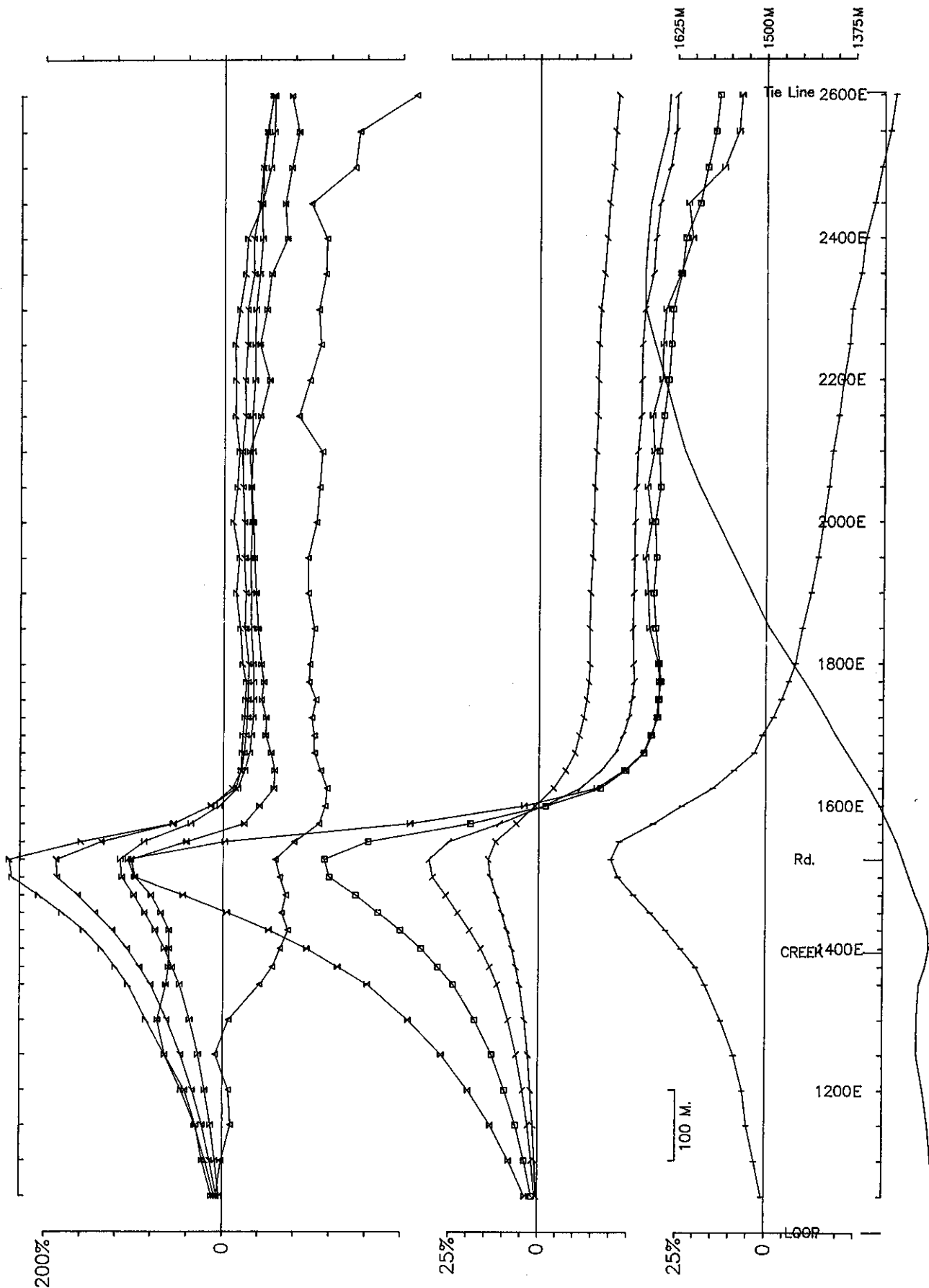
COMINCO

Hz

Op: JLL,DH,MD Freq(Hz): 30.974

Loop: 1 Line: 1500N

Ch1 reduced. Ch1 normalized. Totals:P- 1550M. /L- 1550M. Line Azim.: 90 . Rx Label: 15



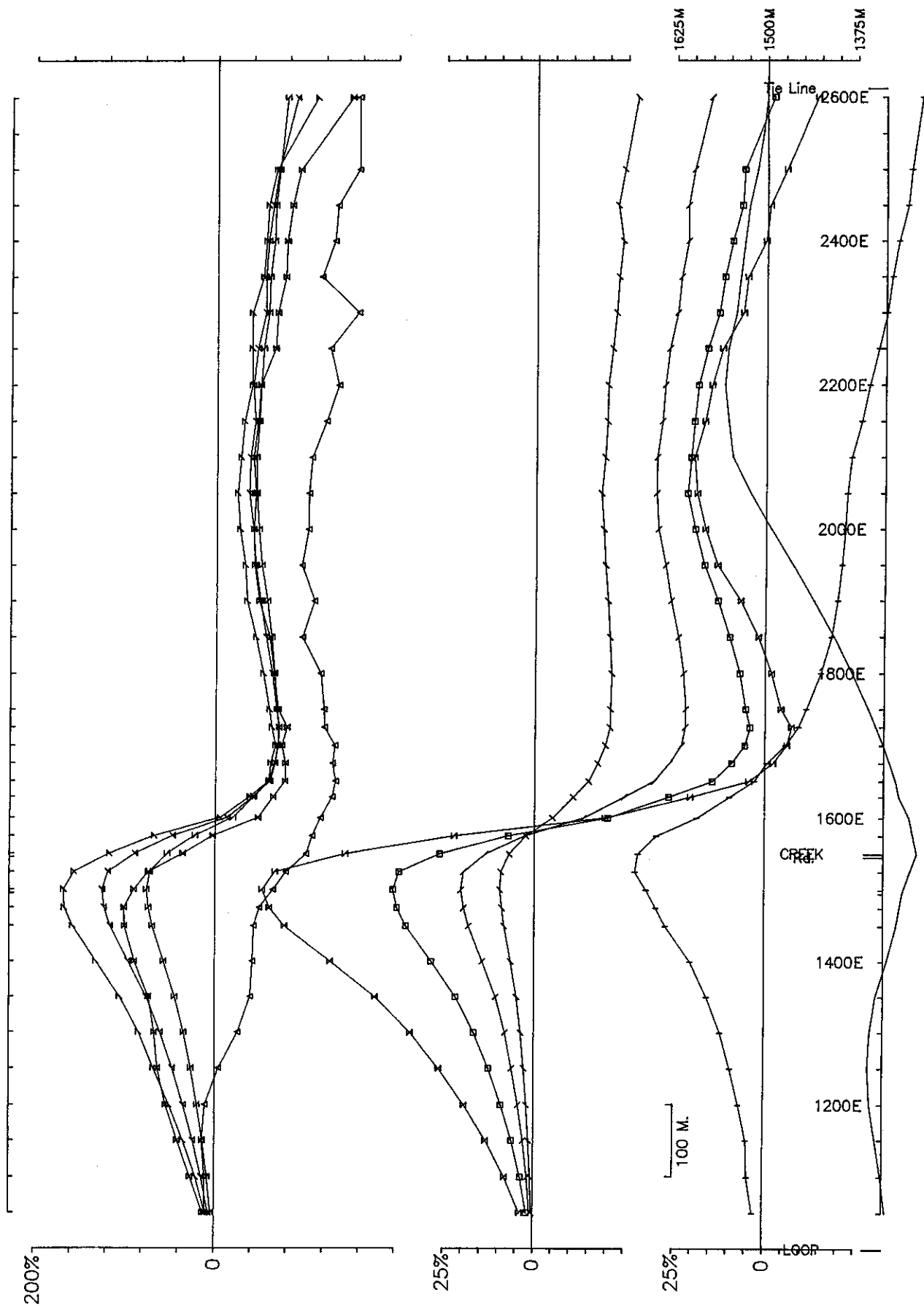
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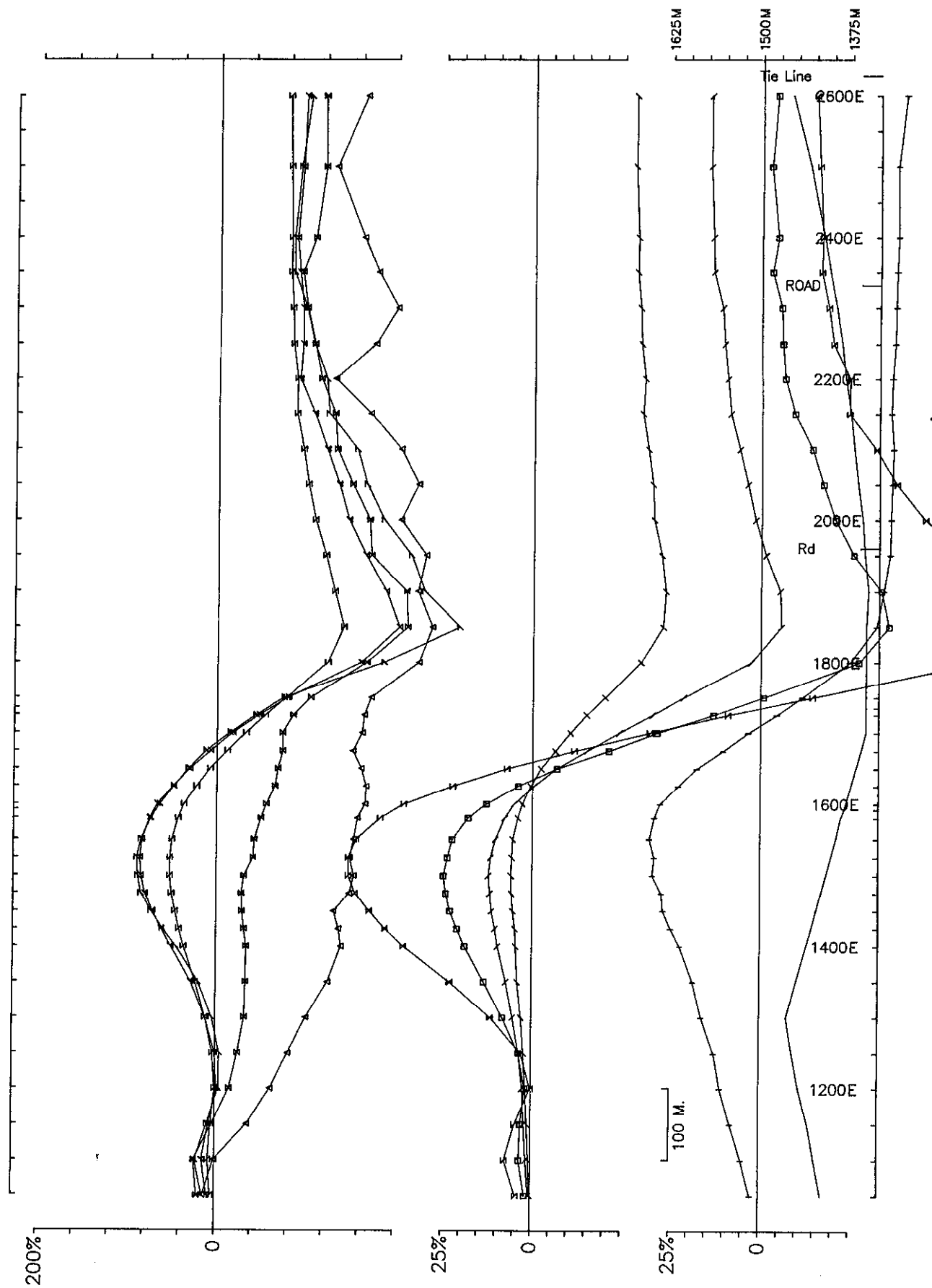
Hz

Loop: 1 Line: 1750N

Ch1 reduced. Ch1 normalized. Totals:P- 1552M./L- 1552M. Line Azim.: 90 . Rx Label: 18



ESTELLA COMINCO Hz  
 Op: JYL,DH,MD Freq(Hz): 30.974 Loop: 1 Line: 2000N  
 Ch1 reduced. Ch1 normalized. Totals:P- 1552M./L- 1552M. Line Azim.: 90 Rx Label: 20



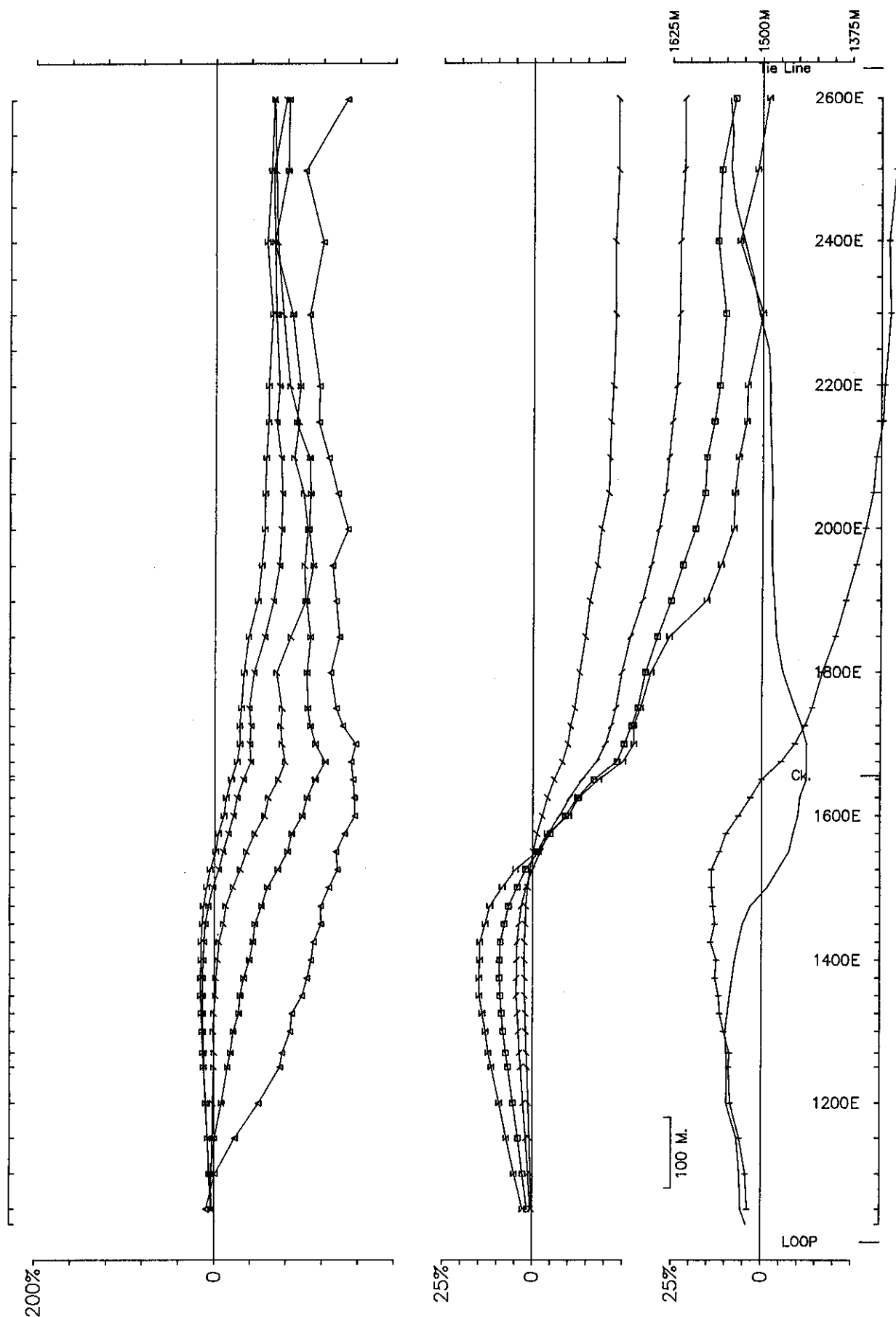
ESTELLA COMINCO

Op: JJL,DH,MD Freq(Hz): 30.974

Hz

Loop: 1 Line: 2250N

Ch1 reduced. Ch1 normalized. Totals:P- 1550M./L- 1550M. Line Azim.: 87 . Rx Label: 23 . Base Shift: 6.0 %



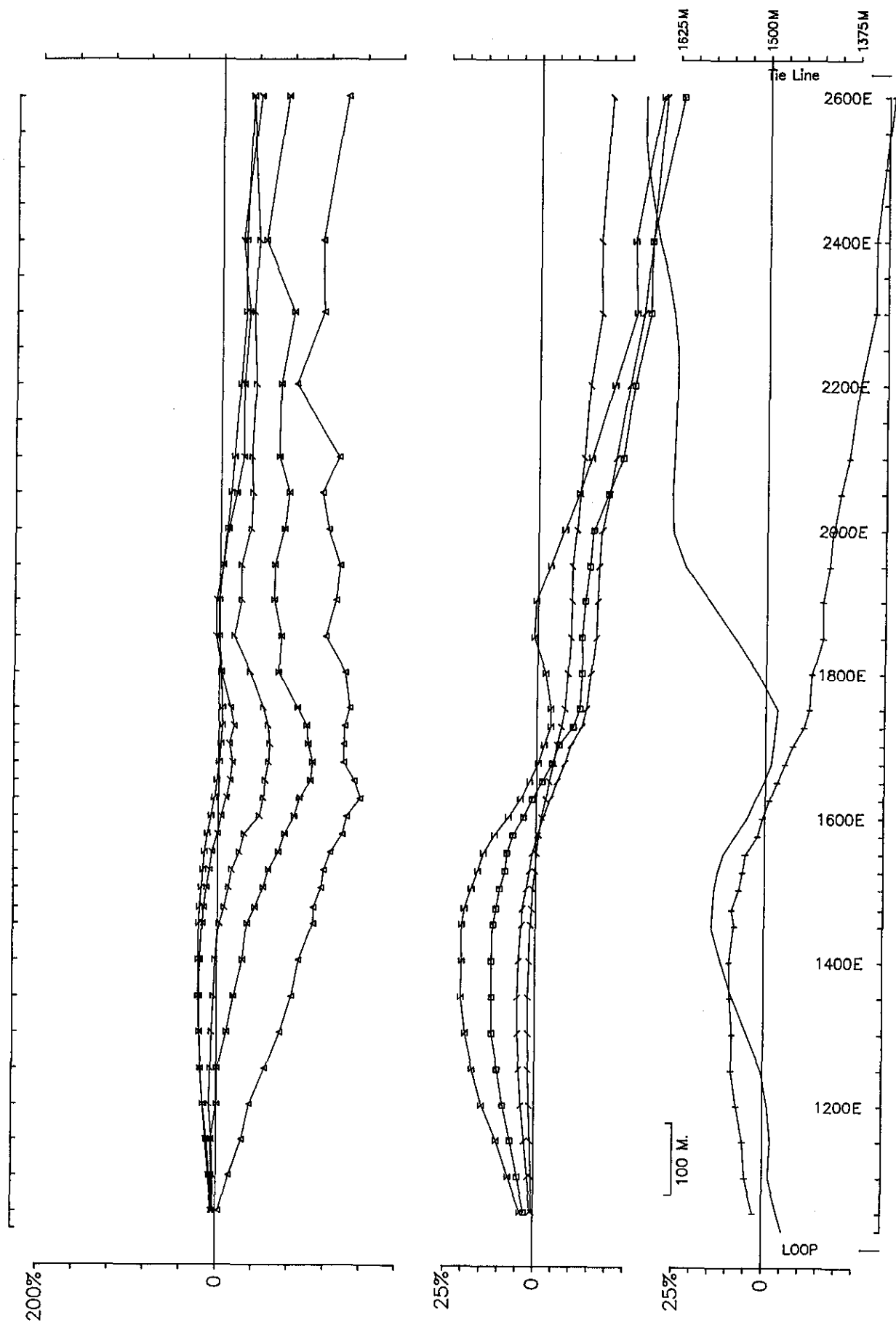
ESTELLA COMINCO

Op: JIL,DH,MD Freq(Hz): 30.974

Ch1 reduced. Ch1 normalized. Totals:P-1551M./L-1573M. Line Azim.: 90 . Rx Label: 25

Hz

Loop: 1 Line: 2500N



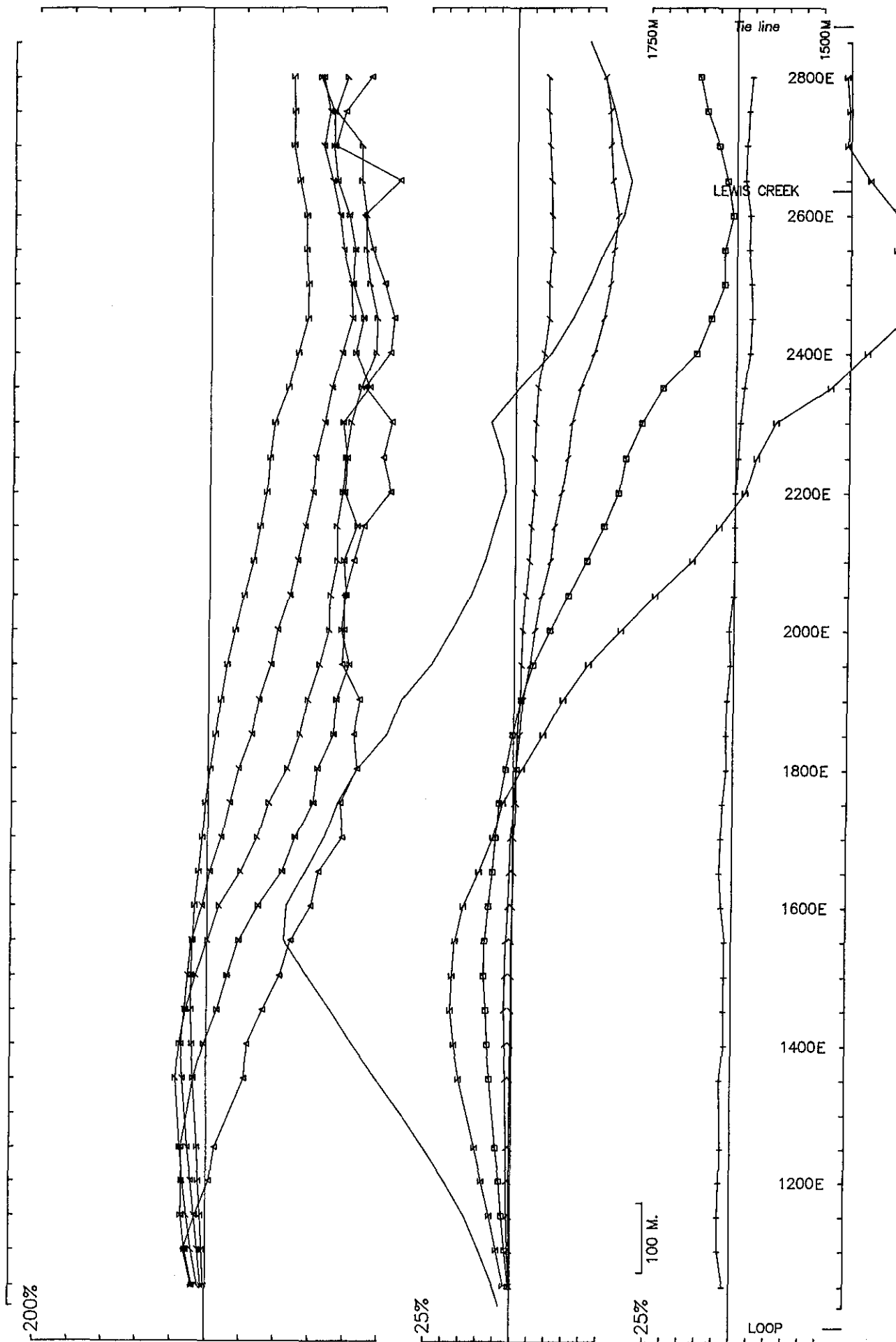
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Op: JIL,DH,MD Freq(Hz): 30.974

Hz

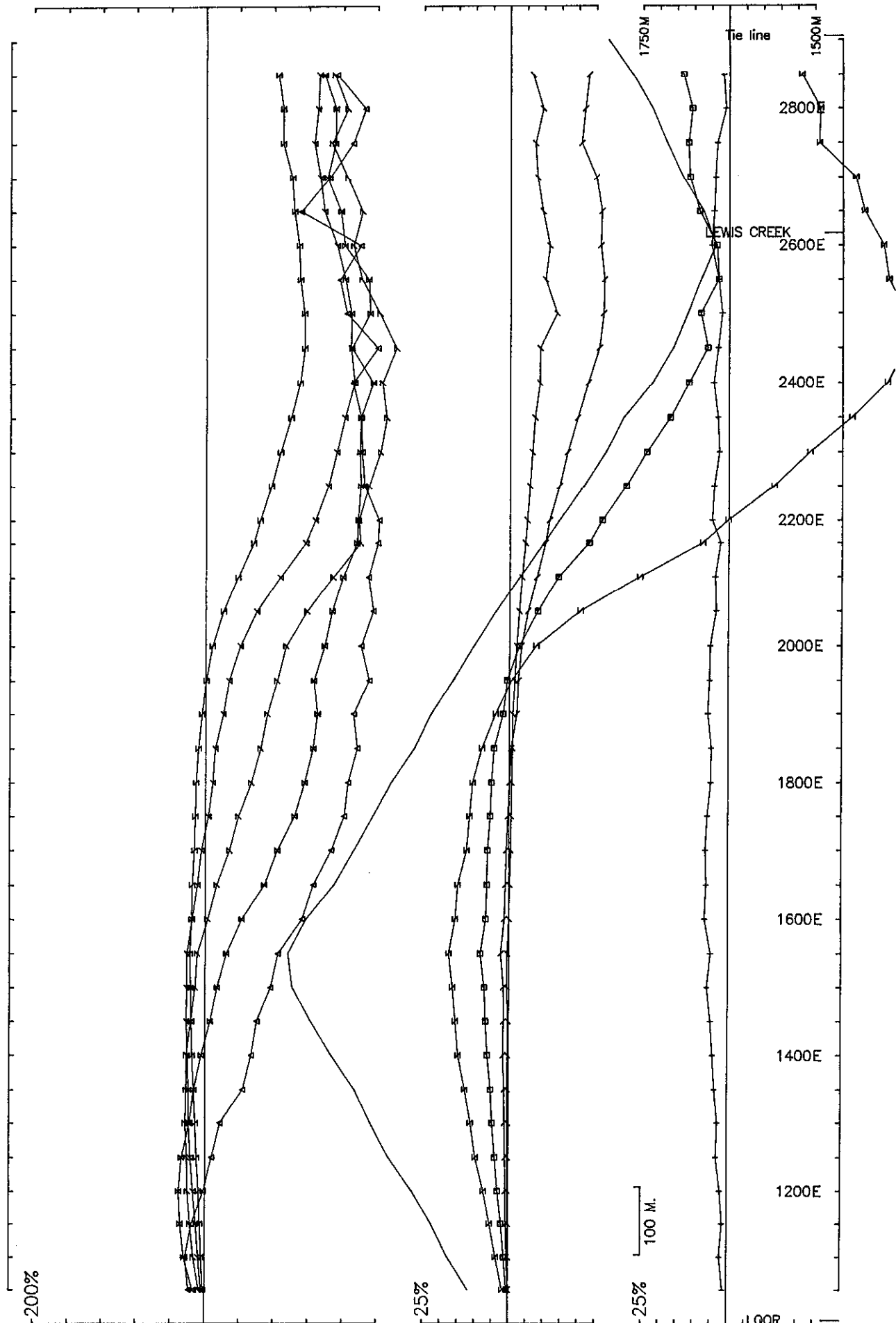
Loop: 1 Line: 2750N

Ch1 reduced. Ch1 normalized. Totals:P- 1550M./L- 1575M. Line Azim.: 90. Rx Label: 28. Base Shift: -3.0%



ESTELLA  
 Op: JJL,DH,MD    Freq(Hz): 30.974  
 Ch1 reduced. Ch1 normalized.    Totals:P- 1750M./L- 1829M. Line Azim.: 72 . Rx Label: 10 . Base Shift: -8.0 %  
 Loop: 2    Line: 1000N





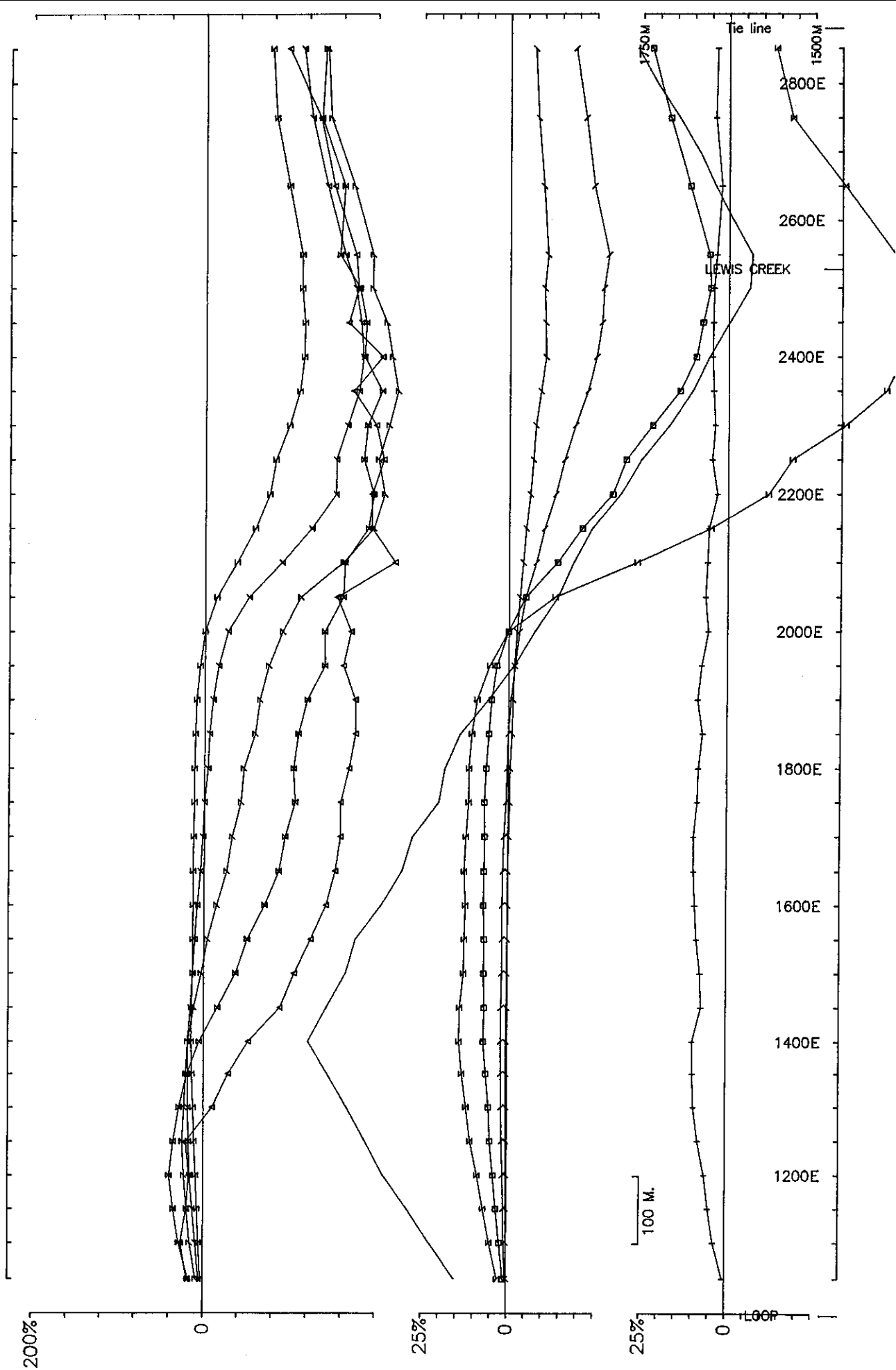
ESTELLA COMINCO

Op: JJL,DH,MD Freq(Hz): 30.974

Ch1 reduced. Ch1 normalized. Totals:P-1778M./L-1828M. Line Azim.: 68 Rx Label: 13

Loop: 2 Line: 1300N

DS 10



ESTELLA

COMINCO

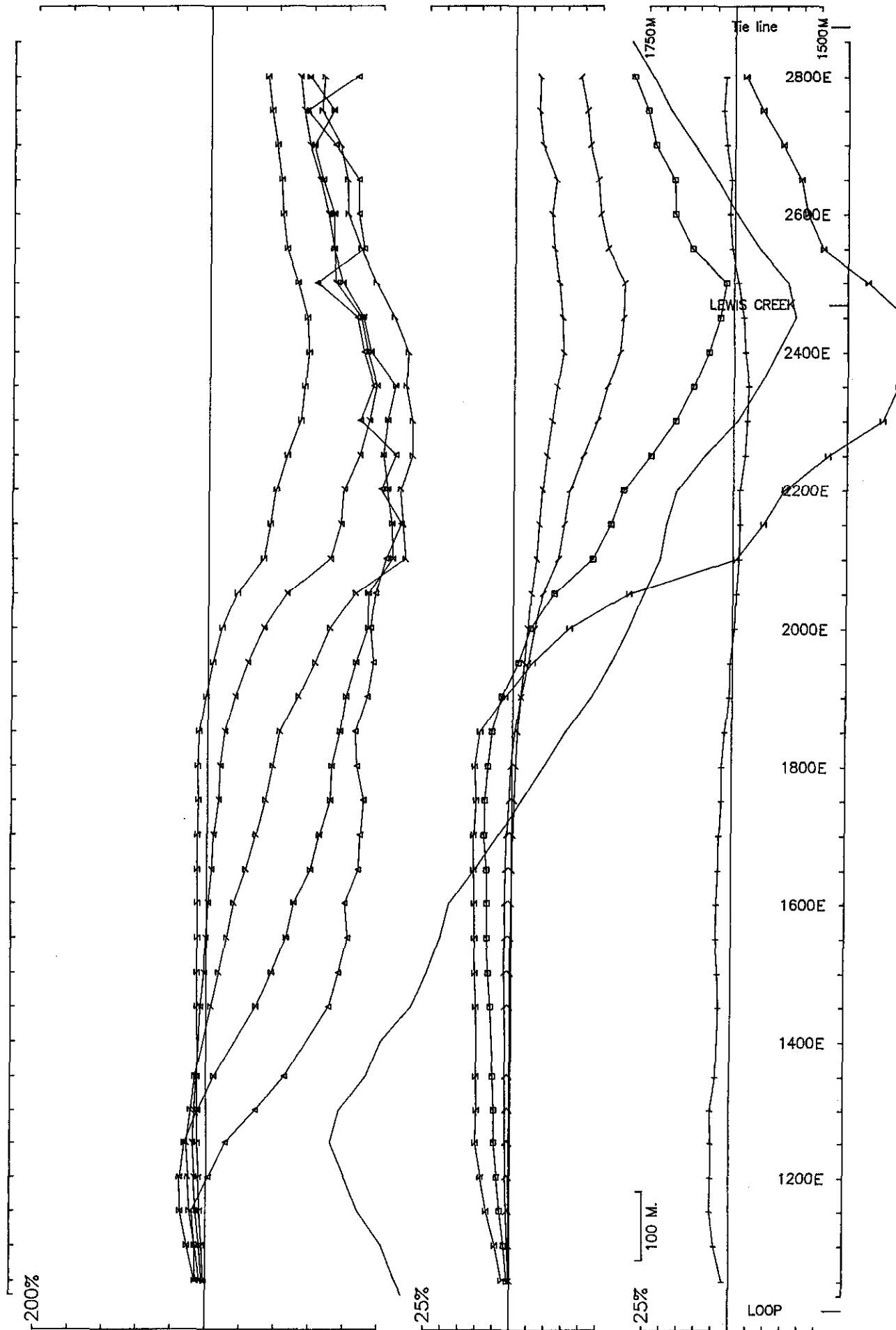
Hz

DS II

Op: JLL,DH,MD Freq(Hz): 30.974

Loop: 2 Line: 1600N

Ch1 reduced. Ch1 normalized. Totals:P-1800M./L-1800M. Line Azim.: 74 . Rx Label: 16



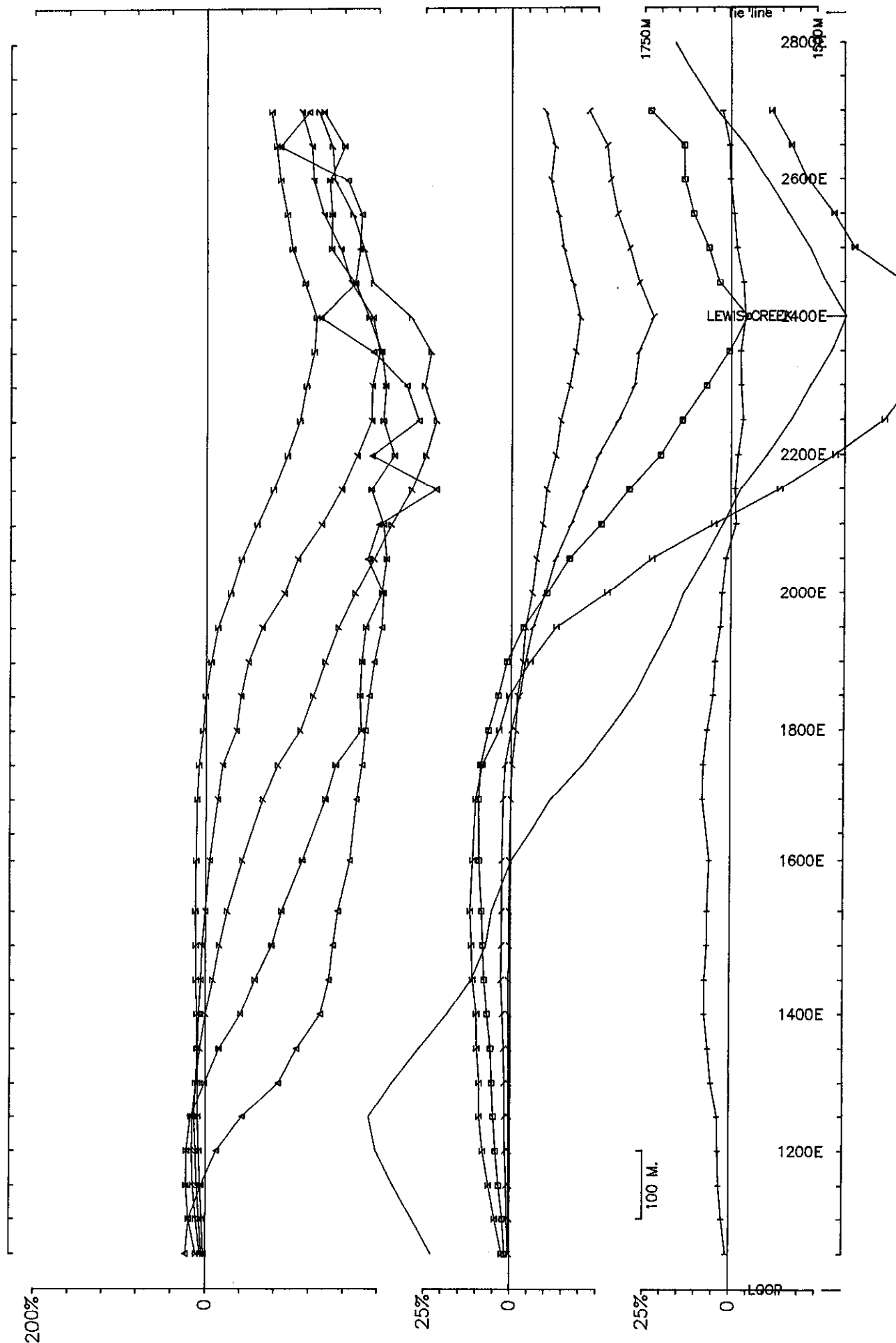
ESTELLA COMINCO

Op: JIL,DH,MD Freq(Hz): 30.974

Ch1 reduced. Ch1 normalized. Totals:P-1747M./L-1818M. Line Azim.: 69 . Rx Label: 19

Loop: 2 Line: 1900N

DS 12



ESTELLA

COMINCO

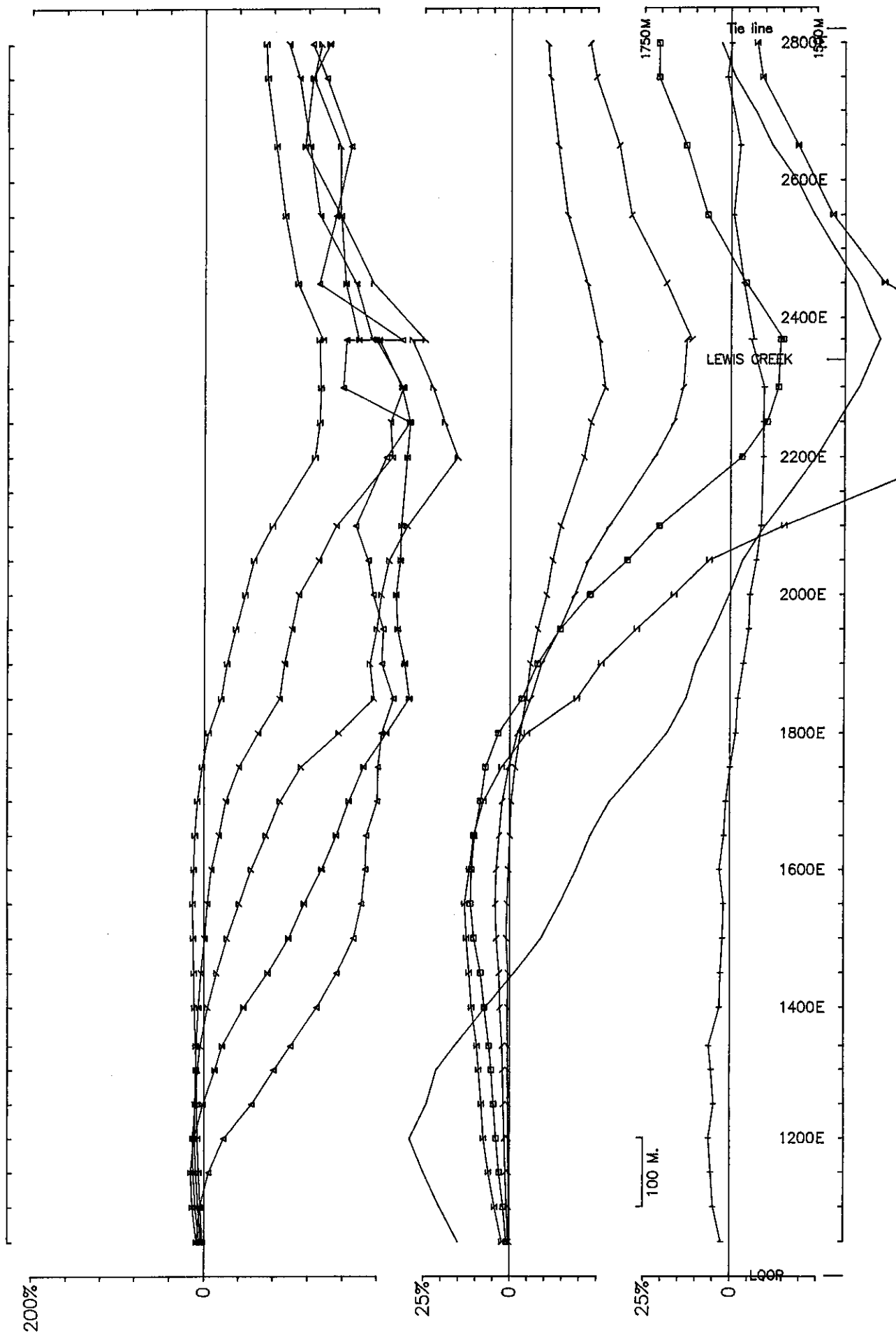
Hz

DS 13

Op: JLL,DH,MD Freq(Hz): 30.974

Loop: 2 Line: 2200N

Ch1 reduced. Ch1 normalized. Totals:P-1664M./L-1764M. Line Azim.: 71 . Rx Label: 22



ESTELLA

COMINCO

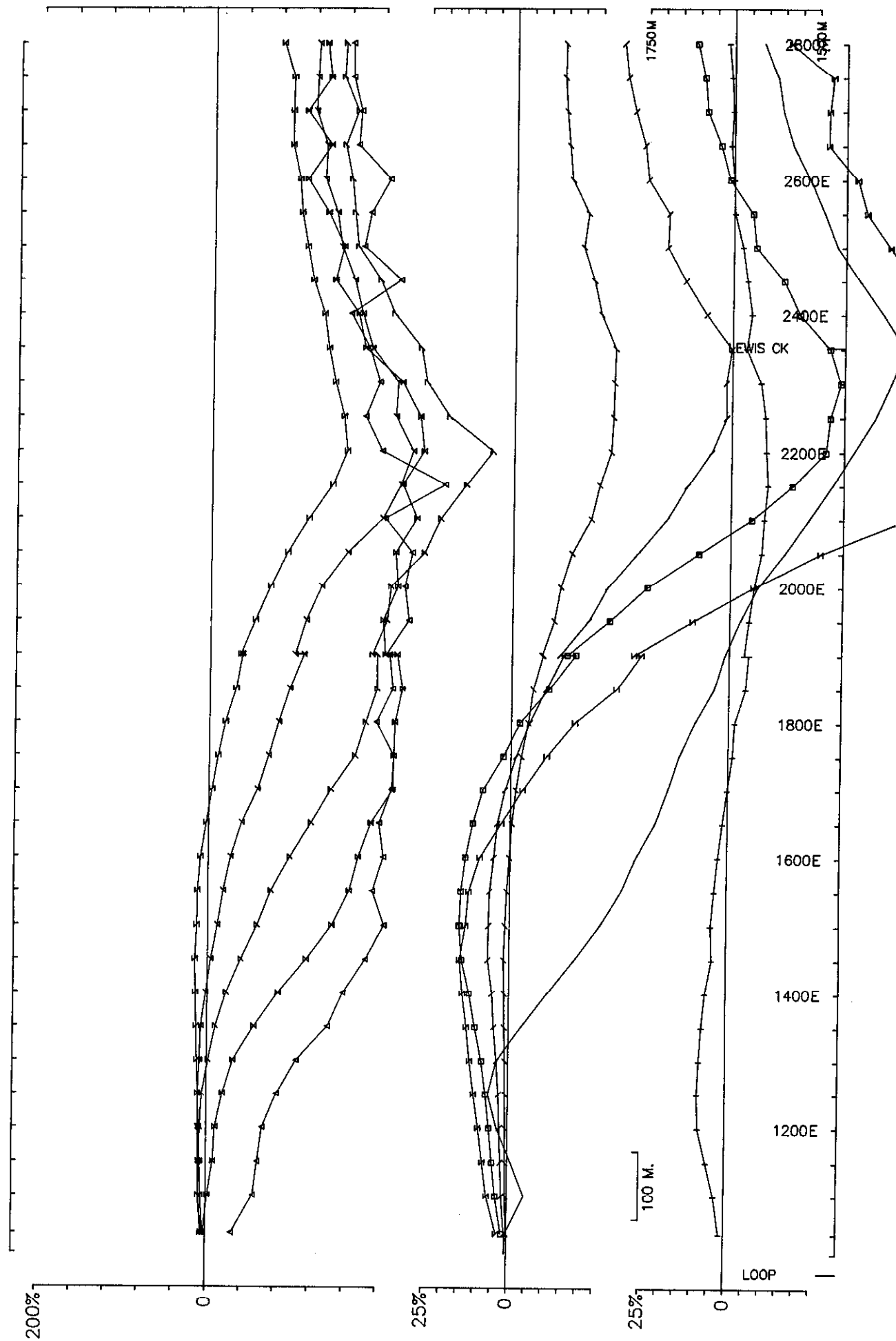
Hz

DS 14

Op: JUL,DH,MD Freq(Hz): 30.974

Loop: 2 Line: 2500N

Ch1 reduced. Ch1 normalized. Totals:P-1743M./L-1743M. Line Azim.: 71 . Rx Label: 25



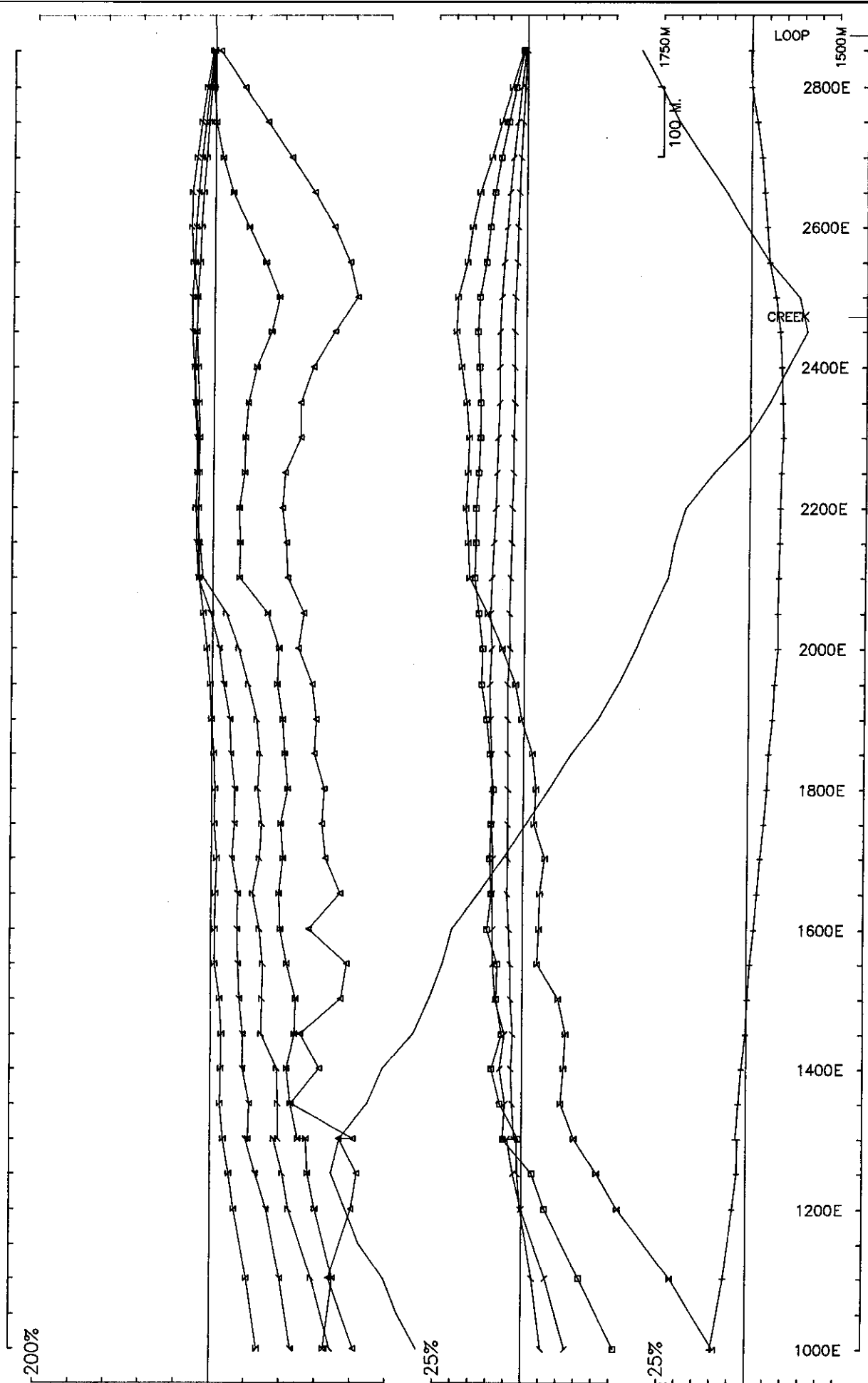
ESTELLA COMINCO

Op: JJJL,DH,MD Freq(Hz): 30.974

Ch1 reduced, Ch1 normalized. Totals: P-1756M / -1785M Line Azim: 71 Rx Label: 28

DS 15

Loop: 2 Line: 2800N



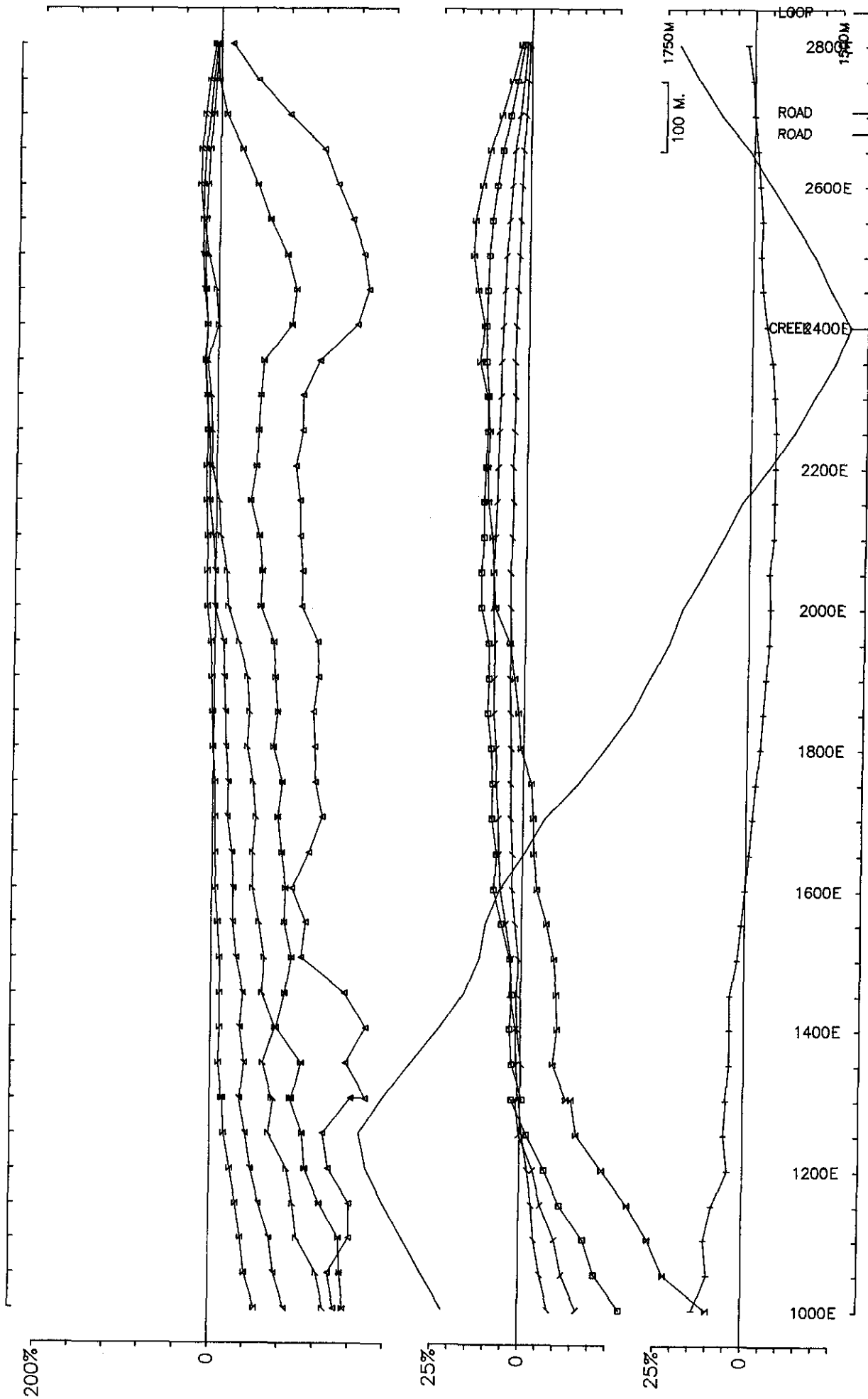
ESTELLA COMINCO

Op: DJH & IJ Freq(Hz): 30.974

Ch1 reduced. Ch1 normalized. Totals: P-1852M./L-1852M. Line Azim.: 250 . Rx Label: 19

Loop: 3 Line: 1900N

DS 16



ESTELLA COMINCO

Hz

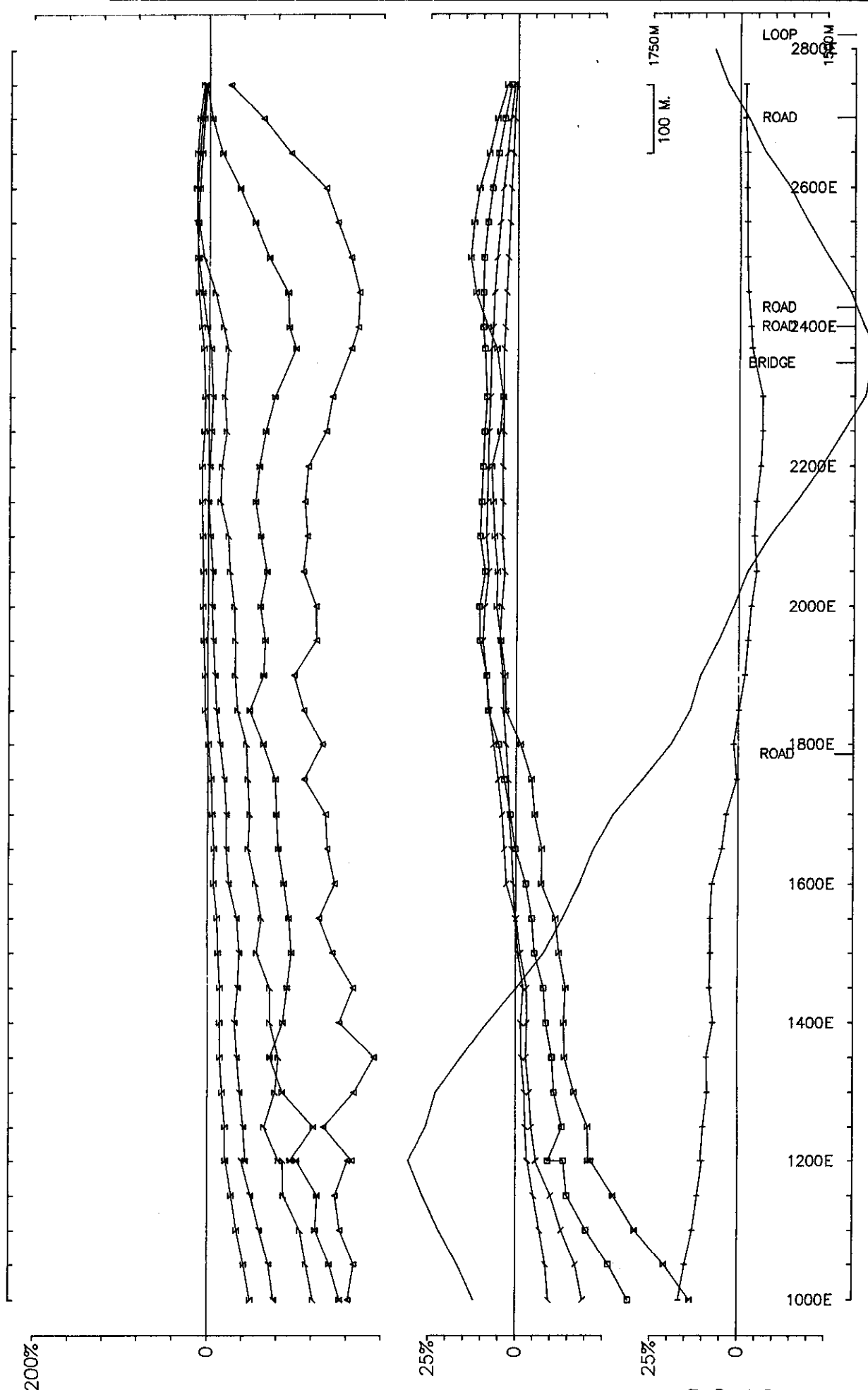
DS 17

Op: DJH & LJ Freq(Hz): 30.974

Loop: 3 Line: 2200N

Ch1 reduced Ch1 normalized Totals: P=1801M / 1801M Line Azim: 250 By: Lch: 22





ESTELLA

COMINCO

Hz

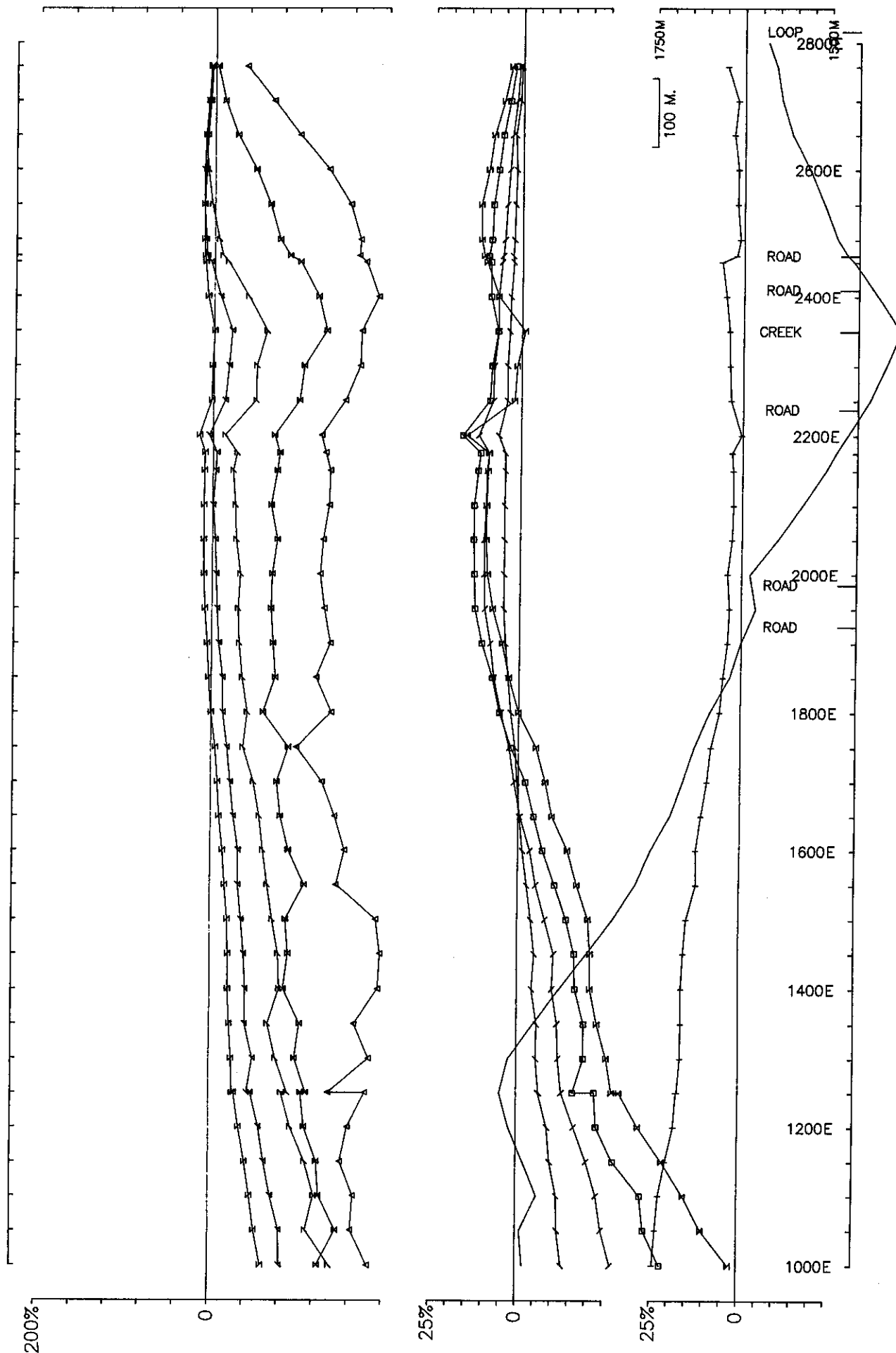
DS 18

Op: DJH & IJ

Freq(Hz): 30.974

Loop: 3 Line: 2500N

Ch1 reduced. Ch1 normalized. Totals:P- 1751M./L- 1801M. Line Azim.: 250 . Rx Label: 25



ESTELLA COMINCO

Op: DJH & IJ Freq(Hz): 30.974

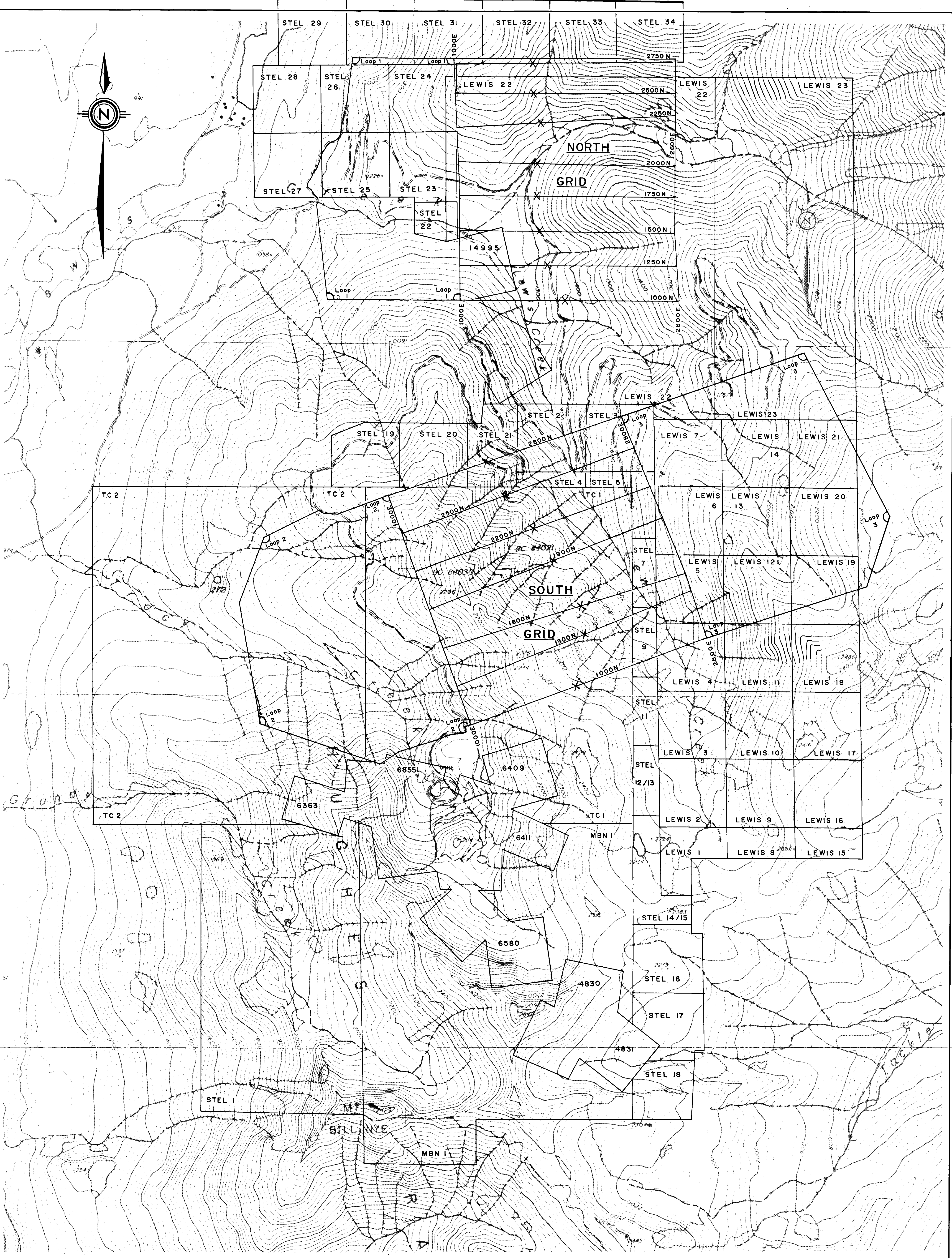
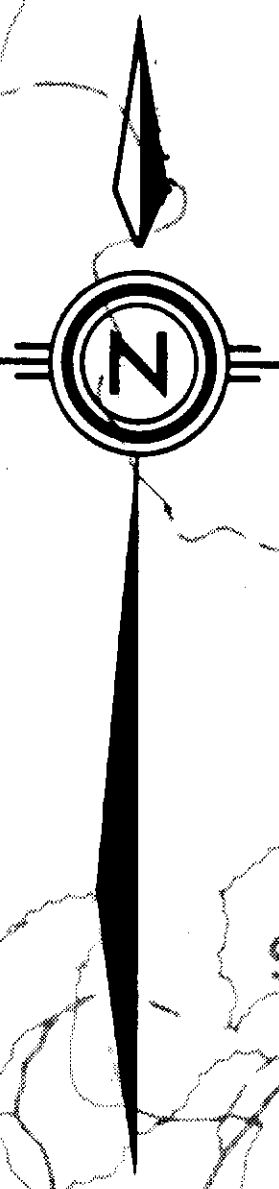
Ch1 reduced. Ch1 normalized. Totals:P- 1733M./L- 1767M. Line Azim.: 250 . Rx Label: 28

Hz

DS 19

Loop: 3 Line: 2800N





GEOLOGICAL BRANCH  
ASSESSMENT REPORT

20,554

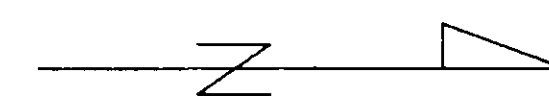
ESTELLA PROPERTY

CLAIM and GRID MAP  
Ft. STEELE M.D., B.C.

Scale 1:10,000 Date NOV. 1990 Plate 381-90-2



150.00  
Hz (gemme)



0 50 100 200 NETRI

20,554

NTS  
82G/13

DRAWN BY:		TRACED BY:		1990 MAG SURVEY NORTH GRID AREA 57700 gamma removed	
DATE	TIME	DATE	TIME		
SCALE: 1" = 2500'		DATE: AUG 1990		PLATE: 381-90-3	